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How did the Asian Stock Markets React to Bank Mergers after the 1997 Financial Crisis?

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Abstract

The objective of this paper is to empirically assess the stock market reaction to the announcement of banks Mergers and Acquisitions (M&As) in eight East Asian countries over the 1997-2003 period. M&As are classified according to the status of entity, the time period of the deal and the maturity of the banking system. A Bivariate GARCH model is used to estimate abnormal returns taking beta conditional variability into account. We find that the market reacts negatively to the M&As that occurred during the crisis period (1997-2000) and in the less mature banking systems (Indonesia, Malaysia, Philippines, South Korea and Thailand).

JEL classification: G14, G21, G34

Keywords: Mergers and Acquisitions; Banking; Event study; Consolidation process

1. Introduction

The move towards globalization entailed some risk that was recognized only upon the onset of the 1997 Asian crisis. Several papers have analysed the causes and consequences of the crisis from different perspectives. For some authors, weak fundamentals were the main cause of the crisis while others place more weight on the radical shift in expectations as the primary trigger of the crisis¹. Beside these explanations that highlight the role of macroeconomic characteristics other studies explore the microeconomic factors of this financial instability². During this crisis, banking institutions came under severe stress. Asian governments faced a trade-off between leaving distressed banks open rather than closing them. This public choice depends on the importance of the particular financial institution to the local economy and its potential systemic impact on the rest of the financial system. Therefore, some governments decided to avoid closure through recapitalization, guarantees of bank liabilities, liquidity support, regulatory forbearance and tax preferences. These direct supports were also accompanied by indirect supports, such as government-led consolidations. Indeed, domestic mergers and takeovers often constitute the least costly way of restructuring the banking system. But, unlike in mature systems where market forces play the dominant role in the incentives to consolidate, some Asian governments were instrumental in the consolidation efforts. They encouraged or even forced banking institutions to merge (Hawkins and Turner (1999), Hawkins and Mihaljek (2001), Gelos and Roldós (2004)). Thus, since the 1997 crisis, the East Asian countries have experienced an unprecedented level of consolidation.

The objective of this study is to examine the stock market reaction to the announcement of bank Mergers and Acquisitions (M&As) in eight East Asian countries (Hong Kong, Indonesia, Malaysia, Philippines, Singapore, South Korea, Taiwan and Thailand) from 1997 to 2003. For purposes of this study, we use Hawkins and Mihaljek's (2001) classification to distinguish "more mature" banking systems where M&As are mainly market

driven, against “less mature” ones where government-led M&As proliferate. Hence M&As in Hong Kong, Singapore and Taiwan are market driven while those on the remaining countries are effectively classified as government-led. The existing studies that examine the effects of financial restructuring announcement on the value of bank stocks mainly focus on direct supports policies (Kho and Stulz (2000), Kang *et al.* (2001), Klingbiel *et al.* (2001), Lau and McInish (2003)). We examine here the market expectations in terms of return.

Most of the available studies on M&As in the banking sector concern the US and Europe (Hannan and Wolken (1989), Houston and Ryngaert (1994), Pilloff and Santomero (1998), Cybo-Ottone and Murgia (2000), Delong (2001), Lepetit *et al.* (2004)). These studies focus on the achievement of performance gains attributable to economies of scale and scope, cost reduction, increased market power and reduced earning volatility due to consolidation. These expected performance gains should be positively valued by the market. By contrast, the bank consolidations in East Asia after the crisis were not mainly conducted for efficiency considerations but were primarily encouraged to strengthen the banking system. Here, strengthening means having a few banks with a large capital base. Indeed, some of the acquiring banks are paired off with banks in distress. In this case, one will not necessarily expect a positive value effect for the acquiring banks. Instead, such a merger should imply an increase in risk for the acquirer banks if the target is about to fail or has a bad portfolio. On the other hand, the target should benefit from a decrease in risk. Thus, whether the process of government-led M&As stabilizes the financial system remains an open question.

The impact of M&As on bank return is studied using a framework developed by Frame and Lastrapes (1998). Abnormal returns are modelled as a Bivariate GARCH process to control for time-varying beta volatility. Although the use of the market model to estimate abnormal returns has a long standing, a growing body of evidence exists which suggests that both individual stock and portfolio betas are time-varying (see Fabozzi and Francis (1978),

Bos and Newbold (1984)). Explicitly modelling time varying betas avoids the problem of inaccurate estimates of abnormal returns induced by a misspecification of beta's properties.

