

# “Dollar exposure of East Asian firms: new evidence”

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## Dollar exposure of East Asian firms: new evidence

### Abstract

The author emphasizes that multinational firms from East-Asian markets report significant aggregate currency exposures to both the home currency – U.S. dollar real exchange rate and the U.S. dollar real effective value. Moreover, by identifying cash flow exposures, the short-term unlevered and financing cash-flow exposure, in addition to the standard stock price exposure, this paper gives new insights of the actual nature of the U.S. dollar exposure. Currency crises, currency arrangements, and the possible operations of the firms in the United States make up a set of decisive determinants of the aggregate time-varying exposure.

**Keywords:** currency exposure, East Asia, currency arrangements, foreign operations, currency crises.

**JEL Classification:** F23, F31, F33, G15, G32.

### Introduction

Since decades, the U.S. dollar has been the currency of reference for many world monetary and trade transactions. Moreover, many emerging economies are very reluctant, for some reasons, to let their home currency exchange rate be completely determined by market forces. Calvo and Reinhart (2002) termed this unwillingness “the fear of floating”. Many emerging countries fix or adjust the nominal exchange rate of their currency against the American currency. The dollar anchor choice is strengthened by the fact that a significant portion of their external debt is generally denominated in U.S. dollar. China and Malaysia, for instance, officially pegged their currency to the U.S. dollar until 2005. However, beyond official U.S. dollar-pegged economies, the role of U.S. dollar may also be major for exchange rate policies determined in terms of a basket of “representative” currencies. Generally, the effective weight of the U.S. dollar in the composite basket is so high that their policy can be characterized as an implicit peg to the U.S. dollar (Omaga, 2002). Finally, the reference to the U.S. dollar is also important for informal (or *de facto*) pegging regimes. Some emerging markets describe their system as one of a (managed) float, although it seems that *in practice* it is closer to a (crawling) peg to the U.S. dollar (Calvo and Reinhart, 2002; Omaga, 2002). This is particularly true in East Asian countries (except Japan), for which Hernandez and Montiel (2003) and McKinnon and Schnabl (2004) noticed that many currency regimes are very similar in the post- and pre-1997-1998 crisis period, despite the official changes toward floating exchange rates urged by the IMF. Indeed, the volatility of the local currency against the U.S. dollar has again become negligible.

Beyond the outright existence of currency arrangements, another key element to take into account is the nature of this arrangement. Indeed, the fixed (or adjusted) exchange rate may be either overvalued and uncompetitive (as it was the case for Argentina) or undervalued and competitive (as for China or Malaysia). The effects are, therefore, different on the country’s current account and the competitiveness of local products and services.

The potential currency exposure implications of these currency arrangements on firms headquartered in these economies should be analyzed in depth. Many previous studies analyzing the exchange rate exposure focus on firms headquartered in developed countries (e.g., the United States, Western Europe, Australia) and operating abroad, notably in emerging markets. Now the studies are more focused on firms *from* emerging markets. Rossi (2004) analyzes the relationship between the exchange rate regime and exchange rate exposure of non-financial Brazilian companies’ stock price. Rossi finds that the number of Brazilian companies exposed to currency fluctuations is much higher than the one in developed countries. Moreover, the exchange rate regime seems to be an important determinant of the exposure. In a fixed regime, the number of firms exposed is higher. Chue and Cook (2004), who investigate the currency exposure of firms’ stock prices in 15 different emerging markets, find also important country effects that are related to national levels of trade openness, external debt and foreign-exchange reserves. Nevertheless, their sample period (1999-2002) is very short to assess the possible effects of all changes in exchange rate regimes and currency crises. Parsley and Popper (2003) show that Asia-Pacific firms’ stock prices are particularly exposed to fluctuations in the U.S. dollar, and that higher stock price sensitivity occurred during the currency crisis period. Similarly, Phylaktis and Ravazzolo (2004) find that currency risk is priced in Pacific Basin financial markets, concluding that investors should not be discouraged by more flexible ex-

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change rate regimes from investing in emerging markets. Finally, Carrieri et al. (2006) support the hypothesis of significant emerging market currency risk premia related to both emerging and developed equity markets. These authors also notice that the spillover impact is heightened during emerging market crisis episodes, suggesting that it is important to account for this aspect. However, these latter studies are restrained to stock price exposures and skip possible important corporate implications connected to cash flow exposures. Indeed, corporate managers could be more interested in currency exposures of cash flows, since they can significantly affect the appraisal of investment projects, the financing planning of the firm and, the last but not least, the managerial compensation. From this perspective, this study contributes to the literature by including cash flow exposures.

In order to analyze the effects of currency arrangements on the dollar exposure of local corporations and the possible implication for management, we should be very careful in the estimation of the dollar exposure. First of all, we limit our investigations to local firms with foreign activities. Of course, “pure” domestic firms still indirectly face dollar exposure, but we wish, in this study, to examine the possible interactions with the firm’s foreign operations and more specifically, among them, the activities in the United States. Then, we distinguish the effects of the exchange rates on actual operating cash flows and on actual financing cash flows and compare these effects to the impact on stock prices.

To our best knowledge, this paper is the first contribution about the cash flow exposures of firms headquartered in emerging markets, distinguishing between operating and financing cash flows. The operating and financing cash flow exposures can be dramatically different, possibly creating a “natural” hedge against total foreign exchange exposure. This is a possible argument to explain that many firms are found to have no or small foreign exchange exposures (Bartram and Bodnar, 2007).

The remainder of the paper is organized as follows. Section 1 deals with the estimation of the dollar exposure. Section 2 presents the data and methods. Section 3 reports the main empirical results, and the last Section concludes the paper.

## 1. The estimation of the dollar exposure

In order to analyze the effects of currency arrangements on the dollar exposure of multinational firms from emerging markets, we have to estimate properly that exposure. The idea is to assess the effect of changes in exchange rates on the future cash flows of the firm.

Several elements must be taken into account<sup>1</sup>:

- ◆ short-term cash flow vs. stock price exposure;
- ◆ inflation;
- ◆ real value of the dollar;
- ◆ contemporaneous and lagged effects;
- ◆ currency crises and arrangements;
- ◆ control for correlated macroeconomic events;
- ◆ role of operations in the United States.

All these parameters could affect the exchange exposure of the multinational firm. We now briefly discuss them.

**1.1. Short-term cash flow vs. stock price exposure.** Many previous studies focus on the foreign exchange exposure of stock returns, following the specification suggested by Adler & Dumas (1984). However, this market-based approach presents some drawbacks. First, current evidence suggests that managers are focused on the reduction of volatility of corporate cash flows and earnings in using derivatives (Geczy et al., 1997; Benson and Oliver, 2004). In addition, the market may not correctly assess the real effect of exchange rate changes on firm value and cash flows (Bartov and Bodnar, 1994; Chow et al., 1997; Martin and Mauer, 2003). Then, the short-term effect of exchange rate changes, based on the sensitivity of actual short-term cash-flows, is not necessarily in line with the stock price exposure, which is based on the present value of all expected future cash flows of the firm. Bartram (2007) finds that for U.S. firms, cash flow and stock price exposures are significantly different in only 10% of all cases. This may not be true for emerging markets for which currency risk exposures are economically higher and more volatile. In addition, Bartram (2007) does not break down the corporate cash flow. Yet, it is also important to distinguish operating and financing activities, which standard stock price analysis generally bypasses except in the late analysis of the determinants of the estimated exposure. Indeed, the operating and financing cash flow exposures can be dramatically different, possibly creating a “natural” hedge against total foreign exchange exposure.

Following the definitions provided by IAS 7 and FASB ASC Topic 230, the **unlevered cash flow** is the cash flow generated directly by the firm’s real assets and that is discounted for valuation purposes (by taking into account the capital expenditures that the firm requires):

<sup>1</sup> The industry to which the firm belongs may also be an important factor. The main argument behind this statement is that, according to their structures, some sectors are more sensitive to exchange rates than others, especially for highly competitive sectors. Nevertheless, it should be noted that even within the same sector, firms have very different exposure coefficients (Dominguez and Tesar, 2006). In addition, given our data limitations, we do not report a pure sector analysis.

$$NCF = OCF + ICF + Int, \quad (1)$$

where  $NCF$  is the nominal (unlevered) cash flow,  $OCF$  is the operating cash flow,  $ICF$  is the investing cash flow and  $Int$  are the debt interests.

