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INTERNATIONAL DIVERSIFICATION WITH AMERICAN DEPOSITORY RECEIPTS (ADRs)

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Abstract

It is already well known that U.S. investors can achieve higher gains by investing directly in emerging markets (De Santis, 1997). Given the opportunity to invest directly in the shares of stocks in the developed (DCs) and emerging (EM) markets, it is interesting to know whether the U.S. investors can potentially gain any benefits by investing in ADRs. We test both index models, and SDF-based model.Our findings show that U.S. investors needed to invest in both ADRs and country portfolios in developed in the eighties, and in Latin American countries in early nineties. During the early and late nineties, we find substitutability between ADRs and country portfolios in DCs. As more and more ADRs are enlisted in the US market from developed countries over time, the ADRs become substitutes to country. Similarly, countries with higher number of ADRs irrespective of regions show the same pattern of substitutability between ADRs and country indices. However, such substitutability does not exist for countries with the highest number of ADRs by the end of sample period, 2001. On the other hand, U.S. investors can achieve the diversification benefits by investing ADRs along with U.S. market index in Asia. The significant marginal contribution of one-third of developed countries requires investment in ADRs and U.S. market in the developed countries. And investors do not need to hold both ADRs and country as it was the case in the eighties. On the other hand, investors need to hold both ADRs and country portfolios in most of the Asian countries to achieve diversification benefits at margin.

1. INTRODUCTION

With the globalization of capital markets, an increasing number of foreign firms have chosen to enter the U.S. market with the issuance of American Depository Receipts[1] (ADRs) in order to broaden the shareholders base, raise additional equity capital by taking advantage of liquidity of U.S. market. Over the last decades the number of foreign firms listed as ADRs in the U.S. market has gone up dramatically. According to Bank of New York, by the year 2000, the number of ADRs have risen to about 2,400, of which about 600 are traded on NYSE, AMEX or NASDAQ, and the remaining on the OTC[2]. Lins, Strickland, and Zenner (2000), in their recent study, found that the greater access to external capital markets is an important benefit of a U.S. stock market listing, especially for emerging markets firms. The enlisted foreign firms that are subject to SEC reporting and disclosure requirements, reduce informational disadvantages, and agency costs of controlling shareholders due to better protections for firms coming from countries with poor investors' rights. As a result, firms with higher growth opportunities coming from countries with poor investors' rights are valued highly (Doidge, Karolyi, and Stulz, 2001).

The objective of the present study is to find the diversification potential of ADRs in different regions, and in countries from the perspective of an U.S. investor. Given the

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[1] The ADRs are negotiable certificates or financial instruments issued by U.S. depository banks that hold the underlying securities in the country of origin through the custodian banks. The ADRs, denominated in U.S. currency, provide American investors the ownership rights to stocks in a foreign country, and are considered as an alternative to cross-border direct investment in foreign equities. The ADRs are traded in the U.S. market like shares in the home market. As a result, it is easy and less costly to invest in ADRs rather than in foreign securities directly. It eliminates global custody safekeeping charges saving investors up to 35 basis points per annum (JP Morgan, 2000). Moreover, an ADR is just as liquid as the shares in the home market. The supply of ADRs is not constrained by U.S. trading volumes. If the U.S. investors (or their brokers) want to build positions in an ADR, they can have ADRs 'created' by purchasing the underlying shares and depositing them in the ADR facility.

[2] A description on the types and characteristics of ADRs are shown in Table 1.

opportunity to invest directly in the shares of stocks in the developed (DCs) and emerging (EM) markets, it is interesting to know whether the U.S. investors can potentially gain any benefits by investing in ADRs. It is already well known that U.S. investors can achieve higher gains by investing directly in emerging markets (De Santis, 1997). Since ADRs are traded in the U.S. market they have been considered as an alternative to such cross-border investments while ensuring a higher diversification benefits. However, a small fraction of these ADRs are, in fact, enlisted on major U.S. exchanges. Most of the ADRs are unlisted, and traded OTC (level I), and they maintain home country accounting standard, and do not require SEC registration. Only level II and level III ADRs are enlisted, and comply with SEC regulations[3]. These ADRs can be considered as the subset of country shares. Solnik (1991) argues that the ADRs traded in the U.S. market are mostly big firms in their home countries, and it is likely that they have lower diversification benefits than a typical foreign firm. As s result we pose the question: can ADRs provide as much diversification gains as the country indices?

Most of the studies on ADRs (Hoffmeister, 1988; Johnson and Walter, 1992; Wahab and Khandwala, 1993; Callaghan, Kleiman, and Sahu, 1996; Jorion and Miller, 1997) show how combining ADRs with U.S. market or other funds can reduce risk without sacrificing expected returns. A host of studies (Parto, 2000; Choi and Kim, 2000; Kim, Szakmary and Mathur, 2000; Alanagar and Bhar, 2001) find the determinants of ADR returns in the context of a single or multi-factor models. Bekaert and Uris (1999) conduct a mean-variance spanning test for closed-end funds, open-end funds, and ADRs of emerging market with a set of benchmark for the period of September 1993 to August 1996, and found the diversification benefits for closed-end funds and ADRs. The contribution of the present study is that we attempt to show how the case of diversification with ADRs varies not only across regions over different sample periods but also with the size of ADR markets measured by the number of ADRs irrespective of country of origins. We also explore the possible combination of assets the U.S. investors require to hold in different regions and countries with respect to diversification. We address the shortcomings of an ill-defined benchmark conduct in standard empirical tests like index models. If the market portfolio is not mean variance efficient, one can incorrectly conclude real assets are "good" diversifiers. Secondly, the case for diversification depends on the temporal stability and significance of a set of assets in an investors portfolio, and these assets' correlation structure. If asset correlation vary widely, then diversification benefits are questionable as an optimized portfolio becomes expensive or impossible to maintain in the face of uncertain correlations. Unlike the index models, spanning tests are not subject to benchmarking error, as they do not rely on a specific benchmark asset pricing model.[4] We use spanning test proposed by Hansen and Jagannathan (1991) based on stochastic discount factors (SDFs).

2. A REVIEW OF RELEVENT LITERATURE

There are some studies that concentrate on ADRs returns behavior, their determinants, and the opportunities for diversification gains in both U.S. and international context. Officer and Hoffmeister (1988) show that ADRs lower portfolio risk when added to portfolio of U.S. stocks. In fact adding as few as four ADRs in a representative U.S. Stock portfolio reduce risk by as much as 20 percent to 25 percent without any sacrifice in expected returns. The authors use monthly return data of 45 pairs of ADRs and

[4] A number of researchers have used spanning tests including Huberman and Kandel (1987), De Santis (1994), Dahlquist and Soderlind (1999), and Maroney and Protopapadakis (2002). DeRon and Nijiman

underlying shares of developed countries mostly traded on NYSE and AMEX exchanges for the period of 1973-1983.