The paper is organized as follows. Section 2 discusses the banking consolidation process that took place after the 1997 crisis in 8 East Asian countries (Indonesia, Hong-Kong, Malaysia, Philippines, Singapore, South-Korea, Taiwan and Thailand). Section 3 presents the sample design and the data sources on East Asian banks M&As. Section 4 explains how abnormal returns are computed using a Bivariate GARCH scheme. Section 5 presents the results and section 6 concludes.

2. Post-Asian crisis banking consolidation process

Since the 1997 crisis, banks M&As in the East Asian countries have taken place at record levels. According to Securities Data Corporation (SDC), the total number of deals was 39 over the period 1990-1996 and jumped to 140 deals for the 1997-2003 period. Table 1 shows that this sharp increase occurred mainly during the three years following the crisis.

Table 1. Number of M&As for the banking industry in 8 East Asian countries, 1990-2003

Country	Number of M&As before the crisis 1990-1996	Number of M&As after the crisis 1997-2003		
		1997-2000	2001-2003	Total
Hong-Kong	12	12	7	19
Indonesia	3	7	3	10
Malaysia	8	14	4	18
Philippines	7	24	9	33
Singapore	4	4	9	13
South Korea	2	14	6	20
Taiwan	3	5	8	13
Thailand	0	14	0	14
Total	39	94	46	140

Data sources: Thomson Financial Securities Data Mergers and Acquisitions Database

As stated in the introduction, the M&As that took place in western and more mature economies can be distinguished from those that occurred in East Asian economies after the 1997 crisis. Gelos and Roldós (2004) list globalization, technological developments and regulation as the main driving forces of M&As in mature banking systems. While these may also be present in some East Asian countries, M&As were mainly driven by government desires to avoid the closure of distressed banks. As Hawkins and Mihaljek (2001) state, two groups of countries can be distinguished in this banking consolidation process.

In the emerging economies with more mature banking systems (Hong-Kong, Singapore and Taiwan), the governments need both to foster the development of the major domestic banks and to help them to compete in the region against foreign banks. As reported by Carse (2001), Hong-Kong banks remained profitable even during the Asian crisis. Financial distress was therefore not a driving force for M&As. In order to compete with foreign banks, a number of local banks merged. The Singapore government has been more pro-active in the banking consolidation process. Indeed, government induced local banks to strengthen themselves by raising disclosure and corporate governance standards to international norms.

In the emerging economies with less mature banking systems (Indonesia, Malaysia, Philippines, South Korea and Thailand), M&As were mainly government-led. Two arguments are used to justify such consolidation process. Firstly, these interventions provide a way for distressed banks, which remain unattractive to potential buyers, to restore their financial viability. Secondly, such interventions may still be more cost-effective than a government bailout or takeover. Korean and Malaysian governments were more active in the restructuring of the financial system through bank consolidation as compared to the Philippines and Thailand where the process was partially driven by market forces. Korea successfully reduced the number of banks from 27 prior to the 1997 crisis to 17 by the beginning of 2000 through

government encouraged consolidation: 9 banks merged to form 4 successor banks in 1999 and 2 merged to form one bank in July 2000. In Malaysia, authorities announced a plan in September 1999 for 54 local banks and finance companies to merge into 6 large groups (Gelos and Roldós, (2004)). In October, these banks and finance companies were allowed to decide voluntarily with whom to merge. This was probably one of the most successful government-led bank consolidation efforts. Other governments have been less successful in inducing mergers and consolidations. Since 1997, 17 private banks and 4 state banks have been involved in 2 mandatory government-sponsored mergers and 3 voluntary mergers in Indonesia. The first government-sponsored mergers took place in July 1999 (4 distressed state banks were merged) and the second one was implemented in June 2000 (9 small banks were consolidated into 1 private bank).

3. Data, sample selection and descriptive statistics

We examine M&As in 8 East Asian countries (Hong-Kong, Indonesia, Malaysia, Philippines, Singapore, South Korea, Taiwan and Thailand) announced between January 1 1997 and December 31 2003 where both of the partners are credit institutions³. The Thomson Financial Securities Data Merger and Acquisition Database lists 140 such deals (see Table 1 for more details). We use only those M&As where the acquirer and/or the target's stock is publicly traded and daily stock return data are available on a continuous basis. The data source for the individual banks' returns as well as home market index is Datastream International⁴. The distinction between a merger and an acquisition is somewhat vague. A merger is often defined as a transaction where one entity is combined with another so that at least one initial entity loses its distinct identity. An acquisition is often considered as a transaction where one firm purchases a controlling stake of another firm without combining the assets of the firms involved. In this study the distinction is not made and the terms merger and acquisition are used interchangeably to refer to transactions involving the combination of

two independent firms to form one entity. This study limits itself to transactions for which the acquirer gets to own at least 25% of the target after the deal⁵. Moreover, only completed operations are considered⁶. Thus, out of the 140 M&As listed by Thomson Financial Securities Data Merger and Acquisition Database, a sample of 90 deals is obtained. Banks with discontinuously traded stocks around the event are excluded. In the remaining sample, there are 16 banks which experienced at least two M&As during the considered period. Hence, the study only includes banks with multiple events for which at least a 160 day no break estimation window is available. The final data set used in the empirical analysis after all these exclusions includes 71 deals involving 48 banks.

