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ABSTRACT

Using daily data during the period of Asian Currency Crises, this paper examines high-frequency contagion effects among Asian six countries. By identifying the "origin" (of exchange rate depreciation, or decline in stock prices) and the "affected" (currencies, or stock prices) in spillover relationship, Indonesia and Korea are found to be the two main origin countries, affecting exchange rates and stock prices of other countries. Evidence of high-frequency crisis spillover from Thailand to other countries was weak at best. A positive relationship between trade link indices and the contagion coefficients is found, implying that the bilateral trade linkage is an important factor for currency market participants to expect which currency should be affected within days of an original a shock in the exchange rate of a particular country.

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1. Introduction

The collapse of *de facto* dollar peg of Thai Baht on July 2, 1997 has had devastating financial and economic effects on most of neighboring countries in East Asia. In January 1998, when the crisis was in its worst state, the cumulative depreciation rate since end-June 1997 was about 50 percent for most of the currencies in the region. Among them, the value of the Indonesia Rupiah had become one-sixth of the pre-crisis level. The degree of Contagion of currency crises in Asia was remarkable.

A sudden and huge capital outflow was one of the key reasons for the Asian currency crisis, by causing depreciation of currencies, higher interest rates, and plummeting stock prices in many countries in 1997-98.[1] The Asian currency crisis, as a capital account crisis, was preceded by the Mexican crisis, and followed by crises in Russia, Turkey, Brazil, and Argentina. However, contagion in terms of currency crises in regions other than Asia was limited, in its scope and its speed. In case of the Mexican Peso crash of 1994, several emerging stock markets in the region fell as investors "ran for cover": countries like Argentina and Brazil were expected to be next in a series of currency crises. The support program for Argentina by IMF in March 1995 turned out to be successful in managing the "tequila effect". The global financial turmoil triggered by Russia's default in 1998 increased risk premium in many emerging markets, but few countries suffered currency crises following Russia.[2]

What was striking in case of Asia was (1) crises in several Asian countries occurred almost contemporaneously in time, and (2) the most affected countries seemed to have shifted from one country to another. Within a few days after the Thai baht floatation in early July 1997, speculators attacked Malaysia, Philippines, and Indonesia. Hong Kong and Korea were attacked somewhat later on. The Asian Crisis differs from other crises in its depth and width of contagion.

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[1] See for example, Corsetti, Pesenti and Roubini (1998a, b), Flood and Marion (1998), Radelet and Sachs (1998), Yoshitomi and Ohno (1999), Ito (1997), Ito (2000), to name a few.

[2] Short-term interest rate soared from 59% as of June 1998 to 200% as of August 1998. Long Term Capital Management (LTCM) suffered a heavy loss due to a sharp increase in bond spread of developing countries and requested bail out package for the Federal Reserve Bank. In order to avoid further default and liquidity contraction in market, FRB cut interest rates three times during September - November 1998.

In this paper we examine high-frequency contagious effects among Asian six economies (Indonesia, Korea, Malaysia, Philippines, Taiwan and Thailand) for the period of Asian Currency Crises.[3] We use daily data to capture the day-to-day movements in the financial market and identify "first victim" currency (stock price), based on the methodology of the high frequency analysis in the finance theory.

We attempt to answer the following two questions: first, given a large depreciation in the first attacked country, to which extent the neighboring countries suffer? And second, which country is most likely to be affected during turbulent times?

Our paper is the first among papers in that the "origin" (of exchange rate depreciation, or decline in stock prices) and the "affected" (currencies, or stock prices) are distinguished by measuring the degree of depreciations. The "origin" is assumed to be the one that suffers the most declines in its value. More specifically, we classify daily depreciation of each country into two groups: a currency that showed the largest depreciation among six currencies as the "origin" and others as the "affected".

In consideration of the difficulty of distinguishing the origin and the affected, based on the time lag, because a currency crisis in one country simultaneously spills over to neighboring countries, we presume the simultaneous (high-frequent) contagion as the spillover effect from the most seriously attacked – and thereby the largest depreciated– country to others.

We then investigate channels through which the crisis is transmitted across countries. In examining the high frequency contagion, it is necessary to consider the markets' perception since a piece of new information may cause a sudden shift in expectations and confidence in the market. Thus, we consider several factors such as news and macroeconomic fundamentals (trade linkage) that investors would take into account for as the crisis transmission channel.

In order to see whether our classification of origin and affect reflects the reality, we check country-specific news of the date we refer to the country as origin from Bloomberg. Then, in the

[3] Hong Kong and Singapore are precluded from the survey because (1) Hong Kong adopted Currency board system even after the onset of crisis and therefore continued to peg its currency to the US dollar, and (2) the depreciation of Singaporean dollar was relatively small.

benchmark regression, we set the origin as explanatory variable to estimate the degree of spillover from a country with the largest depreciation to others: we call this the contagion coefficient. We find evidence of high-frequency causality: a currency crisis appears to spillover to other currencies.[4]

The structure of the rest of the paper is as follows. In section 2, the existing literature on currency crises and contagion is reviewed. Section 3 summaries exchange rates and stock prices of the region during the crisis period. In section 4 the "origin" and the "affected" are defined. In section 5 we present empirics and in section 6 we apply time series analysis. In section 7 we study the relationship between high-frequency contagion and trade link channel. Section 8 concludes the paper.

