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Asymmetric Exchange Exposure in the Asian Emerging Markets

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Abstract

This paper investigates the impact of foregin exchange rate change on stock returns in the Asian emerging markets. Real exchange rate is used in this paper to capture the high inflationary effect in the emerging markets. I find stock returns expose to exchange risk to a lesser extent during currency appreciation than during currency depreciation. An asymmetric exchange exposure embeded asset pricing model is then built to test with small and large size portfolios. My empirical results show that large firms display nothing on fluctuations of exchange rates while small firms show statistically significant exchange exposure. The results support the argument that large firms have advantages in scale of economy to pay less hedging cost, hence more motivated to use hedges to reduce exchange rate risk.

Keywords: Exchange exposure; Asymmetry; Appreciation-Depreciation cycle; the Asian emerging markets

JEL classification: F31; G12; G15

1. Introduction

Foreign exchange risk is one of the important factors in international asset pricing. We start by thinking how asset prices should be determined in a world where financial markets are assumed to be completely integrated with global markets and people all over the world face the same consumption and investment set. In such a world, there are no barriers to international investment and products can export and import freely across different countries. Therefore, an asset should have

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the same price regardless of where it is traded. Under such completely integrated markets, the asset pricing model would contain only global pricing factors. On the contrary, if markets are assumed to be fully segmented, local pricing factors would determine what price assets should have. In other words, under completely segmented markets, the price of an asset depends on where it is traded.

Both extreme cases mentioned above cannot be directly applied into the real world because most of markets all over the world are neither completely integrated nor completely segmented. They are in between, called partially segmented markets (see Bekaert and Harvey (1995)). When markets are partially segmented, asset prices are not the same across different markets and purchasing power parity (PPP) is violated. Under this circumstance, foreign exchange rate risk should be priced (see Solnik (1974), Stulz (1981) and Adler and Dumas (1983)). Therefore, compared with purely global pricing or purely domestic pricing models based on either completely integrated or completely segmented assumptions, asset pricing models under partially segmented markets would include foreign exchange risk pricing factors in addition to global and domestic pricing factors.

The goal of this paper is to investigate the impact of foreign exchange rate change on stock returns in the Asian emerging markets. There have been different approaches to examining the significance of foreign exchange rate risk in pricing assets. For example, Williamson (2001) finds statistically competitive effects of exchange rate shocks between Japan and the U.S. in a specification that regresses the difference in automotive industry returns between the two countries on the dollar/yen exchange rate return. Griffin and Stulz (2001) find that weekly exchange rate shocks explain almost nothing of the relative performance of industries. While longer horizons are used, the importance of exchange rate shocks

increases slightly. However, the available evidence is not sufficient to allow generalization about whether foreign exchange rate risk can be ignored in asset pricing in different market environments, such as emerging markets.

In this paper, I concentrate on the Asian emerging markets for the following reason. Erb, Harvey and Viskanta (1998) discovered that the Asian crisis had widespread impacts on currency valuation. In fact, many Asian emerging countries' currencies severely declined in value during the crises. From the above evidence, we can conclude that the Asian crisis was a "regional" crisis. Since Asian emerging markets have experienced such kind of currency crises with overwhelming negative impact on their economies and stock markets, the fact may affect the perception of investors with respect to the importance of foreign exchange rate risk, then putting more weight on exchange rate risk factor in pricing models. The evidence mentioned above indicates it might be clear to examine the influence of foreign exchange rate change on stock returns in the Asian emerging markets rather than in other developed markets counterparts.

In this study, I choose six Asian emerging countries, Indonesia, Korea, Malaysia, the Philippines, Taiwan and Thailand as my sample countries. Both market liberalization in the beginning of 1990s and the 1997 Asian financial crisis would be covered in sample period in this paper. In this paper, I would use real exchange rate instead of nominal exchange rate to measure foreign exchange rate changes. The main reason is that in the emerging markets, inflation is relatively larger and volatile than in the developed economies. Therefore, if we neglect adjusting inflation change in exchange rates, the pricing of PPP deviations would be misleading. For example, if nominal exchange rate (US dollar/Foregin currency) decreases by 10 percent, we would think that local currency depreciation should

benefit exporters or foreign assets holders. However, after accounting for relative high inflationary effect in home country, currency depreciation benefits would disappear. Since real exchange rates are inflation adjusted, the change in the real exchange rate is a more correct measure of PPP deviations.

