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Are Insurance Firms Exposed to Foreign Exchange Rate Fluctuations? Evidence from Insurers in the Asia-Pacific*

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Abstract

This study investigates the hypothesis that publicly traded insurance companies in the Asia-Pacific region are exposed to foreign exchange rate fluctuation. Despite the fact that the insurers in the sample are mostly domestic firms, the results show that the exchange rate exposure of many insurance firms in the sample is statistically significant. Empirical evidence also reveals that the relation between stock returns and foreign exchange rates differs systematically across nations. Further, the extent to which an insurer is exposed to exchange rate fluctuations is related to variables that are proxies for hedging activities. It is documented that large insurers tend to have low foreign exchange exposure. There is also a negative relation between dividend payout and foreign exchange exposure. Financial leverage is positively related to exchange rate exposure. The finding represents the first empirical evidence of the effect of foreign exchange rate movements on risk and valuation of insurance firms in the Asia- Pacific.

Keywords: Foreign Exchange Exposure, Insurance, Asia-Pacific

1. Introduction

It is commonly believed that exchange rate fluctuations affect current and future expected cash flows of multinational corporations. Furthermore, exchange rate movements should also have an impact on the firm's discount rate which, in turn, affects its valuation. Thus, measurement of foreign exchange exposure for companies has been brought to the fore, yet empirical results remain mixed and challenging to interpret (Pritamani, Shome, and Singal, 2004). At best, only weak evidence exists from empirical studies examining the link between foreign exchange rate movements and firm value among non-financial firms in the US (Jorion, 1990; Bodnar and Gentry, 1993; Chow, Lee and Slot, 1997; Domingez and Tesar, 2003). The weak results may be explained by the use of currency derivatives among US firms. Géczy, Minton and Schrand (1997) find that firms with potentially more exchange rate exposure tend to use more currency derivatives. To check the robustness of results observed among US firms, He and Ng (1998) examine foreign exchange rate exposure among multinational firms in Japan. They find that about 25 percent of Japanese firms in their sample exhibit economically significant foreign exchange exposure during 1979-1993. Although empirical evidence is quite weak among US firms, a number of empirical studies have also documented significant foreign exchange exposure among firms around the world (e.g., Chang, 2002; Chue and Cook, 2004; Kiymaz, 2003; Nguyen and Faff, 2003).

These same empirical questions have not yet been investigated for insurance firms. As of late, insurance firms in the Asia-Pacific are increasingly global in both operations and the types of investments made. In March 1999, for example, the Monetary Authority of Singapore increased the foreign asset limit for insurance firms to 30 percent from 20 percent. In August 2004, the China Insurance Regulatory Commission began to allow qualified insurance companies to invest their foreign exchange funds in overseas bond markets. Further, the Thai government, which imposed a series of exchange-control measures after the 1997 economic crisis, recently announced that it would also ease currency restrictions to promote investment abroad and offer alternative investment opportunities for Thai financial institutions. Following these recent trends, Asian insurers have been moving their investments to foreign markets in a bid to increase investment yield and achieve better diversification. The major implication from this trend is that insurance companies in Asia now actively engage in foreign currency transactions, making exchange rates a major source of uncertainty for these insurance firms.

As noted by He and Ng (1998), the presence of significant international operations leads to exchange rate exposure for non-financial firms. With emerging international transactions, insurance companies are no exception. Cross-sectional variation in the stock returns of insurers can be impacted by movements in foreign currencies. If so, the present value of future cash flows for insurance companies is exposed to another major source of uncertainties. However, if the insurers hedge a foreign currency risk completely (either by cash-flow matching or by using financial instruments), they should have no exchange rate exposure left.

Hence, the objective of this study is to investigate the relation between stock returns and exchange rate movements of insurance firms listed in the stock exchanges around the Asia-Pacific region. To date, a number of empirical studies have examined the foreign exchange exposure of non-financial firms. However, no study has yet investigated insurance companies. It is possible that the exchange rate exposure among insurance companies is not statistically significant because insurers must contend with foreign investment limits that have been imposed by regulators. Investment restrictions often mean that insurers can choose from only a limited selection of investment opportunities, which are frequently mandated to be exclusively domestic investments. Further, it is easy to imagine that insurance firms would have little foreign exchange exposure as funds collected and claims paid are largely transactions with domestic policyholders.

Despite of the importance of measuring the foreign exchange exposure of insurance companies, it is quite difficult to assess the degree to which foreign exchange fluctuations affect insurance firms. This study employs a unique sample of insurance companies that are listed on the stock exchanges in the Asia-Pacific region which, in turn, allows an examination of foreign exchange exposure with an established methodology used in the finance literature. The foreign exchange rate exposure is measured by the regression coefficient of the change in firm value on the change in the exchange rate, after controlling for the change in domestic market returns. Lastly, this study examines variables that are possible determinants of exchange rate exposure. We find that many insurance firms in the sample have exchange rate exposure and that the exchange rate exposure is related to certain firm characteristics corresponding to the hedging incentives. The finding from this study should have important implications for managers in making hedging decisions and regulators in setting regulations.

This paper is organized as follows. Section 2 reviews the existing literature on exchange rate exposure. The hypothesized economic exposure for insurance companies and the measurements of foreign exchange rate exposure and their

determinants are identified in Section 3. Data are described in Section 4. Section 5. presents the empirical results and Section 6 concludes the paper.

2. Literature Review

It is well documented in the finance literature that exchange rates affect firm valuation. Jorion (1990) examines the relation of exchange rates and the values of US multinationals.[1] The results show that exchange rate exposure is positively correlated with the degree of foreign involvement measured by the ratio of foreign to total sales. Yet, a weak link between changes in the value of the US dollar and US stock returns is documented. For robustness, Jorion (1991) employs multifactor asset pricing models to further examine the currency exposure of US industries to movement in the value of the dollar. Using an orthogonal component of innovations in a trade-weighted multilateral exchange rate in the Arbitrage Pricing Theory framework, the results reveal that the currency risk premium coefficient is economically small and statistically insignificant. Jorion (1991) concludes that US stock investors do not price foreign exchange rate risk. Exchange rate risk is perhaps diversifiable or can be hedged and thus may not affect the firm's value through the changing cost of capital as conventionally hypothesized.