2. Previous Studies on Currency Crises and Contagion

There is a growing literature on the empirical evidence on currency crises and its contagious effects. We have seen at least three important currency crises in the 1990s and many papers have been written on these crises. Collins (1992) and Otker and Pazarbasiouglu (1997) investigate the 1992-93 crises in the European Monetary System. The Tequila crisis is surveyed in Sachs, Tornell and Velasco (1996) and Ito (1997), among others. Corsetti, Pesenti and Roubini (1998a, b), Radelet and Sachs (1998), Baing and Goldfajn (1999), and Berg and Pattillo (1999) investigate the Asian crisis.

What we have learned are, in general, two main interpretations of the causes of crises. According to one view, currency crisis reflects economic conditions in countries—structural and policy distortions, and weak fundamentals. As shown in Kaminsky, Lizondo and Reihnart (1998), some macroeconomic variables show weakness during months, if not years, prior to a

[4] Some point out the possibility of the accumulated effect: that is, an affected country falls into a more severe crisis than the origin country in the spillover process. If we see the Asian currency crisis as the accumulated effect from the initially targeted country, then the Thai baht devaluation alone should be interpreted as the Asian Currency Crisis. In our analysis, we do not take into account the accumulated effect during the course of the Asian currency crisis. We detail the contagious phenomenon from various points of views.

crisis. In these cases, it may be necessary to impose strict macroeconomic conditionality on these countries in order to avoid further crises. If one believes that a crisis happens due to weak fundamentals, crises in several countries in one region may be regarded as independent crises that happen to occur simultaneously. The simultaneity may be due to common global shocks, such as the global interest rate hike as well as sheer coincidence.

Another view focuses on sudden shifts in market expectations and confidence --- caused mainly by investors' panic and herd behavior--- regardless of macroeconomic performance. In a financial market where participants share access to much of the same information, a piece of new information (e.g., a small attack on a currency) can provide a signal that lead to a revision of expectations (an information cascade) in the market. The market's perception may be interpreted by currency traders in other markets as an eventual occurrence of a crisis in the near future.[5] This effect could lead to a capital outflow from the market and could result in an attack on currency despite of sound macroeconomic fundamentals. In this case, countries that face difficulties in managing reserves and capital outflows should be rescued with financial assistance from the international community without any conditionality.[6] If investors' sentiment plays a big role, contagion may be a result of a shift in investors; view on neighboring countries when one country goes into a crisis.

In addition to these literatures, there is a lot of literature on contagion in currency crises. There are at least four channels through which instability in financial markets might be transmitted across countries.

First, trade links can be a channel for contagion. This channel suggests that currency crises will spread contagiously among countries that trade disproportionately with one another. The devaluation in a country boosts up its competitiveness at least temporarily, in the presence of nominal rigidities. Then its trade partners are at a competitive disadvantage. Deterioration in

[5] Agenor and Aizenman (1998) investigate currency crisis based on the imperfect credit market.

[6] The IMF's new precautionary facility Contingent Credit Lines (CCL), approved by the IMF Executive Board in 1999, was designed to assist countries with strong economic policies and sound financial systems that are seeking to resist contagion from disturbances in global capital markets.

terms of trade will also worsen their economic performances in the mid- and long- run. Those most-adversely-affected countries are likely to be attacked next. Glick and Rose (1998) find the correlation between the spread of crisis and trade links.

Second, a channel through common creditors may explain spillovers of a crisis. The common creditor hypothesis is based on the lending institutions' tendency to ensure the immediate liquidity. When financial institutions face a default in one country, they tend to withdraw capitals not only from the country but also from other countries so that they will avoid further decline in their asset values. Kaminsky and Reinhart (2000) provide related analysis.

Third, sudden changes in assessment of emerging market countries among investors and lending agencies may cause the contagion. The Wake-up call hypothesis states that investors change the risk assessment to other countries in the wake of one crisis and become pessimistic toward investment or even rush the recovery of credit. Macroeconomic or financial similarities are often trigger re-assessment. A crisis may spread from the initial crisis country to another if the other has similar economic conditions, such as the Current Account to GDP ratio, the Foreign Reserves to short-term borrowings ratio, and so on. Sachs, Tornell and Velasco (1995) put on contagion in this light.[7]

It should also be noted that the concept of "contagion" varies from author to author.

For one case, we can think of a currency crisis as being contagious if it spreads from the initial crisis country to another.[8] Masson (1999a) argues based on multiple equilibria model that crisis contagion can be referred as an equilibrium switch under some economic fundamental conditions.[9] The alternative view is that the contagion

[7] Literature based on Macroeconomic fundamentals, see Collins (1992), Flood and Marion (1994), Eichengreen, Rose and Wyplosz (1994, 1996), Otker and Pazarbasioglu (1997), to name a few. Kaminsky, Lizondo and Reinhart (1998) is an excellent survey on empirical literatures. Berg and Pattillo (1999) argue the crises predictability.

[8] Masson (1999 b) classifies the causes of currency crisis into three: (1) common cause (monsoon effect), (2) fundamentals (spillover effect), and (3) trigger of first and hard hit country (sentiment jump).

[9] Flood and Marion (2000) focus currency crisis based on models of multiple equilibria. Jeanne and Masson (2000) apply the Markov Switching model. Obstfeld (1996) incorporates unemployment rate to the multiple equilibria model.

effect is thought of as an increase in the probability of a speculative attack on the domestic currency. See Eichengree, Rose and Wyplosz (1996), for example, for this view.

As is well known, it is difficult to distinguish empirically between common shocks and contagion, especially in the middle of crisis. In both explanations above, the actual occurrence (or an increase in probability) of crises depends on the existence of a (not necessarily successful) speculative attack elsewhere in the world.