In the next section, I will show that during the sample period, the real exchange rates for all countries are observed to increase when the market is liberalized while decrease sharply after the financial crisis. And stock returns expose to exchange risk to a lesser extent during the liberalization period corresponding to currency appreciation than during the post crisis period related to currency depreciation. The asymmetric exchange exposure feature over appreciation-depreciation cycles thus provides us a helpful basis in incorporating foreign exchange risk into the asset pricing framework in the Asian emerging markets.

Next, an asymmetric exchange exposure embeded asset pricing model is built. Market integration effect is adjusted in this model as well. And I would use the small and large size portfolios of all sample countries to test the validility of the model. The reason to test with the small and large portfolios is that large firms are always regarded as involved with much more international trade or investment activities than small firms, making their returns highly integrated with that of global capital markets and expose to flunctuations of exchange rates. On the other hand, Nance, Smith and Smithson (1993) and Main (1996) argue that large firms have more investment opportunities and advantage in scale of economy to pay less hedging cost, they are hence more motivated to use hedges to reduce exchange rate risk. Whether small firms or large firms command relatively large exchange exposure remains an open question and need empirical analysis to verify that. My empirical results show that the returns on large portfolios display noth-

ing on fluctuations of exchange rates. Small firms of most countries, in contrast, show statistically signifcant exchange exposure. The empirical evidence leads to conclusion that large firms' hedging behaviors sucessfully prevent themselves exposing to the fluctuation of currency value. However, only part of countries' small portfolio returns show asymmetric exchange exposure effect, suggesting the causes behind asymmetric exchange exposure might be related to some firms' characteristics, for instance, exporters or importers, which I did not capture in this empirical analysis.

My paper is organized as follows. In section 2, I would examine the asymmetric exchange exposure feature in the Asian emerging markets. Then I construct an asset pricing model encompassing asymmetric exchange exposure and market integration effect in section 3. Empirical results are presented in section 4. Some concluding remarks are offered in section 5.

2. Asymmetric Exchange Exposure

To examine the foreign exchange exposure, I follow the work of Adler and Dumas (1984). They define foreign exchange exposure in terms of a regression of asset value on the exchange rate. Other works include the research of Jorion (1990), Bondnar and Gentry (1993), Chow et al. (1997), Chamberlain et al. (1997), Wong (2000), Allayannis and Ofek (2001), Dahlquist and Robertson (2001), Dominguez and Tesar (2001), Bondnar and Marston (2004) all take related approaches. Basically the foreign exchange exposure measured with this approach is called "residual" exposure because controlling factors place in the regression other than foreign exchange change capture the common effect between stock returns and foreign exchange rate changes (see Bondnar and Wong (2003)). In this paper, I include both

world and local market returns as controlling variables. The model setting is also consistent with asset pricing concept: as most of Asian emerging countries belong to partially segmented markets, stock returns should be influenced by both global and local pricing factors.

The dealt with the exchange rate in this paper differs from the past studies. As I addressed in the previous section, it is important to adjust inflation change from nominal exchange rate to extract correct pricing of foreign exchange exposure. Therefore, I use real exchange rate against US dollar as the measure of foreign exchange rate. The setting is reasonable because trade and capital flow through current accounts and capital accounts of all sample Asian emerging countries show the United States is their largest source or destination country, and it is believed that sizable shares of firms in these countries are exposed to the fluctuations in the US dollar. To avoid collinearity problem in regression, I don't include other individual exchange rates. The detail calculation of real exchange rate is shown in appendix A.

2.1. Data Description

In this paper, I would measure stock returns' foreign exchange exposure in six Asian emerging countries, including Indonesia, Korea, Malaysia, the Philippines, Taiwan and Thailand. The firm level returns, nominal exchange rate and consumer price index for each country are from Datastream. Sample periods for each country are varying depending on the availability of database. MSCI world market return is adopted as world market return measure. For local market return, returns for stock market index are used: the Jakarta Stock Exchange Composite Price index for Indonesia; the Korea Stock Exchange Composite for Korea; the Kuala

Lumpur Stock Exchange Composite for Malaysia; the Philippines Stock Exchange Composite Price Index for Philippines; the Taiwan Stock Exchange Weighted-price index for Taiwan; and the Bangkok S.E.T. Price Index for Thailand. The stock market index is from Global Financial Database. All returns are measured in US dollar and are in excess of 30-day Eurodollar deposit rate.

