BBVA

WORKING Papers

The Asian crisis: what did local stock markets expect?

Economic
Research
Department

Nº 0902

The Asian crisis: what did local stock markets expect?[1]

Alicia García Herrero, Jacob Gyntelberg and Andrea Tesei

Version: 8 February 2009

Abstract

In this paper we investigate whether cross-sectional information from local equity markets contained information on devaluation expectations during the Asian crisis. We concentrate on the information content of equity prices as these markets were in general the largest and most liquid at the time and, thus, presumably the best carriers of information. Using an event-study approach for the period leading up to each of the devaluations which occurred during the Asian crisis (namely those of Indonesia, Korea, Malaysia, the Philippines and Thailand), we compare returns in the equity prices of exporting and non-exporting firms. This is based on the assumption that the expectation of devaluation should help the stock of exporting firms outperform those of non-exporting firms. Overall we do find some evidence supporting this hypothesis, although at different degrees depending on the country. Our second finding is that local equity market prices, as reflected in the different patterns seen for exporters and non-exporters, did to at least to some extent price in the possibility that the Thai devaluation would be followed by other countries in the region.

JEL classification: F31, G15 and G14.

Key words: Asian crisis, currency crisis, information content of local equity market prices.

[1] Alicia García Herrero, BBVA, email: alicia.garcia-herrero@bbva.com.hk, Jacob Gyntelberg (Corresponding author: Senior economist, Bank for International Settlements, jacob.gyntelberg@bis.org). Andrea Tesei, Pompeu Fabra University, email: andrea.tesei@upf.edu. The authors thank Louisa Wagner and Magdalena Erdem for excellent assistance when completing the paper. We also thank Ramon Moreno, Patric McGuire, Bill Nelson, Frank Packer, Eli Remolona and seminar participants at the Bank for International Settlements for useful comments and discussions. All errors remain our own. The views expressed in this paper are those of the author and should not be attributed to the Bank for International Settlements, BBVA or its other staff.

1. Introduction

Currency crises are a major source of concern for emerging countries. Their output and fiscal losses are well documented in the literature. As a consequence, significant research efforts have been devoted to this area. Some of the efforts have been devoted to improving the ability to predict such crisis.

In this paper we consider the information content of equity prices and their usefulness in predicting the devaluations which were to occur during the Asian crisis. We take as our starting point that an expectation of a significant devaluation should help the stock prices of exporting firms outperform those of non-exporting firms and possibly the overall market. We compare the evolution of exporting firms' equity prices with that of non-exporting firms or the general stock index for the five Southeast Asian countries which underwent a large devaluation during the period 1997-98. Using an event-study approach for the period leading up to each of the devaluations during that period (namely those of Indonesia, Korea, Malaysia, the Philippines and Thailand), we compare returns in the equity prices of exporting and non-exporting firms.

We find that exporting firms stock prices did in fact outperform those of non-exporters as well as the general market - in the period leading up the devaluations, although at different degrees depending on the country. We also find that equity markets did react to devaluations in other countries. We interpret this as an indication that local market participants attached a non-negligible probability to the possibility that Thailand's currency crisis would spread to other countries in the region.

Our paper can be considered as a study of the information embedded in local equity market prices during a period of stress. Our approach is consistent with Cohen and Remolona (2008), who provide evidence that stock prices in Asia before the crises were driven to a larger extent by local information, whereas during the crisis itself they were driven by foreign investor sentiments. We focus on equity markets as these were more liquid and had a higher capitalisation than local bond markets in Asia in the mid to late 1990s. Further, the devaluations during the Asian crisis is found to be one of the most difficult to predict by literature on early warning indicators.

In a more restrictive way, given the short-run predictive power of our indicator, our paper contributes to the literature on early warning indicators. Pioneering work was conducted by Kaminski, Lizondo and Reinhart (1998). They monitor the evolution of a number of macroeconomic variables, such as the current account balance or the real exchange rate, and assess whether a variable deviates from its normal trend beyond a certain threshold value. If it does, this variable is said to issue a signal. Guesnerie and Woodford (2003), though, report on the limited predictive power of the Kaminski, Lizondo and Reinhart (1998) model when testing whether it would have been able to forecast the Thai crisis in 1997. Following this, a great number of forecasting models has emerged both in the academic literature, as well as in the private sector. Most of them relying on multivariate logit or probit regressions. Berg, Borensztein and Patillo (2004) offer an excellent overview of the predictive capacity of such models and find it to be very poor in the short-term horizon and only slightly better in the long-term than the Kaminski, Lizondo and Reinhart (1998) framework. The results are especially poor when applied to the Asian crisis.

Very few papers in the early warnings literature have considered the predictive power of domestic financial markets. This is a particularly relevant issue for Southeast Asia, given the much larger size of their financial system as compared to other emerging regions. Probably the roughest - but earliest - attempt is that of Ferri, Liu and Stiglitz (1999), who look into the informational value embedded in the sovereign ratings of Asian countries prior to the 1997 crisis and conclude that credit rating agencies failed to predict the emergence of the crisis. More recently Crespo Cuaresma and Slacik (2007) exploit the term structure of interest rates to obtain estimates of changes in the timing of the currency crises in the Czech Republic in 1997 and Russia in 1998. They find their indicator to have a very good short-term predictor power. One potential issue with an indicator based on the term structure however, is endogeneity. In fact, it is constructed with exchange rate and money-market interest rates, which are both indicators of exchange rate pressures.

The paper is structured as follows. In the following section we present our hypothesis and the data. The third section describes the statistical methodology used. In the fourth section we present our results. The final section concludes.

2. Experiment and data

The paper deals with stock market developments prior to the devaluations which occurred in Indonesia, Korea, Malaysia, the Philippines and Thailand in 1997. In particular, it compares stock returns of exporting companies versus those of non-exporting companies to determine whether investors favoured the former prior to a devaluation in the form of higher relative returns, compared to a calm period (ie well before the crisis). The fact that we can interpret such higher relative returns as a sign that investors were expecting a devaluation has a key underlying assumption, namely that exporting firms would generally benefit from a devaluation, relative to non-exporting firms.