A weak relation between exchange rates and stock returns of US multinationals was commonly found in subsequent studies as well. For instance, Amihud (1994) studies 32 large US exporters and finds little evidence of exchange rate exposure among firms in the sample. Bartov and Bodnar (1994) face the same evidence and thus offer the explanation that the lack of evidence on contemporaneous exchange rate exposure is due to the lagged responses to exchange rate changes. Pritamani, Shome, and Singal (2004) propose a dual effect hypothesis to explain weak results documented by the literature. Specifically, they posit that firms are affected by both the domestic economy and foreign markets. These two effects offset each, other resulting in the contradicting empirical results documented in the literature.

With a weak casual relation between exchange rates and stock returns of US multinationals, He and Ng (1998) look for the presence of exchange rate exposures in Japanese firms. They contend that the higher a Japanese firm's international activities, the greater the foreign currency exposure. However, the perceived exposure may be minimal if firms engage in hedging. They thus hypothesize that exchange rate variations can be explained by international business activities and proxy variables for

[1] Jorion (1990) extends the foreign exchange works of Dumas (1978), Adler and Dumas (1980, 1984), and Hodder (1982).

hedging activities. In their study, He and Ng (1998) find that a quarter of sampled Japanese multinational firms' stock returns exhibit significant and positive currency exposures. The authors continue investigating and note that the observed exposure can be explained by the export ratio and by variables representing hedging incentives. Following He and Ng (1998), several studies attempt to examine the relation between firm value and exchange rate exposure under different settings. Chow and Chen (1998) examine the exchange rate exposures of Japanese firms and their determinants over different time horizons. They find that firms with low financial leverage, low liquidity, and high cash dividends tend to have high exposures to exchange rate fluctuations.

To proxy for firms' foreign activities, Jorion (1990) and Allayannis (1997) suggest that US firms' exchange rate exposures are related to the proportion of foreign sales to total sales and the level of exports and imports, respectively. The functional proxies for hedging incentives investigated by He and Ng (1998) are as follows. First, Nance, Smith and Smithson (1993) posit that firm size can be used to price economies of scale in hedging. However, the association of firm size and exchange rate exposure cannot be *a priori* determined. Warner (1977) suggests that while larger firms may have economies of scale in hedging, smaller firms may have greater incentives to hedge since they face greater bankruptcy risk. Second, Froot, Scharfstein, and Stein (1993) and Nance, Smith and Smithson (1993) contend that the expected costs of financial distress can be mitigated by preserving a high liquidity position, implying relatively less hedging incentives and high exposures. The quick ratio and the dividend payout ratio can thus be used to proxy for a level of liquidity. For example, a high quick ratio or a low dividend payout provides a signal for high liquidity reserve on a firm's balance sheet. Third, Froot, Scharfstein and Stein (1993) suggest that the costs of underinvestment due to costly external financing and firms' dependence on it can be mitigated by hedging. Geczy, Minton, and Schrand (1997) thus suggest the book-to-market value of equity as a proxy for a firm's growth opportunities. The rationale is that the lower the book value to market value (book-to-market) ratio, the greater the hedging incentives. Finally, Smith and Stulz (1985) state that hedging transactions can lower expected costs of financial distress. Firms with higher levels of debt tend to have higher bankruptcy probability and thus have greater incentives to hedge, which in turn lowers the degree of foreign currency exposure. The long-term debt ratio can be used as a proxy for financial distress as a result.

There is ample evidence of foreign exchange exposure in international markets. For example, Chang (2002) examines industry-level currency risk of firms in the Taiwan Stock Exchange (TSE) around the Asian financial crisis and finds that export-oriented industries have positive returns when the Taiwanese dollar depreciates,

consistent with a conventional macroeconomic view. Chang (2002) also finds that exchange rate risk is less for larger firms listed in the TSE than for smaller firms traded over the counter in the same industries. Crabb (2002) offers financial hedging activities using foreign currency derivatives (FCDs) as an explanation for the lack of significant foreign exchange exposure found in studies of US multinational firms. Using a sample of US multinationals during 1992-1996, Crabb (2002) finds that currency hedging, defined as the ratio of nominal FCDs to total assets, mitigates foreign exchange exposure of the firms. Kiymaz (2003) supplies additional evidence of foreign exchange exposure by examining Turkish firms listed in the Istanbul Stock Exchange during a highly inflationary economy from 1991 to 1998. The results show that Turkish firms are exposed to currency risk, yet the exposure declines after the currency crisis on April 1994. Nguyen and Faff (2003) look at foreign currency derivatives as a tool to alleviate foreign exchange exposure of Australian firms for the period 1997-1999 and find that Australian firms are exposed to foreign exchange rate fluctuations which, in the long run, are a function of firm size and financial hedging. Fraser and Pantzalis (2004) postulate that foreign exchange exposure is dependent upon the type of foreign exchange rate index used. They thus formulate a firm-specific exchange rate index based on each company's geographic network of foreign subsidiaries to account for the unique operating characteristics of each firm. The study concludes that both the magnitude and sign of the currency exposure found are dependent on the selection of a foreign change rate index. However, the findings of the determinants of the exposure are inconclusive. The analysis of the network structure variables on the magnitude of the exposure shows that only the percent of foreign subsidiaries has explanatory power.

