

Financial Crisis in Asia – The Transmission A Regression-Based Approach

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Abstract

Primary objective of this paper is to empirically explore the nature of crisis transmission in Asian countries. Exchange Market Pressure (EMP) has been used as proxy for crisis. To find EMP, we used the measure of Komulainen and Lukkarila (2003). Using the EMPs of eight Asian countries over the period of 1982 to 2008, we tried to get an insight into the nature of transmission of crisis and the channels through which the Asian Financial Crisis transmitted among these countries. We used estimation techniques based on Vector AutoRegression (VAR) and OLS specifications and found out that: i. During the crisis, Japan and Jordan did not respond significantly to the crisis from other countries. Indonesia was impacted by crisis from Nepal and Thailand. Sri Lanka was subject to crisis from Indonesia and Thailand. ii. Israel had strong impacts on the almost all the countries. The vice versa also existed for most of the countries like Jordan, Nepal, Philippines, Sri Lanka and Thailand, which also had strong impacts on Israel's EMP. iii. Except for Indonesia, competitive devaluation did not play important role in the transmission of crisis. Indonesia, Sri Lanka and Thailand showed significant signs of wake-up call effect. iv. During the Asian Financial Crisis, crisis transmission was more significant than non-crisis periods.

Keywords: Financial Markets, Crisis Transmission, Competitive Devaluation, Wake-up call effect, Cash-in effect, Asian Financial Crisis

1. Introduction

Over the next two decades, Asia would most probably become the world's largest economic region. Asian GDP could exceed the GDP of G-7 countries by 2030 (IMF Forecasts). The significance of Asia can never be under-estimated in the present global context. Asia has emerged as one of the largest economic centers over the last few years or so. Economists and researchers have focused a lot on the Asian financial policies and procedures in order to prevent any financial collapses in future. A huge number of studies have been made on the previous instances of crisis in Asia including the Asian Financial Crisis (1997) and various drawbacks and shortcomings in the policies have been eradicated with the passage of time.

Except China and Hong Kong, almost all emerging economies faced huge currency depreciations against US dollar, during the Asian financial crisis. The Asian financial crisis started with the decline in Thai Baht's value. This decline impacted other connected economies

like Malaysia, Indonesia and Philippines etc., which indicates transmission of crisis from Thailand to these countries.

The Asian financial crisis 1997 – 98 was very severe. Before the crisis, countries like Singapore, South Korea, Indonesia, Thailand, Malaysia and Hong Kong had their economies expanded by 6% to 9% (measured by GDP growth). The crisis imploded the stock and currency markets of some of the Asian countries. By the time the crisis ended, these countries had lost most of their value, with their currencies heavily depreciated as compared to the US dollar. With the passage of time, these countries have managed to pull back from the effects of the Asian financial crisis, with the aid of International Monetary Fund, other financial helpers and through the review of their financial policies and procedures. The Global Financial Crisis 2007 also had impacts on the Asian countries, because of the markets interconnectedness with US.

In this paper, we have tried to do an analysis as to how the crisis transmitted throughout Asia, over the period 1982 – 2008. We have divided the period of study, on the basis of Asian Financial Crisis, into two sub-periods i.e., non-crisis period (1982:01 – 1997:06 and 1999:01 – 2008:12) and the crisis period (1997:07 – 1998:12). The study has focused on eight Asian countries including Indonesia, Israel, Japan, Jordan, Nepal, Philippines, Sri Lanka and Thailand.

Gong, Lee & Chen (2004) have classified the previous literature on Asian Financial Crisis into four categories. The first category deals with the causes of the crisis and its effects. The second category mentions the ways and means for the prevention of similar episodes in future. The next category is about the resolutions of the crisis (policy and regulatory), whereas the fourth category studies the transmission of the crisis from one country to the other.

Studies related to other crises episodes may also be divided into the same four categories. This study focuses on the fourth category of the literature i.e., the transmission of the crisis from one country to the other. Vector AutoRegression (VAR) analysis and OLS specification have been used and we have tested for crisis transmission through the competitive devaluation effect and the transmission effect.

Remainder of the paper is organized as: Section 2 discusses Literature Review, Section 3 includes the Research Methodology, Section 4 contains Estimation Results and Section 5 includes the Conclusion.

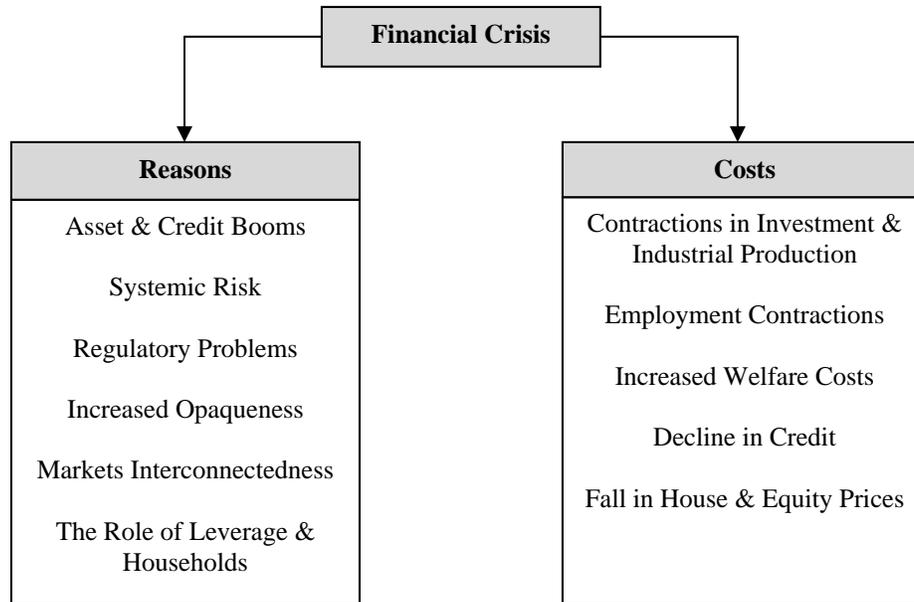
2. Literature Review

Financial crisis is said to occur when an institution (financial) devaluates. A wide range of literature covers areas like the development and the transmission of crises episodes. Depreciation of 25% or more in a country's exchange rate may be considered as a sign of a financial crisis (Frankel and Rose, 1996).

