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ADR Risk Characteristics and Measurement

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Abstract

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1. Introduction

While a healthy empirical literature exists on international diversification and its benefits, surprisingly few studies have examined the risk characteristics and efficacy of asset pricing models for one avenue of international diversification – investments in American Depository Receipts (ADRs). Originating in approximately 1927, ADRs provide an opportunity for investors to indirectly purchase shares of foreign firms. ADRs represent a claim to a given number of shares of a foreign firm held by a U.S. financial institution (e.g., Bank of New York). With the increasingly significant presence of ADR trading in the American stock markets – increasing six-fold between 1990 and 1999 - an analysis of these securities' diversification impact on a U.S. stock portfolio and tests of the acuity of asset pricing models for predicting their returns should contribute to investors' utility in efficiently diversifying risk.

To date, studies of American Depository Receipts have focused on two main topics: (1) pricing efficiency of ADRs relative to their underlying foreign security, and (2) potential international diversification benefits of ADRs in an individual's stock portfolio.

The studies on the efficiency of ADRs relative to their underlying security find that, on average, exploitable arbitrage opportunities do not exist. ADR prices do reflect changes in the price of the underlying security. Kato, Linn, and Schallheim (1991) find no real opportunity for arbitrage profits in a small sample of ADRs between 1981 and 1984. They conclude that the law of one price holds even though the returns of their sample ADRs and underlying securities are not perfectly positively correlated. They attribute some of the difference to tax issues. In a response to Kato, et al., Wahab,

Lashgari, and Cohn (1992) argue that the standard deviations for ADRs will be greater than the standard deviation for their underlying security and again attempt to determine whether arbitrage opportunities can be exploited. Ultimately, they are not able to make a strong case for the existence of arbitrage opportunities. Jayaraman, Shastri, and Tandon (1993) find that the listing of an ADR results in positive excess returns as well as increased variance of returns for the underlying security.[1] Sundaram and Logue (1996) provide support for Jayaraman, et al.'s finding. Their results indicate that the issuance of ADRs is associated with an increase in the issuing firms equity price. Kim, Szakmary, and Mathur (2000) also test whether ADR prices are efficient relative to the price of the underlying shares. They contend (as do others) that ADR prices should reflect the price of the underlying shares in local currency, the relevant exchange rate, and the U.S. market index. They find that the most influential factor on ADR prices is the underlying share price followed by exchange rates.

The other branch of ADR literature finds support for ADRs as a means of increased international diversification in a portfolio. Officer and Hoffmeister (1987) find that ADRs in combination with U.S. stock result in increased diversification possibilities for a given investor's portfolio. Wahab and Khandwala (1993) test whether the ADRs are actually better means of diversification than the underlying stock. Their empirical tests find that the ADRs and underlying stocks have similar returns but that the ADRs do have additional risk reduction benefits. Jiang (1998) finds a portfolio consisting of the U.S. market portfolio and ADRs outperform portfolios containing the U.S. market index and foreign indexes in the short-run, but cannot unequivocally state that these same

[1] The day 0 excess return is 0.47 percent, and the authors note that the Japanese ADRs account for the majority of the excess return.

results hold for the long-run. Choi and Kim (2000) examine ADRs from 1990-1996, and also conclude that ADRs can be beneficial in an individual's portfolio for diversification purposes with emerging market ADRs giving the best chance for diversification.

We seek to make such a contribution to this existing ADR literature in our study. The sample employed in this study consists of 85 ADRs traded continuously on the U.S. stock exchanges between 1990 and 1999. In particular, we measure the volatility of the ADRs in terms of their volatility in U.S. trading, volatility of trading in their home countries, and the volatility of exchange rates between the U.S. and the home country of the ADR. We then decompose the volatility of the ADR into terms attributable to either home country volatility or exchange rate volatility. Finally, we expand the ADR literature by conducting ex-post tests of the Capital Asset Pricing Model (CAPM) in both the U.S. and the home country of the ADR in order to determine the ability of CAPM to serve as an accurate predictor of returns for ADRs and/or their home country stocks.