3. Foreign Exchange Exposure of Insurance Firms

A. Hypotheses

The main hypothesis to be tested is whether publicly listed insurance companies in Asia-Pacific are exposed to foreign exchange rate fluctuation. Thus far, the literature has established the presence of foreign exchange exposure for non-financial firms and a relation with the international business activities and firm characteristics. Although most manufacturing firms in the Asia-Pacific have substantial foreign transactions, most insurance companies in this sample (with the exception of Japan) are largely domestic firms with high concentrations of domestic underwriting activities. Therefore, it is possible that these insurers are not exposed to foreign exchange rate fluctuations. However, the degree to which the present value of future

cash flows is influenced by foreign exchange movements, the so-called *economic exposure,* may be quite strong. Insurance companies could be no than non-insurance companies in terms of exposure to foreign exchange movements. For instance, when a local currency appreciates, the interest received from an insurer's foreign investments can have a significant impact not only on the transaction exposure due to a currency conversion but also on the insurance firm's cash flows and future investment policy. Yet, the impact of local currency appreciation (or depreciation) on an insurance firm's net cash flows depends on the relative magnitude of the inflow and outflow transactions and cannot be determined *priori*.

It is thus the intent of this study to empirically investigate the impact of exchange rate fluctuations on stock returns of insurance firms in the Asia-Pacific region. To measure the economic exposure to exchange rates of insurance companies, the estimation method used in this study follows that used in He and Ng (1998) and Pritamani, Shome, and Singal (2004) as follows:

$$R_{it} = \beta_{io} + \beta_{ix} R_{xt} + \beta_{im} R_{mt} + \varepsilon_{it} \quad (1)$$

where R_{it} is the rate of return on the ith company's stock, R_{xt} is changes in the foreign currency, R_{mt} is the rate of return on the market index, and ε_{it} is an error term. The data for this regression model are taken from *Datastream*. Our study spans two years, 2002 and 2003. For each year, we use five years' worth of monthly individual company returns to estimate Equation (1). For example, to find the value of R_{it} for 2002, we use monthly stock and market return data spanning January 1999 to December 2002. The estimation period for 2003 would be January 2000 to December 2003.[2] The market return for each country is represented by the return of each country's most widely-used market index.

The foreign currency exposure is estimated by calculating the monthly currency portfolio return of the local currency against two of the most common foreign currencies: US dollar and Euro. The currency returns are calculated using the month-end price of each foreign currency as quoted in local currency. For example, if in one month the Thai baht appreciates from 55 baht to 43 baht per US dollar, the monthly baht to dollar currency return would be negative. The composite currency return for each month is the simple average of the monthly currency return of each currency against the US dollar and the Euro. Monthly currency returns are calculated for a five-year period from January 1999 to December 2003.

The important results of equation (1) are the values of β_{ix} for each stock as well as β_{im}, the measure of systematic risk for each stock. After calculating the values

of β_{ix} and β_{im} for each insurance company, the average foreign exchange exposure coefficients will be calculated for each country. The regression coefficient β_{ix} will suggest how movements in the foreign currency affect the value of an insurance firm. The value of β_{im} will also indicate how the value of an insurance firm responds to a market condition. If insurance companies in the Asia-Pacific region are not exposed to foreign exchange fluctuations, the coefficient, β_{ix}, will not be statistically different from zero (H_0: $\beta_{ix} = 0$). On other hand, if foreign exchange fluctuations affect stock returns on insurance companies in Asia-Pacific, the coefficient, β_{ix}, will be statistically different from zero(H_a: $\beta_{ix} \neq 0$). The signs will also indicate the direction of the impact of foreign exchange fluctuations on insurers' stock returns in respective country.

B. Foreign Exchange Exposure and Firm Characteristics

If insurance firms in Asia-Pacific are exposed to foreign exchange rate fluctuation, then the next logical step is to examine whether the exposure is related to specific firm characteristics. Previous studies have documented that certain firm specific characteristics explain the variation in exchange rate exposure of non-financial firms (Géczy, Minton, Schrand, 1997; He and Ng, 1998). This study employs similar underlying theoretical concepts with a slight modification to accommodate a specific nature of insurance companies. This exploratory investigation is achieved in the following regression model:

$$FX_i = \beta_0 + \beta_1 MKT_i + \beta_2 LEVER_i + \beta_3 LEVER2_i + \beta_4 LIQUID_i + \beta_5 SIZE_i + \beta_6 PAYOUT_i + \beta_7 MKBK_i + \varepsilon_i \quad (2)$$

The dependent variable in this regression is the absolute foreign exchange exposure for each insurer. This variable, FX, is obtained from, β_{ix}, estimated in equation (1). The independent variables used in the regression analyses are proposed determinants of exchange rate exposure and are proxies for the optimal hedging incentives. MKT measures the systematic risk of the insurer and is calculated from a cross-sectional regression of individual firms' monthly returns with the respective domestic market indices during 1999-2003. MKT is included to control for cross-sectional variations of the equity risk factor among firms from various countries. It is

[2] For a given year in the sample, we estimate Equation (1) for each of the 68 firms in the sample, using a total of 60 observations for each firm to estimate the coefficients. In a given month in the estimation window, the value of R_{it}, the rate of return on the *i*th company's stock, will be different for each company. The value of R_{mt}, the rate of return on the market index, will be the same for all firms in a given country.

hypothesized that companies with high systematic risk have more incentives to hedge which in turn leads to low foreign exchange exposure.

Two leverage measures are used as proxies for financial risk: LEVER1 and LEVER2. LEVER1 is total debt divided by total assets, where total debt (as tabulated and reported by Datastream) is the sum of long-term and short-term liabilities and represents all interest-bearing obligations including capitalized leases. Smith and Stulz (1985) suggest that highly levered firms should have a greater incentive to hedge to avoid the costs of bankruptcy (or to maximize the firm value). Corporate hedging would in turn mitigate the foreign exchange exposure of the firm's cash flows. The end result is a predicted negative relation between financial leverage and foreign exchange exposure.[3] For insurance firms, there is another type of liability resulting from the insurance underwriting business. This factor is captured by LEVER2, which is calculated as the sum of benefit and loss reserves, unearned premiums, policy and contract claims and other reserves divided by total assets. For the insurers in the sample, the main sources of these liabilities are mostly domestic. However, it is possible that some insurance firms underwrite business overseas which, in turn, leads to exposure to foreign exchange rate fluctuations.