Spreading of crises takes place from market to market and broadly speaking, they transmit among countries, especially those that are interconnected through trade. The term contagion describes such a situation. The crisis episode of Thailand (1997) is example of contagion. Cases of crisis transmission have risen, significantly, with globalization and increased markets interconnectedness. No emerging market, especially an open market, can hide itself from the events taking place around it in other countries. For preventing events of crisis, an integrated and combined policy has to be adopted (Fratzscher, 2002).

The US Financial Crisis (2007) initiated with regulatory problems on the part of US Banking System. The main issue faced by the banks was maintenance of liquidity. Other associated reasons were household leverage, asset price and credit expansion.

The following figure refers to some of the reasons and costs associated with a financial crisis (S. Claessens et al., 2010):



Diagrammatical Representation of the Reasons & Costs Associated with Financial Crisis

The period 1982 – 2008 (used in this study) has been full of crises episodes includes declines in stock markets, Crises in banking sector, recessions, devaluations etc. Some of these crises are listed below:

- 1982 – Latin American Crisis (Debt)
- 1983 – Israel Bank Crisis (Stock)
- 1989 – 91 – US Crisis (Loans & Savings)
- 1990 – Japan Crisis (Asset Price Collapse)
- Early 1990s – Scandinavian Banking Crisis
- 1994 – 95 – Mexico Crisis (Economic)
- 1997 – 98 – Financial Crisis in Asia
- 1998 – Financial Crisis in Russia
- 2001 – Dot-com Decline
- 2007 – 10 – Financial Crisis of US

Historians treat each event as unique, whereas, economists are of the view that there are repetitive patterns in our society and around us in the nature (Kindelberger, 1978 – p.14). So, financial crises also bear the same common patterns. Crises normally take place after the economic fundamentals, of a country or institution, deteriorate over a period of time. The vice versa also exists i.e., sound fundamentals may prevent episodes of a potential crisis to take place (Kaminsky and Reinhart, 1999).

For the prevention of crises, governments need to play pivotal role by enhancing their regulatory role. Also reforms must be undertaken in the banking and corporate sector. There is also a strong need of strengthening market competitiveness. (Knowles, Pernia and Racelis; 1999). It can be said that banking and corporate sector owe a lot to an episode of a potential crisis. Also regulatory mishaps are strong antecedents of financial crises.

Monetary policies causing high Inflation and increased reserve losses are considered the main affecting variables for the countries which are susceptible towards crises (Eichengreen, Rose and Wyplosz; 1996).

Researchers have investigated the channels through which a crisis can transmit from one country to another. Gong, Lee & Chen (2004) have classified the previous studies on Asian Financial Crisis into four categories:

- i. Explanation of causes and effects of the crisis
- ii. Prevention of future similar episodes
- iii. Policy resolutions of the crisis
- iv. Transmission of the crisis

Most of the previous studies have focused on the first three categories, whereas less work has been done on the transmission of crisis in Asian countries.

Eichengreen et al. (1996) studied the data of 20 countries over 30 year of time period and found that closer trade relationships between countries signify the transmission of crises.

Sachs et al. (1996) in Mexico found that three major factors of crises transmission are exchange rate elevation, increased credit, and decline in foreign reserves.

Glassman (2001) claimed that the manufacturing sector yielded to the negative economic trend in Asia during the crisis. Thailand was the first to enter into crisis. Other countries joined soon after, owing to the transmission effect of crises.

Komulainen and Lukkarila (2003) studied 31 countries during a period of 1980 – 2001. They employed various variables (macroeconomic and financial) and found that currency and banking crises go side by side. Huge liabilities yield to crises, because of capital outflows that are unexpected and sudden.

Kroszner et al. (2007) collected data from 38 countries which were exposed to financial crises, over a span of 25 years. They suggested that the sectors depending on outer (or external) financial support fall towards value contraction during banking crises, especially in the countries that have deeper financial systems.

According to Fratzser (1998), the three channels of crisis transmission are Economic factors, Financial markets cluster and Competitive devaluation (through close trade relationship). Two main channels of crisis transmission were identified by Goldstein (1998), which were wake-up call effect and the competitive evaluation. Eichengreen, Rose and Wyplosz (1996) identified that close trade relationship plays the most significant role in crisis transmission.

In short, the three major channels identified in literature are competitive devaluation through close trade relationship, wake-up call effect (transmission of crises from one country to another) and the cash-in effect (outflow of capital from the country during crisis). The first two channels are considered to be of significant nature, especially in regard to the Asian Financial Crisis, whereas less importance is given to the third channel i.e., the cash-in effect.

3. Research Methodology

3.1. Financial Crisis

Financial crisis is the pressure (speculated) of weighted variations in foreign exchange rates, interest rates and foreign reserves (Girton and Roper, 1997). If the weighted average of change

in exchange rate, change in interest rate and change in reserves is more than 2 standard deviations (3 standard deviations also used by some analysts), then there exists a financial crisis (value taken as 1).

Considering no involvement of the authorities, the change in exchange rate is mentioned as Exchange Market Pressure (EMP). EMP is measured by a variety of different methods. Structural EMP approach by Girton and Roper (1977), the ad-hoc EMP approach by Eichengreen, Rose and Wyplosz (1996) and model-free EMP measurement approach by Weymark (1995) are some of the approaches used. But none of the EMP approaches gives a perfect measure of EMP. Therefore, different approaches are used to find Exchange Market Pressure (EMP) by researchers across the world.

The measure used by Komulainen and Lukkarila (2003) has been used in this study. The measure is given by:

$$EMP = \text{Change in Exchange Rate} - \left(\frac{\text{Std. Dev. of Exchange Rate Change}}{\text{Std. Dev. of Reserves}} \right) \times \text{Change in Reserves} \dots\dots\dots (1)$$

The same specification has been used by Kaminsky, Lizondo and Reinhart (1998), using the variations in exchange rates and foreign reserves to calculate foreign exchange market pressure.