The operating cash flow is computed as follows:

- ♦  $OCF$  = Funds from operating activities (which represents the sum of all non-cash charges and credits added to the net operating income of the firm) + the net change in working capital requirements.
- ♦  $ICF$  = Increase (–) and decrease (+) in investments – net assets from acquisitions – capital expenditures + disposal of fixed assets – additions to other assets + other sources (+) and uses (–) of investing.

The financing activities of the firm can be summarized by the **financing cash flow** (FCF), which is computed as follows:

- ♦  $FCF$  = Net proceeds from sale and issue of common/preferred stocks – cash dividends paid (total common/preferred dividends) – stock repurchases – interests + long-term borrowings – reduction in long-term debt + increase (+) and decrease (–) in short-term debt + other sources (+) and uses (–) of financing.

Martin and Mauer (2003), which use the depreciation-adjusted operating income as cash flow proxy, ignore the investing and financing activities of the firm. In addition, they omitted the net change in working capital requirements in the operating activities of the firm and probably other non-cash charges and credits.

At the same time, a comparison with the standard stock price exposure will also be carried out in the first part of our investigations.

**1.2. Inflation.** Inflation-adjusted exchange rates and cash flows are important, especially for higher volatile emerging markets. Even if there was no longer nominal exposure, these economies would still face real exposure to the U.S. dollar. The local and the U.S. inflation rate are not necessarily similar, so that emerging markets could often report relatively higher inflation pressures. The use of real exchange rates and cash flows seems to be the most reasonable estimation.

Therefore, although the local currency is pegged to the U.S. dollar, the internal and the external purchasing power of the local currency are not equal, leading generally to a deterioration of the competitive position of the firm at home (if it faces foreign

competition) and abroad. The cash flows are deflated by the home currency inflation, namely:

$$\Delta RCF_{t, t-1} = \frac{\Delta NCF_{t, t-1} - I_{t, t-1}}{1 + I_{t, t-1}}, \quad (2)$$

where  $\Delta RCF_{t, t-1}$  is the cash-flow real change from  $t - 1$  to  $t$ ,  $\Delta NCF_{t, t-1}$  the cash flow nominal change and  $I_{t, t-1}$  is the inflation rate. It should be noted that we compute inflation rates from local consumer price indexes, monthly disclosed by IMF. In addition, the inflation rate exactly coincides with the fiscal year of the firm, which does not end necessarily on the December 31.

Changes (%) in real exchange rates  $\Delta RS_{t, t-1}$  can be computed in a similar way, since they represent deviations from the relative purchasing power parity:

$$1 + \Delta RS_{t, t-1} = \frac{(1 + \Delta S_{t, t-1})(1 + I_{t, t-1}^*)}{1 + I_{t, t-1}}, \quad (3)$$

where  $\Delta S_{t, t-1}$  is the change in the nominal exchange rate (expressed in direct quotes), and  $I_{t, t-1}^*$  is the corresponding foreign inflation rate. Inflation differentials can be significant across developed and emerging markets.

**1.3. Real value of the dollar.** Generally, previous analyses focus on the exchange rates of a considered “home” country and some major currencies. Here, since the home currencies are assumed to be somehow dependent on the U.S. dollar, the evolution of the real effective value of the U.S. dollar itself may also play an important (contrasting) role.

The exposure to the U.S. dollar real effective value somewhat presents an opposing effect, compared to the home currency against the U.S. dollar exposure. A real depreciation of the U.S. dollar tends generally to decrease the short-term unlevered cash flow and to increase the short-term financing cash-flow. As usual, currency depreciation has a two-sided effect. A (real) depreciation in the effective value of the U.S. dollar should increase the international competitiveness of products and services denominated in U.S. dollar, all else being equal. On the other hand, it also means an increased competition of the U.S. firms in international markets. Furthermore, the purchasing power of the U.S. dollar abroad declines and can possibly produce harmful inflationary effects. Even if the price of many commodities is denominated in U.S. dollar (as this is the case for oil, for example), it should be noted that the

purchasing power of the oil barrel will be lower. Members of OPEC will probably suffer from a loss of dollar oil revenues resulting from the depreciation of the U.S. dollar and will urge them to increase nominal oil prices, pushing up inflation in the oil-importing countries.

Similarly, a general real depreciation of the U.S. dollar can also affect the financing cash flows. For example, firms could have to borrow more dollars further to the declining purchasing power of the American currency unit.

Therefore, we will also include in our regressions the changes in the effective real value of dollar provided by IMF.

**1.4. Contemporaneous & lagged effects.** Some previous studies dealing with currency exposure only assume contemporaneous effects of exchange rates, although some authors provide evidence that exchange rate changes also affect firm's performance with a lag (Bartov and Bodnar, 1994; Walsh, 1994; Chow et al., 1997; Martin and Mauer, 2003). Therefore, following this literature, we will regress changes in cash flows and stock returns on both current and lagged real exchange rate movements. It is particularly important to form lagged structures if we also want to capture the economic effects of currency changes on the competitive position of the firm.

**1.5. Currency crises and arrangements.** Dramatic currency movements must be included in the analysis, as well as possible changes in the currency regime and arrangements. These events should be taken into account at each country level, since each country experiences specific crises and arrangements, in addition to contagion effects.

We could expect the short-term unlevered cash flow exposure to be positive, while the financing cash flow exposure to be negative. Intuitively, a depreciation of the home currency against the U.S. dollar tends to increase the unlevered cash flow through notably the improvement in the export competitiveness of national products and services. On the other hand, a depreciation of the home currency can lead to a decrease in the financing cash flow, since the burden of the foreign debt service has increased.

However, this general view has to be qualified, according to the considered country and the inflationary pressures possibly brought about by currency crises. As a matter of fact, home currency unlevered cash flow exposure is expected to be positive during non-crisis periods. By contrast, during crisis periods, the exposure could be reversed, suggesting the inflationary dangers for the economic growth. As for the short-term financing cash-flow exposure, we

already mentioned that we could expect to find a negative exposure. Nevertheless, a positive exposure could be expected during currency crises, suggesting that firms have to borrow to meet their interest and other financial ongoing commitments during currency crises. This kind of events can, therefore, reverse the exposures and underlines the need of caution when estimating a currency exposure at a specific period of time. In order to get significant results, crisis and non-crisis periods should therefore be carefully indentified, so that we could successfully test for significant currency exposures in these different periods.

#### **1.6. Control for correlated macroeconomic events.**

Following Jorion (1990) and subsequent papers (e.g., Bodnar and Wong, 2003), an exposure model should ensure that the estimated exposure is not unduly influenced by spuriously correlated macroeconomic events, especially over short horizons. These authors suggest the inclusion of market portfolios as the control from macroeconomic factors. However, consistent with the findings of Bodnar and Wong (2003), we prefer using an indicator such as the change in real Gross Domestic Product (GDP) for checking macroeconomic factors in emerging markets. The inclusion of a market index does not seem really appropriate for emerging markets. One obvious weakness of market-capitalization-based portfolios is the disproportionate weight received by one or two constituents. In addition, the relatively smaller size and diversification of the local market index may also be a sign that it is not a good representative of the national economy<sup>1</sup>.