Three criteria are used to classify our panel of M&As. The first criterion is the status of the entity, target or acquirer, traditionally used in such studies. Following the analysis of Hawkins and Mihaljek (2001) on the banking consolidation process in emerging countries, two specific criteria related to the Asian crisis are also used: the time period of the deal and the maturity of the banking system. As stated by these authors, the government-led M&As occurred mostly during the 1997-2000 period. Thus, we distinguish two sub periods: the crisis period (1997-2000) and the post crisis period (2001-2003). Concerning the maturity of the banking system, we previously highlighted that consolidation has been predominantly a way of resolving problems of financial distress in the less mature banking systems (Indonesia, Malaysia, Philippines, South Korea and Thailand), whereas M&As are essentially market driven in the more mature banking systems (Hong Kong, Singapore and Taiwan). In our sample, 45% of the deals concern the countries with a less mature banking system and 60% of the deals occurred during the crisis period.

Financial ratios, which provide information on individual bank characteristics, are computed using annual financial statements obtained from Bankscope Fitch IBCA. Information is available for all the 48 banks considered in our analysis. We consider: (i)

profitability defined by the return on assets (ROA); (ii) capital requirement as measured by the total capital ratio (TCR); (iii) asset quality represented by the ratio of non performing loans to total loans (NPL); (iv) management quality defined by the ratio of operating expenses to total revenue often called the inefficiency ratio (INEFF); (v) size as measured by the logarithm of total assets (SIZE). For the 71 deals in our sample, we compute for each bank the mean of each variable over the two years before the deal. Table 2 shows summary statistics for sub-samples based on the three criteria defined above.

Table 2. Summary statistics of banks' financial statement before the deal

Mean (%)	ROA	TCR	NPL	INEFF	SIZE
<i>Full sample (N=71)</i>	-0.096	15.337	14.322	56.75	15.972
<i>Entity Status</i>					
Target (N=35)	-0.651	12.852	19.851	67.54	15.951
Acquirer (N=36)	0.557	18.685	9.253	43.07	15.996
Mean Test: t-statistic	-2,079**	-5,860**	5,965**	2,057**	-0,121
<i>Time period of the deal</i>					
Crisis period (N=43)	-0,396	15,079	13,232	58,625	15,674
Post crisis period (N=28)	0,365	15,571	15,737	53,827	16,431
Mean Test: t-statistic	-1,255	-0,218	-0,427	0,383	-2,110**
<i>Maturity of the banking system</i>					
More mature (N=26)	0.719	17.037	9.144	49.058	15.968
Less mature (N=45)	-0.557	13.932	19.067	60.702	15.974
Mean Test: t-statistic	2,118**	1,976**	-2,818**	-4.289**	-0.018

Note: ROA=the return on assets; TCR=the total capital ratio; NPL=the ratio of non performing loans to total assets; INEFF=the ratio of operating expenses to total revenue; SIZE=the logarithm of the total assets. These variables are calculated on average for the 2 years before the deal.

More mature banking system are Hong Kong, Singapore and Taiwan; Less mature banking system are Indonesia, Malaysia, Philippines, South Korea and Thailand.

**** indicates significance at the 5% level.**

On average, the whole sample presents a negative profitability before the deal, mainly due to the weakness of target banks compared to the acquired banks. This weakness is highlighted by three factors. Firstly, the ROA is on average negative and significantly lower for target banks compared to acquirer banks. Secondly, target banks have total capital ratios significantly lower and non-performing loan (NPL) ratios greater than acquirer banks. Their NPLs represent around 20% of total loans. Thirdly, operating expenses are particularly high for target banks and lead to a higher inefficiency. This fragility of target banks supports the government-led consolidation effort to strengthen capital adequacy and the financial viability of many banks affected by the 1997-1998 crisis. Indeed, healthier banks are being induced to merge through government buyouts of NPLs and the prospect of increasing their market share.

Moreover, banks' published accounts suggest substantial differences in efficiency and profitability across countries according to the maturity of their banking system. Table 2 shows that banks in mature banking systems show positive and significantly higher profits and capital ratios than those in less mature banking systems. Moreover, the non-performing loans and the inefficiency ratios are significantly higher for the less mature banking systems.

