The Role of Investability Restrictions on Size, Value, and Momentum in International Stock Returns

by

G. Andrew Karolyi and Ying Wu*

Abstract

Using monthly returns for over 37,000 stocks from 46 developed and emerging market countries over a two-decade period, we test whether empirical asset pricing models capture the size, value, and momentum patterns in international stock returns. We propose and test a multi-factor model that includes factor portfolios based on firm characteristics and that builds separate factors comprised of globally-accessible stocks, which we call "global factors," and of locally-accessible stocks, which we call "local factors." Our new "hybrid" multi-factor model with both global and local factors not only captures strong common variation in global stock returns, but also achieves low pricing errors and rejection rates using conventional testing procedures for a variety of regional and global test asset portfolios formed on size, value, and momentum.

First Version: November 23, 2011.
This Version: April 20, 2012.
Key words: International asset pricing; investment restrictions; cross-listed stocks.
JEL Classification Codes: F30, G11, G15.

* Karolyi is Professor of Finance and Economics and Alumni Chair in Asset Management at the Johnson Graduate School of Management, Cornell University and Wu is a Ph.D. student, Department of Economics, Cornell University. We are grateful for detailed comments from Ken French, for useful conversations with Vihang Errunza, Gene Fama, John Griffin, Kewei Hou, Bong-Chan Kho, Robert Kieschnick, Paolo Pasquariello, Richard Roll, Bernell Stone, René Stulz, Harry Turtle, Hao Wang, and for feedback from workshop participants at BYU, Cheung Kong, Cornell, Florida International, Laval, SMU, UT Dallas, Tsinghua, and the 2011 Australasian Banking and Finance Conference. Financial support from the Alumni Professorship in Asset Management at Cornell University is gratefully acknowledged. All remaining errors are our own. Address correspondence to: G. Andrew Karolyi, Johnson Graduate School of Management, Cornell University, Ithaca, NY 14853-6201, U.S.A. Phone: (607) 255-2153, Fax:(607) 254-4590, E-mail: gak56@cornell.edu

I. Introduction

Whether securities are priced locally in segmented markets or globally in a single integrated market is an enduring question in international asset pricing, and one that has been reviewed by Karolyi and Stulz (2003). The liberalization of financial markets around the world has increased market accessibility for global investors, but many indirect barriers, such as political risk, differences in information quality, legal protections for private investors and market regulations, can still inhibit full market integration.

Early empirical tests focused on whether market or consumption risks are priced locally or globally, following predictions made by the seminal international asset pricing models of Solnik (1974), Grauer, Litzenberger and Stehle (1976), Sercu (1980), Stulz (1981), and Errunza and Losq (1985). In the past decade, however, focus has shifted to the role of firm characteristics, such as size, book-to-market-equity ratios, cash-flow-to-price ratios, and momentum, in pricing securities in global markets. And an important debate has emerged over whether the explanatory power of these characteristics arises locally or globally. Griffin (2002) studies a global variant of the three-factor model similar to that of Fama and French (1993, 1998), which includes a market factor, a size factor and a book-to-market-equity factor for four countries (U.S., U.K., Canada, and Japan). He finds that only the local, country-specific components of the global factors are able to explain the time-series variations in the stock returns and multi-factor models built from local factors only generally outperform those built from global factors with lower pricing errors. These findings are important because studies advocate for models that incorporate both local and foreign components of factors based on firm characteristics (Bekaert, Hodrick, and Zhang, 2009).

The debate has further advanced with newer, more broad-based evidence in two recent studies. Hou, Karolyi, and Kho (HKK, 2011) examine the relative performance of global, local, and what they call "international" versions of various multifactor models to explain the returns of industry and characteristics-sorted test portfolios in each country. The international versions of their models represent a "hybrid" factor structure that includes separately local, country-specific factors as well as foreign factors built from stocks outside the country of interest. They find that the international versions of these multifactor models have much lower pricing errors than the purely local and global versions.[1] They recommend that the foreign components of these factors are as important as local components for pricing global stocks. Fama and French (2011), however, show that a global multi-factor model performs only passably for average returns on global size/book-to-market ratios ("B/M" hereafter) and size/momentum portfolios, and it works poorly when asked to explain average returns on regional (for North America, Europe, Japan, Asia-Pacific) size/B/M or size/momentum portfolios. They test hybrid models following the methods in Griffin (2002) and HKK (2011) but find that the improved performance in terms of explanatory power and lower pricing errors over the strictly local versions of the model (for which they deem the performance only passable) is negligible.

In this paper, we make an important contribution to this debate. We propose and test a new multi-factor model based on firm characteristics that builds *separate* factor portfolios comprised of only globally-accessible stocks, which we call "global factors," and of locally-accessible stocks, which we call "local factors." Our new "hybrid" multi-factor model with both global and local factors not only captures strong common variation in global stock returns, but also achieves low pricing errors and rejection rates using conventional testing procedures for a variety of regional and global test asset portfolios formed on size, value, and momentum. Relative to a purely global factor model for global test asset portfolios, the increase in explanatory power is substantial and the reduction in average absolute pricing errors can be large; these gains are even larger for tests that include microcap stocks, that focus on global test asset portfolios that exclude North America and that include a momentum factor in the model. Relative to purely local factor models for regional test asset portfolios, the pricing errors and model rejection rates for the hybrid model are similar, except for emerging market test asset portfolios for which the hybrid model's pricing errors and rejection rates are much lower.

[1] HKK (2011) also show that the international version of their proposed multifactor model with the market factor, a value factor constructed from cash-flow-to-price ratios, and a momentum factor (following Jegadeesh and Titman, 1993; Rouwenhorst, 1998; Griffin, Ji, and Martin, 2003; and, Asness, Moskowitz, and Pedersen, 2009) provides the lowest average pricing error and rejection rates among various versions of competing multifactor models.

Our experiment examines monthly returns for over 37,000 stocks from 46 countries over a two-decade period. The intuition for this novel multi-factor structure comes from international asset pricing models that account for barriers to international investment and from the empirical studies that validate them.[2] In particular, Errunza and Losq (1985) define a two-country world with two sets of securities: all securities traded in the "foreign" market are eligible for investment by all investors ("globally accessible"), but those traded in the "domestic" market are ineligible and can only be held by domestic investors ("locally accessible"). These restrictions define the expected return on one of the ineligible securities as a function of a global market risk premium (i.e., a global CAPM) plus a "super risk premium" which is proportional to the conditional local market risk. The condition under which local market risk is priced depends on the availability of substitute assets that may offer the same diversification opportunities as with the ineligible securities. The model can reduce to the two polar cases of full integration or full segmentation and, most importantly, allows for intermediate cases in between so that both global and local risks can be priced. Though this model is derived in the context of the CAPM, we seek to extend the same intuition (without formal theoretical justification) to extra-market factors based on firm-specific attributes like size, value and momentum.

How we define the set of globally-accessible ("eligible") and locally-accessible ("ineligible") stocks is critical for our exercise. Accessibility, or investability, refers to the ability of global investors to access certain markets and securities in those markets, so any definition should include consideration of openness (limits on foreign equity holdings), as well as liquidity, size, and float at the market and individual security level. We choose to define globally-accessible stocks in our equity universe as those for which shares are actively traded in the markets fully open to global investors, whether they are listed in their domestic exchange or secondarily cross-listed on exchanges outside of their main listing in their country of domicile. Locally-accessible stocks are, therefore, those that are only traded in their respective home markets. Again, our inspiration for this particular experimental choice comes from extensive

[2] Among many others, we include Stulz (1981), Errunza and Losq (1985), Eun and Janakiramanan (1986), Bodurtha (1999), Chaieb and Errunza (2007), and Errunza and Ta (2011), and extensive empirical evidence in Bekaert and Harvey (1995), Errunza, Hogan, and Hung (1999), de Jong and de Roon (2005), Carrieri, Errunza, and Hogan (2007), and Pukthuanthong and Roll (2009), and Bekaert, Harvey, Lundblad, and Siegel (2011).

research on risk and return attributes and institutional features of internationally cross-listed stocks.[3] Some studies (Foerster and Karolyi, 1993, 1999; Errunza and Miller, 2000) show that the systematic risk exposures of these stocks change dramatically and permanently around their secondary listings: local market betas (measured relative to local market proxies) decline and foreign market betas (measured relative to global market proxies) rise. Newly globally accessible, these cross-listed stocks are much more likely to be held and traded by institutional investors in the U.S. and around the world (Ferreira and Matos, 2008).

In our hybrid multi-factor model, global factor portfolios for the market, size, value and momentum are constructed from globally-accessible stocks, while local factor portfolios for the market, size, value and momentum are constructed from locally-accessible stocks that are listed and traded only in their home markets.[4] The locally-accessible stocks are constructed from among the stocks that are not globally accessible *in the region* in which our model is seeking to explain the cross-section of average returns. That is, they include only those that are listed and traded in their home markets. This is different from the construction of factors for the international models in Griffin (2002), HKK (2011), as we reassign what would be local stocks in their local factors to the global factors if those stocks are deemed globally accessible by our definition.

There are, of course, other ways in which stocks can become globally accessible, such as being included in a closed-end country fund, or in one of Morgan Stanley Capital International (MSCI) or Standard & Poor's (S&P) global indexes (especially, in their investable indexes for emerging markets). Indeed, if they do not face insurmountable or costly foreign investment restrictions that preclude them from doing so, many institutions do hold shares of foreign stocks in their home markets even if they are

[3] Consider, among many others, studies by Foerster and Karolyi (1993, 1999), Bodurtha (1994), Errunza, Hogan, and Hung (1999), Errunza and Miller (2000), Bekaert, Harvey, and Lumsdaine (2002), Doidge, Karolyi, and Stulz (2004), Carrieri, Errunza, and Hogan (2007), and Carrieri, Chaieb, and Errunza (2011). Karolyi (2006) provides a survey of the cross-listing literature.

[4] We will define the globally accessible set to include stocks that secondarily cross-list their shares on one of seven different target markets: the U.S. on one of the major exchanges, New York Stock Exchange (NYSE), American Stock Exchange (AMEX) or Nasdaq, or on the over-the-counter (OTC) markets), the U.K. on the London Stock Exchange, London OTC, or SEAQ International, Euronext Europe, Germany, Luxembourg, Singapore, or Hong Kong. We later discuss the rationale behind this set of target markets.

not secondarily cross-listed elsewhere. Though narrow in its definition, we prefer to consider only those stocks in fully-open markets and among secondary cross-listings for our globally-accessible set because of clear identification as well as the timing of the listing event. We also explore the robustness of our findings to several alternative definitions of global accessibility, such as additional restrictions that account for how actively the cross-listed shares are traded.

Our paper differs in scope from that of Fama and French (2011) in that we incorporate into our analysis more than 11,000 stocks from 23 emerging markets. In fact, we include the emerging markets as one of the regions in which we evaluate how well our hybrid multi-factor model performs for size, value, and momentum test asset portfolios. Expanding our analysis into emerging markets is important because it is there that investability restrictions are most likely to bind. We expect that this is where a global or hybrid model is likely to face the greater challenge relative to a purely-local factor model. Like Fama and French (2011), we provide evidence for size groups. Our sample, like theirs, covers all size groups, and indeed very small, microcap stocks produce challenging results (Fama and French, 2008). We control for the potential influence of microcap stocks globally and in each region by performing our tests with and without the extremely-small test asset portfolios and also by building the factor portfolios using value and momentum breakpoints using the top 90% of market capitalization in each region to limit their influence.

Section II outlines the experiment. Section III describes our global equity universe, the globally-accessible and locally-accessible sets, and furnishes summary statistics. The construction of the factor portfolios and test assets are outlined in Section IV and our main results follow in Section V. Section VI describes several robustness tests and Section VII concludes the paper.

II. The Design of the Experiment

Fama and French (1993) propose a three-factor model to capture the patterns in U.S. average returns associated with size and value versus growth,

$$R_{it} - R_{ft} = \alpha_i + \beta_i (R_{mt} - R_{ft}) + s_i F_{Size,t} + h_i F_{B/M,t} + \varepsilon_{i,t} \quad (1)$$

In this regression, R_{it} is the return on asset i in month t, R_f is the risk free rate, R_{mt} is the market return, $F_{Size,t}$ is the difference between the returns of diversified portfolios of small stocks and big stocks (F denotes a factor portfolio), and $F_{B/M,t}$ is the difference between the returns on diversified portfolios of high B/M (value) stocks and low B/M (growth) stocks. Model (1) is motivated by observed patterns in returns and the authors (Fama and French), as well as those of us who follow their lead, readily acknowledge that they try to capture the cross-section of expected returns without specifying the underlying economic model that governs asset pricing. The null hypothesis is that the slope coefficients (β_i, s_i, h_i) and the associated factor portfolio returns capture the cross-section of returns, so we test whether the intercepts equal zero for all test assets. This test is akin to the mean-variance spanning tests of Huberman and Kandel (1987). For a given set of test asset portfolios, we judge each model based on its explanatory power, the magnitude of model pricing errors (the absolute magnitude of the intercepts), and the Gibbons, Ross, and Shanken (GRS, 1989) F-test statistic for the hypothesis that the intercepts are jointly equal to zero across the test assets of interest. We also follow Lewellen, Nagel, and Shanken (2010) by computing a core component of the GRS statistic, denoted $SR(\alpha)$,

$$SR(\alpha) = [\alpha' S^{-1} \alpha]^{1/2} \tag{2}$$

where α is the vector of regression intercepts produced by Model (1) across a set of test asset portfolios. S is the covariance matrix of regression residuals.[5]

Fama and French (2011) build the global and local versions of model (1) for global and local stock returns, respectively:

$$R_{it} - R_{ft} = \alpha^G{}_i + \beta^G{}_i\,(R^G{}_{mt} - R_{ft}) + s^G{}_i\,F^G{}_{Size,t} + h^G{}_i\,F^G{}_{B/M,t} + \varepsilon_{i,t} \tag{3a}$$

$$R_{it} - R_{ft} = \alpha^L{}_i + \beta^L{}_i\,(R^L{}_{mt} - R_{ft}) + s^L{}_i\,F^L{}_{Size,t} + h^L{}_i\,F^L{}_{B/M,t} + \varepsilon_{i,t}. \tag{3b}$$

The superscript "G" on the market and factor portfolios implies that they are constructed from all stocks around the world and the superscript designation of "L" on the market and factor portfolios implies that

[5] Gibbons, Ross, and Shanken (1989) relate $SR(\alpha)^2$ to the difference between the square of the maximum Sharpe ratio for the portfolios constructed from the test asset portfolios and factor portfolios and that constructed from the factor portfolios alone. As Fama and French (2011) argue, the advantage of this statistic is that it combines the regression intercepts with a measure of their precision captured by the covariance matrix of the regression residuals.

they are constructed only from local - or regional, in our experiments - stocks. Extending the experiment in this way is naturally complicated by the fact that asset pricing globally or even in a particular region may not be fully integrated.

To capture the impact of investability restrictions on global investing, we propose a new hybrid model based on the Fama-French three-factor model,

$$R_{it} - R_{ft} = \alpha^{H}_{i} + \beta^{A}_{i} (R^{A}_{mt} - R_{ft}) + s^{A}_{i} F^{A}_{Size,t} + h^{A}_{i} F^{A}_{B/M,t}$$
$$+ \beta^{\bar{A}-A}_{i} R^{\bar{A}-A}_{mt} + s^{\bar{A}-A}_{i} F^{\bar{A}-A}_{Size,t} + h^{\bar{A}-A}_{i} F^{\bar{A}-A}_{B/M,t} + \varepsilon_{i,t}, \quad (4)$$

where the superscript "H" denotes the intercept for the hybrid model, the superscript "A" denotes a market or factor portfolio comprised of stocks only in the globally-accessible sample, and the superscript "Ā-A" denotes a spread factor portfolio of purely-local stocks in a given region (represented by "Ā") relative to that of the globally-accessible sample ("A"). For example, $F^{\bar{A}-A}_{Size,t}$ is the difference between the size-based factor portfolio of purely-local stocks in a region and that of the globally-accessible stocks. Each of the size-based factor portfolios are constructed as returns of diversified portfolios of small stocks and big stocks among the respective samples of stocks. The spread portfolios for the market factor ($R^{\bar{A}-A}_{mt}$) and the value-based factor ($F^{\bar{A}-A}_{B/M,t}$) are built in a similar fashion.

Our second experiment examines whether the empirical validity of the hybrid model is influenced by the purely mechanical way in which we construct the globally-accessible and purely-local subsamples. We adjust the investment opportunity set by gradually imposing a variety of "viability constraints" on the globally accessible sample. That is, we require that the stocks in the globally accessible sample qualify by meeting certain minimum thresholds of trading volume in the target markets for the secondary cross-listing. In comparing the performance of the hybrid model in which the global factors are built in different ways, we still find reliable evidence about the explanatory power of the hybrid model in explaining returns in both global and regional test asset portfolios.

In our third and final experiment, we investigate whether the cross-sectional explanatory power of the hybrid model is specific to the Fama-French three-factor model in explaining the portfolios sorts on size and B/M. Carhart (1997) proposes a four-factor model for U.S. return in order to capture momentum,

$$R_{it} - R_{ft} = \alpha_i + \beta_i (R_{mt} - R_{ft}) + s_i F_{Size,t} + h_i F_{B/M,t} + m_i F_{Mom,t} + \varepsilon_{i,t}, \qquad (5)$$

which is Model (1) enhanced with a momentum return, $F_{Mom,t}$ is the difference between the month t returns on a diversified portfolios of the winners and losers of the past year. Similarly, we test a hybrid model based on the Carhart's four-factor model,

$$R_{it} - R_{ft} = \alpha^H{}_i + \beta^A{}_i (R^A{}_{mt} - R_{ft}) + s^A{}_i F^A{}_{Size,t} + h^A{}_i F^A{}_{B/M,t} + m^A{}_i F^A{}_{Mom,t}$$
$$+ \beta^{\bar{A}-A}{}_i R^{\bar{A}-A}{}_{mt} + s^{\bar{A}-A}{}_i F^{\bar{A}-A}{}_{Size,t} + h^{\bar{A}-A}{}_i F^{\bar{A}-A}{}_{B/M,t} + m^{\bar{A}-A}{}_i F^{\bar{A}-A}{}_{Mom,t} + \varepsilon_{i,t}, \qquad (6)$$

which is Model (4) extended by two momentum factor portfolio returns, $F^A{}_{Mom,t}$ for the globally-accessible stocks and $F^{\bar{A}-A}{}_{Mom,t}$, for the spread portfolio of locally-accessible stocks net of those for the globally-accessible stocks.

III. Data and Summary Statistics

A. The Global Equity Universe

We obtain U.S. dollar-denominated stock returns and accounting data from Datastream and Worldscope. To ensure that we have a reasonable number of firm-level observations in each country, the sample period begins in November 1989 and ends in December 2010, which encompasses the widest coverage in the Worldscope database. Our final sample of the global equity universe includes 37,399 stocks from 46 countries. To ensure that there are sufficient numbers of stocks in each test asset portfolio, as in Fama and French (2011), 23 developed markets are combined into four regions: (i) *North America (NA)*, including the U.S. and Canada; (ii) *Japan*; (iii) *Asia Pacific*, including Australia, New Zealand, Hong Kong, and Singapore (but not Japan); and (iv) *Europe*, including Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the U.K. And the remaining 23 countries are combined into *Emerging Markets*, the fifth region in our tests; it includes Israel, Turkey, Pakistan, South Africa, Czech Republic, Poland, Hungary, Russia, China, India, Indonesia, Malaysia, Philippines, South Korea, Taiwan, Thailand, Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela. We construct test asset portfolios for each of these five regions and for four global experiments: all global markets, developed markets, global markets excluding North America, and developed markets excluding North America.

We require each firm's home country to be clearly identified in the database. Financial firms are excluded from the study due to their different characteristics. We also exclude depositary receipts (DRs), real estate investment trusts (REITs), preferred stocks, and other stocks with special features.[6] For most countries, we restrict the sample to stocks from major exchanges, which we define as the exchanges on which the majority of stocks in that country are listed. However, multiple exchanges are included in samples for China (Shanghai Stock Exchange and Shenzhen Stock Exchange), Japan (Osaka Stock Exchange, Tokyo Stock Exchange, and JASDAQ), Russia (MICEX and Russian Trading System), South Korea (Korea Stock Exchange and KOSDAQ), Canada (Toronto Stock Exchange and TSX Ventures Exchange), and U.S.(NYSE, AMEX and NASDAQ). To limit the effect of survivorship bias, we include dead stocks in the sample.

To reduce errors in Datastream, we follow several screening procedures for monthly returns as suggested by Ince and Porter (2003) and HKK (2011). First, any return above 300% that is reversed within one month is set to missing. Specifically, if R_t or R_{t-1} is greater than 300%, and if $(1+ R_t) \times (1+ R_{t-1}) - 1 \leq 50\%$, then both R_t and R_{t-1} are set to missing. Second, in order to exclude remaining outliers in returns that cannot be identified as stock splits or mergers, we treat as missing the monthly returns that fall out of the 0.1% and 99.9% percentile ranges in each country. Third, included firms are required to have at least 12 monthly returns during the sample period.

Additionally, we require the availability of the following financial variables for at least one firm-year observation: market value of equity ("Size" hereafter), B/M, and cash flow to price ("C/P" hereafter). To make sure that the accounting ratios are known before the returns, we match the financial statement data for fiscal year-end in year *t-1* with monthly returns from July of year *t* to June of year *t+1*. We take

[6] We drop stocks with name including "REIT", "REAL EST", "GDR", "PF", "PREF", or "PRF" as these terms may represent REITs, GDRs, or preferred stocks. We drop stocks with name including "ADS", "CERTIFICATES", "RESPT", "Rights", "Paid in", "UNIT", "INCOME FD", "INCOME FUND", "HIGH INCOME", "INC.&GROWTH", "INC.&GW", "UTS", "RTS", "CAP.SHS", "SBVTG", "STG.SAS", "GW.FD", "RTN.INC", "VCT", "ORTF", "HI.YIELD", "GUERNSEY", "DUPLICATE", "DUAL PURPOSES", and "NOT Rank for Dividend" due to various special features. A number of additional country-specific screening rules are applied.

the inverse of the price-to-book ratio (WC09304) and the price-to-cash flow ratio (WC09604) to calculate the ratios of B/M and C/P, respectively. We do not use negative B/M (or C/P) stocks when calculating the breakpoints for B/M (or C/P) or when forming the size/B/M (or size/C/P) portfolios.

