Does Exchange Rate Exposure Matter?

By

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Draft: May 8, 2002. Comments Welcome.

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Abstract

Previous literature finds mixed empirical support for a relation between exchange rate exposure and its theoretical determinants and that exposure is of negligible economic importance. To re-examine the nature and the economic significance of the exchange rate to firm value relation, we construct an international database of over 17,000 non-financial firms from 18 countries. We find that firms' foreign activity is broadly and significantly related to exchange rate exposure and that after controlling for this activity, large firms are more sensitive to currency movements than small firms. Using a portfolio approach to investigate the economic importance of these effects, we find that firms with high international sales outperform those with no international sales during periods of large currency depreciations by 0.72 percent per month, whereas they underperform by 1.10 percent per month during periods of large currency appreciations. Exchange rate movements have an economically significant impact on firm value in ways that are consistent with theory.

1. Introduction

While finance theory, firm level survey results, and common intuition strongly support the notion that firm value is sensitive to exchange rate movements, empirical support is fragile. Studies examining exchange rate exposure generally find limited evidence of a relation between exposure and its theoretical determinants and that the economic importance of this relation is small. We provide new evidence that helps to solve this puzzle by examining both the nature and the economic significance of exposure using a new approach and a comprehensive database of firm level information in 18 countries from 1975 to 1999.

Prior studies in the empirical exposure literature have primarily focused on the measurement of exposure and its consistency with the theoretical determinants of exposure. Jorion (1990) finds evidence of significant exchange rate exposure and shows that the level of foreign sales is the main determinant of exchange rate exposure for large U.S. multinational firms. However, Amihud (1994) and Bartov and Bodnar (1994) find no evidence of contemporaneous exposure for U.S. multinationals, although Bartov and Bodnar do find that U.S. firms respond to past quarterly exchange rate movements. Using a sample of Japanese firms, He and Ng (1998) find a strong contemporaneous relation between foreign sales and exposure, but find no evidence of a lagged relation. Dominguez and Tesar (2001) find no relation between foreign sales and exposure in a sample of firms from eight non-U.S. countries, including Japan.

A second finding regarding the nature of exposure is its relation to firm size. If large firms have more foreign activity relative to small firms, they may have more exposure. Therefore, to the extent that size proxies for a firm's level of foreign activity, it could be a determinant of exposure. Indeed, Bodnar and Wong (2000) and He and Ng (1998) show that large firms have more exposure than small firms in the U.S. and Japan. Interestingly, they also show that large firms have more exposure, even after controlling for the level of foreign sales. Conversely, Dominguez and Tesar (2001) argue that exposure varies little with firm size.

In addition to the questions about the importance of foreign sales and firm size, there is evidence that the nature of exposure varies across countries and time (e.g., Bodnar and Gentry (1993), Williamson (2001), and Allayannis (1997)). The various findings regarding the nature of the exposure relation highlight the need for a systematic comparison of exchange rate exposure across time, countries, and determinants. To this end, we expand the investigation of the nature of the relation between exposure and foreign activity and firm size by using unique firm-level data with broad coverage across markets over a 25-year period and an approach that allows for time-variation in exposure.

Another finding of the empirical exposure literature is that exchange rate movements do not explain a large part of the variation in stock returns. Although it is not the focus of the analyses, Jorion (1990), and Bartov and Bodnar (1994) show that exchange rates do not explain a large fraction of the variation in individual stock returns. Griffin and Stulz (2001) demonstrate that in a variety of settings, exchange rate movements explain only a small amount of variation in international industry stock returns and conclude that exchange rate movements have little economic importance. These results are seemingly at odds with the conditional international asset pricing literature (e.g., Dumas and Solnik (1995) and De Santis and Gerard (1998)) in that it is puzzling how exchange rate risk can be priced if it is of small economic importance. Our findings help reconcile these literatures.

The focus of the literature that examines the economic importance of exposure is on calculating the fraction of the variation of an industry's or an individual firm's stock returns that is related to exchange rate movements. For some applications such as hedging, this may be the relevant question. However, from the perspective of a portfolio manager, an investor who holds a diversified portfolio, or simply an economist who wishes to assess the average relation between firm value movements and exchange rates, the relevant question is whether exchange rate movements affect the returns on certain groups of stocks more than others. Therefore, we re-

examine the economic importance of exchange rate movements by measuring cross-sectional differences in returns between firms with high and no international activity.

This paper provides new evidence regarding both the nature and economic importance of exposure. We first examine traditional linear regressions and find that the number of firms that are exposed to exchange rate movements is greater than what can be attributed to chance, but that the percentage of firms that are exposed is not overwhelming. We then regress exposure betas on the determinants of exposure and find that sales abroad generated by foreign production (foreign sales), sales abroad generated by domestic production (export sales), firm size, and other variables related to foreign operations are systematically related to exchange rate exposure. While the statistical significance and magnitudes of the relations vary substantially across countries, the finding that large firms with high international sales (foreign sales plus export sales) are more sensitive to currency movements than small firms with low international sales is fairly pervasive across markets.

To evaluate the economic impact of exchange rate movements on stock returns, we form portfolios that are long in firms with high international sales and short in firms with no international sales. Because no linear relation is assumed and portfolios are rebalanced annually, the approach addresses concerns about imposing linearity and allows for time-variation in exposure. If exchange rates impact high and no foreign sales firms differently, then the difference in returns between these groups of firms should be an interesting gauge of the impact of exchange rates on firm value. Consistent with theory, we find that during periods of large currency depreciations, firms with high international sales outperform those with no international sales in 14 of 18 countries, whereas in periods of large currency appreciations these same firms underperform in 16 of 18 countries. Although the magnitude of these effects varies widely across countries, during periods of large currency depreciations, the average difference in returns between the high and no international sales portfolios is 0.72 percent per month, whereas during currency appreciations these same firms underperform by an economically and statistically

significant -1.10 percent per month. These large return differences are concentrated in large market capitalization firms. Our findings provide strong evidence that exposure does vary systematically with international activity and that exposure has an economically important relation with firm value.

The remainder of the paper is organized as follows. Section 2 connects our approach to the theoretical and empirical literature that examines the relation between firm value and exchange rate movements. Section 3 describes the data and shows some basic properties of its coverage. Firm-level regression results for all firms, for firms partitioned by their level of international sales, and different sub-periods are evaluated in Section 4. Section 5 relates exposure betas to variables related to its determinants through cross-sectional regression analysis. Section 6 presents portfolio returns during different periods of currency movements for portfolios that are long firms with high international sales and short firms with no international sales. The effect of firm size is also examined. Section 7 briefly examines some remaining issues related to exposure and Section 8 concludes.

2. Exchange Rate Exposure and Firm Value

2.1 Theoretical Review

The theoretical exchange rate exposure literature supports the common belief that exchange rate changes should impact firms that import from foreign markets, export to foreign markets, or face foreign competition. Shapiro (1975) argues that a multinational firm with export sales and competition should exhibit exchange rate exposure and that the firm's exposure should be related to the proportion of export sales, the level of foreign competition, and the degree of substitutability between local and imported factors of production. Levi (1994) supports these ideas by showing that the main impact on the value of a multinational firm is the profitability of sales in the foreign country; Marston (2001) demonstrates that net foreign revenues are the main component of a firm's exchange rate exposure. Marston also argues that for an oligopolistic firm,

exposure is a function of the firm's own elasticity of demand and the cross-elasticity of demand with its competitors.[1] Bodnar, Dumas, and Marston (2002) show that pass through can impact exchange rate exposure because firms with inelastic demand can pass price changes on to consumers. Allayannis and Ihrig (2001) argue that industry markup and competition play key roles in exposure and show that low markup U.S. industries have high exchange rate exposure. While this literature demonstrates that exposure can be non-linear, offsetting within a firm, and quite complex, the theory points to an economically important relation between exchange rates and firm value.

Over the past 30 years, firms and industries that were once national have become more global, resulting in large increases in international activity. Additionally, large real exchange rate changes followed the breakdown of the Bretton Woods system in 1973. These deviations in exchange rates away from purchasing power parity have an average half-life of four or five years (Froot and Rogoff (1995)) and lead to large movements in price markups and profit margins (Knetter (1993) and Froot and Klemperer (1989)). These factors all generally suggest that exchange rate movements should have a measurable effect on firm value.

2.2 Our approach relative to the empirical literature

Although theory suggests that the exposure relation can be quite complex and data related to the determinants is limited, we are able to obtain proxies for exposure determinants such as sales from foreign production, sales exported abroad, foreign income, and foreign assets. One advantage of our approach is that the data are gathered from a consistent source across firms and countries, which facilitates cross-country comparisons. Most empirical exposure studies focus on U.S. firms (e.g., Jorion (1990), Bartov and Bodnar (1994), Linck (1999)) or international

[1] Bessembinder (1992) shows that the size of the home country and strategic interactions of the firm and its competitors play important roles in firms' exchange rate exposure. Other theoretical arguments focus on particular aspects of the exchange rate to firm value relation such as future exchange rates and changes in domestic prices (Hekman (1985) and Hodder (1982)).

industries (e.g., Bodnar and Gentry (1993), Griffin and Stulz (2001), Bodnar, Dumas, and Marston (2002)). A potential problem with examining only U.S. firms is that they may differ widely in their exposure even after controlling for the level of foreign sales. Indeed, recent studies show much more evidence of exposure in industries and firms outside the U.S. (e.g., Bodnar and Gentry (1993), He and Ng (1998), and Dominguez and Tesar (2001)). Examining exposure on an industry level is potentially problematic as a movement in exchange rates may lead to offsetting affects on net importing and net exporting firms within an industry.[2] To address these concerns, we examine exposure for individual firms from 18 different countries.