Figure 1 displays the real exchange rates of six sample countries from 1980 to 2007. Since the sample period covers the market liberalization and the 1997 financial crisis, I check if real exchange rate has significant change after market liberalization and financial crisis. I partition the whole sample period into four sub-sample periods, defined as pre-liberalization, the liberalization period between market liberalization and the 1997 financial crisis, post-crisis period and recent period. Table 1 summarizes the break dates used to partition sub-sample periods for each Asian emerging country. For liberalization break date, I adopt Bekaert and Harvey's discussion of the choices for official liberalization dates (2000) to define the market liberalization break date in my research.

[Insert Figure 1]

[Insert Table 1]

Table 2 shows the sub-sample mean of real exchange rate for each country. From Table 2, we can see all six countries exhibit the similar pattern in real exchange rate change. Real exchange rates rise after market liberalization, meaning local currency appreciates after adjusting inflation change. But it decreases sharply during post-crisis period, showing large currency depreciation in this time. However, real exchange rate recovers gradually in the recent period. From what mentioned above, we can thus attribute the liberalization period and recent period

as currency appreciation cycles while post-crisis period as a depreciation cycle.

[Insert Table 2]

2.2. Estimating Exchange Exposure

To estimate foreign exchange exposure, I conduct the following regression:

$$r_{i,t} = \beta_{i,w} r_{w,t} + \beta_{i,h} r_{h,t} + \beta_{i,x} r_{x,t} + u_{i,t} \tag{1}$$

where $r_{i,t}$ is the excess return on stock i; $r_{w,t}$ is the excess return in the world market; $r_{h,t}$ is the excess return on local market; $r_{x,t}$ is the real exchange rate change. I proceed the above regression in each sub-sample period for the stocks in every country, and the results are summarized in Table 3. Table 3 reports the fraction of firms for which we can reject the hypothesis that the coefficient on the exchange rate change is zero. For all countries except Taiwan, we can see that compared to pre-liberalization period, fewer firms in the liberalization period have the coefficient on the exchange rate change statistically significant from zero. The fact suggests that foreign exchange exposure has fallen when Asian emerging countries' governments start to liberalize their markets. The evidence also contradicts our intuition that market liberalization would cause exchange rate become more volatile and thus have firms exposed more to foreign exchange risk. The post-crisis period, however, shows the most exposure. Until the recent period, the high foreign exchange exposure is mitigated. As the pattern of real exchange rate suggests that the liberalization period and recent period belong to appreciation cycles but the post-crisis period corresponds to a depreciation cycle, one possible direction is to think there might exist asymmetric exchange exposure over appreication-depreciation cycle in the Asian emerging marekts.

[Insert Table 3]

To examine if asymmetric exchange exposure feature does exist in the Asian emerging markets and the cause behind it, I divide the sample into appreciation state and depreciation state. The regression can be written as follows:

$$r_{i,t} = \beta_{i,w} r_{w,t} + \beta_{ih} r_{h,t} + \sum_{j=1}^{2} \beta_{j,i,x} D_{j,t} r_{x,t} + u_{i,t} \tag{2}$$

where each D_j is a dummy variable:

$D_1 = 1$, $r_x \geq 0$, implying currency appreciation

$= 0$, otherwise

$D_2 = 1$, $r_x < 0$, implying currency depreciation

$= 0$, otherwise

The estimated results for each country are reported in Table 4. From Table 4, we can observe that no matter in which subperiod, higher fraction of firms exhibit exposure in currency depreciation than in appreciation. The evidence confirms the existence of asymmetric exchange exposure over appreciation-depreciation cycle in the Asian emerging market. In Table 4, the number in parentheses represents the fraction of firms with significantly positive coefficient on exchange change out of significant part. We can see these ratios are generally high. From economic theory, we know that net importers or firms with net US dollar liabilities should have positive coefficient on exchange change while net exporters or frims with net US dollar assets have negative coefficient. Therefore, the high ratios in parentheses imply that importers or firms with US dollar liabilities command higher exchange exposure than exporters or firms with US dollar assets in either appreciaton or depreciation cycle. This finding indicates that exporters or firms with US dollar assets perform more successful hedging works than importers or firms with

US dollar liabilities. One possible reason for the difference of hedging ability is that our sample period covers many large and unpredictable currency depreciation shocks, causing importers or firms with US dollar labilities cannot proceed hedging strategies successfully.