In this paper, we measure the contagion coefficient as the ratio of depreciation of currency (or a decline in stock prices) of one country to that of the initial crisis country. In order to see if large movements of exchange rates are caused by the common shocks that simultaneously affected several countries or a crisis and its contagion in the region, we check the news release relevant to the date of large depreciation from Bloomberg. We find that Asian exchange rate movements during the crisis period were highly sensitive to crisis-related statements, such as the financial systems, bankruptcies, and political instability of a country where the currency depreciated most.

Our objective in this paper advances these viewpoints to analyze intra-day spillover effect from the first affected country, namely the high frequency contagion. We do not judge why the original crisis happened either by bad fundamentals (first generation model) or by a self-fulfilling attack (second generation model). Instead, the size of contagious effect from "ground zero" to other countries is measured, given the incidence of the initial attack. To anticipate a result, it is found that a high-frequency contagion phenomenon can be explained by the trade linkage within Asia. See, Glick and Rose (1999) and Eichengreen, Wyploz and Rose (1996).

One of the most significant weaknesses of earlier literatures on contagion is the absence of distinguishing the origin and affected in causality relationship. In the financial market, investors are likely to respond to an attack by withdrawing capital not only from the first attacked country, but also from neighboring countries within a few days, if not hours. In this respect, using monthly or quarterly data, even weekly data, on which many previous analyses based, may limit

analytical capability of crisis correlations among countries during a crisis period.

Our measure of contagion permits us to identify systemically important countries. Namely, whose contagion effects are significant and sizable can be found.

3. Exchange Rate and Stock Price during the crisis period

The daily data of the nominal exchange rate (vis-a-vis US dollar) and stock prices of Indonesia, Korea, Malaysia, Philippines, Taiwan and Thailand are used.[10] The sample period begins at January 3, 1997 for the exchange rate and January 3, 1994 for stock prices and ends at July 7, 1999 for both series. Both the exchange rate and stock prices data are obtained from Datastream.

Figure 1-1 （exchange rate, June 30 1997=100）

Figure 1-1 shows the exchange rates of six currencies against US dollar from June 30, 1997 to July 7, 1999. They are normalized at 100 on June 30, 1997. The behavior of exchange rates through the crisis period varied considerably across the countries. In Thailand, after an initial sharp depreciation due to the floatation of the baht on July 2, 1997, there were a series of smaller, but still substantial depreciation over a prolonged period, culminating in 17 percent depreciations by the end of August. The pressures were eased in September in response to measures to prevent further depreciation. We can see that a large depreciation in Thai baht initially had a substantial impact on Philippines peso and Indonesia rupiah.

In contrast, Indonesia's exchange rate depreciated fairly steadily starting in July 1997. Pressure on the Indonesia rupiah was intensified in late September due to increased problems in the financial market, but complicated by the political sector. With the rupiah falling further against the U.S. dollar by early October, IMF-supported programs for Indonesia were

[10] Stock price indices are: Jakarta Composite Index (ID), Korea South Composite Index (KR), Composite Index (ML), Composite Index (PH), Weighted Index (TW), Bangkok Book Club (TH).

announced on October 31, 1997. Then, Indonesia rupiah recovered temporarily in response to the program.[11] The limited recovery in the next few weeks was reversed by large further depreciation starting in late 1997 to mid 1998.

Korea avoided substantial depreciation until October 1997, with the exchange rate remaining broadly stable in July-October 1997. However, as Korean banks began to face difficulties in rolling over their short-term foreign liabilities, the exchange rate fell precipitously during late November- end December 1997.

Figure 1-2, stock prices

Figure 1-2 plots stock price indices of 6 countries from January 3, 1994 to July 7, 1999, with January 3, 1994=100. It is obvious from this figure that the stock market paints a different picture from the exchange rate market. Stock prices of Thailand peaked in 1994. On the other hand, stock prices of Indonesia, Korea, Malaysia, and Taiwan continued to increase or had been stable until late 1996.

Stock prices of Korea, Malaysia and Philippines began to fall in December 1996. In Indonesia, stock prices even increased through mid-1997, but fell sharply in the aftermath of the Thai crisis. Stock prices of Taiwan also fell by some extent, but its level in mid 1997 still exceeded the 1994 price level. In October 1997, stock prices of Korea and Malaysia dropped significantly.[12] The declines in stock prices continued until September 1998, then headed for recovery except Thailand and Malaysia.

4. Definitions of "origin" and "affected"

In the midst of the crises, many currencies depreciated at the same time. For instance, a large depreciation of the Thai baht seemed to have made a substantial impact on Philippines peso

[11] On November 5, 1997, the IMF's Executive Board and Indonesia approved a three-year Stand-By Arrangement equivalent to $10 billion. Additional financing commitments included $8 billion form the World Bank and the Asian Development Bank, and pledges from interested countries amounting to some $18 billion as a second line of defense.

[12] In October 1997, Hong Kong dollar was targeted of speculative attack and the Currency Board system raised interest rate that resulted in a decline in stock prices. So, several measures to shore up the stock market, including public funds injection, were taken.

and Indonesia rupiah and then it made a feedback to the Thai baht. In order to analyze statistically the size and the direction of spillover effect, we differentiate the "ground zero (origin)" from the "affected" countries.

In order to sharpen our analysis, we use the daily data. The problem of using a low frequency data (semi-annual, quarterly, and monthly), on which many previous literature are based, is that it smoothes out a lot of shorter duration interactions between the markets. Low frequency data makes it difficult to capture small but important events in the sample period. The feedback movements explained above would be grossed over by the use of monthly or quarterly data.