Although our analysis is more comprehensive, we are not the only study to examine exposure for individual firms outside the U.S. However, studies using non-U.S. firms often find results that are not consistent with U.S. studies, or with each other. For example, in Japan, He and Ng (1998) find that exposure varies systematically with foreign sales and firm size. Similarly, Bodnar and Wong (2000) show that large U.S. firms have more exposure, even after controlling for the level of foreign sales.[3] However, using a sample of eight countries (including Japan, but not the U.S.), Dominguez and Tesar (2001) argue that exposure is not related to foreign sales, firm size, or other international activities. While Dominguez and Tesar (2001) study 2,387 firms in eight countries, we study U.S. firms, as well as non-U.S. firms from 17 other countries. More importantly, as we discuss below, our approach differs substantially from prior studies.

One problem in modeling the relation between exchange rates and firm value is that perhaps it is too simplistic to assume that exchange rate changes have a linear and constant impact on firm value. Only in simplified situations does the theoretical literature predict a linear relation and these methodological issues may mask exposure (Dewenter, Higgins, and Simin (2002)). Even if the exposure-return relation is linear, but varies through time (e.g., Allayannis

[2] Consistent with this argument, Williamson (2001) finds varying exposure for firms within the automotive industry and that the exposure is affected by a firm's foreign operations.
[3] Bodnar and Wong (2000) show that because of the relation between firm size and exposure, the market benchmark can affect the exposure coefficient.

(1997)), an exposure regression will be mis-specified if an imperfect proxy is used to capture the time-variation in exposure. To address these concerns, in addition to tabulating results based on standard regression approaches, we propose a different method to examine exposure. We form portfolios of firms with high international sales and portfolios of firms with no international sales and then compute the average returns of the portfolios during periods of appreciating or depreciating currency movements. Therefore, we can analyze exposure without assuming a linear or constant exposure relation.

Because the exact nature of derivative positions is usually not disclosed, a potential problem with our analysis and most other analyses of exposure is that the effect of exchange rate movements on firm value is observed without knowledge of potentially offsetting positions taken in a firm's derivative portfolio. A recent study by Allayannis and Ofek (2001) shows that the use of foreign currency derivatives does reduce exposure. However, other evidence suggests that the magnitude to which derivatives reduce exposure may be small. Bodnar, Hayt, and Marston (1998) show that less than half of payables and receivables are hedged and that most hedges are short-term. Brown (2001) and Brown, Crabb, and Haushalter (2001) find that firms hedge for many speculative reasons that are inconsistent with financial theory. Guay and Kothari (2001) argue that even assuming perfect hedging, derivatives positions held by U.S. non-financial firms are only around $1/15^{th}$ the size of the estimated effect on firm market value from a three standard deviation movement in relative currency value. Therefore, it seems reasonable to conclude that our lack of hedging data is not likely to be a large concern; however, we do indirectly examine this relation through firm size as a proxy for hedging, since large firms are more likely to use derivatives than small firms.[4]

Firm size is also often used as a proxy for the amount of information available to the market regarding a firm's operations and hence is related to market inefficiency arguments for

[4] For U.S. evidence that shows that large firms are more likely to hedge, see Mian (1996), Géczy, Minton, and Schrand (1997), Bodnar, Hayt, and Marston (1998), and Allayannis and Ofek (2001).

findings of low exposure. Bartov and Bodnar (1994) show a lagged effect for exchange rate exposure in the U.S., which suggests that investors are slow to understand the effects of exchange rates on firm value. If one assumes that investors understand the effect of exposure on firm value better for more closely analyzed large firms, then the market inefficiency argument would predict that large firms have higher contemporaneous exposure than small firms. Small firms may be less likely to use derivatives to manage the exchange rate exposure, but if they are not widely followed, the market does not immediately incorporate exchange rate changes into stock prices. We focus on the differential impact of exchange rate exposure for small and large firms after controlling for the level of international sales. Additionally, we evaluate the lagged impact of exchange rates on stock prices. In general, the richness of the data regarding the theoretical determinants of exposure, the cross-country variation in this data, and the uniqueness of our approach allows for an analysis that extends our understanding of the relation between exchange rates and firm value.

3. Data and Summary Statistics

Stock return and market capitalization data for individual firms are from the Datastream International database. Foreign sales, export sales, total sales, foreign assets, total assets, foreign income, and total income are from the Worldscope database. For the country-specific market index, we use the Datastream value-weighted market indices. For most of the analysis we use the Bank of England trade-weighted exchange rates, but for robustness we later use the country's bilateral cross-rates with the predominate regional rate. The sample period is from January 1975 to July 1999, but coverage in some markets does not begin until later. To be included in the sample, firms must have at least 36 consecutive monthly return observations and must not be classified by Datastream as a financial firm. In addition, only countries that have at least 40 firms with data on foreign activity are included in the sample. Further, in each country, we require that there are firms that report zero foreign activity and firms that report non-zero foreign activity.

Further details about the data and sample construction are provided in the Data Appendix and Table A1.

The data item "Foreign Sales" is sales revenue from goods produced and sold abroad, whereas "Export Sales" is sales revenue from goods produced domestically and sold abroad.[5] To make them comparable across firms, foreign sales (FS) and export sales (ES) are scaled by total sales. We define "International Sales" (IS) as the combined total of foreign sales and export sales as a fraction of total sales. For most of the analysis, we rely on international sales since it has the broadest coverage across countries. However, results based on foreign sales or export sales alone are qualitatively similar and where space allows we show separate results for international sales, foreign sales, and export sales. We also use data on foreign assets (FA) and foreign income (FI), where foreign assets are scaled by total assets and foreign income is scaled by foreign sales.[6] Finally, it is important to note that Worldscope distinguishes between firms that report and those that do not report data.

Table 1 shows summary statistics for the full sample. There is a large cross-section of 17,929 firms from 18 countries. Coverage is extensive – all countries have over 100 firms and the median country has 299 firms. Table 1 also displays the percentage of firms in each country with Worldscope data for foreign sales, export sales, foreign assets, and foreign income. Eleven of the 18 countries have more than 50 percent of the firms reporting foreign sales data. The cross-country mean (median) percentage of firms that report foreign sales is 52.4 (54.7). The information on export sales, foreign assets, and foreign income is not as comprehensive. Across countries, on average, 15.7, 31.0, and 34.0 percent of firms report data on export sales, foreign assets, and foreign income.

[5] Note that foreign sales ignore foreign expenses. Ideally, we should use firms' net foreign sales in the analysis – foreign sales minus foreign expenses. Allayannis and Ofek (2001) point out that the ratio of foreign sales to total sales should be a good proxy for the percentage of net foreign sales (out of total sales) if foreign profit margins are similar to domestic margins.

[6] We scale foreign income by foreign sales because total income can be small or negative due to fluctuations in domestic income that are unrelated to foreign income. However, when we use foreign income scaled by total income, the results are qualitatively similar.

The average level of these variables is also reported for the firms that have Worldscope coverage on each variable. On average, the percentage foreign sales as a fraction of total sales is 28.9 percent and the average percentage export sales as a fraction of total sales is 30.2 percent. For foreign assets, the average as a percentage of total assets is 10.0 percent and foreign income is 3.6 percent of foreign sales. While the coverage varies across variables and countries, the fairly extensive coverage allows for a rich examination of exchange rate exposure across determinants and countries.

4. Firm-level Regressions

4.1 Firm-level exposure measurement

To begin the analysis, we employ the regression framework that is used as the standard method to estimate exposure in the literature and we apply it to a much larger set of countries than is done in any previous work. Specifically, we examine the impact of exchange rates on firm value using the following models:

$$R_i = \alpha_i + d_i R_M + \eta_i \tag{1}$$

$$R_i = \alpha_i + b_i R_{FX} + d_i R_M + \eta_i \tag{2}$$

where, R_i is the monthly stock return, R_M is the country specific value-weighted market return, and R_{FX} is the percentage change in the monthly foreign currency per home currency exchange rate. b_i is the estimate of exchange rate exposure – it is the change in firm i's returns that can be explained by changes in the exchange rate after controlling for movements in the market.[7] Therefore, a negative exchange rate coefficient corresponds to a decrease in the firm's stock returns when the home currency appreciates (as would be the case for an exporter). Since the nature of exposure for a firm may change over time, we estimate the individual firm regressions

[7] Adler and Dumas (1984) show how exposure can be estimated and interpreted in a linear regression framework. See Jorion (1990) and Bodnar and Wong (2000) for a discussion of why it is important to include the market return in equation (2).

over five-year sub-periods beginning in January 1975 and ending in the sub-period from January 1995 to July 1999.

Several methods are used to examine the significance of the coefficients. First, the absolute value of each firm's exchange rate coefficient (and average absolute value of the *t*-statistic) is aggregated across firms in a given country and over each sub-period. Second, the percentage of the exchange rate coefficients that are significant at the five percent level (upper and lower 2.5 percent levels) are examined as a statistical measure of performance. To measure the incremental or marginal explanatory power of the exchange rate, the average difference between the adjusted R^2 in regressions (2) and (1) is computed. To get a relative sense of the magnitude of this measure in comparison to what is explained by the market model (equation (1)), we report the percentage change in the adjusted R^2.[8]

Table 2 shows that the magnitude of the absolute value of the average exposure coefficient is quite large. An exposure coefficient with an absolute value of one would indicate that a one percent movement in the exchange rate leads to a one percent positive or negative movement in equity returns. The absolute value of the exchange rate exposure coefficient varies widely across markets from a low of 0.30 in Malaysia to 1.79 in Norway. Across countries, the mean absolute value of the exposure coefficient is one and the median coefficient is 0.96. However, the standard errors are large as well.