[Insert Table 4]

2.3. Explanation Behind Asymmetric Exchange Exposure

The existence of asymmetric exchange exposure in the Asian emerging markets might be attributed to firms' asymmetric heding behaviors. Asymmetric hedging occurs when firms take one-sided hedges. For example, firms with net long positions may be inclined to hedge against domestic currency appreciations yet remain unhedged against domestic currency depreciations. Alternatively, firms with net short positions may be tended to hedge against domestic currency depreciations yet remain unhedged against domestic currency appreciations. If the hedging theory mentioned above can fully describe firms' hedging behaviors in the Asian emerging markets, we should see net importers or firms with net US dollar labilities expose to fluctuations of exchange rate in appreciation cycle while net exporters or firms with net US dollar assets have higher exchange exposures in depreciation cycle. In other words, high porportion of significantly positive coefficient on exchange rate change should be observed when currency appreciates but low fraction of significantly positive coefficient should be seen when currency depreciates.

I then use the number in parentheses, the fraction of firms with significantly positive coefficient out of significant portion, to verify the above argument. The numbers in appreciaton cycle are high enough to prove that firms with net long positions perform hedging strategies successfully. Therefore, only firms with net

short positions expose to exchange rate change and benefit from currency appreciation. However, the numbers in parentheses in depreciation cycle, though lower than those in appreciation cycle, are still very high. As asymmetric hedging behavior theory suggests, firms with net short positions should take hedges when currency depreciates, avoiding adverse effect by depreciaton. But obviously, they are not! One possible explanation is that currency depreciaton shock comes too dramatically and unexpectedly to fail firms' hedging works. As a result, during depreciation cycle, we can observe both firms with net long positions and net short positions expose to exchange rate fluctuations, inducing higher exchange exposure in depreciation cycle than in appreciation one.

The argument made above may serve as one of possible reasons to cause asymmetric exchange exposure in the Asian emerging markets. However, without detailly capture the industry structure and firm characteristics of every country, we cannot extract exact sources behind this fact. Nevertheless, the discovery of asymmetric exchange exposure provides us a helpful basis to incorporate into an asset pricing model.

3. Exchange Exposure Embeded Asset Pricing Model

In this section, I would like to construct an asset pricing model encompassing asymmetric exchange exposure for Asian emerging markets. Since the sample period cover market liberalization in the beginning of 1990s, in addition to embed asymmetric exchange exposure setting, we have to take into account market integration effect as well. My model setting is as follows:

$$r_{i,t} = \beta_{i,0} + (1 - D_{c,t})\beta_{i,1} r_{h,t} + D_{c,t}(\beta_{i,w} r_{w,t} + \beta_{i,h}\varepsilon_{h,t}) + (\beta_{i,x} + D_{x,t}\beta_{i,r}) r_{x,t} + u_{i,t}$$

$$\sigma^2_{i,t} = \alpha_{i,0} + \alpha_{i,1} u^2_{i,t-1} + \alpha_{i,2}\sigma^2_{i,t-1} \tag{3}$$

where $r_{i,t}$ is the excess return on portfolio i, including small and large portfolios[1] for each sample country; $r_{w,t}$ is the excess return in the world market; $r_{h,t}$ is the excess return on local market; $r_{x,t}$ is the real exchange rate change.

D_c and D_x are dummy variables:

$D_c = 1$, if after the official liberalization date documented by Bekaert and Harvey (2000)

$= 0$, if before the official liberalization date

$D_x = 1$, $r_x < 0$, implying currency depreciation

$= 0$, otherwise

$\varepsilon_{h,t}$ is the residual from the regression of local market excess return on world market excess return after market liberalization. The regression can be shown as follows:

$$r_{h,t} = \gamma_0 + \gamma_1 r_{w,t} + \varepsilon_{h,t} \tag{4}$$

Here, I propose that even the Asian emerging countries' governments officially liberalize their market to foreign investors, the market is still not compeletly integrated with the world capital market. Therefore, besides global influences, the asset returns would be affected by domestic forces as well. To avoid double counting of world capital market impact, I regress local market excess return on the world market excess return, and then take the residual as an explanatory variable.

[1] The small and large size portfolios are formed as Fama and French (1995) did in their paper.