Figure 1 exhibits the distribution of our global equity universe across regions over the period from 1990 to 2010, reported by total market capitalization. On average, North America, Europe, Japan, Asia Pacific, and the Emerging Markets account for 43.13%, 25.50%, 13.44%, 4.45%, and 13.49% of global market capitalization. Figure 2 offers a slightly different picture based on the total number of stocks. North America constitutes one-quarter of the sample population, higher than Europe (23.08%), Japan (11.50%), and Asia Pacific (10.47%) but lower than the Emerging Markets (29.72%). Proportionally more large-cap stocks are concentrated in North America, especially the U.S. In contrast, proportionally more of the stocks from Asia Pacific and Emerging Markets are small cap stocks. In addition, Figures 1 and 2 show the distribution of our global equity universe across countries within each region. Among the countries in Europe, the average size of stocks in the Netherlands, Spain, and Switzerland are larger than those in Greece, Sweden, and the U.K. Hong Kong accounts for 40.62% of all market capitalization in Asia Pacific but only constitutes 24.96% of the sample population in the region. Most of the stocks in Emerging Markets are from Asia, either by count or by total market capitalization. The average size of stocks varies substantially across emerging market countries, with greater values for Mexico, Brazil, Russia, and China.

Figure 3 shows the sample over time and breaks it down by regions. There are some differences in the evolution of counts and total market capitalization. The counts steadily increase from around 10,000 in 1990 to a peak of almost 28,000 in 2008. Especially, the count in Emerging Markets has jumped from less than 2,000 in 1990 to nearly 9,500 in 2009. In contrast to these counts, global market capitalization has less steady growth. It rises from US$7 trillion in 1990 to a peak of US$26 trillion in 2000. It falls after 2000 before reaching another peak of almost US$40 trillion in 2007. In the most recent two years, it rises again to reach US$34 trillion in 2010.

Table 1 presents summary statistics of total counts and other firm-level characteristics for each country. We report the time-series averages of median size, B/M, C/P, and momentum ("Mom" hereafter). There is considerable cross-country variation in the average median B/M, but much less for C/P. Mom for month *t* is the cumulative return for *t-11* to *t-1*, skipping the sort month *t*. The first momentum sort absorbs one year of data, so the sample period for Mom is November 1990 through December 2010. Among all the countries in our sample, Mom ranges from a low of -2.19% (Japan) to highs of 40.97% (Poland), 37.17% (Russia), and 26.48% (China).

B. The Globally Accessible Sample and Purely Local Sample of Stocks

We categorize stocks into two subsets based on accessibility or investability constraints as defined by whether or not the stock is actively traded in the markets fully open to global investors. Ultimately, we identify a set of over 5,700 stocks accessible to global investors by being cross-listed in major developed markets; another group of around 32,000 individual stocks are locally accessible to domestic investors. We acknowledge that previous studies have used global industry portfolios, closed-end country funds, and the investable indices in emerging markets as globally-accessible assets used to replicate returns on only locally accessible assets (e.g., Bekaert and Urias, 1996; Carrieri, Chaieb and Errunza, 2008, 2011; Errunza and Ta, 2011). In this study, by contrast, we focus on the impact of the market openness and the secondary cross-listing on the size, value, and momentum patterns in international stock returns to keep the accessibility criteria as transparent as possible.

We require that the stocks in the globally accessible sample need to be listed in the markets which are fully open to global investors or to be secondarily cross-listed in those as target markets. Within those target markets, we include secondary listings from overseas that can trade on many different venues or platforms. We confine the list to seven target markets: (i) *the U.S.*, which includes NYSE/AMEX, NASDAQ, and the Non-NASDAQ OTC markets;[7] (ii) *the U.K.*, which includes the London Stock

[7] Non-Nasdaq OTC markets include both the OTC Bulletin Board, an interdealer electronic quotation system and the OTC Markets Group, for which its OTCQX International trading platform is designed for listings from overseas.

Exchange, London OTC Exchange, London Plus Market, and SEAQ International;[8] (iii) *Europe*, which includes Euronext at Amsterdam, Brussels, Lisbon, Paris, and EASDAQ;[9] (iv) *Germany* in which the Frankfurt Stock Exchange is located; (v) *Luxembourg* in which the Luxembourg Stock Exchange is located; (vi) *Singapore*, which includes the Singapore Stock Exchange, Singapore OTC Capital, and Singapore Catalist;[10] and (vii) *Hong Kong* in which the Hong Kong Stock Exchange is located. The distinguishing feature of these target exchanges is that they are fully open to global investors, having minimum foreign investment restrictions and reasonably active trading in foreign cross-listed issues. We try to strike a balance between obtaining maximum breadth of stock exchange platforms accessible for international investors and avoiding problems related to differences in cross-listing trading mechanisms and conventions. For the Frankfurt Stock Exchange and OTCQX International trading platforms, for example, there are "unregulated" cross-listed stocks alongside the "regulated" cross-listed stocks, in which trading takes place without the sponsorship of the company.[11] We include both unregulated and regulated cross-listings in Frankfurt and OTCQX International.

The appendix describes the procedure for constructing the sample of globally accessible stocks. Our sample construction begins with all non-domestic stocks listed in the target exchanges. From the list containing over 30,000 stocks, we select those with available records of home market and a parent code in the database so that the cross-listed stocks in the target exchanges can be matched with their parent stocks

[8] The London Plus Stock Exchange (www.plusmarketsgroup.com) is a London-based stock exchange providing cash trading and listing services and regulated under the auspices of the Markets in Financial Instruments Directive (2004/39/EC, "MiFiD"), a European Union (EU) law providing for harmonized investment services in the EU. London OTC trading falls under the auspices of the London Stock Exchange (LSE) Group (www.londonstockexchangegroup.com) and is done under MiFiD with the exchange furnishing trade reporting and publication services. The Stock Exchange Automated Quotation (SEAQ) International is the LSE's electronic price quotations system for non-U.K. securities.

[9] EASDAQ was an electronic securities exchange based in Brussels founded originally as an equivalent to Nasdaq in the U.S., was purchased by the American Stock Exchange in 2001 and then shut down in 2003.

[10] See www.sgx.com for details on main board versus Catalist listing requirements. Like the Alternative Investment Market in the U.K., a listing applicant must be sponsored by an approved sponsor of Catalist and must satisfy some disclosure and performance requirements. Singapore's OTC Capital (www.otccapital.com) is an unaffiliated trading platform for shares of unlisted public companies.

[11] If a company is already listed on an approved foreign stock exchange ("Like Exchanges"), it is exempt from the primary registration rules and can be dual listed on the Frankfurt Stock Exchange without an underwriter. There are over 200 such "Like Exchanges" approved by the Frankfurt Stock Exchange (www.franfurtstockexchange.de). Given the looser regulation on the Frankfurt Exchange unregulated program, we perform a robustness check to assure that the inclusion of the Frankfurt Stock Exchange does not affect our results.

listed in the home market. Because there are a few mismatches in Datastream, we verify the matching records. We correct the mismatched records for the cross-listed stocks if their true parent equities can be found in the global universe sample, keep those that have no parent equities but are only listed on the target exchanges, and drop those whose true parent equities are missing in the database. To ensure the validity of the sample, we drop the stocks whose Return Index (RI) records are not available in the database.[12] Furthermore, if one stock is cross-listed on more than one target exchange within the same target market, these multiple records are consolidated into one record. The sample at this point contains 22,612 stocks. Similar to the global equity universe, we exclude financial firms and confine the sample to firms from 46 countries and with available company account items from Worldscope. We then have 11,319 stocks secondarily cross-listed on at least one of the target markets. We then add domestic stocks from the seven target markets as long as three criteria are satisfied: they are among those stocks in the top 75% of market capitalization for the market; they have a minimum price of U.S. $5 and equivalent levels in terms of percentile rank for non U.S. markets; and, they are among those stocks with a minimum 75% public float for listed stocks. These filters render a sample of 11,057 stocks which we label as "CL1" to denote the first group of cross-listed stocks.

To construct our final sample, we impose additional restrictions on how actively the secondarily cross-listed shares are traded, which we call our "viability" constraints. We only drop the cross-listed stocks for which trading in the target markets is too limited to be viably accessible for global investors. For each secondarily cross-listed stock in CL1, we compare (a) its monthly trading in the target markets with the total trading of all secondarily cross-listed stocks from the same country (using VA, turnover by value, from Datastream) and (b) its monthly trading volume (VO, turnover by volume, from Datastream) in the target markets relative to that of the same stock in the home market. The first viability constraint evaluates the annual percentage of its trading in target markets relative to all secondarily cross-listed stocks from the same country trading there. If the time-series average of the annual percentages during the

[12] To limit the effect of survivorship bias, we include dead stocks in the sample. For both dead and active stocks, we confirm their effective ending months according to two criteria: (i) consecutive constant RIs from the month until the end of the period, December 2010; and, (ii) zero trading volume from the month until the end of the period. If one stock has the same month for its base month and ending month, the stock is excluded from the sample.

sample period is required to be at least 0.5%, there are nearly 900 stocks that qualify, many of which are the most popularly traded stocks for global investors. For the stocks that fail to meet our first viability criterion, we use a second one based on the annual percentage of its own global trading volume in any of the target markets (Baruch, Karolyi, & Lemmon, 2007). If the time-series average of these annual percentages during the sample period is required to be at least 0.1%, there are around 5,300 stocks left in the sample. Merging these two cross-listed sets of stocks and qualified domestic set of stocks from the target markets leaves 5,747 stocks, which we call the "Main CL Sample."

Figure 4 presents its distribution across regions over the period from 1990 to 2010, reported by total market capitalization. On average, North America (47.66%) and Europe (29.56%) constitutes the bulk of the total market capitalization in the Main CL Sample, followed by Japan (10.50%), the Emerging Markets (8.49%), and Asia Pacific (3.79%). The cross-listed stocks constitute a significant fraction of the overall market capitalization in each home region (compare with Figure 1). By count, North America, Europe, Japan, Asia Pacific, and Emerging Markets represent 44.95%, 23.56%, 3.43%, 13.66%, and 14.41% of the sample population, respectively (shown in Figure 5). Figures 4 and 5 also exhibit the distribution of Main CL Sample stocks across countries within each region. In Europe, stocks from France, Germany, the Netherlands, and Switzerland are more likely to have shares secondarily cross-listed overseas but stocks from Austria, Greece, and the U.K. tend to stay in their home markets. In Asia Pacific, Hong Kong stocks are over-represented in the Main CL Sample relative to the global equity universe. Among emerging market countries, equities from China, India, and Taiwan are more likely to stay at home. On the other hand, equities from Russia, Mexico, and South Africa tend to go abroad.

Figure 6 illustrates the total market capitalization and the total number of the globally accessible sample, represented by the Main CL Sample, and breaks them down by regions *and* by year. The total count increases from less than 1,000 in the early 1990s to a peak of 4,123 in 2009 and then falls to 4,088 in 2010. In contrast to the counts, total market capitalization, as well as the market capitalizations from each region, has experienced more volatility over the period, reaching peaks in 2000 and 2007.

Figure 6 also shows the distribution of Main CL stocks by each *target market* and by year. Most notably, the U.S. as a target market for internationally cross-listed stocks is more resilient than those in the U.K., Europe, and Germany, either by count or by market capitalization. Annual counts in the U.K. reach a peak of 670 in 2007 and decrease steadily to 347 in 2010. For Europe, the number of cross-listed stocks never goes up above 450 and it decreases steadily from 450 in 2001 to 261 in 2010. For the Frankfurt Stock Exchange, the annual count increases significantly from less than 270 in the early 1990s to 2,917 in 2008, but it falls during the most recent two years until down to 2,845 in 2010. Distinct from these markets, NYSE/AMEX, Nasdaq and the Non-Nasdaq OTC markets have attracted more foreign stocks cross-listed. Even after the 2008 financial crisis, the count is steadily rising from 2,087 in 2007 to 2,529 in 2010 (Iliev, Miller, and Roth, 2011). Although all target markets have shrunk in size around 2008, the cross-listed market capitalization in the U.S. drops by 28.01% from 2007 to 2009, much less than the 61.09% in the U.K., 48.31% in Europe, and 30.66% in Germany.

In addition to the Main CL Sample, we construct and evaluate two other definitions for the globally accessible sample, together with CL1, to ensure the reliability of the hybrid model we propose. First, we introduce an *absolute* viability constraint: for each stock in CL1 in a given year, if there is at least one month of non-zero trading in the target markets, the stock is included in the globally accessible sample for that year. The resulting sample has 9,605 stocks and is labeled "CL2a." Second, we consider more stringent screening on the two viability constraints: the screening ratios are up to 5% for the first relative viability constraint and 1% for the second one. Another new sample, denoted "CL2b," then contains 4,058 stocks. For each globally accessible sample, we group the stocks left in each respective region as the purely local set. Summary statistics on total counts and firm-level characteristics for the Main CL Sample are provided in Appendix Tables 1 and 2 (appendix tables are available upon request).

IV. Building Factor Portfolios and Test Assets

We follow Fama and French (1993, 2011) in constructing proxy factors as returns on zero-investment portfolios that go long in stocks with high values of a characteristic and short in stocks with low values of the characteristic. These factors are explanatory returns in our asset pricing regression models. We also follow Fama and French (2011) in constructing 5×5 size/B/M portfolios, the 5×5 size/momentum portfolios, and the 5×5 size/C/P portfolios that are used as test assets in our tests.

A. Building Factor Portfolios

Our first asset pricing tests are for 5×5 size/B/M portfolios and the explanatory returns are for 2×3 portfolios sorted on size and B/M. As in Fama and French (2011), at the end of each June from 1990 to 2010, we allocate stocks in one region to two size groups – small stocks and big stocks. Big stocks are those in the top 90% of market capitalization for the region, and small stocks are those in the bottom 10%. The only difference between our sorting breakpoints and those of Fama and French (2011) is related to the B/M breakpoints. Fama and French (2011) uses the 30^{th} and 70^{th} percentiles of B/M for the big stocks in each given region to avoid undo weight on micro-cap stocks. Value stocks are those with B/M ratios at or above the 70^{th} percentile, growth stocks, those with B/M ratios at or below the 30^{th} percentile, and the rest are neutral stocks. However, there are still differences in terms of accounting rule across countries within any one region. Given the fact that our globally accessible stocks are more likely to accept global standards for reporting that can be comparable across countries, we follow the line of reasoning in Fama and French (2011) and use the B/M breakpoints based on the big stocks in the globally accessible sample from each region to avoid sorts that are dominated by the less comparable and tiny stocks in the region.

The global explanatory returns are constructed from the globally accessible sample. Similar to Fama and French (2011) in constructing the global portfolios, we use a universal size breakpoint, but use each region's B/M breakpoints to allocate the globally accessible stocks. Beyond the global factor returns, the hybrid model includes local factor returns that are based on the purely local stocks from the region for which the test is performed relative to the globally accessible stocks. Fama and French (2008, 2011) document that microcap stocks pose a challenge for asset pricing models and suggest factor returns should not be dominated by small stocks. Small stocks constitute the major component of the purely local samples. So, if the size breakpoint is the bottom 10^{th} percentile of market capitalization of the purely local sample for each region, either the size factor or the value factor will be dominated by small stocks. Thus we follow Fama and French (2011) and use regional size cutoffs for the purely local portfolios. In addition, we adopt the same regional B/M breaks as in the globally accessible portfolios to avoid the microcap effect. Then, for each given region, the return spread factor portfolios of purely-local stocks relative to the globally-accessible stocks are the differences in the respective factor portfolio returns for the set of purely-local stocks in the region and for the globally-accessible stocks. For example, for the size-related spread factor portfolio, we compute the return difference between the factor portfolio for the locally-accessible stocks (measured, in turn, as the difference between an equally-weighted average of the small-growth, small-neutral, and small-value portfolios and an equally-weighted average of the big-growth, big-neutral, and big-value portfolios) and the globally-accessible stocks (measured similarly). The value- and momentum-related spread factor portfolios are built in the same way. The spread factor portfolios vary by region because the set of locally-accessible stocks from which they are built changes.

Another set of explanatory returns are 2×3 factor portfolios returns sorted on size and momentum, which will be introduced in our second asset pricing tests on size/momentum portfolios. The momentum factor, WML, is formed following Fama and French (1998, 2011) using a 12-month/2-month strategy where each month's return is the average return on the two high prior return portfolios minus the average return on the two low prior return portfolios. Similar to the size/B/M portfolios, the momentum breakpoints for the global explanatory returns are the 30th and 70th percentiles for the big stocks in the globally accessible sample from each region. And we use the regional momentum cutoffs based on big stocks for the given region when forming local explanatory returns. As in Fama and French (2011), the momentum breakpoints from each region are employed in forming global portfolios. In our third set of tests on size/C/P portfolios, we build the set of explanatory returns that are for 2×3 portfolios sorted on size and C/P. The explanatory return associated with C/P is constructed by the same way as HML.

Table 2 presents summary statistics for factor portfolio returns for all stocks in the equity universe, for the globally-accessible stocks and for the spread factor portfolios of locally-accessible relative to the globally-accessible stocks; they are reported separately for the global experiments (Panel A) and the regional experiments (Panel B). The market excess returns are similar in magnitude in North

America and Europe, but higher for the globally-accessible samples in three other regions and all four global experiments. The size premiums are always higher for the globally accessible samples everywhere likely because of the wider differences in size across regions than within regions. On the other hand, higher value premiums obtain for all stocks than either the globally- or locally-accessible subsets regardless of the region. In addition, Table 2 displays summary statistics for the local spread factor returns for each regional and global experiment. There are positive local market spread premiums in North America and Asia Pacific, but negative local market spread discounts in Europe, Japan and Emerging Markets. The global value spread premium, a respectable 0.40% (for B/M) and 0.44% (for C/P) on average per month, is statistically reliably different from zero over the sample period. For other global and most of the regional experiments, the value spread factor portfolio returns are also positive and statistically significant. As for momentum spread factor portfolio returns, that in Japan is as low as -0.96% per month (t statistic of -3.02), while that in Europe is as high as 0.35% (t statistic of 1.90). The correlations (unreported, but available in Appendix Tables 3 and 4) between the spread factor portfolio returns and the respective factor portfolios for the globally-accessible are, as expected, relatively low, whether for the global or regional experiments and for the size-, value- and momentum-related factors.

B. Building Test Assets

Our first set of asset pricing tests evaluates 5×5 size/B/M portfolios and we follow the method in Fama and French (2011). The size breakpoints for a region are the 3^{rd}, 7^{th}, 13^{th}, and 25^{th} percentiles of the region's aggregate market capitalization. The B/M breakpoints are defined by the 20^{th}, 40^{th}, 60^{th}, and 80^{th} percentiles for big stocks in the region. Table 3 displays the average excess returns and standard deviations for each set of 5×5 size/B/M test assets by global and regional experiment. Our results confirm the finding in Fama and French (2011) that the size pattern in value premiums poses a challenge for asset pricing models. The next two test assets are 5×5 size/momentum portfolios and 5×5 size/C/P portfolios. For the sake of brevity, average excess returns for these two types of test asset portfolios are reported in Appendix Tables 5 and 6.

V. Time-Series Regression Tests

Our first experiment involves time-series regression tests, as applied by Fama and French (1993, 1996, and 2011) and others, in which test assets are 5×5 size/B/M portfolios. We compare the performance of global, local, and hybrid versions of the Fama-French three-factor model. Our criteria for success consist of the explanatory power (average adjusted R^2 across the test asset portfolios), the GRS statistic, the Sharpe Ratio, $SR(\alpha)$, and summary statistics for the intercepts, including the difference between the highest and lowest regression intercepts ("H-L α") and the average absolute intercepts ("|α|").

A. Main Experiment

Table 4 reports regressions to explain excess returns on the 5×5 portfolios from the sorts on size and B/M. Appendix Tables 7 and 8 furnish details on the intercepts and their *t*-statistics, as well as the betas for the hybrid model based on the Fama-French three-factor model. Panel A of Table 4 summarizes the results for the global version of the Fama-French three-factor model. The global factor model offers adequate explanatory power for the global test asset portfolios, but fares poorly for the returns on regional size/B/M test asset portfolios. The average R^2 is 0.92 for the global portfolios, but it is lower (only 0.83) if North America is excluded. Among the five regional tests asset portfolios, the average R^2 reaches only as high of 0.72 for Europe and is as low as 0.32 for Japan. The GRS statistics for the Global portfolios (3.12 and 2.67, for Developed Markets only) are well into the right tail of the relevant *F*-distribution and the average absolute intercepts average 0.16% per month.

Part of the reason for the model rejections may arise from the poor explanatory power of the regressions, as we see that the GRS statistics for the Global portfolios excluding North America are much lower (1.27 overall, 1.58 for Developed Markets only). For the regional test asset portfolios, however, we have not only poor explanatory power, but also high GRS statistics beyond the 99^{th} percentile of the *F*-distribution (except for Japan and the Emerging Markets). Another possible reason for the high model rejection rates is the presence of extremely small stocks. In a separate part of Panel A, we also present the same statistics for only the 4×5 global test asset portfolios, excluding the five in the smallest size quintile.

There is modest improvement in average R^2 but the GRS statistics and their Sharpe ratio (*SR(α)*) core components are much lower.

Panel B of Table 4 reports results for the regressions of the purely local factor model in explaining excess returns on just the five regional test asset portfolios. Consistent with Fama and French (2011), our results indicate that the local three-factor model works well in Japan and Europe. Despite the fact that the GRS tests reject North America and Asia Pacific at the 99th percentile of the *F*-distribution, the purely local factor model performs better than the purely global factor model in all experiments, pushing up the average R^2s and lowering the average absolute intercepts. The microcap stocks in North America are still a challenge for the models; the GRS statistic without them is only 1.57, but then it rises to 2.12 if microcap stocks are included, which would constitute a rejection at the 99% level. For Emerging Markets, the purely local factor model works well if only judged by the GRS test. However, without a presumption of integrated pricing in the region, the power loss is significant with an average R^2 of only 0.65. The poor performance of the purely local factor model makes it useless for an application for which the focus is on emerging markets.