The large standard errors can also be seen by examining the percentage of firms with significant coefficients at the five percent level. By chance, one should expect 2.5 percent significance in each tail; we find that the numbers in both tails are greater than 2.5 percent in most countries. Norway has the largest percentage of firms with significantly positive coefficients at 8.6 percent, while Belgium has the largest percentage of firms with significantly negative coefficients at 9.3 percent. The overall average across countries is 4.2 percent of firms in the

[8] The percentage change in adjusted R^2 is the difference between the adjusted R^2 in (2) minus the adjusted R^2 in (1) divided by the initial level of the adjusted R^2 from the market model in equation (1).

positive tail and 4.0 percent of firms in the negative tail. Our results that show significant exchange rate exposure are similar to findings by Jorion (1990) for U.S. multinationals.

The final column in Table 2 shows the increase in explanatory power from the simple market model in equation (1) to the market model with the trade-weighted exchange rate in equation (2). The increase in explanatory power is greatest in Canada and Norway at 7.8 and 6.6 percent respectively. The cross-country average increase in adjusted R^2 is 2.1 percent. The finding that exchange rates explain only a small portion of the variation in stock returns is similar in nature to that found for industry portfolios by Griffin and Stulz (2001).[9]

In Table A2 in the appendix, we tabulate regression results for countries where we do not have sufficient data on firms' foreign operations. In these countries, which are primarily classified as emerging markets, we find a large cross-sectional variation of exchange rate exposure across countries. Overall, in emerging countries, 7.0 percent of firms have a positive and significant exchange rate exposure while 3.6 percent of firms have a negative and significant exposure. While these mean exposure coefficients indicate more significant exposure in emerging markets, the median exposure coefficients are similar to those in Table 2 for mostly developed markets, indicating that the significance is concentrated in a few countries. Because we do not have sufficient data on foreign activity for firms in the countries in Table A2, we do not examine them in further analysis.

Overall, the unconditional analysis for individual firms indicates that the average exposure coefficient is quite large in magnitude and that there are more firms that have

[9] We repeated the analyses (not reported) in Table 2 using the bilateral cross-rate with the major regional currency in a particular region and make similar inferences. The cross-rates are the Yen for Asian countries and the U.S., the Deutschmark for European countries, and the U.S. dollar for all other countries including Japan and Germany. Another approach would be to examine the significance of the regional cross-rates, as well as the trade-weighted exchange rate, and any other relevant cross-rate all jointly (see e.g. Dominguez and Tesar (2001)). Because more rates leads to a greater chance of significance, such an approach would most likely result in finding more joint significance but it is not clear how such joint significance should be evaluated. More importantly, the use of multiple exchange rates would not be appropriate for our cross sectional regression analysis (Section 5) or for our portfolio returns results that are partitioned on exchange rate regimes (Section 6) since there are not enough time periods to jointly sort them into bins based on multiple currency classifications. A promising avenue for future research would be to define the appropriate exchange rates at the individual firm level.

statistically significant exchange rate coefficients than can be attributed to chance. However, the coefficients are not estimated with much precision and the significance varies across markets. Further, exchange rate movements do not explain a large fraction of the variation in individual stock returns. To get a deeper understanding of the exchange rate to firm value relation, it is important to consider firms' foreign activities.

4.2. Individual firm regressions partitioned on international sales

In the theoretical literature, the main determinant of exchange rate exposure is the level of foreign activity. Therefore, one would expect that firms with more international sales (sum of foreign sales and export sales relative to total sales) would exhibit more sensitivity to exchange rate movements. Panel A of Table 3 reports the across-country average regression results similar to the summary numbers in Table 2, except that firms are partitioned into categories based on international sales. Although many more firms do not report or have zero international sales, for firms with international sales greater than 25 percent of their total sales, there are an average of 303 firm-level regressions in each country.[10]

Firms with international sales greater than 25 percent have a slightly higher percentage of significantly negative exposure coefficients than firms with no international sales, which is consistent that notion that firms that have international sales benefit during currency depreciations. In unreported results we find substantial variation across countries. In Japan and Germany, 20.2 and 7.4 percent, respectively, of firms with high international sales have negative and significant exchange rate coefficients as compared to only 3.4 and 3.3 percent of firms in the U.S. and the U.K. Comparing incremental explanatory power across international sales classifications shows that firms reporting international sales above 25 percent have changes in

[10] The number of firm regressions within each country is the sum of all firms that have coverage in each five-year regression period. Thus, if a firm has international sales data over the whole 1975 to 1999 period (which few firms do) it would be counted five times. The cross-country average is then taken as the average of this number across countries.

adjusted R^2 that are above those in other categories. However, in all groups the incremental explanatory power is limited.

With the increasing importance of international trade, capital market integration, and changes in global competitiveness one might expect that the impact of exchange rate movements on firm value is changing over time. Panel B of Table 3 reports results similar to those in Panel A except that they are partitioned by sub-period. The sub-periods are selected by breaking the full sample, from January 1975 to July 1999, into five-year sub-periods. For the most part, the results do not seem to differ dramatically across sub-periods. An exception is the 1985 to 1989 sub-period where adding exchange rates to the market model leads to a 10.1 percent increase in explanatory power for firms with international sales greater than 25 percent. This was during the period in which major currencies experienced very large real changes in value as a result of the Plaza Accords of 1985. One would suspect that these large real changes would have more impact on firms with substantial foreign operations. Consistent with theory, 8.8 percent of firms with high international sales in this sub-period have significant negative exposure as compared to only 2.2 percent with positive exposure. Both sub-periods in the 1990's show only a modest amount of incremental explanatory power due to exchange rate movements and that firms with international sales have slightly more negative exposure than positive.

In sum, consistent with theory, we find that firms with high international sales are negatively impacted by a currency appreciation. Consistent with prior research, we find some evidence that exposure varies through time and is more pronounced for firms with substantial foreign activities during periods of large exchange rate movements. While the regression results partitioned by international sales allow for some examination of the nature of exposure across the foreign activity level of the firm, a fuller statistical and joint assessment of the determinants of exposure is needed.

5. The determinants of exchange rate exposure

To further understand the relationship between exchange rate exposure and foreign activity, we turn to cross-sectional regression analysis. Exchange rate betas estimated from regressions in equation (2) are used to investigate their relation with variables that are theoretically linked to exposure after controlling for firm size. Following Jorion (1990), He and Ng (1998), and Allayannis and Ofek (2001), among others, we estimate cross-sectional regressions of the exposure betas on the determinants of exposure as follows:

$$\hat{b}_i = function(size, FS, ES, IS, FI, FA)_i \tag{3}$$

Size is the log of the firm's dollar market capitalization divided by the average market capitalization for firms in that country. Size is standardized by the firm's average country market capitalization to control for cross-country differences in firm size.[11] FS is foreign sales, IS is international sales, FI is foreign income, and FA is foreign assets. Weighted least squares is used to estimate equation (3), where the weights are the inverse of the standard errors of the exchange rate betas obtained in the first pass regressions in equation (2). The weighting is important and should be used so that the betas that are estimated with more precision in the first-pass regression play a more important role in the second-pass cross-sectional regressions. We also include country dummies (not reported) in each regression to control for differences in exposure estimates across countries. The t-statistics are computed with heteroskedasticity consistent standard errors that do not assume independence within countries.

The two five-year sub-periods in the 1990s have wide coverage of the foreign activity variables, whereas prior to the 1990's many of the foreign activity variables (such as export sales) are unavailable or coverage is incomplete. Therefore, we focus on the 1990's and examine separately the sub-periods from 1990 to 1994 and 1995 to 1999. Results displayed in Panel A of

[11] So that the firm-specific variables are representative of the nature of the firm over the period which exposure is estimated, all variables are averaged across the five-year period (i.e. if for the 1990 to 1994 period, a particular firm's size is the average of that firm's market capitalization from 1990 to 1994).

Table 4 for the 1990 to 1994 period show that when examined alone in regressions (1) to (6), size, foreign sales, international sales, foreign income, and foreign assets all have a negative and statistically significant relation (at the five percent level) with the exchange rate betas. This implies that large firms and firms with higher levels of foreign activity have lower returns during periods of currency appreciations and higher returns during depreciations. When size is included jointly with the foreign activity variables in regressions (7) to (11), foreign sales and foreign assets are significant and negatively related to exposure and international sales is marginally significant. Foreign Sales and international sales (which are highly correlated) are more important predictors of exposure than foreign income. Size remains negatively related to the exposure betas irrespective of the foreign activity variables that are added. This is consistent with Bodnar and Wong (2000) who find that large U.S. firms have more negative exposure than small firms after controlling for the extent of foreign operations. He and Ng (1998) also find that large Japanese firms benefit relatively more from currency depreciations after controlling for firm export ratios.

It may seem counterintuitive that the foreign assets variable is negatively related to exposure betas since one might expect it to be an exposure hedge.[12] Recall that the foreign sales variable is defined as sales based on foreign production (or foreign assets abroad) and, therefore, foreign assets may simply be a proxy for foreign sales. Consistent with this explanation, we find that they are highly correlated (0.87). In unreported results, when the two variables are included in the same regression, they become insignificant as expected.