$\beta_{i,r}$ is incorporated to estimate the asymmetric exchange exposure effect. If there is no asymmetric exchange exposure in market, we should see $\beta_{i,r}$ is not statistically significant from zero. Otherwise, $\beta_{i,r}$ appear to be statistically significant from zero. Moreover, since the volatility of stock returns in the Asian emerging markets is usually large and clustering compared to the developed countries, I incorporate GARCH (1,1) to capture the above feature. The degree of volatility persistence is measured by $\alpha_1 + \alpha_2$ and the unconditional variance, σ^2, is given by $\alpha_0 / (1 - \alpha_1 - \alpha_2)$. Existence of the unconditional variance requires that persistence is less than one.

The reason that I test the constructed asset pricing model with small and large size portfolios is that large firms are always regarded as involved with much more international trade or investment activities than small firms, making their returns highly integrated with that of global capital markets and expose to flunctuations of exchange rates. But another stream of research insists that large firms have more investment opportunities and advantage in scale of economy to pay less hedging cost, they are hence more motivated to use hedges to reduce exchange rate risk. I would do empirical studies to verify which hypothesis is supported in the Asian emerging markets. I report the estimated results in Table 5.

[Insert Table 5]

4. Empirical Results

From the estimates of large portfolios in Table 5, we can see all countries except Thailand have intercept term β_0 statistically insignificant from zero, and the adjusted R^2 are ranging from 0.76 to 0.919. The above evidence suggests that

the constructed asset pricing model is robust for explaining returns variation of large size portfolios in most of Asian emerging countries. β_1 characterize local market risk exposure during pre-liberalization period. From Table 5, we observe all countries except Thailand show statistically significant β_1 in explaining returns variation of large size portfolios. β_w and β_h represent the global market risk exposure and domestic market risk exposure after market liberalization, respectively. Both of the above exposure estimates are statistically significant at the 5% level for all countries. The significance of β_h implies that the Asian emerging markets keep partially segmented rather than fully integrated with global capital market even their government officially liberalize the markets. For the exchange exposure estimates, β_x and β_r, none of the countries shows these two coefficients significant in capturing returns variation of large size portfolios. The results also mean that large size portfolio exposes less to exchange rate fluctuations, confirming the argument that large firms have advantages in scale of economy to pay less hedging cost, and then more motivated to use hedges to reduce exchange rate risk. For conditional variance parameter estimates, all countries except Thailand show statistical significance at the 5% level. Moreover, the sum of α_1 and α_2 is close to one, implying that the volatility of returns in the Asian emerging markets exhibits strong clustering feature.

The results of small portfolios show the estimates of intercept term are statistically insignificant for all countries except Malaysia. The adjusted R^2 is ranging from 0.125 to 0.665, lower than that in large size portfolio estimation. The relatively low adjusted R^2 might be attributed to some unspecified risk exposures existed in small size portfolios. From the estimated results of β_1, we can deduce that, except for Philippines, local market risk exposure can explain returns

variation of small portfolios in the pre-liberalization period. After market liberalization, both global and domestic market risk exposures are obeserved to affect returns variation of small size portfolios for all countries other than the Philippines. The most distinction between estimates of small and large portfolios comes from the estimates of exchange exposures, β_x and β_r. The estimates of large portfolios show that the exchange exposure is not significant at all to explain returns variation of large size portfolio. However, the estimated results of small portfolios exhibit that Korea, Malaysia, Taiwan and Thailand exhibit significant exchange exposures (either β_x or β_r) in explaining returns variation of small size portfolios. Therefore, we can conclude that compared to large firms, small firms expose much to currency shocks although they are usually regarded as dealing with fewer international trade or investment activities. The relatively large exchange exposure of small firms might be due to their lack of hedging budgets and motivation.

5. Conclusion

Many Asian emerging countries' currencies severely declined in value during the 1997 financial crisis. Since Asian emerging markets have experienced such kind of currency crises with overwhelming negative impact on their economies and stock markets, investors may emphasize more on exchange rate risk in the Asian emerging markets than in the developed markets. Therefore, it is important to examine the impact of foreign exchange rate change on stock returns in the Asian emerging markets. To proceed, I use real exchange rate instead of nominal exchange rate to account for the high inflationary effect in the Asian emerging markets. Real exchange rates for all sample countries are observed to appreciate after market liberalization while depreciate sharply after the 1997 financial crisis.

From the evidence metioned above, the liberalization period and recent period can be attributed as currency appreciation cycles while post-crisis period can be attributed as a depreciation cycle.