While initially this is a plausible assumption, one may consider several reasons why this need not be the case. The first is that the amount of foreign currency indebtedness was larger for exporting firms. This would imply that devaluation would increase the cost of debt relatively more for exporters. Such expected balance sheet effect would need to be larger than the expected competitiveness effect in order for exporting firms not to be favoured by devaluation. We have not been able to take into account information on the level and structure of individual firms' debt prior to the Asian crisis. Allayannis, Brown and Klapper (2003) however studies balance sheet effects from foreign currency debt and currency hedging practices of non-financial firms from eight East Asian countries over the period 1996—98. They document that foreign currency debt did not have a significantly larger impact on financial performance than local currency debt. Their findings also suggest that for firms in East Asia, foreign cash incomes were in fact a substitute for derivatives based hedging for dollar indebted firms during the Asian crisis. Similarly, Bleakley and Cowan (2005) find that non-financial firms in Latin American emerging countries tend to match the currency denomination of their liabilities with the exchange rate sensitivity of their profits. Because of this matching, they also find that the negative balance sheet effect of depreciation is more than offset by the competitiveness gains due to the depreciation. A second reason why a devaluation need not favour exporters is that a devaluation might result in higher costs of production inputs. For instance, although the computer industry may be considered as highly export oriented, because a large share of gross sales arise from exports. However, it might in fact benefit less from a depreciation than industries that are less dependent on imported goods such as mining and textiles. Unfortunately, we have not been able to account for these types of effects as we do not have data on input costs. Overall this implies however, that it should be even more difficult statistically to not reject our hypothesis. Finally, a devaluation would not favour an exporting firm would be one in which the major trading partners also devalue their currencies. The trade structure for the five countries does however rule out this scenario. The most important export destinations prior to the crisis for the five countries were the US, Japan and Singapore and trade between the crisis countries was limited, ranging from the 7.9~percent of the total country exports for Thailand to 11.8~percent for Indonesia.

In order to compare stock market returns in the five countries in our sample, we single out the main exporting sector/firm and compare it with non-exporting sectors or, at least, the stock market general index. The scope of this exercise, though, is limited by the relatively small size of Asian stock markets prior to the Asian crisis. Table 1 offers details about the main indices of these countries' stock markets.

Table 1. Characteristics of main equity indices in sample countries

Country	Name	Market Capitalisation in 1996*	Number of sub-sectors
Thailand	SET Index	55.5	25
Philippines	PCOMP Index	97.4	n/a
Malaysia	KLCI Index	294.0	n/a
Indonesia	JCI Index	40.4	9
Korea	KOSPI Index	26.2	19

* As percent of GDP.
Sources: World Federation of Exchanges; national authorities.

2.1 Export sector

2.1.1 Exporter subindices

Ideally, we would like to compare the returns of all exporting sectors/firms with the non exporting ones. An exporting sector should be one in which firms obtain more than half of their revenues from exports. Since such detailed data does not really exist as early as 1997, we opt for concentrating on the most export oriented sectors/firms relative to others for each country in our sample. In fact, we take the stock market sub-index of the most export oriented sector in each country's main equity index.

We choose the most export-oriented sectors by analysing the trade composition of the sample countries in 1996 as reported by the Economist Intelligence Unit and we also reinforce our choice by looking on Bloomberg at the revenues composition for the 5 biggest companies listed on the chosen exporting sector. In the three countries where sub-indices for the exporting sectors exist, we find that the biggest companies listed have revenues from exports well above the 50 percent threshold.

Unfortunately, it has not been possible to find similar indices for the export sector. One reason for this is that the structure of equity market indices reflect the industry structure in a given country. A second reason is that not all countries had sufficiently granular sub-index structures in place. Finally, equity indices are in general not typically organised to capture exporters and non-exporters.

For *Thailand* we use the electronic sector sub-index (SETETRON). This is composed of computers and computer parts, which comprised more than 11 percent of total manufactured goods exports in 1996, the second most important category of manufactured exports. Besides, the traditional main exporting categories, textiles and garments, were only rising at a 5~percent annual rate over the 1994—96 period, whereas high technology exports were growing at a 25—40 percent annually. Finally, the SETETRON represents only a small share of the overall SET Index (see Appendix A), which limits the influence of this sub-index on the main index, used as benchmark in this exercise. For *Indonesia* we use the mining sub-index (JAKMINE) since mineral fuels were the most important exporting sector, with as much as 25.8 percent of total exports, in 1996. Nonetheless, the JAKMINE sub-index is small enough (12.3 percent) relative to the main Jakarta Composite Index (JCI), used as benchmark.

For *Korea* we use the sub-index for heavy industries (KOSPTREQ) whose principal components are machine, motor and ship producers all of which are export oriented with over 80 percent of the total production exported and some of its most prominent firms exporting their whole production. As in the case of Thailand and Indonesia, the proportion of the KOSPTREQ sub-index, as compared to the main KOSPI index, is not very large (10.2 percent). For *Malaysia* and the *Philippines* the markets have no sectoral breakdown so that we need to do a more granular analysis, based on firm-level information.

2.1.2 Individual firms

For the *Philippines* we chose a firm specialised in exporting telephone services, PLDT. This is because practically all its revenue comes from calls from abroad and is billed in USD.[2] While PLDT accounts for a big share of the main index (25.8 percent of the PCOMP Index), its evolution does not seem to be influenced by its large size since the other large stocks did not perform as well as PLDT did.

For *Malaysia* we chose the largest listed company in the palm oil production sector, Golden Hope Plantations. At the end of 1996, 86 percent of the total production of palm oil in Malaysia was exported, making it the most export oriented sector in the Malaysian economy. In fact, Golden Hope Plantations concentrates more than half of its sales abroad.