#### **1.7. The role of operations in the United States.**

The existing literature argues that the international activities of the firm may affect the currency exposure of the firm. However, two contrasting main views may be brought up. On the one hand, we could think that increasing its international involvement may increase its currency exposure. If the firm increases its foreign involvement, we may expect that its performance and its cash flows are more exposed to international competition, and the volume of transactions denominated in foreign currency increases. Doukas et al. (2001) and Dominguez and Tesar (2006), for example, find that the level of international sales is significantly positively associated with exchange rate exposure. However, two objections should be mentioned. First, the dichotomy domestic/foreign is a limited view. The country of destination is particularly important if we focus our analysis on a specific currency. For instance, the exposure to the Chilean currency may be higher if,

<sup>1</sup> Moreover, Chen, Roll and Ross (1986) found that the factors representing the growth rate in GDP, among others, had significant effects on risk premiums.

among the international activities of the firm, some are located in Chile, all else being equal. In this respect, Fraser and Pantzalis (2004) carried out a study using subsidiary-weighted exchange rate indices. Second, we cannot ignore hedging activities. Indeed, there has been some evidence that scale economies exist in hedging foreign exchange exposure (Chow et al., 1997, Bodnar et al., 1998, Martin & Mauer, 2004). Firms with significant activities in a region should be more able to achieve economies of scales and justify the hedging of their exposures to the currency of that region. Furthermore, managers may be more concerned (or/and aware) of the exposure if the firm actually operates in that region. Therefore, we are now interested in investigating whether the possible operations in the United States affect our analysis of the short-term cash flow dollar exposure of multinationals from dollar-pegged economies.

Based on these considerations, our general exposure estimation for each considered emerging market is as follows:

$$\Delta RCF_{is,t-1 \rightarrow t} = \gamma_1 + \gamma_2 \Delta REXC_{s,t-1 \rightarrow t} + \gamma_3 \Delta RUSD_{t-1, \rightarrow t} + \gamma_4 \Delta RGDP_{s,t-1 \rightarrow t} + \mu_s \quad (4)$$

for the contemporaneous effect model and

$$\Delta RCF_{is,t-1 \rightarrow t} = \eta_1 + \eta_2 \Delta REXC_{s,t-2 \rightarrow t-1} + \eta_3 \Delta RUSD_{t-2, \rightarrow t-1} + \eta_4 \Delta RGDP_{s,t-1 \rightarrow t} + \chi_s \quad (5)$$

for the lagged effect model,

where  $\Delta RCF_{is,t-1 \rightarrow t}$  is the percentage change in the real cash flow of the firm  $i$  expressed in home currency  $s$  from  $t-1$  to  $t$ ,  $\Delta REXC_{s,t-2 \rightarrow t-1}$  is the percentage change in the real home currency  $s$  exchange rate against the U.S. dollar from  $t-2$  to  $t-1$ ,  $\Delta RUSD_{t-2, \rightarrow t-1}$  is the percentage change in the real effective value of the U.S. dollar, and  $\Delta RGDP_{s,t-1 \rightarrow t}$  is the percentage change in the real GDP from  $t-1$  to  $t$ .

We then include, for each country, specific year dummies in order to control for both currency crises and arrangements, and dummies accounting for the U.S. operations and the sector of the firm<sup>1</sup>. We therefore carry out analyses on a country aggregate

exposure and not on a particular firm-specific exposure. We want here assess the exposure of a portfolio consisting of all firms together within a country, a kind of “systematic” exposure, given the specific currency arrangements and national monetary policies.

## 2. Sample and data

From 1994 to 2004, we select multinational firms from seven Asian market indices, namely China (Hong-Kong HANG SENG and Taiwan TSEC), India (BSE SENSEX), Indonesia (LQ45), Malaysia (KL composite index), Singapore (SGX) and Thailand (THAI SET). Only firms covered by the main local market index and reporting any international activities in its financial statements, as indicated by the Thomson Worldscope database, were included in the sample. Finally, the resulting sample includes 108 multinational firms. We also collect from the Worldscope database the needed data to compute the unlevered and financing cash flows. Stock prices come from Datastream.

Table 1 summarizes the crises during the sample period of 1994-2004. Based on Table 1, we will specifically include sub-period dummies for each country estimation.

Table 1. Main crises for the East Asian countries included in the sample

1995-2003	
	Crises
China (Hong Kong)	1997-1998: Asian crisis.
China (Taiwan)	1997-1998: Asian crisis.
India	2001: turbulent year (Gujarat earthquake, fear of war with Pakistan). Relatively unaffected by the Asian crisis.
Indonesia	1997-1998: Asian crisis.
Malaysia	1997-1998: Asian crisis.
Singapore	1997-1998: Asian crisis. 2001: recession.
Thailand	1997-1998: Asian crisis.

Table 2 reports the breakdown of the sample of emerging market multinational firms across country industrial sectors and fiscal years. The industrial sector, followed by the consumer cyclical and the material sectors, are the most represented ones among all industry sectors. A cross-country analysis shows that some countries are more biased towards specific sectors, although it is not a general rule.

Table 2. Sample statistics

Sector	Country							
	HK	Ind	Indo	Mal	Tw	Thai	Sin	# obs.
CCY	37	4	15	23	4	2	14	99
CNC	9	6	7	0	0	0	9	31

<sup>1</sup> Empirical evidence supporting nonlinearities in foreign exchange rate exposures is somewhat weak (see, Bartram, 2004; Muller and Verschoor, 2006; Bartram and Bodnar, 2007). Therefore, they are not accounted for in each subperiod.

Table 2 (cont.). Sample statistics

Sector	Country							
	HK	Ind	Indo	Mal	Twn	Thai	Sin	# obs.
ENE	4	2	2	0	0	2	0	10
HEA	0	4	0	0	0	0	17	21
IND	38	9	15	41	16	4	16	139
MAT	2	4	2	4	7	13	0	32
TEC	7	2	0	6	31	8	30	84
UTI	8	0	0	0	0	0	0	8
Indep.	0	0	0	32	0	0	0	32
# obs.	105	31	41	106	58	29	86	456
(# firms)	(17)	(13)	(17)	(20)	(19)	(7)	(15)	(108)
Year								
1995	6	0	0	5	0	0	4	
1996	8	0	0	8	0	1	6	
1997	10	0	0	8	1	1	7	
1998	10	0	1	11	0	2	9	
1999	10	0	1	11	0	2	11	
2000	14	0	1	11	9	4	12	
2001	17	2	16	15	13	5	12	
2002	15	11	16	19	17	7	11	
2003	15	10	6	18	18	7	13	
2004	0	8	0	0	0	0	1	

Notes: This table reports the breakdown of the sample of emerging market multinational firms by country, industrial sector and fiscal year. Country codes are: HK is Hong Kong, Ind is India, Indo is Indonesia, Mal is Malaysia, Twn is Taiwan, Thai is Thailand and Sin is Singapore. Industry codes are: CCY is consumer cyclical, CNC is consumer non-cyclical, ENE is energy, HEA is health care, IND is industrials, MAT is materials, TEC is technology, UTI is utilities.

Table 3 reports the summary statistics for the change in the yearly exchange rate against the US dollar, as well as the change in the yearly real effective dollar value. We can notice that the currency unit of Hong-Kong, India and Taiwan exhibit the smaller variations, in contrast to the other East Asia countries.

Table 3. Summary statistics for real exchange rate movements against the U.S. dollar

Currency	Statistics					
	# obs.	Mean	S.d.	Max.	Min.	Median
Hong Kong	105	0.03	0.04	0.09	-0.06	0.04
India	31	-0.03	0.05	0.07	-0.10	-0.03
Indonesia	41	-0.08	0.13	0.28	-0.20	-0.08
Malaysia	106	0.03	0.14	0.58	-0.19	0.01
Taiwan	58	0.05	0.04	0.15	-0.02	0.03
Thailand	29	0.02	0.17	0.74	-0.24	-0.02
Singapore	86	0.03	0.07	0.22	-0.09	0.02
USA	456	0.01	0.05	0.10	-0.09	0.01

Notes: This table reports the summary statistics for the percentage change in the yearly exchange rate against the U.S. dollar of all the countries included in the sample, as well as the change in the yearly real effective dollar value. Statistics provided here correspond to the observations for our sample and therefore include several observations during the same year according to the fiscal year end of each firm.

### 3. Empirical results

**3.1. Short-term cash flow exposures: home currency against the U.S. dollar.** We first deal with the home currency-U.S. dollar exchange rate exposures of

the short-term cash flows. Results are reported in Panel A of Table 4 (see Appendix). For an easier comparison, we also report the stock price exposure in the same table. Specific comparison will be carried out in Section 3.3.