Our results indicate that the volatility of ADRs as measured by the standard deviation of return is not significantly different from the volatility of their underlying home country stocks. However, the volatility in exchange rates causes the correlation between ADRs and the S&P 500 to be much lower than for the average U.S. stock. This result leads to beta measures near zero for the ADRs in our study and indicates that ADRs can be used to reduce both systematic and unsystematic portfolio risk. This result also leads us to conclude that the CAPM is not an appropriate asset pricing model for ADRs. {Developed vs. emerging results?}

The remainder of this paper is organized as follows: Section 2 describes our sample and methodology, Section 3 presents our results, and Section 4 concludes.

2. Sample and methodology

We obtained our sample of ADRs from the Center for Research in Security Prices (CRSP) tapes, identifying all ADRs traded on any of the U.S. exchanges between 1990 and 1999. This initial sample resulted in 95 ADRs traded during this time period. We chose our sample period on the basis of three factors – availability of data, size of sample, and span of overall market returns. First, CRSP data were available through year-end 1999 at the time of this study. Second, we had to account for the trade-off between sample size and range of returns for the U.S. stock markets. Longer time periods of analysis lead to more robust results across different market environments, yet longer periods also cause a rapid decrease in the number of observations. For example, reducing our sample period to 1995-1999 would have nearly tripled our sample size, but our entire sample period would have consisted of only positive returns for the U.S. stock markets. Extending our sample period to pre-1990 would have significantly reduced our sample as ADR listings positively temporally distributed and would have introduced the problems associated with small sample properties into our analysis. Thus, 1990-1999 seems to be a logical time period for analysis as it represents an entire decade of stock market returns (both positive and negative) with a sample size that avoids small sample properties. The CRSP listing of ADRs was then checked against *The McGraw-Hill Handbook of American Depository Receipts* to identify the home country of the ADRs. All ADR price and return data were also taken from the CRSP tapes.

For home country stock price and return information and exchange rate data, we retrieved data from either the Bloomberg database or from the *Financial Times*. Our initial sample of 95 ADRs was reduced to a sample size of 89 due to missing data from

either Bloomberg or the *Financial Times*. The six excluded ADRs included listings from Bermuda, Finland, Israel, Luxembourg, and two from Mexico. Two additional ADRs from each Australia and the United Kingdom were excluded because they traded in a range less than $1.00 and severely positively skewed volatility results in such a small sample. Thus, our final sample size for this study includes 85 observations. Table 1 exhibits a description of our sample distributed by home country.

Our empirical analysis follows a standard study design – employing t-tests for significance of individual variables and paired t-tests for subsample comparisons. As in prior studies of ADRs, we analyze our full sample of ADRs as well as subsamples according to home country of ADR and classification of the home market as either developed or emerging. Following the convention of Choi and Kim (2000), we classify the markets of Australia, France, Japan, and the United Kingdom as developed and all other countries are classified as emerging markets. This market classification is necessary in order to obtain robust results as ADRs from many countries are sparsely represented in our sample and cannot be analyzed with standard tests of significance.

We selected our market indices according to the primary stock index listed by either Bloomberg or the *Financial Times* for each country. Use of the Standard & Poors 500 Index (S&P 500) for the United States differs somewhat from prior studies, but use of this index is more congruent with the choice of other countries' indices than either of the CRSP indices more commonly used. The indices used in this study are shown in Table 1. The empirical results generated from our sample and design are presented in the following section.

3. Empirical results

3.1 Comparisons of risk measures between ADRs and home country stocks

Presented in Table 2 are descriptive statistics for the ADRs in our study. The average annual return for the entire length of the study (1990-1999) in the home market was 9.81% versus a return of 9.13% for the ADRs themselves. Home market returns ranged from a high of 18.83% in South Africa to a low of 2.09% in Japan. Irish ADRs had the highest return at 14.04% while Spanish ADRs had the lowest at 3.52%. The returns between ADRs and their underlying stocks were significantly positively correlated with a correlation of 0.62 (p-value = 0.000).

Standard deviations were also very similar between the home markets and ADRs – averaging 45.05% for home stocks and 44.55% for ADRs. The range for home country stocks was a high of 63.19% in France and a low of 23.04% in Norway. ADRs ranged from 55.98% in South Africa to 24.35% in Norway. The standard deviation measures are also highly correlated between home stocks and ADRs at 0.94 (p-value = 0.000).