3.2. Estimation Model and Technique

3.2.1. Estimation Model

The quarterly data for the eight Asian countries, from 1982 to 2008, was used in the above equation. The crisis measurement was inputted in a VAR estimation model, using E-views. The equation used for VAR analysis was:

$$EMP_t = A_0 + A_1(L)EMP_{t-1} + \alpha_t \dots\dots\dots (2)$$

Where

$EMP_t (8 \times 1)$ = foreign exchange market pressure index vector of the eight countries

$A_0 (8 \times 1)$ = vector of constants for the eight countries

$A_1 (8 \times 8)$ = matrix of interactive EMP coefficients and $\alpha_t (8 \times 8)$ = random shock

Also,

$$A(L) = \begin{pmatrix} A_{11}(L) & A_{12}(L) & A_{13}(L) & A_{14}(L) & A_{15}(L) & A_{16}(L) & A_{17}(L) & A_{18}(L) \\ A_{21}(L) & A_{22}(L) & A_{23}(L) & A_{24}(L) & A_{25}(L) & A_{26}(L) & A_{27}(L) & A_{28}(L) \\ A_{31}(L) & A_{32}(L) & A_{33}(L) & A_{34}(L) & A_{35}(L) & A_{36}(L) & A_{37}(L) & A_{38}(L) \\ A_{41}(L) & A_{42}(L) & A_{43}(L) & A_{44}(L) & A_{45}(L) & A_{46}(L) & A_{47}(L) & A_{48}(L) \\ A_{51}(L) & A_{52}(L) & A_{53}(L) & A_{54}(L) & A_{55}(L) & A_{56}(L) & A_{57}(L) & A_{58}(L) \\ A_{61}(L) & A_{62}(L) & A_{63}(L) & A_{64}(L) & A_{65}(L) & A_{66}(L) & A_{67}(L) & A_{68}(L) \\ A_{71}(L) & A_{72}(L) & A_{73}(L) & A_{74}(L) & A_{75}(L) & A_{76}(L) & A_{77}(L) & A_{78}(L) \\ A_{81}(L) & A_{82}(L) & A_{83}(L) & A_{84}(L) & A_{85}(L) & A_{86}(L) & A_{87}(L) & A_{88}(L) \end{pmatrix}$$

Where, $A_{ij}(L)$ = lag operator of matrix. Here all coefficients represent EMP lag effects on i th country's current period EMP.

The order of variables was rotated in repetitive estimations to see the difference produced. In order to look into the goodness of fit and parsimony problems, Akaike Information Criterion (AIK) or Schwartz Bayesian Criterion (SBC) procedure was used for the numbers of lag to be used.

3.2.2. Estimation Model of Crisis Transmission

We have divided the period under consideration 1982 – 2008 into two sub-periods: non-crisis period (1982:01 – 1997:06 and 1999:01 – 2008:12) and the crisis period (1997:07 – 1998:12).

In the following equation, we have tried to account for the devaluation effect and the transmission effect.

$$EMP_{x,t} = (A_{01} + A_{02}D) + (A_{11} + A_{12}D)EXP_{x,t-n} + \sum (A_{21,y} + A_{22,y}D)EMP_{y,t} + \mu_t \dots\dots\dots (3)$$

Where

$EMP_{x,t}$ and $EMP_{y,t}$ are the foreign exchange pressures of x th and y th countries at time t .

$EXP_{x,t-n}$ is the lagged export growth rate of the x th country at time $t - n$.

The dummy intercept $D = 0$ when time period is from January 1982 to June 1997 and from January 1999 to December 2008, and $D = 1$ when time period is from July 1997 to December 1998.

The equation uses the two channels for transmission, the competitive devaluation effect and the transmission effect (wake-up call effect). Asian countries, due to trade interconnectedness and competitiveness, may impact each other. Therefore, currency devaluation by one of the countries is supplemented by the other connected countries, in order to keep the exports intact (prevent from dropping). This is termed as the devaluation effect. For the transmission effect of the crisis, we do not use the EMPs of all the other countries. Instead, we add the EMPs of only those countries that have significant effects on the EMP of the considered country.

3.2.3. Data Sources

For the estimation of EMP, we obtained the data for foreign reserves, exchange rate and exports (F.O.B) for all the eight countries from the International Monetary Fund's (IMF) International Financial Statistics (IFS) database. We used quarterly data in this study.

4. Estimation Results

We have divided the estimation results into three categories. EMP estimated results, VAR estimation results and the analysis of transmission channels.

4.1. Foreign Exchange Market Pressure Index (EMP)

There are no hard and fast rules to measure a financial crisis. Researchers have used various means for this purpose. Using three standard deviations from the mean, Kaminsky et al. (1998) found an estimation to the crisis episodes. Similarly, various other studies have used two or 1.5 standard deviations as the threshold levels for the measuring the crises.

In this study, EMP estimation has been used to define a crisis episode. Table 1 reports the EMPs of the countries over the period 1982:02 to 1984:04 (Israel Bank Stock Crisis 1983), based on the quarterly data. Table 2 reports the EMPs of the countries over the period 1989:01 to 1991:04 (Japanese Asset Price Collapse 1990), based on the quarterly data. Table 3 reports some of the significant EMPs of the countries under study over the period 1996:01 to 1998:04 (Asian Financial Crisis 1997), based on the quarterly data. Table 4 reports the EMPs of the countries over the period 2006:01 to 2008:04 (The Global Financial Crisis 2007), based on the quarterly data.

Table 1

For Table 1, if we represent an EMP index higher than 0.1 to be a crisis state and less than 0.1 to be a wake up call effect (signs of a potential crisis), the table above can give us a reasonable insight into the Israel Bank Stock Crisis (1983) and its impact on the other Asian countries.

Before the Israel Bank Stock Crisis, Israel showed clear signs of a crisis about to originate. High values of EMP were recorded in the period prior to the crisis (0.28 and 0.22 in the second and third quarters of 1982). This crisis acted very sharply in the later part of 1983 and the complete 1984.

During this period, some other Asian countries also recorded relatively higher EMP indices. Indonesia having the highest EMP index in the first quarter of 1983 and this continued in the second quarter also. But the effect vanished quickly by the mid of 1983. Japan also showed some high EMPs, but they were not outrageous ones (may have been due to some local events).

Nepal and Philippines also reacted to the Israeli crisis by recording some high EMP indices during the period. Philippines had fairly high EMP indices in this period (0.26 in the last quarter of 1983 and 0.24 in the second quarter of 1984). Sri Lanka and Thailand also showed some signs of a potential crisis threat but no major harm was recorded.

Table 2

For Table 2, if we represent an EMP index higher than 0.05 to be a crisis state and less than 0.05 to be a wake up call effect, the table can explain the Japanese Asset Price Collapse (1990) and its impact on the other Asian countries.