To now, we have re-established many of the key inferences from Fama and French (2011) for the three-factor model. Panel C of Table 4 presents the results of the new hybrid version of the Fama-French three-factor model. Our hybrid model works distinctly better than the purely global factor model for global test asset portfolio experiments. All the average R^2s are over 0.89 or even higher, with and without microcap stocks. The average absolute intercepts for all the five global test asset portfolios are 0.14% or less, without microcap stocks, and 0.15% or less, with microcap stocks included. The Sharpe ratios, *SR(α)*, for the intercepts drop for all four of the experiments. Consider, for example, that for the Global portfolios, the GRS statistic falls from 3.12 for the purely global factor model to 1.55 for the hybrid model. Excluding the microcap stocks, the hybrid model achieves yet a smaller GRS statistic, 0.92, below the 90th percentile of the relevant *F*-distribution. For the Developed Markets portfolios, shifting to the hybrid model pushes the average R^2 from 0.90 up to 0.95 without microcap stocks and from 0.89 to 0.95 with microcap stocks. It also lowers the average absolute intercepts and the GRS statistics. Diagnostics shown only in Appendix Table 7 (available upon request) illustrates that the only two remaining statistically significant intercepts all fall within the set of the smallest five quintile portfolios.

The improved performance from the hybrid model is more notable when we turn to the regressions on the Global and Developed Markets test asset portfolios excluding North America. For the Global portfolios excluding North America, the hybrid model improves upon the performance of the global factor model in explaining the average excess returns, lifting the average R^2s from 0.83 to 0.90 without microcap stocks and from 0.83 to 0.89 with microcap stocks, shrinking the average absolute intercepts from 0.25% to 0.14% without microcap stocks and from 0.24% to 0.15% with microcap stocks. In addition, the GRS statistics fall to 0.81 without microcap stocks and 1.10 with microcap stocks, and neither of them leads to the rejection of model at conventional cutoff criteria. The hybrid model produces an even greater improvement over the purely global factor model when it is challenged to explain the average returns on the Developed Markets portfolios excluding North America. When microcap stocks are dropped, the average R^2 rises from 0.78 for the global factor model to 0.94 for the hybrid model, the average absolute intercept drops from 0.35% to 0.07%, the Sharpe ratio falls from 0.38 to 0.29, and the GRS is only 0.76. Even with microcap stocks, the hybrid model still performs well, improving on the purely global factor model by any of the evaluation criteria. In sum, the hybrid model is quite successful in capturing average returns on global portfolios.

For the regional test asset portfolios, the hybrid model and the purely local factor model produce similar regression fits. In Europe, Asia Pacific, and Japan, the average absolute intercepts for the hybrid model are close to those for the purely local factor model, and there are no significant differences in terms of the Sharpe ratio and the GRS statistic. In the Emerging Markets test, however, the hybrid model works better than the purely local factor model in shrinking the average absolute intercepts. Without microcap stocks, the average absolute intercept for the purely local factor model is 0.42%, which is much higher than that for the hybrid model of 0.18%. With microcap stocks, if the purely local factor model is replaced by the hybrid model, the average absolute intercept falls by more than half, from 0.43% to 0.23% per month. The superior performance of the hybrid model in the Emerging Markets is likely due to the hybrid model's introduction of an important feature: the dependence of emerging markets on developed markets. Indeed, in Appendix Table 8 (available upon request), the betas for the test asset portfolios in the Emerging Markets on the market, size, and value factor portfolios for the globally-accessible set are economically large and usually statistically important. The only exception is the North America experiment: the GRS statistics rise to 2.20 without microcap stocks and 2.66 with microcap stocks, both implying a rejection of the model. The poor performance is due to the first five years of our sample, 1991-1995. Given the somewhat slower pace of globalization during the earlier period, not only stocks from Europe were less correlated with stocks from North America, but also the correlation between Japanese stock markets and America stock markets was as low as just 15%. What appears to be the problem is the greater representation of large-cap stocks from four regions outside North America in the globally-accessible sample, which adversely affects the performance of the global market factor in the hybrid model (Appendix Table 8). When the first five years are excluded, the hybrid model works as well as the purely local factor model in the North America experiments.[13]

B. Robustness Checks

We further test the reliability of the hybrid model by carrying out two rounds of robustness checks. We first check the hybrid versions of the Fama-French three-factor model which are built on other definitions of the globally-accessible sample according to the viability criteria. A second round of tests involves time-series regressions to see whether the inclusion of the Frankfurt Stock Exchange and non-Nasdaq OTC market – and especially its unusually large number of unsponsored secondary foreign listings, respectively, in their unregulated and OTCQX International segments - in the list of target exchanges for the globally-accessible sample changes the results.

Table 5 summarizes regressions to explain excess returns on size/B/M portfolios when the Main CL Sample is replaced by four alternative definitions of the globally-accessible set of stocks. We first disregard the so-called viability constraints altogether and start with the largest globally accessible sample,

[13] Another solution we investigated for the North American experiment was to construct three sets of factors in the hybrid model: globally-accessible stocks from outside the U.S. only, globally-accessible stocks from the U.S. only and then the locally-accessible stocks from U.S. In this case, the GRS statistic was 1.35 without microcap stocks and 2.14 with microcap stocks.

denoted CL1. Recall that this sample represents 91% of the global market capitalization, so we expect this experiment is most likely to inhibit the performance of the hybrid model relative to the local models for regional experiments. Panel A of Table 5 shows that for all four global test asset portfolios, the tight regression fits affirm that the hybrid model is economically meaningful, and the GRS test indicates that using CL1 for the hybrid model works as well as using the Main CL Sample. Taking the Global portfolios as an example, without microcap stocks, the GRS statistic is 1.14 for the hybrid model built on CL1, slightly higher than 0.92 for that built on the Main CL Sample. With microcap stocks, the GRS statistic, 1.86, is also close to 1.55 for the Main CL Sample. However, the benefit of using CL1 in the global experiments comes at the cost of the relatively poorer regression fits for the regional test asset portfolios, especially those for North America and Europe. Microcap stocks aside, for the North America test, the hybrid model produces a larger average absolute intercept of 0.21% compared to only 0.13% with the Main CL Sample. In Europe, the GRS statistic rises as high as 1.76. The problems (witnessed by higher GRS statistics, higher average absolute intercepts, and larger Sharpe ratios) result from the depleted local factors in the two regions which include many fewer stocks than before. The purely-local samples in North America or Europe in this CL1 sample accounts for less than 10% of total market capitalization of the region.

Panel B of Table 5 reports the results for the hybrid model built on what we call "CL2a." Changing from *relative* viability constraints (at least 0.1% of global trading volume occurs in target markets *or* at least 0.5% of total trading value in target markets relative to all secondarily cross-listed stocks from the same country trading there) to an *absolute* viability constraint (at least one month in a given year with non-zero trading volume in a target cross-listing market) on the cross-listing does not affect the performance of the hybrid model in explaining the average returns for global test asset portfolios and most of the regional test asset portfolios. The North America sample is the only exception in which the hybrid model now has a power problem, possibly because the absolute viability constraint breaks the consistency of our time-series explanatory returns. Some companies are identified as local stocks when there are no overseas trading records but as globally-accessible stocks when trading actually occurs in the target markets. Allowing these companies to switch between the two samples at a relatively high frequency may alter the profile of the returns of the explanatory factor portfolios. Panel C of Table 5 reports the regression results when CL2b is used. The more stringent relative viability constraints (above 1% of own-stock global trading volume in target markets *or* above 5% of all secondary cross-listing trading by country) shrink the globally accessible sample down to account for 62% of the total market capitalization for the global equity universe. The new CL2b performs similarly to the Main CL sample in the regional and global experiments.

Given the looser secondary cross-listing rules on the Frankfurt Stock Exchange and OTCQX International, we repeat the experiments above for the case where these two markets are excluded from the list of target exchanges. Our results are not driven by their inclusion. To save space, the regression results are only shown in Appendix Table 9 (available upon request). When no viability constraints are imposed on this globally-accessible sample, the hybrid model provides good descriptions for our four global test asset portfolios. The GRS statistics are not higher than 1.38 without microcap stocks and not higher than 2.12 with microcap stocks. When the globally-accessible sample is screened by our relative viability constraints based on target markets other than Germany and OTCQX International, the hybrid model performs better than the purely global factor model for the global test asset portfolios, and works as well as the purely local factor model for most of the regional test asset portfolios. On the other hand, the hybrid model still fares poorly in North America. The early years of the sample appear to be the problem once again. In the Main CL sample, the GRS statistics increase to 2.47 without microcap stocks and to 2.77 with microcap stocks. If only focusing on the period of 1995-2010, the GRS statistics decline to 1.46 without microcap stocks and to 1.77 with microcap stocks.

With different adjustments on the viability constraints for cross-listed stocks, the hybrid model appears quite resilient in explaining the average returns in the global and regional test asset portfolios. But one open question is how robust our hybrid model is to the size, liquidity and float screens that we apply for the stocks in the seven target markets to qualify them as globally-accessible. After all, those stocks that are secondarily cross-listed in a target market may simply be those that meet those screens in their respective markets and so the extra criterion of cross-listing may be redundant. In this additional test, we redefine the globally-accessible set of stocks around the world to be those that meet the same size, liquidity and float screens as for the stocks in the target markets.[14] The new globally-accessible sample, when compared with the Main CL sample, has smaller counts but similar market capitalizations across five regions. However, the hybrid model built from this new sample, unlike that for the Main CL Sample, makes little or no improvement relative to the global model for the global test asset portfolios, especially where the focus is on Developed Markets. Consider, for instance, the case without microcap stocks, for the Developed Markets portfolios, the average absolute intercept increases from 0.07% to 0.12%, the Sharpe ratio for the intercept goes up from 0.35 to 0.42, and the GRS statistic rises from 1.12 to 1.64. For the Developed Markets portfolios excluding North America, the average absolute intercept doubles from 0.07% to 0.15%, the Sharpe ratio from 0.28 to 0.42, and the GRS statistic from 0.76 to 1.65. In the regional experiment for North America, a hybrid model using this new globally-accessible sample fails to improve relative to the local factor model instead pushing the GRS statistics up to 2.46, without microcap stocks, and as high as 2.84 when microcap stocks are included.

We acknowledge that there exist some data issues for this alternative globally-accessible sample. Less than half of stocks from markets outside the seven target exchanges have float records in Datastream, and those stocks are automatically dropped out of the globally-accessible sample. But we take from this that identifying those stocks that are secondarily cross-listed on one of the target markets likely furnishes a more complete assessment of the investability of stocks, especially for those from emerging markets.

In sum, the hybrid model not only captures strong common variation in global and regional stock returns, but also brings low pricing errors and rejection rates for a variety of regional and global test asset portfolios. Compared with the purely global factor model for global test asset portfolios, the hybrid model always achieves better performance: the explanatory power increases up to 0.89 or even higher, average absolute pricing errors have reduced to 0.14% or even lower, the GRS statistics are not rejected at the 90%

[14] The distribution of free floats varies substantially across countries outside the seven target markets. If using a universal float screening, there will be few or even no stocks selected for many countries as globally accessible stocks. Therefore, the median float (75% for U.S. and equivalent levels for other markets) is applied in this case.

level when microcap stocks are excluded. Compared with the purely local factor model for regional test asset portfolios, the hybrid model brings neither larger pricing errors nor higher model rejection rates, and it performs even better for Emerging Market test asset portfolios.

VI. Some More Robustness Tests

A. Time-series Regression Tests for Size/Momentum Portfolios

Table 6 summarizes the asset pricing tests in which the Carhart four-factor model is applied to explain excess returns on 5×5 size/momentum portfolios. The Fama-French three-factor model generally works poorly in such an experiment in terms of regression fit and GRS statistic (Fama and French, 2011, see their Tables 6 and 7). So, we turn to the Carhart (1997) four-factor model to build our hybrid model.

There are power problems with the global Carhart four-factor model for the global test asset portfolios. Reasonable performance is only achieved in the Global portfolio tests when microcap stocks are removed: the average R^2 is 0.92, the average absolute intercept is 0.12%, and the GRS statistic is 1.89, which is below the 99th percentile threshold. For the three other global test asset portfolios, the global four-factor factor model fares poorly, producing higher GRS statistics and large average absolute intercepts. For instance, for the Developed Markets portfolios, the GRS statistic is 2.05, which exceeds the 99th threshold of the *F*-distribution, even without microcap stocks. The test on the Developed Markets portfolios excluding North America has a relatively lower GRS statistic of 1.42, but this result is hampered by low power. As with earlier results on size/B/M portfolios, the global factor model fares poorly for the regional portfolio returns. By contrast, the local Carhart four-factor model is reasonable for applications in the regional test asset portfolios for North America and Japan. The regressions on Europe, Asia Pacific, and the Emerging Markets are relatively disappointing: even leaving microcap stocks aside, the GRS test rejects the purely local factor model in these three regions.

The experiment for size/momentum portfolios produces the most disappointing results among all asset pricing tests for the global or purely local versions of the Carhart model, as Fama and French (2011) uncover. But, even with this challenge, the hybrid model fares reasonably well. For the Global portfolios, the hybrid model and the global factor model perform similarly. In the three other global test asset portfolios, the hybrid model better captures the returns than the global factor model. Using the Developed Markets portfolios excluding North America as an example, we see the regression fit improves from 0.77 for the global factor model to 0.94 for the hybrid model. The average absolute intercepts fall from 0.32% to 0.12% without microcap stocks and experience a similar decrease with microcap stocks. In the regional tests, the hybrid model produces high GRS statistics in Europe (2.91 without microcap stocks), Asia Pacific (2.12 without microcap stocks), and Emerging Markets (1.51 without microcap stocks), but these are all similar to the results for the purely local factor model. The regression fits and the average absolute intercepts are also close. As we discussed earlier, the relatively poor performance of the hybrid model in the North America experiment stems from the first five years of the sample similar to the case with size/B/M test asset portfolios. The improvement of the hybrid model over the purely local factor model arises in the Emerging Markets test asset portfolios: the average absolute intercepts decline from 0.60% to 0.32% without microcap stocks, and from 0.69% to 0.38% with microcap stocks.

Echoing previous robustness checks on size/B/M portfolios, we use three other globally accessible samples to reconstruct the explanatory factor returns and get supporting evidence on the resilience of the hybrid model (all shown in Appendix Table 10). Among all four cross-listed samples, CL2a (which includes stocks with non-zero target market trading during the year) produces the lowest model rejection rates for all four global test asset portfolios. Compared with the Main CL Sample in the regional experiments, CL2a improves the performance of the hybrid model in North America and Europe. For example, it shrinks the Sharpe ratio from 0.56 to 0.46 and the GRS statistic from 2.91 to 1.91 without microcap stocks, and from 0.70 to 0.64 for the Sharpe ratio and from 3.56 to 2.84 for the GRS statistic with microcap stocks in the Europe experiment. In tests of other regions, the performance of CL2b (with more stringent viability constraints on the cross-listed stocks) comes close to those of the Main CL Sample. In addition, we are interested in whether the performance of the hybrid model is influenced by the inclusion of the unsponsored secondary foreign listings. Appendix Table 11 reports the regression results when the Frankfurt Stock Exchange and non-Nasdaq OTC markets are dropped from the list of target exchanges. The results are quantitatively similar to those reported in Table 6.

Preliminary results show that the hybrid version of the HKK (2011) three-factor model performs reasonably well for size/momentum portfolios.[15] We compare the Carhart four-factor model and the extended version of the HKK (2011) three-factor model in which the SMB factor in Fama and French (2011) is added. The HKK (2011) extended four-factor model is equivalent to the Carhart four-factor model in explaining the average returns on the global and regional portfolios. Like the global Carhart four-factor model, the global HKK (2011) extended four-factor model works well for the Global portfolios when microcap stocks are dropped: the average R^2 is 0.92, the average absolute intercept is 0.13%, and the GRS statistic is 1.88 (reported in Appendix Table 12). As before, for the three other global test asset portfolios the global HKK (2011) extended four-factor model produces low power and large average absolute intercepts. In the regional scenarios, the local HKK (2011) extended four-factor model works well for North America and Japan, but suffers loss of power and higher model rejection rates for Europe, Asia Pacific, and Emerging Markets. On the other hand, the hybrid version of the HKK (2011) extended four-factor model increases the average R^2 up to 88% and shrinks the average absolute intercepts down to less than 0.24% in the global tests, and it does not fare worse than the local version in the regional test asset portfolios.

We repeat previous robustness checks on size/momentum portfolios, including trying several alternative definitions of global accessibility and dropping the unsponsored cross-listed stocks on the Frankfurt Stock Exchange and OTCQX International. Once again, we uncover supporting evidence for the hybrid model. For the sake the brevity, regression results are provided in Appendix Tables 12 and 13.

B. Time-series Regression Tests for Size/C/P Portfolios

Table 7 provides the regressions of the Carhart four-factor model in explaining excess returns on size/C/P portfolios. As in Fama and French (2011), there is a size pattern in the average value premium in

[15] HKK (2011) propose and test a three-factor model that includes the C/P and momentum factors in addition to the global market portfolios and that produces the lowest pricing errors among various multifactor models in regressions for country, industry, and characteristic-sorted portfolios: $R_{it} – R_{ft} = \alpha_i + \beta_i (R_{mt} – R_{ft}) + c_i F_{C/P,t} + m_i F_{Mom,t} + \varepsilon_{i,t}$ substitutes for Eqn. (1).

the sorts on C/P, but it is somewhat weaker than the sorts on B/M. It is perhaps not surprising then that the GRS statistics do not increase much when microcap stocks are considered. For example, if the global Carhart four-factor model is used in the test of the Global portfolios, the GRS statistics are 1.73 for the 4×5 portfolios and 1.96 for the 5×5 portfolios.

Panel C of Table 7 indicates that the hybrid model improves the regression fit of the global factor model. Moreover, the average absolute intercepts drop to below 0.14% and the GRS statistics are all below 1.36, when microcap stocks are excluded. At the same time, the regressions of the hybrid model are largely similar to those of the purely local factor model for the regional test asset portfolios. The GRS statistics, average absolute intercepts, and SR(*a*) are close in the Asia Pacific test. In addition, if the purely local factor model is replaced by the hybrid model, excluding microcap stocks, the average absolute intercepts decrease from 0.16% to 0.08% for Japan, and from 0.50% to 0.21% for the Emerging Markets. With microcap stocks, the average absolute intercepts decrease from 0.14% to 0.10% for Japan, and from 0.51% to 0.25% for the Emerging Markets. In the Europe test, the hybrid model fares slightly worse than the purely local factor model. The average absolute intercept rises from 0.08% in the purely local factor model to 0.15% in the hybrid model when microcap stocks are dropped. Despite that, the GRS test is not rejected if evaluated at the 95th percentile of the *F*-distribution. As before, the hybrid model suffers in the North American experiment because of the first five years and this issue could be fixed by a refined definition of the globally-accessible stocks in that region.

We perform three more robustness checks with the size/C/P test asset portfolios (as reported in Appendix Tables 14 through 17). We first try alternative definitions for the globally-accessible sample for the Carhart four-factor model; there are measurable benefits to extend the global factor model to the hybrid model in most experiments. Second, we drop the cross-listed stocks from the Frankfurt Stock Exchange and OTCQX International and repeat the tests. Excluding them does not change the results. We also find that the hybrid model maintains its performance when the global factors and local factors are adjusted by different viability constraints and size considerations. Finally, we apply the HKK (2011) extended four-factor model in the tests on the 5×5 size/C/P portfolios. The results are quantitatively similar to those in Table 7. To conserve space, we report these results in Appendix Table 16. Our test does not permit us to adequately distinguish the Carhart four-factor model and the HKK (2011) extended four-factor model when it comes to explain the size/C/P portfolios. The HKK (2011) model is another reasonable choice for applications in international asset pricing.

C. Time-series Regression Tests for Additional Portfolios and Individual Securities

In this section, we first build global test-asset portfolios that include just globally accessible stocks. Intuitively, we expect many global asset managers would impose such accessibility constraints to define their investment universe. In this setting, we further expect the traditional global factor model is most likely to succeed, so we propose a test to compare the ability of the traditional global factor and our new global factor model, in which the factor portfolios are built only from the globally accessible stocks, to explain the portfolio returns. Here, we mainly check the experiments on the Global portfolios and the Developed Markets portfolios.[16]

When compared to the traditional global factor model, the new global factor model yields lower average absolute intercepts, lower Sharpe ratios, smaller GRS statistics and higher R^2s. The results hold for all three sets of 5×5 test asset portfolios sorted on size-B/M, size-momentum, and size-C/P. Taking the size/B/M Developed Markets portfolios as an example, without microcap stocks, the average absolute intercept falls from 0.23% for the traditional global factor model to 0.12% for the new global factor model. With microcap stocks, average absolute intercept declines from 0.26% to 0.13%. In terms of SR(a), the new global factor model produces smaller values: 0.36 without microcap stocks and 0.41 with microcap stocks, compared to 0.48 and 0.51 respectively for the traditional global factor model. Accompanied with similar or even tighter regression fits, the GRS statistics drop from 2.36 for the traditional global factor model to 1.33 for the new global factor model, microcap stocks aside, and from 2.13 to 1.35, if microcap stocks are added. In either case we cannot reject at the 90% level. The complete set of regression results is available in Appendix Tables 18.

[16] If North America is excluded in the global test asset portfolios, there are only 2,333 stocks for the Developed Markets portfolios excluding North America and around 3,100 stocks for the Global portfolios excluding North America. Technically, the numbers of stocks are insufficient to construct portfolios.

We next move to supplementary tests using regressions on individual stocks to assess the explanatory powers of the local factor model and the hybrid model for their returns. Each month, beginning with November 1990, individual security regressions are estimated over 180 rolling 60-month periods. The last period ends in December 2010. In all regions, the hybrid Fama-French three-factor models achieve statistically significant increases in the average adjusted R^2. The incremental R^2s account for, on average over time, 11.73%, 8.39%, 6.76%, 2.58%, and 17.04% of the R^2s by the corresponding local models in the North America, Europe, Asia Pacific, Japan, and Emerging Markets tests. Furthermore, we decompose our hybrid model in order to evaluate the incremental R^2 from adding the global factors to the local factors. The global factors in the hybrid model increase the average adjusted R^2 by 2.29%, 1.22%, 1.00%, 0.81%, and 2.22% in North America, Europe, Asia Pacific, Japan, and Emerging Markets, respectively. The increase in the average adjusted R^2 due to the addition of global factors can be expressed relative to the total average adjusted R^2 for the hybrid model. The proportion of the explained variance attributable to global factors is 15.03%, 6.84%, 5.07%, 2.29%, and 15.03% in North America, Europe, Asia Pacific, Japan, and Emerging Markets, respectively, indicating the importance of global factors in the hybrid model.