Differenced in betas between markets shows a much different pattern however. The average beta of home country stocks to their home market indices is 1.05 compared to an average beta of 0.06 for ADRs relative to the S&P 500. Home country betas fall into a relatively narrow range of 1.94 for South Africa to 0.61 for Italy. ADR betas a re much more dispersed – ranging from 2.14 for Dutch ADRs to –1.40 for South African ADRs. The correlation between home stock betas and ADR betas was an insignificant 0.01.

We also present the volatility of exchange rates over the sample period for each country. The average standard deviation of exchange rates for all countries is 10.32% -

ranging from a high of 12.92% for the Italian Lira and a low of 8.42% for the South African Rand.

We next perform paired t-tests to determine if differences exist between measures of risk and return between home country stocks and their ADRs. These tests are presented in Table 3. As can be seen in Panel A, the 0.69% difference in returns between the home country stocks and their ADRs (Home-ADR) is insignificant. A review of individual countries reveals an interesting pattern however. With the exception of Japan, returns are higher in the underlying stocks than in the ADRs. These returns are significantly higher in Australia (1.87%), Italy (5.66%), South Africa (9.39%), Spain (4.62%), Sweden (5.58%), and the United Kingdom (0.55%). Japanese ADRs outperform their underlying stocks by a significant 4.38%.[2] These results support the notion of Kato, Linn, and Schallheim (1991) that tax preferences in the home country and transactions costs associated with ADRs may lead to higher home country returns.

Just as with returns, standard deviations between ADRS and their underlying stocks are not significantly different (0.49%, t-stat = 0.85). But as before, individual countries reveal different patterns. Home country standard deviations are higher in every country except Australia and Japan. Standard deviations are significantly higher in the Netherlands (3.83%), South Africa (4.15%), Spain (3.62%), Sweden (4.82%), and the United Kingdom (1.99%). Japan is the only country where ADR standard deviations are less than in the underlying stocks (5.18%). These results run counter to the conjecture of Kato, Linn, and Schallheim (1991) that ADR standard deviations will be higher and perhaps more consistent with in that ADR markets are informationally efficient.

[2] Denmark, France, and Norway each have only one ADR in the sample and cannot be evaluated with t-tests.

Volatility is virtually the same between the ADRs and the underlying stocks; thus, exchange rate volatility appears to be driving the aforementioned differences in standard deviations.

As might be expected, betas are quite different between ADRs and their underlying stocks. The beta measure contains a limit property that asserts that in the limit the beta of a portfolio of all stocks in a market approaches 1.00 as the correlation between the market index and its stocks also approaches 1.00 in the limit. This property should hold true in any country's market. However, ADRs are different in the sense that they are derivative securities traded on a U.S. exchange with the primary security trading on a foreign exchange. Thus, while the underlying stock would be expected to be correlated with its home country index, the level of correlation of its ADR with the S&P 500 would depend on the degree of correlation between its home country index and the S&P 500 (see Section 3.2 below for further analysis of cross-country correlations). This cross-correlation issue leads to large differences in betas between ADRs and their underlying stocks. The average difference in beta is a significantly higher 0.99 beta in the home country relative to the U.S. The largest difference of 3.34 occurs in South Africa and the lowest of –1.04 occurs in Denmark. The only other country in which the ADR beta is higher is Ireland., but the difference is insignificant Yet, only two countries have significantly higher home country betas – South Africa and Japan (difference of 1.46). On the whole, these results suggest that ADRs posses significantly lower co-movements with the S&P 500 than either co-movements with their own indices or U.S. stocks with the S&P 500. This also implies that systematic risk can be significantly reduced with the

inclusion of ADRs in a portfolio of U.S. stocks and also holds important implications for our CAPM tests described in Section 3.3.

We also want to consider the differences in risk and return with regard to developed and emerging markets. As can be seen in Panel B of Table 3, ADR returns are significantly higher for developed countries (1.19%) while underlying returns are 5.20% higher for emerging markets. This result loosely supports Kato, Linn, and Schallheim (1991) in their assertion that tax preferences and transactions costs lead to higher returns in the home country relative to ADRs. Both taxes and transactions costs tend to be higher in emerging markets, leading to lower ADR returns vis-à-vis the underlying stocks. However, the reverse situation occurs with developed countries with lower taxes and transactions costs where adverse exchange rate movements cause ADR returns to be significantly higher.