In order to better compare results across countries, we select some exporting firms for those countries for which there is data on sub-sectors, namely Indonesia, Korea and Thailand. For *Indonesia* we choose a manufacturer of garments - Karwell ID - which exported most of its production at the time of the crisis.[3] In fact, the textile industry was the most export oriented at the end of 1996.

Finally, for *Korea* we choose Samsung Heavy Industries, which manufactures oil tankers, container ships and passenger ferries. Almost 90 percent of its revenues come from sales in the rest of the world.

2.2 Non-export sector

The non-export sub-index chosen for each country should be the least export oriented. In the case of

[2] A Bloomberg report dated 11 July 1997 states: "While the economy may take a hit, many companies are expected to benefit from the devaluation, especially exporters whose goods will be cheaper abroad ...". Revenues at Ph. Long Distance Tel. Co will swell because half its business comes from international calls, which are billed in dollars. Those dollars now buy more pesos when PLDT brings its earnings home."

[3] As Bloomberg reports, the company's customers are mostly from overseas retail companies.

[4] Companies in these non-export sectors may have overseas assets which would result in positive balance-sheet effects from a devaluation. However, the correlation of returns with exchange rate movements was very low during crisis in the considered sectors.

Southeast Asia, as in many other countries, the most suitable sectors should be the service sectors, such as banking, insurance and real estate. Unfortunately, it has not been possible to find similar indices for the non-export sectors, for the same reasons that it has not **b**een possible for exporters.

For *Thailand* we use the insurance sub-index (SETINS), whose three biggest listed companies have 100 percent domestic revenues. For both *Indonesia* and *Korea* we use the real estate sub-index. In the case of Indonesia, we perform a robustness test with another available sector, namely the chemical and industrial one, whose share of domestic revenues is close to 100 percent, as for the real estate sub-index. Details on the composition of these sub-indices can be found in Appendix A.[4] The absence of a detailed breakdown for Philippines and Malaysia prevents from identifying a non-exporting sub-index so that only the main stock market index can be used as benchmark.

3. Procedures

We use an event-study methodology to compare the daily evolution of exporting firms' equity prices with that of the general stock index, or the non-export sector if available, for each of the countries in our sample. This methodology allows us to exploit the daily frequency of the equity market prices data, which is crucial to assess the information content of stock markets, as well as their capacity to predict the devaluations which followed. For details on the methodology, see Campbell (1996). We control for potentially relevant macroeconomic and financial factors in a separate panel regression.

3.1 Event dates

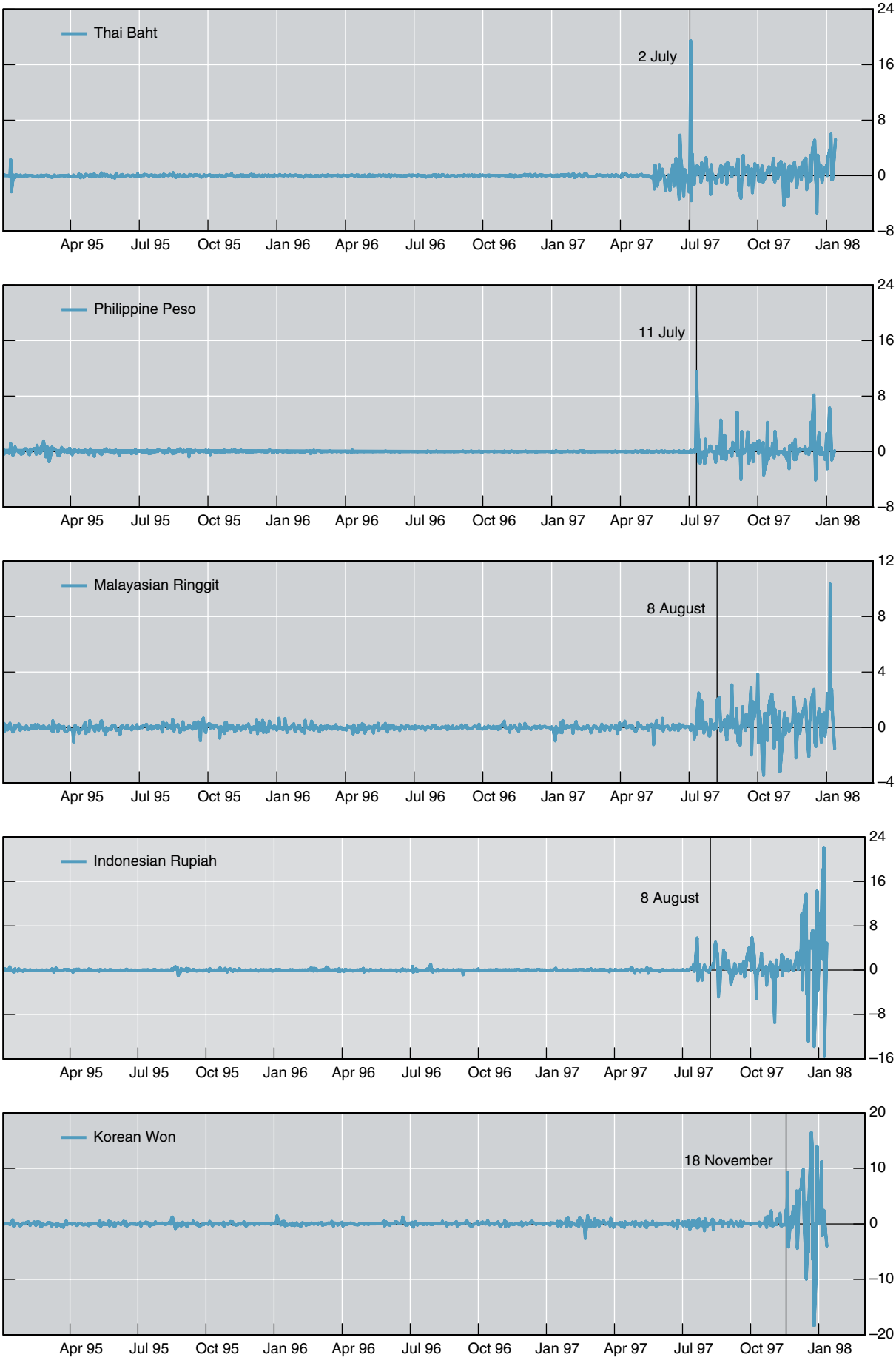
Identifying event dates is key in event study methodology and is not always easy. The easiest one is the first devaluation, namely that of *Thailand*. On 2 July 1997 the Thai baht declined 14~percent, the lowest rate since January 1985 and there was also an official announcement that the exchange rate would be a managed float from that date.