Generally, the short-term unlevered cash flow exposure is positive, while the financing cash flow exposure is negative, as expected. Intuitively, a depreciation of the home currency against the U.S. dollar tends to increase the unlevered cash flow through notably the improvement in the export competitiveness of national products and services. On the other hand, a depreciation of the home currency leads to a decrease in the financing cash flow, since the burden of the foreign debt service has increased. However, this general view has to be qualified, according to the considered country and the inflationary pressures possibly brought about by currency crises.

As a matter of fact, home currency unlevered cash flow exposure is positive and statistically significant during non-crisis periods: India, Indonesia, Malaysia (post-1998) and post-crisis Singapore. On the other hand, during crisis periods, the sign is negative, suggesting the inflationary dangers for the economic growth: 1997-1998 Thailand, and 2001 crisis in Singapore<sup>1</sup>. It should also be noted that the sign is also

<sup>1</sup> We didn't have sufficient data to assess the aggregate exposure during the crisis in Indonesia.

significantly negative for Taiwanese firms even in non-crisis period, which may be justified by the fact that Taiwan is a small economy with a high degree of (import) trade dependency. Hong-Kong does not report any significant short-term unlevered cash flow exposure.

As for the short-term financing cash flow exposure, we accordingly find a significant negative sign for Indonesia and Thailand. On the one hand, a reverse exposure is found during currency crises, which may suggest that firms have to borrow to meet their interest and other financial ongoing commitments during currency crises. It was the case for 1997-1998 Hong-Kong and Singapore. Malaysia is an interesting case, since that country officially announced a change in its currency regime, as a result of the Asian currency crisis. Indeed, the Malaysian ringgit is officially pegged to the U.S. dollar since 1998. Our analysis of short-term cash flows shows clearly a significant exposure only for the pegging period (1998-2004): a contemporaneous positive ringgit-dollar exchange rate exposure for the unlevered cash-flow. Interestingly, the financing cash flow exposure is also positive for this period. Taiwan also exhibits an opposing positive exposure, as it was already the case for the unlevered cash flow.

**3.2. Short-term cash flow exposures: U.S. dollar real effective value.** Regarding the exposure to the US dollar real effective value, we find a negative sign for the unlevered cash flow exposure for (non-crisis) India, Indonesia, Malaysia (pegging period), and Singapore in non-crisis periods, suggesting harmful inflationary effects on cash flows. Thailand exhibits significant U.S. dollar exposure during the Asian currency crisis, but here the sign is different according to the time horizon. The exposure is indeed negative with lagged exchange rate changes but positive with contemporaneous changes. Taiwan also exhibits an opposing effect, as we found for the home currency exposure. The U.S. dollar exposure is still contrary to the home currency exposure, but with an opposing sign compared to the other countries.

As for the financing cash flow exposure, the sign of the U.S. dollar exposure is generally positive, in contrast to the home currency exposure, generally negative, which supports the hypothesis of a need for further financing when the purchasing power of the U.S. dollar declines. The positive and significant exposure is found for (non-crisis) Indonesia. By contrast, the exposure is reversed in crisis periods. Hong Kong presents its single significant (and once again positive) exposure during the Asian crisis. The sign is positive as for the home currency exposure. Singapore also reports a significant exposure during the 1997-1998 Asian

crisis period but the sign is here negative. Taiwanese exposure is negative, consistent with our previous results.

**3.3. Short-term cash flow exposures vs. stock price exposure.** We now compare the cash flow exposures with the stock price exposure. Short-term cash-flows from Hong Kong are not particularly sensitive to exchange rates either, except once again during the Asian currency crisis for which we also find a positive USD exposure. As for stock prices, we only find a statistically significant and negative exposure for the non-crisis periods (and dollar-pegging period). Interestingly, we also find the same only stock price exposure during the pegging era of Malaysia (since 1999). This exposure is also negative, but in contrast to Hong-Kong, a significant short-term unlevered cash flow negative exposure was also observed. Still, no ringgit exposure is observed. Among countries reporting more short-term cash flow exposures, we can notice India and Taiwan which present significant stock price exposures with the same signs as the financing cash flow exposure (or, in other words, an opposing sign to the unlevered cash flow), in contrast to Indonesian and firms' exposure, which has the same sign as the unlevered cash flow. As for Indonesia, firms from Singapore also report significant stock price exposure with the same sign as the financing cash flow exposure, but only during the 1997-1998 crisis. No significant stock price exposure is reported for the recession in 2001 (although the unlevered cash flow was strongly exposed). We find nevertheless a significant negative exposure for the other years. Finally, we also notice one country for which we report some cash flow exposure during some period, but in contrast we report significant stock price for another period. This is the case of Thailand. In contrast to Malaysia, Thailand has officially dropped the peg to a currency basket and set up a managed float rate. We do not find any evidence of exposure for the post-crisis period for both the short-term cash flow and the stock price. Nevertheless, some evidence (both dollar exposure and dollar effective value) is reported for the 1996-1998 era.

**3.4. The role of U.S. operations.** In order to assess the impact of operations in the United States, we include in our exposure estimation model the dummy "USA", which is equal to one if the firm has actual operations in the USA and zero otherwise. We also keep our structure taking into account currency crises and arrangements. Geographical segmentation of the firm's operations comes from the Worldscope database. Table 5 summarizes the American activities of the firms included in our sample. Chinese firms from Hong Kong have relatively few operations in the United States, in contrast to their Taiwanese counterparts.

Table 5. Operations in the United States for the multinational firms

Currency	# obs.	# firms operating in the USA	USA sales ratio (%)*	USA/foreign sales* (%)
Hong Kong	105	31	8.6	16.7
India	31	13	50.2	45.5
Indonesia	41	16	11.1	71.1
Malaysia	106	23	10.9	32.2
Taiwan	58	32	21.1	67.8
Thailand	29	4	29.9	89.7
Singapore	86	33	24.9	32.0

Note: \* Average USA sales to total/foreign sales ratios among the firms operating in the USA.

Results reported in Panel B of Table 4 (see Appendix) offer some interesting insights. We can notice that only Indonesian and Taiwanese multinational firms which have *no* operations in the United States exhibit significant short-term unlevered and financing cash flow exposure with the same sign that we have found in the full sample analysis. Managers from these firms seem only concerned (or aware) of the dollar exposure when they are operating in the USA, which is consistent with Martin and Mauer (2004) analysis on U.S. multinational firms operating in Europe. In addition, firms from Taiwan exhibit the same patterns for the stock price exposure. Only Taiwanese firms which do not report U.S. operations present significant stock price exposure. Interestingly, the effects of American operations on cash flow exposures are the same for Malaysian firms, for both contemporaneous and lagged effects during the post-1998 (U.S. dollar peg) period. Only Malaysian firms without U.S. operations report significant exposure. In addition, the stock price exposure is also only significant (and negative) for the firms with no American operations during the pegging period. By contrast, both firms (with and without U.S. operations) from Indonesia report significant stock price exposure. We notice, however, that the direction of the exposure depends on the presence of American activities. The dollar value exposure is negative if the firm has no operations in the U.S., and positive if the firm do have operations in the USA. Home currency exposure presents opposing signs. As for India, firms do not report any significant cash flow exposure when the sample is partitioned according to the foreign operations of the firm. By contrast, the U.S. operations once again influence the direction of the stock price exposure. Nevertheless, stock prices of firms operating in the USA are not exposed to the USD effective value, but only to the home currency-U.S. exchange rate. On the other hand, Thailand only reports significant

unlevered cash flow exposure when firms *do* have operations in the USA during non-crisis periods. The financing cash flow exposure is more mixed.

Singapore presents different and more complex patterns. In the 2001 crisis, both types of firms present significant dollar exposure, but interestingly the exposure is with an opposite sign. Nevertheless, stock price exposure is only significant for firms without U.S. operations. For the pre-crisis period, both cash flows and stock prices are significantly exposed to the exchange rates, provided the firm has operations in the U.S. It is interesting to note that stock price exposure is significant for firms with U.S. operations during the pre-crisis and crisis periods and since then, the exposure is only significant for firms without U.S. operations (including the 2001 recession). As for the unlevered cash flow, this tendency is also verified, except that no exposure is found during the Asian crisis. By contrast, financing cash flow generated by firms from Singapore is strongly sensitive to exchange rate changes during all periods and both firms. Sometimes, the effect is lagged but significant.