Japan showed potential signs of a crisis episode in 1989, about to originate. The crisis took effect in 1990 (EMP index of 0.11 in the third quarter of 1990) and continued into 1991 (EMP index of 0.06 in the first quarter of 1991). Indonesia, Israel, Nepal, Philippines and Sri Lanka reacted to the Japanese crisis by recording high EMP indices during the period. Thailand showed potential signs of a threat, but escaped a crisis.

Table 3

For Table 3, we represent an EMP index higher than 0.1 to be a crisis state and less than 0.1 to be a sign of a potential crisis.

Before the Asian financial crisis (July 2007), Indonesia, Jordon, Nepal, Philippines, Sri Lanka and Thailand did not show high EMP indexes and the situation seemed to be pretty calm in these countries. Crisis hit Thailand quite hard (EMP indices of 0.40 and 0.28 in the last two quarters of 2007), but the impact lasted for two quarters only. EMP index for Indonesia was very high (0.77 and 0.79 in the first and second quarter of 2008), which shows that Indonesia reacted the most to the crisis. Israel showed signs of crisis before the actual episode which continued till the end of 2008, where it showed high EMP indices of 0.1 and 0.37 in the last two quarters of 2008. Jordon recorded some signs of a possible threat, but it did not respond hugely to the crisis episode taking place in rest of the Asian countries. Sri Lanka reacted mildly to the crisis by recording a higher EMP index of 0.93 in the third quarter of 1998. The trends of EMPs of all the countries over the period of 1996 Q1 – 1999 Q4 are shown in the following Figure 1.

Figure 1 (Graphs 1 - 8)

The combined EMP and Export Growth trends of all the countries, during the Asian Financial Crisis (1997 Q1 – 1998 Q4) are shown in the Figures 2 and 3 below. *x*-axis represents the eight quarters of 1997 and 1998.

*Figures 2 and 3**Table 4*

For Table 4, we represent an EMP index higher than 0.06 to be a crisis state and less than 0.06 to be a wake up call effect, to find Global Financial Crisis's impact on the Asian countries.

Before the Global financial crisis (2007), Nepal and Thailand did not show significant EMPs; whereas Indonesia, Israel, Japan, Jordon and Sri Lanka had crisis signals before the crisis episode. Israel did not react much to the Global financial crisis. Although Israel had a significantly high EMP index (0.06) in the first quarter of 2006, but after that it went calm until the second quarter of 2007. Jordon had clear signs of crisis before the episode actually took place and the crisis impacted in the beginning of 2008. Thailand also did not react to the crisis; except for the second quarter of 2008, which may have been due to some local disturbances. Similarly, Nepal and Philippines also did not show significant signs of a crisis before 2007, but they were affected by the crisis in 2008.

4.2. Nature of the Transmission of Crises

Vector AutoRegression (VAR) model is used to find any correlations that exist between the variables under study. Impulse responses and Variance decomposition is found, selecting a sequence for the ordering of the variables. The ordering used here is Indonesia, Israel, Japan, Jordon, Nepal, Philippines, Sri Lanka and Thailand.

4.2.1. Impulse Functions

Table 5

Table 5 explains the impulse responses of the 8 countries estimated from Vector AutoRegression (VAR). The table shows that a change in the EMP of Indonesia did not affect Japan, Jordon and Nepal at all. Israel was affected for only one period, but the impact was not stronger. Philippine was affected the most by Indonesia and the impact lasted for three periods, the longest. EMPs of Sri Lanka and Thailand were also affected by the EMP of Indonesia and the affect was quite strong.

The impact of crisis on Israel was transmitted to almost all the other countries except Jordon and Sri Lanka. Except for Nepal where impact lasted for 2 periods, the crisis impact on the other countries continued for all the four periods.

Japan did not significantly affect the other countries. Israel and Indonesia were least impacted by the change in EMP of Japan. When the crisis originated from Jordon, Israel and Nepal were affected the most. A crisis originating from Nepal and Thailand had strong impacts on Israel, where the effect lasted for four periods. Crisis episodes in Philippines and Sri Lanka did not have major impacts on other countries.

Summarizing, Indonesia and Japan did not have major impacts on other countries. Whereas, Israel had strong impacts on the almost all the countries, therefore, a crisis episode arising from Israel had significant impacts on the other countries. The vice versa also existed for most of the countries like Jordon, Nepal, Philippines, Sri Lanka and Thailand, which also had strong impacts on Israel's EMP.

The ordering of variables was rotated in order to see if the impulse changed significantly or not, but it was found that there was no major change.

4.2.2. Variance Decomposition Analysis

Variance decomposition analysis refers to the EMP variances of the eight countries under study, and the contribution of each country in other countries' EMP variance.

Table 6

Indonesia explains most of its own variance i.e., 89% of the EMP variance while Israel and Nepal explain 85% of theirs. Self-EMP variances explained by Japan and Philippines are 84% and 82% respectively. This implies that these five countries were not much impacted by the crises episodes in the period under study. This is because of the reason that these countries are less impacted by other countries.

The least value of the self-explanatory power of the EMP variance was recorded for Jordan, which shows that it is much dependent on other economies and any crises episode in the other countries will have significant impact on Jordan's economy. Jordan's variance is mostly impacted by Thailand (16%) and Nepal (10%).

Nepal impacts quite a lot of countries (3% in Indonesia's EMP, 7% in Israel's, 10% in Jordan's, 6% in Philippines', 4% in Sri Lanka and major impact in Thailand's EMP). The reverse impact of these countries in Nepal's EMP is not much significant except for Israel, which contributes 7% in Nepal's EMP variance.

4.3. *Transmission of Crises (estimation results)*

From the variance decomposition analysis, two countries having the strongest impact on the country's EMP are selected and are used as the explanatory variables. Table 7 shows the results of the estimation equation used in this research, which is summarized as:

1. During non-crisis periods, Indonesia's EMP was affected by Nepal. Similarly, Sri Lanka's EMP was impacted by Indonesia, whereas Thailand's EMP was affected by Israel. Other countries did not show significant integration among their EMPs.