We first construct an indicator that distinguishes the "origin" from others that are referred to as "affected". To sketch the idea briefly, we first show the weekly (Friday to Friday) origin. It is calculated based on the weekly change in the exchange rate. Weekly origin of a crisis is a currency that depreciated most in the week with its depreciation exceeding 4%. This cut off number is ad hoc.

Table1-1 plots weekly origin of exchange rate depreciation, from July 1997 to January 1998.

Table 1-1, weekly origin

One problem using weekly change as origin is that weekly origin depends on the choice of the day of the week. Think of a currency that depreciates 3 percent from Thursday to Friday and then again 2 percent from Friday to Monday. Using the definition of 4-percent-cut-off depreciation starting on Friday does not pick this currency as origin; while, Monday-to-Monday origin does.

Now, a new way of defining origin is developed.

First, daily percentage change of the exchange rate (stock price) is written as:

$$DR(t,j) = R(t, j) - R(t-1, j),$$

where R(t,j) is log of nominal exchange rate (country j) with respect to the US dollar at date t. We next compute the weighted cumulative change, DRR(t,j), as the weighted cumulative change with the declining weights of past DRs [13]:

$$DRR(t,j) = 0.5DR(t,j)+0.25DR(t-1,j)+0.125DR(t-2,j) +0.0625DR(t-3,j)+0.0625DR(t-4,j).$$

The rationale for our measurement of origin based on DRR, not on DR, is as follow. It is often observed that a large depreciation (decline in stock price) followed by a large recovery in order to correct the overshooting. For example, both currency A and B were heavily hit to depreciate 11 and 10 percent respectively. Next day, currency A showed a recovery of 8 percent, while currency B did only 2 percent. It would be appropriate to interpret that currency B was more severely targeted. DR-based-origin, however, counts A as ground zero. We are likely to misjudge the severity of crisis should we see only the daily percentage change of depreciation. Using DRR, country B will be identified as a crisis country.

Our declining weight formula is also intended to avoid lingering effects of large changes of days ago. A crisis is not judged as severe when the rate of depreciation (decline in stock price) is large, but one-time-only. If we assume the equal weights, then, a very large depreciation of 5 days ago would influence the selection of the current origin of a crisis.

Our "origin" measure, DOR, is defined as follows:

DOR(t,0) = largest DRR at each t and also whose depreciation rate exceeds 2%.[14]

[13] The weights are arbitrarily chosen. The optimal weight (coefficient) may be computed from running VAR, but this method would not be plausible for East Asian countries since they pegged their currencies to US dollar prior to 1997.
[14] The threshold of 2% is arbitral.

Table1-2 and Table 1-3 summarize the DOR(t,0) of exchange rates and stock prices, respectively.

Table 1-2; Daily origin of exchange rate, Table 1-3; daily origin of Stock price

Table 1-2 lists the origins determined by DOR for the exchange rate depreciation from July 1997 to July 1999. The table makes it possible to pin down the crisis date in each country. For instance, July 1997 for Thailand, August-September 1997 for Indonesia, October 1997- January 1998 for Korea, and after January 1998 for Indonesia. With the economy back on the growth path in most of Asian countries after April 1999, the number of plots of origin declined. Our measure of origin is consistent with academic references as to the beginning of the crisis period: number of different measures gives a starting date of July 1997 for Thailand, August 1997 for Indonesia, and November 1997 for Korea.

Table 1-3 plots the origin of stock price declines. The stock price in the region was at its peak in early 1990s and then went downward by 1997 in most of countries. Since late 1994, stock prices began to fall in Thailand and fell by almost one third. The decline continued in Thailand in early 1997. In Indonesia, stock prices increased through mid-1997, but fell dramatically in the aftermath of the Thai crisis. In Korea, the decline of stock prices was temporarily interrupted in the first half of 1997 but continued in the second half in the wake of the banking sector crisis. As the contagion of exchange rate depreciation spread in the region, the downward pressure of stock prices was further intensified in Malaysia, Korea, and Indonesia. Since July 1998, stock price decline originated mainly from Indonesia, Malaysia and Philippines. The rate of decline and the frequency of large decline have been moderated since December 1998. The tremors in the stock market occurred even before the currency crisis and lingered on long after the currency started to strengthen.

In wake of financial crisis, market sentiment tends to be more volatile in general. Investors become more sensitive to bad news announcements and events. The news works as a signal to investors. A publicly available signal provides investors common information that may induce them to behave uniformly. The so-called herd behavior may result.

Table 2 lists news release, relevant to the timing and date of exchange rate origin in Table 1-2, collected from Bloomberg. Before the July 1997 crisis, exchange rates in most of the East Asian countries did not respond to news because of the de facto peg to the US dollar. Therefore we check if the behavior of exchange rate began to reflect the news release after the floatation.

Table2, exchange rate, daily origin-News

For early stage of crisis, news was relatively straightforward and was categorized to crisis-related statement; such as authorities' announcement on exchange rate regime, foreign reserves and IMF support package. In late 1997 and early 1998, news relevant to large movements of the exchange rates became related to the vulnerability of financial and economic systems, bankruptcies, and political instability. A case can be seen that concerns on the banking system in Korea intensified the devaluation pressure at this stage. It is also argued that exchange rate movement was highly sensitive to news related to political instability in Indonesia.

5. Matrices of Cumulative Contagion

In order to make the idea of high-frequency contagion more concrete, a new measure of crisis spillover is proposed, namely the contagion coefficient. This is the ratio of depreciation rate of origin to that of affected country. This contagion coefficient measures high-frequent spreading of financial crisis from the origin (first attacked country) to other affected countries.