Panel B of Table 4 presents results for the 1995 to 1999 period. When the variables are examined alone in regressions (1) to (6), each variable is strongly negatively related to the exposure betas. We examine the foreign activity variables jointly with size in regressions (7) to (11) and again find that size along with the foreign activity variables are significantly negatively

[12] This result is also consistent with Allayannis, Ihrig, and Weston (2001) who find that variables related to operating hedging are not associated with reduced exposure.

related to exchange rate exposure. When we include size, international sales (or foreign sales), and foreign income in regressions (12) and (13), all variables are significant.[13]

To further examine the importance of our results and how they vary across countries, we estimate cross-sectional regressions on a country-by-country basis in Table 5. Because of their importance at the aggregate level, size and international sales are the focus of these cross-sectional regressions. We estimate weighted least squares cross-sectional regressions with exposure betas estimated over the 1995 to 1999 period. Exposure is negatively related to firm size in 12 of the 18 countries, and significantly so in five (Australia, Canada, Hong Kong, Japan, and the U.S.). However, the relation does vary across countries as three countries with a fewer number of firms (Denmark, Italy, and New Zealand) show a statistically significant positive relation. International sales is negatively related to exposure betas in 13 of 18 countries and the relation is significantly negative at the five percent level in seven countries (France, Germany, Japan, Singapore, Switzerland, U.K., and the U.S.). Interestingly, the variation in exposure betas that can be explained also varies widely across countries with over 10 percent of the variation in exposure betas being explained by size and international sales in Hong Kong, Italy, Japan, and New Zealand, but less than two percent in France, Malaysia, the Netherlands, Spain, the U.K., and the U.S.

Our finding that international sales are an important determinant of exposure is consistent with findings for the U.S. in Jorion (1990) and Allayannis and Ofek (2001) and those for Japan in He and Ng (1998). Dominguez and Tesar (2001) have eight countries in their sample and conclude that firm size, foreign sales, and international assets are not related to exposure. Possible explanations for the differences between our findings and those of Dominguez and Tesar include differences in our empirical approaches and differences in our data. For example, Dominguez and Tesar report that they cannot distinguish between zero values and missing observations in their

[13] We also repeat results with Foreign Income/Total Income and find statistical significance for foreign income in the 1990 to 1994 period but not in the 1995 to 1999 period.

foreign activity data while we do not have this problem. Additionally, our sample size is much larger, even in countries that are common to both samples.

Overall, our results indicate that large firms and firms with high international sales lose value during currency appreciations and gain during depreciations. The finding is fairly widespread and is not driven by a particular country, although the magnitude and the significance varies across countries. These findings suggest that exchange rates may play an important economic role in explaining average cross-sectional differences in stock returns between firms of various sizes and different levels of international operations.

6. The economic impact of exchange rate exposure

6.1 Economic measurement of exposure

Our previous analysis shows that exposure is related to variables that can be linked theoretically to exchange rate exposure but that exchange rates do not explain a large part of the variation in firm value. However, one might argue that this finding is not surprising since we know that stock returns have many sources of variation, including idiosyncratic movements. Furthermore, for many applications such as portfolio allocation and diversification analysis, the question is not what determines variation in a particular stock, but rather, what are the sources of common co-variation that affect groups of stocks.

The regression analysis assumes that a firm's exposure is constant and linear throughout a five-year period even though these assumptions are not imposed by theory and empirically, may be inappropriate. Therefore, we propose a new approach to examine exposure that does not assume exposure is constant or linear. Each year we aggregate firms into portfolios that should exhibit high and low levels of exposure according to their level of foreign activity. We then examine the relative performance of these portfolios during different periods of exchange rate movements. By focusing on the relative returns of portfolios that are re-sorted each year, this approach allows the exposure to firm value relation to vary over time and does not impose a

linear structure. This allows us to more thoroughly assess the cross-sectional differences in exchange rate exposure.

It should be noted that to the extent that international sales or any other grouping variable is an imperfect proxy for exposure, such an approach will likely underestimate the economic importance of exposure. Nevertheless, this lower bound should be informative in evaluating the relation between exchange rate movements and firm characteristics. Since theory predicts that foreign activity is the main determinant of exchange rate exposure and this prediction is supported by the evidence in Tables 4 and 5, we first form portfolios based on international sales.

6.2 Portfolios formed on international sales

For firms in each country, in June of each year, we form portfolios based on the previous year's international sales. One portfolio is formed for firms with over 25 percent international sales and another portfolio for those with zero international sales.[14] The difference between the returns on the two portfolios is equivalent to being long stocks with high international sales and short stocks with no international sales. We then partition the time-series returns of the high minus no international sales portfolio into four periods based on relative movements of the trade-weighted exchange rate.

We use the following procedure to define exchange rate 'regimes'. For each country, we compute the standard deviation of the exchange rate change over the sample period. Exchange rate changes that are less than one standard deviation, in absolute value, from zero (16.1% confident interval) are defined as small movements and exchange rate changes that are greater than one standard deviation from zero are defined as large movements. Thus, we have four regimes of both large and small appreciations and depreciations. We calculate the average value-

[14] So that portfolios will be diversified and not subject to extreme movements due to a particular firm, we require at least five firms in a portfolio before it is included in the analysis. The portfolio composition is rebalanced annually according to the previous years' international sales.

weighted returns of the high minus no international sales portfolio for the firms in each country in each exchange rate 'regime'.

The results in Table 6 indicate an important role for exchange rates. During periods where exchange rates depreciate by more than one standard deviation, firms with international sales outperform those with no international sales in 14 of 18 markets.[15] On an individual country basis, the differences are statistically significant at the 10 percent level in four markets (France, Japan, the Netherlands, and Switzerland). The overall high minus no international sales portfolio at the bottom of the table is a value-weighted portfolio comprised of all firms (rather than forming portfolios at the country level). For this overall portfolio, we find that firms with high international sales gain an economically and statistically significant 0.72 percent per month relative to firms with no international sales during periods of large depreciations in exchange rates.

For small depreciations in exchange rates, the overall portfolio results indicate that on average, firms with high international sales do about the same as those with no international sales (a statistically insignificant average difference of 0.13 percent per month). For small appreciations in exchange rates, firms with high international sales underperform those with low international sales in 12 of 18 countries. For the overall portfolio, firms with high international sales underperform by a statistically insignificant -0.25 percent per month.

An even stronger relation between exchange rates and stock returns holds for large currency appreciations. For large home currency appreciations, firms with high international sales underperform those with no international sales in 16 of 18 markets.[16] At the individual country level, these differences are statistically significant at the five percent level in France, Japan, Switzerland, and the U.K. In the overall portfolio, firms with high international sales underperform those with no international sales by a highly statistically significant -1.10 percent

[15] This fraction of countries is significantly positive using a binomial test (p-value=0.015).
[16] Using a binomial test, this fraction of countries is significantly negative (p-value=0.0007).

per month.[17]

It is interesting to examine cross-country differences in the nature of exposure, particularly in countries such as Japan, the U.K., and the U.S. that have well-diversified high and no international sales portfolios with an average of more than 100 firms in each portfolio. The high minus no international sales return is 1.96, 0.53, and -0.26 percent per month in Japan, the U.K., and the U.S. respectively, during large currency depreciations and -3.97, -0.96, and -0.04 percent per month during large currency appreciations. Overall, Japan and to a lesser extent the U.K., indicate a strong economic and statistically significant relation between exchange rate movements and changes in firm value, whereas no such relation is present in the U.S.

To check the robustness of these results, rather than use standard deviations to define exchange rate regimes, we define changes in the exchange rate between zero and three percent as small changes and changes greater than three percent as large changes. These (unreported) results indicate that the magnitude of returns on the difference portfolios for large exchange rate movements is similar to those displayed in Table 6. In addition, we estimate regressions of the time-series of high minus no international sales portfolio returns on contemporaneous exchange rate movements. Consistent with the sorting results, we find that the relation between the difference portfolio and exchange rates is negative in 13 of 18 countries. However, the results vary across countries with a one percent currency appreciation leading to a -0.55 relative loss of firm value in Japan, -0.19 in the U.K., but only -0.02 in the U.S. On average, exchange rates have a negative coefficient of -0.18 indicating that a one percent appreciation in the dollar leads to a 0.18 percent loss in firm value for firms with high international sales as compared to firms with no international sales. Pooled regression results across countries indicate an even more important role for exchange rates. These findings confirm previous results that exchange rates impact firm value in an economically important and sensible way – firms with high levels of international

[17] We also calculate the returns for the overall portfolio without Japan and obtain similar statistical significance.

sales outperform those with no international sales during periods of large currency depreciations and underperform during currency appreciations.

6.3 Portfolios formed on firm size and international sales

The cross-sectional regression analysis in Section 5 indicates that large firms have more exposure than small firms, even after controlling for the level of international sales. To account for the role of firm size and international sales jointly, we use a double sorting procedure. First, we sort firms into high and no international sales portfolios. The firms in the high international sales portfolio are then split into large market value and small market value portfolios based on the median market value in June of year t-1. The median market value from the high international sales portfolio is also used to split the no international sales portfolio into large and small market value portfolios. We then examine the returns to high minus no international sales portfolios separately for both the large and small firm groups. We require five stocks in each portfolio and that the small and large portfolio return series be available over the same time periods. The end result is that the small and large firm results have fewer firms and observations in many countries and we no longer have enough firms to include Belgium, Denmark, Norway, and Switzerland in the analysis. Therefore, the results are not directly comparable with the results in Table 6.

In Table 7, the results for small firms are in panel A and the results for large firms are in panel B. It is clear from the table that there are large differences in market capitalization between the large and small firm portfolios, but that the average level of international sales is similar between the groups. Therefore, we can focus on firm size while holding international sales constant. For the small firm portfolios, the average returns are generally decreasing as they move from periods of large depreciations to large appreciations. However, only in the small appreciation period is the average return of -0.31 per month on the overall high minus no international sales portfolio significant. In this period, the average returns are negative in 11 out of 14 markets.

The large firm results in panel B show a stronger relation between exchange rate movements and returns on the high minus no international sales portfolios. For large currency depreciations, firms with high international sales outperform firms with low international sales in nine out of 14 markets. The overall portfolio earns average returns of 0.78 percent per month (p-value=0.02). For periods of small depreciations, the overall portfolio earns average returns of 0.44 percent per month (p-value=0.03). For large currency appreciations, firms with high international sales underperform those with no international sales in nine of the 14 markets and the overall portfolio earns an average of -0.90 percent per month (p-value=0.02).