As can be seen from Figure 1, it is also relatively straightforward to identify the date of the crisis for the *Philippines*. Also, 2 July for Thailand falls within this definition. Nine days after Thailand's devaluation, on 11 July, the Philippines also abandoned the defence of the peso. On this day it declined 11.5 percent before trading was suspended. The currency dropped to 29.45 against the US dollar, its lowest value in four years. In the previous one-and-a-half year, the peso had been virtually fixed to the dollar. It is perhaps worth noting that the Bangko Central tried not to let the peso float until the very last moment. On 10~July the overnight rate was raised to an unprecedented 32 percent.

For both *Indonesia* and *Malaysia* the event date we have chosen was 8 August, more than one month after the beginning of the financial turmoil in East Asia. On this day both the ringgit and the rupiah depreciated by over three times the standard deviation. A few days later on 14 August the rupiah depreciated by more than 4 percent, followed by a further depreciation of 6 percent on the following day. The Malaysian ringgit had a few large depreciations of 4.5—5.5 percent against the USD in the weeks following the Thai devaluation. However, our procedure identified the event date on 8 August since this was the first time in which the ringgit outpaced our defined threshold for three consecutive days. This date is one week before the Bank Negara Malaysia stopped defending the ringgit. The ringgit lost 5.4 percent in this occasion on a weekly basis dropping to 24-year low against the US dollar on the 15 August.

It is however, not straightforward to identify an exact date for the remaining countries. Both the Indonesian and the Malaysian currencies became more volatile following the Thai devaluation in early July, with the Indonesian rupiah also responding to the initial devaluation of the ringgit. The fluctuations had, however, been contained and insulated by the strong intervention by Bank Indonesia. In the case of Korea the currency remained relatively stable until much later in the year. To identify the event date in a transparent way we used the mean and standard deviation of the daily exchange rate variations for the two and a half years preceding the 2~July 1997. We identify the event date as the first day in the first period (after the 2~July 1997) in which the exchange rates depreciated vis-à-vis the US dollar by more than i) 3 times the standard deviation and ii) for at least three consecutive days. This procedure avoids picking up single-day events, thus ensuring that we identify the first day in a period of repeated violations of an established threshold. Thus implicitly we define the event as a powerful and protracted deviation from a well consolidated pattern.

Figure 1. Daily variation in the exchange rate and event dates



Vis-à-vis the US dollar. Positive values indicated depreciation.
Sources: Bloomberg, authors'calculations.

For *Korea* it is also difficult to pinpoint an event date. For Korea the first signs of difficulties appeared at the end of October. On 28 October, the won depreciated by more than the official daily limit for the first time. Despite repeated reassurance by the Bank of Korea that the country had sufficient foreign currency reserves, speculative attacks continued during November. On the 18 and 19 of November, the won repeatedly hit the floor of the fluctuation band depreciating around 2.5 percent vis-à-vis the dollar. Following our methodology, the date chosen as event is 18 November, the first day of the first three consecutive days where the won depreciated more than three times the standard deviation of the normal period daily variation. On this day the Korean Won depreciated by more than 2 percent. A few days the later, on the 20 November, it depreciated by almost 10 percent. It is perhaps worth noting that on the 20 November the Korean government widened the band to 10 percent allowed fluctuation from the previous 2.25 percent.

3.2 Event window

Following a standard event study methodology, we distinguish between the event window and the estimation window. The estimation window should be chosen as a suitably long period before the event, in our case the currency devaluation. Such estimation window is used to estimate differences in stock market returns between the export and non-export sectors during quiet times. Such "normal" returns will, then, be used as benchmark to calculate the "abnormal" returns, that is, those in the run up to the devaluation. The event window is the period over which the returns of the sectors involved in the event will be examined. In our case, this event coincides with the run-up to each country's currency devaluation. For all countries the event window is chosen as the 20 days preceding the event and 10 days after the event.

The latter serves to investigate the short-run impact of the devaluation on the returns of exporting firms relative to others. In fact, after the devaluation occurs, we should observe a widening gap between the returns in the general index and those in the exporting sector, with these last ones taking effective advantage of the occurred devaluation. In any event study, the most relevant part of the exercise is the evolution of abnormal returns prior to the devaluation. To avoid the influence of the Thai crisis on other countries and the overlapping of estimation and event windows, we consider one-year-and-a-half of daily observations (330 working days) up to 16 May 1997.

3.3 Normal returns, abnormal returns and cumulative abnormal returns

We now calculate normal, abnormal returns and cumulative abnormal returns (CARs) following Campbell (1996). In our setting, the differential return (R) is calculated as the difference between the exporting and the non-exporting sector/firm (or the general stock market index), depending on the specification.

R_t = Day t returns for exporter – Day t returns for non-exporter

To calculate the normal returns, E(R), we use the average differential return over the estimation window. This could be labelled a "constant-mean-difference-in-returns" model. Formally:

E(R) = Average daily return in the estimation window

To calculate the daily abnormal returns E_t in the event window we take the difference between the daily return differential during the event window and the average daily return in the estimation window.

$$E_t = R_t - E(R)$$

To calculate the cumulative abnormal returns (CAR) for a given period we simply sum over the daily abnormal returns in the event window, namely:

$$CAR_{t,t+n} = E_t + E_{t+1} + \ldots + E_{t+n}$$

The difference between the CAR and the normal returns should provide a measure of the impact of the event on the relative value of the exporting sector equity.