The contagion coefficient is defined as:

$$CC(t,i) = DRR(t,i) / DOR(t,0),$$

where $i \neq 0$. Table 3-1 reports CC(t,i) for exchange rate and Table 3-2 to Table 3-4 report CC(t,i) for stock price. Sample period starts on July 1 1997 and ends on July 7 1999.[15]

[15] The sample period includes when Malaysia began to peg its currency to US dollar starting at September 1, 1998. The daily percentage change in exchange rate is close to zero and so is the DRR in Malaysia after September 1998. Therefore, Malaysia is virtually excluded from "origin" for this period. Thus, we do not need to explicitly impose structural change of Malaysia on regression models in the following section.

A negative sign of CC indicates the opposite movements of exchange rate (stock price) between origin and affected countries: in the case of exchange rate, a devaluation of the origin country leads to an appreciation of affected countries. On the other hand, a positive sign of CC indicates that the direction of exchange rate (stock price) movements between the origin country and affected countries are the same. That is, a devaluation of origin country leads to a devaluation of affected countries: namely contagion.

"t-stat (t-statistics)" in Table 3-1-Table 3-4 is the significance for testing the null hypothesis of CC equals zero.[16] The null hypothesis implies there exists no significant high-frequency contagion from origin to affected.

Table3-1 plot of CC (exchange rate), Figure 2-1

Table 3-1 shows CC(t,i) for the exchange rate. As shown in Table 1-2, the frequency of crisis (the origin) drastically decreases after June 1998, implying that exchange rates had become stabilized or back on a recovery track by the summer 1998. Most of crisis (large depreciation) after July 1998 were from Indonesia. Therefore, we divide the sample period into four in the case of Indonesia. Specifically, for origin of Indonesia, we calculate CC(t,i) for the two sub-sample periods, crisis period (1997/7/1-12/31, 1998/1/1-6/30) and recovery period (1998/7/1-1999/7/7), in addition to the worst-state period (1997/10/1-1997/12/31).

In the case of exchange rates, there are 87 instances that are regarded as the crisis origin in terms of our definition. Of those, 60 instances are of Indonesia, 14 instances of Korea, and 7 instances of Thailand, and 6 others.

The significance of estimated coefficients varies according to sample periods and countries. The contagion coefficients originating from Thailand and from Philippines are, in many cases, negative. Shortly after the onset of currency crisis, two hard-hit currencies, the Thai baht and Philippines peso, continued the devaluation while other currencies were not severely affected and remained their value to US dollar. Thus, the contagion coefficients from these countries to

[16] Calculation is as follows: Stat = (x^-x0)/(square root of variance / square root of NOB), where x^:average; x0:(Null)=0 and x0 is the ratio of DOR/DRR (CC).

others are not significantly different from zero.

The sign of coefficients of affected countries, when the origin is either Indonesia or Korea, is positive and significantly different from zero. That is, the large depreciation of Indonesian and Korean currencies tended to induce simultaneous depreciation in other currencies. That is, we find evidence of significant high-frequency contagion originating from Indonesia to Malaysia, Indonesia to Thailand, Korea to Malaysia, Korea to Thailand, and Korea to Indonesia.

Our high-frequency data shows that the contagion coefficients of Indonesia as the origin are positive and significant for all but Korea over the period from July to December 1997. Also, the Korean won as an origin does no t affect the Indonesian Rupiah. Contrary to the conventional wisdom that the depreciation of Indonesian Rupiah won contagiously spilled over to Korean won and vice versa, the finding provides evidence that the collapse of Indonesian rupiah did not cause the depreciation of Korean won. As shown in Table 2 (news release), exchange rate movement was highly sensitive to news related to political instability in Indonesia: the concerns on the political instability intensified the devaluation pressure. The effect of Rupiah depreciation, or political instability, affected neighboring countries, but not Korea. After June 17, 1998, the result is reversed: the contagion coefficient of Indonesia is significantly positive only in Korea and insignificantly different from zero or significantly negative in other countries.

Figure 2-1 shows the significance of exchange rate contagion coefficient graphically. As seen from the figure, depreciation of Indonesia and Korea has high-frequency contagion effects on currencies in the region, while we do not find evidence of significant spillover effect from Thailand to other countries.

Table 3-2～3-4, plot of CC (stock price), Figure 2-2, Figure 2-3

Table 3-2 - Table 3-4 presents CC(t,i) of stock prices. Table3-2 shows CC for whole sample period and Table3-3 and Table3-4 present results for pre-crisis and post-crisis periods, respectively. The instances as origin as a whole dramatically increase for post-crisis, but the situation depends on pairs of countries. Figure 2-2 and 2-3 show the significance of stock price

contagion coefficient before and after the crisis, respectively.

For Indonesia, there are 2 instances as the origin for the pre-crisis period, and 28 instances for the post-crisis period. For Korea, 3 instances for the pre-crisis and 44 for the post-crisis; for Malaysia, 4 for the pre-crisis and 25 for the post-crisis. For these 3 countries, the number of instances regarded as origin dramatically increased after the onset of crisis.

On the other hand, for the Philippines and Thailand, the number of instances before and after the crisis does not show marked difference. For the Philippines, there are 12 instances for the pre-crisis period and 15 instances for the post-crisis period. For Thailand, 17 for the pre-crisis and 16 for the post-crisis. In contrast to other countries, Taiwan is the only country whose instances as origin surprisingly decreased from 16 for the pre-crisis period to 6 for the post-crisis period.