Hong Kong exhibits the same opposing significant exposures during the 1997-1998 crisis, but no exposure for the non-crisis periods. Interestingly, the stock price exposure is only significant if the firm have no operations in the United States for both the crisis and the non-crisis periods.

## Conclusion

In this paper, we investigate the aggregate U.S. dollar exposure of multinational firms from seven East Asian markets. In contrast to the previous literature, we analyze three types of currency exposure: the actual short-term unlevered and financing cash flow exposures, and the well-known stock price exposure. We also estimate both the home currency-U.S. dollar exchange rate exposure and the U.S. dollar real effective value exposure. Our evidence clearly shows many significant aggregate exposures provided that currency crises and currency arrangement changes are taken into account. Generally, the financing cash flow of firms from emerging markets is more exposed to the U.S. dollar changes, especially during currency crises, than the unlevered cash flow, suggesting that the firms are generally heavily financed by U.S. dollar denominated debt.

U.S. operations are particularly important in the exposure estimation, since in general, unlevered cash flow and stock price exposures are more significant when the firm has no operations in the USA, suggesting that the manager is more concerned (and/or aware) of the exposure when the firm generates U.S. sales. Although their home currency is somehow adjusted to the U.S. dollar, managers

should be aware that their operations are still strongly exposed to real changes in the American currency unit. Countries report different patterns. Some countries present strongly significant cash flow and stock price exposures, but with a lag (Hong-Kong and Singapore). Basically, our study shows that the majority of the countries exhibit

many similar cash flow and stock price exposures. Nevertheless, our paper underlights the importance of decomposing cash flows. Indeed, given the firm's characteristics, the direction of the stock price exposure follows either the unlevered cash flow, or the financing cash flow, which strongly qualifies Bartram's (2007) findings.

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## Appendix

Table 4a. Exposure estimates for India

Panel A. India								
	Fixed year 2001		Fixed other years	DOM/USD		USD	Adj. R <sup>2</sup> (%)	
n = 31	Short-term unlevered cash flow exposure							
Real changes Simultaneous	-1.47 (2.07)		5.62 (3.49)	-31.15 (21.93)		14.37 (39.48)	<0	
Real changes Lagged	-4.81* (2.39)		6.85 (4.78)	147.15* (73.05)		-132.2* (67.9)	18.1	
n = 31	Short-term financing cash flow exposure							
Real changes Simultaneous	-1.27 (2.26)		0.93 (3.19)	-33.47 (31.21)		33.54 (32.46)	<0	
Real changes Lagged	-0.629 (2.06)		2.58 (5.19)	-12.09 (47.7)		-2.71 (54.17)	<0	
n = 31	Stock price exposure							
Real changes Simultaneous	-0.499 (0.453)		0.504 (0.433)	-22.56*** (6.69)		15.12** (6.90)	25.6	
Real changes Lagged	-0.789 (0.585)		1.398* (0.786)	5.705 (8.034)		-15.12* (8.63)	9.0	
Panel B. India								
	Fixed year 2001	Fixed other years	Fixed other years USA	DOM/USD	DOM/USD USA	USD	USD USA	Adj. R <sup>2</sup> (%)
n = 31	Short-term unlevered cash flow exposure							
Real changes Simultaneous	-1.50 (2.16)	6.16 (4.06)	-0.49 (1.25)	-23.63 (28.91)	-25.12 (41.46)	-0.91 (54.89)	40.47 (53.81)	<0
Real changes Lagged	-4.76** (2.28)	7.82 (5.37)	-0.76 (1.12)	190.5 (121.2)	-94.9 (125.1)	-172.3 (111.8)	80.45 (106.22)	13.5
n = 31	Short-term financing cash flow exposure							
Real changes Simultaneous	-1.30 (2.24)	1.01 (3.35)	1.53 (1.60)	-41.04 (45.71)	2.00 (35.12)	28.90 (47.03)	8.22 (44.81)	<0
Real changes Lagged	-0.39 (2.54)	1.50 (5.42)	0.61 (0.93)	-44.63 (80.93)	72.94 (82.55)	23.19 (83.66)	-48.05 (64.23)	<0
n = 31	Stock price exposure							
Real changes Simultaneous	-0.81* (0.45)	0.53 (0.49)	0.09 (0.26)	-31.46*** (9.58)	19.81* (10.78)	19.25* (10.07)	-9.12 (9.29)	37.1
Real changes Lagged	-0.63 (0.46)	1.74** (0.80)	-0.53* (0.26)	12.26 (13.94)	-14.70 (14.38)	-24.42* (13.87)	20.30 (12.52)	17.6

Table 4b. Exposure estimates for Indonesia

Panel A. Indonesia							
	Constant		DOM/USD		USD	Adj. R² (%)	
n = 41	Stock price exposure						
Real changes Simultaneous	0.83* (0.46)		11.97* (6.09)		-34.80 (30.21)		7.6
Real changes Lagged	2.72*** (0.75)		13.84** (6.13)		-100.94** (38.62)		14.1
n = 41	Short-term financing cash flow exposure						
Real changes Simultaneous	-1.98* (1.164)		-16.38 (10.04)		16.24 (23.35)		18.0
Real changes Lagged	-5.65* (2.95)		-6.46* (3.41)		133.19* (67.14)		31.5
n = 41	Stock price exposure						
Real changes Simultaneous	0.219 (0.201)		1.729 (1.468)		6.66 (5.35)		43.0
Real changes Lagged	0.659* (0.36)		2.09* (1.11)		-18.92** (9.20)		40.4
Panel B. Indonesia							
	Constant	Constant USA	DOM/USD	DOM/USD (USA)	USD	USD USA	Adj. R² (%)
n = 41	Stock price exposure						
Real changes Simultaneous	0.77 (0.58)	0.14 (0.67)	12.05 (9.04)	-0.196 (10.67)	-28.94 (32.63)	-15.29 (11.62)	1.0
Real changes Lagged	2.76*** (0.89)	0.50 (0.95)	16.4* (8.25)	-9.82 (8.68)	-112.03* (57.9)	20.64 (50.11)	12.1
n = 41	Short-term financing cash flow exposure						
Real changes Simultaneous	-0.92 (0.79)	-2.35 (1.65)	-5.86 (6.92)	-22.47 (14.11)	19.44 (26.97)	-0.49 (31.13)	30.3
Real changes Lagged	-5.66* (3.28)	0.33 (2.35)	-8.25* (4.74)	6.26 (6.31)	142.11* (76.8)	-30.39 (56.51)	26.6
n = 41	Stock price exposure						
Real changes Simultaneous	0.42 (0.26)	-0.78** (0.33)	2.82 (1.97)	-5.19** (2.51)	7.34 (6.69)	4.72 (8.45)	45.4
Real changes Lagged	0.88* (0.47)	-0.99* (0.58)	2.74* (1.48)	-3.67* (1.96)	-23.63* (12.08)	25.43* (14.89)	40.8