LIQUID is a measure of firm liquidity, calculated by dividing cash holdings and equivalents (but excluding short-term investments) by total assets. PAYOUT is the dividend payout ratio, which is the ratio of dividends per share to earnings per share, expressed as a percentage. Both LIQUID and PAYOUT are used as proxies for a firm's short-term liquidity.[4] The greater the firm's liquidity and the lower the dividend payout, the lower the hedging incentive the firms have. Thus, firms with higher levels of short-term liquidity are in a better position to endure fluctuations in foreign exchange rates, resulting in more foreign exchange exposure.[5]

Two measures to control for firm size are used: SIZE1 is the logarithm of total assets while SIZE2 is the logarithm of total premium income. As tabulated by *Datastream,* total income for insurance companies includes net premiums earned and any other underwriting/trading income. The effects of firm size on exchange rate exposure are twofold. Since hedging is costly, large firms possess greater resources to

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[3] He and Ng (1998) and Chow and Chen (1998) observe a negative relation between financial leverage and foreign exchange exposure among Japanese manufacturing firms.

[4] Nance, Smith and Smithson (1993) suggest that firms can reduce the odds of bankruptcy and agency costs of debt by maintaining sufficiently high short-term liquidity.

[5] Consistent with the rationale, He and Ng (1998) and Chow and Chen (1998) document a positive relation with foreign exchange exposure and firm liquidity and a negative relation with foreign exchange exposure and dividend payout.

implement hedging. Large firms should have a greater incentive to hedge to reduce foreign exchange exposure.[6] However, if hedging costs are proportional to firm size, smaller firms are more likely to hedge since the benefits of lower expected bankruptcy costs are relatively high for them. Consequently, the association between firm size and foreign exchange exposure is thus an empirical question.[7]

MKBK is the market-to-book ratio. It is used as a proxy for growth options in the firm's investment opportunities as suggested by Géczy, Minton, and Schrand (1997) and He and Ng (1998). To mitigate the underinvestment problem resulting from the interaction of potential growth opportunities and costly external financing, a firm is likely to hedge its cash flows to minimize the dependence on external funding. Thus, the higher the growth opportunities, the greater a firm's incentive to hedge its cash flows to minimize the underinvestment costs. The foreign exchange exposure for high MKBK firms would be small as a result.[8]

Finally, a year dummy variable is included to capture whether the degrees of foreign exchange exposure differ across time. A country dummy variable is also incorporated in the analysis to control for different institutional settings for different countries.

To sum up, the null hypothesis is that none of the explanatory variable are significantly related to the foreign exchange exposure coefficients. If this is not the case, a significant explanatory power for the model will provide empirical support to the notion that firm specific characteristics are related to foreign exchange exposure.

4. Data

The sample consists of public insurance companies from the Asia-Pacific region. Initially, the sample dataset covered spanned over one hundred firms in 13 countries, but there were no listed insurance firms in India or the Philippines. In order to be included in the sample dataset, insurance must be the firm's main line of business and the firm must have financial data available for the full two-year sample period of 2002-2003. Reinsurance companies, insurance brokers, and diversified financial

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[6] Nance, Smith and Smithson (1993) argue that firm size can be used to proxy for economies of scale in hedging.

[7] He and Ng (1998) find a positive relation between firm size and foreign exchange exposure, whereas Chow and Chen (1998) observe a negative relation with firm size.

[8] Chow and Chen (1998) also document a negative relation between growth opportunities and foreign exchange exposure among manufacturing firms in Japan. It is hypothesized that the rationale should also be applicable to insurance companies.

services companies were removed from the sample. Any firm listed in two countries (cross-listed) was also excluded. After the above exclusions and adjustments for missing data, the sample size was reduced to 68 firms. Table 1 shows the companies and their respective countries included in the study.

Table 1 Insurer List and Countries of Origin

	Public Insurance Firms in Datastream Database	Firms Included in Study	Market Index
Thailand	19	19	Stock Exchange of Thailand (SET) Index
Hong Kong	4	1	Hang Seng Index
Indonesia	11	10	Jakarta SE Composite
Japan	9	7	Nikkei 225
Korea	10	10	Korea SE Composite (KOSPI)
Malaysia	8	8	KLSE Composite
Philippines	0	0	- - -
Singapore	3	2	Straits Times Index
Taiwan	7	3	Taiwan SE Composite
Australia	4	4	ASX All Ordinaries
New Zealand	1	1	NZ Stock Exchange (NZSX)
India	0	0	- - -
Pakistan	28	3	Karachi SE 100
	104	68	

Thailand
Ayudhya Insurance
Bangkok Ins.
Bangkok Union Ins.
Charan Insurance
Deves Insurance
Dhipaya
Indara Insurance
Interlife Asurance
Nam Seng Insurance
Navakij Insurance
Phatra Insurance
Safety Insurance
Samaggi Insurance
Siam Coml. New York
Syn Mun Kong
Thai Coml. Insurance
Thai Insurance
Thai Setakij Ins.
Thaivivat Insurance

Hong Kong
China Life Insurance 'H'

Indonesia
Ahap Insurance
Asuransi Bina Dana Artha
Asuransi Bintang
Asuransi Dayin Mitra
Asuransi Ramayana
Lippo E Net
Lippo General Ins.
Panin Insurance
Panin Life
Pool Advista Indo.