Wahab and Khandwala (1993) use weekly and daily return data of 31 pairs of ADRs and the underlying shares of mostly developed countries (UK, Japan, France, Germany, Australia, S. Africa, Sweden, Norway, Luxembourg), and with the use of active portfolio management strategies they show that ADRs provide expected returns that are similar to their respective underlying shares. However, the greater the investment proportion in ADRs, or the higher the number of ADRs given assumed investment weights, the larger the percentage decline in daily returns on the combined portfolio in comparison to the standard deviation of returns on S&P500.Thus ADRs potentially provide better risk reduction benefit, and have been stable over several sub-periods.

Johnson and Walther (1992) show that while combining the ADRs, direct foreign shares, and international mutual funds substantially increases portfolio returns per unit of risk, ADRs and direct foreign shares alike would have offered more attractive portfolio risk and return improvements when compared to domestic diversification strategy.

Callaghan, Kleiman, and Sahu (1996), using Compustat data of 134 cross-listed firm for 1983-1992 sample period, find that ADRs have lower P/E multiples, higher dividend yields, lower market-to-book ratios than international benchmark, as measured by MSCIP. Moreover, ADRs provide a higher monthly return and a higher standard deviation than the MSCIP, while both the ADR sample and MSCIP have lower betas than the S&P 500, and ADRs offer greater return per unit of risk than the MSCIP. Jorion and Miller (1997) find that while emerging market country portfolio returns of ADRs are highly correlated with the IFCI composite emerging market index, it is low with S&P 500

(2001) provide extensive survey of this literature.

index. And ADRs receipts can be used to replicate or track the emerging market IFC index.

Alaganar and Bhar (2001) find that ADRs have significantly higher reward-to-risk than underlying stocks. On the other hand, ADRs have a low correlation with the US market under high states of global and regional shocks. Kim, Szakmary, and Mathur (2000) document that while the price of underlying shares are most important, the exchange rate and the US market also have an impact on ADR prices in explaining ADR returns. Parto, 2000; Choi and Kim, 2000 find that local factors (market and industry), and their underlying stock returns across both countries and industries better than the world factor, especially for emerging markets. On the other hand, a multi-factor model with world market return and the home market return as the risk factors performs better than models with just the world return, the home market return or a set of global factors as the risk factors.

Bekaert and Uris (1999) conduct a mean-variance spanning test for closed-end funds, open-end fund and ADRs of emerging market with some global return indices such as FT-Actuaries, U.S. index, U.K. index. European less U.K. index, and Pacific index as the benchmark. For comparison, they also examine the diversification benefits of investing in the corresponding IFC investable indexes. The sample period consists of two sub-periods: September 1990 – August 1993 for closed-end funds, and September 1993 August 1996 for closed-end, opened-end funds, and ADRs. The study finds that the U.S. closed-end funds appear to offer diversification benefits in line with comparable ADRs during the test period. However, the benefits are sensitive to time period of the tests.

3. HYPOTHESE AND METHODOLOGY

3.1 Motivation and Hypotheses

De Santis (1997) has found that an U.S. investor can gain diversification benefits by investing directly in Emerging markets, not in developed markets. He found higher reward-to-risk performance from investing in EM countries. However, Latin American countries provide the highest level of diversification countries. With recent popularity of ADRs as an investment vehicle raise a reasonable question: Is ADR an alternative to investing directly in stocks in different countries? In other words, can a U.S. investor achieve diversification benefits beyond what is achievable through investing directly in country index? Solnik (1991) expresses his doubt on such diversification benefits. The ADRs traded in the U.S. market are mostly big firms in their home countries, it is likely that they have lower diversification benefits than a typical foreign firms. As a result, the efficient frontier is expected to shift in mean-variance space when the test asset, i.,e., the portfolio of ADRs is excluded if there really exits any gains for ADRs. Secondly, the level of economic integration and asymmetry of information are different between developed and emerging countries, even within the emerging countries. As a result, we want to test such diversification benefits across countries, and across regions (developed, Latin America, Asia, Emerging markets). Moreover, a huge number of ADRs, especially from emerging countries, have been enlisted in the U.S. market in 1990s. It is also interesting to look how such influx of foreign shares in the U.S. market has changed the gains form investment. We hypothesize that ADRs provide as much diversification benefits as the country indices. In other words, our spanning question is: Can ADRs and U.S. market indices mimic country returns? If the hypothesis is not rejected then it implies an achievable diversification benefits by investing in ADRs, and U.S. investors can gain, at least, the same level of benefits from their investment in ADRs, which can be regarded as the substitute of cross-border investment. However, substitutability may not be the only outcome. Investors may require to hold both ADRs and country indices. As a result, we further ask: Can country and U.S. market indices mimic the ADR returns? The following table the implications of our spanning questions:

		Can country and U.S. market mimic ADR return?	
		YES	*NO*
Can ADRs and U.S. market indices mimic country returns?	*YES*	ADRs and country are *substitutes* for each other	ADR required, country not required
	NO	Country portfolios required, ADR not required	Both ADR and country required

If country indices and U.S. market can mimic ADR returns, then ADRs become redundant. On the other hand, if ADR portfolios and U.S. market can mimic country returns, investors do not need to hold country indices. The latter scenario is most unlikely as the ADRs are the sunsets of country stocks. In case country and U.S. market mimic ADR returns, but ADR and market cannot mimic country returns (NO-YES in the above table), no achievable diversification benefits to the U.S. investors as proposed by Solnik. However, in NO-NO situation, investors need to hold both country and ADR portfolios to achieve the benefits spanned by the country, ADR, and U.S. market.

3.2. Model

We use both index models, and spanning test proposed by Hansen and Jagannathan (1991), De Santis (1993), Bekaert and Uris (1996), and Maroney and Protopapadakis (1999) based on stochastic Discount factors (SDFs).

3.2.1 Index models

The index model with risk-free rate is defined as

$$r_{c,i} = \alpha_i + \beta_{a,i} r_{a,i} + \beta_{m,i} r_{m,i} + \varepsilon_i \quad \forall i = 1, \ldots.., N \tag{1}$$

where, $r_{c,i}$, $r_{a,i}$, and $r_{m,i}$ are the excess returns over risk free rate of country, ADR, and U.S. market portfolio returns for each country. The null hypothesis is:

$$H_0 : \qquad \alpha_i = 0 \;\; \forall i \tag{2}$$

The rejection of null hypothesis implies ADR portfolios are not enough to achieve as much diversification benefits as the country indices can provide. In other words, when the null is not rejected, a linear combination of ADR returns and U.S. market returns can replicate the returns of country indices.

We apply Seemingly Unrelated Regression (SUR) estimation technique for the system of equations in (1). And in order to test the restriction in (2), we use Wald test, which reports chi-square statistics with degrees of freedom equal to the number of restrictions in (2). We also reports the likelihood ratio test, which reports the chi-square statistics with degrees of freedom equal to q, T-k, where q is the number of restrictions, T is the number of observations, and k is the number of parameter to be estimated. Both Wald and LR tests are asymptotically equivalent, but different outcomes are not unexpected in a small sample.

We also apply the test developed by Gibbons, Ross, and Shanken (1989) [GRS, hereafter], for which the relevant test statistic has a tractable small sample distribution.