The contagion coefficients of ASEAN countries as the origin for the post-crisis period turn to be significantly positive, and the magnitude of contagion coefficients become larger. A case for Korea as the origin, the contagion coefficients for the pre-crisis period are negative, while they become positive and significantly different from zero for the post-crisis period.

In sum, high frequency contagion of stock prices has been intensified with some exceptions in Taiwan, after the currency crisis occurred in Thailand in July 1997.

6. Regression Results

6.1. Exchange Rates

In the previous section we find high-frequency contagion in both exchange rates and stock prices among the Asian countries. The stock price high-frequency contagion becomes intensified after the crisis.

In this section, we present some formal econometric results to show statistically to what extent the depreciation of exchange rate (decline of stock prices) of first attacked country, namely origin, affects others.

The Dynamic OLS (DOLS) method with the following specification is used:[17]

$$affected(t,i) = const + a1*origin(t, 0) + b1*dorigin(t+1, 0) + b2*dorigin(t, 0) + b3*dorigin(t-1, 0) + e,$$

where $i \neq 0$. Here, affect(t,i) is DRR and origin(t,0) is DOR defined in section 4 above, and dorigin(t,0) = DOR(t,0)-DOR(t-1,0).

The Dynamic OLS method provides efficient estimator if the regressor is cointegrated or endogenous. By including the current change as well as the past and future changes of the regressor in the regression, we are able to maintain the strict exogeneity of the regressor, the origin (DOR). The order of leads and lags of changes of regressor, dorigin, is arbitrary: we set the order of both leads and lags being equal to 1 in the analysis below. Standard errors for a point estimate of a1 is recalculated based on the DOLS residuals and then adjusted to the sample period of recalculated the augmented cointegrating regression.[18]

For purposes of comparison, 2 types of estimation are conducted. (1) The regressor, origin(t,j), includes all instances of being the "origin". That is, we do not distinguish the first crisis "country". We call this regressor "pooled origin". And (2) country specific origin(t,j). That is, a regression is conducted on origin according to the country. We call this "country-specific origin".

The expected sign of a point estimate of a1 is positive if there exists high-frequency contagion. Estimation results are summarized in Table 4-1.

Table4-1 DOLS exchange rate

Table 4-1 shows the estimation results for exchange rate for the period from July 1 1997 to July 7 1999. The first row of the table shows the regression results estimated with the pooled

[17] We do not include the interest rate differentials in the estimation. For the very short period of time, especially in the phase of crisis, investors do not take account of interest rate parity, but only nominal price (exchange rate, stock price). Thus, interest rate differentials are expected to be insignificant.
[18] See Hayashi (2000) for details.

origin. The second and the third rows of the table show the estimation results with country-specific origins, Indonesia and Korea, respectively.[19]

Estimation results show that estimated coefficients a1 in Korea, Malaysia, Philippines and Thailand with the pooled origin are positive and significantly different from zero. The sign of estimated coefficient is, however, negative in Indonesia. The result for Indonesia can be interpreted as that the Indonesian rupiah behaved differently from others, namely no contagion in general. For example, most of the currencies in East Asia are back on recovery track around April 1998, while Indonesia rupiah continued to decline.

Estimated coefficients in Korea, Malaysia, Philippines and Thailand are significantly different from zero and the point estimates range from 0.12 to 0.19. In contrast, the estimated coefficient is not significant in Taiwan: that is, Taiwan did not suffer the high-frequency contagion of crisis from the first-hit country. This finding is consistent with the fact that Taiwan is one of the least hit countries in 1997.

Next, estimation results on country-specific origin are examined. A case of Indonesia as origin, contagion coefficients in Malaysia, Philippines, Taiwan and Thailand are positive and significantly different from zero. In contrast, contagion coefficient in Korea is significantly negative. Indonesia rupiah severely depreciated following the Korea won in early 1998. The movement of Korean won was opposite to that of Indonesia: when Indonesia was hard hit, Korean won was on the recovery track. Therefore, the coefficient of Korea on rupiah is likely to be negative.

There seems a significant high frequency contagion in Indonesia and Malaysia in case of Korea as the origin. The estimated coefficient in Indonesia is 0.68 and significantly different from zero. The estimated coefficient in Philippines is 0.24 but insignificant, and in Thailand, significantly negative.

Two important findings emerge from the estimation results. First, there exists

[19] DOLS regressions include leads and lags in both OLS and residual regressions and therefore, reduce degree of freedom. Thus, Thai origin is precluded from the regression.

high-frequency contagion among East Asian countries. Our contagion coefficients are positive and statistically significant in most country pairs of the origin and the affected. Second, contagion effects originating from Indonesia and from Korea are significant in many countries.[20]

6.2. Stock Prices

Table 5-1 to Table 5-7 presents the estimation results for stock prices. We run regressions for three sample periods: whole sample period (January 1994-July 1999), pre-crisis (January 1994-June 1997), and post-crisis period (July 1997-July 1999). Due to the degree of freedom problem, regressions for the pre-crisis period for Indonesia, Korea and Malaysia as the origin are excluded. The regression estimates on Taiwan as the origin is not shown for the post-crisis period for the same reason.

Table5-1～Table5-7 Stock Price DOLS

Regression results of contagion coefficients estimated on pooled origin are shown in Table 5-1. Contagion effects are significant with positive coefficients in all countries for the whole sample period. The estimated coefficient is significantly negative in Korea for both pre- and post- crisis periods. However, the magnitude of coefficient becomes smaller for post crisis period. In contrast to the results that showed the intensified contagious effects for post crisis period in most countries, the magnitude of estimated coefficient in Taiwan declined sharply after the crisis. Taiwan was less influenced from high-frequency stock price contagion after the crisis.