Japan
Aioi Insurance Company
Fuji Fire & Marine Ins.
Mitsui Sumitomo In.
Nipponkoa Insurance
Nisshin Fire & Mar.Ins.
Nissay Dowa Gen. Ins.
Sompo Japan Insurance

South Korea
Daehan Fire & Mar. Ins.
Dongbu Insurances
First Fire & Marine Ins.
Green Fire & Mar. Ins.
Hyundai Marine & Fire In.
Lg Insurance
Orntl. Fire & Mar. Ins.
Samsung Fire & Mar. Ins.
Shin Dong-Ah Fire
Ssangyong F & M Ins.

Malaysia
Allianz Gen.In.Mal.
John Hancock Lf. Ins.
Jerneh Asia
Lpi Capital
Maa Holdings
Mni Holdings
Pacific & Orient
Syarikat Takaful Mal.

Singapore
United Overseas Ins.
Great Eastern Hdg.

Taiwan
Union Insurance
China Life Insurance
Taiwan Life Insurance

Australia
Amp
Axa Asia Pacific Hdg.
Insurance Aus. Group
Qbe Insurance Group

New Zealand
Tower

Pakistan
Adamjee Insurance
American Life Insurance
Century Insurance

The study spans two years, 2002 and 2003, and the pooled sample includes both life and non-life insurance firms. No attempt was made to classify the firms by line of business. In addition to monthly foreign currency data and monthly stock returns, annual company financial data are retrieved from *Datastream,* published by Thomson Financial.

5. Empirical Results

Table 2 presents descriptive statistics of both the exchange rate exposure coefficient and market return or systematic risk of the firms classified by country. The arithmetic means with the t-statistics, standard deviations, median, maximum, and minimum values are shown for foreign exchange exposure coefficients of insurance companies in all eleven countries. For the exchange rate exposure variable, FX, descriptive statistics are shown individually for both sample years (2002 and 2003) as well as a pooled sample. When examining the pooled sample results by individual country, the coefficients of the exchange rate variable show mixed results. The coefficients of FX are not statistically different from zero for insurance firms in Japan, Pakistan, and Singapore. Though the coefficients are statistically significant and different from zero for insurers in Hong Kong and New Zealand, the sample sizes for these countries are quite small so the results from these nations should be viewed cautiously. Most importantly, the coefficients of the exchange rate exposure variable are positive; the difference from zero is statistically significant for insurance companies from Australia, Indonesia, South Korea, Malaysia, and Thailand. Interestingly, the average coefficient is negative and statistically significant at conventional levels for Taiwanese insurers. Overall, the finding indicates that depreciation in the local currency against the US dollar and Euro is correlated with positive stock price performance of several insurance companies in Australia, Indonesia, South Korea, Malaysia, and Thailand. The opposite is found among Taiwanese insurers.

The positive signs of foreign exchange exposure indicate that a depreciation (appreciation) of the domestic currency against the US dollar and the Euro has a positive (negative) impact on stock returns of insurance companies. This implies that insurance firms benefit from currency depreciation because their overseas investments generate additional returns from currency transaction. When a currency appreciates, returns from overseas investments lose value. The reverse is true for insurers that have negative signs of foreign exchange exposure. Although the signs are not the same, the magnitude indicates that currency fluctuations do affect firm valuation among publicly listed insurance companies in the Asia-Pacific region. In summary, there is some supporting empirical evidence to the notion that foreign exchange rate fluctuations affect returns of insurance companies.

Table 2 Descriptive Statistics for the Foreign Exchange Risk Proxy and Market Return Variables, by Country

This table presents descriptive statistics for the foreign exchange risk proxy and market return variables used in the regression models. The sample consists of insurance firms from 11 countries during 2002-2003: Australia, Hong Kong, Indonesia, Japan, South Korea, Malaysia, New Zealand, Pakistan, Singapore, Taiwan and Thailand. Currency return and financial data are obtained from *Datastream,* published by Thomson Financial. FX and MKT are β_{ix} and β_{im} estimated from the equation: $R_{it} = \beta_{io} + \beta_{ix} R_{xt} + \beta_{im} R_{mt} + \varepsilon_{it}$, where R_{mt} is the rate of return of the market index and R_{xt} is the rate of return on a foreign currency portfolio. The t-statistic is for the null hypothesis of H_0: $\beta_{ix} = 0$.

	Australia			Hong Kong			Indonesia			Japan		
	2002	2003	Pooled	2002	2003	Pooled	2002	2003	Pooled	2002	2003	Pooled
FX												
Mean	0.397	0.280	0.338	-1.878	-0.796	-1.337	0.129	0.302	0.220	-0.084	0.100	0.008
Std Dev	0.352	0.857	0.610			0.765	0.416	0.431	0.421	0.245	0.492	0.386
t-statistic	2.256	0.653	1.569			-2.470	0.930	2.214	2.275	-0.910	0.539	0.078
Median	0.520	0.510	0.520			-1.337	0.079	0.361	0.121	-0.154	0.329	-0.035
Maximum	0.664	0.996	0.996			-0.796	1.023	0.818	1.023	0.333	0.634	0.634
Minimum	-0.115	-0.898	-0.898			-1.878	-0.486	-0.407	-0.486	-0.377	-0.590	-0.590
Sample size	4	4	8	1	1	2	9	10	19	7	7	14
MKT												
Mean			1.111			1.128			0.836			0.342
Std Dev			0.692			0.368			0.679			0.231
Median			0.792			1.128			0.628			0.323
Maximum			2.136			1.388			2.126			0.684
Minimum			0.588			0.868			-0.043			-0.137

Table 2 Descriptive Statistics for the Foreign Exchange Risk Proxy and Market Return Variables, by Country (continued)

This table presents descriptive statistics for the foreign exchange risk proxy and market return variables used in the regression models. The sample consists of insurance firms from 11 countries during 2002-2003: Australia, Hong Kong, Indonesia, Japan, South Korea, Malaysia, New Zealand, Pakistan, Singapore, Taiwan and Thailand. Currency return and financial data are obtained from *Datastream,* published by Thomson Financial. FX and MKT are β_{ix} and β_{im} estimated from the equation: $R_{it} = \beta_{io} + \beta_{ix} R_{xt} + \beta_{im} R_{mt} + \varepsilon_{it}$, where R_{mt} is the rate of return of the market index and R_{xt} is the rate of return on a foreign currency portfolio. The t-statistic is for the null hypothesis of H_0: $\beta_{ix} = 0$.