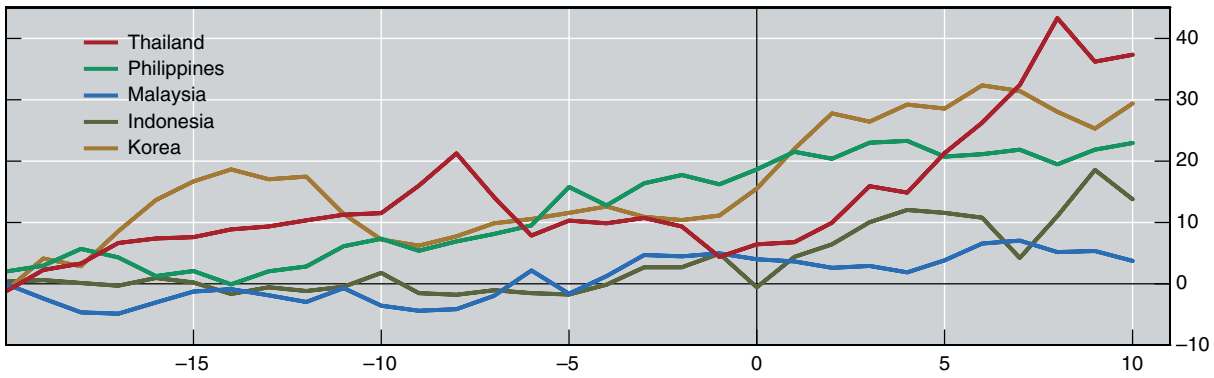
4. Results

We find some evidence that the CARs for exporting firms' equity prices did indeed convey some information on how investors valued the likelihood of a devaluation in the Southeast Asian countries which experienced major devaluations in 1997. In other words, market participants did seem to bet in favour of a devaluation occurring soon. More generally, for all the countries in our sample, the returns of the exporting sector relative to the general index increased as the devaluation dates got closer (Figure 2).

The CAR are increasing in all cases but the question is whether such positive slope is statistically significant (i.e., if the CAR are different from the normal excess returns one would expect from investing in the export sector shares relative to the market in normal times). To answer this question we turn to the observation of Table 2.

Table 2 shows the CAR by country in a period before the event which can be longer (20 days) or shorter (10 days). For example, the second column indicates that in Thailand, the cumulative abnormal returns from investing in the electronic (exporting) sector relative to the general index was 8.05% for the 25 days before the devaluation with a significance level of 10%. The statistical significance is obtained by comparing the excess returns with those that would have been obtained on the same time span during a normal period. In this case, the probability of observing in normal times an excess return of the exporting sector over the general index of as much as 8.05% in 25 working days is less than 10%. By the same logic, investing in the Philippines exporting firm 25 days before the crisis would guarantee 17.73% over the general index. The probability of observing such an excess return in normal periods is zero percent.

Figure 2. Cumulative abnormal returns in event-window



Specificiation II.
Sources: Bloomberg, authors'calculations.

Table 2. Before the events
Cumulative abnormal returns and signficance level

	Specification I: Export sector – General index		Specification II: Export firm – General index		Specification III: Export sector – Non-export sector	
	20 days	10 days	20 days	10 days	20 days	10 days
Thailand	6.65 (0.12)	3.44 (0.19)	4.41 (0.37)	-6.86 (0.76)	5.31 (0.23)	6.93* (0.09)
Philippines			16.22*** (0.01)	10.11*** (0.01)		
Malaysia			6.01 (0.25)	7.44* (0.10)		
Indonesia	1.39 (0.43)	5.00* (0.10)	4.93 (0.34)	5.42 (0.26)	-1.20 (0.56)	5.89 (0.15)
Korea	2.53 (0.23)	2.78 (0.12)	11.14 (0.12)	-0.25 (0.51)	7.11 (0.11)	6.46* (0.06)

* Significance between 5 and 10% ** Significance between 1 and 5% *** Significance below 1%.
Sources: Bloomberg, authors' calculations.

The first specification compares the sub-index for the exporting sector with the main index. Here we find that the CARs for Thailand, Indonesia and Korea are all positive and very close to being significant at the 10 percent level in the 10 days or two weeks prior to the event date. In Thailand, they were also positive and close to being significant at the 10 percent level 20 days or 4 weeks before the devaluation.

The second specification, which compares a single exporting firm with the main index, allows us to calculate CAR for all countries in our sample. The above table shows a strong and significant abnormal behaviour during the last 20 as well 10 trading days before the event in the Philippines. This likely reflects the impact of the Thai devaluation which took place on 2 July, only 9 days before the devaluation of the peso. For both Indonesia and Malaysia we find high and positive CARs 10 and 20 days before the devaluation, although none of them are statistically significant. For both Thailand and Korea the evidence with this specification is mixed, as the CARs are negative in some cases and only one of them is even close to statistical significance. This finding may reflect that the export sector chosen for Thailand is computers and computer parts sub-index which may have a higher degree of imported inputs and the sectors chosen for the other countries.

The third specification compares the exporting sector with the non-exporting sector. This specification provides only limited support for our hypothesis 20 days before the event. In the 10 days closest to the devaluations however, there is some evidence that excess returns are positive and high for the export sector.[5] The results are almost statistically significant for Indonesia and statistically significant for both Thailand and Korea.[6]

Overall, we interpret these results as providing some support for the hypothesis that the devaluation was in fact expected by local equity market participants during the Asian crisis. The results are robust to changes in the estimation window. Appendix B provides results similar to those shown in Table 2 where the estimation period was moved back one month. As one can see, the results are very similar to those presented in Table 2, and in some cases stronger.

[5] For Malaysia similar results were found using Kuala Lumpur Kepong BHD, with a similar share of revenues from exports and with sales in other Asian countries not affected by the 1997 crisis.