Table 4c. Exposure estimates for Malaysia

Panel A. Malaysia													
	Fixed 1995→1996	Fixed 1997→1998	Fixed 1999→2004	DOM/USD 1995→1996	DOM/USD 1997→1998	DOM/USD 1999→2004	USD 1995→1996	USD 1997→1998	USD 1999→2004	Adj. R² (%)			
n = 106	Short-term unlevered cash flow exposure												
Real changes Simultaneous	-4.96 (5.76)	-0.74 (1.24)	1.53 (1.00)	-229.7 (213.6)	14.13 (17.38)	13.79*** (5.09)	109.8 (114.8)	-25.12 (70.7)	-16.41 (10.01)	6.7			
Real changes Lagged	1.91 (3.7)	3.49 (2.25)	3.59** (1.62)	202.0 (192.9)	-22.06 (16.78)	2.46 (3.48)	-220.8 (185.5)	39.84 (64.12)	-39.2* (20.6)	12.7			
n = 106	Short-term financing cash flow exposure												
Real changes Simultaneous	-0.804 (4.48)	1.245 (2.174)	-1.546** (0.641)	49.59 (153.9)	14.2 (9.77)	5.92** (2.98)	-0.79 (85.5)	-67.5 (46.7)	0.43 (4.45)	<0			
Real changes Lagged	0.82 (3.38)	2.40 (3.16)	-1.50* (0.765)	144.5 (115.3)	16.5 (10.73)	1.66 (2.04)	-66.29 (71.15)	-92.19 (67.40)	-7.74 (9.06)	3.2			
n = 106	Short-term financing cash flow exposure												
Real changes Simultaneous	0.25* (0.14)	-0.02 (0.11)	0.108** (0.053)	3.25 (4.60)	-0.126 (0.479)	-1.604 (2.18)	-1.065 (3.037)	-4.45 (2.97)	-1.52*** (0.55)	16.9			
Real changes Lagged	0.325** (0.146)	-0.537*** (0.157)	0.125 (0.076)	6.30* (3.59)	-0.138 (0.874)	0.222 (0.330)	-2.49 (3.08)	5.85 (5.12)	-0.96 (1.02)	11.0			
Panel B. Malaysia													
	Fixed 1995→1996	Fixed 1997→1998	Fixed 1999→2004	Fixed 1999→2004 USA	DOM/ USD 1995→1996	DOM/ USD 1997→1998	DOM/ USD 1999→2004	DOM/USD 1999→2004 USA	USD 1995→1996	USD 1997→1998	USD 1999→2004	USD 1999→2004 USA	Adj. R² (%)
n = 106	Short-term unlevered cash flow exposure												
Real changes Simultaneous	-4.80 (5.83)	-0.82 (1.23)	2.12** (0.89)	-4.73 (3.72)	-229.6 (217.1)	13.9 (17.3)	14.9** (5.78)	247.8 (250.6)	109.8 (116.6)	-22.7 (69.3)	-18.4 (12.2)	-16.64 (35.32)	7.6
Real changes Lagged	1.93 (3.74)	3.50 (2.29)	4.06** (1.72)	-2.04* (1.13)	202.03 (196.01)	-22.10 (17.04)	1.75 (3.42)	20.54 (30.54)	-220.85 (188.5)	39.77 (64.96)	-38.07* (22.44)	-20.77 (58.99)	12.2
n = 106	Short-term financing cash flow exposure												
Real changes Simultaneous	-0.807 (4.55)	1.25 (2.21)	-1.45** (0.67)	-0.25 (0.78)	49.59 (156.44)	14.18 (9.93)	6.82** (3.01)	-35.67 (42.5)	-0.786 (86.56)	-67.53 (47.48)	-0.25 (5.06)	-0.537 (8.41)	<0
Real changes Lagged	0.87 (3.45)	2.42 (3.21)	-1.37* (0.81)	-0.49 (0.60)	144.47 (117.24)	16.37 (10.95)	1.53 (2.18)	6.39 (13.07)	-66.30 (72.33)	-92.17 (68.54)	-7.87 (10.90)	-4.68 (20.18)	0.2
n = 106	Stock price exposure												
Real changes Simultaneous	0.25* (0.14)	-0.02 (0.12)	0.11* (0.06)	-0.032 (0.09)	3.25 (4.68)	-0.12 (0.48)	-1.60 (2.23)	0.54 (7.06)	-1.06 (3.08)	-4.47 (3.02)	-1.42** (0.62)	-0.65 (1.22)	14.3
Real changes Lagged	0.33** (0.15)	-0.53*** (0.16)	0.124 (0.09)	0.01 (0.100)	6.30* (3.65)	-0.15 (0.89)	0.18 (0.33)	1.92 (1.39)	-2.49 (3.13)	5.83 (5.22)	-0.79 (1.30)	-1.62 (2.08)	8.5

Table 4d. Exposure estimates for Thailand

Panel A. Thailand										
	Fixed 1997→1998	Fixed 1999→2003	DOM/USD 1997→1998		DOM/USD 1999→2003		USD 1997→1998	USD 1999→2003		Adj. R² (%)
n = 29	Short-term unlevered cash flow exposure									
Real changes Simultaneous	-30.49*** (0.787)	-0.039 (0.642)	-214.51*** (0.807)		2.93 (7.68)		1840.4*** (0.00)	-7.46 (16.02)		<0
Real changes Lagged	0.600*** (0.192)	-0.219 (1.149)	4.17*** (1.13)		2.45 (5.58)		-25.32*** (0.00)	-2.33 (23.36)		<0
n = 29	Short-term financing cash flow exposure									
Real changes Simultaneous	-87.05 (0.911)	0.37 (0.71)	-561.7*** (0.935)		-14.81** (6.52)		4880.67*** (0.00)	24.96* (12.65)		13.8
Real changes Lagged	0.38 (0.26)	0.84 (1.32)	-0.87 (1.52)		4.47 (9.36)		-67.16*** (0.00)	-16.77 (24.07)		7.9
n = 29	Stock price exposure									
Real changes Simultaneous	3.57*** (0.354)	0.495 (0.392)	20.47*** (0.363)		-7.31 (6.05)		-177.94*** (0.00)	-0.158 (10.57)		<0
Real changes Lagged	0.135 (0.120)	1.54** (0.67)	-1.328* (0.705)		-2.52 (2.30)		2.45*** (0.00)	-10.14 (13.4)		<0
Panel B. Thailand										
	Constant 1997→1998	Constant Ex-USA 1999→2003	Constant USA 1999→2003	DOM/ USD 1997→1998	DOM/ USD Ex-USA '99→'03	DOM/ USD USA 1999→2003	USD 1997→1998	USD Ex-USA 1999→2003	USD USA 1999→2003	Adj. R²
	Short-term unlevered cash flow exposure									
Real changes Simultaneous	-4.30 (2.84)	-0.16 (0.56)	0.84 (0.83)	-36.3** (12.6)	6.32 (8.6)	-27.8* (14.7)	305.1** (115.9)	-18.9 (19.5)	64.1** (28.5)	<0
real changes Lagged	0.72*** (0.25)	-0.098 (1.30)	-1.75* (0.96)	4.38*** (1.21)	2.04 (6.31)	34.23*** (5.90)	-27.51*** (3.21)	-9.23 (28.40)	-23.36 (27.87)	<0
	Short-term financing cash flow exposure									
Real changes Simultaneous	5.31 (3.17)	0.25 (0.62)	-1.35** (0.59)	56.71*** (13.79)	-18.70*** (6.27)	18.16 (10.90)	-457.17*** (123.27)	37.90*** (13.12)	-51.37** (18.47)	12.0
Real changes Lagged	0.181 (0.426)	0.996 (1.55)	-0.248 (0.758)	-1.11 (1.796)	5.01 (10.51)	-4.01 (9.75)	-63.09*** (5.78)	-13.29 (29.28)	-20.19 (29.13)	<0
	Stock price exposure									
Real changes Simultaneous	0.79 (1.41)	0.69 (0.48)	-0.97* (0.55)	3.28 (6.29)	-7.73 (6.78)	16.73*** (5.27)	-27.99 (57.89)	-4.52 (11.64)	-4.60 (10.37)	<0
Real changes Lagged	0.17 (0.13)	1.70** (0.72)	-0.68 (0.71)	-1.32 (0.86)	-1.90 (2.52)	-7.29 (5.92)	1.57 (1.51)	-12.87 (14.92)	19.28 (22.19)	<0

Table 4e. Exposure estimates for China (Taiwan)