Table 5-2 to 5-7 presents regression results estimated with the country-specific origin.

Table5-2 shows the results with the Indonesia origin. The estimated coefficients are significantly positive in both Malaysia and the Philippines.

Table5-3 is the case of Korea as the origin. All estimated coefficients, except Thailand, are significantly negative. The magnitude of estimated coefficients for the post-crisis period becomes larger (in negative) in Indonesia and Malaysia. These are consistent with the fact that

[20] Baig and Goldfajin (1999), for instance, use VAR to analyze impulse response among Indonesia, Korea, Malaysia, Philippines and Thailand and conclude that the impulse shock of Indonesia has significant effect on other countries. Our findings are consistent with these results.

Korean stock price index declined sharply in late 1997 while stock prices in other countries remained stable.

Table5-4 reports the estimation results on Malaysia as the origin. Most of the estimates are significantly negative, but positive and significant only in Thailand.

The results of Philippines as the origin are summarized in Table 5-5. The estimated coefficients in Indonesia, Korea and Malaysia are significantly positive for both pre- and post-crisis periods. The sign of coefficients turn to be positive (but insignificant) in Thailand for the post-crisis period.

Table5-6 presents the results of Taiwan as the origin. The coefficients are all significant.

The estimation results of Thailand as the origin are shown in Table 5-7. The sign of coefficients turn to be positive (insignificant) in Indonesia and negative in Taiwan (significant) and in Malaysia (insignificant), after the crisis.

In sum, the regression results estimated on the pooled origin and on the country-specific origin do not show marked differences. The sign and significance of estimated coefficients vary from country to country depending on origin by individual countries. The estimation results with the pooled origin, however, clearly show the existence of high-frequency contagion in the stock market, especially after the crisis. This finding is consistent with a view that the change in the exchange rate regimes among the Asian countries influenced the relationship between capital markets performances, and investors started to treat the region as a whole.[21]

7. Contagion and Trade Link Channel

In this section we explore for possible channels of high-frequency contagion. Why crises spread and why they tend to be regional are, as briefly mentioned in Section 2, explained in the literature by macroeconomic similarities, the existence of common creditor, and a trade linkage.

In financial market, investors pull their capital out of countries in the same region of the

[21] Malliaropulos (1998), for example, reports negative relationship between the return of stock prices and the change in exchange rates.

first-hit country. Investors' perception of which countries will be affected next depends on several factors including macroeconomic fundamentals and financial vulnerability. From the perspective of most empirical crisis models, however, it is hard to understand why crises tend to spread in the same region, at least at an early stage of crisis. As shown in Glick and Rose (1999), performances of macroeconomic fundamentals are not necessarily similar among crises countries.

Another transmission channel, the Common Creditor hypothesis, emphasize the role of bank lending. Lenders tend to withdraw capital not only from the first-hit country but also from others in order to avoid further losses. Figure 3-1 reports the bank liabilities in Asian six countries at the end of June 1997.[22] The figure reveals that the Asian countries, most notably Indonesia, Korea and Thailand, relied on international bank credit. The common creditor hypothesis can be examined whether capital withdrawal by financial institutions, whose loan ratio to these countries are as high as that in the first-hit country, will induce depreciation. The common creditor index is calculated as

$$CCI(i,0,k) \equiv L_{i0} * L_{ik}$$

The loan ratio, L_{i0} (L_{ik}), is the bank lending from country i (Japan, US, Europe) to country 0 (or k) (Asia, and $0 \neq k$) divided by the total loan lending to the world from country i. For example, L_{i0} is the ratio of Japan's lending to Thailand (i=Japan and 0=Thailand) to Japan's total lending to the world. The loan ratio L_{ik} is the ratio of Japan's lending to Malaysia. (i=Japan and k=Malaysia). The common creditor hypothesis states that the higher the loan ratio to the origin and other countries, the larger the withdrawal of capital from other countries. According to the hypothesis, a positive relationship between the common creditor index, CCI(i,0,k) and contagion coefficient CC(i,k).

Figure 3-2 plots the contagion coefficients (CC) and the Common creditor index (CCI). The CC is measured on the vertical axis and the CCI is measured on the horizontal axis. The devaluation spillover from Thailand to Indonesia, from Korea to Thailand and to Indonesia, and,

[22] Bank for International Settlement (BIS), Consolidated International Claims of Reporting Banks on Individual Countries, by Nationality of Reporting Banks, BIS Quarterly Review, June 2002.

from Indonesia to Thailand, seems to be supported by the existence of common creditors. For other pairs, however, it is difficult to find a strong relationship between common creditor index and contagion. The correlation coefficient, in total, is –0.14. Therefore, it is difficult to interpret the results as a supportive evidence for the Common Creditor hypothesis.

Figure 3-1, 3-2

Depreciation of the first-hit country gains price competitiveness at least in the short run. Then, countries that have trading relationship with this country lose competitiveness. They are therefore more likely to allow depreciation to maintain competitiveness.

In practice, it takes some time until current trade balance deterioration will be reflected in GDP and other economic data so that depreciation is justified by fundamentals. However, investors predict the future depreciations of trading partners at the onset of a currency crisis in one country. Investors are likely to sell currencies of trading partners in anticipation of depreciation in the near future, so that depreciation happens even before the actual trading channel runs its course. Hence, theory predicts a slow process, but expectation moves events faster. That is, investors based on expectation of deterioration of trading balances of the neighboring economies in the future sells the currency immediately, resulting in high frequency contagion. This is the trade link channel through which the devaluation (or depreciation) of the first-hit currency contemporaneously spills over to other currencies in the region.