VII. Conclusions

Using monthly returns for over 37,000 stocks from 46 developed and emerging market countries over a two-decade period, we test whether empirical asset pricing models capture the size, value, and momentum patterns in international stock returns. We specifically propose and test a new multi-factor model that includes factor portfolios based on firm characteristics and that builds separate factors comprised of globally-accessible stocks, which we call “global factors,” and of locally-accessible stocks, which we call “local factors.” Our new “hybrid” multi-factor model with both global and local factors not only captures strong common variation in global stock returns, but also achieves low pricing errors and rejection rates using conventional testing procedures for a variety of regional and global test asset portfolios formed on size, value, and momentum.

A critical ingredient of our analysis is how we categorize the equity universe into two subsets - the globally-accessible sample and purely-local sample of stocks – based on constraints as defined by whether or not the stock has shares actively traded in the markets fully open to global investors. To capture the impact of investability constraints on the size, value, and momentum patterns in international stock returns, we then build *separate* factor portfolios – global factors comprised stocks only in the globally-accessible sample, and local factors comprised of the purely-local stocks from the specific region for which the test is perform – and propose a new "hybrid" multifactor model. We find that neither a purely global factor model nor a purely local factor model can work as well as the new "hybrid" when asked to explain average returns on global and regional size/value and size/momentum portfolios. The new "hybrid" model does not encounter the problems of the purely global factor models, such as high rates of rejections with GRS tests and large average absolute intercepts. Rather, it improves the regression fit and reduces the pricing errors, with or without microcap stocks. And, at the same time, the new "hybrid" model fares reasonably relative to a purely local factor model, and works even better for emerging markets, in terms of explanatory power, model pricing errors and rejection rates. The robustness of the new "hybrid" model is confirmed by tests conducted with a variety of definitions of global accessibility, other double-sorted test portfolios, and other asset pricing models.

We interpret our findings in this study as a step forward in the international asset pricing literature with important implications for practitioners in guiding cost-of-capital calculations and risk control and performance evaluation analysis of global portfolios. Of course, we acknowledge several limitations in the scope of our work as well as in the implementation. There may be alternative ways in which stocks become globally accessible beyond secondarily cross-listing on overseas exchanges that we have not considered. Including other mechanisms for global investor accessibility, such as being included in one of MSCI or S&P global indexes (especially, in their investable indices in emerging markets), emerging market ETFs and closed-end country funds, would be valuable to explore how the returns of global factor portfolios have changed over time. We also cannot disregard the fact that simply being accessible does not necessarily mean global investors will actually pursue these opportunities. Although this fact is taken into consideration to a certain extent by imposing additional viability restrictions on how actively the cross-listed shares are traded in our experiments, a more comprehensive picture of institutional trading around the world would reveal the varying preferences and constraints face by different groups of institutional investors. One would also hope for a more reliable proxy for the measure of viability consideration than the relative (and absolute) criteria in this study. Third, one could criticize our reliance on conventional test procedures, which is necessarily limiting. Finally, it also remains to be seen whether the new proposed "hybrid" model works for country, industry, and other characteristic-sorted test asset portfolios, as evaluated in HKK (2011).

There are also other possible avenues for future work. We can study the effect of exchange rate risks on the relative performance of global factors and local factors in the new "hybrid" model. All of our returns are U.S. dollar denominated at prevailing exchange rates. Because what constitutes globally-accessible stocks and purely-local stocks vary for investors by country of domicile, the need to hedge exchange rates varies and exchange rate risks are expected to play different roles in the risk prices of global factors and local factors. Exchange rate risk is certainly a potential problem in global asset pricing. A key contribution of Solnik's (1974) influential international asset pricing model is that currency risk can be priced and there is also growing evidence that the magnitude of currency-risk exposures can be quite large (Dumas and Solnik, 1995; De Santis and Gerard, 1997, 1998; Griffin and Stulz, 2001). Second, we can push the new "hybrid" structure to incorporate cross-sectional variation in real estate, commodities and bonds, which comprise a significant portion of global investment activity. Third, we can extend our unconditional testing framework for the hybrid model to a conditional one allowing for time variation in expected returns, variances and covariances, a potentially important factor for the transitioning emerging markets (Bekaert and Harvey, 1995; Bekaert, Harvey, Lundblad, and Siegel, 2011) for which our hybrid model performs especially well.

References

Asness, C.S., Tobias J. Moskowitz, and Lasse H. Pedersen, 2009, Value and Momentum Everywhere, Working paper, National Bureau of Economic Research.

Baruch, Samuel, G. Andrew Karolyi, and Michael L. Lemmon, 2007, Multimarket Trading and Liquidity: Theory and Evidence, *Journal of Finance*, 62, 2169-2201.

Bekaert, G., and C. Harvey, 1995, Time-varying World Market Integration, *Journal of Finance*, 50, 403-444.

Bekaert, G., C.R. Harvey, and R.L. Lumsdaine, 2002, Dating the Integration of World Equity Markets, *Journal of Financial Economics*, 65, 203-248.

Bekaert, G., C.R. Harvey, C.T. Lundblad, and S. Siegel, 2011, What Segments Equity Markets? *Review of Financial Studies*, doi: 10.1093/rfs/hhr082.

Bekaert, G., Robert J. Hodrick, and Xiaoyan Zhang, 2009, International Stock Return Comovements, *Journal of Finance*, 64, 2591-2626.

Bekaert, G., and M.S. Urias, 1996, Diversification, Integration and Emerging Market Closed-End Funds, *Journal of Finance*, 51, 835-869.

Bodurtha, J., 1994, International Factors and U.S. Equity Excess Returns, Working paper, Georgetown University.

Bodurtha, J., 1999, International Investment Restrictions and Factor Pricing, Working paper, Georgetown University.

Carhart, Mark M., 1997, On Persistence in Mutual Fund Performance, *Journal of Finance*, 52, 57-82.

Carrieri, F., I. Chaieb, and V. Errunza, 2008, On the Pricing of Investable Securities and the Role of Implicit Barriers, Working paper, McGill University.

Carrieri, F., I. Chaieb, and V. Errunza, 2011, Do Implicit Barriers Matter for Globalization? Working paper, Swiss Finance Institute Research Paper No. 10-55.

Carrieri, F., Errunza, V., and K. Hogan, 2007, Characterizing World Market Integration Through Time, *Journal of Financial and Quantitative Analysis*, 42, 915-940.

Chaieb, I., and V. Errunza, 2007, International Asset Pricing Under Segmentation and PPP Deviations, *Journal of Financial Economics*, 86, 543-578.

De Jong, F., and F. A. De Roon, 2005, Time-varying Market Integration and Expected Returns in Emerging Markets, *Journal of Financial Economics*, 78, 583-613.

De Santis, Giorgio, and Bruno Gerard, 1997, International Asset Pricing and Portfolio Diversification with Time-Varying Risk, *Journal of Finance*, 52, 1881-1912.

De Santis, Giorgio, and Bruno Gerard, 1998, How Big Is the Premium For Currency Risk? *Journal of Financial Economics*, 49, 375-412.

Doidge, Craig, G. Andrew Karolyi, and Rene M. Stulz, 2004, Why Are Foreign Firms Listed in the U.S. Worth More? *Journal of Financial Economics*, 71, 205-238.

Dumas, Bernard, and Bruno Solnik, 1995, The World Price of Foreign Exchange Risk, *Journal of Finance*, 50, 445-479.

Errunza, V., and D. Miller, 2000, Market Segmentation and the Cost of Capital in International Equity Markets, *Journal of Financial and Quantitative Analysis*, 35, 577-600.

Errunza, V., and E. Losq, 1985, International Asset Pricing under Mild Segmentation: Theory and Test, *Journal of Finance*, 40, 105-124.

Errunza, V., and Hai Ta, 2011, The Impact of Investability on Asset Valuation, Working paper, McGill University

Errunza, V., K. Hogan, and M.W. Hung, 1999, Can the Gains from International Diversification be Achieved without Trading Abroad? *Journal of Finance*, 54, 2075-2107.

Eun, C. S., and S. Janakiramanan, 1986, A Model of International Asset Pricing with a Constraint on the Foreign Equity Ownership, *Journal of Finance*, 41, 897-914.

Fama, Eugene F., and Kenneth R. French, 1993, Common Risk Factors in the Returns on Stocks and Bonds, *Journal of Financial Economics*, 33, 3-56.

Fama, Eugene F., and Kenneth R. French, 1996, Multifactor Explanations of Asset Pricing Anomalies, *Journal of Finance*, 51, 55-84.

Fama, Eugene F., and Kenneth R. French, 1998, Value versus Growth: The International Evidence, *Journal of Finance*, 53, 1975-1999.

Fama, Eugene F., and Kenneth R. French, 2008, Dissecting Anomalies, *Journal of Finance*, 63, 1653-1678.

Fama, Eugene F., and Kenneth R. French, 2011, Size, Value, and Momentum in International Stock Returns, Working paper, University of Chicago, forthcoming *Journal of Financial Economics*.

Ferreira, Miguel A., and Pedro Matos, 2008, The Colors of Investors' Money: The Role of Institutional Investors Around the World? *Journal of Financial Economics*, 88, 499-533.

Foerster, S.R., and G. Andrew Karolyi., 1993, International Listings of Stocks: The Case of Canada and the U.S., *Journal of International Business Studies*, 24, 763-784.

Foerster, S.R., and G. Andrew Karolyi., 1999, The Effects of Market Segmentation and Investor Recognition on Asset Prices: Evidence from Foreign Stocks Listing in the U.S., *Journal of Finance*, 54, 981-1013.

Gibbons, Michael R., Stephen A. Ross, and Jay Shanken, 1989, A Test of the Efficiency of A Given Portfolio, *Econometrica*, 57, 1121-1152.

Grauer, Frederick L. A., Robert H. Litzenberger, and Richard E. Stehle, 1976, Sharing Rules and Equilibrium in an International Capital Market under Uncertainty, *Journal of Financial Economics*, 3, 233-256.

Griffin, John M., 2002, Are the Fama and French Factors Global or Country Specific? *Review of Financial Studies*, 15, 783-803.

Griffin, John M., and Rene M. Stulz, 2001, International Competition and Exchange Rate Shocks: A Cross-Country Industry Analysis of Stock Returns, *Review of Financial Studies*, 14, 215-241

Griffin, John M., Susan Ji, and J. Spencer Martin, 2003, Momentum Investing and Business Cycle Risk: Evidence from Pole to Pole, *Journal of Finance*, 58, 2515-2547.

Hou, Kewei, G. Andrew Karolyi., and Bong Chan Kho, 2011, What Factors Drive Global Stock Returns? *Review of Financial Studies*, 24, 2527-2574.

Huberman, G., and S.A. Kandel, 1987, Mean-Variance Spanning, *Journal of Finance*, 42, 873-888.

Iliev, Peter, Darius P., and Lukas Roth, 2011, Uninvited U.S. Investors? Economic Consequences of Involuntary Cross-listings, Working paper, Pennsylvania State University.

Ince, Ozgur, and R. Burt Porter, 2006, Individual Equity Return Data From Thomson Datastream: Handle with Care!, *Journal of Financial Research*, 29, 463-479.

Jegadeesh, Narasimhan, and Sheridan Titman, 1993, Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency, *Journal of Finance*, 48, 65-91.

Karolyi, G. Andrew, 2006, The World of Cross-Listings and Cross-Listings of the World: Challenging Conventional Wisdom, *Review of Finance*, 10, 73-115.

Karolyi, G. Andrew, and Rene M. Stulz, 2003, Are Assets Priced Locally or Globally? in *The Handbook of the Economics of Finance*, G. Constantinides, M. Harris and R. Stulz (eds.), North Holland, 2003.

Lewellen, Jonathan, Stefan Nagel, and Jay Shanken, 2010, A Skeptical Appraisal of Asset Pricing Tests, *Journal of Financial Economics*, 96, 175-194.

Pukthuanthong, Kuntara, and Richard Roll, 2009, Global Market Integration: A Better Way to Measure it and its Application, *Journal of Financial Economics*, 94, 214-232.

Rouwenhorst, K. Geert, 1998, International Momentum Strategies, *Journal of Finance*, 53, 267-284.

Sercu, Piet, 1980, A Generalisation of the International Asset Pricing Model, *Revue de l' Association Française de Finance*, 1, 91-135.

Solnik, Bruno, 1974, An Equilibrium Model of the International Capital Market, *Journal of Economic Theory*, 8, 500-524.

Stulz, Rene M., 1981, A Model of International Asset Pricing, *Journal of Financial Economics*, 9, 383-406.

Table 1
Summary Statistics of Global Equity Universe by Country, Nov. 1989 – Dec. 2010

Country	Beginning Date	Total Number of Stocks	Size (U.S. $ mills.)	Book-to-Market (B/M)	Cash flow-to-Price (C/P)	Momentum (Mom, %)
North America		9,438				
United States	1989/11	6,494	256.70	0.47	0.09	6.60
Canada	1989/11	2,944	9.86	0.61	0.07	0.61
Europe		8,630				
Austria	1989/11	240	185.30	0.62	0.15	3.13
Belgium	1989/11	178	106.47	0.64	0.14	4.93
Denmark	1989/11	205	66.88	0.73	0.12	5.69
Finland	1989/11	157	133.66	0.83	0.14	10.81
France	1989/11	1,170	71.55	0.59	0.12	3.44
Germany	1989/11	1,109	78.98	0.51	0.10	-0.41
Greece	1989/11	332	45.31	0.64	0.09	12.45
Ireland	1989/11	78	184.90	0.57	0.10	7.71
Italy	1989/11	351	184.86	0.75	0.13	-0.92
Netherland	1989/11	203	228.09	0.55	0.14	7.10
Norway	1989/11	347	103.29	0.69	0.11	6.77
Portugal	1989/11	100	76.45	0.85	0.12	0.99
Spain	1989/11	169	430.65	0.68	0.12	6.57
Sweden	1989/11	571	50.14	0.61	0.10	5.55
Switzerland	1989/11	265	195.75	0.70	0.13	8.13
UK	1989/11	3,155	54.25	0.51	0.09	2.51
Asia Pacific		3,914				
Hong Kong	1989/11	977	70.57	0.91	0.09	3.89
Australia	1989/11	2,012	19.54	0.61	0.05	2.28
New Zealand	1989/11	170	49.80	0.71	0.11	10.79
Singapore	1989/11	755	71.72	0.77	0.10	6.07
Japan	1989/11	4,301	174.90	0.82	0.08	-2.19
Emerging Markets		11,116				
Israel	1989/11	326	21.18	0.71	0.12	6.43
Turkey	1989/11	241	57.24	0.56	0.15	12.13
Pakistan	1989/11	129	34.79	0.77	0.19	9.53
South Africa	1989/11	567	57.83	0.61	0.13	8.02
Czech Republic	1993/08	76	0.98	1.34	0.23	5.34
Poland	1992/01	348	30.50	0.74	0.10	40.97
Hungary	1991/02	45	37.57	0.86	0.14	4.21
Russia	1994/07	292	104.54	2.30	0.23	37.17
China	1991/02	1,550	247.05	0.62	0.08	26.48
India	1989/11	1,455	37.50	0.71	0.12	11.86
Indonesia	1990/05	312	40.90	0.76	0.12	5.42
Malaysia	1989/11	993	58.70	0.79	0.09	5.84
Philippines	1989/11	158	30.97	0.94	0.10	1.20
South Korea	1989/11	1,757	41.55	1.22	0.21	3.48
Taiwan	1989/11	1,344	156.80	0.64	0.08	-0.16
Thailand	1989/11	483	36.72	0.86	0.16	1.59
Argentina	1989/11	84	69.24	1.10	0.17	16.30
Brazil	1993/01	404	97.29	1.54	0.20	32.76

Table 1, continued

Country	Beginning date	Total number of Stocks	Size (U.S. $ mills.)	Book-to-Market (B/M)	Cash flow-to-Price (C/P)	Momentum (Mom)
Chile	1990/12	179	115.76	0.77	0.12	11.31
Colombia	1992/02	85	58.78	1.51	0.15	6.99
Mexico	1989/11	150	327.45	0.80	0.13	10.86
Peru	1991/02	111	10.59	1.10	0.15	11.93
Venezuela	1990/02	27	46.54	2.29	0.23	10.50
Total All		37,399				

This table reports summary statistics of our sample stocks for each country over the 198911-201112. We exclude financial firms and to be included in the analysis, each stocks has to have at least 12 monthly returns, is listed in its country's major exchange(s), and has sufficient information to calculate at least one of the characteristics including market value of equity (Size), book-to-market (B/M), cash flow-to-price (C/P). We also apply several screening procedures for Datastream data errors in monthly returns as suggested by Ince and Porter (2003) and others, as detailed in the text. The beginning date for each country is as shown. The total numbers of unique stocks are reported for each country. Mom is the time series average of the median lagged cumulative returns from *t-11* to *t-1* (skipping the most recent month). Also reported are the time-series average of annual medians for size, B/M, and C/P.

Table 2
Summary Statistics for Factor Portfolio Returns, Nov. 1990 – Dec. 2010

Panel A: Return Distributions of Factor Portfolios in the Global Experiments

Attributes	Market			Size			B/M			Mom			C/P		
	Equity Universe	Accessible	Local Spread	Equity Universe	Accessible	Local Spread	Equity Universe	Accessible	Local Spread	Equity Universe	Accessible	Local Spread	Equity Universe	Accessible	Local Spread
Global															
Mean	0.46	0.53	-0.24	0.09	0.48	-0.19	0.54	0.25	0.40	0.52	0.54	-0.04	0.60	0.36	0.44
Std Dev	4.47	4.29	1.78	2.45	2.69	2.28	2.50	2.89	2.04	4.37	4.98	2.44	3.03	2.90	2.11
t-Mean	1.59	1.93	-2.12	0.59	2.80	-1.28	3.39	1.35	3.06	1.84	1.68	-0.25	3.07	1.91	3.22
Developed Markets Only															
Mean	0.47	0.52	-0.23	0.04	0.51	-0.25	0.53	0.21	0.38	0.60	0.48	-0.22	0.64	0.26	0.42
Std Dev	4.46	4.22	1.72	2.38	2.43	2.21	2.39	2.90	1.67	4.13	5.26	1.86	2.67	3.02	1.86
t-Mean	1.62	1.91	-2.10	0.25	3.23	-1.78	3.42	1.12	3.58	2.26	1.42	-1.85	3.71	1.34	3.54
Global excl. North America															
Mean	0.33	0.46	-0.41	0.15	0.43	-0.29	0.73	0.42	0.37	0.60	0.50	0.05	0.73	0.50	0.42
Std Dev	4.79	4.81	2.76	2.17	2.66	2.81	4.32	2.43	2.56	4.13	4.39	3.73	3.42	2.15	2.85
t-Mean	1.06	1.49	-2.31	1.09	0.86	-1.63	2.62	2.70	2.26	2.26	1.76	0.21	3.34	3.64	2.30
Developed Markets Only excl. North America															
Mean	0.32	0.43	-0.43	0.05	0.42	-0.41	0.80	0.37	0.32	0.39	0.33	-0.21	0.72	0.35	0.35
Std Dev	4.85	4.76	2.97	2.29	2.30	2.73	4.31	2.60	2.17	4.27	4.59	3.06	2.59	2.35	2.34
t-Mean	1.04	1.41	-2.27	0.35	2.83	-2.36	2.88	2.23	2.27	1.43	1.13	-1.08	4.36	2.34	2.36

Table 2, continued

Panel B: Return Distributions of Factor Portfolios in the Regional Experiments

Attributes	Market			Size			B/M			Mom			C/P		
	Equity Universe	Accessible	Local Spread	Equity Universe	Accessible	Local Spread	Equity Universe	Accessible	Local Spread	Equity Universe	Accessible	Local Spread	Equity Universe	Accessible	Local Spread
North America															
Mean	0.68	0.66	0.11	0.33	0.79	-0.02	0.26	-0.06	0.17	0.40	0.68	-0.18	0.35	-0.02	0.12
Std Dev	4.58	4.16	2.53	3.67	3.79	2.47	3.34	4.23	2.04	5.99	6.53	2.65	3.85	4.36	2.09
t-Mean	2.32	2.48	0.70	1.39	3.23	-0.12	1.22	-0.23	1.28	1.03	1.63	-1.05	1.43	-0.06	0.93
Europe															
Mean	0.58	0.56	-0.11	-0.16	0.23	-0.54	0.64	0.31	0.38	0.83	0.49	0.35	0.67	0.37	0.47
Std Dev	4.91	4.82	2.68	2.48	2.44	3.02	2.68	3.10	2.16	4.59	5.21	2.90	2.33	2.79	2.30
t-Mean	1.83	1.81	-0.61	-1.00	1.47	-2.78	3.70	1.58	2.72	2.80	1.46	1.90	4.51	2.09	3.21
Asia Pacific															
Mean	0.74	0.85	0.19	-0.11	0.37	-0.59	0.65	0.19	0.49	1.07	0.91	0.40	0.63	0.43	0.40
Std Dev	5.87	6.22	3.85	3.38	4.37	2.97	3.21	5.15	3.38	5.14	5.32	4.48	2.98	3.96	3.14
t-Mean	1.96	2.12	0.78	-0.52	1.31	-3.10	3.18	0.57	2.26	3.23	2.67	1.40	3.27	1.70	1.97
Japan															
Mean	-0.04	0.12	-0.72	-0.15	0.30	-0.51	0.48	0.40	0.20	-0.44	-0.12	-0.96	0.32	0.33	-0.08
Std Dev	6.07	6.07	5.24	4.29	3.40	3.83	2.72	3.53	2.86	5.38	6.23	4.95	2.32	3.53	2.70
t-Mean	-0.10	0.30	-2.14	-0.53	1.38	-2.06	2.77	1.76	1.09	-1.29	-0.31	-3.02	2.17	1.47	-0.45
Emerging Markets															
Mean	0.32	0.77	-0.34	0.37	0.41	0.16	0.64	0.64	0.43	1.05	0.96	0.56	0.95	0.95	0.72
Std Dev	6.33	6.71	5.30	3.45	3.61	4.07	3.95	4.40	4.45	7.38	5.99	8.67	4.96	4.28	5.72
t-Mean	0.79	1.78	-1.00	1.66	1.75	0.60	2.53	2.26	1.51	2.22	2.50	1.00	2.99	3.46	1.97