The empirical results show that stock returns expose to exchange risk to a lesser extent during appreciation cycles than during depreciation cycles. The asymmetric exchange exposure feature over appreciation-depreciation cycles thus provides us a helpful basis in constructing an asset pricing model in the Asian emerging markets. One possible reason causing asymmetric exchange exposure is firms' asymmetric hedging behaviors. Therefore, we should see only firms with net short position expose to fluctuations of exchange rate in appreciation cycle while firms with net long position have higher exchange exposures in depreciation cycle. However, currency depreciation shock comes too dramatically and unexpectedly so that firms with net short position fail to hedge successfully. As a result, we can see higher exchange exposure is exhibited in depreciation cycle than in appreciation cycle.

Next, I construct an asset pricing model encompassing asymmetric exchange exposure for the Asian emerging markets. And then test the model with small and large size portfolios. The empirical results show that small firms expose more to currency shocks than large firms although they are usually regarded as involving with fewer international trade and investment activities. My results support the hypothesis that compared to small firms, large firms have advantages in scale of economy to pay less hedging cost, and then more motivated to use hedges to reduce exchange rate risk.

Appendix A. Derivation of Real Exchange Rate Change

Define S_j^r as the real exchange rate of currency j versus U\$

$S_{jt}^r = S_{jt} \times \frac{P_{jt}}{P_t}$

$S_{jt}^r \times P_t = S_{jt} \times P_{jt}$

where S_{jt} is the nominal exchange rate (U\$/FC$_j$), P_t is the price level in the US, P_{jt} is the price level in country j.

After taking log and difference, we get

$\Delta \ln \left(S_{jt}^r\right) + \Delta \ln \left(P_t\right) = \Delta \ln \left(S_{jt}\right) + \Delta \ln \left(P_{jt}\right)$

Thus, if we assume inflation in the US dollar is stable and non-stochastic, $\Delta \ln \left(P_t\right) = 0$.

And real exchange rate change can be derived by the sum of nominal exchange rate change and local inflation rate change:

$\Delta \ln \left(S_{jt}^r\right) = \Delta \ln \left(S_{jt}\right) + \Delta \ln \left(P_{jt}\right)$

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Figure 1: Real Exchange Rate (U$/FC)