Surprisingly, standard deviations are significantly higher (4.19%) in emerging home country stocks than in their ADRs. This finding lends support to the conclusions of Kim, Szakmary, and Mathur, 2000 in that ADR returns initially under-react to contemporaneous underlying security and especially exchange rate returns and refutes the contention of Wahab, Lashgari, and Cohn (1992) that the standard deviations of ADRs will be higher than those of their underlying stocks. Considering that no significant difference exists between ADR and underlying standard deviations in developed countries, the higher underlying standard deviations in emerging markets might indicate the more liquid and less risky trading environment that exists in developed countries (the U.S. market in particular).

As expected, the ADR betas of both developed and emerging markets are significantly lower than those of the underlying stocks. The differences are 0.90 for developed countries and 1.21 for emerging markets. These large and significant differences imply very different systematic risk measures between domestic and international portfolios for the same stock in both developed and emerging markets.

3.2 Measures of correlation

As we alluded to earlier in our analysis, levels of correlation play a vital role in determining the level of systematic and unsystematic risk reduction achieved through the inclusion of ADRs in a domestic portfolio. Of course, the sum of weighted covariances formula shows that lower levels of correlation between securities lead to lower levels of total risk in a portfolio. However, the use of beta in the CAPM formula assumes that unsystematic risk has been diversified away and the only relevant remaining risk to consider is systematic risk as measured by beta. Yet, as previously discussed, the limit property of beta no longer holds as ADR correlations with the S&P 500 may or may not approach 1.00 in the limit. Therefore, we must analyze additional correlations between ADR returns and the S&P 500, underlying stocks and their indices, and between the indices themselves. Pearson correlation coefficients for all such pairings are presented in Table 4.

As can be seen in Panel A, underlying stocks are significantly positively correlated with their home index in all countries with the exception of Ireland (which is significant at the 10% level). The average correlation across all countries is a significant 0.42 – less than the 0.xx reported by _____ () in their study of U.S. stocks. ADR

returns are generally positively correlated with the S&P 500 (Norway and South Africa being the exceptions), but the only significant correlation is the 0.18 for ADRs from the United Kingdom. For all countries, the average correlation is a significant 0.11. This correlation is significantly lower than the 0.42 for the home country stocks.

Given these results, the fact that home indices are positively correlated with the S&P 500 is not surprising. The only negative correlation with the S&P 500 comes from the South African Johannesburg Index at –0.06 and is insignificant. Indices in Australia (0.57), Ireland (0.59), Italy (0.47), Japan (0.22), Spain(0.63), Sweden (0.41), and the United Kingdom (0.78) are all significantly positively related to the S&P 500. The average correlation for all indices relative to the S&P 500 is a significant 0.39. These results are similar to prior studies.

As shown in Panel B, considering market classification also reveals that correlations are significantly positive – irrespective of whether the home country stocks are from developed or emerging markets. The one exception is in the ADRs in emerging markets which have an insignificant correlation of 0.05 with the S&P 500. Interestingly, correlations between developed and emerging markets' indices with the S&P 500 are an identical 0.41. This compares to ADR correlations to the S&P 500 of 0.12 and 0.05 for developed and emerging markets, respectively. These results lead us to conclude that macro index studies of international diversification such as Harvey's (19xx) do not capture the full effect of diversification offered by ADRs as even a diversified portfolio of ADRs (85 for all ADRs, 60 for developed country ADRs, and 25 for emerging market ADRs) offers a lower correlation (0.11, 0.12, and 0.05) than the correlation between indices.

We next consider the impact of these correlations on the validity of CAPM for generating expected returns for both ADRs and their underlying stocks.

3.3 Ex-post CAPM tests

Our first step in testing the validity of CAPM involves testing for a beta with predictive power (i.e., >0). We do this by estimating beta over a moving five-year period and averaging each of these five-year betas. Thus, we have beta estimates for 1995-1999 for each of our ADRs and underlying stocks and average these five betas for average annual beta estimate. This procedure is conducted for ADRs relative to the S&P 500 and for the underlying stocks relative to their home indices. Results are shown in Panel A of Table 5.