	South Korea			Malaysia			New Zealand			Pakistan		
	2002	2003	Pooled	2002	2003	Pooled	2002	2003	Pooled	2002	2003	Pooled
FX												
Mean	1.551	0.827	1.189	0.259	0.520	0.389	-1.205	-0.674	-0.939	-0.219	-0.718	-0.468
Std Dev	0.983	1.348	1.207	0.673	0.900	0.779			0.376	1.447	1.710	1.443
t-statistic	4.988	1.939	4.405	1.089	1.634	2.000			-3.537	-0.262	-0.728	-0.795
Median	1.700	0.577	1.257	0.456	0.525	0.457			-0.939	-0.426	-1.038	-0.732
Maximum	3.026	2.834	3.026	0.894	2.189	2.189			-0.674	1.321	1.128	1.321
Minimum	-0.052	-1.827	-1.827	-1.135	-0.575	-1.135			-1.205	-1.551	-2.246	-2.246
Sample size	10	10	20	8	8	16	1	1	2	3	3	6
MKT												
Mean			1.322			0.723			1.340			1.212
Std Dev			0.493			0.362			0.397			0.662
Median			1.440			0.703			1.340			0.848
Maximum			2.192			1.295			1.621			2.130
Minimum			0.377			-0.200			1.059			0.702

Table 2 Descriptive Statistics for the Foreign Exchange Risk Proxy and Market Return Variables, by Country

This table presents descriptive statistics for the foreign exchange risk proxy and market return variables used in the regression models. The sample consists of insurance firms from 11 countries during 2002-2003: Australia, Hong Kong, Indonesia, Japan, South Korea, Malaysia, New Zealand, Pakistan, Singapore, Taiwan and Thailand. Currency return and financial data are obtained from *Datastream,* published by Thomson Financial. FX and MKT are β_{ix} and β_{im} estimated from the equation: $R_{it} = \beta_{io} + \beta_{ix} R_{xt} + \beta_{im} R_{mt} + \varepsilon_{it}$, where R_{mt} is the rate of return of the market index and R_{xt} is the rate of return on a foreign currency portfolio. The t-statistic is for the null hypothesis of H_0: $\beta_{ix} = 0$.

	Singapore			Thailand			Taiwan		
	2002	2003	Pooled	2002	2003	Pooled	2002	2003	Pooled
FX									
Mean	0.950	1.037	0.994	0.403	0.850	0.627	-1.168	-1.432	-1.300
Std Dev	2.206	1.259	1.467	1.499	2.030	1.775	1.130	0.854	0.908
t-statistic	0.609	1.165	1.354	1.171	1.825	2.176	-1.789	-2.905	-3.509
Median	0.950	1.037	1.037	0.704	1.227	0.967	-0.719	-1.724	-1.222
Maximum	2.509	1.927	2.509	2.439	4.784	4.784	-0.331	-0.471	-0.331
Minimum	-0.610	0.147	-0.610	-2.849	-4.748	-4.748	-2.453	-2.102	-2.453
Sample size	2	2	4	19	19	38	3	3	6
MKT									
Mean			0.600			0.083			1.187
Std Dev			0.137			0.347			0.616
Median			0.627			0.099			1.207
Maximum			0.733			1.229			1.874
Minimum			0.411			-0.482			0.225

Table 3 presents descriptive statistics for all variables used in a cross-sectional regression. The average foreign exchange exposure, FX, is 0.36, which is statistically significant different from zero (t-test not shown). The average stock market exposure (market beta) for all firms in the sample is 0.68. The average leverage, as measured by the ratio of total debt to total assets, is about 2%, which is not surprising as insurance firms have little if any debt. The average amount of investment for all firms, as measured by a ratio of total investments in insurance divided by total assets, is 0.69. The average of the liquidity measure (cash holding divided by total assets) is approximately 5%, showing that firms have notable cash positions on average, but this is a relatively small portion of total assets. Two measures of firm size are shown in Table 3: the logarithms of total assets and total income. Across the sample, the average of the first size measure is 17.2, while the average of the total income-based size measure is 16.1. The dividend payout ratio (dividends divided by earnings) shows that firms on average pay about 35% of earning as dividends. Lastly, the average market-to-book ratio for the sample is approximately 1.15.

Table 3 Descriptive Statistics for Variables in Regression Analyses

This table presents descriptive statistics for the variables used in the regression models. The sample consists of insurance firms from 11 countries during 2002-2003: Australia, Hong Kong, Indonesia, Japan, South Korea, Malaysia, New Zealand, Pakistan, Singapore, Taiwan and Thailand. Currency return and financial data are obtained from *Datastream,* published by Thomson Financial. FX and MKT are β_{ix} and β_{im} estimated from the equation: $R_{it} = \beta_{io} + \beta_{ix} R_{xt} + \beta_{im} R_{mt} + \varepsilon_{it}$, where R_{mt} is the rate of return of the market index and R_{xt} is the rate of return on a foreign currency portfolio. LEVER1 is total debt divided by total assets. LEVER2 is the sum of benefit and loss reserves, unearned premiums, policy and contract claims and other reserves divided by total assets. LIQUID is cash holdings divided by total assets. SIZE1 is the natural logarithm of total assets; SIZE2 is the natural logarithm of total income. PAYOUT is the dividend payout ratio, expressed as a percentage. MKBK is the market-to-book ratio, market value of equity divided by book value. The t-statistic value shown in parenthesis is the value to test if $|\beta_{ix}| = 0$ for the variable FX.