The test reveals the necessary condition for the efficiency of a linear combination of L returns with respect to the total set of N+L risky assets given in the null in (2). The noncentral F distribution with degrees of freedom N and (T-N-L) is given as:

$$\left[\frac{T}{N}\right]\left[\frac{T-N-L}{T-L-1}\right]\left(1+\bar{r}_p'\hat{\Omega}^{-1}\bar{r}_p\right)^{-1}\hat{\alpha}_0'\hat{\Sigma}^{-1}\hat{\alpha}_0 \tag{3}$$

where $\bar{r}_p$ is a vector of sample means for $\bar{r}_{pt}=\left(\bar{r}_{1t},\bar{r}_{2t},.......,\bar{r}_{Lt}\right)$, $\hat{\Omega}$ is the sample variance-covariance matrix for $\bar{r}_{pt}$, α_0 has a typical element α_{i0}, and $\hat{\alpha}_0$ is the least squares estimators for α_0 based on the N regressions in (1). The noncentrality parameter is given by

$$\lambda \equiv \left[T/\left(1+\bar{r}_p'\hat{\Omega}^{-1}\bar{r}_p\right)\right]\hat{\alpha}_0'\hat{\Sigma}^{-1}\hat{\alpha}_0 \tag{4}$$

Under the null hypothesis in (2) $\lambda=0$, and we have a central *F* distribution.

In absence of any common risk-free rate, which is plausible in real world since risk-free rates differ across countries, investors may choose risky portfolios – zero-beta portfolios - from the set of efficient frontier portfolios. In such case, benchmark portfolios include one more asset. In order to test whether benchmark portfolios matter, we test the following hypothesis:

$$H_0: \qquad \alpha_i=\alpha \ \forall i \tag{5}$$

In other words, we test whether the alphas are same across countries. We use Wald and Likelihood ratio tests for that purpose.

3.2.2 Spanning Test

Spanning tests, first proposed by Huberman and Kandel (1987), reveal whether an asset or set of assets offers additional diversification opportunities to a portfolio. Spanning tests measure the difference between two mean variance frontiers. There are *p* benchmark assets common to both frontiers and the other q test assets are only included in the construction of one of the frontiers. The frontier MV_{p+q} will always encompass MV_p because it contains more assets used in its construction. As mechanics dictate, the Sharpe ratio S_{p+q} is necessarily greater than S_p. The null hypothesis of spanning states that both frontiers statistically coincide,

$$H_0:\ MV_{p+q} = MV_p\ . \qquad (6)$$

It is sufficient to measure the distance between frontiers at two points, as all other points are convex combinations[5]. A confirmation of the spanning hypothesis implies that additional test assets q will not offer diversification opportunities relative to those already included in the portfolio of benchmark assets p. In other words, the set of benchmark assets prices the broader set of assets. Evidence against the spanning hypothesis means the inclusion of test assets takes advantage of diversification opportunities not available in the benchmark assets, thus these test assets should be included in any well-diversified portfolio.

Spanning-like tests can be conducted with a variety of asset pricing models. For example, the Capital Asset Pricing Model restriction that constant term in the CAPM regression of excess returns be zero is the less restrictive intersection hypothesis that tests the distance at one point (test to see if $S_{p+q} = S_p$). This approach is problematic as this is a joint test of the specific discount factor created by the CAPM and the intersection hypothesis. The claim that the market portfolio is on the efficient frontier of all assets is dubious at best.

The proper implementation of spanning tests requires measuring the distance between frontiers at two points. The advantage of the Stochastic Discount Factor SDF approach to spanning tests is that it guarantees portfolios used in spanning tests lie on the mean variance frontier of assets used in their construction. These tests are based on Hansen and Jagannathan (1991), HJ, volatility bounds that give a lower boundary on the volatility of all stochastic discount factors SDFs such that the Law of One Price (LOP) is not violated. HJ bounds have a dual relationship to the mean variance frontier because SDFs are portfolios constructed to have the lowest variance possible for a given return. Spanning tests exploit the mean variance efficiency of the HJ bounds: selecting two points on the mean variance frontier is the same as selecting two points on the HJ bounds. HJ bounds are model free in the sense they do not require one to specify a specific benchmark model and therefore avoid the joint hypothesis problem inherent in using CAPM or Multifactor benchmarks. HJ (1991) use the LOP to derive the bound on admissible discount factors. The LOP is the minimum restriction on asset prices that assets which have the same set of payoffs sell for the same price. The LOP is the present value relation at the heart of asset pricing:

$$E(X_{t+1}m_{t+1}) = P_t \text{, or equivalently } E(R_{t+1}m_{t+1}) = 1, \qquad \text{(7a, 7b)}$$

where X, and R are a $t+1$ payoffs and gross returns on N assets, m is the SDF and P is vector of today's asset prices. The SDF m is commonly called the intertemporal marginal rate of substitution, which places additional restrictions on its construction. If there is no such restriction, it is straightforward to derive the SDF m as an algebraic exercise.

Expand (7b) using the definition of covariance and suppressing time subscripts for clarity yields,

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[5] A mean-variance frontier is a parabola therefore fully describe by two points in mean-variance space.

$$E[Rm] = E[R]E[m] + Cov[R, m] = 1 \, . \tag{8}$$

HJ prove *m* is linear in returns:

$$m = E[m] + r'\beta \, , \tag{9}$$

where *r'=R-E[R]* is vector of *N* return deviations from their times series means, β is a vector of weights on *N* assets, and *E[m]* is the expected value of the discount factor. Now solve for the set of weights such that the solution satisfies (8). Substituting (9) into (8) and simplifying gives,

$$E[R]E[m] + E[rr'\beta] = \iota \quad . \tag{10}$$

Solving for β we see,

$$\beta = \Sigma^{-1}(\iota - E[R]E[m]) \, , \tag{11}$$

where Σ is the covariance matrix of returns. The discount factor has variance,

$$Var[m] = \beta'\Sigma\beta \tag{12}$$

which has the lowest variance of any candidate discount factor because the SDF is constructed to satisfy (7b) with a linear projection on the payoffs (refer to Campbell, Lo and MacKinlay (1997), or Cochrane (2001) for proofs of propositions related to the SDF).[6] This is similar to the BLUE property in Ordinary Least Squares. Given the first and finite second moments of returns and a nonsingular covariance matrix, an SDF with

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[6] The dual relationship between mean variance and HJ bounds is easily proved by noticing equation (4) has an identical form (up to a normalization) to the FOCs derived from maximizing a Sharpe ratio. Benninga

E[m] as its expectation can be constructed solely from returns data. The SDF will have the lowest variance of any candidate SDF with the same expectation. The expectation of *E[m]* has the property of being the price of the risk free asset.

To form the parabola that is the HJ volatility bound, HJ treat *E[m]* as an unknown parameter *c*, and the standard deviation of the SDF with expectation *c*, □(m_c) is plotted against *c*. This forms the lower bound on all SDFs constructed from a set of returns that satisfy the LOP. Any other SDF must have higher variance than the one along the bound to price all the assets.