As previously discussed, home country betas are all positive and fall into a fairly tight range of 0.61 to 1.94. The average across all countries is 1.05 and significantly different from zero. For most countries with multiple observations – Australia, Japan, South Africa, Spain, Sweden, and the United Kingdom – betas of underlying stocks are significantly positive. All of the three remaining countries – Ireland, Italy, and the Netherlands – are emerging markets, a point to be addressed later. Thus, beta appears to have significant predictive power for home country stocks – especially those in developed countries. The betas for ADRs behave very differently from their underlying counterparts. The only significantly positive ADR betas belong to Japan (-0.84) and the United Kingdom (0.89). All other ADR betas are insignificant and the average of 0.06 across all countries is not significant. As seen in Panel B, home market betas are similarly significant between developed (1.04) and emerging (1.07) markets. Neither

exhibit significant ADR betas. In aggregate, these results suggest that CAPM is most likely to be accurate in developed home markets, followed by emerging home markets and with little predictive ability in the ADR market. We now test to see if this is indeed the case.

Presented in Table 6 are our ex-post tests of CAPM. In conducting these tests for the underlying stocks, we use the five-year beta calculated above and multiply this by the market risk as determined by the actual return on the home index for each year minus the one-year U.S. Treasury (risk-free) rate for the same year. This is then added to the risk-free rate to calculate an expected return for the stock. This expected return is then deducted from the actual return of the stock for that year in order to compute an abnormal return for the stock. Just as before, the procedure is repeated rolling forward a year. This results in five abnormal returns and we take the average of these five returns as our measure of abnormal return for the stock. The same procedure is then used to generate ADR abnormal returns by replacing the home country beta with the ADR beta, the home country index return with that of the S&P 500, and the actual underlying stock return with that of the ADR. This procedure is shown in Equations 1 and 2 below. If a t-test of mean abnormal returns is significant, then we can reject the validity of CAPM for generating expected returns – at least in an ex-post sense and in realization of the dual hypothesis problem.

$$Abnormal\,\mathrm{Re}turn_i = Actual\,\mathrm{Re}turn_i - \beta_{i-5,i-1} * (Home\,Market\,\mathrm{Re}turn_i - rf_i) \quad (1)$$

$$Stock\ or\ ADR\ Abnormal\,\mathrm{Re}turn = \sum_{1995}^{1999} Abnormal\,\mathrm{Re}turn / 5 \quad (2)$$

We present our CAPM tests of individual countries in Panel A of Table 6. The average abnormal return for home country stocks is less than 1% in absolute terms and is

not significantly different from zero. This result is not unexpected given that our average beta was significant. What is somewhat unexpected is the insignificant abnormal return of 3.61% for ADRs. While substantially (and significantly) larger than the home country abnormal returns, the insignificant ADR abnormal return cannot lead us to reject CAPM as a valid generator of expected returns. The only individual country to exhibit any significant abnormal return is Japan in its ADRs with a 14.76% abnormal return. No other country's home stocks or ADRs possess abnormal returns; however, this is probably due to small sample sizes for most of the countries. In order to address this issue, we analyze abnormal returns according to market classifications as shown in Panel B of Table 6.

Again, CAPM cannot be rejected for its validity in the ADR market as both developed and emerging markets' ADR abnormal returns are not significantly different from zero. The same holds true for the underlying stocks of developed countries. However, the abnormal returns of the home market stocks in these countries is a significant –11.62% - implying that CAPM significantly overestimates the expected return on these stocks relative to heir actual returns. Although we can only speculate at the cause of this result, the source of the abnormal returns are likely from one of the following – a small sample size leading to erroneous results, higher levels of unsystematic risk in emerging markets, or simply model mis-specification. The result makes for an interesting topic of future study.

4. Conclusion

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Table 1
Description of sample

This table contains a description of the 85 American Depository Receipts (ADRs) traded on the U.S. stock markets the entire sample period of 1990-1999. The sample is distributed according to ADRs' home country.