Table 2, continued

This table shows the summary statistics for explanatory returns. It includes five regional portfolios for North America, Europe, Japan, Asia Pacific (excluding Japan) and Emerging Markets. Four sets of global portfolios are also reported, including Global portfolios that combine all the five regions, Developed Markets portfolios that combine the first four regions, Global portfolios excluding North America, Developed Markets portfolios excluding North America. For each scenario, it shows the explanatory returns for three samples, the whole sample ("Equity Universe" in the table), the subset of globally-accessible stocks, the Main CL Sample, which stands for the globally accessible sample ("Accessible" in the table) and the subset of locally-accessible stocks relative to the globally-accessible stocks ("Local Spread" in the table). We form portfolios at the end of June of each year *t* by sorting stocks in a region into two market cap and three book-to-market (B/M) or cash flow-to-price (C/P) groups. Big stocks are those in the top 90% of market cap for the region, and small stocks are those in the bottom 10% (Fama and French, 2011). The B/M or C/P breakpoints for the five regions are the 30^{th} and 70^{th} percentiles of B/M for the big stocks from the globally accessible sample for each given region. The global portfolios use global size breaks, but we use the B/M or C/P breakpoints for the five regions to allocate the stocks of these regions to the global portfolios. The independent 2×3 sorts on size and B/M (or C/P) produce six value-weighted portfolios, SG, SN, SV, BG, BN and BV, where S and B indicate small or big and G, N, and V indicate growth, neutral and value. The factor portfolios based on size is the equally-weighted average of the returns on the three small stock portfolios for the region minus the equally-weighted average of the returns on the three big stock portfolios where all the six portfolios are all based on B/M. The factor portfolios based on B/M (or C/P) are calculated as the equally-weighted average of value-growth returns for small and big stocks, SV-SG and BV-BG. The 2×3 sorts on size and lagged momentum are similar, but the size/momentum portfolios are formed monthly. For portfolios formed at the end of month *t*, the lagged momentum return is a stock's cumulative return for *t-11* to *t-1*. The independent 2×3 sorts on size and momentum produce six value-weighted portfolios, SL, SN, SW, BL, BN and BW, where S and B indicate small and big, and L, N, and W indicate losers, neutral, and winners. The factor portfolios based on momentum is constructed as the equally-weighted average of WML_S=SW-SL and WML_B=BW-BL. B/M(C/P) breakpoints are the same for all three samples within each scenario, the globally accessible sample uses its own size and momentum breakpoints, and the purely local sample uses regional size and momentum breakpoints. For each given region, the return spread factor portfolios of purely-local stocks relative to the globally-accessible stocks are the differences in the respective factor portfolio returns for the set of purely-local stocks in the region and for the globally-accessible stocks. For example, for the size-related spread factor portfolio, we compute the return difference between the factor portfolio for the locally-accessible stocks (measured, in turn, as the difference between an equally-weighted average of the SG, SN, and SV portfolios and an equally-weighted average of the BG, BN, and BV portfolios) and the globally-accessible stocks (measured similarly). The value- and momentum-related spread factor portfolios are built in the same way. All returns are in U.S. dollars. Market is the return on a value-weighted market portfolio globally or for the region minus the U.S. one month Treasury bill yield. Mean and Std Dev are the mean and standard deviation of the return, and t-Mean is the ratio of Mean to its standard error.

Table 3
Summary Statistics for the 25 size/B/M Excess Returns, Nov. 1990 – Dec. 2010

	Mean					Standard Deviation				
	Low	2	3	4	High	Low	2	3	4	High
Global										
Small	0.06	0.55	1.36	0.93	1.25	6.55	5.95	8.42	5.06	4.91
2	0.09	0.59	0.64	0.76	0.94	6.02	5.51	5.03	4.89	4.97
3	0.15	0.37	0.56	0.62	0.83	5.75	5.37	5.18	4.84	5.06
4	0.40	0.47	0.59	0.60	0.81	6.05	5.02	5.00	4.74	5.08
Big	0.28	0.49	0.46	0.62	0.54	4.87	4.44	4.43	4.38	4.73
Developed Markets Only										
Small	0.05	0.58	0.88	0.84	1.10	6.66	5.72	5.88	5.08	4.65
2	0.11	0.42	0.58	0.70	0.80	6.50	5.61	5.02	4.70	4.87
3	0.14	0.37	0.46	0.58	0.75	6.16	5.50	5.32	4.74	5.00
4	0.42	0.36	0.59	0.59	0.74	6.29	4.97	4.81	4.80	5.09
Big	0.26	0.49	0.42	0.63	0.51	4.86	4.38	4.44	4.28	4.74
Global excl. North America (NA)										
Small	-0.15	0.30	0.66	0.66	1.00	6.77	5.71	5.32	5.00	5.16
2	-0.11	0.36	0.88	0.63	0.74	6.03	5.58	8.01	5.08	5.26
3	-0.05	0.25	0.34	0.51	0.75	5.73	5.57	5.25	5.19	5.40
4	0.12	0.32	0.40	0.47	0.70	5.70	5.34	5.27	5.22	5.60
Big	0.02	0.30	0.43	0.54	0.65	5.32	4.98	4.89	4.91	5.27
Developed Markets Only excl. North America (NA)										
Small	-0.15	0.23	0.43	0.54	0.76	6.84	5.46	5.25	4.86	4.87
2	-0.31	0.19	0.31	0.47	0.47	6.18	6.08	5.03	4.90	5.08
3	-0.12	0.12	0.28	0.50	0.53	6.04	5.49	5.35	5.11	5.41
4	0.02	0.20	0.33	0.37	0.60	6.10	5.21	5.21	5.27	5.58
Big	-0.04	0.29	0.37	0.55	0.64	5.30	4.96	4.96	4.87	5.39
North America										
Small	0.89	1.14	1.45	1.32	1.64	8.90	7.34	7.68	6.56	6.00
2	0.61	0.94	1.03	1.00	1.20	8.37	7.22	6.51	5.48	5.75
3	0.96	0.67	0.85	0.92	1.11	8.42	6.51	5.75	4.93	5.31
4	0.89	0.75	0.93	0.77	0.99	7.71	5.75	5.29	5.06	5.20
Big	0.54	0.67	0.53	0.79	0.55	5.21	4.61	4.42	4.23	4.72
Europe										
Small	-0.20	0.07	0.51	0.50	0.87	6.59	5.62	5.40	5.16	5.14
2	0.14	0.28	0.40	0.72	0.96	6.47	5.62	5.55	5.32	5.66
3	0.19	0.38	0.41	0.72	0.90	6.46	5.71	5.37	5.51	5.92
4	0.35	0.39	0.66	0.68	0.75	6.06	5.19	5.28	5.47	5.81
Big	0.26	0.52	0.58	0.84	0.86	5.34	4.79	5.29	5.17	5.63
Asia Pacific										
Small	0.68	0.93	1.30	1.45	2.11	11.34	9.80	8.78	8.11	8.78
2	0.17	0.93	0.60	1.03	1.12	8.23	8.21	8.06	7.41	7.93
3	-0.15	0.32	0.77	1.03	0.94	7.97	6.84	7.25	7.11	7.32
4	0.99	1.08	0.79	0.94	0.92	7.14	8.28	6.41	6.13	7.38
Big	0.54	1.02	0.56	0.77	1.24	6.39	6.31	6.54	5.77	7.94

Table 3, continued

	Mean					Standard Deviation				
	Low	2	3	4	High	Low	2	3	4	High
Japan										
Small	-0.46	-0.05	-0.06	0.18	0.09	10.07	7.89	7.57	7.20	6.98
2	-0.55	-0.13	-0.15	-0.05	-0.02	8.90	8.19	7.50	7.10	6.97
3	-0.47	-0.21	-0.14	-0.08	0.03	8.39	8.19	7.19	7.03	7.05
4	-0.51	-0.12	-0.09	-0.03	0.19	7.82	7.11	6.68	6.63	6.77
Big	-0.48	-0.06	0.12	0.21	0.39	6.90	6.32	5.78	5.66	6.33
Emerging Markets										
Small	0.13	0.55	1.45	1.04	1.72	10.09	7.66	8.50	7.27	7.55
2	0.36	0.92	0.73	1.02	1.31	7.77	7.42	7.30	6.82	7.55
3	0.26	0.86	0.56	1.00	1.41	7.32	7.33	7.43	6.92	7.14
4	0.19	0.46	0.56	0.74	1.22	6.78	6.77	6.61	6.50	7.39
Big	0.37	0.40	0.63	0.57	0.91	6.42	6.72	6.32	6.89	7.17

This table shows the summary statistics for the 25 size/B/M excess returns. As in Fama and French (2011), at the end of June of each year we construct 25 size/B/M portfolios for each region. The size breakpoints are the 3rd, 7th, 13th, and 25th percentiles of aggregate market cap for a region. The B/M quintile breakpoints use the big stocks (top 90% of market cap) of a region. Regional quintile B/M breakpoints are used to allocate the stocks of these regions to the global test asset portfolios. The intersections of the 5×5 independent size and B/M sorts for a region produce 25 value-weighted size/B/M portfolios.

Table 4
Summary Statistics for Regression Tests of the Fama-French Three-Factor Model Using Monthly Excess Returns on 25 Size/B/M Portfolios, With (5×5) and Without (4×5) Microcap Stocks: Nov. 1990 – Dec. 2010

Panel A: Global Benchmark: Global Fama-French Three-factor Model

Portfolios	Test Assets	4×5					5×5				
		H-L α	$\|\alpha\|$	$SR(\alpha)$	R^2	GRS	H-L α	$\|\alpha\|$	$SR(\alpha)$	R^2	GRS
Global	Global	0.39	0.11	0.41	0.94	1.74	1.13	0.16	0.62	0.92	3.12
	Developed Only	0.43	0.13	0.39	0.90	1.62	0.77	0.16	0.57	0.89	2.67
	Global excl. NA	0.68	0.25	0.34	0.83	1.24	0.80	0.24	0.39	0.83	1.27
	Developed only excl.NA	0.69	0.35	0.38	0.78	1.51	0.81	0.34	0.44	0.77	1.58
Regional	North America	0.86	0.35	0.44	0.71	2.00	0.94	0.41	0.54	0.70	2.41
	Europe	0.57	0.19	0.37	0.73	1.41	0.74	0.21	0.50	0.72	2.01
	Asia Pacific	1.45	0.25	0.44	0.58	2.00	2.09	0.30	0.51	0.56	2.08
	Japan	0.93	0.56	0.29	0.33	0.90	1.06	0.56	0.36	0.32	1.06
	Emerging Markets	0.77	0.18	0.30	0.55	0.94	1.16	0.23	0.39	0.52	1.25

Panel B: Regional Benchmark: Local Fama-French Three-factor Model

Test Assets	4×5					5×5				
	H-L α	$\|\alpha\|$	$SR(\alpha)$	R^2	GRS	H-L α	$\|\alpha\|$	$SR(\alpha)$	R^2	GRS
North America	0.43	0.11	0.39	0.91	1.57	0.74	0.14	0.51	0.91	2.12
Europe	0.43	0.11	0.35	0.92	1.24	0.51	0.12	0.46	0.92	1.71
Asia Pacific	1.10	0.26	0.42	0.81	1.79	1.73	0.30	0.49	0.80	1.95
Japan	0.32	0.10	0.26	0.92	0.75	0.49	0.10	0.31	0.92	0.81
Emerging Markets	0.58	0.42	0.30	0.65	0.98	1.13	0.43	0.40	0.63	1.34

Panel C: Hybrid Model (Main CL Sample)

Portfolios	Test Assets	4×5					5×5				
		H-L α	$\|\alpha\|$	$SR(\alpha)$	R^2	GRS	H-L α	$\|\alpha\|$	$SR(\alpha)$	R^2	GRS
Global	Global	0.30	0.08	0.32	0.94	0.92	0.80	0.11	0.46	0.92	1.55
	Developed Only	0.35	0.07	0.35	0.95	1.12	0.72	0.09	0.53	0.95	2.05
	Global excl. NA	0.72	0.14	0.29	0.90	0.81	1.14	0.15	0.38	0.89	1.10
	Developed only excl.NA	0.28	0.07	0.28	0.94	0.76	0.51	0.08	0.42	0.94	1.27
Regional	North America	0.62	0.13	0.46	0.90	2.20	0.72	0.15	0.57	0.90	2.66
	Europe	0.48	0.12	0.35	0.90	1.22	0.71	0.13	0.51	0.91	2.06
	Asia Pacific	0.94	0.23	0.39	0.81	1.44	1.66	0.30	0.51	0.79	1.92
	Japan	0.54	0.08	0.25	0.92	0.65	0.54	0.09	0.35	0.93	0.97
	Emerging Markets	0.64	0.18	0.29	0.68	0.82	1.20	0.23	0.40	0.64	1.22

Table 4, continued

The regressions use the global, local and hybrid version of the Fama-French three-factor model to explain the returns on four sets of global portfolios and five sets of regional portfolios on North America, Europe, Japan, Asia Pacific(excluding Japan), and Emerging Markets formed on size and B/M. The 5×5 results include five size quintiles, the 4×5 results exclude microcap portfolios. The GRS statistic tests whether all intercepts in a set of 25 (5×5) or 20 (4×5) regressions are zero; H-L α is the difference between the highest and lowest intercepts for a set of regressions; $|\alpha|$ is the average absolute intercepts; R^2 is the average adjusted R^2; $SR(\alpha)$ is the Sharpe ratio for the intercepts. With 25 portfolios and 242 monthly returns, critical values of the GRS statistic for all models are: 90%: 1.41; 95%: 1.56; 97.5%: 1.69; 99%: 1.86 and 99.9%: 2.26. With 20 portfolios and 242 monthly returns, critical values of the GRS statistic for all models are: 90%: 1.45; 95%: 1.62; 97.5%: 1.78; 99%: 1.95 and 99.9%: 2.41. Three classes of models are investigated:

Global Fama-French Three-factor Model: $R_i - R_f = \alpha_i^G + \beta_i^G(R_m^G - R_f) + s_i^G F_{Size}^G + h_i^G F_{B/M}^G + \varepsilon_i$

Local Fama-French Three-factor Model: $R_i - R_f = \alpha_i^L + \beta_i^L(R_m^L - R_f) + s_i^L F_{Size}^L + h_i^L F_{B/M}^L + \varepsilon_i$

Hybrid Fama-French Three-factor Model: $R_i - R_f = \alpha_i^H + \beta_i^A(R_m^A - R_f) + \beta_i^{\bar{A}-A} R_m^{\bar{A}-A} + s_i^A F_{Size}^A + s_i^{\bar{A}-A} F_{Size}^{\bar{A}-A} + h_i^A F_{B/M}^A + h_i^{\bar{A}-A} F_{B/M}^{\bar{A}-A} + \varepsilon_i$

The superscript "G" on the market and factor portfolios implies that they are constructed from all stocks around the world and the superscript designation of "L" on the market and factor portfolios implies that they are constructed only from local - or regional, in our experiments - stocks. The superscript "H" denotes the intercept for the hybrid model. The superscript "A" denotes a market or factor portfolio comprised of stocks only in the globally-accessible sample, which is represented by the sample of secondary cross-listings in this study, and the superscript "Ā-A" denotes a market or factor spread portfolio of the difference in the market or factor for purely-local stocks from the specific region (those not secondarily cross-listed overseas for which the test is performed) and that of the globally accessible stocks. The Main CL Sample is used here.

Table 5

Summary Statistics for Regression Tests of the Hybrid Version of the Fama-French Three-Factor Model Using Monthly Excess Returns on 25 Size/B/M Portfolios When Other CL Samples are Used to Construct the Global Factors: Nov. 1990 – Dec. 2010

Panel A: CL1 (no viability constraints on target market trading)

Portfolios	Test Assets	4×5					5×5				
		H-L α	$\lvert\alpha\rvert$	$SR(\alpha)$	R^2	GRS	H-L α	$\lvert\alpha\rvert$	$SR(\alpha)$	R^2	GRS
Global	Global	0.42	0.07	0.34	0.95	1.14	1.04	0.12	0.50	0.92	1.86
	Developed Only	0.35	0.07	0.38	0.94	1.23	0.69	0.11	0.61	0.94	2.54
	Global excl. NA	0.74	0.12	0.29	0.90	0.80	1.15	0.14	0.37	0.88	1.04
	Developed only excl.NA	0.26	0.12	0.35	0.93	1.06	0.43	0.13	0.45	0.92	1.42
Regional	North America	0.57	0.21	0.44	0.87	1.93	0.59	0.25	0.61	0.87	2.90
	Europe	0.43	0.19	0.44	0.89	1.76	0.48	0.19	0.58	0.89	2.47
	Asia Pacific	0.94	0.26	0.41	0.78	1.57	1.48	0.34	0.51	0.77	1.89
	Japan	0.63	0.16	0.33	0.91	1.13	0.73	0.16	0.43	0.92	1.43
	Emerging Markets	0.59	0.13	0.27	0.74	0.70	1.21	0.20	0.37	0.70	1.07

Panel B: CL2a (non-zero target market trading in trailing 12 months)

Portfolios	Test Assets	4×5					5×5				
		H-L α	$\lvert\alpha\rvert$	$SR(\alpha)$	R^2	GRS	H-L α	$\lvert\alpha\rvert$	$SR(\alpha)$	R^2	GRS
Global	Global	0.44	0.09	0.40	0.94	1.65	1.03	0.14	0.58	0.91	2.73
	Developed Only	0.45	0.11	0.42	0.93	1.75	0.74	0.13	0.63	0.92	3.06
	Global excl. NA	0.74	0.11	0.39	0.90	1.54	1.07	0.14	0.48	0.89	1.82
	Developed only excl.NA	0.50	0.12	0.40	0.93	1.60	0.71	0.13	0.50	0.92	1.96
Regional	North America	0.53	0.11	0.36	0.83	1.36	0.89	0.15	0.51	0.84	2.08
	Europe	0.43	0.10	0.34	0.90	1.18	0.61	0.12	0.51	0.90	2.01
	Asia Pacific	0.93	0.23	0.40	0.80	1.55	1.70	0.31	0.51	0.79	2.01
	Japan	0.60	0.19	0.34	0.91	1.17	0.62	0.17	0.37	0.91	1.11
	Emerging Markets	0.54	0.12	0.26	0.67	0.69	1.31	0.20	0.40	0.64	1.24

Table 5, continued

Panel C: CL2b (more stringent viability constraints on the Main CL Sample)

Portfolios	Test Assets	4×5					5×5				
		H-L α	$\|\alpha\|$	$SR(\alpha)$	R^2	GRS	H-L α	$\|\alpha\|$	$SR(\alpha)$	R^2	GRS
Global	Global	0.33	0.07	0.33	0.94	1.02	0.81	0.11	0.49	0.92	1.71
	Developed Only	0.37	0.07	0.38	0.95	1.38	0.64	0.10	0.54	0.95	2.12
	Global excl. NA	0.69	0.13	0.31	0.89	0.90	1.05	0.14	0.40	0.88	1.19
	Developed only excl.NA	0.35	0.08	0.33	0.93	1.05	0.53	0.09	0.44	0.93	1.42
Regional	North America	0.56	0.13	0.46	0.90	2.20	0.66	0.15	0.57	0.90	2.64
	Europe	0.46	0.13	0.39	0.89	1.51	0.78	0.15	0.57	0.90	2.53
	Asia Pacific	0.99	0.25	0.40	0.81	1.57	1.72	0.29	0.48	0.79	1.72
	Japan	0.48	0.08	0.25	0.92	0.63	0.50	0.08	0.32	0.92	0.78
	Emerging Markets	0.61	0.18	0.29	0.69	0.82	1.30	0.24	0.40	0.65	1.23

The regressions use the hybrid model to explain the returns on four sets of global portfolios and five sets of regional portfolios on North America, Europe, Japan, Asia Pacific(excluding Japan), and Emerging Markets formed on size and B/M. The global factor portfolios are based on other globally accessible samples, where CL1 refers to the sample without viability constraints, CL2a is the sample with absolute viable constraint, CL2b is the sample where more stringent screenings are imposed on the two viability constraints. The selection criteria are described in the Appendix. The 5×5 results include five size quintiles, the 4×5 results exclude microcap portfolios. The GRS statistic tests whether all intercepts in a set of 25 (5×5) or 20 (4×5) regressions are zero; H-L α is the difference between the highest and lowest intercepts for a set of regressions; $|\alpha|$ is the average absolute intercept; R^2 is the average adjusted R^2; $SR(\alpha)$ is the Sharpe ratio for the intercepts. With 25 portfolios and 242 monthly returns, critical values of the GRS statistic for all models are: 90%: 1.41; 95%: 1.56; 97.5%: 1.69; 99%: 1.86 and 99.9%: 2.26. With 20 portfolios and 242 monthly returns, critical values of the GRS statistic for all models are: 90%: 1.45; 95%: 1.62; 97.5%: 1.78; 99%: 1.95 and 99.9%: 2.41. The hybrid model based on the Fama-French three-factor model is:

$$R_i - R_f = \alpha_i^H + \beta_i^A(R_m^A - R_f) + \beta_i^{\bar{A}-A} R_m^{\bar{A}-A} + s_i^A F_{Size}^A + s_i^{\bar{A}-A} F_{Size}^{\bar{A}-A} + h_i^A F_{B/M}^A + h_i^{\bar{A}-A} F_{B/M}^{\bar{A}-A} + \varepsilon_i$$

The superscript "H" denotes the intercept for the hybrid model. The superscript "A" denotes a market or factor portfolio comprised of stocks only in the globally-accessible sample, which is represented by the sample of secondary cross-listings in this study, and the superscript "Ā-A" denotes a market or factor spread portfolio of the difference in the market or factor for purely-local stocks from the specific region (those not secondarily cross-listed overseas for which the test is performed) and that of the globally accessible stocks.