In sum, these sorting results (similar to previous cross-sectional results) indicate that after controlling for the level of international sales, large firms are actually more sensitive to changes in exchange rates than small firms. Since large firms are more likely to use derivatives, our results are inconsistent with hedging as an explanation for the return differences. One possible explanation is that large firms compete in markets where demand is price sensitive whereas small firms fill niches in markets with inelastic demand. Another possible explanation consistent with Bartov and Bodnar (1994) is that if fewer investors understand the role of exchange rate exposure in a small firm compared to a large firm, possibly due to a lack of information or following by investors, it will take more time for the effect of exchange rate movements to be incorporated into prices for small stocks.

To investigate this issue, we estimate (unreported) regressions of the high minus no international sales portfolio on the contemporaneous and previous quarter's exchange rate. For small firms, we find that the lagged quarterly exchange rate is negative and significant in the U.K. and the U.S. For large firms, the lagged quarterly exchange rate is negative and significant only in the Netherlands and the U.S. In the U.S., the coefficient on the lagged exchange rate is more negative and has more statistical significance (p-value=0.00) for small firms. Thus, while stock prices do not respond to lagged exchange rate movements in most countries, there is strong evidence consistent with Bartov and Bodnar (1994) that investors fail to adequately capture

exchange rate movements into prices in the U.S.

7. Other Issues

7.1 Foreign income and exposure

Foreign Income may be a better proxy for exposure as it is the net income or cash flows accruing to a firm from foreign sources that should affect firm value. The disadvantage of partitioning on foreign income is that there are fewer firms that report foreign income and firm-months coverage is about half of what it is for international sales. Nevertheless, we examine the returns to portfolios that are long firms with high foreign income and short firms with no foreign income. These (unreported) partitions are similar in nature to those performed for international sales in Table 6. Firms with high foreign income gain during currency depreciations and lose relative to firms with no foreign income during currency appreciations. However, because of the more restrictive foreign income coverage, inferences are less precise than with the international sales results. Overall the foreign income sorts provide supporting evidence that the exchange rate movements affect the relative returns of stocks with income generated abroad.

7.2 Cash flow forecasts

A final question that we address is whether cash flow exposure is greater or less than stock price exposure. Because cash flow data is usually only gathered on an annual basis, we collect average analyst earnings forecasts through IBES on a monthly basis.[18] We then calculate changes in analyst earnings estimates on an individual firm basis and sort firms into high and no international sales portfolios. Within each country, we then estimate regressions of earnings forecast changes for both the high and no international sales portfolios, as well as for the difference between the earnings changes of the high and low international sales portfolio on

[18] Because the coverage for this data is not as extensive as it is for international sales, we do not have data for the complete set of countries in our sample.

contemporaneous and lagged exchange rate movements. In general, we found almost no evidence that contemporaneous or lagged exchange rate movements were related to changes in cash flow estimates. One possibility is that analysts simply do not update their earnings estimates frequently or that they update them primarily in response to other factors. Further, it is not clear how much information can be gleaned from these results because analysts may not update earnings forecasts as a result of small changes in cash flows. Nevertheless, it is interesting that firm value is related to exchange rate movements despite the fact that analyst earnings forecasts do not move systematically with exchange rates.

8. Conclusion

This paper examines the nature and the economic magnitude of exchange rate exposure using a unique database of firm-level data from 18 different countries over a 25-year time period. We first estimate time-series regressions over five-year windows. Consistent with prior studies, we find that more firms are exposed to exchange rate movements than can be attributed to chance and that exchange rates do not explain a large portion of the variation in firm value. We then estimate cross-sectional regressions of exchange rate betas on determinants of exposure and find that the level of international sales, as well as foreign income and foreign assets are all significantly negatively related to exchange rate exposure. For example, firms with high international sales benefit from exchange rate depreciations and are hurt by exchange rate appreciations. In addition, we find that large firms gain (lose) relative to small firms during currency depreciations (appreciations), even after controlling for the level of foreign activity.

We then turn to evaluating the average magnitude of these exposure effects by examining the relative performance of firms with high international sales as compared to those with no international sales during different periods of currency movements. We find that firms with high international sales outperform those with no international sales in periods of currency depreciations, but underperform during periods of currency appreciations. While the magnitude

of these relations varies widely, these patterns are pervasive across countries. In 16 of 18 countries, firms with high international sales underperform those with no international sales during periods of currency appreciations by an average of 1.10 percent per month. Finally, we show that the strong relationship between international sales and firm value is concentrated in large firms.

Overall our results provide evidence that exchange rate movements do affect firm value in a manner consistent with theory and that exchange rate movements have an economically large impact on differences in average stock returns. These results help to reconcile the exposure literature with the international asset pricing literature – our findings that exposure broadly affects groups of stocks makes it plausible that it can also be priced. The results of this study should also be of interest to policy makers who wish to understand the affects of relative exchange rate movements on certain sectors of the economy and to investors who under or overweight large multinational corporations in their portfolios. It should be promising to consider the impact of exchange rate movements in portfolio optimization, value-at-risk, performance attribution, and other analyses that seek to understand major sources of co-variation among stock returns.

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Table 1. Summary Statistics.
The "Country Lists" and "Dead lists" in Datastream International are used to identify the set of firms in each country. Data on foreign sales (Export sales; Foreign Assets; Foreign Income) as a percent of Total Sales (Total Sales; Total Assets; Foreign sales), denoted as FS (ES; FA; FI) are from Worldscope. Firms with FS (ES; FA; FI) data is the percentage of firms in each country that have FS (ES; FA; FI) data available during the sample period. Average FS (ES; FA; FI) is the average FS (ES; FA; FI) for those firms in a country that have data available in the Worldscope database. The sample period is from 1975 to July 1999.

Country	Total # of Firms	% of Firms with FS Data	Average FS (%)	% of Firms with ES Data	Average ES (%)	% of Firms with FA Data	Average FA (%)	% of Firms with FI Data	Average FI (%)
Australia	947	23.4	16.7	3.2	27.9	23.3	16.4	23.1	6.1
Belgium	121	45.5	31.9	7.4	20.5	22.3	5.7	21.5	0.5
Canada	956	32.2	26.5	11.8	35.8	32.4	22.2	30.2	5.7
Denmark	176	35.8	52.2	27.8	50.6	8.5	10.8	8.0	0.9
France	649	52.9	31.3	18.8	26.4	21.6	7.4	21.7	1.7
Germany	562	68.3	27.4	36.3	20.5	37.5	1.5	36.8	0.3
Hong Kong	490	56.5	32.6	2.5	57.8	15.7	2.9	40.4	11.9
Italy	169	76.3	32.1	16.0	23.4	32.5	3.9	30.8	0.5
Japan	2705	72.6	7.5	37.4	11.9	69.6	2.6	69.0	0.6
Malaysia	348	75.0	6.7	3.5	22.3	72.9	5.0	69.7	2.9
Netherlands	250	59.2	43.4	10.4	21.9	17.2	14.3	16.0	2.8
New Zealand	146	29.1	21.7	12.7	22.8	28.4	16.9	28.4	5.1
Norway	181	24.4	52.5	9.6	49.3	7.1	13.1	7.1	2.5
Singapore	188	72.0	25.6	2.06	65.2	27.2	22.3	70.2	9.9
Spain	105	44.8	19.0	25.7	24.7	19.1	0.0	19.1	0.0
Switzerland	179	63.7	59.1	3.4	32.9	21.2	17.4	16.8	3.12
U.K.	2308	60.1	23.1	26.0	15.2	50.9	8.2	53.1	5.4
U.S.	7449	51.3	11.6	27.3	13.7	50.3	9.8	49.5	4.2
Mean (Total)	996 (17,929)	52.4	28.9	15.7	30.2	31.0	10.0	34.0	3.6
Median	299	54.7	26.9	12.3	24.1	25.3	9.0	29.3	2.9

Table 2. Firm-Level Regressions.

This table shows the results of the regression: $R_i = \alpha_i + b_i R_{FX} + d_i R_M + \eta_i$, where R_i is the monthly stock return, R_M is the Datastream local monthly stock index return, and R_{FX} is the Bank of England (BOE) trade-weighted exchange rate. Countries marked with a * do not have BOE rates and the Japanese Yen bilateral rate is used instead. Rates are quoted as foreign currency per one unit of home currency. The regression is estimated over the following sub-periods: 1975-79, 1980-84, 1985-89, 1990-94, and 1995-July 1999 for all firms that have at least 36 observations in each sub-period. N is the number of sub-period – firm observations for a country. The reported b_i coefficients and t-statistics are the average (of the absolute value) for all firms in the country over the sample period from 1975 to July 1999. To be included, a firm must have at least 36 observations in a given sub-period. %+ (%-) is the percentage of firms in the country with positive (negative) b_i coefficients that are significant at the 5% level. % Change is the percentage difference between the adjusted R^2 of the estimated regression and the adjusted R^2 of the market model regression.