Spanning tests use two SDFs with expectations $E(m_1)$, and $E(m_2)$ chosen in a reasonable range to measure the difference between frontier portfolios at two points. Following Maroney and Protopapadakis (2002), the empirical form of spanning tests is:

$$\begin{aligned} R - E(R|m_1) &= \varepsilon_1, \quad E(\varepsilon_1) = 0, \\ R - E(R|m_2) &= \varepsilon_2, \quad E(\varepsilon_2) = 0, \end{aligned} \qquad (13)$$

where,

$$E(R|m_j) = \frac{1 - \mathrm{cov}(Rm_j)}{E(m_j)}, \text{ and } m_j = E(m_j) + r_p'\beta_{pj} + r_q'\beta_{qj}\,;\ j = \{1,2\}.$$

With *N* assets there are *2N* orthogonality conditions and without restrictions the system is just identified and linear with coefficients $\{\beta_{p1}, \beta_{q1}, \beta_{p2}, \beta_{q2}\}$. Without restrictions all orthoga1ity conditions are satisfied and sample averages are replicated using either SDF--by construction. The restriction given by spanning implies the two SDFs produced from *p* benchmark assets will replicate the averages of the *q* test assets not used in its construction. Spanning implies *2q* overidentifying conditions positing that there is no

(2002) shows that any sets of portfolio weights satisfying the FOCs are of this form and therefore give portfolios that lie on a mean variance frontier.

need to include test assets in the construction of the SDFs: $\{\beta_{q1} = \beta_{q2} = 0\}$.

Overidentifying conditions reveal how well the SDF produced from *p* assets replicates the sample averages of the broader set. We estimate the system using GMM with a Newly and West (1987) correction for first order autocorrelation. The Hansen (1982) *J*-Statistic based on the criterion from GMM and distributed $\chi^2(2q)$ will evaluate the goodness of fit of the overidentifying conditions.

3.2 Data

Our sample consists of NYSE/AMEX/NASDAQ-enlisted ADRs of 27 countries from developed, Asian, Latin American market. Table 2 presents the number of ADRs for each country by the year they have been introduced in the U.S. market. We selected only the ADRs for which the data are available in CRSP. We observe a proliferation of ADRs with more countries in the 1990s. We construct monthly country-level portfolios of returns (equally-weighted) of those ADR programs from CRSP database for the period 1981 – 2001. Since developed countries entered U.S. market earlier, and the Lain American or Emerging markets are late starter, a long time span that includes most recent periods is an essential element to capture the implications for return dynamics. We divide the sample period into three sub-periods: 1981-1990, 1991-1995, and 1996-2001. All country indices are collected from MSCI. We use U.S. market index of MSCI as the benchmark of U.S. investors.

4. RESULTS ANALYSIS

4.1 Summary Statistics

The summary statistics of returns of country ADR portfolios are presented in Table 3. We can see that very high percentage of mean returns for ADR portfolios of different countries during different periods. Without exception, ADR portfolios have higher variances uniformly. The t-statistics are used to compare the mean returns between the country and ADR indices for each country. We find significantly different mean returns for half of countries in the early 1990s, and for one-third of countries during late 1990s. In Asian region mean returns are statistically different for five out of six countries. Table 4 shows the own correlation between ADR portfolios and country indices for different countries in three sub-periods. We find, in general, correlation are less than perfect creating an opportunity for benefits form investments in ADRs, and an increase in correlation subsequent periods for a majority of countries after the introduction of ADRs in U.S. market.

4.2. Index Model Results

In Table 5, we presented the probability of Wald, LR, and GRS tests. While the probability of rejections of Wald test are based on chi-square distribution, the probability of rejections of LR and GRS tests are based on F-distributions. During the first sub-period, 19981-1990, our same includes only countries from developed regions. For developed countries the hypothesis of alphas equal to zero jointly is rejected at a very high level of significance. We find similar results during the early nineties. This signifies that a linear combination of U.S. market returns and ADR returns of developed countries cannot span the countries' national returns. In other words, an U.S. investor can not achieve the same level of diversification benefits by investing ADRs with U.S. market index.. During the second sub-period, we cannot reject the null for Latin American countries implying a potential diversification benefits from investing in Latin American ADRs. During the third sub-period (1996-2001) LR test accept the null, while GRS test reject the hypothesis for developed regions. Similarly, we reject the null according to GRS test only for Latin America. In Asia, all test tests report significantly different from zero alphas jointly.

We report the test results of the null hypothesis that the intercepts are joint same across portfolios. Except for developed regions, the hypothesis is rejected for all countries in Latin America and Asia. This is plausible as the developed countries are more integrated economically, whereas the emerging markets face varying levels of integration so that zero-beta returns vary across countries. This finding also indicates that the benchmark assets matter in pricing the emerging markets' assets, and risk-free rates are not same across countries.

4.3 Spanning Test Results

4.3.1 Regional diversification benefits

In case of regional diversification test, we our benchmark assets are all country indices, all ADR portfolios and the U.S. market except the set of country indices (ADR portfolios) for a region, which are considered as test assets. The spanning test results for three regions are presented in Table 6. For the set of countries, we find that the overidentifying conditions are rejected irrespective of whether we choose country indices or ADR portfolios as test assets during different sub-periods except for DCs for periods 19991-1995, and 1996-2001, and for Asian region when country indices are used as test assets. In cases where null hypotheses for both (country indices as test assets or ADR portfolios as test assets) are rejected, the volatility bounds or the MV frontiers shift. This implies that both ADRs and country indices provide diversification benefits independently. However, we do not know which one gives higher diversification benefits.

As a result, U.S. investors need to invest both in ADRs and country portfolios. In other words, we find the diversification potentials in the developed region during the early periods, 1981-1990, and in Latin American region. For the early and late nineties, we cannot reject the hypothesis at 5 percent level implying that both ADRs and country portfolios can be substituted for each other in DCs. During the period 1981-1990, we have only nine developed countries, which have ADRs in the U.S. market. The total number of ADRs during this period was 90 as shown in table 2. We observe an explosion of ADRs in later periods form developed countries, and more countries in the U.S. ADR market. Such proliferation of ADRs may have changed the market. An increase in own correlation between ADR returns and country indices indicate a more integrated nature of market. As a result, investors can substitute the ADRs for country with no additional benefits to gain. We find independent diversification benefits in Latin American countries. Only for Asian countries, we cannot reject the null when country indices are used as test assets, but it is rejected when we use ADR portfolios as test assets implying that U.S. investors need to invest in ADR portfolios with market index to achieve diversification benefits.

Since our sample sizes are small; and spanning tests can be potentially bias with such small sample. In order to check that we use the bootstrap technique, for which we use 3,000 iterations by randomizing the $e_i = r - E(r)$, and generate J-statistics sample. Based on the sample we find the probability of our original J-statistics from the GMM estimations. The findings are reported in Table 6. We find the significance levels for the rejection of null have increased only a few cases; but the findings based on our original sample data do not change.