Country	*N*	*Index*	*Currency*
Australia	8	All Ordinaries	Australian Dollar
Denmark	1	Copenhagen	Kroner
France	1	CAC-40	French Franc
Ireland	2	Irish Overall	Punt
Italy	3	Milan Index	Lira
Japan	24	Nikkei-225	Yen
Netherlands	4	Amsterdam	Guilder
Norway	1	Oslo	Krone
South Africa	5	Johannesburg	Rand
Spain	5	IBEX	Pesata
Sweden	4	Stockholm	Krona
United Kingdom	27	FTSE-100	British Pound
All countries	85		

Table 2
Descriptive statistics

			Home market			ADR			Cross
Country	*Mkt*	*n*	*Average annual return*	*Average annual standard deviation*	*Average annual beta*	*Average annual return*	*Average annual standard deviation*	*Average annual beta*	*Currency standard deviation*
Australia	D	8	13.74 %	41.27 %	1.20	11.87 %	41.41 %	0.43	8.82 %
Denmark	E	1	15.71	42.24	1.10	12.63	38.09	2.14	10.69
France	D	1	10.53	63.19	1.41	6.72	54.39	0.74	10.15
Ireland	E	2	17.25	49.13	1.02	14.04	44.25	1.15	10.32
Italy	E	3	12.03	34.26	0.61	6.38	27.87	-0.27	12.92
Japan	D	24	2.99	41.31	0.62	7.37	46.73	-0.84	9.09
Netherlands	E	4	10.05	41.92	0.85	7.72	38.09	0.09	10.19
Norway	E	1	9.91	23.04	0.55	8.13	24.35	-0.98	9.62
South Africa	E	5	18.83	60.13	1.94	9.44	55.98	-1.40	8.42
Spain	E	5	8.15	35.64	0.66	3.52	32.02	0.60	12.78
Sweden	E	4	13.59	54.60	1.22	8.01	49.78	-0.61	12.62
United Kingdom	D	27	11.72	48.42	1.34	11.16	46.42	0.89	9.72
All countries		85	9.81 %	45.05 %	1.05	9.13 %	44.55 %	0.06	10.32 %

Table 3
Univariate comparisons of risk measures

Panel A: Differences in beta and standard deviation for each country

			Difference: Home market - ADR					
Country	***Mkt***	***n***	***Average annual return***	***t-stat***	***Average annual standard deviation***	***t-stat***	***Average annual beta***	***t-stat***
Australia	D	8	1.87 %	3.77 *	-0.14 %	-0.11	0.77	2.06
Denmark	E	1	3.07	-	4.15	-	-1.04	-
France	D	1	3.81	-	8.80	-	0.67	-
Ireland	E	2	3.21	4.18	4.70	2.15	-0.13	-0.14
Italy	E	3	5.66	9.63 *	6.38	3.00	0.88	3.26
Japan	D	24	-4.38	-13.24 *	-5.18	-4.52 *	1.46	4.31 *
Netherlands	E	4	2.33	5.01	3.83	5.83 *	0.76	1.88
Norway	E	1	1.79	-	1.30	-	1.53	-
South Africa	E	5	9.39	22.44 *	4.15	13.94 *	3.34	6.51 *
Spain	E	5	4.62	23.25 *	3.62	5.63 *	0.06	0.68
Sweden	E	4	5.58	5.85 *	4.82	3.49 *	1.83	1.85
United Kingdom	D	27	0.55	2.55 *	1.99	3.47 *	1.75	1.33
All countries		85	0.69 %	1.54	0.49 %	0.85	0.99	5.54 *

Panel B: Differences in beta and standard deviation for developed and emerging markets

		Difference: Home market - ADR					
Market	***n***	***Average annual return***	***t-stat***	***Average annual standard deviation***	***t-stat***	***Average annual beta***	***t-stat***
Developed	60	-1.19 %	-3.06 *	-1.05 %	- 1.47	0.90	4.18 *
Emerging	25	5.20 %	9.80 *	4.19 %	9.23 *	1.21	3.76 *