4. Methodology

We consider the market reaction to M&As announcement occurred after the 1997 crisis. Then, the event study methodology is used to estimate abnormal stock market returns around the event day D , which is the announcement date. Abnormal returns (AR) are defined as the daily realised return for each firm i , net of the estimated expected returns for the period around a given event date (the event window). Traditionally, the standard market model is used to calculate abnormal returns. This methodology is severely limited by the assumption of a constant beta over the estimation period. We apply here a methodology developed by Frame

and Lastrapes (1998) based on a Bivariate GARCH which allows beta to be time-varying.

This method is described by the following equations:

$$(1) \quad r_{it} = a_{i1} + a_{i2} r_{i,t-1} + u_{it}$$

$$(2) \quad r_{mt} = a_{m1} + a_{m2} r_{m,t-1} + u_{mt}$$

$$(3) \quad h_{iit} = c_{i1} + c_{i2} u_{i,t-1}^2 + c_{i3} h_{i,t-1}$$

$$(4) \quad h_{mmt} = c_{m1} + c_{m2} u_{m,t-1}^2 + c_{m3} h_{m,t-1}$$

$$(5) \quad h_{imt} = c_{im} \sqrt{h_{iit} \cdot h_{mmt}}$$

where r_{it} and r_{mt} are the expected returns on security i and market benchmark. Equations (1) and (2) define the average returns on security i and market index. Equations (3) and (4) define the conditional variances of r_{it} and r_{mt} . Equation (5) defines the conditional covariance. The optimised log likelihood function is:

$$(6) \quad \text{Log } L_t = -0.5 \text{Log } |H_t| - 0.5 u_t' H_t^{-1} u_t$$

where $|H_t|$ is the determinant of the matrix H_t with $H_t = \begin{bmatrix} h_{iit} & h_{imt} \\ h_{imt} & h_{mmt} \end{bmatrix}$, and $u_t' = [u_{it}, u_{mt}]$.

Equilibrium return $r_{i,T+k}^*$ of security i at time $(T+k)$ of the event window is defined as a function of: (i) the anticipation at time T of beta coefficient, denoted $\beta_{i,T+k}$; (ii) the actual return on the market at time $(T+k)$, $r_{m,T+k}$:

$$(7) \quad r_{i,T+k}^* = E(r_{i,T+k} | I_T, r_{m,T+k}) = E(r_{i,T+k} | I_T) + \frac{E(h_{imT+k} | I_T)}{E(h_{mmT+k} | I_T)} (r_{m,T+k} - E(r_{m,T+k} | I_T))$$

where I_T is the information available at time T and $\frac{E(h_{imT+k} | I_T)}{E(h_{mmT+k} | I_T)}$ is the expected value of

$\beta_{i,T+k}$ at time T .

Abnormal return at time $(T+k)$ is defined as the difference between the actual return and the equilibrium return:

$$(8) \quad AR_{iT+k} = r_{iT+k} - r_{iT+k}^*$$

and cumulative abnormal returns (CAR) on the event window $[T+1, T+k]$ is:

$$(8') \quad CAR_{iT+k} = \sum_{j=1}^k AR_{iT+j}$$

For each bank, the model (1) to (5) is first estimated on a pre-event window. The length of this pre-event window is different according to the event considered. It ranges from 160 to 300 days. Cumulative abnormal returns are then evaluated over two-tailed symmetric event windows: $[D - J, D + J]$, for $J = 7, 15$ where D is the event day.

Cumulative abnormal returns are computed for each of these event windows and for each bank i . The null hypothesis that there is no cumulative abnormal returns for the bank i over the entire event window ($CAR_{iT+k} = 0$) is tested with a parametric test. Following Frame and Lastrapes (1998), we define the parametric statistic T_{1i} , which is the standardised cumulative abnormal returns for the bank i on the event window $[T+1, T+k]$ as:

$$T_{1i} = \frac{CAR_{iT+k}}{\sqrt{\text{Var}(CAR_{iT+k} \mid I_T, \{r_m\})}},$$

Under the null hypothesis (no abnormal returns), T_{1i} is asymptotically distributed as a standard normal variable.