Table 7

2. During the Asian financial crisis,
 - (i) The EMPs for Japan and Jordan did not change much, structurally. This shows that these countries were not affected significantly by the other Asian countries under consideration.
 - (ii) Almost all the countries except Indonesia, Sri Lanka and Thailand; did not show significant signs of the wake-up call effect. Indonesia was impacted by crisis from Nepal and Thailand. Similarly, Sri Lanka was subject to crisis from Indonesia and Thailand was subject to crisis from Israel.
 - (iii) Except for Indonesia, none of the other countries showed significant impacts of the exports growth. This indicates that the competitive devaluation effect did not play an important role in the crisis transmission among these Asian countries.
 - (iv) The intersect coefficients for Indonesia, Sri Lanka and Thailand in our estimation indicate that these three countries were subject to the effects other than competitive devaluation and wake up call effect.

The estimation results show us that the devaluation effect and the wake-up call (crisis transmission) effect did not play important roles in the transmission of crisis among the eight Asian countries under consideration. This study shows that the third channel of crisis transmission i.e., cash-in effect might have a vital role in understanding the transmission of crisis. This contradicts the argument by Gong, Lee & Chen (2004) that wake-up call effect was the more significant channel of crisis transmission during the Asian Financial Crisis. Also, this study does not support the argument by Goldstein (1998) that the two main channels for Asian crisis transmission were wake-up call and competitive dynamics hypothesis.

5. Conclusion

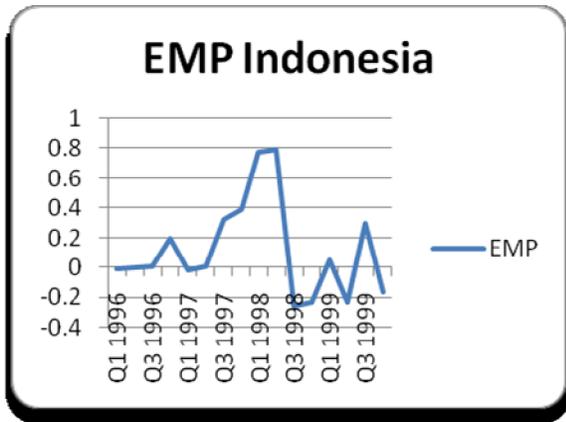
In this paper, we have tried to analyze the channels through which crisis was transmitted among eight Asian countries during the Asian Financial Crisis. We focused on two channels of crisis transmission, competitive devaluation and the wake-up call effects, which were thought to be more significant in the previous researches like Gong, Lee & Chen (2004) and Goldstein (1998). We intentionally left the third channel of crisis transmission i.e., cash-in effect, in order to check if the other two channels of crisis transmission explained the transmission of crisis or not. Estimations through VAR and OLS refer to the following:

- i. Before the Asian financial crisis, Indonesia, Jordan, Nepal, Philippines and Thailand did not show high EMP indexes and the situation was more or less stable. Thailand was impacted the most by the crisis, but for a limited period. EMP index for Indonesia was very high during the crisis, which shows that Indonesia reacted the most to the crisis. Israel showed signs of crisis before the actual episode which continued during the whole crisis period.
- ii. Jordan recorded some signs of a possible threat, but it did not respond hugely to the crisis episode taking place in rest of the Asian countries. Sri Lanka reacted mildly to the crisis.
- iii. The impulse responses of the eight countries estimated from Vector Autoregression (VAR) show that Indonesia did not affect Japan, Jordan and Nepal at all. Israel was affected for only one period, but the impact was not stronger. Philippine was affected the most by Indonesia. Sri Lanka and Thailand were also affected strongly by Indonesia. The impact of crisis on Israel was transmitted to almost all the other countries except Jordan and Sri Lanka. Japan did not significantly affect the other countries. When the crisis originated from Jordan, Israel and Nepal were affected the most. A crisis originating from Nepal and Thailand had strong impacts on Israel. Crisis episodes in Philippines and Sri Lanka did not have major impacts on other countries.
- iv. Indonesia and Japan did not have major impacts on other countries. Whereas, Israel had strong impacts on the almost all the countries, therefore, a crisis episode arising from Israel had significant impacts on the other countries. The vice versa also existed for most of the countries like Jordan, Nepal, Philippines, Sri Lanka and Thailand, which also had strong impacts on Israel's EMP.
- v. From the empirical evidence obtained through estimation, we can say that both the channels of crisis transmission (competitive devaluation and wake-up call effects) have roles to play in crisis transmission; especially with regard to the Asian Financial Crisis. Japan and Jordan were not affected significantly by the other Asian countries under consideration, during the crisis. Except Indonesia, Sri Lanka and Thailand; the rest of the countries did not show significant signs of the wake-up call effect. Indonesia was impacted by crisis from Nepal and Thailand. Similarly, Sri Lanka was subject to crisis from Indonesia and Thailand was subject to crisis from Israel. Except for Indonesia, the competitive devaluation effect did not play a significant role in crisis transmission among the other Asian countries. The intersect coefficients for Indonesia, Sri Lanka and Thailand were subject to the effects other than competitive devaluation and wake up call effect. This signifies the argument under consideration that these countries might have been affected by the third channel of transmission i.e., the cash-in effect.

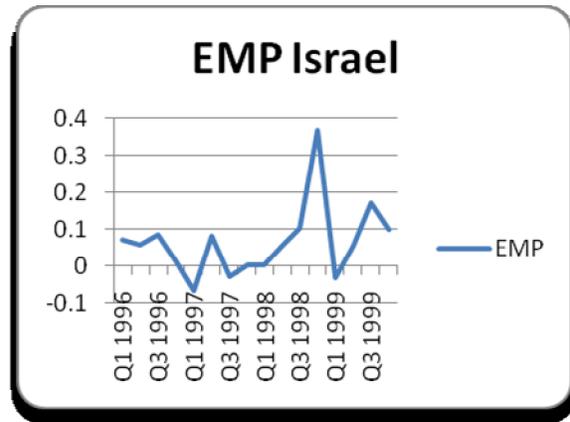
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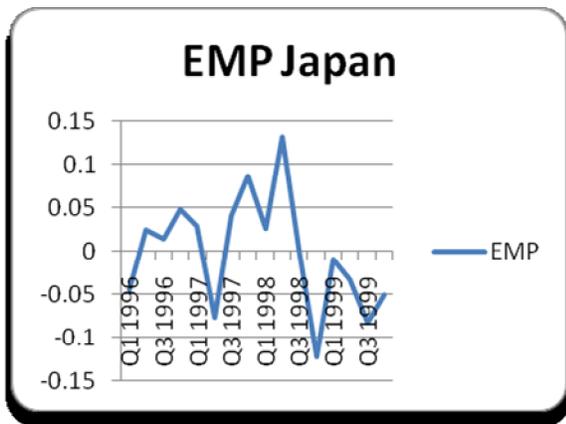
Annexure