All Firms: 1975 to 1999

Country	N	b_i	t-statistic	% +	% -	% Change
Australia	1645	0.76	(0.86)	5.1	1.8	2.1
Belgium	354	1.36	(0.96)	3.1	9.3	2.4
Canada	2300	1.55	(0.95)	4.3	2.7	7.8
Denmark	363	1.59	(0.92)	1.1	7.4	3.3
France	1374	1.36	(0.81)	3.4	2.7	-0.1
Germany	1396	0.99	(0.92)	2.6	3.6	0.1
Hong Kong*	942	0.56	(0.98)	6.4	4.0	2.0
Italy	500	0.92	(0.92)	5.4	3.6	1.0
Japan	7296	0.41	(0.92)	5.6	3.5	2.0
Malaysia*	790	0.30	(0.78)	3.0	1.3	-0.3
Netherlands	793	1.39	(0.84)	2.4	3.7	1.2
New Zealand	178	0.91	(0.83)	1.5	5.5	0.4
Norway	302	1.79	(1.05)	8.6	3.6	6.6
Spain	190	1.23	(0.92)	4.7	6.3	1.6
Singapore*	417	0.46	(0.95)	5.5	4.1	1.3
Switzerland	530	0.63	(0.83)	2.1	2.8	0.2
U.K.	6068	0.61	(0.90)	6.0	2.6	2.3
U.S.	16819	1.09	(0.90)	5.4	2.8	3.2
Mean	2348	1.00	(0.90)	4.2	4.0	2.1
Median	792	0.96	(0.92)	4.5	3.6	1.8

Table 3. Sub-period Regression Results Sorted by International Sales.

This table shows the results of the following regression: $R_i = \alpha_i + b_i R_{FX} + d_i R_M + \eta_i$,where R_i is the monthly stock return, R_M is the Datastream local monthly stock index return and R_{FX} is the Bank of England (BOE) trade-weighted exchange rate. Trade-weighted rates are not available for Hong Kong, Malaysia, and Singapore so the Japanese Yen bilateral rate is used instead. Rates are quoted as foreign currency per one unit of home currency. The regression is estimated over the following sub-periods: 1975-79, 1980-84, 1985-89, 1990-94, and 1995-July 1999 for all firms that have at least 36 observations in each sub-period. The reported b_i coefficients and t-statistics are the average (of the absolute value) for all countries over each sub-period. N is the number of firms in each bin. %+ (%-) is the percentage of firms in a country with positive (negative) b_i coefficients that are significant at the 5% level. % Change is the percentage difference between the adjusted R^2 of the estimated regression and the adjusted R^2 of the market model regression. International Sales (IS) is Foreign Sales plus Export Sales as a percentage of Total Sales as reported by Worldscope. Firms are sorted into bins each sub-period based on the first year in the sub-period that a firm has a IS observation. Firms with no IS data in a sub-period are put in a separate bin. See Table 1 for the list of countries included in the sample.

	Averages Across Countries						
	N	**Average IS**	b_i	**t-statistic**	**%+**	**%-**	**% Change**
Panel A. Whole Period				**1975 – 1999**			
No IS Data	20627	-	1.56	(0.88)	4.2	3.0	1.5
IS = 0%	12240	0.0	1.01	(0.88)	4.4	3.3	1.7
0 < IS < 25%	4229	12.8	0.83	(0.85)	4.4	2.7	1.5
IS ≥ 25%	5451	46.6	0.94	(0.94)	4.5	6.6	1.9
Panel B. Sub-Periods				**1975 – 1979**			
No IS Data	4838	-	0.60	(0.89)	5.1	2.4	2.1
IS = 0%	244	0.0	0.52	(0.84)	5.1	1.9	1.2
0 < IS < 25%	188	13.1	0.45	(1.05)	10.9	2.4	2.4
IS ≥ 25%	140	46.9	0.40	(1.10)	7.2	2.3	2.2
				1980 – 1984			
No IS Data	4437	-	0.92	(0.84)	2.8	3.0	1.7
IS = 0%	600	0.0	0.87	(0.97)	4.5	4.4	2.0
0 < IS < 25%	295	17.0	0.52	(0.87)	4.2	3.8	2.6
IS ≥ 25%	324	47.4	0.58	(0.92)	5.1	4.2	0.6
				1985 – 1989			
No IS Data	4348	-	1.33	(0.89)	4.3	3.2	1.7
IS = 0%	1688	0.0	1.02	(0.90)	4.9	2.9	2.4
0 < IS < 25%	621	12.9	0.54	(0.95)	4.6	5.2	6.3
IS ≥ 25%	679	51.1	0.84	(0.97)	2.2	8.8	10.1
				1990 – 1994			
No IS Data	3568	-	1.43	(0.83)	4.1	2.3	1.3
IS = 0%	3945	0.0	1.10	(0.86)	3.6	4.0	1.5
0 < IS < 25%	1420	15.6	0.72	(0.87)	4.5	3.6	1.4
IS ≥ 25%	1629	53.9	0.96	(0.92)	4.2	4.9	2.2
				1995 – 1999			
No IS Data	2597	-	2.86	(0.95)	5.4	1.7	2.5
IS = 0%	6300	0.0	1.17	(0.90)	4.6	3.2	2.9
0 < IS < 25%	1799	10.3	0.85	(0.86)	3.1	2.0	3.1
IS ≥ 25%	2654	40.8	0.99	(0.95)	4.0	6.5	2.6

Table 4. Cross-sectional Regressions.

This table shows the results of regression models where $\hat{b}_i$, the estimated foreign exchange beta from the regression $R_i = \alpha_i + b_i R_{FX} + d_i R_M + \eta_i$, is the dependent variable. R_i is the monthly stock return, R_M is the Datastream local monthly stock index return, and R_{FX} is the Bank of England (BOE) trade-weighted exchange rate. Trade-weighted rates are not available for Hong Kong, Malaysia, and Singapore so the Japanese Yen bilateral rate is used instead. Rates are quoted as foreign currency per one unit of home currency. The regression is estimated over periods from 1990-94 (Panel A), and 1995 – 1999 (Panel B). The sample includes firms from 18 countries that are listed in Table A1. Sample sizes differ across regression specifications due to different data availability of the independent variables. All independent variables are averaged over the period. Size = log(firm market value / country average market value), where all market values are in U.S.$. Foreign Sales and Export Sales scaled by Total Sales. International Sales is the sum of Foreign Sales and Export Sales divided by Total Sales. Foreign Income is scaled by Foreign Sales and Foreign Assets is scaled by Total Assets. Country dummy variables are included (but not reported) in each specification. The regressions are estimated by weighted least squares, where the weights are the inverse of the standard error of $\hat{b}_i$. t statistics are computed using heteroskedasticity consistent standard errors that do not assume independence within countries.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	Panel A. 1990 – 1994.												
Constant	0.342	0.446	0.523	0.460	0.422	0.452	0.357	0.400	0.369	0.335	0.354	0.352	0.354
	(14.25)	(45.12)	(23.8)	(38.09)	(43.11)	(45.13)	(12.29)	(10.71)	(10.55)	(14.52)	(11.29)	(11.97)	(10.78)
Size	-0.054						-0.074	-0.091	-0.076	-0.083	-0.077	-0.077	-0.078
	-(3.57)						-(2.81)	-(3.45)	-(2.79)	-(3.32)	-(2.89)	-(2.91)	-(2.96)
Foreign sales		-0.343					-0.175					-0.181	
		-(3.97)					-(2.19)					-(2.07)	
Export sales			-0.170					-0.178					
			-(0.94)					-(1.00)					
International Sales				-0.287					-0.164				-0.158
				-(3.56)					-(1.84)				-(1.73)
Foreign income					-0.244					-0.033		0.023	0.013
					-(2.78)					-(1.04)		(0.41)	(0.26)
Foreign assets						-0.426					-0.183		
						-(5.44)					-(2.17)		
N	12926	7614	2722	7911	6488	6151	7480	2697	7776	6357	6019	6317	6324
Adjusted R^2	0.068	0.068	0.069	0.068	0.054	0.059	0.090	0.103	0.092	0.087	0.085	0.087	0.088

Table 4, continued

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	Panel B. 1995 – 1999.												
Constant	-0.192	-0.178	-0.157	-0.138	-0.205	-0.178	-0.219	-0.277	-0.195	-0.252	-0.230	-0.219	-0.207
	-(7.42)	-(14.55)	-(12.59)	-(10.33)	-(12.56)	(-12.94)	-(15.02)	-(12.99)	-(10.47)	-(15.66)	-(17.20)	-(17.66)	-(14.29)
Size	-0.058						-0.030	-0.069	-0.037	-0.040	-0.035	-0.033	-0.032
	-(3.84)						-(4.33)	-(5.10)	-(4.35)	-(-5.80)	-(6.30)	-(5.43)	-(5.23)
Foreign sales		-0.343					-0.276					-0.237	
		-(3.27)					-(2.89)					-(2.03)	
Export sales			-0.308					-0.309					
			-(2.65)					-(2.71)					
International Sales				-0.352					-0.291				-0.262
				-(4.08)					-(3.67)				-(2.78)
Foreign income					-0.244					-0.170		-0.128	-0.124
					-(3.36)					-(3.18)		-(5.19)	-(4.97)
Foreign assets						-0.377					-0.258		
						-(2.62)					-(1.99)		
N	17684	9550	4258	10400	8267	8116	9535	4252	10384	8253	8102	8191	8199
Adjusted R^2	0.026	0.047	0.018	0.042	0.036	0.036	0.050	0.033	0.047	0.042	0.041	0.045	0.047

Table 5. Country-level Cross-sectional Regressions.

For each country, the table shows the results of the regression, $\hat{b}_i = \gamma_i + \delta_{1i} Size_i + \delta_{2i} IS_i + \varepsilon_i$ where $\hat{b}_i$ is the estimated foreign exchange beta from the regression $R_i = \alpha_i + b_i R_{FX} + d_i R_M + \eta_i$. R_i is the monthly stock return, R_M is the Datastream local monthly stock index return, and R_{FX} is the Bank of England (BOE) trade-weighted exchange rate. Countries marked with a * do not have BOE rates and the Japanese Yen bilateral rate is used instead. Rates are quoted as foreign currency per one unit of home currency. The regression is estimated over the period from 1995 – 1999. The sample includes firms from 18 different countries. All independent variables are averaged over the period. Size = log(firm market value), where all market values are in U.S.$. International Sales is the sum of Foreign Sales and Export Sales divided by Total Sales. The regressions are estimated by weighted least squares, where the weights are the inverse of the standard error of $\hat{b}_i$. t-statistics are computed using heteroskedasticity consistent standard errors.