4.3.2 Portfolios sorted by number of ADRs

We observe a significant increase in ADRs in the 1990s from different countries. We also find substitutability between ADR portfolios and country indices in the later periods for developed region, whereas they provide diversification benefits independently in the 1980s. In order to find whether such proliferation of ADRs each country became representative of those countries so that investors do not need ADRs in their portfolios, we form portfolios based on the number of ADRs irrespective of regions. For each *t*-period returns, we form equally-weighted portfolios based on *(t-1)*-period ranking of countries with respect to the number of ADRs for each country. The reason to rank countries is to divide the countries in three different groups: largest, medium, and smallest. We continue to follow the same process for each years starting form 1980 to 2001. Then we stacked the data for the whole period, and conduct our spanning test. The benchmark assets consist of all three – largest, medium, and smallest - ADR portfolios, three equally-weighted country portfolios, and the U.S. market except one of the ADR (country) portfolios that is considered as test asset.

The spanning test results are presented in Table 7, panel A. We find that the overidentifying conditions are rejected for all sub-periods for all portfolios whether we choose country or ADR portfolios as the test assets except the largest one in the third sub-period. In other words, the null hypothesis that the ADR and the U.S. market can mimic country or the country and the U.S. market can mimic cannot be rejected at conventional significance levels for the largest portfolios during the period 1996-2001. Thus our results support the investors can substitute country for ADRs for those countries that have higher number of ADRs listed in the U.S. market. However, for the whole period, both the nulls are rejected showing the requirement to hold both ADRs and country in the portfolios.

Unlike forming equally-weighted portfolios as previous, we also divide country and ADR portflios into the largest, medium, and the smallest groups based on the number of ADRs in the year 1990, 1995, and 2001 irrespective of regions. The spanning test results are presented in panel B of table 7. We find that the largest portfolio in the third sub-period, 1996-2001, cannot reject the null that the country plus the U.S. market index can mimic the ADR return, but it rejects the null that ADRs plus the U.S. market can mimic the country return. This implies that ADRs cannot provide diversification benefits for countries that have the highest number of ADRs by the end of sample period. For all other period, we the null hypotheses are rejected implying that the investors need to hold both ADRs and country to gain benefits in the market.

4.3.3 Marginal diversification benefits

We attempt to evaluate the contribution of each country at margin towards diversification benefits with respect to the grand mean-variance frontier composed of all ADR and country portfolios, and the U.S. market index. Each time we exclude one country ADR portfolio (one country index), find the probability of rejection of the null hypothesis that returns of all countries' portfolios, ADRs portfolios and U.S. market can mimic that country's ADR returns (returns of ADRs portfolios, all other countries' portfolios and U.S. market can mimic that country's returns) from corresponding J-statistics. Then we replace that country's ADR portfolio (country index), and exclude another country's ADR portfolio (country index), and test the null hypothesis. We repeat the process for all countries' ADR portfolios and country indices. The results of marginal diversification benefits for each country are presented in table 8 and 9. We find that in the early period, Denmark, and Ireland show substitutability between ADR and country. For majority of the developed countries, U.S. investors need either both (No-No) of them or country (No-Yes) portfolios with U.S. market index. During the period, 1991-1995, most of the countries get transition from No-No situation to Yes-Yes situation implying substitutability between ADRs and country. During the period 1996-2001, we explore the similar trend with some countries with no diversification benefits, or requiring investments in ADRs. We find, similarly, an increase in substitutability in Latin America for the period 1996-2002. However, in Asia, for majority of countries, investors need both ADRs and country to achieve benefits from investment.

5. CONCLUSION

The objective of the present study is to measure the diversification benefits of different country ADRs portfolios from the perspective of an U.S. investor. Studies on ADRs show indirect evidence of achievable diversification benefits. Given the opportunity to invest directly in the shares of stocks in the developed (DCs) and emerging (EM) markets, it is interesting to know whether the U.S. investors can potentially gain any benefits by investing in ADRs. Our findings show that U.S. investors needed to invest in both ADRs and country portfolios in developed in the eighties, and in Latin American countries in early nineties. During the early and late nineties, we find substitutability between ADRs and country portfolios in DCs. As more and more ADRs are enlisted in the US market from developed countries over time, the ADRs become substitutes to country. Similarly, countries with higher number of ADRs irrespective of regions show the same pattern of substitutability between ADRs and country indices.

However, such substitutability does not exist for countries with the highest number of ADRs by the end of sample period, 2001. On the other hand, U.S. investors can achieve the diversification benefits by investing ADRs along with U.S. market index in Asia. The significant marginal contribution of one-third of developed countries requires investment in ADRs and U.S. market in the developed countries. And investors do not need to hold both ADRs and country as it was the case in the eighties. On the other hand, investors need to hold both ADRs and country portfolios in most of the Asian countries to achieve diversification benefits at margin.

References

1. Bekaert, G, 1996, "Market Integration and Investment Barriers in Emerging Equity Markets.
2. Bekaert, G, and M. S. Urias, 1999 "Is there a free lunch in emerging market equities?", *Journal of Portfolio Management*, Vol 25, No. 3, 83-95.
3. Callaghan, J.H., R. T. Kleiman, and A. P. Sahu, 1996 The investment characteristics of American depository receipts", *Multinational Business Review,* Vol. 4, 29-39.
4. De Santis, G., "Volatility Bounds for SDFs: Tests and Implications from International Stock Returns", 1993, *Unpublished Ph.D. dissertation*, University of Chicago.
5. De Santis, G., "Asset pricing and portfolio diversification: evidence from emerging financial markets", in *Investing in Emerging Markets*, Euromoney Books, 1997
6. Gibbons, Michael, Stephen A. Ross, and Jay Shanken, 1989, "A test of the efficiency of a given portfolio", Econometrica, V 57, Issue 5, pp.1121-1152.
7. Hansen, L.P. and R. Jaganathan, 1991, "Implications of Securities Market Data for Models of Dynamic Economies", *Journal of Political Economy*, vol. 99 - 262.
8. Jorion, P. and D. Miller, 1997, "Investing in emerging markets using depository receipts", *Emerging Markets Quarterly,* Vol. 1, 7-13.
9. Kim, M., A. C. Szakmary, and I. Mathur, 2000, "Price transmission dynamics between ADRs and their underlying foreign securities", *Journal of Banking and Finance,* Vol. 24, 1359-1382.
10. Lins, Karl, and Deon Strickland, 2000, "Do non-U.S. Firms Issue Equity on U.S. Stock Exchanges to Relax Capital Constraints?", *NBER Working Paper*.
11. Maroney, N, and A. Protopapadakis, 1999, "The Book-to-market and Size Effects in a General Asset Pricing Model: Evidence from Seven National Markets", *Working Paper*, University of New Orleans.
12. Officer, D. T. and J. R. Hoffmeister, 1987, "ADRs: a substitute for the real thing?", *Journal of Portfolio Management,* Vol 13, 61-65.
13. Solnik, International Finance, 2nd edition, Addision-Wessley, 1991
14. Wahab, M., and A. Khandwala, 1993, "Why not diversify internationally with ADRs?", *Journal of Portfolio Management,* Vol. 19, 75-82.
15. Wahab, M., M. Lashgari, and R. Cohn, 1992, "Arbitrage opportunity in the American depository receipts market revisited", *Journal of International Financial Markets Institutions, and Money,* Vol 2, 97-130.