Table 6
Summary Statistics for Regression Tests of the Carhart Four-Factor Model Using Monthly Excess Returns on 25 Size/Momentum Portfolios, With (5×5) and Without (4×5) Microcap Stocks: Nov. 1990 – Dec. 2010

Panel A: Global Benchmark: Global Carhart Four-factor Model

Portfolios	Test Assets	4×5					5×5				
		H-L *α*	|*α*|	*SR(α)*	R^2	GRS	H-L *α*	|*α*|	*SR(α)*	R^2	GRS
Global	Global	0.57	0.12	0.43	0.92	1.89	1.18	0.20	0.53	0.89	2.20
	Developed Only	0.71	0.14	0.45	0.89	2.05	0.97	0.16	0.59	0.88	2.72
	Global excl. NA	0.89	0.25	0.44	0.81	1.96	1.05	0.26	0.49	0.80	1.88
	Developed only excl.NA	0.71	0.32	0.37	0.77	1.42	0.95	0.31	0.44	0.75	1.56
Regional	North America	0.82	0.45	0.37	0.72	1.37	1.22	0.51	0.51	0.72	2.02
	Europe	1.22	0.23	0.51	0.73	2.68	1.75	0.29	0.67	0.71	3.57
	Asia Pacific	1.61	0.34	0.52	0.58	2.74	2.00	0.36	0.64	0.58	3.21
	Japan	1.57	0.49	0.43	0.34	1.84	1.57	0.50	0.52	0.33	2.11
	Emerging Markets	2.53	0.47	0.44	0.45	1.96	2.53	0.56	0.52	0.46	2.15

Panel B: Regional Benchmark: Local Carhart Four -factor Model

Test Assets	4×5					5×5				
	H-L *α*	|*α*|	*SR(α)*	R^2	GRS	H-L *α*	|*α*|	*SR(α)*	R^2	GRS
North America	0.54	0.10	0.30	0.91	0.94	1.05	0.15	0.45	0.91	1.64
Europe	0.98	0.20	0.55	0.91	2.98	1.26	0.23	0.68	0.91	3.56
Asia Pacific	0.84	0.23	0.47	0.83	2.17	1.26	0.28	0.64	0.83	3.12
Japan	0.63	0.19	0.36	0.92	1.37	0.78	0.20	0.47	0.92	1.79
Emerging Markets	0.84	0.60	0.43	0.62	1.90	1.07	0.69	0.51	0.62	2.13

Panel C: Hybrid Model (Main CL Sample)

Portfolios	Test Assets	4×5					5×5				
		H-L *α*	|*α*|	*SR(α)*	R^2	GRS	H-L *α*	|*α*|	*SR(α)*	R^2	GRS
Global	Global	0.44	0.13	0.44	0.93	1.74	0.98	0.19	0.52	0.90	1.93
	Developed Only	0.53	0.12	0.45	0.95	1.80	0.96	0.15	0.58	0.94	2.39
	Global excl. NA	0.99	0.19	0.47	0.89	2.07	0.99	0.22	0.50	0.88	1.85
	Developed only excl.NA	0.63	0.12	0.40	0.94	1.50	0.92	0.14	0.51	0.94	1.89
Regional	North America	0.73	0.21	0.42	0.90	1.77	0.86	0.24	0.51	0.90	2.02
	Europe	0.81	0.19	0.56	0.90	2.91	1.09	0.22	0.70	0.91	3.56
	Asia Pacific	0.79	0.24	0.48	0.83	2.12	1.33	0.32	0.66	0.83	3.08
	Japan	0.74	0.14	0.40	0.93	1.53	0.74	0.14	0.51	0.92	1.98
	Emerging Markets	1.17	0.32	0.40	0.64	1.51	1.31	0.38	0.49	0.64	1.76

Table 6, continued

The regressions use the global, local and hybrid version of the Carhart four-factor model to explain the returns on four sets of global portfolios and five sets of regional portfolios on North America, Europe, Japan, Asia Pacific(excluding Japan), and Emerging Markets formed on size and momentum. The 5×5 results include five size quintiles, the 4×5 results exclude microcap portfolios. The GRS statistic tests whether all intercepts in a set of 25 (5×5) or 20 (4×5) regressions are zero; H-L α is the difference between the highest and lowest intercepts for a set of regressions; |α| is the average absolute intercept; R2 is the average adjusted R2; SR(α) is the Sharpe ratio for the intercepts. With 25 portfolios and 242 monthly returns, critical values of the GRS statistic for all models are: 90%: 1.41; 95%: 1.56; 97.5%: 1.69; 99%: 1.86 and 99.9%: 2.26. With 20 portfolios and 242 monthly returns, critical values of the GRS statistic for all models are: 90%: 1.45; 95%: 1.62; 97.5%: 1.78; 99%: 1.95 and 99.9%: 2.41. Three classes of models are investigated:

Global Carhart Four-factor Model: $R_i - R_f = \alpha_i^G + \beta_i^G\left(R_m^G - R_f\right) + s_i^G F_{Size}^G + h_i^G F_{B/M}^G + m_i^G F_{Mom}^G + \varepsilon_i$

Local Carhart Four-factor Model: $R_i - R_f = \alpha_i^L + \beta_i^L\left(R_m^L - R_f\right) + s_i^L F_{Size}^L + h_i^L F_{B/M}^L + m_i^L F_{Mom}^L + \varepsilon_i$

Hybrid Carhart Four-factor Model: $R_i - R_f = \alpha_i^H + \beta_i^A\left(R_m^A - R_f\right) + \beta_i^{\bar{A}-A} R_m^{\bar{A}-A} + s_i^A F_{Size}^A + s_i^{\bar{A}-A} F_{Size}^{\bar{A}-A} + h_i^A F_{B/M}^A + h_i^{\bar{A}-A} F_{B/M}^{\bar{A}-A} + m_i^A F_{Mom}^A + m_i^{\bar{A}-A} F_{Mom}^{\bar{A}-A} + \varepsilon_i$

The superscript "G" on the market and factor portfolios implies that they are constructed from all stocks around the world and the superscript designation of "L" on the market and factor portfolios implies that they are constructed only from local - or regional, in our experiments - stocks. The superscript "H" denotes the intercept for the hybrid model. The superscript "A" denotes a market or factor portfolio comprised of stocks only in the globally-accessible sample, which is represented by the sample of secondary cross-listings in this study, and the superscript "Ā-A" denotes a market or factor spread portfolio of the difference in the market or factor for purely-local stocks from the specific region (those not secondarily cross-listed overseas for which the test is performed) and that of the globally accessible stocks. The Main CL Sample is used here.

Table 7
Summary Statistics for Regression Tests of the Carhart Four-Factor Model Using Monthly Excess Returns on 25 Size/C/P Portfolios, With (5×5) and Without (4×5) Microcap Stocks: Nov. 1990 – Dec. 2010

Panel A: Global Benchmark: Global Carhart Four-factor Model

Portfolios	Test Assets	4×5					5×5				
		H-L *α*	|*α*|	*SR(α)*	R^2	GRS	H-L *α*	|*α*|	*SR(α)*	R^2	GRS
Global	Global	0.47	0.09	0.41	0.93	1.73	1.00	0.13	0.50	0.91	1.96
	Developed Only	0.50	0.08	0.40	0.90	1.62	0.72	0.12	0.53	0.88	2.25
	Global excl. NA	0.83	0.19	0.38	0.83	1.45	0.91	0.19	0.46	0.82	1.65
	Developed only excl.NA	0.64	0.28	0.37	0.79	1.42	0.90	0.26	0.50	0.77	1.99
Regional	North America	0.60	0.41	0.36	0.71	1.32	0.69	0.45	0.48	0.70	1.80
	Europe	0.77	0.15	0.38	0.73	1.45	0.80	0.17	0.48	0.72	1.82
	Asia Pacific	1.19	0.24	0.46	0.58	2.15	1.74	0.31	0.54	0.56	2.29
	Japan	0.50	0.48	0.25	0.33	0.63	0.55	0.46	0.30	0.31	0.70
	Emerging Markets	1.14	0.29	0.39	0.54	1.52	1.61	0.32	0.49	0.52	1.89

Panel B: Regional Benchmark: Local Carhart Four -factor Model

Test Assets	4×5					5×5				
	H-L *α*	|*α*|	*SR(α)*	R^2	GRS	H-L *α*	|*α*|	*SR(α)*	R^2	GRS
North America	0.38	0.09	0.30	0.90	0.94	0.77	0.12	0.46	0.90	1.69
Europe	0.40	0.08	0.32	0.91	1.00	0.55	0.10	0.44	0.91	1.45
Asia Pacific	1.29	0.27	0.45	0.80	1.98	1.79	0.32	0.54	0.78	2.18
Japan	0.51	0.16	0.32	0.92	1.10	0.51	0.14	0.36	0.92	1.04
Emerging Markets	0.84	0.50	0.38	0.63	1.49	1.46	0.51	0.49	0.61	1.94

Panel C: Hybrid Model (Main CL Sample)

Portfolios	Test Assets	4×5					5×5				
		H-L *α*	|*α*|	*SR(α)*	R^2	GRS	H-L *α*	|*α*|	*SR(α)*	R^2	GRS
Global	Global	0.44	0.10	0.39	0.94	1.36	0.92	0.13	0.48	0.91	1.67
	Developed Only	0.37	0.08	0.34	0.94	1.06	0.89	0.12	0.56	0.93	2.21
	Global excl. NA	0.63	0.14	0.38	0.89	1.32	0.66	0.15	0.50	0.88	1.81
	Developed only excl.NA	0.44	0.09	0.34	0.93	1.07	0.74	0.12	0.52	0.92	1.99
Regional	North America	0.58	0.18	0.40	0.89	1.60	0.68	0.19	0.51	0.89	2.09
	Europe	0.57	0.15	0.39	0.90	1.43	0.65	0.17	0.51	0.90	1.92
	Asia Pacific	1.50	0.27	0.50	0.81	2.23	1.89	0.37	0.58	0.79	2.41
	Japan	0.50	0.08	0.26	0.92	0.65	0.50	0.10	0.34	0.92	0.87
	Emerging Markets	0.83	0.21	0.34	0.66	1.12	1.58	0.25	0.48	0.63	1.68

Table 7, continued

The regressions use the global, local and hybrid version of the Carhart four-factor model to explain the returns on four sets of global portfolios and five sets of regional portfolios on North America, Europe, Japan, Asia Pacific(excluding Japan), and Emerging Markets formed on size and C/P. The 5×5 results include five size quintiles, the 4×5 results exclude microcap portfolios. The GRS statistic tests whether all intercepts in a set of 25 (5×5) or 20 (4×5) regressions are zero; H-L α is the difference between the highest and lowest intercepts for a set of regressions; $|\alpha|$ is the average absolute intercept; R^2 is the average adjusted R^2; SR(α) is the Sharpe ratio for the intercepts. With 25 portfolios and 242 monthly returns, critical values of the GRS statistic for all models are: 90%: 1.41; 95%: 1.56; 97.5%: 1.69; 99%: 1.86 and 99.9%: 2.26. With 20 portfolios and 242 monthly returns, critical values of the GRS statistic for all models are: 90%: 1.45; 95%: 1.62; 97.5%: 1.78; 99%: 1.95 and 99.9%: 2.41. Three classes of models are investigated:

Global Carhart Four-factor Model: $R_i - R_f = \alpha_i^G + \beta_i^G(R_m^G - R_f) + s_i^G F_{Size}^G + h_i^G F_{B/M}^G + m_i^G F_{Mom}^G + \varepsilon_i$

Local Carhart Four-factor Model: $R_i - R_f = \alpha_i^L + \beta_i^L(R_m^L - R_f) + s_i^L F_{Size}^L + h_i^L F_{B/M}^L + m_i^L F_{Mom}^L + \varepsilon_i$

Hybrid Carhart Four-factor Model: $R_i - R_f = \alpha_i^H + \beta_i^A(R_m^A - R_f) + \beta_i^{\bar{A}-A} R_m^{\bar{A}-A} + s_i^A F_{Size}^A + s_i^{\bar{A}-A} F_{Size}^{\bar{A}-A} + h_i^A F_{B/M}^A + h_i^{\bar{A}-A} F_{B/M}^{\bar{A}-A} + m_i^A F_{Mom}^A + m_i^{\bar{A}-A} F_{Mom}^{\bar{A}-A} + \varepsilon_i$

The superscript "G" on the market and factor portfolios implies that they are constructed from all stocks around the world and the superscript designation of "L" on the market and factor portfolios implies that they are constructed only from local - or regional, in our experiments - stocks. The superscript "H" denotes the intercept for the hybrid model. The superscript "A" denotes a market or factor portfolio comprised of stocks only in the globally-accessible sample, which is represented by the sample of secondary cross-listings in this study, and the superscript "Ā-A" denotes a market or factor spread portfolio of the difference in the market or factor for purely-local stocks from the specific region (those not secondarily cross-listed overseas for which the test is performed) and that of the globally accessible stocks. The Main CL Sample is used here.

Figure 1
Global Equity Universe, reported by Total Market Capitalization, 1990-2010

The figure shows the distribution of the global equity universe by region. Beside each region name is the time series average market capitalization from that region that qualifies for analysis, which is in U.S. dollars trillion, and its percentage of global market capitalization. The sample selection criteria are described in Table 1.

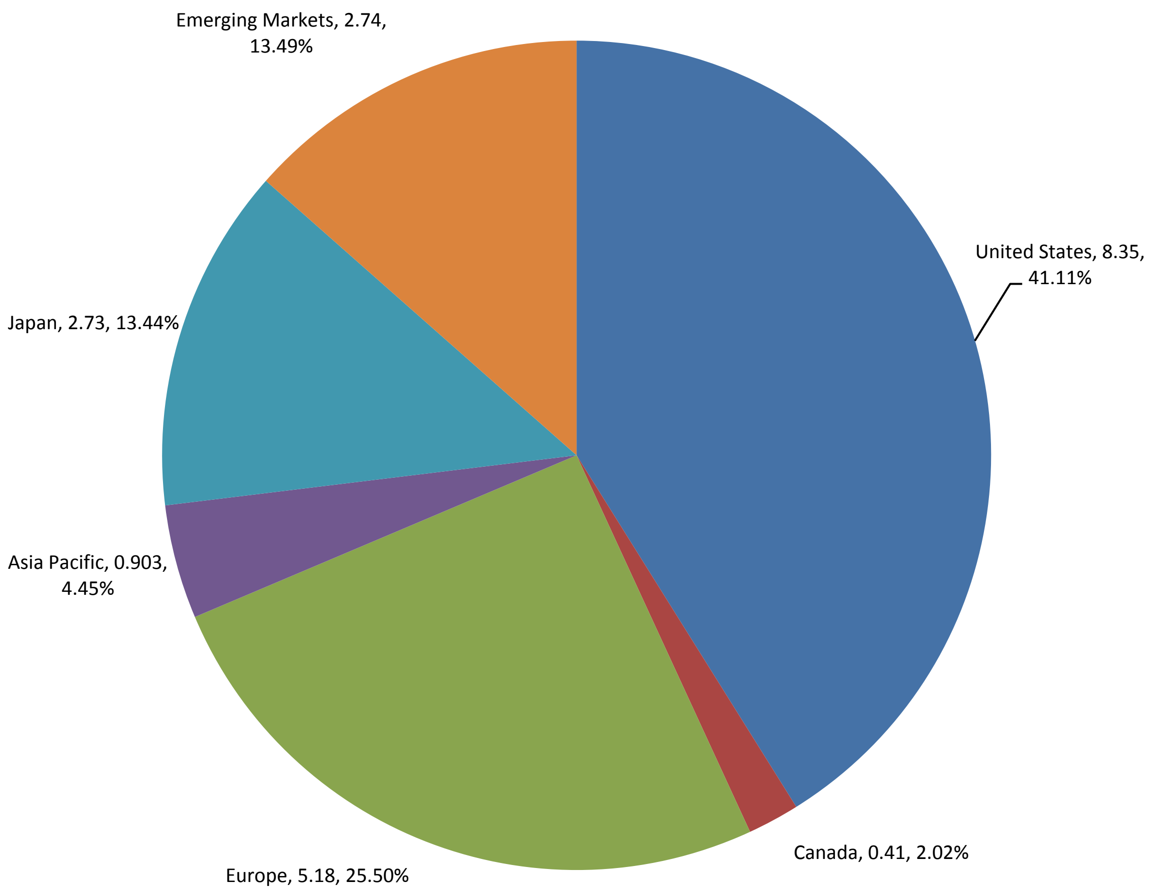
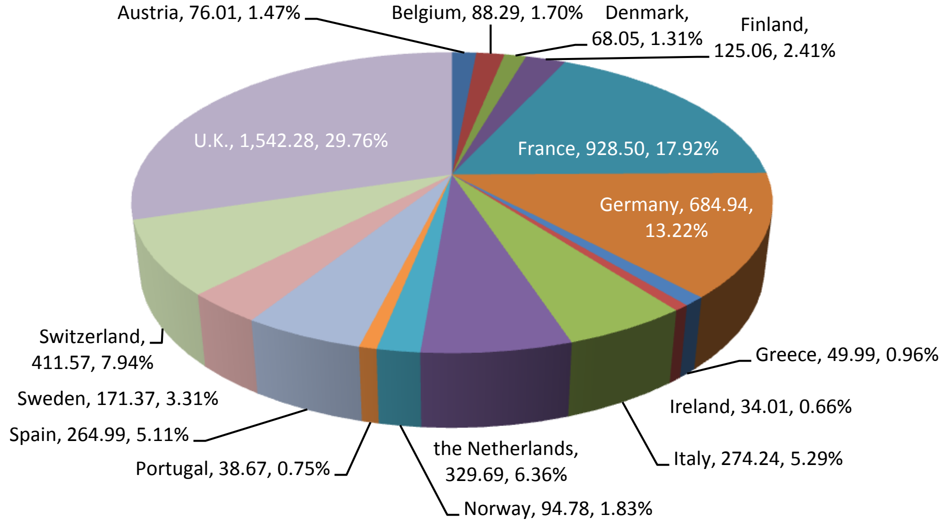
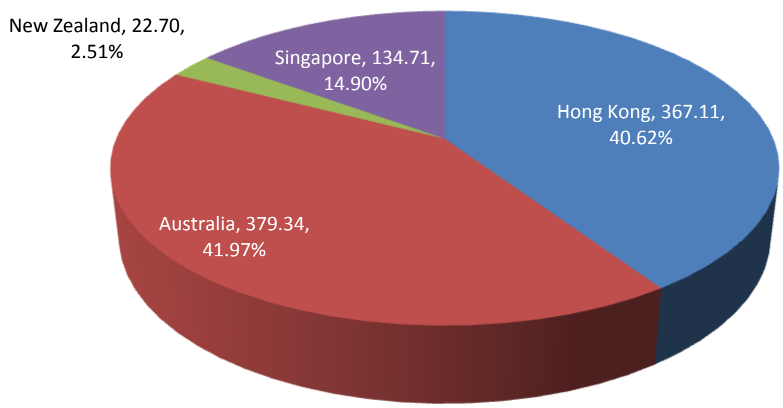


Figure 1
Global Equity Universe, reported by Total Market Capitalization, 1990-2010

The figures show the distributions of Europe, Asia Pacific and Emerging Markets equity universes by country. Beside each country name is the average market capitalization from that country, which is in U.S. dollars billion, and the percentage of regional market capitalization. The sample selection criteria are described in Table 1.





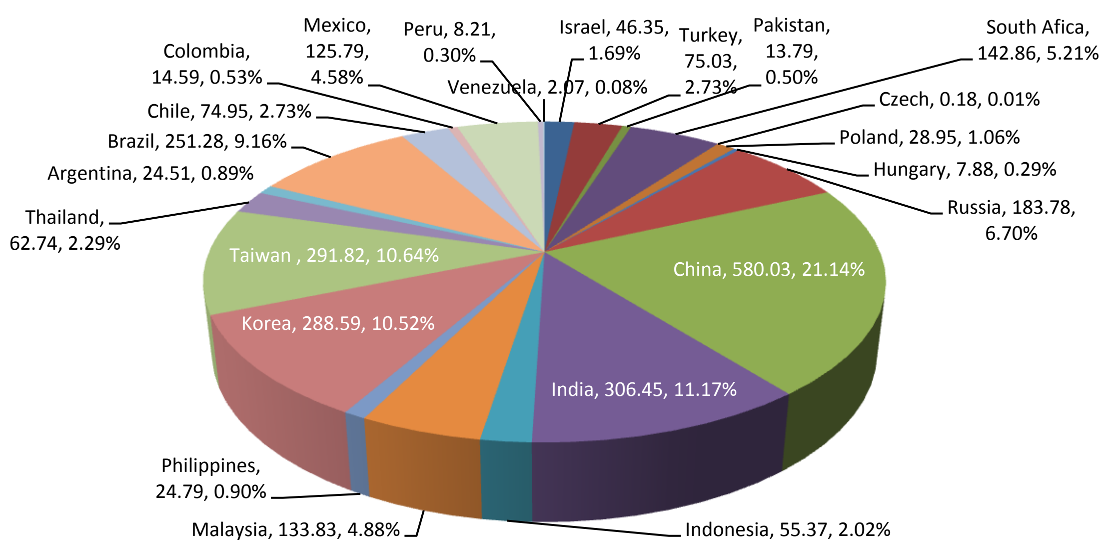


Figure 2
Global Equity Universe, reported by Total Number of Stocks, 1990-2010

The figure shows the distribution of the global equity universe by region. Beside each region name is the total number of sample stocks from that region that qualifies for analysis and the percentage of the total number that this count represents. The sample selection criteria are described in Table 1.