On the other hand, the null hypothesis that there are no abnormal returns for the entire bank sample and over the entire event window is tested. We use the statistic defined by Lepetit *et al* (2004):

$$T_2 = \frac{\overline{SCAR}}{s_{\overline{SCAR}}} = \frac{\frac{1}{N} \sum_{i=1}^N SCAR_{iU}}{\sqrt{\frac{1}{N(N-1)} \sum_{i=1}^N (SCAR_{iU} - \overline{SCAR})^2}}$$

where N is the number of banks in the sample, $SCAR_{iU}$ is the standardised cumulative abnormal return for bank i at the upper bound U of the event window and $\overline{SCAR}$ is the cross section mean of the different $SCAR_{iU}$. Under the null hypothesis, T_2 is asymptotically distributed as a standard normal variable⁷.

5. Results

Abnormal return estimations are carried out using both $[-7, +7]$ and $[-15, +15]$ event windows, and sampling M&As' according to the status of the entity, the time period of the deal and the maturity of the banking system. Table 3A presents the results. According to T_2 statistic values, cumulative abnormal returns are negative and significant for the whole sample, but only at the 10% level. Thus, on average, Asian M&As in the banking industry lead to significant decrease in overall value. This result is not consistent with the findings of most event studies carried out for the U.S. (Pilloff and Santomero (1998), Delong (2001)) and the European banking markets (Cybo-Ottone and Murgia (2000) and Lepetit *et al.* (2004)). But the market expects a negative value effect only for few M&As. Indeed, the statistic T_1 statistics show that less than 10% of the deals lead to, individually, significant negative abnormal returns.

The three classification criteria (entity status, time period of the deal, maturity of the banking system) allow us to identify M&As for which the market reacts negatively and makes a distinction between the different types of deal. Figure 1 graphically shows the CARs classified according to these classification criteria. and for a 7-day symmetric event window.

Firstly, Table 3A and Figure 1 show that the market reacts negatively to M&As occurred during the crisis period (1997-2000), when they were often used to solve financial distress. Moreover, M&As occurred after the crisis period (2001-2003), when market forces play a dominant role (scale and scope economies, cost reductions, increased market power,...), does not present a positive and significant abnormal returns as we can expect. Indeed, as M&As may be mostly driven by market forces during this period, the expected performance should be then positively valued by the market.

Secondly, the market does not differentiate between the target and the acquirer. There are no significant abnormal returns for both of them. This result is not consistent with the findings of Houston and Ryngaert (1994), Delong (2001), Cybo-Ottone and Murgia (2000) and Lepetit *et al.* (2004), who obtain significant positive abnormal returns for the target group. Such a result can be explained by efficiency gains (X-efficiency improvement, replacement of inefficient managers,...).

Thirdly, the market makes a distinction between the deals according to the maturity of the banking system. Table 3A and Figures 1 show that, there is a significant and negative market reaction to M&As in the less mature banking systems as expected. Moreover, Table 3B shows that this negative reaction of the stock market concerns deals which occurred during the crisis period only. Indeed M&As were mainly driven by government to solve the financial distress. On the contrary, there is a positive market reaction to M&As in the more mature banking systems, but not significant for deals which took place during or after the crisis period.

Table 3A. Sign and significance of abnormal returns

Sample	Event window	T_2 value	Number of significant T_{1i} value	
			Positive	Negative
<i>Full sample</i>	[-7, +7]	-1,898*	2	6
(N = 71)	[-15, +15]	-0,161	3	5
<i>Entity status</i>				
Target	[-7, +7]	-1,629	2	3
(N = 35)	[-15, +15]	-0,306	3	4
Acquirer	[-7, +7]	-0,989	0	3
(N = 36)	[-15, +15]	0,201	0	1
<i>Time period of the deal</i>				
Crisis period	[-7, +7]	-2,471**	0	4
(N = 43)	[-15, +15]	-1,234	1	4
Post crisis period	[-7, +7]	-0,177	2	2
(N = 28)	[-15, +15]	1,210	2	1
<i>Maturity of the banking system</i>				
More mature	[-7, +7]	0,038	2	1
(N = 26)	[-15, +15]	1,277	2	0
Less mature	[-7, +7]	-2,363**	0	5
(N = 45)	[-15, +15]	-0,809	1	5

** and * indicate significance respectively at the 5% and 10% levels. T_{1i} is the standardised cumulative abnormal returns for the bank i on the event window. T_2 is the standardised cumulative abnormal returns for the entire bank sample and over on the event window.