Table 1
Characteristics of American Depository Receipts (ADRs)

	Level I	Level II	Level III	144a
Description	Unlisted	Listed on major U.S. exchanges	Offered and listed on major U.S. exchanges	Private U.S. placement to qualified institutional buyers (QIBs)
Primary Exchange	OTC 'pink sheets'	NYSE, AMEX, or NASDAQ	NYSE, AMEX, or NASDAQ	U.S. private placement market using PORTAL
SEC registration	Registration Statement Form F-6	Registration Statement Form F-6	Form F-1 and F-6 for IPOs, full registration	Exempt
Accounting standard	Home country standards. No GAAP reconciliation required	Only partial reconciliation for financials	Full GAAP reconciliation for financials	Home country standards. No GAAP reconciliation required
U.S. Reporting Requirements	Exemption under Rule 12g3-2(b)	Form 20-F filed annually	Form F-20 filed annually; short forms F-2 and F-3 used only for subsequent offerings	Private placement, as Rule 144a or, new issue, as Level III.
Capital Raising	No capital raising. Existing share only	No capital raising. Existing share only	Capital raising with new share issues	Capital raising with new share issues
Type of Offering	Public	Public	Public	Private
Time to completion	9 weeks	14 weeks	14 weeks	7 weeks
Costs to Enter Market	≤ $25,000	$200,000 – 700,000	$500,000 - $2,000,000	$250,000 - $500,000

Source: "The ADR Reference Guide", JP Morgan, 2000.

TABLE 2
Number of ADRs listed Each Year from Each Country

Region	Country	upto Y80	Y81	Y82	Y83	Y84	Y85	Y86	Y87	Y88	Y89	Y80-Y90	Y90	Y91	Y92	Y93	Y94	Y95	Y91-Y95	Y96	Y97	Y98	Y99	Y00	Y96-Y01	Total
	Australia	1	4				1	1	1	2	1	**11**	1	1		1		1	**4**	2	1		2		**5**	**20**
	Denmark		1									**1**					1		**1**		1				**1**	**3**
	France											**0**		1	1	2	1	1	**6**	7	5	3	2	6	**23**	**29**
	Germany											**0**							**0**	5	1	3	3	9	**21**	**21**
	Ireland					1			1		1	**3**	1			1		2	**4**	1	2	1	1	3	**8**	**15**
	Italy								1		2	**3**	1			2	2	1	**6**			2	2		**4**	**13**
Developed Countries	Japan	22			1					1	1	**25**					1		**1**	1		1	2	2	**6**	**31**
	Netherlands	3				1	1				1	**6**		1			2	1	**4**	1	4	2	3	3	**13**	**23**
	New Zealand											**0**			1		1		**2**	4					**4**	**6**
	Norway											**0**				1		1	**2**	2					**2**	**4**
	Spain								2	2	1	**5**							**0**				1	1	**2**	**7**
	Sweden	1				1	1		1			**4**							**0**	4	2	2		1	**9**	**13**
	Switzerland											**0**							**0**		2	1	2	5	**10**	**10**
	UK	9			2	3		4	5	3	3	**29**	2	1	3	6	2	5	**19**	8	10	9	13	15	**55**	**103**
	Argentina											**0**								8	2			1	**11**	**11**
	Brazil											**0**								1	5	2	2	5	**15**	**15**
Latin America	Chile											**0**	1		1	4	8	2	**16**	17	7		1	1	**9**	**25**
	Columbia											**0**								1					**1**	**1**
	Mexico											**0**	2	2	3	8	7		**22**	3	1	2	2	1	**9**	**33**
	Peru											**0**								3					**3**	**3**
	Venezuela											**0**								1	1		1		**3**	**3**
	China											**0**								5	3	1		4	**13**	**13**
	Indonesia											**0**								3					**3**	**3**
	Korea											**0**								3			2	2	**7**	**7**
	Philippines											**0**								1				1	**2**	**2**
Asia	Singapore											**0**								1			1	1	**3**	**3**
	Taiwan											**0**								1	1			3	**5**	**5**
	Total											**90**							**86**						**245**	**423**

TABLE 3
Summary Statistics

The table reports mean and standard deviation of ADR portfolio returns and MSCI country indices. All statistics are calculated from monthly data for the specific periods, and expressed in percentage. The equality of mean returns of ADR portfolio of a country and the corresponding MSCI country index are examined using *t*-test. The table shows the probability of rejection of null hypothesis for both *t*.

		1981-1990					1991-1995					1996-2001				
		ADR Portfolio		Country indice		t-test	ADR Portfolio		Country Indice		t-test	ADR Portfolio		Country Indice		t-test
		Mean	σ	Mean	σ	P-val	Mean	σ	Mean	σ	P-val	Mean	σ	Mean	σ	P-val
Developed Countries	Denmark	12.50	111.00	7.78	31.81	0.66	15.37	53.86	5.18	25.20	0.11	14.10	66.88	7.49	36.15	0.49
	Netherlands	21.11	75.13	9.34	28.50	0.12	25.72	49.36	2.98	34.99	0.02	20.73	73.85	5.29	20.15	0.11
	Sweden	17.74	124.81	8.88	37.64	0.47	20.75	96.15	2.93	24.24	0.29	30.41	99.00	8.78	25.86	0.11
	UK	24.97	78.42	7.68	34.55	0.03	27.97	53.34	8.80	18.47	0.00	25.78	145.01	8.95	34.16	0.37
	France						18.52	54.06	6.55	32.43	0.09	-0.55	119.15	4.46	45.05	0.75
	Italy	14.09	93.98	7.78	39.06	0.23	30.63	61.95	5.65	22.42	0.00	1.62	124.63	-1.31	36.49	0.85
	New Zealand						19.97	85.42	5.42	22.51	0.28	24.18	134.14	4.99	37.36	0.27
	Norway						23.79	108.15	2.70	38.86	018	26.96	96.55	7.57	34.55	0.30
	Spain	15.34	70.24	6.23	32.22	0.31	18.05	69.11	7.39	29.86	0.16	23.59	162.30	18.47	46.20	0.72
	Ireland	32.33	79.88	7.13	39.74	0.55	46.73	81.73	3.93	32.73	0.00	27.01	96.08	2.49	24.95	0.05
	Australia	9.74	138.17	4.11	47.41	0.68	66.77	99.43	3.96	30.23	0.00	24.39	152.10	6.17	96.45	0.35
	Japan	19.71	83.46	7.86	39.32	0.17	12.80	74.59	6.62	25.17	0.32	15.35	71.01	6.35	26.38	0.34
	Germany											27.24	125.79	5.21	29.12	0.18
	Switzerland											28.08	82.24	6.67	27.42	0.05
Latin America	Chile						19.45	110.40	3.56	39.36	0.15	3.36	103.58	-2.02	40.3	0.05
	Mexico						8.54	137.37	3.49	56.45	0.00	5.45	117.87	5.00	55.43	0.53
	Columbia											-39.6	142.48	-6.42	55.82	0.00
	Peru											-11.5	124.1	-5.41	43.9	0.20
	Venezuela											22.3	215.98	2.13	77.11	0.10
	Brazil											9.39	151.85	2.31	66.14	0.00
	Argentina											9.53	107.01	0.77	49.4	0.40
Asian Countries	Indonesia											7.68	222.54	-13.2	103.62	0.03
	Korea											2.32	178.21	-6.66	84.42	0.00
	Philippines											11.11	172.81	-11.4	62.84	0.00
	Singapore											-2.16	218.27	-0.17	52.68	0.05
	Taiwan											42.23	198.36	-1.31	50.05	0.00
	China											11.92	203.72	-7.06	71.8	0.07
	USA			5.98	25.38				6.82	20.23				7.34	24.96	