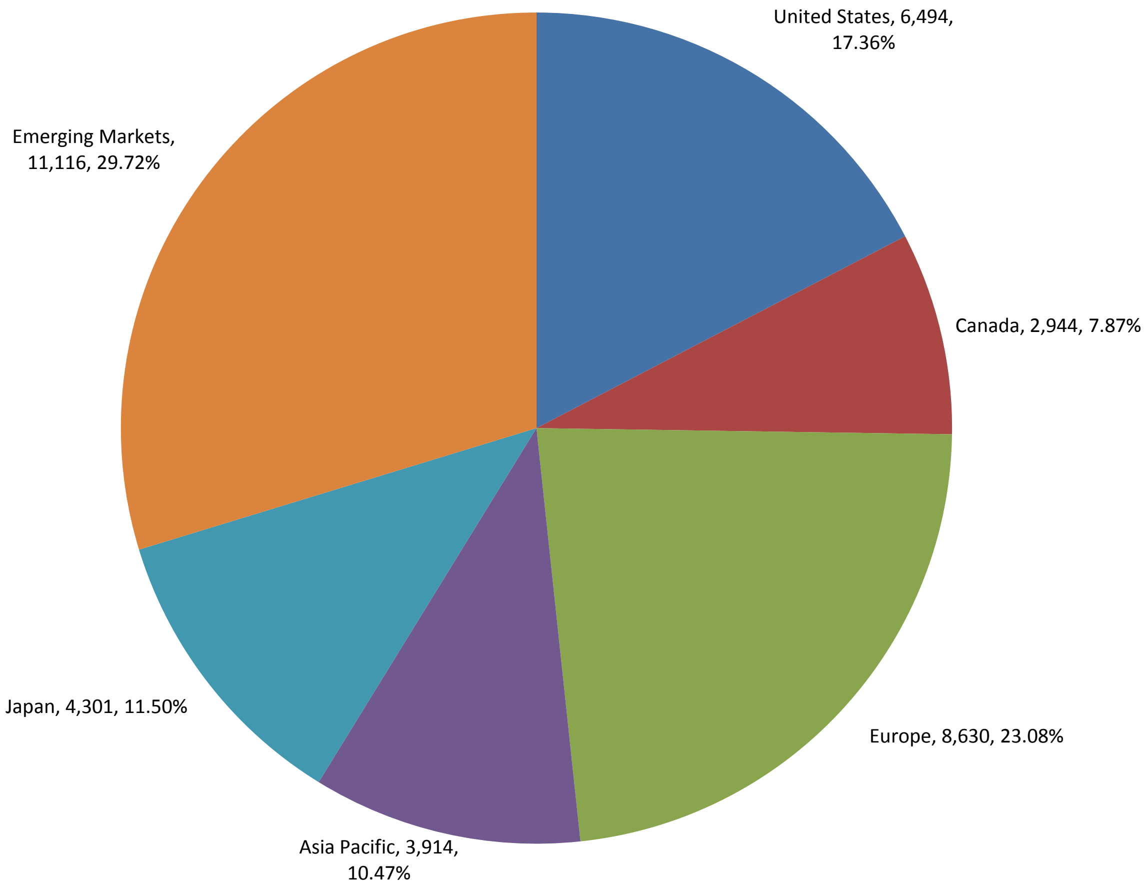


Figure 2

Global Equity Universe, reported by Total Number of Stocks, 1990-2010

The figures show the distributions of Europe, Asia Pacific and Emerging Markets equity universes by region. Beside each country name is the total number of sample stocks from that country that qualifies for analysis and the percentage of the total number that this count represents. The sample selection criteria are described in Table 1.

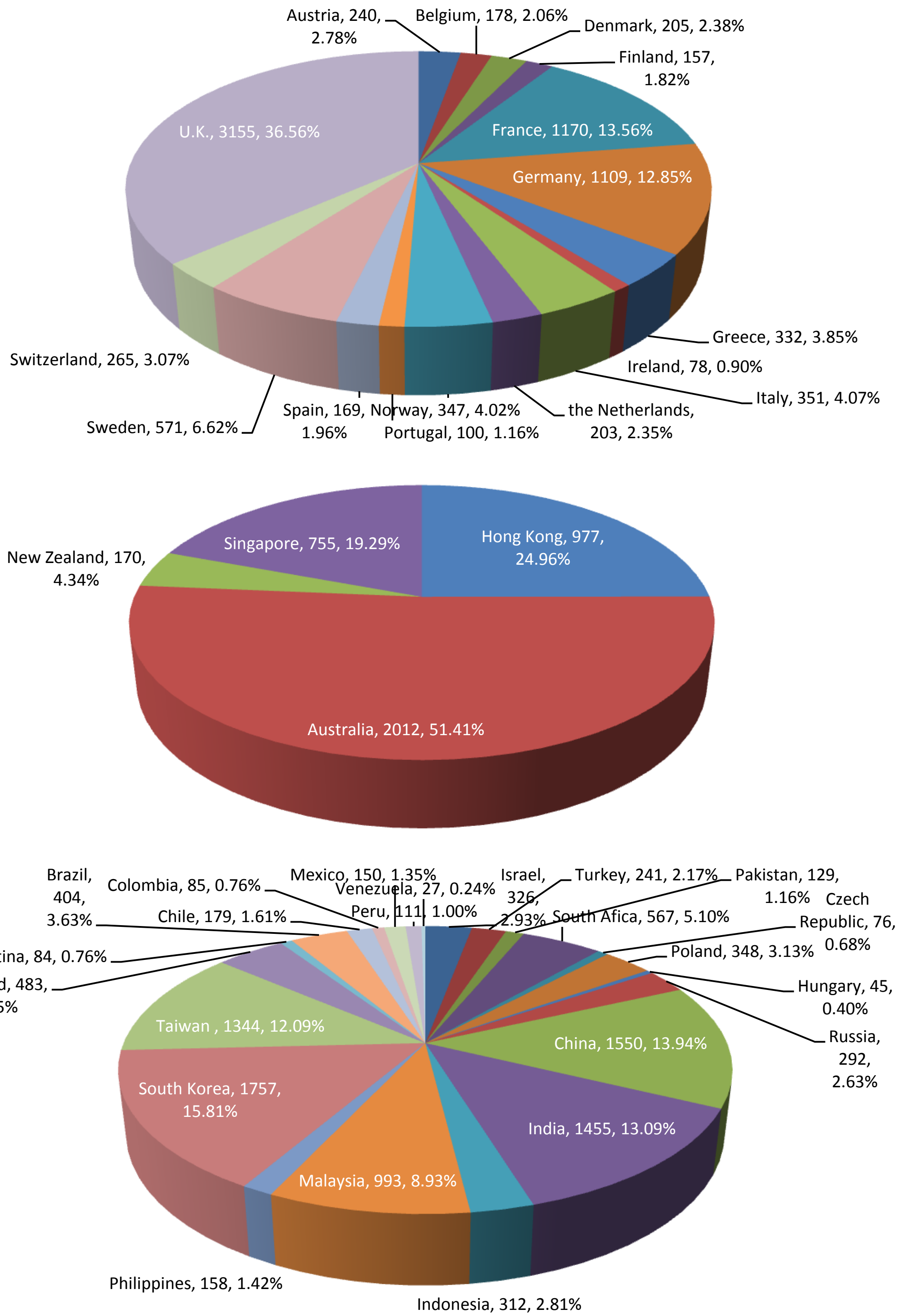
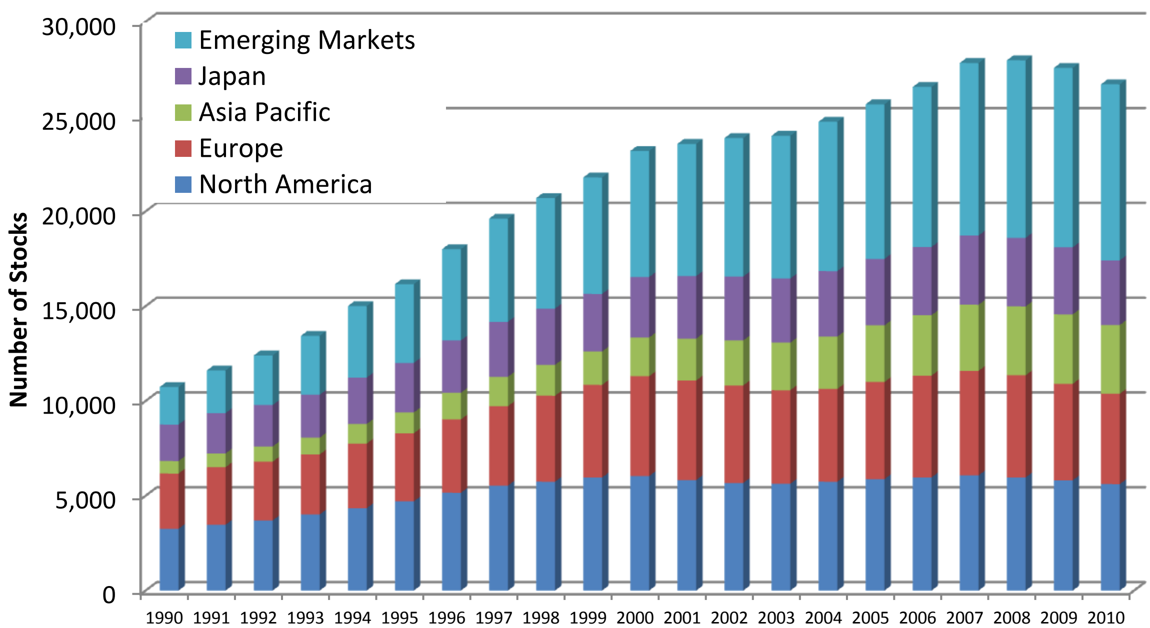


Figure 3
Global Equity Universe by Year, reported by Total Number of Stocks (above) and by Market Capitalization (below), 1990-2010
The figures show the distribution of our sample stocks from each region by year. The sample selection criteria are described in Table 1.



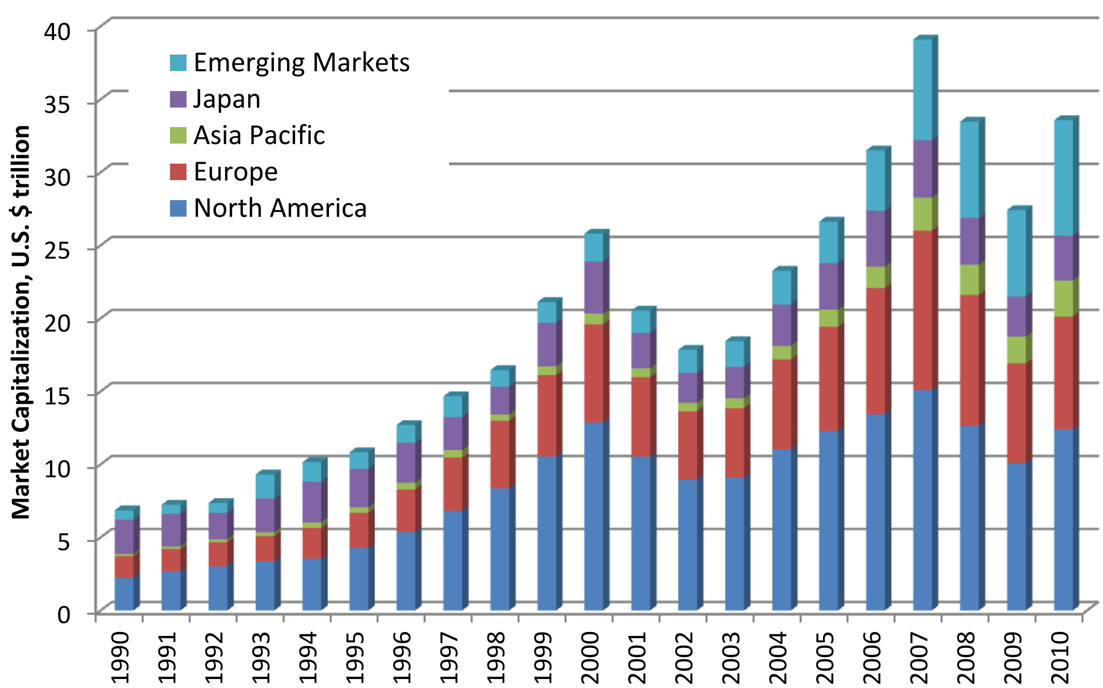


Figure 4
Globally Accessible Sample, reported by Total Market Capitalization, 1990-2010

The figure shows the distribution of the globally accessible sample by region. Beside each region name is the average market capitalization from that region, which is in U.S. dollars trillion, and its percentage of market capitalization. Here the sample is represented by the Main CL Sample and the sample selection criteria are described in the Appendix.

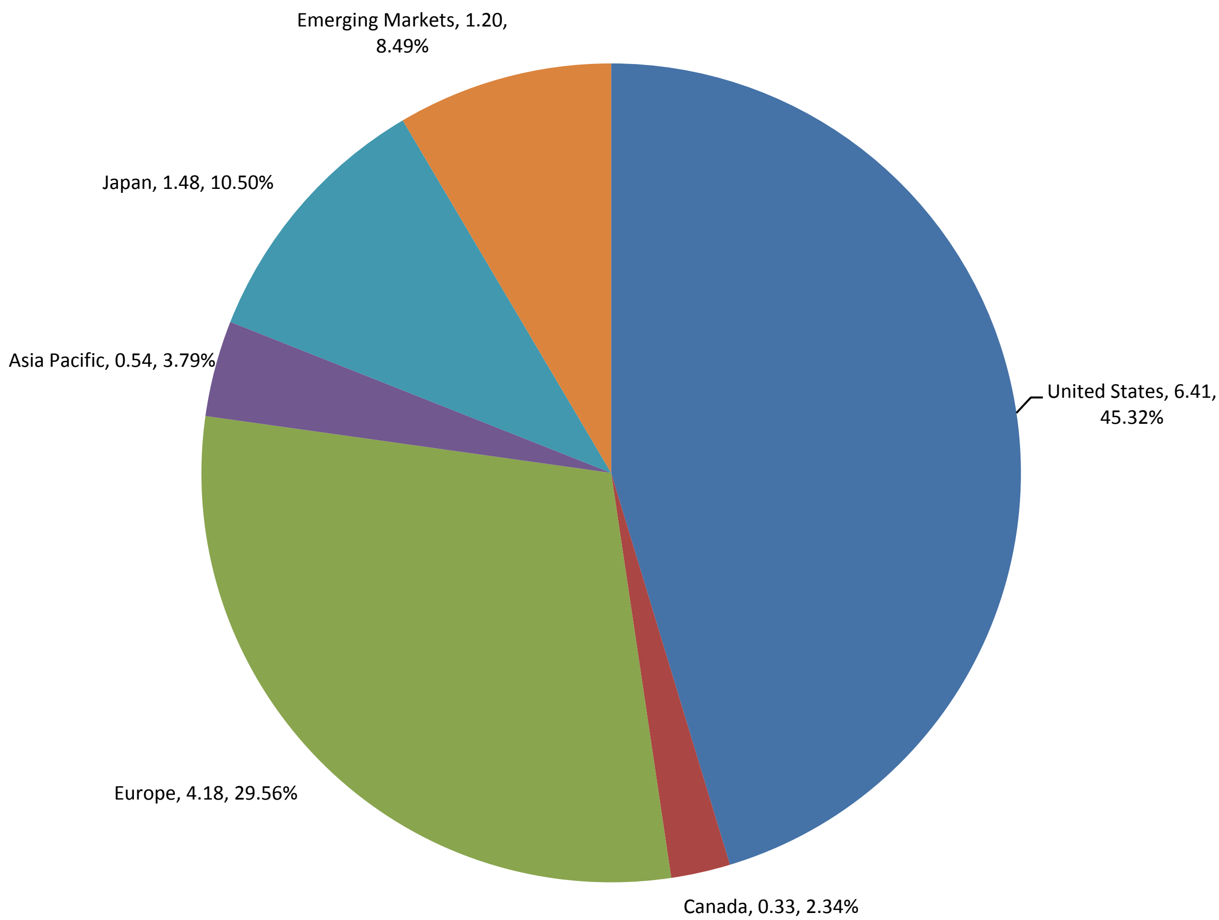


Figure 4, continued

Globally Accessible Sample, reported by Total Market Capitalization, 1990-2010

The figures show the distributions of Europe, Asia Pacific and Emerging Markets globally accessible samples by country. Beside each country name is the average market capitalization from that country, which is in U.S. dollars billion, and its percentage of market capitalization. Here the sample is represented by the Main CL Sample and the selection criteria are described in the Appendix.

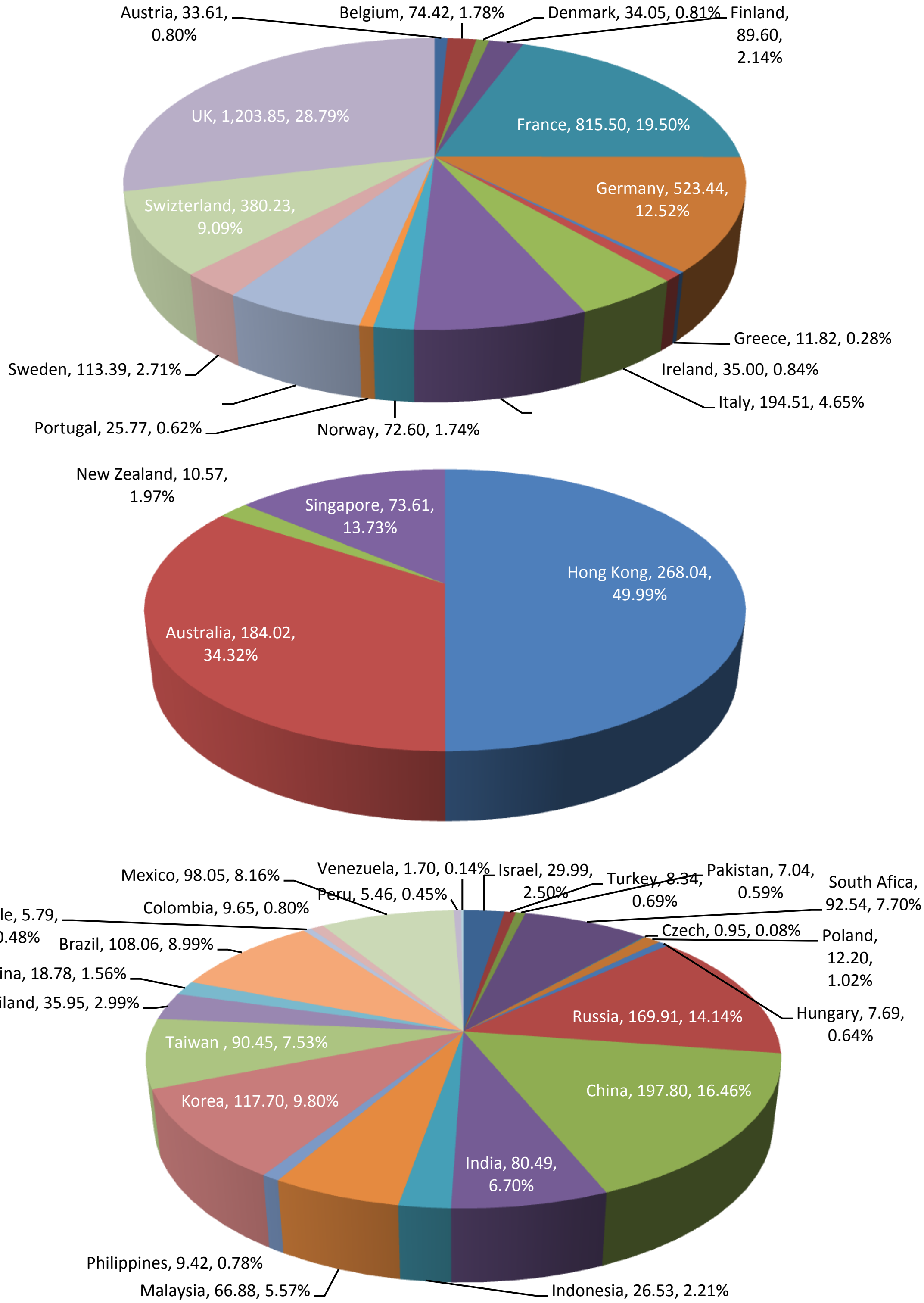


Figure 5

Globally Accessible Sample, reported by Total Number of Stocks, 1990-2010

The figure shows the distribution of the globally accessible sample by region. Beside each region name is the total number of sample stocks from that region that qualifies for analysis and the percentage of the total number that this count represents. Here the sample is represented by the Main CL Sample and the sample selection criteria are described in the Appendix.