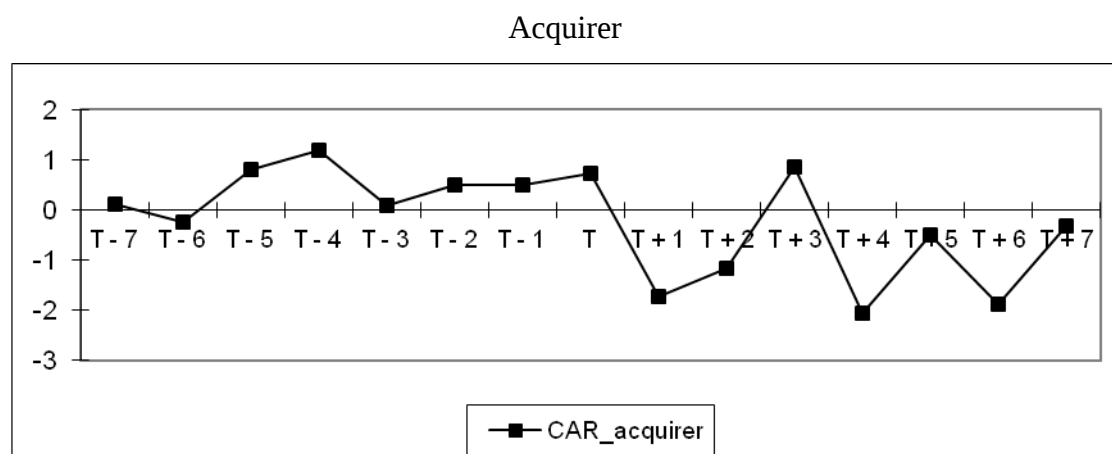
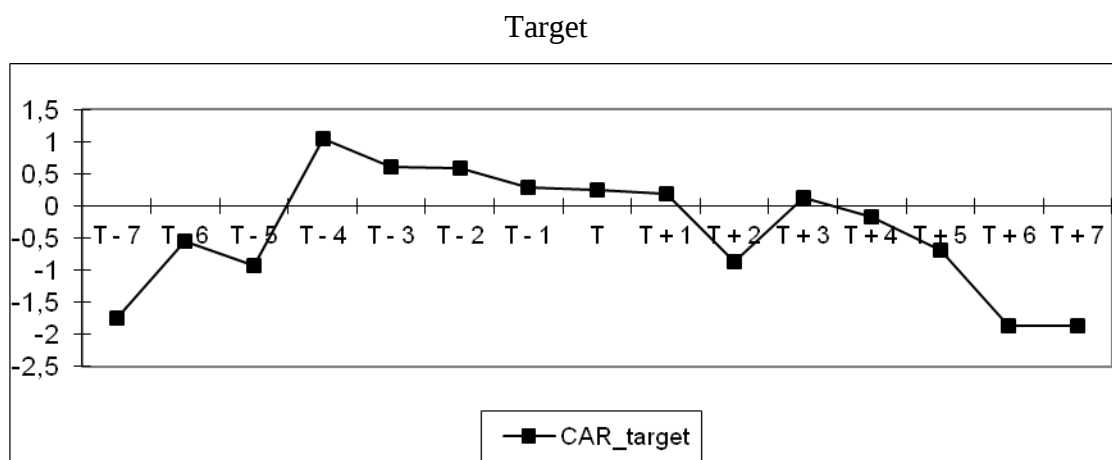
Table 3B. Sign and significance of abnormal returns according to the maturity of the banking system and the time period of the deal.

Sample	Event window	T ₂ value	Number of significant T _{1i} value	
			Positive	Negative
<i>Crisis period</i>				
Less mature banking system (N = 36)	[-7, +7]	-2.537**	0	4
	[-15, +15]	-0,646	0	1
More mature banking system (N = 7)	[-7, +7]	0.082	0	0
	[-15, +15]	0.583	1	1
<i>Post crisis period</i>				
Less mature banking system (N = 9)	[-7, +7]	0.604	1	1
	[-15, +15]	-0.024	1	1
More mature banking system (N = 19)	[-7, +7]	0.462	2	2
	[-15, +15]	1.440	1	0

** and * indicate significance respectively at the 5% and 10% levels. T_{1i} is the standardised cumulative abnormal returns for the bank i on the event window. T_2 is the standardised cumulative abnormal returns for the entire bank sample and over on the event window.