TABLE 4
Own Correlation Between ADR portfolio Returns and Country Indices

Period	Developed Countries													
	Aus	Jap	Den	Neth	Swe	UK	Fra	Ita	NZ	Nor	Spa	Ire	Ger	Swi
1981-1990	0.50	0.80	0.45	0.85	0.74	0.93	-	0.59	-	-	0.83	0.59	-	-
1991-1995	0.62	0.92	0.70	0.89	0.92	0.80	0.75	0.58	0.70	0.78	0.95	0.95	-	-
1996-2001	0.70	0.81	0.73	0.88	0.90	0.90	0.75	0.82	0.86	0.91	0.83	0.94	0.39	0.42

Period	Latin America						
	Chi	Mex	Col	Per	Ven	Bra	Arg
1981-1990	-	-	-	-	-	-	-
1991-1995	0.36	0.34	-	-	-	-	-
1996-2001	0.91	0.87	0.49	0.74	0.60	0.85	0.95

Period	Asia					
	Ind	Kor	Phi	Sin	Tai	Chi
1981-1990	-	-	-	-	-	-
1991-1995	-	-	-	-	-	-
1996-2001	0.70	0.69	0.68	0.56	0.65	0.91

Table 5
Test Results of Index Model

The index model with risk-free rate is defined as $r_{c,i} = \alpha_i + \beta_{a,i} r_{a,i} + \beta_{m,i} r_{m,i} + \varepsilon_i \quad \forall i = 1,.....,N$ where, $r_{c,i}$, $r_{a,i}$, and $r_{m,i}$ are the excess returns over risk free rate of each country indices, ADR portfolio returns, and U.S. market portfolio returns. All country indices and U.S. market index have been collected from MSCI. ADR returns have been collected from CRSP. We construct equally weighted ADR portfolio for each country. We have 6, 12, and 15 countries from developed region for the period 1981-1990, 1991-1995, and 1996-2001 respectively. A total of 2 countries have been included for the period 1991-1995, and 7 countries for the period 1006-2001 in Latin American region. We have 6 Asian countries in the period 1996-2001. As a result we have system of equations for each sample period. We hypothesize: $H_0 : \alpha_i = 0 \ \forall i$. The rejection of null implies that ADR portfolio cannot provide as much diversification benefits as the country indices. In panel A, we report the *p-values* of three different tests: Wald (chi-square), Likelihood Ratio, LR (F-statistics), and Gibbons, Ross, Shanken, GRS (F-statistics). In Panel 2, we test the hypothesis: $H_0 : \alpha_i = \alpha \ \forall i$, that is, each country have the same alpha. In other words, the reject of the null implies that each country has different zero-beta asset.

Time Period	**Region**	**Index Model** H_0: $\alpha_i = 0 \ \forall i$			**Index Model (zero beta)** H_0: $\alpha_i = \alpha \ \forall i$	
		Wald Test	**LR Test**	**GRS Test**	**Wald Test**	**LR Test**
		P-value	**P-value**	**P-value**	**P-value**	**P-value**
1981-1990	**Developed**	0.000	0.000	0.000	0.004	0.021
1991-1995	**Developed**	0.000	0.000	0.000	0.003	0.074
	Latin America	0.296	0.306	0.323	0.816	0.871
1996-2001	**Developed**	0.154	0.052	0.276	0.125	0.107
	Latin America	0.000	0.000	0.201	0.663	0.058
	Asia	0.000	0.000	0.000	0.297	0.401

TABLE 6
Spanning Tests of Overidentifying Conditions: By Region

R_t is the n-dimensional vector of *n*-assets, and $r_t = R_t - E(R_t)$ is the vector of excess returns. There are *p* benchmark assets, and the remaining, $q = n\text{-}p$ are test assets. The SDF mc, cj is the predetermined risk-free rate. We use two risk-free rate for the tests. If the *n* assets are spanned by the benchmark assets, then the volatility bound constructed from the benchmark and test assets remain unchanged when test assets are excluded. The volatility bound is formed by constructing two discount factors that have two expected values c1, and c2. The system that define the volatility bound for *n* assets is:

$R_t = E\left(R_t \mid m_{c1}\right) = v_{1,t}$ and $R_t = E\left(R_t \mid m_{c2}\right) = v_{2,t}$ where $E\left[R\right] = \iota - Cov\left[Rm\right] / E\left[m\right]$, and $m_{cj,t} = \sum_{l=1}^{p} \beta_{l,j} r_{l,t} + \sum_{k=1}^{q} \beta_{k,j} r_{k,t} + c_j$ with $E(m_{cj,t}) = c_j,\ j = 1,2$ and $r_t = R_t - E(R_t)$. The null hypothesis is that *p* benchmark assets are sufficient to span all $n=p+q$ assets, It means that if *q* test assets are excluded from the SDF, then the volatility bound does not change. In other words, the null hypothesis is: $\beta_{l,1} = \beta_{l,2} = 0$. That is the overidentifying condition. For *q* test assets the number of overidentifying conditions are *2q*. Hansen J-statistics are used to evaluate the conditions, which is a chi-square distribution with degrees of freedom equal to *2q*. GMM technique is used to estimate the equations. Our benchmark assets are all country indices, all ADR portfolios, and the U.S. market except the country indices (ADR portfolios) for a region.

Panel A: Spanning tests: P-values

Regions	Excluded Index	1981-1990		1991-1995		1996-2001	
		P-values		P- values		P-values	
		Asymptotic	Bootstrap	Asymptotic	Bootstrap	Asymptotic	Bootstrap
Developed	**Country**	0.000	0.000	0.219	0.151	0.334	0.341
	ADR	0.000	0.001	0.199	0.108	0.302	0.308
Latin America	**Country**	-	-	0.000	0.003	0.016	0.009
	ADR	-	-	0.000	0.001	0.013	0.022
Asia	**Country**	-	-	-	-	0.070	0.102
	ADR	-	-	-	-	0.004	0.000

Panel B: Implication of spanning test results in panel A

		Can country plus U.S. market index mimic ADR returns?	Implications	Regions 1981-1990	1991-1995	1996-2001
Can ADRs plus U.S. market index mimic country returns?	*Yes*	*Yes*	*ADR and country substitutes*	-	DC	DC
	Yes	*No*	*ADR required, country not required*	-	-	AS
	No	*Yes*	*Country required, ADR not required*	-	-	-
	No	*No*	*Both ADR and country required*	DC	LA	LA

TABLE 7
Spanning Tests For Portfolios Sorted By Number of ADRs

In panel A, for each *t*-period returns, we form equally-weighted portfolios based on *(t-1)*-period ranking of countries with respect to the number of ADRs for each country. We divide the countries in three different groups: largest, medium, and smallest based on the rank each year. We continue to follow the same process for each years starting form 1980 to 2001. Then we stacked the data for the different periods, and conduct our spanning test. The benchmark assets consist of all three – largest, medium, and smallest - ADR portfolios, three equally-weighted country portfolios, and the U.S. market except one of the ADR (country) portfolios that is considered as test asset. In panel B, we divide country and ADR portflios into the largest, medium, and the smallest groups based on the number of ADRs in the year 1990, 1995, and 2001. Hansen J-statistics are used to evaluate the overidentifying conditions of the spanning test, which is a chi-square distribution with degrees of freedom equal to *2q*. GMM technique is used to estimate the equations.