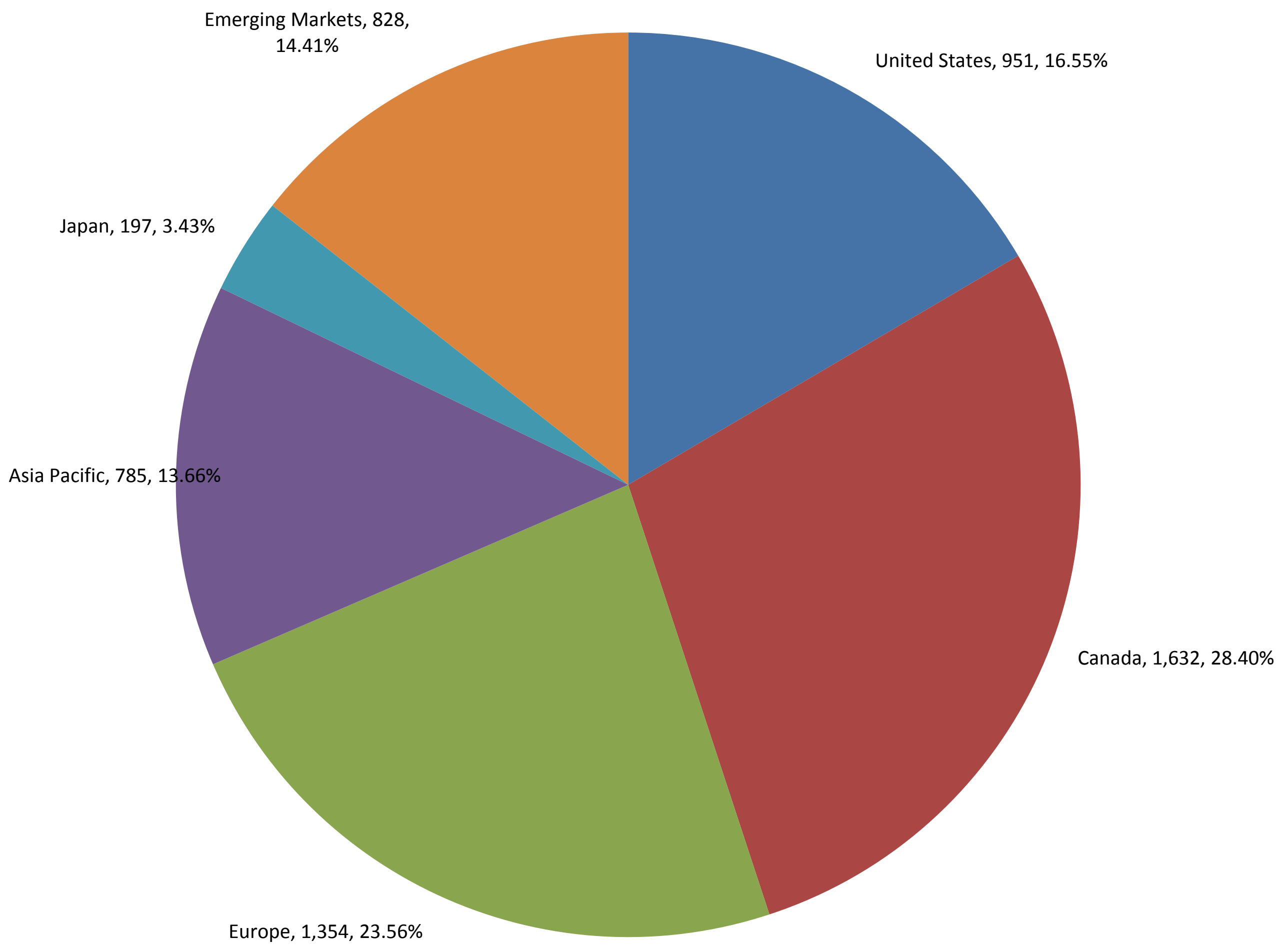
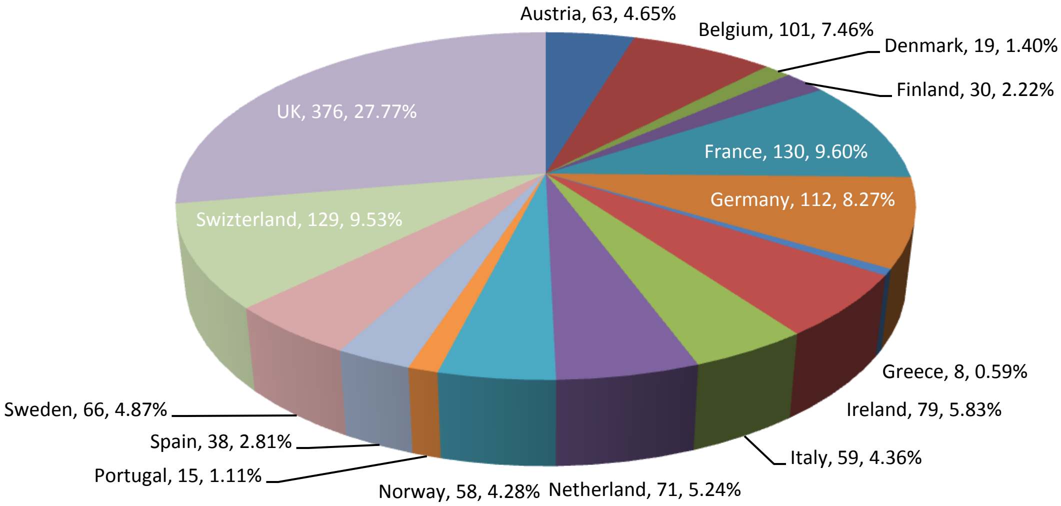
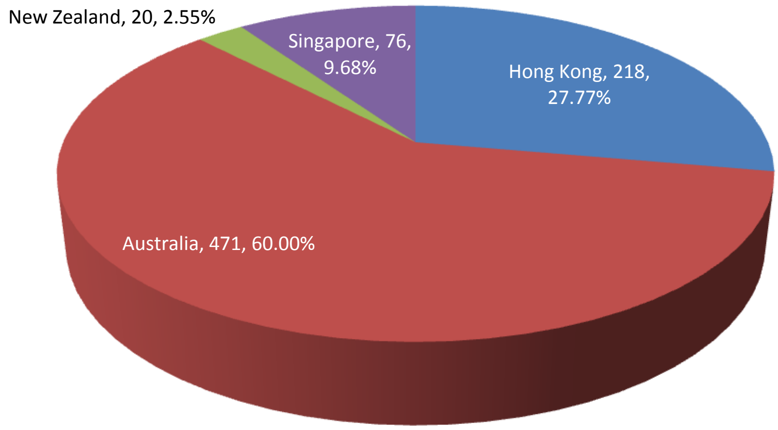


Figure 5, continued

Globally Accessible Sample, reported by Total Number of Stocks, 1990-2010

The figures show the distributions of Europe, Asia Pacific and Emerging Markets globally accessible samples by country. Beside each country name is the total number of sample stocks from that country that qualifies for analysis and the percentage of the total number that this count represents. Here the sample is represented by the Main CL Sample and the selection criteria are described in the Appendix.





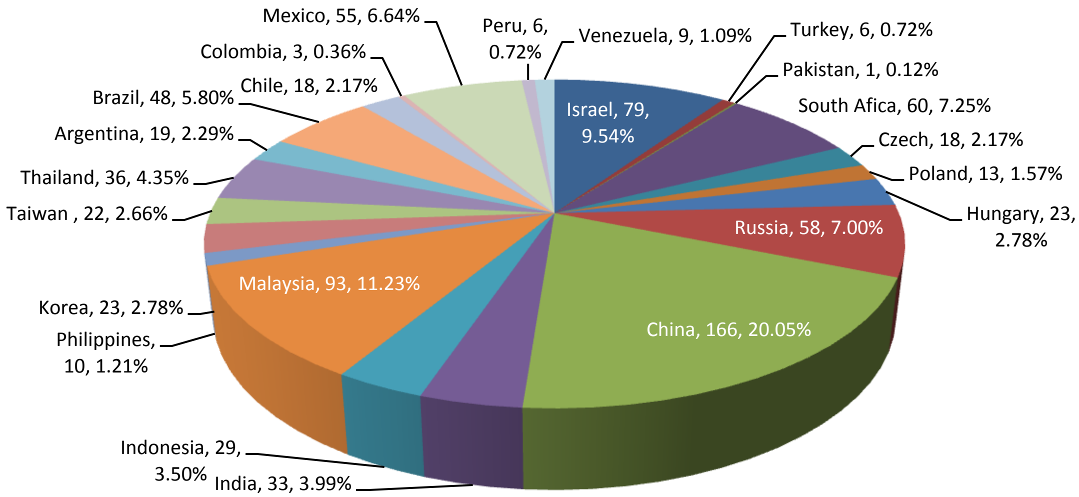
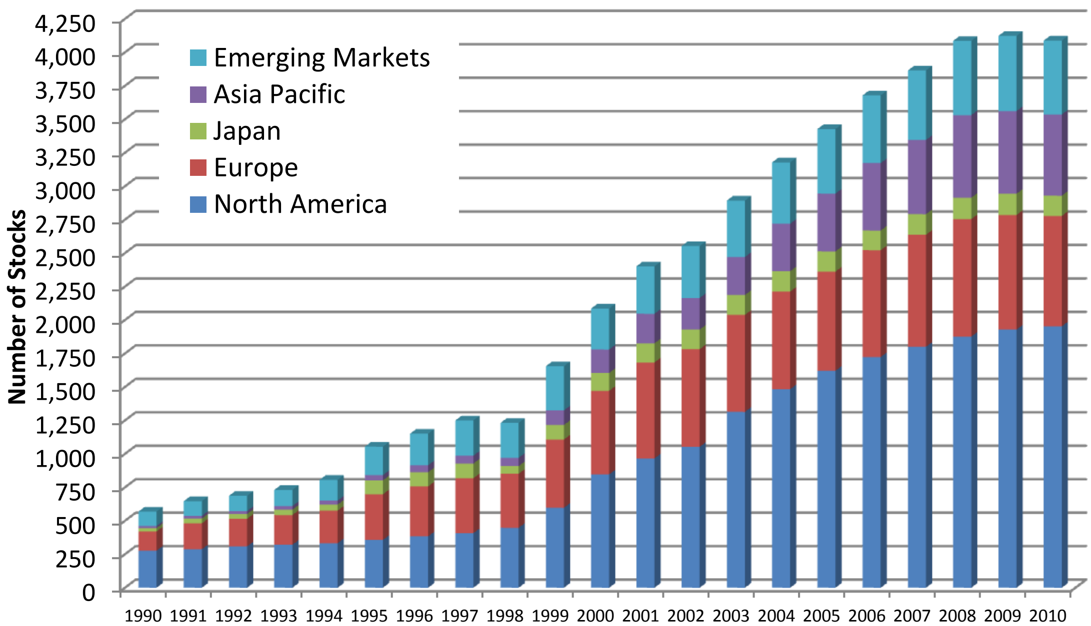


Figure 6
Globally Accessible Sample by Year, reported by Total Number of Stocks (above) and by Market Capitalization (below), 1990-2010
The figures show the distribution of globally accessible sample from each region by year. Here the sample is represented by the Main CL Sample and the sample selection criteria are described in the Appendix.



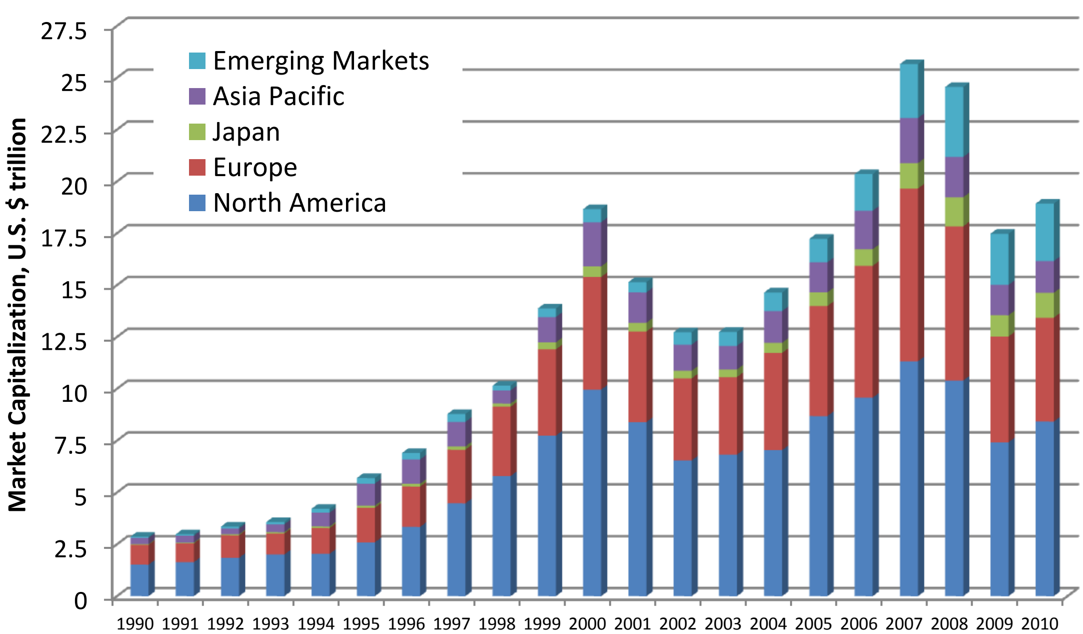
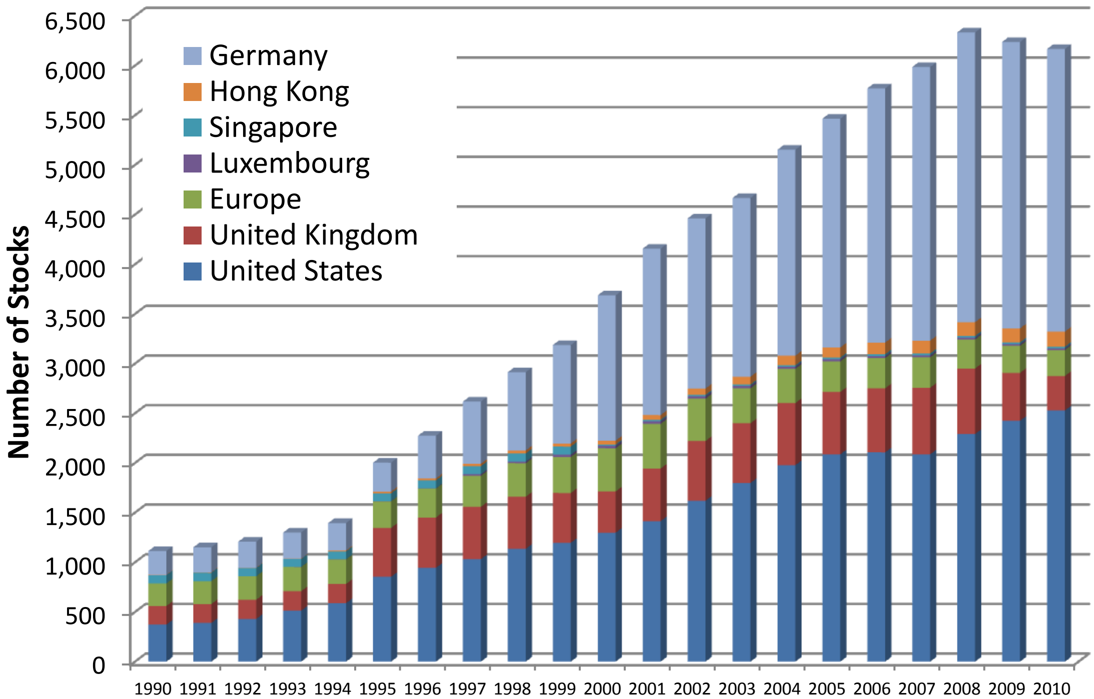
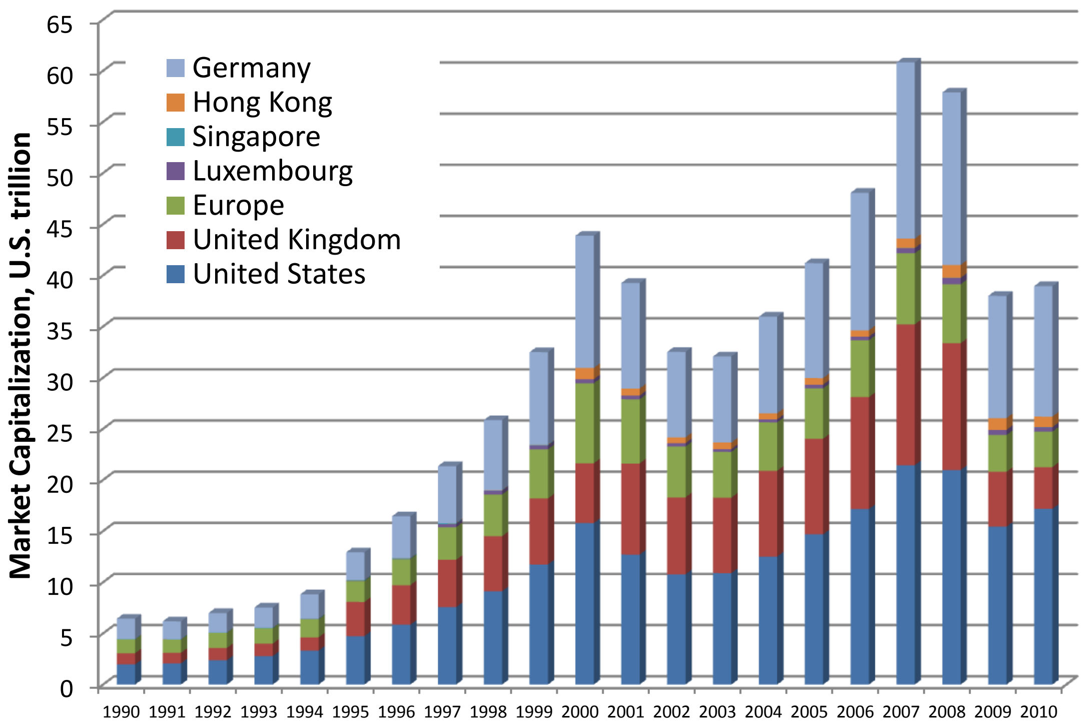


Figure 6, continued
Globally Accessible Sample by Year, reported by Total Number of Stocks (above) and by Market Capitalization (below), 1990-2010

The figures show the distribution of globally accessible sample from each target markets by year. Here the sample is represented by the Main CL Sample and the sample selection criteria are described in the Appendix.





Appendix

Procedure for Constructing the Globally Accessible Sample

Target Market	U.S.	U.K.	Europe	Germany	Luxembourg	Singapore	Hong Kong
Target Exchanges	NYSE/AMEX, NASDAQ, Non NASDAQ OTC New York, NASDAQ/NMS, NYSE Arca	London London OTC London Plus Market SEAQ International	Euronext Amsterdam Brussels Lisbon Paris Easdaq	Frankfurt	Luxembourg	Singapore Catalist Singapore OTC Singapore	Hong Kong
Exclusion Criteria							
• *Non domestic stocks only*	9,632	4,114	5,165	14,542	430	300	314
• *Target market currency denominated only*	9,585	4,114	5,165	14,542	430	215	284
• *ADRs, GDRs, or equity only*	8,900	3,112	4,212	13,899	404	212	246
• *Available records of home market only*	9,181	3,086	4,205	13,873	363	212	246
• *Qualified records of parent code only*	8,857	3,078	4,205	12,591	363	211	246
• *Available RI records only*	7,586	2,413	2,997	12,186	143	179	216
• *Exclude dual record in one target market*	6,421	1,995	2,217	11,463	133	171	212
• *Qualified countries only*	6,320	1,791	2,165	11,292	126	170	210
• *Available records from Worldscope only*	5,080	1,517	1,058	9,986	101	160	201
• *Non-financial stocks only*	4,392	1,283	690	8,680	82	120	175
• *Exclude special cases*	4,354	1,273	689	8,622	81	120	175
• *Total across regions*				11,319			
• *Additional domestic stocks included*				11,335			
• *Qualified stocks only*		CL1		11,057			
• *Viability Constraints*		Main CL Sample		5,747		• *Relative viability constraints(I or II)*	
		CL2a		9,605		• *Absolute viability constraint*	
		CL2b		4,058		• *Stringent Relative viability constraints(I or II)*	

Appendix, continued

This table shows the procedure on how to construct the globally accessible sample and the total number of stocks is reported for each step. The list of target exchanges is as shown and each exclusion criterion is explained in the table below. To be included in the global accessible sample, each stock has to be also cross listed in any of the 7 target markets with the types of ADRs, GDRs or equity, has sufficient information to identify its home market and parent codes, have at least one monthly returns, has sufficient information to calculate at least one of the characteristics including Size, B/M and C/P. "CL" stands for cross-listing.

Definitions of Exclusion Criteria

Exclusion Criteria	Description
• *Non domestic stocks only*	If one stock is only listed in its home market, it is excluded from the sample. And these stocks are excluded as follow, ▪ Stocks are from U.S. and only listed in the target exchanges within the U.S.; ▪ Stocks are from U.K. and only listed in the target exchanges within the U.K.; ▪ Stocks are from Portugal and only listed in Euronext Lisbon; ▪ Stocks are from France and only listed in Euronext Paris; ▪ Stocks are from Netherland and only listed in Euronext Amsterdam; ▪ Stocks are from Luxembourg and only listed in Luxembourg; ▪ Stocks are from Singapore and only listed in the target exchanges within Singapore; ▪ Stocks are from Hong Kong and only listed in Hong Kong Stock Exchange
• *Target market currency denomination only*	If one stock is denominated with a currency other than that of the host market, it is excluded from the sample. This exclusion criterion only applies to stocks cross-listed in the U.S., Singapore and Hong Kong.
• *ADRs, GDRs, or equity only*	If one stock is recorded as other instrument types than ADRs, GDRs or equity from Datastream, it is excluded from the sample.
• *Available records of home market only*	If one stock has no available records of home market from Datastream, it is excluded from the sample.
• *Qualified records of parent code only*	If one stock has no available records of parent code in each major exchange from Datastream, it is excluded from the sample.
• *Available RI records only*	If one stock has no available Return Index (RI) from Datastream, it is excluded from the sample.
• *Exclude dual record case in one target market*	If one stock is cross listed on more than one target exchange within one given target market, it is counted as only one stock in the sample.
• *Qualified countries only*	If one stock is from countries other than the country list in Table 1, it is excluded from the sample.
• *Available records from Worldscope only*	If one stock has no available company account item from Worldscope, it is excluded from the sample.
• *Non-financial stocks only*	If one stock is financial stock, it is excluded from the sample.
• *Exclude special cases*	Special cases include but is not limited to that the ADR (or GDR), instead of the home equity, is primary quoted in Datastream.
• *Total across regions*	If one stock is listed in more than one target market, it is counted as only one stock in the sample.
• *Additional domestic stocks included*	Domestic stocks from the seven target markets are included as long as three criteria are satisfied: a. size (in the top 75% of market cap for the market); b. liquidity (a minimum price of $5 for U.S. and equivalent levels in terms of percentile rank for non U.S. markets); and c. float (a minimum 75% public float for listed stocks)
• *Qualified stocks only*	If one stock has less than 12 monthly returns, it is excluded from the sample.
• *Viability Constraints*	Viability constraints are evaluated by the Turnover (VO) from Datastream and it includes records in the home market and those in the target markets.
• *Relative viability constraint I*	For each cross-listed stock in the sample, there should be at least 0.5% of annual oversea trading value relative to all secondarily cross-listed stock trading from its country of domicile
• *Relative viability constraint II*	For each cross-listed stock in the sample, there should be at least 0.1% of annual global trading volume occurred in any of the target markets on average during the sample period
• *Absolute viability constraint*	For each cross-listed stock in the sample in a given year, if there is at least one month of non-zero trading occurred in the target markets, the stock is included in the sample for that year
• *Stringent Relative viability constraints(I or II)*	The screening ratios are 5% for relative viability constraint I and 1% for relative viability constraint II.