[6] Given Korea's higher level of financial development, we are also able to perform an additional test, namely comparing Samsung Heavy Industries branch with the Samsung Securities branch, which is fully home based. By comparing two subsidiaries of the same firm this exercise controls (to some extent for firm heterogeneity). The results are similar in spirit to those presented in Table 2. We thank Doo Yong Yang for suggesting this additional specification.

Table 3. After the events
Cumulative abnormal returns and significance level

	5 days after THB devaluation	5 days after PHP devaluation
Thailand	14.86*** (0.01)	2.24 (0.24)
Philippines[1]	8.10*** (0.01)	2.10 (0.25)
Malaysia	5.08 (0.28)	6.71 (0.18)
Indonesia	10.28 (0.23)	9.22 (0.22)

Specification II. * Significance between 5 and 10 percent. ** Significance between 1 and 5 percent. *** Significance below 1 percent.
Source: Bloomberg, authors calculations.

Up to now we have considered the presence of devaluation expectations for the local currency for equity prices in the local market. We now consider to what extent the other countries' equity markets responded to the devaluation of the Thai baht and peso.

As shown in Table 3, we find that following the Thai devaluation all markets had higher returns for exporters, with the difference being statistically significant for both Thailand and the Philippines. The findings for the latter however, likely also reflect expectations of a devaluation of the peso which occurred a few days later. Similarly, we also find that the following the devaluation of the peso returns were higher for exporters in all markets. The results are however, less strong than following the devaluation of the baht. We interpret the results in Table 3 as an indication that both the devaluation of the baht and the peso in early July resulted in devaluation of the other currencies as being seen as more likely than before, with the impact of the Thai devaluation being the most important.

4.1 Controlling for macroeconomic factors

Event study methodology is, by nature, a uni-variate methodology. To check the robustness of our results to the inclusion of other variables, we move to panel regression. This allows us to control for potentially relevant financial and macroeconomic determinants of the devaluation which occurred during the Asian crisis, drawing from the literature of early warning indicators reviewed before. The disadvantage of this methodology, compared to the event study analysis, is obvious in our case: it cannot profit from the daily nature of the stock market information, as control variables have a much lower frequency (monthly in few cases and, otherwise, quarterly or yearly).

However, even if we have to aggregate the daily data on the stock markets, to make them comparable with the other macroeconomic control variables, we still succeed in building our objective variable (excess returns) starting from daily observations in the following way: we first consider two years of daily observations (from 10.01.1995 to 27.12.1996) and we obtain the daily average excess returns in this period. This will represent our out-of-sample period. We then get the daily average excess returns on a monthly basis for all the months starting from January 1997 until December 1998. This will represent our in-sample period. By taking the difference between the out-of-sample and the in-sample average daily excess returns, we obtain our objective variable.

The dependent variable is a categorical variable built in accordance with the literature on early warning systems: it characterises an event as any devaluation in the exchange rate vis-à-vis the US Dollar which exceed the 90th percentile of monthly variation in the two years in-sample-period. This means that of the 24 months under consideration (from January 1997 to December 1998), only three will be considered as events. After controlling for unobserved heterogeneity with fixed effects, we find that excess returns by exporting companies are significantly higher just prior to the devaluation, as compared with those that had been obtained during a normal period (our out-of-sample period). None of the other controls are found to be significant, which confirms the general view in the literature that the Asian devaluations were extremely difficult to predict using macroeconomic variables.

Table 4. Controlling for macroeconomic factors
Significance of the explanatory variables

Objective variable				
Excess returns	0.056**	0.062*	0.057**	0.065*
	(0.01)	(0.03)	(0.01)	(0.02)
Macroeconomic control variables				
Change in domestic credit (one period lag)		0.041		0.529
		(0.64)		(0.46)
Change in REER (one period lag)		0.024		0.025
		(0.74)		(0.74)
Change in CPI (one period lag)			0.035	0.011
			(0.81)	(0.93)
Change in industrial production (one period lag)			0.028	0.029
			(0.38)	(0.34)
	Observations:120 Pseudo R^2 = 0.04	Observations:120 Pseudo R^2 = 0.05	Observations:120 Pseudo R^2 = 0.05	Observations:120 Pseudo R^2 = 0.06

Significant at 5 percent level. * Significant at 1 percent. P-values are reported in parenthesis.
Sources: Authors' calculations.

5. Concluding thoughts

In this paper we have used event study methodology to analyse whether stock markets in the five Southeast Asian countries which devalued in 1997, namely Indonesia, Korea, Malaysia, the Philippines and Thailand could have conveyed useful information to predict the 1997 currency crises. The underlying assumption for our analysis is that a large devaluation should benefit exporting firms relatively more than non-exporting firms, other things given. The implication being that if a depreciation is seen as likely, returns for exporting firm equities should be unusually high relative to non-exporting firm equities in the period leading up the event.

We relied on three different specifications with different degrees of granularity. First we compared, where available an export sector subindex with the main index. Second, we compared individual firm equity prices for exporting firms with the main index. The third and final specification compared the export sector index with a non-export sector index.

Our results broadly confirm, using several different data combinations for the event study, that local equity markets favoured exporters in the periods leading up to the devaluations. We also find that equity markets in the other sample countries reacted by favouring exporters immediately after the devaluation of the Thai baht. We interpret this as mild evidence in favour of investors expecting Thailand's currency crisis to spread to other countries in the region, contrary to what many had thought. Using a panel regression, we also find that the event-study results are robust to the inclusion macroeconomic variables generally used in the literature.