Figure 1. Cross-sectionnal average of the CAR_{iT+k} evaluated for a 7 days symmetric event windows

Entity Status



Time period of the deal

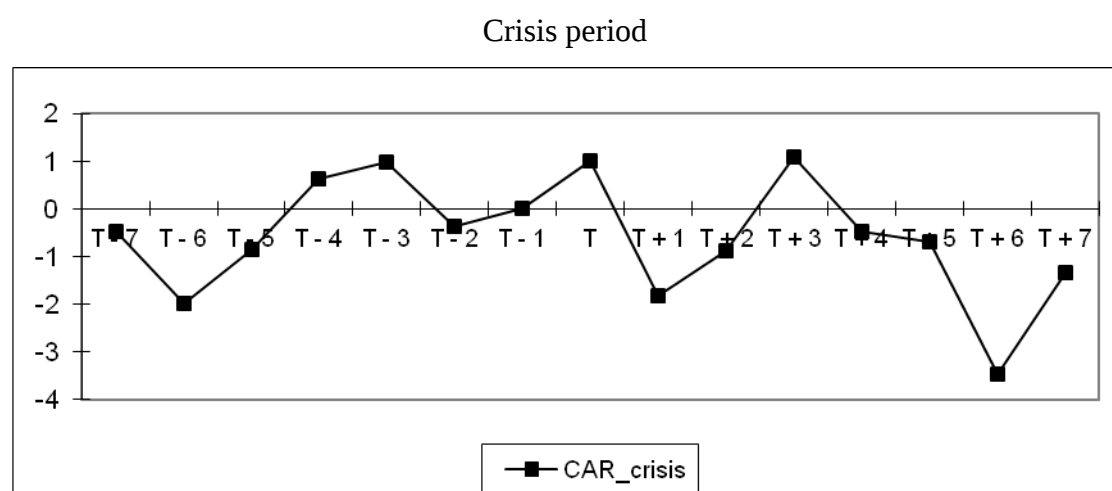
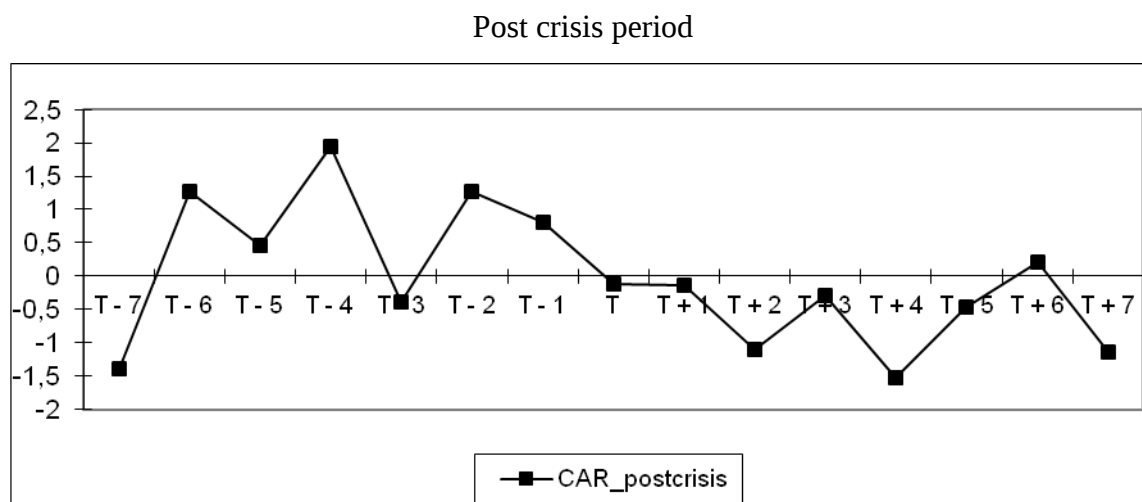
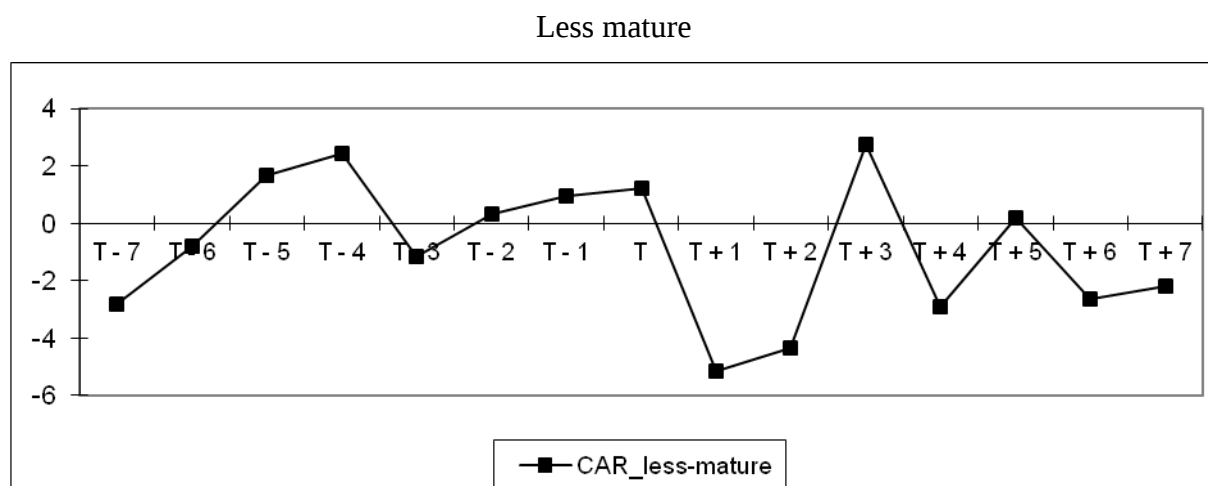
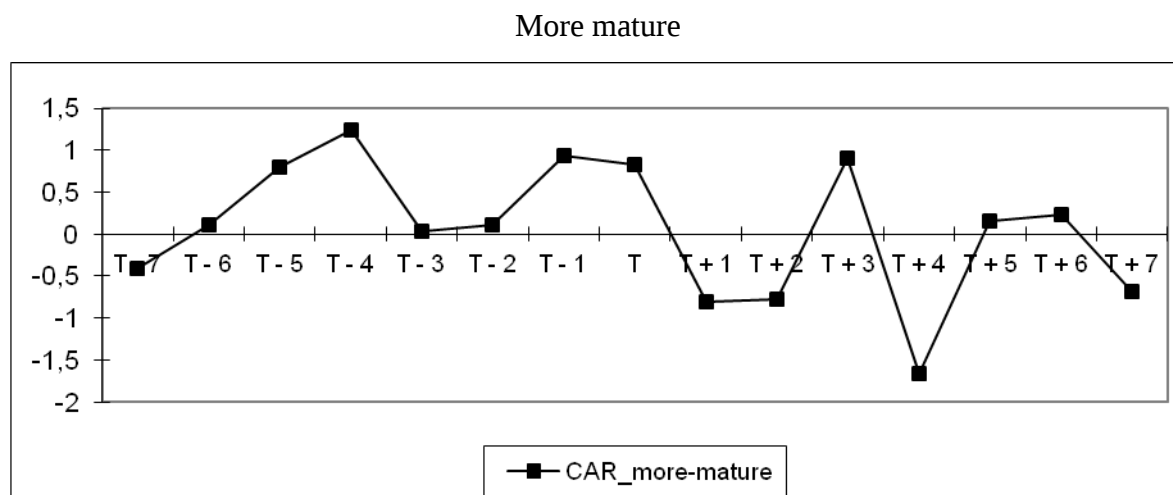