	Sample size	Constant	t-statistic	Size	t-statistic	International Sales	t-statistic	Adjusted R^2
Australia	201	0.378	(2.95)	-0.058	-(2.76)	0.293	(2.65)	0.035
Belgium	45	0.171	(0.21)	-0.100	-(0.68)	-0.952	-(1.59)	0.075
Canada	271	0.761	(3.08)	-0.087	-(2.20)	0.312	(1.69)	0.020
Denmark	89	-2.421	-(3.91)	0.280	(2.03)	-0.096	-(0.14)	0.050
France	349	-0.289	-(1.26)	0.056	(1.25)	-0.704	-(2.45)	0.014
Germany	382	0.199	(1.03)	-0.018	-(0.50)	-0.857	-(3.78)	0.034
Hong Kong*	276	0.953	(7.58)	-0.118	-(6.44)	0.052	(0.52)	0.108
Italy	119	-1.145	-(3.63)	0.191	(3.48)	-0.442	-(1.94)	0.113
Japan	1918	0.307	(9.01)	-0.033	-(5.70)	-0.491	-(10.27)	0.106
Malaysia*	239	0.198	(2.43)	-0.021	-(1.37)	-0.151	-(1.16)	0.017
Netherlands	135	0.012	(0.03)	-0.076	-(1.01)	0.027	(0.06)	0.006
New Zealand	41	-1.198	-(2.20)	0.251	(2.53)	-0.337	-(0.78)	0.159
Norway	44	1.380	(2.26)	-0.112	-(1.05)	-0.565	-(1.39)	0.060
Spain	143	-0.011	-(0.05)	-0.017	-(0.47)	0.009	(0.05)	0.001
Singapore*	62	-0.590	-(0.62)	0.136	(1.05)	-1.892	-(2.28)	0.078
Switzerland	114	-0.593	-(2.10)	0.079	(1.80)	-0.527	-(2.25)	0.059
U.K.	1244	0.193	(3.20)	-0.005	-(0.48)	-0.351	-(4.57)	0.017
U.S.	4711	0.128	(2.57)	-0.049	-(5.90)	-0.344	-(4.45)	0.011

Table 6. High minus No International Sales Portfolio Returns.
Each year, firms are sorted into three bins based on International Sales (IS); IS=0, 0 to 25%, and > 25% in year t-1 (firms that do no report FS or ES in Worldscope are excluded). Monthly value-weighted portfolio returns are then created in the following year. HMN is the return on a portfolio that is long firms with IS>25% and short firms with IS=0%. Portfolios comprised of less than five firms are deleted. The returns on each portfolio are computed from July to June in year t. The returns on this portfolio are computed over four different exchange rate 'regimes'. The exchange rate is the Bank of England (BOE) trade-weighted exchange rate. Countries marked with a * do not have BOE rates and the Japanese Yen bilateral rate is used instead. Rates are quoted as foreign currency per one unit of home currency. N_N (N_H) is the average number of firms in the IS=0 (>25%) portfolio. N_{FX} is the number of monthly observations in each exchange rate regime. σ_i is the monthly standard deviation of the exchange rate change for country i. The first (last) columns show periods of large home currency depreciations (appreciations), defined as exchange rate changes that are less (greater) than -1.0 * σ_i (1.0 * σ_i). The middle columns show periods of small depreciations (appreciations). For the overall portfolio results, all difference portfolios with observations on a given date are used in the calculation.

Country			< – 1.0 * σ_i			0 to – 1.0 * σ_i			0 to 1.0 * σ_i			> 1.0 * σ_i		
	N_N	N_H	N_{FX}	HMN	p-val	N_{FX}	HMN	p-val	N_{FX}	HMN	p-val	N_{FX}	HMN	p-val
Australia	37	28	24	0.18	0.86	64	-0.47	0.41	73	0.35	0.52	19	-0.44	0.74
Belgium	9	19	18	2.15	0.21	53	2.49	0.03	51	-0.21	0.82	21	-0.02	0.99
Canada	54	77	36	0.34	0.47	85	0.48	0.21	78	-0.22	0.60	28	-0.28	0.76
Denmark	5	53	7	1.82	0.27	27	0.16	0.90	29	0.95	0.30	8	-1.98	0.45
France	53	145	18	2.36	0.03	50	0.03	0.98	54	1.21	0.08	21	-2.10	0.03
Germany	43	92	29	0.33	0.72	84	0.94	0.06	84	-0.32	0.62	42	-1.01	0.22
Hong Kong*	21	35	28	-0.17	0.84	57	0.09	0.90	66	0.70	0.22	16	-1.11	0.27
Italy	21	47	11	3.56	0.32	67	-0.25	0.81	56	0.27	0.79	9	-1.82	0.73
Japan	552	190	22	1.96	0.07	96	0.63	0.36	79	-0.42	0.61	42	-3.97	0.03
Malaysia*	82	14	14	2.94	0.14	57	-0.68	0.34	61	-0.88	0.17	11	-0.81	0.58
Netherlands	12	73	22	1.31	0.05	51	-1.52	0.21	47	-1.01	0.17	23	-0.78	0.34
New Zeal.	15	13	14	-3.66	0.08	23	0.39	0.68	35	-0.37	0.59	11	0.11	0.97
Norway	6	24	5	-0.77	0.79	19	-2.63	0.13	18	-1.25	0.46	5	-0.26	0.97
Singapore*	12	34	19	0.03	0.97	35	-1.60	0.21	61	-1.71	0.30	16	1.36	0.04
Spain	10	17	10	0.55	0.66	52	0.32	0.67	39	-2.68	0.02	6	-1.05	0.27
Switzerland	6	66	16	2.36	0.07	35	1.59	0.03	41	0.60	0.49	15	-2.22	0.02
U.K.	133	242	35	0.53	0.41	88	0.01	0.97	82	-0.28	0.46	34	-0.96	0.05
U.S.	698	320	39	-0.26	0.56	73	-0.10	0.73	92	-0.11	0.66	35	-0.04	0.94
Portfolio	**1769**	**1489**	**367**	**0.72**	**0.01**	**1016**	**0.13**	**0.50**	**1046**	**-0.25**	**0.18**	**362**	**-1.10**	**0.00**

Table 7. High minus No International Sales Portfolio Returns – Small vs. Large Firms.
Each year, firms are sorted into three bins based on International Sales (IS); IS=0, 0 to 25%, and > 25% in year t-1 (firms that do no report IS or ES in Worldscope are excluded). The firms in the high IS portfolio are split into large market value (MV) and small MV portfolios based on the median MV in June of year t-1. The median MV from the high IS portfolio is also used to split the IS=0 % portfolio into large and small MV portfolios. Monthly value-weighted portfolio returns are then created in the following year. HMN is the return on a portfolio that is long firms with IS>25% and short firms with IS=0%. Portfolios comprised of less than 3 firms are deleted. The returns on each portfolio are computed from July to June in year t. The returns on this portfolio are computed over four different exchange rate 'regimes'. The exchange rate is the Bank of England (BOE) trade-weighted exchange rate. Countries marked with a * do not have BOE rates and the Japanese Yen bilateral rate is used instead. Rates are quoted as foreign currency per one unit of home currency. MV is the average MV (in billions of local currency). IS is the average International Sales. N_{FX} is the number of monthly observations in each exchange rate regime. σ_i is the monthly standard deviation of the exchange rate change for country i. The first (last) columns show periods of large home currency depreciations (appreciations), defined as exchange rate changes that are less (greater) than -1.0 * σ_i (1.0 * σ_i). The middle columns show periods of small depreciations (appreciations). For the overall portfolio results, all difference portfolios with observations on a given date are used in the calculation.

Panel A	**Averages**			**Small Firms**											
	IS=0%	**IS > 25%**		**< – 1.0 * σ_i**			**0 to – 1.0 * σ_i**			**0 to 1.0 * σ_i**			**> 1.0 * σ_i**		
Country	**MV**	**MV**	**IS**	**N_{FX}**	**HMN**	**p value**	**N_{FX}**	**HMN**	**p value**	**N_{FX}**	**HMN**	**p value**	**N_{FX}**	**HMN**	**p value**
Australia	0.22	0.29	53.0	21	-1.16	0.24	60	-0.33	0.64	63	-0.13	0.87	22	-0.15	0.92
Canada	0.12	0.15	62.9	32	-0.59	0.28	89	0.20	0.61	74	0.00	0.97	32	1.61	0.09
France	0.56	0.87	49.7	17	1.90	0.06	42	0.16	0.73	55	-0.16	0.70	17	-0.84	0.37
Germany	0.69	0.86	49.1	34	0.65	0.48	71	1.15	0.05	89	-0.63	0.20	33	-2.17	0.02
Hong Kong*	0.70	0.48	65.0	17	-1.92	0.13	44	0.18	0.84	55	-1.59	0.18	15	-0.90	0.73
Italy	0.77	0.96	51.6	10	-0.06	0.96	60	-1.66	0.10	51	-0.32	0.58	10	0.73	0.47
Japan	32.6	41.0	48.5	26	1.13	0.19	92	0.35	0.44	83	-0.03	0.94	38	-1.72	0.02
Malaysia*	0.32	0.35	55.5	8	0.62	0.64	32	1.97	0.34	37	-1.40	0.20	6	-1.61	0.76
New Zealand	0.15	0.09	55.9	16	-0.85	0.19	38	-3.30	0.11	37	-0.76	0.16	16	-1.17	0.32
Netherlands	0.42	0.60	57.6	10	-1.63	0.23	16	-1.66	0.13	27	-1.98	0.13	6	-1.16	0.57
Singapore*	0.17	0.12	55.4	16	-0.88	0.58	30	-0.46	0.70	50	1.75	0.17	12	1.14	0.56
Spain	0.58	0.57	50.1	4	-2.10	0.49	36	0.64	0.59	26	-1.24	0.39	5	8.24	0.19
U.K.	0.28	0.37	54.6	34	-0.29	0.64	89	0.70	0.02	81	-0.32	0.18	35	-0.58	0.08
U.S.	0.86	1.05	45.2	39	0.30	0.47	73	0.28	0.38	93	0.30	0.36	34	-0.38	0.29
Portfolio			**53.9**	**284**	**-0.14**	**0.58**	**772**	**0.04**	**0.85**	**821**	**-0.31**	**0.08**	**281**	**-0.44**	**0.18**