Panel A. China (Taiwan)								
		Constant	DOM/USD		USD	Adj. R² (%)		
n = 58		Short-term unlevered cash flow exposure						
Real changes Simultaneous		20.9 (11.7)	-291.6* (151.1)		199.5* (100.7)	6.6		
Real changes Lagged		-8.07** (3.8)	71.55 (49.2)		18.04 (44.3)	7.4		
n = 58		Short-term financing cash flow exposure						
Real changes Simultaneous		-18.02* (9.50)	244.59* (125.83)		-188.16** (88.25)	7.2		
Real changes Lagged		5.56* (2.95)	-16.45 (40.81)		-87.67 (52.79)	8.1		
n = 58		Stock price exposure						
Real changes Simultaneous		-1.09** (0.49)	17.3*** (6.35)		-14.7*** (4.22)	30.0		
Real changes Lagged		0.48** (0.204)	1.80 (3.68)		-10.01** (4.10)	24.2		
Panel B. China (Taiwan)								
	Constant other	Constant USA	DOM/USD other	DOM/USD USA	USD other	USD USA	Adj. R² (%)	
n = 58		Short-term unlevered cash flow exposure						
Real changes Simultaneous		16.21* (8.09)	4.42 (13.9)	-266.9** (119.51)	4.84 (207.38)	188.48** (87.38)	-6.71 (135.1)	8.0
Real changes Lagged		-8.51** (3.38)	0.805 (4.98)	34.06 (32.09)	61.5 (109.97)	23.56 (78.65)	-9.55 (118.44)	10.4
		Short-term financing cash flow exposure						
Real changes Simultaneous		-10.29 (6.52)	-13.36 (10.21)	125.6 (80.63)	204.91 (144.1)	-93.91* (53.05)	-166.72 (108.61)	6.1
Real changes Lagged		3.93* (2.23)	3.93 (5.19)	-6.18 (24.23)	-39.81 (101.8)	-52.79* (27.51)	-37.49 (101.33)	5.8
		Stock Price exposure						
Real changes Simultaneous		-1.23** (0.55)	0.25 (0.60)	19.72** (7.71)	-4.24 (9.06)	-16.7*** (5.48)	3.55 (6.13)	26.6
Real changes Lagged		0.72*** (0.25)	-0.57* (0.29)	-1.09 (4.23)	8.59 (5.57)	-10.14* (5.21)	-3.64 (6.18)	25.9

Table 4f. Exposure estimates for China (Hong Kong)

Panel A. China (Hong Kong)													
	Fixed 1997→1998	Fixed other years	DOM/USD 1997→1998		DOM/USD other years		USD 1997→1998	USD Other years	Adj. R <sup>2</sup> (%)				
n = 105	Short-term unlevered cash flow exposure												
Real changes Simultaneous	-2.77 (3.5)	1.11 (1.62)	121.2 (118.3)		16.8 (31.6)		76.5 (68.1)	1.19 (11.2)	<0				
Real changes Lagged	-8.02 (11.7)	1.71 (1.72)	-272.2 (346.6)		11.9 (24.6)		-4.8 (43.3)	-6.74 (13.5)	<0				
n = 105	Short-term financing cash flow exposure												
Real changes Simultaneous	3.41 (3.06)	-1.10* (0.607)	-22.11 (108.79)		2.99 (7.72)		-53.08 (67.45)	9.45 (8.04)	3.4				
Real changes Lagged	22.43** (9.30)	-1.77* (0.92)	735.79*** (259.46)		5.34 (8.03)		62.92* (35.19)	1.51 (7.91)	5.7				
n = 105	Stock price exposure												
Real changes Simultaneous	0.86 (0.60)	-0.32 (0.44)	-14.2 (17.15)		7.15 (6.98)		-7.03 (8.07)	-5.84** (2.60)	6.3				
Real changes Lagged	2.9 (4.0)	-0.04 (0.33)	117.0 (131.8)		-3.25 (1.98)		11.52 (9.48)	2.29 (3.95)	2.5				
Panel B. China (Hong Kong)													
		USA		USA		USA		USA		USA		USA	
	Fixed 1997→1998	Fixed 1997→1998	Fixed other years	Fixed other years	DOM/USD 1997→1998	DOM/USD 1997→1998	DOM/USD other years	DOM/USD Other years	USD EER 1997→1998	USD 1997→1998	USD other years	USD other years	Adj. R <sup>2</sup> (%)
n = 105	Short-term unlevered cash flow exposure												
Real changes Simultaneous	-6.72** (2.92)	8.52** (3.59)	1.51 (2.6)	-0.98 (2.8)	278.4*** (84.4)	-379.5*** (100.2)	16.4 (51.3)	-0.23 (54.3)	165.4*** (48.7)	-206.6*** (63.1)	5.36 (15.8)	-12.5 (19.4)	<0
Real changes Lagged	219.6*** (50.4)	-235.6*** (46.7)	1.6 (2.3)	-0.50 (2.4)	6960.4*** (1552.4)	-7465.2*** (1431.3)	12.7 (43.6)	-5.02 (44.7)	51.8 (62.1)	-36.5 (55.3)	1.914 (14.94)	-26.9 (23.2)	<0
n = 105	Short-term financing cash flow exposure												
Real changes Simultaneous	6.76*** (1.02)	-8.40** (3.52)	-0.9 (0.7)	-0.56 (0.61)	-143.24*** (46.79)	286.6** (128.9)	-4.77 (11.14)	20.18 (16.05)	-156.1*** (37.7)	271.9*** (91.2)	15.48 (10.72)	-26.57 (16.13)	5.4
Real changes Lagged	-116.15*** (39.09)	152.85*** (35.86)	-1.7* (1.0)	-0.38 (0.60)	-3592.9*** (1197.6)	4640.9*** (1086.1)	-1.60 (12.2)	16.6 (15.84)	51.79 (46.29)	-41.56 (51.63)	3.57 (10.29)	-0.50 (15.47)	6.0
n = 105	Stock price exposure												
Real changes Simultaneous	0.53 (0.33)	0.604 (0.87)	-0.13 (0.3)	-0.31 (0.36)	-3.87 (14.95)	-26.28 (35.77)	-2.41 (2.89)	26.7 (18.79)	-7.47*** (2.80)	4.44 (17.23)	-5.18** (2.25)	-3.47 (6.70)	12.7
Real changes Lagged	-5.17 (12.38)	8.83 (10.01)	-0.1 (0.5)	0.27 (0.42)	-130.7 (409.17)	264.3 (328.3)	-7.15* (4.25)	10.35 (8.74)	8.70 (12.57)	9.06 (6.41)	4.83 (6.16)	-6.51 (7.19)	1.0