Appendix A – Data characteristics

Data characteristics

NATION	VARIABLE	DESCRIPTION
THAILAND	SET	Main Stock Index.
	SETETRON	Electronic sub-index. Main export based sector in the SET Index. It represents 1.83% of the whole SET Index.
	SETINS	Insurance sub-index. Main home-based sector in the SET Index.
	Muramoto Electronics[1]	Manufactures and exports electronic components. More than 80% of revenues from sales abroad. Four biggest companies listed in the Setetron index.
KOREA	KOSPI	Main Stock Index.
	KOSPTREQ	Heavy industrial equipment sub-index. Almost 100% export oriented in the five biggest listed companies (covering 70% of the sub-index). It represents 10.27% of the whole KOSPI Index.
	KOSPCONS	Real estate sub-index. Main home-based sector in the KOSPI Index.
	Samsung Heavy Industries Ltd	Manufactures crude oil tankers. Also produces steel and bridge structures. More than 80% of revenues from sales abroad.
	Samsung Securities	Provides brokerage and investment trust. Revenues are 100% home based.
PHILIPPINES	PCOMP	Main Stock Index
MALAYSIA	Philippine LDT	Provides domestic and international telephone services.
	KLCI	Main Stock Index.
	Golden Hope Plantations[2]	Produces and processes rubber and palm oil. More than 50% of revenues from sales abroad. Two biggest companies in the palm oil production sector. For further information: www.ids.org.my/stats/Agriculture
INDONESIA	JCI	Main Stock Index.
	JAKMINE	Mining sub-index. Main exporting sector in the JCI Index. It represents 12.34% of the whole JCI Index.
	JAKCONS[3]	Real estate sub-index. Three biggest companies (representing 65% of the sub-index) are 90% home-based. For the alternative specification, the four biggest companies in the Industrial and Chemicals sub-index (representing 70% of the whole index) are also 90% home-based.
	Medco Energi Internasional[4]	Provides exploration, production and support services for oil, natural gas and other energy industries. Two biggest exporting companies listed in the Jakmine Index for which data are available.

˙ Hana, MPT and Delta considered as alternatives. [2] KPK considered as alternative. [3] JAKBIND considered as alternative. [4] TINS considered as alternative.
Source: Bloomberg, Economist Intelligence Unit

Appendix B – Event study robustness to estimation window

Event study results with different estimation window

Cumulative abnormal returns and signficance level

	Specification I: Export sector – General index		Specification II: Export firm – General index		Specification III: Export sector – Non-export sector	
	20 days	10 days	20 days	10 days	20 days	10 days
Thailand	7.50* (0.09)	3.87 (0.16)	6.34 (0.32)	-5.89 (0.73)	5.20 (0.23)	6.88* (0.09)
Philippines			16.74*** (0.003)	10.36*** (0.01)		
Malaysia			7.96 (0.16)	7.80* (0.08)		
Indonesia	7.92* (0.07)	1.49 (0.42)	2.23 (0.45)	8.29 (0.24)	-1.00 (0.55)	5.98 (0.15)
Korea	9.95*** (0.00)	2.94*** (0.11)	12.35* (0.08)	0.35 (0.48)	7.78* (0.18)	6.80** (0.09)

Significance between 5 and 10% ** Significance between 1 and 5% *** Significance below 1%.
Sources: Bloomberg, authors' calculations.

References

Allayannis, G, G Brown and L Klapper (2003): "Capital structure and financial risk: evidence from foreign debt use in East Asia", Journal of Finance, vol 58, pp 2285–2812.

Berg, A, E Borensztein and C. Patillo (2004): "Assessing early warning systems: how have they worked in practice?", IMF Working Paper WP/04/52.

Bleakley, H and K Cowan (2005) "Dollar debt and devaluations: much ado about nothing?" IADB Working Paper WP/532.

Campbell, J, A W Lo and A C MacKinlay (1996): "The econometrics of financial markets", Princeton University Press.

Cohen, B and E Remolona (2006), "Information flows during the Asian crisis: evidence from closed-end funds", *Journal of International Money and Finance*, vol 27, pp 636–53.

Crespo-Cuaresma, J C and T Slacikz (2006): "An 'almost-too-late' warning mechanism for currency crises", mimeo, University of Vienna.

Ferri, G, L G Liu and J E Stiglitz (1999): "The pro-cyclical behaviour of credit rating agencies: evidence from the East Asian crisis ", *Economic Notes*, Vol. 28, pp 335–355.

Guesnerie, R and M Woodford (2003): -Can currency crises be forecast?, in International Economic Flows, Currency Crises, Investment and Economic Development: Essays in Memory of Vittorio Marrama (G. Gandolfo and F. Marzano, eds.), Roma, EUROMA, 2003.

Kaminski, G, S Lizondo and C M Reinhart (1998): "Leading indicators of currency crisis", IMF Staff Papers, Vol. 45, pp 1– 48.

WORKING PAPERS

0001 **Fernando C. Ballabriga, Sonsoles Castillo:** BBVA-ARIES: un modelo de predicción y simulación para la economía de la UEM.

0002 **Rafael Doménech, María Teresa Ledo, David Taguas:** Some new results on interest rate rules in EMU and in the US

0003 **Carmen Hernansanz, Miguel Sebastián:** The Spanish Banks' strategy in Latin America.

0101 **Jose Félix Izquierdo, Angel Melguizo, David Taguas:** Imposición y Precios de Consumo.

0102 **Rafael Doménech, María Teresa Ledo, David Taguas:** A Small Forward-Looking Macroeconomic Model for EMU

0201 **Jorge Blázquez, Miguel Sebastián:** ¿Quién asume el coste en la crisis de deuda externa? El papel de la Inversión Extranjera Directa (IED)

0301 **Jorge Blázquez, Javier Santiso:** Mexico, ¿un ex - emergente?

0401 **Angel Melguizo, David Taguas:** La ampliación europea al Este, mucho más que economía.

0402 **Manuel Balmaseda:** L'Espagne, ni miracle ni mirage.

0501 **Alicia García Herrero***:* Emerging Countries' Sovereign Risk:Balance Sheets, Contagion and Risk Aversion

0502 **Alicia García-Herrero and María Soledad Martínez Pería:** The mix of International bank's foreign claims: Determinants and implications

0503 **Alicia García Herrero, Lucía Cuadro-Sáez:** Finance for Growth:Does a Balanced Financial Structure Matter?