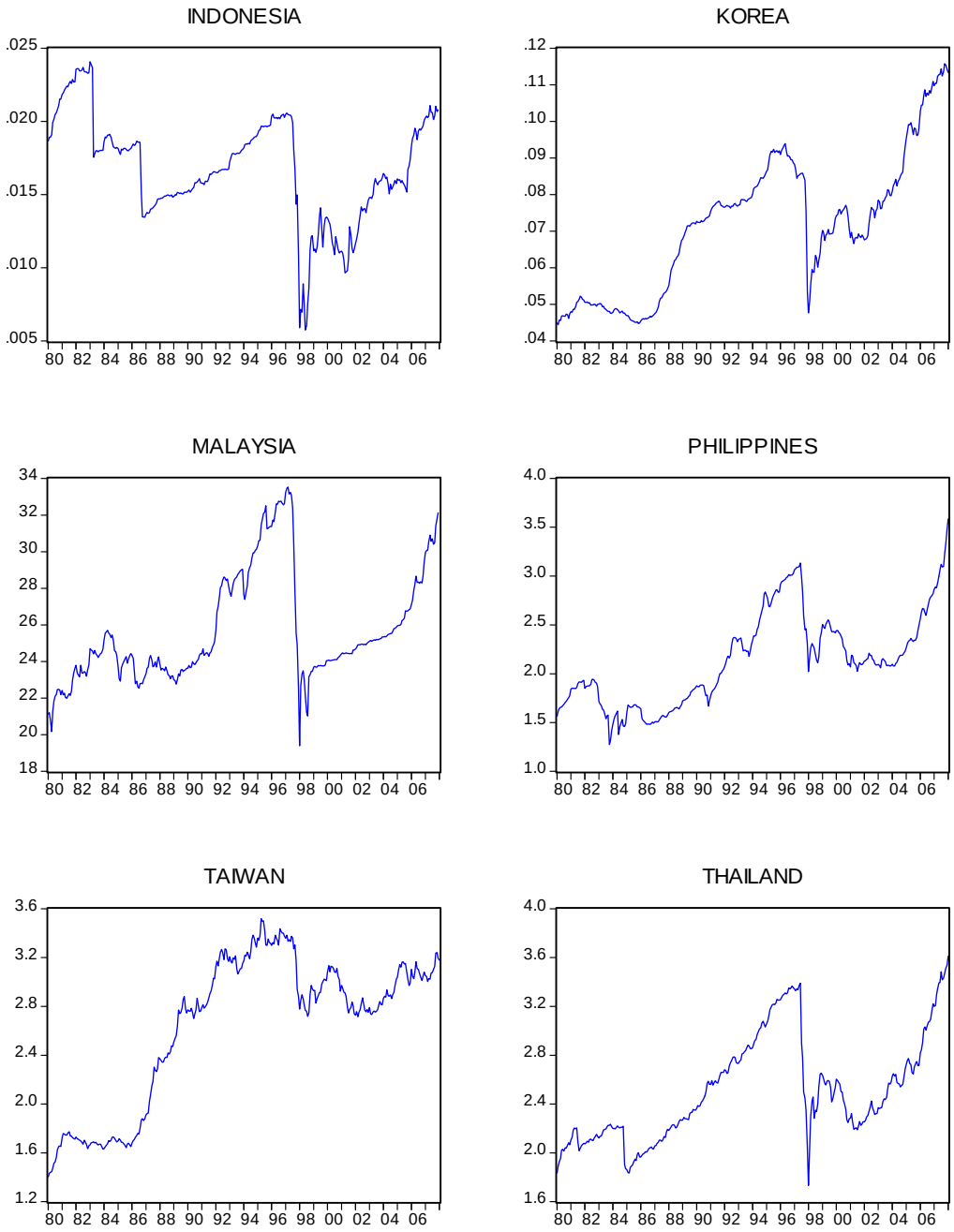

Table 1: Break Dates for the Asian Emerging Countries

Country	Indonesia	Korea	Malaysia	The Philippines	Taiwan	Thailand
Pre-liberalization Period						
Liberalization Break Date[1]	Sep. 1989	Jan. 1992	Dec. 1988	Jun. 1991	Jan. 1991	Sep. 1987
Liberalization Period						
Crisis Break Date	Jul. 1997					
Post-crisis Period						
Recovering Break Date	Jul. 2002					
Recent Period						

[1] These liberalization break dates are documented by Bekaert and Harvey (2000) in their paper, "Foreign speculators and emerging equity markets."

Table 2: Sub-sample Mean of Real Exchange Rate for Each Country

	Pre-liberalization Period	Liberalization Period	Post-crisis Period	Recent Period
Indonesia	0.018172	0.018178	0.011578	0.017146
Korea	0.055803	0.084241	0.069314	0.094708
Malaysia	23.52612	27.80153	24.18272	27.02246
The Philippines	1.685235	2.553728	2.297798	2.461327
Taiwan	1.982172	3.218701	2.930489	2.975091
Thailand	2.071356	2.748697	2.395549	2.805702

Table 3: Estimating Exchange Exposure by Sub-period

The equation estimated is:

$$r_{i,t} = \beta_{i,w} r_{w,t} + \beta_{i,h} r_{h,t} + \beta_{i,x} r_{x,t} + u_{i,t}$$

	Percent of firms rejecting $H_0 : \beta_{i,x} = 0$ at the 5% level			
	Pre-liberalization Period	Liberalization Period	Post-crisis Period	Recent Period
Indonesia	----	2.67	0	1.69
Korea	6.91	1.57	3.68	4.22
Malaysia	10.53	7.6	15.71	6.78
The Philippines	7.69	6.74	10.15	20.88
Taiwan	3.45	4.55	7.76	13.71
Thailand	----	4.29	14.06	4.49

Table 4: Estimating Exchange Exposure by Appreciation-Depreciation Cycle

The equation estimated is

$$r_{i,t} = \beta_{i,w} r_{w,t} + \beta_{i,h} r_{h,t} + \sum_{j=1}^{2} \beta_{j,i,x} D_{j,t} r_{x,t} + u_{i,t}$$

Percent of firms rejecting $H_0 : \beta_{j,i,x} = 0$ at the 5% level

( ): the number in parentheses represents the fraction of firms with significantly positive coefficient on exchange change out of significant part