Panel A:

Portfolios	Excluded Index	1981-1990	1991-1995	1996-2001	1981-2001
		P-values	P-values	P-values	P-values
Large	Country	0.000	0.000	0.299	0.000
	ADR	0.000	0.000	0.216	0.000
Medium	Country	0.008	0.028	0.034	0.002
	ADR	0.001	0.001	0.009	0.000
Small	Country	0.000	0.000	0.049	0.009
	ADR	0.018	0.000	0.046	0.000

Panel B:

Portfolios	Excluded Index	1981-1990	1991-1995	1996-2001
		P-values	P-values	P-values
Large	Country	0.000	0.000	0.013
	ADR	0.001	0.019	0.141
Medium	Country	0.000	0.020	0.024
	ADR	0.003	0.003	0.019
Small	Country	0.000	0.000	0.027
	ADR	0.000	0.015	0.007

TABLE 8
Spanning Tests: By Country

For marginal diversification benefits, each time we exclude one country ADR portfolio (one country index), find the probability of rejection of the null hypothesis that returns of all countries' portfolios, ADRs portfolios and U.S. market can mimic that country's ADR returns (returns of ADRs portfolios, all other countries' portfolios and U.S. market can mimic that country's returns) from corresponding J-statistics. Then we replace that country's ADR portfolio (country index), and exclude another country's ADR portfolio (country index), and test the null hypothesis. We repeat the process for all countries' ADR portfolios and country indices. Countries are organized in three categories based on the ranking by the number of ADRs as of year 2001.

Panel A:

Portfolio	Country	Excluded Index: Country			Excluded Index: ADR		
		1981-1990	1991-1995	1996-2001	1981-1990	1991-1995	1996-2001
Large	UK	0.000	0.047	0.701	0.000	0.766	0.006
	Japan	0.000	0.037	0.013	0.008	0.061	0.711
	France	-	0.155	0.045	-	0.232	0.177
	Mexico	-	0.000	0.549	-	0.000	0.012
	Chili	-	0.106	0.000	-	0.001	0.007
Medium	Australia	0.022	0.006	0.629	0.492	0.000	0.000
	Netherlands	0.000	0.189	0.483	0.023	0.478	0.000
	Sweden	0.032	0.116	0.101	0.073	0.120	0.339
	Italy	0.002	0.086	0.000	0.120	0.197	0.076
	Sweden	0.032	0.116	0.101	0.073	0.120	0.339
	Italy	0.002	0.086	0.000	0.120	0.197	0.076
	Ireland	0.241	0.111	0.019	0.140	0.117	0.006
	Brazil	-	-	0.009	-	-	0.012
	Argentina	-	-	0.061	-	-	0.071
	China	-	-	0.009	-	-	0.000
Small	Denmark	0.357	0.335	0.064	0.205	0.507	0.749
	Spain	0.320	0.209	0.688	0.004	0.002	0.062
	New Zealand	-	0.071	0.801	-	0.008	0.488
	Norway	-	0.756	0.081	-	0.661	0.004
	Germany	-	-	0.752	-	-	0.998
	Switzerland	-		0.821	-	-	0.013
	Colombia	-	-	0.000	-	-	0.004
	Peru	-	-	0.013	-	-	0.061
	Venezuela	-	-	0.947	-	-	0.929
	Bolivia	-	-	0.924	-	-	0.052
	Indonesia	-	-	0.039	-	-	0.581
	Korea	-	-	0.008	-	-	0.041
	Philippines	-	-	0.517	-	-	0.815
	Singapore	-	-	0.007	-	-	0.000
	Taiwan	-	-	0.002	-	-	0.000

Panel B: Implication for spanning results in panel A

Can ADRs plus U.S. market index mimic country returns?	Can country plus U.S. market index mimic ADR returns?	Implications	1981-1990			1991-1995			1996-2001		
			Developed Country	**Latin America**	**Asia**	**Developed Country**	**Latin America**	**Asia**	**Developed Country**	**Latin America**	**Asia**
Yes	*Yes*	*ADR and country substitutes*	Denmark Ireland	-	-	Denmark Netherlands Sweden UK France Italy Norway Ireland	-	-	Sweden New Zealand Germany Spain Denmark	Venezuela Argentina	Philippines
Yes	*No*	*ADR required, country not required*	Spain	-	-	New Zealand Spain	Chile	-	Australia Netherlands UK Norway Switzerland	Mexico Bolivia	
No	*Yes*	*Country required, ADR not required*	Australia Sweden Italy	-	-	Japan	-	-	Japan France Italy	Peru	Indonesia
No	*No*	*ADR and country required*	Japan Netherlands UK	-	-	Australia	Mexico	-	Ireland	Brazil Chile Columbia	Korea Singapore Taiwan China

TABLE 9
Ranking of Countries by Number of ADRs Each Year

Region	Country	Y80	Y81	Y82	Y83	Y84	Y85	Y86	Y87	Y88	Y89	Y90	Y91	Y92	Y93	Y94	Y95	Y96	Y97	Y98	Y99	Y00
Developed Countries	Australia	3	2	2	2	2	2	2	2	2	2	1	1	1	1	2	2	1	2	1	2	2
	Denmark		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	France													3	2	2	2	3	1	1	1	1
	Germany																	3	3	2	3	3
	Ireland				3	3	3	3	3	3	3	3	3	2	2	3	2	2	2	2	2	2
	Italy								3	3	3	3	3	3	3	2	2	2	2	2	2	2
	Japan	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Netherlands	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	New Zealand														3	3	3	2	3	3	3	3
	Norway														3	3	3	3	3	3	3	3
	Spain								3	3	2	2	2	2	2	3	3	3	3	3	3	3
	Sweden	3	3	3	3	3	3	3	3	3	3	2	2	2	3	3	3	2	2	2	2	2
	Switzerland																	3	3	3	3	3
	UK	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Latin America	Argentina																	2	2	2	2	2
	Brazil																	3	3	2	2	2
	Chile											3	3	3	2	3	1	1	1	1	1	1
	Columbia																	3	3	3	3	3
	Mexico											3	2	2	1	1	1	1	1	1	1	1
	Peru																	3	3	3	3	3
	Venezuela																	3	3	3	3	3
Asia	China																	3	2	2	2	2
	Indonesia																	3	3	3	3	3
	Korea																	3	3	3	3	3
	Philippines																	3	3	3	3	3
	Singapore																	3	3	3	3	3
	Taiwan																	3	3	3	3	3