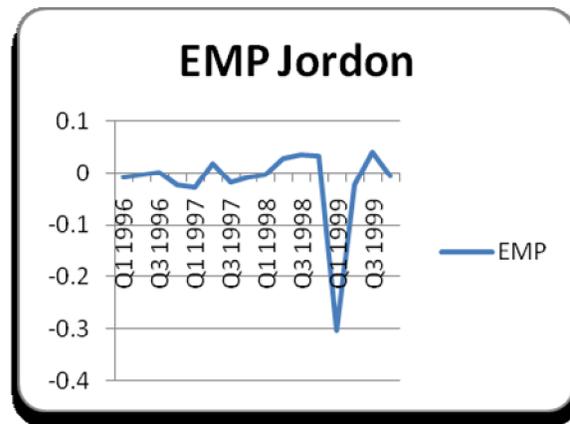
Graph1



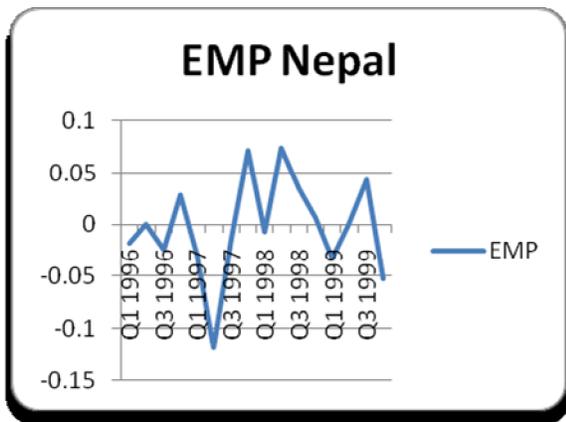
Graph2



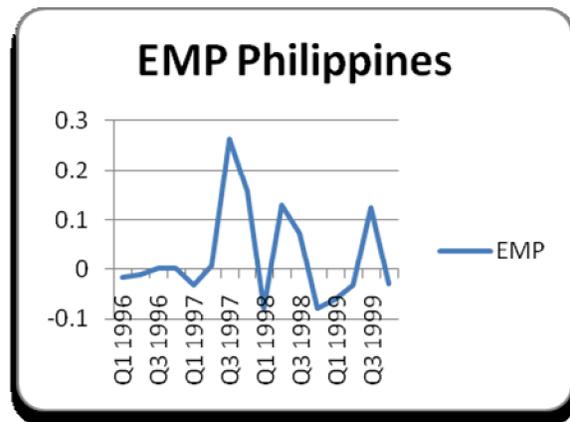
Graph3



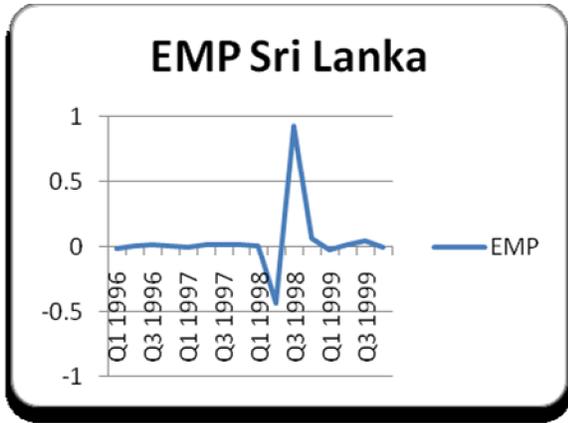
Graph4



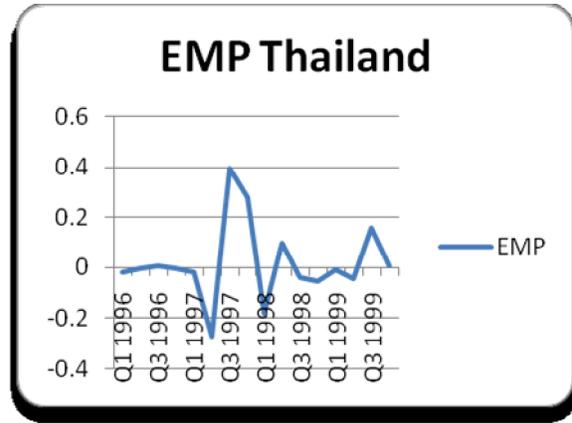
Graph5



Graph6



Graph7



Graph8

Figure1. EMP trends of the Eight countries over the period of 1996 Q1 – 1999 Q4

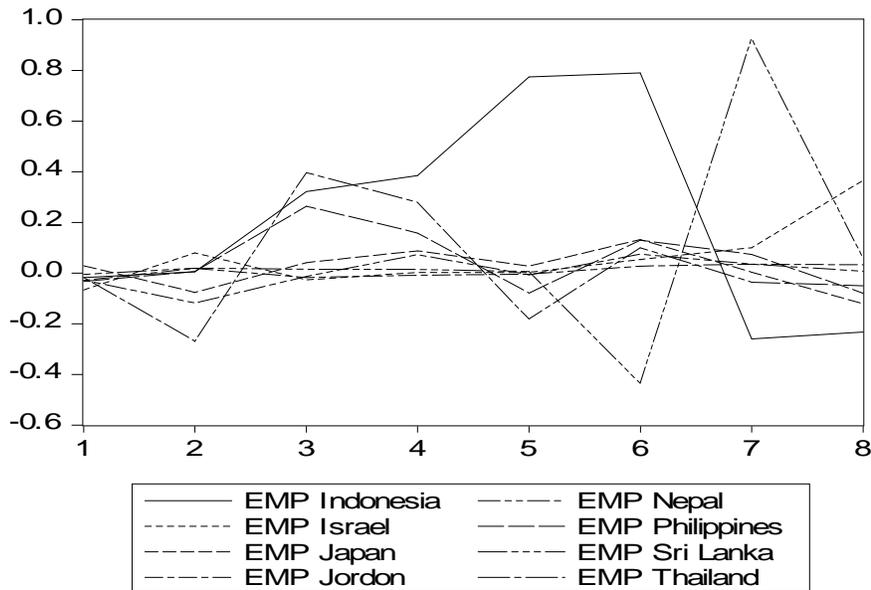


Figure2. Combined EMP trends of the Eight countries during the Asian Financial Crisis