0504 **Rodrigo Falbo, Ernesto Gaba**: Un estudio econométrico sobre el tipo de cambio en Argentina

0505 **Manuel Balmaseda, Ángel Melguizo, David Taguas:** Las reformas necesarias en el sistema de pensiones contributivas en España.

0601 **Ociel Hernández Zamudio**: Transmisión de choques macroeconómicos: modelo de pequeña escala con expectativas racionales para la economía mexicana

0602 **Alicia Garcia-Herrero and Daniel Navia Simón:** Why Banks go to Emerging Countries and What is the Impact for the Home Economy?

0701 **Pedro Álvarez-Lois, Galo Nuño-Barrau**: The Role of Fundamentals in the Price of Housing: Theory and Evidence.

0702 **Alicia Garcia-Herrero, Nathalie Aminian, K.C.Fung and Chelsea C. Lin:** The Political Economy of Exchange Rates: The Case of the Japanese Yen

0703 **Ociel Hernández y Cecilia Posadas**: Determinantes y características de los ciclos económicos en México y estimación del PIB potencial

0704 **Cristina Fernández, Juan Ramón García**: Perspectivas del empleo ante el cambio de ciclo: un análisis de flujos.

0801 **Alicia García-Herrero, Juan M. Ruiz:** Do trade and financial linkages foster business cycle synchronization in a small economy?

0802 **Alicia García-Herrero, Eli M. Remolona:** Managing expectations by words and deeds: Monetary policy in Asia and the Pacific.

0803 **José Luis Escrivá, Alicia García-Herrero, Galo Nuño and Joaquin Vial:** After Bretton Woods II.

0804 **Alicia García-Herrero, Daniel Santabárbara:** Is the Chinese banking system benefiting from foreign investors?

0805 **Joaquin Vial, Angel Melguizo:** Moving from Pay as You Go to Privately Manager Individual Pension Accounts: What have we learned after 25 years of the Chilean Pension Reform?

0806 **Alicia García-Herrero y Santiago Fernández de Lis:** The Housing Boom and Bust in Spain: Impact of the Securitisation Model and Dynamic Provisioning.

0807 **Ociel Hernández, Javier Amador:** La tasa natural en México: un parámetro importante para la estrategia de política monetaria.

0808 **Patricia Álvarez-Plata, Alicia García-Herrero**: To Dollarize or De-dollarize: Consequences for Monetary Policy

0901 **K.C. Fung, Alicia García-Herrero and Alan Siu:** Production Sharing in Latin America and East Asia.

0902 **Alicia García-Herrero, Jacob Gyntelberg and Andrea Tesei:** The Asian crisis: what did local stock markets expect?

0903 **Alicia Garcia-Herrero and Santiago Fernández de Lis:** The Spanish Approach: Dynamic Provisioning and other Tools

0904 **Tatiana Alonso:** Potencial futuro de la oferta mundial de petróleo: un análisis de las principales fuentes de incertidumbre.

0905 **Tatiana Alonso:** Main sources of uncertainty in formulating potential growth scenarios for oil supply.

0906 **Ángel de la Fuente y Rafael Doménech:** Convergencia real y envejecimiento: retos y propuestas.

0907 **KC FUNG, Alicia García-Herrero and Alan Siu:** Developing Countries and the World Trade Organization: A Foreign Influence Approach.

0908 **Alicia García-Herrero, Philip Woolbridge and Doo Yong Yang:** Why don't Asians invest in Asia? The determinants of cross-border portfolio holdings.

0909 **Alicia García-Herrero, Sergio Gavilá and Daniel Santabárbara:** What explains the low profitability of Chinese Banks?.

0910 **J.E. Boscá, R. Doménech and J. Ferri:** Tax Reforms and Labour-market Performance: An Evaluation for Spain using REMS.

0911 **R. Doménech and Angel Melguizo:** Projecting Pension Expenditures in Spain: On Uncertainty, Communication and Transparency.

0912 **J.E. Boscá, R. Doménech and J. Ferri:** Search, Nash Bargaining and Rule of Thumb Consumers

0913 **Angel Melguizo, Angel Muñoz, David Tuesta and Joaquín Vial**: Reforma de las pensiones y política fiscal: algunas lecciones de Chile

0914 **Máximo Camacho:** MICA-BBVA: A factor model of economic and financial indicators for short-term GDP forecasting.

0915 **Angel Melguizo, Angel Muñoz, David Tuesta and Joaquín Vial:** Pension reform and fiscal policy: some lessons from Chile.

0916 **Alicia García-Herrero and Tuuli Koivu:** China's Exchange Rate Policy and Asian Trade

0917 **Alicia García-Herrero, K.C. Fung and Francis Ng:** Foreign Direct Investment in Cross-Border Infrastructure Projects.

0918 **Alicia García Herrero y Daniel Santabárbara García;** Una valoración de la reforma del sistema bancario de China

0919 **C. Fung, Alicia Garcia-Herrero and Alan Siu:** A Comparative Empirical Examination of Outward Direct Investment from Four Asian Economies: China, Japan, Republic of Korea and Taiwan

0920 **Javier Alonso, Jasmina Bjeletic, Carlos Herrera, Soledad Hormazábal, Ivonne Ordóñez, Carolina Romero and David Tuesta:** Un balance de la inversion de los fondos de pensiones en infraestructura: la experiencia en Latinoamérica

0921 **Javier Alonso, Jasmina Bjeletic, Carlos Herrera, Soledad Hormazábal, Ivonne Ordóñez, Carolina Romero and David Tuesta:** Proyecciones del impacto de los fondos de pensiones en la inversión en infraestructura y el crecimiento en Latinoamérica

BBVA

Interesados dirigirse a:

Servicio de Estudios Económicos BBVA P. Castellana 81 planta 7 48046 Madrid http://serviciodeestudios.bbva.com