Table 7, continued

Panel B	**Averages**			**Large Firms**											
	IS=0%	**IS > 25%**		**< – 1.0 * σ_i**			**0 to – 1.0 * σ_i**			**0 to 1.0 * σ_i**			**> 1.0 * σ_i**		
Country	**MV**	**MV**	**IS**	**N_{FX}**	**HMN**	**p value**	**N_{FX}**	**HMN**	**p value**	**N_{FX}**	**HMN**	**p value**	**N_{FX}**	**HMN**	**p value**
Australia	1.41	4.40	46.6	21	-0.43	0.70	60	0.29	0.65	63	0.89	0.23	22	0.25	0.80
Canada	1.32	2.94	65.4	32	0.75	0.21	89	0.72	0.10	74	0.01	0.98	32	0.03	0.98
France	1.32	3.38	56.9	17	2.35	0.06	42	0.62	0.55	55	1.12	0.08	17	-1.85	0.12
Germany	0.69	3.17	55.8	34	1.24	0.19	71	0.74	0.25	89	0.23	0.68	33	-0.93	0.39
Hong Kong*	14.8	10.1	56.6	17	-0.90	0.40	44	0.21	0.76	55	0.64	0.23	15	-0.30	0.75
Italy	142.2	92.6	58.9	10	4.06	0.29	60	0.04	0.97	51	-0.23	0.85	10	-2.78	0.57
Japan	498.9	624.0	48.6	26	2.54	0.02	92	1.05	0.16	83	0.39	0.50	38	-3.84	0.04
Malaysia*	3.79	3.07	49.3	8	3.56	0.43	32	-0.04	0.97	37	0.34	0.74	6	-2.02	0.30
New Zealand	0.76	1.48	55.1	16	1.42	0.28	38	0.45	0.72	37	-0.83	0.43	16	-1.64	0.14
Netherlands	0.98	3.77	62.5	10	-3.62	0.27	16	-1.02	0.43	27	-0.66	0.54	6	1.78	0.71
Singapore*	0.76	1.37	51.4	16	-0.27	0.86	30	-0.04	0.94	50	-0.33	0.66	12	3.30	0.01
Spain	1.97	1.79	52.1	4	-0.94	0.49	36	1.84	0.04	26	-1.19	0.25	5	-1.28	0.12
U.K.	0.75	1.58	58.4	34	0.73	0.30	89	0.02	0.96	81	-0.09	0.83	35	-0.82	0.15
U.S.	2.65	7.70	42.5	39	0.05	0.91	73	0.02	0.93	93	0.09	0.75	34	0.09	0.87
Portfolio			**54.3**	**284**	**0.78**	**0.02**	**772**	**0.44**	**0.03**	**821**	**0.14**	**0.44**	**281**	**-0.90**	**0.02**

Data Appendix

Data for both currently listed (alive) and delisted (dead) firms are from Datastream International. The alive stocks are from the 'Country Lists' in Datastream, while the 'dead' stocks come from the 'Deadlists' files. Returns include the change in stock price plus any dividends paid by the firm in a given month. We exclude all financial firms from the data because of the potential issues with making inferences concerning exchange rate exposure.

We exclude preferred shares (except in countries where preferred shares are the main share class, e.g. Brazil), convertible shares, warrants, investment certificates, participation certificates, units, mutual funds, and foreign listed shares. In many countries, firms have several classes of equity, e.g. 'A', 'B', 'C', etc. share series. The distinction between these share classes differs across countries. For example, in Denmark the 'A' shares carry enhanced voting rights, usually on a 10-to-1 basis, while the 'B' shares carry ordinary voting rights. In China, 'A' shares are restricted to nationals, while 'B' and 'H' shares are available to foreigners. Therefore, when there are multiple share classes in a country, we try to select the most representative share class by choosing:

1. The share class with ordinary voting rights.
2. The share class that is most widely traded.
3. The share class that is available for foreign investment.

These criteria are similar to the criteria that Worldscope uses to select the most representative share class for a firm. However, these criteria are not necessarily mutually exclusive. For example, in some cases, shares that are restricted to nationals are also the most widely traded – in these cases we choose the share class that is most widely traded even though it is restricted to only nationals**.**

Table A1.
This table provides summary statistics for the countries included in the main sample. The "Alive" firms are from the "Country Lists" in Datastream International. The "Dead" firms come from the "Deadlists". To be included in the sample, a firm must have at least 36 return observations during the sample period from 1975 to July 1999 and must not be classified as a financial firm. The tabulations in this table impose no further data requirements.

Country	Start Date	Alive Firms	Dead Firms	Total # of Firms
Australia	1975	763	184	947
Belgium	1975	75	46	121
Canada	1975	743	213	956
Denmark	1975	145	31	176
France	1975	401	248	649
Germany	1975	492	70	562
Hong Kong	1975	459	31	490
Italy	1975	120	49	169
Japan	1975	2605	100	2705
Malaysia	1980	346	2	348
Netherlands	1975	152	98	250
New Zealand	1988	98	48	146
Norway	1975	108	73	181
Singapore	1975	178	10	188
Spain	1987	80	25	105
Switzerland	1975	131	48	179
U.K.	1975	1172	1136	2308
U.S.	1975	5627	1822	7449
Total		**13695**	**4234**	**17929**

Table A2. Firm-Level Regressions: Firms in Countries with Insufficient Data on Foreign Operations. This table shows the results of the regression: $R_i = \alpha_i + b_i R_{FX} + d_i R_M + \eta_i$, where R_i is the monthly stock return, R_M is the Datastream local monthly stock index return (IFC Global Monthly Indices are used if no Datastream index is available), and R_{FX} is the Bank of England (BOE) trade-weighted exchange rate. Countries marked with a * do not have BOE rates and the country's bilateral exchange rate with the Yen (Asia/Pacific Rim), Deutschmark (Europe), or Dollar (Americas) is used instead. Rates are quoted as foreign currency per one unit of home currency. The regression is estimated over the following sub-periods: 1975-79, 1980-84, 1985-89, 1990-94, and 1995-July 1999 for all firms that have at least 36 observations in each sub-period. N is the number of sub-period – firm observations for a country. The reported b_i coefficients and t-statistics are the average (of the absolute value) for all firms in the country over the sample period from 1975 to July 1999. To be included, a firm must have at least 36 observations in a given sub-period. %+ (%-) is the percentage of firms in the country with positive (negative) b_i coefficients that are significant at the 5% level. % Change is the percentage difference between the adjusted R^2 of the estimated regression and the adjusted R^2 of the market model regression.

All Firms: 1975 to July 1999

Country	N	b_i	t-statistic	% +	% -	% Change
Argentina*	77	21.84	(0.86)	1.3	5.2	0.6
Austria	227	1.72	(0.79)	1.8	2.6	-0.4
Bangladesh*	112	1.63	(1.01)	3.6	11.6	4.2
Brazil*	116	4.16	(1.29)	8.6	11.2	85.0
Chile*	247	7.45	(0.85)	7.3	2.0	0.7
China*	388	0.32	(0.71)	2.5	1.2	-0.3
Colombia*	21	0.92	(0.93)	4.8	0.0	-0.1
Finland	128	1.38	(1.07)	3.9	10.2	6.8
Greece	252	2.12	(1.09)	14.7	4.0	7.9
India*	871	0.46	(0.76)	1.6	1.3	-0.8
Indonesia*	292	0.66	(1.83)	35.3	2.7	42.4
Ireland	159	1.89	(0.86)	2.5	7.5	1.1
Israel*	29	0.48	(0.87)	3.4	3.4	0.0
Kenya*	78	0.39	(0.72)	2.6	2.6	-0.9
Korea*	1479	0.56	(1.21)	20.2	1.4	9.22
Mexico*	123	0.48	(1.12)	13.1	4.9	4.5
Morocco*	38	0.62	(0.90)	2.6	2.6	0.6
Pakistan*	124	0.36	(0.70)	2.4	0.8	-2.5
Peru*	55	1.60	(0.80)	5.6	1.8	-0.1
Philippines*	190	1.50	(0.90)	5.8	3.7	1.7
Portugal	132	1.88	(0.92)	3.0	5.3	3.8
South Africa*	768	0.78	(0.90)	4.3	4.9	2.9
Sri Lanka*	137	0.41	(0.83)	6.6	4.4	2.5
Sweden	369	1.14	(0.96)	7.3	3.8	3.6
Taiwan*	507	0.53	(1.07)	11.6	0.2	2.7
Thailand*	541	0.64	(1.09)	12.3	3.1	9.1
Turkey*	267	0.89	(0.76)	1.9	2.6	-0.4
Venezuela*	24	0.33	(0.91)	12.5	0.0	0.3
Zimbabwe*	58	0.37	(0.68)	0.0	0.0	-2.2
Mean	269	1.98	(0.94)	7.0	3.6	6.3
Median	137	0.78	(0.90)	4.3	2.7	1.1