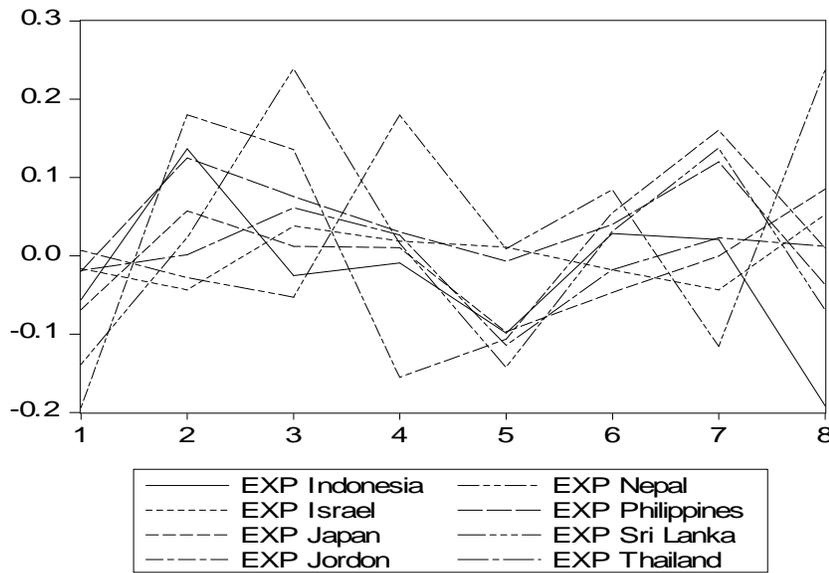


Figure3. Combined Export Growth trends of the Eight countries during the Asian Financial Crisis

Year : Quarter	Indonesia	Israel	Japan	Jordon	Nepal	Philippines	Sri Lanka	Thailand
1982:02	0.03	0.28		0.01				
1982:03	0.01	0.22	0.04	0.01		0.01		
1982:04	0.07				0.11	0.09	0.05	0.04
1983:01	1.02	0.17	0.02	0.02		0.04	0.03	
1983:02	0.38	0.26		0.01	0.02	0.12		0.04
1983:03		0.33			0.01		0.05	
1983:04	0.01	0.71			0.02	0.26	0.02	
1984:01	0.02	0.58	0.02		0.09	0.02	0.02	0.07
1984:02		0.59	0.03	0.01	0.01	0.24		
1984:03	0.01	0.84		0.01				
1984:04		0.60			0.02	0.07		0.17

Table 1: Estimated Significant EMPs (1982 - 84)

Year : Quarter	Indonesia	Israel	Japan	Jordon	Nepal	Philippines	Sri Lanka	Thailand
1989:01		0.17	0.02	0.09				
1989:02		0.10	0.12	0.02	0.04			
1989:03	0.03	0.03		0.02	0.05	0.04	0.19	0.02
1989:04	0.06	0.07	0.06	0.09		0.03	0.03	0.02
1990:01	0.01	0.02	0.02	0.02	0.01	0.01		
1990:02	0.03	0.16		0.01	0.03	0.04	0.02	0.01
1990:03	0.07	0.04	0.11	0.04	0.12	0.17	0.05	0.04
1990:04	0.03	0.18		0.05	0.05	0.11	1.11	0.02
1991:01		0.03	0.06					
1991:02		0.06			0.07			
1991:03	0.06			0.04	0.27	0.01	0.06	0.03
1991:04	0.07			0.03	0.21	0.04	0.06	0.04

Table 2: Estimated Significant EMPs (1989 - 91)

Year : Quarter	Indonesia	Israel	Japan	Jordon	Nepal	Philippines	Sri Lanka	Thailand
1996:01		0.07						
1996:02		0.06	0.02				0.01	
1996:03		0.08	0.01				0.02	0.01
1996:04	0.19	0.01	0.05		0.03		0.01	
1997:01			0.03					
1997:02		0.08		0.02		0.01	0.02	
1997:03	0.32		0.04			0.26	0.01	0.40
1997:04	0.38		0.09		0.07	0.16	0.01	0.28
1998:01	0.77		0.03				0.01	
1998:02	0.79	0.05	0.13	0.03	0.07	0.13		0.10
1998:03		0.10		0.04	0.03	0.07	0.93	
1998:04		0.37		0.03	0.01		0.06	

Table 3: Estimated Significant EMPs (1996 - 98)

Year : Quarter	Indonesia	Israel	Japan	Jordon	Nepal	Philippines	Sri Lanka	Thailand
2006:01		0.06		0.01			0.02	
2006:02	0.06			0.03	0.03	0.07	0.04	0.01
2006:03	0.02		0.02	0.05				
2006:04			0.03	0.02			0.06	
2007:01	0.08			0.01			0.02	
2007:02		0.08	0.05	0.01			0.02	
2007:03	0.04			0.05			0.05	0.02
2007:04	0.04		0.01	0.02	0.02			
2008:01	0.02			0.09	0.04	0.05	0.03	
2008:02			0.06		0.07	0.06		0.06
2008:03					0.05			
2008:04		0.09			0.01	0.09	0.04	

Table 4: Estimated Significant EMPs (2006 - 08)