* Significant at the 5% level

Table 4
Correlations

Panel A: Correlation tests for individual countries

Country	*Mkt*	*n*	*Average correlation of home country stock with home country index*	*p-value (>0)*	*Average correlation of ADR with S&P 500*	*p-value (>0)*	*Average correlation of home country index with S&P 500*	*p-value (>0)*
Australia	D	80	0.44	0.000 *	0.19	0.086	0.57	0.000 *
Denmark	E	10	0.65	0.043 *	0.57	0.084	0.56	0.093
France	D	10	0.75	0.012 *	0.47	0.171	0.61	0.062
Ireland	E	20	0.41	0.068	0.13	0.569	0.59	0.006 *
Italy	E	30	0.58	0.001 *	0.22	0.232	0.47	0.009 *
Japan	D	240	0.46	0.000 *	0.03	0.646	0.22	0.001 *
Netherlands	E	40	0.42	0.007 *	0.11	0.499	0.65	0.000 *
Norway	E	10	0.79	0.006 *	-0.55	0.099	0.11	0.768
South Africa	E	50	0.75	0.000 *	-0.22	0.118	-0.06	0.697
Spain	E	50	0.45	0.001 *	0.15	0.304	0.63	0.000 *
Sweden	E	40	0.70	0.000 *	0.17	0.292	0.41	0.009 *
United Kingdom	D	270	0.28	0.000 *	0.18	0.003 *	0.78	0.000 *
All countries		850	0.42	0.000 *	0.11	0.002 *	0.39	0.000 *

Panel B: Correlation tests for developed and emerging markets

Market	*n*	*Average correlation of home country stock with home country index*	*t-stat (>0)*	*Average correlation of ADR with S&P 500*	*p-value (>0)*	*Average correlation of home country index with S&P 500*	*p-value (>0)*
Developed	600	0.37	0.000 *	0.12	0.002 *	0.41	0.000 *
Emerging	250	0.57	0.000 *	0.05	0.440	0.41	0.000 *

* Significant at the 5% level

Table 5
Tests of beta

Panel A: Tests of beta for individual countries

Country	*Mkt*	*n*	*Average beta of home country stock relative to home country index*	*t-stat (>0)*	*Average beta of ADR relative to S&P 500*	*t-stat (>0)*
Australia	D	8	1.20	3.13 *	0.43	0.99
Denmark	E	1	1.10	-	2.14	-
France	D	1	1.41	-	0.74	-
Ireland	E	2	1.02	3.99	1.15	1.13
Italy	E	3	0.61	2.35	-0.27	-0.76
Japan	D	24	0.62	4.85 *	-0.84	-2.65 *
Netherlands	E	4	0.85	1.96	0.09	0.17
Norway	E	1	0.55	-	-0.98	-
South Africa	E	5	1.94	12.72 *	-1.40	-1.93
Spain	E	5	0.66	3.16 *	0.60	2.34
Sweden	E	4	1.22	4.23 *	-0.61	-0.57
United Kingdom	D	27	1.34	3.46 *	0.89	3.55 *
All countries		85	1.05	7.59 *	0.06	0.41

Panel B: Tests of beta for developed and emerging markets

Market	*n*	*Average beta of home country stock relative to home country index*	*t-stat (>0)*	*Average beta of ADR relative to S&P 500*	*t-stat (>0)*
Developed	60	1.04	5.55 *	0.14	0.61
Emerging	25	1.07	8.42 *	-0.14	-0.53

* Significant at the 5% level

Table 6
Tests of CAPM

Panel A: Tests of CAPM for individual countries

Country	*Mkt*	*n*	*Average CAPM-adjusted return of home country stock relative to home country index*	*t-stat (>0)*	*Average CAPM-adjusted return of ADR relative to S&P 500*	*t-stat (>0)*
Australia	D	8	5.06 %	0.72	-5.33 %	-0.74
Denmark	E	1	10.48	-	-19.07	-
France	D	1	8.71	-	-2.44	-
Ireland	E	2	-10.44	-2.15	-10.99	-0.48
Italy	E	3	4.69	0.57	18.57	2.36
Japan	D	24	10.56	1.68	14.76	2.16 *
Netherlands	E	4	-16.65	-3.07	-2.70	-0.27
Norway	E	1	-3.78	-	20.92	-
South Africa	E	5	-13.49	-1.19	21.38	1.63
Spain	E	5	-16.86	-2.50	-11.50	-2.19
Sweden	E	4	-18.03	-1.69	12.07	0.52
United Kingdom	D	27	-3.48	-0.76	-4.62	-1.33
All countries		85	-0.96 %	-0.36	3.61 %	1.29

Panel B: Tests of CAPM for developed and emerging markets

Market	*N*	*Average CAPM-adjusted return of home country stock relative to home country index*	*t-stat (>0)*	*Average CAPM-adjusted return of ADR relative to S&P 500*	*t-stat (>0)*
Developed	60	3.48 %	1.03	3.08 %	0.90
Emerging	25	-11.62 %	-3.70 *	4.90 %	0.99

* Significant at the 5% level