	Pre-liberalization Period		Liberalization Period		Post-crisis Period		Recent Period	
	Appreciation	Depreciation	Appreciation	Depreciation	Appreciation	Depreciation	Appreciation	Depreciation
Indonesia	----	----	0	5.33	1.9	0.95	1.69	8.78
				(24.95)	(100)	(50.53)	(79.88)	(92.37)
Korea	3.23	5.53	1.57	5.09	1.72	6.99	3.79	5.72
	(100)	(83.26)	(62.42)	(49.9)	(78.49)	(94.85)	(92.61)	(76.22)
Malaysia	5.26	5.26	0	9.94	3.45	10.34	6.06	9.67
	(100)	(100)		(5.84)	(88.99)	(98.16)	(54.79)	(92.55)
The	0	7.69	6.74	8.99	2.03	14.72	18.07	22.49
Philippines		(100)	(100)	(100)	(50.25)	(96.54)	(97.79)	(91.06)
Taiwan	0	0	2.84	4.55	1.08	10.13	2.16	14.54
			(100)	(100)	(39.81)	(100)	(81.02)	(85.08)
Thailand	----	----	1.43	5.71	15.48	9.79	3.53	3.04
			(0)	(75.13)	(82.75)	(81.82)	(95.47)	(73.68)

Table 5: Estimated Results of the Constructed Asset Pricing Model

Large Portfolio Estimates

Panel A: conditional mean parameter estimates

$$r_{i,t} = \beta_{i,0} + (1 - D_{c,t})\beta_{i,1} r_{h,t} + D_{c,t}(\beta_{i,w} r_{w,t} + \beta_{i,h}\varepsilon_{ht}) + (\beta_{i,x} + D_{x,t}\beta_{i,r}) r_{x,t} + u_{i,t}$$

Market	β_0	β_1	β_w	β_h	β_x	β_r	Adj. R^2
Indonesia	-0.295	----	1.029*	1.006*	0.186	0.146	0.919
Korea	-0.153	0.911*	1.416*	0.948*	0.116	-0.081	0.77
Malaysia	0.012	0.949*	0.827*	0.94*	0.218	0.072	0.849
The Philippines	0.46	0.841*	1.106*	0.772*	0.205	0.255	0.76
Taiwan	0.232	1.139*	0.925*	0.992*	-0.306	0.309	0.905
Thailand	0.273*	0.672	0.993*	0.855*	0.149	0.245*	0.813

Panel B: conditional variance parameter estimates

$$\sigma_{i,t}^{\ 2} = \alpha_{i,0} + \alpha_{i,1} u_{i,t}^{\ 2} + \alpha_{i,2}\sigma_{i,t-1}^{\ 2}$$

Market	α_0	α_1	α_2
Indonesia	0.851*	0.261*	0.679*
Korea	0.355*	0.241*	0.76*
Malaysia	0.131*	0.25*	0.748*
The Philippines	2.664*	0.346*	0.604*
Taiwan	0.276*	0.245*	0.745*
Thailand	3.704*	1.696*	-0.014

* denote statistical significance at the 5% level.

Small Portfolio estimates

Panel A: conditional mean parameter estimates

$$r_{i,t} = \beta_{i,0} + (1 - D_{c,t})\beta_{i,1} r_{h,t} + D_{c,t}(\beta_{i,w} r_{w,t} + \beta_{i,h}\varepsilon_{ht}) + (\beta_{i,x} + D_{x,t}\beta_{i,r}) r_{x,t} + u_{i,t}$$

Market	β_0	β_1	β_w	β_h	β_x	β_r	Adj. R^2
Indonesia	0.045	----	0.693*	0.731*	0.344	-0.032	0.582
Korea	0.62	0.656*	1.185*	0.979*	1.17*	-1.194*	0.399
Malaysia	1.006*	0.788*	1.088*	1.248*	-0.345	0.811*	0.542
The Philippines	2.7	0.5	0.444	0.112	1.836	-0.451	0.125
Taiwan	-0.094	1.485*	0.383*	0.82*	1.289*	-1.311	0.665
Thailand	0.69	1.169*	0.565*	0.548*	0.965*	-0.717*	0.538

Panel B: conditional variance parameter estimates

$$\sigma_{i,t}^{\ 2} = \alpha_{i,0} + \alpha_{i,1} u_{i,t}^{\ 2} + \alpha_{i,2}\sigma_{i,t-1}^{\ 2}$$

Market	α_0	α_1	α_2
Indonesia	6.427*	0.411*	0.514*
Korea	10.908*	0.365*	0.533*
Malaysia	1.511	0.081*	0.896*
The Philippines	93.081	-0.011	0.578
Taiwan	1.09	0.029	0.935*
Thailand	16.307*	0.438*	0.098

* denote statistical significance at the 5% level.