Figure 1. Cross-sectionnal average of the CAR_{iT+k} evaluated for a 7 days symmetric event windows

Time period of the deal



Maturity of the banking system



6. Conclusion

The aim of this paper was to carry out an empirical investigation on the market reaction of M&As announcements in East Asian countries over the 1997-2003 period. A Bivariate GARCH model was used to construct abnormal returns. M&As were divided into several groups depending upon the entity status, the time period of the deal and the maturity of the banking system.

Our results show that there is, on average, a negative and significant decrease in value for banks. More precisely, the market reacts negatively to the M&As that occurred during the crisis period (1997-2000) and in the less mature banking system (Indonesia, Malaysia, Philippines, South Korea and Thailand), which are mainly government-led. Moreover the market does not differentiate between the target and the acquirer in terms of returns. Indeed we do not find abnormal returns for both of them.

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¹ A representative “weak fundamentals” view of the crisis is Corsetti et al (1998) while a “changing expectations” perspective can be found in Radelet and Sachs (1998).

² See among others Bongini *et al.* (2001) for a study of the microeconomic foundations of financial distress and Bongini *et al.* (2002) for an analysis of the influence of market information to assess financial fragility.

³ Credit institutions include commercial banks, saving banks, mutual and cooperative banks, investment banks and bank holdings. We use the term “banks” to refer to these credit institutions.

⁴ Datastream International General Market Indexes are used.

⁵ The 25% threshold is chosen in order to include in our sample some cross-borders M&As which occurred in country like Malaysia where a 30% ceiling on foreign ownership of banks is effected by law. Anyway, in our final sample, we have 65% of the transactions for which the acquirer gets to own at least 80% of the target and only 10% of the transactions for which the acquirer gets to own less than 30%.

⁶ The stock market should not react to the incomplete operations which did not lead to the creation of a new entity.

⁷ The T_2 statistic assumes that the CARs on individual banks are uncorrelated in the cross section. Cross-sectional dependence is likely to exist when at least some of the returns are sampled from common time periods. Then, the usual distributional results no longer apply and T_2 will be misleading. However, as few of our announcement dates are on common periods, the correlation between CARS should be limited.