Shock Countries	Reaction of affected countries					Shock Countries	Reaction of affected countries				
	Country	1 st Term	2 nd Term	3 rd Term	4 th Term		Country	1 st Term	2 nd Term	3 rd Term	4 th Term
Indonesia	Indonesia	-	-	-	-	Nepal	Indonesia	0.0003	0.0007	-	-
	Israel	0.0002	-	-	-		Israel	0.0005	0.0013	0.0013	0.0007
	Japan	-	-	-	-		Japan	0.0004	0.0002	-	-
	Jordon	-	-	-	-		Jordon	0.0006	-	-	-
	Nepal	-	-	-	-		Nepal	0.0023	0.0002	-	0.0002
	Philippines	0.0015	0.0007	0.0009	-		Philippines	0.0004	0.0007	-	-
	Sri Lanka	-	0.0007	0.0009	-		Sri Lanka	0.0006	-	-	-
	Thailand	-	0.001	0.0011	-		Thailand	0.0018	-	-	0.0004
Israel	Indonesia	0.0043	0.0045	0.0036	0.0024	Philippines	Indonesia	-	0.0004	0.0002	-
	Israel	0.0262	0.0194	0.0166	0.0129		Israel	0.0009	-	0.0004	0.0003
	Japan	0.0015	0.0017	0.001	0.0007		Japan	0.0004	0.0004	-	-
	Jordon	-	-	-	-		Jordon	-	-	-	-
	Nepal	0.0007	0.0032	-	-		Nepal	-	0.0012	-	-
	Philippines	0.0029	0.002	0.0022	0.0007		Philippines	-	0.0009	0.0005	-
	Sri Lanka	-	-	-	-		Sri Lanka	-	0.0008	-	-
	Thailand	0.0026	0.0032	0.0013	0.0007		Thailand	0.0005	0.0011	-	-

Japan	Indonesia	0.0008	-	-	-	Sri Lanka	Indonesia	-	0.0006	0.0008	-
	Israel	-	0.0003	-	-		Israel	0.0011	-	0.0006	0.0008
	Japan	0.0003	-	-	0.0002		Japan	-	0.0012	-	-
	Jordan	0.0004	-	0.0002	-		Jordan	0.0012	-	-	-
	Nepal	0.002	-	-	0.0006		Nepal	-	0.0029	-	-
	Philippines	0.0005	-	-	0.0002		Philippines	-	0.0014	0.0002	-
	Sri Lanka	0.0012	-	-	0.0003		Sri Lanka	-	0.0016	-	-
Thailand	0.0011	-	-	0.0004	Thailand	-	0.0028	-	-		
Jordan	Indonesia	-	-	0.0012	-	Thailand	Indonesia	-	0.0007	-	-
	Israel	0.0017	-	0.0001	0.0013		Israel	0.0014	0.0008	0.0011	0.0005
	Japan	-	0.0011	-	-		Japan	0.0006	0.0002	-	-
	Jordan	0.0009	-	0.0003	-		Jordan	-	-	-	-
	Nepal	-	0.0037	0.0018	-		Nepal	-	0.0004	-	0.0002
	Philippines	-	0.0004	0.0007	-		Philippines	0.0005	0.0004	-	-
	Sri Lanka	-	0.0012	0.0003	-		Sri Lanka	0.0007	-	-	-
Thailand	-	0.0026	-	-	Thailand	0.002	-	-	0.0004		

Note: The impulse coefficients lower than 0.0002 are not reported.

Estimated results are based on the ordering of Indonesia, Israel, Japan, Jordan, Nepal, Philippines, Sri Lanka and Thailand.

Table 5: Reaction Variables of the Eight Asian Countries

	Indonesia	Israel	Japan	Jordan	Nepal	Philippines	Sri Lanka	Thailand
Indonesia	89	1	1	1	3	1	1	3
Israel	2	85	1	1	7	1	1	2
Japan	8	1	84	1	1	1	1	3
Jordan	3	7	5	47	10	3	9	16
Nepal	1	7	2	3	85	1	1	2
Philippines	2	2	1	2	6	82	3	2
Sri Lanka	6	1	5	1	4	6	73	4
Thailand	7	7	1	1	23	4	2	55

The order of variables used for variance decomposition is Indonesia, Israel, Japan, Jordan, Nepal, Philippines, Sri Lanka and Thailand.

Table 6: Variance Decomposition of the Eight Asian Countries

EMP in each country contagion	Indonesia	Israel	Japan	Jordan	Nepal	Philippines	Sri Lanka	Thailand
Inception	0.049 (2.63)***	0.109 (4.57)***	-0.011 (-1.68)	0.013 (1.24)	0.03 (3.63)***	0.018 (1.67)	0.023 (1.58)	-0.019 (-1.71)
Inception – D	0.688 (5.12)***	-0.004 (-0.02)	-0.023 (-0.66)	-0.007 (-0.13)	0.011 (0.27)	-0.051 (-0.54)	0.311 (3.61)***	0.129 (2.54)**
Export Growth Rate	-12.7 (-5.16)***	-1.26 (-0.26)	-0.724 (-1.26)	0.084 (0.2)	-0.267 (-0.69)	1.046 (1.1)	-0.302 (-0.59)	0.433 (0.66)
Export Growth Rate – D	12.358 (5.01)***	1.049 (0.22)	0.823 (1.41)	-0.05 (-0.12)	0.254 (0.65)	-1.136 (-1.18)	0.356 (0.68)	-0.334 (-0.5)
EMP _{ind}		-0.158 (-0.56)	0.121 (1.96)				-0.745 (-5.19)***	
EMP _{ind} – D		0.207 (0.66)	-0.142 (-1.94)				0.768 (4.64)***	
EMP _{isr}					-0.33 (-0.85)			-0.629 (-2.48)**
EMP _{isr} – D					0.293 (0.76)			0.675 (2.63)**

EMP_{jap}										
EMP_{jap} – D										
EMP_{jor}										
1.787 (0.86)										
EMP_{jor} – D										
-1.727 (-0.83)										
EMP_{nep}										
-19.458 (-4.22)***										
0.595 (0.18)							0.327 (0.27)	1.64 (1.26)	0.984 (0.96)	
EMP_{nep} – D										
19.187 (4.15)***							-0.962 (-0.29)	-0.231 (-0.19)	-1.427 (-1.09)	-0.669 (-0.65)
EMP_{ph}										
0.001 (0.003)										
EMP_{ph} – D										
0.213 (0.46)										
EMP_{sl}										
-0.021 (-0.22)										
EMP_{sl} – D										
0.151 (1.19)										
EMP_{th}										
2.545 (4.34)***										
		0.214 (1.52)						-0.104 (-0.38)		
EMP_{th} – D										
		-0.28 (-1.7)						0.203 (0.66)		
R²										
.32	.04	.11	.02	.03	.09	.26	.19			

***, **, * denote significance at 1%, 5% and 10% level, respectively. White's robust *t*-tests are in parentheses.
Source: Authors' calculations.

Table 7: Transmission Estimation Results