Variable	Mean	Standard Deviation	Minimum	Maximum
FX	0.367	1.318	-4.748	4.784
MKT	0.685	0.656	-0.482	2.192
LEVER1	0.022	0.084	0.000	0.886
LEVER2	0.547	0.259	0.001	0.922
LIQUID	0.050	0.071	0.0001	0.662
SIZE1	17.231	3.168	11.981	23.131
SIZE2	16.127	3.350	9.780	22.461
PAYOUT	34.957	28.153	0.000	100.000
MKBK	1.147	0.810	0.070	6.320

Table 4 presents a correlation matrix for all the regression variables. This finding gives a first hint of the relation between exposure to foreign exchange rate fluctuations and other firm characteristics. A formal regression analysis, including control variables for other determinants of foreign exchange exposure, will illuminate the relation more clearly.[9]

Table 4 Correlation Matrix for Variables in Regression Analyses

This table presents the correlation coefficients for the variables used in the regression models. This table presents descriptive statistics for the variables used in the regression models. The sample consists of insurance firms from 11 countries during 2002-2003: Australia, Hong Kong, Indonesia, Japan, South Korea, Malaysia, New Zealand, Pakistan, Singapore, Taiwan and Thailand. Currency return data and financial data are obtained from Datastream, published by Thomson Financial. FX and MKT are β_{ix} and β_{im} estimated from the equation: $R_{it} = b_{io} + b_{ix} R_{xt} + b_{im} R_{mt} + e_{it}$, where R_{mt} is the rate of return of the market index and R_{xt} is the rate of return on a foreign currency portfolio. LEVER1 is total debt divided by total assets. LEVER2 is the sum of benefit and loss reserves, unearned premiums, policy and contract claims and other reserves divided by total assets. LIQUID is cash holdings divided by total assets. SIZE1 is the natural logarithm of total assets. SIZE2 is the natural logarithm of total premium income. PAYOUT is the dividend payout ratio, expressed as a percentage. MKBK is the market-to-book ratio, market value of equity divided by book value. Statistical significance at the 1, 5, and 10 percent levels are denoted by ***, ** and * respectively.

	FX	MKT	LEVER1	LEVER2	LIQUID	SIZE1	SIZE2	PAYOUT	MKBK
FX	1.000								
MKT	-0.048	1.000							
LEVER1	0.061	0.149*	1.000						
LEVER2	0.012	0.272***	-0.119	1.000					
LIQUID	-0.052	0.120	0.651***	0.187**	1.000				
SIZE1	-0.223**	0.410***	0.046	0.393**	0.130	1.000			
SIZE2	-0.176*	0.385***	-0.029	0.393**	0.108	0.981***	1.000		
PAYOUT	-0.155*	-0.287***	-0.064	-0.477***	-0.069	-0.255***	-0.263***	1.000	
MKBK	-0.144*	0.187**	0.511***	0.258**	0.407***	0.069	0.006	-0.082	1.000

[9] The correlation coefficients among variables also indicate the need to check for multicollinearity in the regression analyses. The average variance inflation factor (VIF) was 1.4 for both regression models in Table 5, showing no significant multicollinearity.

Table 5 Regression Results

This table presents the results from least squares regression analyses of foreign exchange exposure for publicly-traded insurance firms in the Asia-Pacific region. The sample consists of insurance firms from 11 countries during 2002-2003: Australia, Hong Kong, Indonesia, Japan, South Korea, Malaysia, New Zealand, Pakistan, Singapore, Taiwan and Thailand. Currency return data and financial data are obtained from *Datastream,* published by Thomson Financial. The dependent variable is FX or foreign exchange exposure, β_{ix}, estimated from the equation: $R_{it} = \beta_{io} + \beta_{ix} R_{xt} + \beta_{im} R_{mt} + \varepsilon_{it}$, where R_{mt} is the rate of return of the market index and R_{xt} is the rate of return on a foreign currency portfolio. LIQUID is cash holdings divided by total assets. LEVER1 is total debt divided by total assets. LEVER2 is the sum of benefit and loss reserves, unearned premiums, policy and contract claims and other reserves divided by total assets. SIZE1 is the natural logarithm of total assets; SIZE2 is the natural logarithm of total income. MKBK is the market-to-book ratio, market value of equity divided by book value. PAYOUT is the dividend payout ratio, expressed as a percentage. MKT is the systematic risk of the stock estimated by β_{im}. Statistical significance at the 1, 5, and 10 percent levels are denoted by ***, ** and * respectively.

Variables	Model (A)	Model (B)
Intercept	2.665*** (5.452)	2.313*** (5.118)
MKT	-0.052 (-0.399)	-0.088 (-0.669)
LEVER1	4.639** (2.345)	4.763** (2.371)
LEVER2	0.326 (0.898)	0.262 (0.715)
LIQUID	-0.714 (-0.427)	-0.486 (-0.287)
SIZE1	-0.083*** (-3.017)	
SIZE2		-0.064** (-2.438)
PAYOUT	-0.005* (-1.690)	-0.005* (-1.716)
MKBK	-0.217* (-1.876)	-0.216* (-1.839)
R^2	0.168	0.148
F-statistic	3.471***	2.967***
N	128	128

Table 5 shows the results of the regression analyses. Though two different models are presented in Panels A and B using different measures of firm size, the results are qualitatively similar and will be discussed simultaneously. Both regressions are also statistically significant at conventional levels with R-square values of approximately 14 and 16 percent. First of all, empirical results show an insignificant negative relation between MKT, stock market exposure (market beta), and foreign exchange exposure.