Table 4g. Exposure estimates for Singapore

Panel A. Singapore													
	Fixed 1995→1996	Fixed 1997→1998	Fixed 2001	Fixed other years	DOM/USD 1995→1996	DOM/USD 1997→1998	DOM/USD 2001	DOM/USD other years	USD 1995→1996	USD 1997→1998	USD 2001	USD other years	Adj. R² (%)
n = 86	Short-term unlevered cash flow exposure												
Real changes Simultaneous	2.73 (9.09)	-5.53 (7.92)	5.71 (9.95)	-0.65 (2.48)	405.35 (462.77)	212.31 (147.6)	-70.91 (67.38)	-35.75 (23.1)	-24.6 (356.1)	-240.3 (212.5)	165.9 (145.9)	-40.1 (29.2)	1.9
Real changes Lagged	20.65 (12.64)	5.72 (5.04)	21.2*** (5.13)	3.75 (2.31)	290.3 (227.2)	83.4 (199.6)	-674.7*** (119.9)	102.8** (47.07)	-114.2 (207.6)	-269.4 (414.8)	208.3** (88.14)	-167.1** (78.2)	18.4
n = 86	Short-term financing cash flow exposure												
Real changes Simultaneous	-0.865 (1.979)	-6.69* (3.93)	-7.92*** (2.805)	2.73* (1.495)	-152.2 (95.51)	-14.64 (71.11)	28.52 (29.24)	-3.31 (22.89)	-1.41 (79.90)	58.37 (107.96)	-0.032 (24.24)	29.22** (14.17)	2.7
Real changes Lagged	-4.15* (2.35)	3.55 (2.85)	-2.38 (2.30)	1.95* (1.07)	-64.02 (49.10)	188.62** (87.22)	14.37 (45.06)	-36.42 (25.94)	73.43 (69.74)	-406.1** (178.6)	-34.70 (36.84)	36.24 (35.99)	14.6
n = 84	Stock price exposure												
Real changes Simultaneous	-0.01 (0.18)	0.36 (0.45)	0.16 (0.60)	-0.04 (0.20)	4.8 (4.7)	-8.7 (9.1)	-3.3 (4.5)	3.2 (2.9)	-5.0 (3.8)	9.0 (13.0)	3.2 (8.4)	-5.9*** (1.9)	<0
Real changes Lagged	0.08 (0.19)	-0.9*** (0.21)	-0.39 (0.41)	0.14 (0.17)	-8.67 (6.67)	-28.4*** (8.9)	-5.09 (19.7)	6.53 (6.31)	12.44** (5.87)	52.2*** (13.1)	6.97 (10.64)	-5.59 (4.79)	1.0
USA effects		Panel B. Singapore											
		Short-term unlevered cash-flow exposure											
		Real changes (simultaneous)						Real changes (lagged)					
		Fixed Effects		DOM/ USD		USD		Fixed effects		DOM/USD		USD	
1995→1997		6.19 (9.64)		308.63 (416.12)		-9.73 (440.24)		26.7 (19.1)		543.7 (492.8)		-794.4 (738.6)	
1995→1997 (USA)		-0.55 (10.42)		2869.7*** (420.27)		-1296.2*** (448.2)		-12.5 (19.3)		46.6 (499.1)		326.6 (753.9)	
1997→1998		2.12 (2.49)		78.46 (67.84)		-98.75 (78.53)		8.35 (5.12)		120.6 (115.4)		-386.5 (296.9)	
1997→1998 (USA)		-21.72 (26.19)		103.79 (154.23)		256.89 (416.10)		0.44 (4.99)		-882.5 (1169.6)		502.9 (1027.6)	
2001		-1.33 (3.21)		-76.38** (29.13)		385.74*** (19.44)		-0.14 (5.86)		432.9*** (76.0)		-363.5*** (93.1)	
2001 (USA)		8.03** (4.03)		173.87** (66.06)		-291.5*** (86.64)		-7.23* (4.19)		-546.2*** (114.1)		569.1*** (176.9)	
Other		-1.77 (2.49)		-30.18 (28.54)		-17.23 (18.51)		5.57 (4.05)		107.9** (49.5)		-173.6** (85.9)	

Table 4g (cont.). Exposure estimates for Singapore

USA effects	Panel B. Singapore					
	Short-term unlevered cash-flow exposure					
	Real changes (simultaneous)			Real changes (lagged)		
	Fixed effects	DOM/ USD	USD	Fixed effects	DOM/USD	USD
Other (USA)	-2.35 (4.01)	-63.65 (65.35)	-99.43 (85.54)	-1.09 (3.76)	11.3 (92.7)	-16.4 (173.1)
GDP	22.03 (32.48)			-135.5* (77.5)		
Adj. R²	16.8			21.1		
USA effects	Singapore					
	Short-term financing cash-flow exposure					
	Real changes (simultaneous)			Real changes (lagged)		
	Fixed effects	DOM/ USD	USD	Fixed effects	DOM/USD	USD
1995→1996	-0.17 (2.25)	-120.54 (101.27)	-185.9** (84.86)	-7.08** (3.32)	-185.51** (86.32)	386.47*** (131.0)
1995→1996 (USA)	-2.96 (2.86)	-423.8*** (110.52)	448.92*** (86.68)	1.82 (3.34)	87.83 (98.22)	-305.74** (146.13)
1997→1998	-1.24 (2.54)	-114.6* (59.59)	152.95* (86.92)	-4.40 (2.75)	-91.66 (72.99)	222.42 (147.3)
1997→1998 (USA)	-29.68*** (3.71)	96.22 (104.9)	290.11 (215.42)	6.08** (2.64)	1160.7*** (285.7)	-1152.6*** (249.27)
2001	-10.67*** (1.82)	34.77 (23.72)	71.83*** (15.37)	17.66*** (1.70)	-872.3*** (46.06)	394.56*** (49.77)
2001 (USA)	6.15*** (1.99)	32.29 (51.54)	-78.53*** (28.17)	-16.13*** (2.97)	871.85*** (84.75)	-452.58*** (81.90)
Other	0.72 (1.42)	29.67 (23.4)	10.99 (14.88)	-0.23 (1.13)	-58.33** (27.38)	66.47 (44.16)
Other (USA)	1.70 (1.98)	-108.01** (49.79)	19.12 (22.97)	0.56 (1.28)	16.91 (54.12)	-22.76 (78.17)
GDP	-11.65 (19.90)			29.95 (22.84)		
Adj. R²	22.8			22.9		

Table 4g (cont.). Exposure estimates for Singapore

USA effects	Singapore					
	Stock price exposure					
	Real changes (simultaneous)			Real changes (lagged)		
	Fixed effects	DOM/ USD	USD	Fixed Effects	DOM/ USD	USD
1995→1997	-0.04 (0.12)	0.08 (4.16)	8.26 (7.31)	0.020 (0.15)	1.58 (4.31)	-5.22 (7.38)
1995→1997 (USA)	0.25 (0.48)	40.0*** (9.12)	-37.77*** (8.85)	0.55** (0.28)	-16.7 (13.28)	32.78** (13.26)
1997→1998	-0.05 (0.29)	1.83 (6.99)	-5.08 (8.94)	-0.46** (0.22)	-2.54 (6.76)	5.17 (14.49)
1997→1998 (USA)	2.81*** (0.55)	13.33 (16.49)	-58.80** (29.24)	-0.15 (0.30)	-118.9*** (42.17)	101.54*** (32.4)
2001	-0.16 (0.24)	0.18 (3.11)	4.37* (2.29)	-0.19 (0.34)	-28.66*** (13.0)	18.55** (8.89)
2001 (USA)	0.53 (0.72)	-6.31 (8.78)	-4.01 (13.95)	0.24 (0.40)	2.46 (21.6)	1.61 (17.09)
Other	-0.10 (0.18)	2.22 (2.83)	-5.06*** (1.88)	0.35* (0.19)	1.42 (2.93)	-3.04 (4.16)
Other (USA)	0.22 (0.47)	2.27 (8.59)	-0.82 (5.33)	-0.13 (0.26)	13.58 (12.89)	-12.64 (11.76)
GDP	2.71 (2.62)			-3.75 (3.19)		
Adj. R <sup>2</sup>	< 0			< 0		

Notes: For each country separately, Panels A of this table report the exposure estimates obtained from the equations  $\Delta RCF_{is,t-1 \rightarrow t} = \gamma_1 + \gamma_2 \Delta REXC_{s,t-1 \rightarrow t} + \gamma_3 \Delta RUSD_{t-1, \rightarrow t} + \gamma_4 \Delta RGDP_{s,t-1 \rightarrow t} + \mu_s$  for the contemporaneous effect model, and  $\Delta RCF_{is,t-1 \rightarrow t} = \eta_1 + \eta_2 \Delta REXC_{s,t-2 \rightarrow t-1} + \eta_3 \Delta RUSD_{t-2, \rightarrow t-1} + \eta_4 \Delta RGDP_{s,t-1 \rightarrow t} + \chi_s$  for the lagged effect model, where  $\Delta RCF_{is,t-1 \rightarrow t}$  is the change in the real cash flow of the firm  $i$  expressed in home currency  $s$  from  $t-1$  to  $t$ ,  $\Delta REXC_{s,t-2 \rightarrow t-1}$  is the change in the real home currency  $s$  exchange rate against the U.S. dollar from  $t-2$  to  $t-1$ ,  $\Delta RUSD_{t-2, \rightarrow t-1}$  is the change in the real effective value of the U.S. dollar, and  $\Delta RGDP_{s,t-1 \rightarrow t}$  is the change in the real GDP from  $t-1$  to  $t$ . Specific year dummies in order to control for both currency crises and arrangements have been added in the estimation. Panels B report the exposure estimates, for each country separately, when control dummies for U.S. operations of the firm are added in the estimation. The column “USA” reports the exposure estimations for firms generating sales in the United States, next to those for firms without U.S. sales. \*\*\*, \*\*, \* indicate that the estimate is statistically different from zero at the 1%, 5% and 10% level, respectively. White (1980) heteroskedasticity-consistent standard errors are exhibited in parentheses. For clarity, GDP coefficients are not reported.