Several other control variables are statistically significant in the regression models. While the coefficient for liquidity (LIQUID) is not statistically significant in either regression, the coefficients for dividend payout ratio (PAYOUT) are negative and statistically significant. This finding provides partial support for the relation between firm liquidity and the hedging incentive. The coefficients for total debt (LEVER1) are positive and statistically significant at conventional levels in both Models A and B. This result implies that firms with high financial leverage tend to have high foreign exchange exposure. This result is quite surprising in that insurance firms typically have very low levels of financial leverage as the average value of LEVER1 for the entire sample was slightly more than 2 percent of total assets. This finding is not consistent with the findings for non-financial firms in Japan (Chow and Chen, 1998; He and Ng, 1998). The coefficients for total liabilities (LEVER2) are not statistically significant. The reason may be that the sources of these insurance liabilities are mostly domestic. Next, coefficients for both firm size measures (SIZE1 and SIZE2) are negative and statistically significant at conventional levels. This finding is consistent with the finding of Chow and Chen (1998), but in conflict with the finding of He and Ng (1998). The coefficients for market-to-book ratio (MKBK) are negative and statistically significant in both regression models. This finding is consistent with those for manufacturing firms in the US (Géczy, Minton, and Schrand, 1997) and Japan (Chow and Chen, 1998; He and Ng, 1998). The year dummy variables are not statistically significant in either regression.

In conclusion, the empirical findings from this study represent the first empirical evidence in support of the notion that insurance firms are susceptible to foreign exchange rate fluctuations. The results also reveal that some of the firm characteristics related to incentives for hedging activities are also related to foreign exchange exposure of insurance companies in the sample.

6. Conclusions

It is widely believed that exchange rates affect a firm's cash flows and its valuation. Consequently, the estimation of a firm's foreign exchange exposure

becomes critical for investors and managers. Numerous studies have attempted to examine the foreign exchange exposure among non-financial firms worldwide. For insurance firms, exchange rates also have become a major source of uncertainty due to an increase in foreign portfolio investment activities. However, it is quite difficult to estimate the foreign exchange exposure of insurance companies. This study employs a unique sample of public insurers listed on stock exchanges in the Asia-Pacific region. The fact that shares of these insurers are publicly traded provides a unique opportunity to empirically examine the foreign exchange exposures of these insurers with an established methodology used in the finance literature. In this study, the empirical investigation reveals the presence of foreign currency exposures of publicly-traded insurance companies in the Asia-Pacific region. Specifically, insurance companies in five out of 11 markets studied exhibit a positive and statistically significant exposure to foreign exchange rate movements. Our results are similar to those of non-financial firms studies such as He and Ng (1998), Chow and Chen (1998), among others.

Further, there is a negative relation between firm size and foreign exchange exposure, an outcome that is consistent with several studies (e.g., Nance, Smith and Smithson (1993) and Chow and Chen (1998)). Big firms exhibit lower exposures to foreign exchange rate movements than do their smaller counterparts. Perhaps big firms possess more financial resources to absorb transaction losses should there be any adverse movement in the business-related exchange rates. Second, the empirical analysis suggests a positive association between a proxy variable for financial leverage and foreign exchange exposure. Insurance firms with high levels of financial leverage exhibit a higher degree of exchange rate exposure. This result is contradicted to the corporate hedging theory suggested by Smith and Stulz (1985). Perhaps, a leverage-related hedging theory for non-financial firms cannot be directly applied to insurance firms. Financial companies are known to have a different degree of financial leverage from that of non-financial firms. In this study, an insurance-specific leverage variable, LEVER2, is employed with little success.

This study finds a negative relation between a proxy for short-term liquidity and foreign exchange exposure. Specifically, insurance firms with high dividend payouts tend to have low foreign exchange exposures, a result similar to He and Ng (1998), Chow and Chen (1998). The negative relation indicates that insurance companies with low liquidity may actively manage their foreign exchange exposures through hedging activities compared with insurance firms with low liquidity.

Despite the interesting findings revealed, this study suffers from some notable limitations. First, data availability limits the scope of investigation. To continue along this line of inquiry into the foreign exchange-derived risks borne by insurers, it would

be ideal to have more detailed information about companies included in the sample, such as portfolio holdings and underwritings. For example, much as the extent of the multinational efforts of an industrial company can be gauged by calculating the export ratio, it would be helpful to have a similar measurement for insurance companies. Knowing the percentage of both local and domestic portfolio investments and underwritings could illuminate the extent of foreign currency risk by an insurance company. With more complete information, it should be plausible to make more clear inferences about the underlying sources of foreign exchange exposure of insurers.

Similarly, a complete list of the investment regulations and restrictions would show the barriers faced by insurers operating in each country. Restrictions set by national insurance regulators may limit the types and nationalities of assets that are permitted for investment. Regulators may also impose restrictions on the use of reinsurance or international transfers of assets or cash between affiliated companies.[10] Future studies should focus on the specific rules and regulations with regard to investment and underwriting restrictions.

In summary, this study represents the first attempt to empirically measure the exposure to foreign exchange rate fluctuations among insurance firms in the Asia-Pacific. Overall, the results are consistent with the prevalent foreign exchange exposure hypotheses and previous empirical studies. Insurance companies are not immune to foreign exchange exposure and the resultant risk. This finding highlights the need for managers and investors to accurately measure the foreign exchange exposure of insurance firms. The regulator should also be aware of the impact of currency fluctuations on domestic insurance firms. The study also illuminates several questions that need further examination. For instance, are concerns surrounding exchange rate fluctuations outweighed by the diversification benefits that accrue from holding foreign assets? What is the extent of derivative usage among insurers? Do insurance regulations limiting foreign asset holdings matter at all? And, finally, what should be an effective role of insurance regulatory and supervisory bodies pertaining to international portfolio investment? Further investigation into these areas should provide additional insights. The complex interplay and countervailing forces of the limitations remain a challenge to efforts undertaken to tease out the risks of foreign currency fluctuations. Despite the data limitations, the findings are still significant, indicating the foreign currency exposure and resultant risk are clearly evidence among insurers in the Asia-Pacific.

[10] To accommodate this limitation, one may create a country-specific index based on the degree of the insurance regulations. A scaled variable can then be used in the regression model.

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