For many Asian countries, a large portion of their goods is exported to the United States, Japan, EU, and Intra Asia.[23] It is tempting to believe that some direct and indirect trade linkages due to bilateral and third-market competition were instrumental in repeated rounds of competitive devaluation. There is a large volume of studies on contagion and trade link (Eichengreen and Rose (1999), Glick and Rose (1999), Forbes (2000), Kaminsky and Reinhart (2000) to name a few), and they support the evidence of relationship between the contagion and trade links.

In the following, we investigate evidence of the relationship between the high-frequency

[23] Export share within Asia varies between countries and ranges from 25% to 45%.

contagion and trade link channel using three measures; competitive effect, income effect, and cheap import effect.

7.1 Competitive Effect

There are three different types of explanations why contagion spreads via the trade channel in geographic proximity. The first explanation relies on the competitive effect analyzed by Gerlach and Smets (1995), and Corsetti, Pesenti, Roubini and Tille (2000). Devaluation of a first-hit country makes export prices of its trading competitors relatively more expensive. Then, market participants may expect declining trade balance in competitors due to weakened price competitiveness, and are likely to withdraw capital out of these countries.

For analysis, we provide two indices, export share and Direct Trade Linkage Index (DTLI).

Table 6

Table 6 presents the export share in intra-Asia trade for each of 5 countries (Indonesia, Korea, Malaysia, Philippines and Thailand) for 1996-1999.[24] The export share of country *m* is the ratio of export from country *m* to country *n* divided by the total export of country *m*. The relationship between contagion coefficient (CC) and the export share is expected to be positive. If the export share of the origin to affected countries is large, the price competitiveness of the origin affects those countries adversely. As a result, affected countries are more likely to suffer the crisis contagion from the first-hit country.

In order to look at the competitive effect more carefully, we employ another index, Direct Trade Linkage Index (DTLI), similar to that used in Glick and Rose (1999).[25]

$$DTLI_{0i} = 1 - (x_{i0} - x_{0i}) / (x_{i0} + x_{0i}).$$

[24] IMF, Direction of Trade (2000).
[25] Although this index is similar to that in Glick and Rose (1999), the calculation is different from theirs. They focus on the absolute difference of export share between countries 0 and i, while our calculation incorporates the difference of export and import size, and direction of trade between the two countries.

Here, x_{mn} denotes bilateral exports from country *m* to *n*. Subscript *o* and *i* indicate home country and its direction of trade, respectively. Thus, x_{0i} measures exports from home country to other country *i*, while x_{i0} can be interpreted as imports of home country from other country. Then, $(x_{i0} - x_{0i})$ denotes the net import of home country from country *i*, and $(x_{i0} + x_{0i})$ denotes the aggregate trade of home country.

The index $DTLI_{0i}$ is higher than 1 if exports from country *o* to country *i* is greater than imports of *o* from *i*. The index lies between 0 and 1 if imports exceed exports. The index is close to 1 if the bilateral trade between countries *o* and *i* are almost equal.

For example, when the bilateral trade balance from countries *o* to *i* is positive, then the depreciation (or devaluation) of country *o* accelerates the export of country *o* and, in contrast, depresses the export of country *i* to country *o*. Then, country *i* may suffer the disadvantage of price competition. Thus, contagion coefficient (CC) is expected to be positively related to $DTLI_{0i}$ for $DTLI_{0i} > 1$. On the other hand, when exports from country *i* to country *o* exceeds imports of country *i* from country *o*, for $DTLI_{0i} < 1$, it is assumed that the price disadvantage of country *i* resulting from the depreciation of country *o* is less severe. So, CC may be small and/or negative. Therefore, the positive correlation coefficient between DTLI and CC is expected as a whole. The expected relationship between DTLI and CC is summarized below.

	country *0* (origin)	country *i*	country *i* : price competitiveness	CC
$DTLI_{0i} > 1$	export surplus	excess of import	great loss	positive
$DTLI_{0i} \approx 1$	balance	balance	small loss-no change	positive
$DTLI_{0i} < 1$	excess of import	export surplus	no change	small or negative

Table 7 Figure 3-3, Figure 3-4

Table 7 summarizes $DTLI_{0i}$. Figure 3-3 plots the contagion coefficients (CC) and the export share, and figure 3-4 plots the CC and $DTLI_{0i}$. The CCs are measured on the vertical axis in both

figures. The export share and DTLI are measured on the horizontal axis in figure 3-3 and figure 3-4, respectively.

As shown in figure 3-3 and figure 3-4, there exists a positive relationship between CC and export share, and between CC and DTLI. The correlation coefficient of each figure is 0.329 and 0.258, respectively.

7.2 Income Effect

The second measure to relate the trade links to crisis contagion is the income effect.[26] Imports of crisis country decline due to the downturn of economic activities and therefore the income level decreases. Then, its trading partners also suffer negative macroeconomic effects because of reduction in exports to the first-hit country. Countries with large export share to the first-hit country suffer from a negative income effect of the crisis country and, therefore, are likely to experience depreciation as well.

Table8 Figure 3-5

Table8 reports the income effect index. The index is represented by the export (from "affected" to "origin") to GDP ratio, $export_{i0} / GDP_i$, where i and o denote the affected country and the origin country, respectively. Figure 3-5 plots the index on the horizontal axis and the Contagion Coefficient on the vertical axis. There is a positive relationship between the income effect and the contagion. This correlation coefficient is 0.357. This result implies that countries with large export share to origin country are likely to suffer currency crisis.

7.3 Cheaper Import Effect (bilateral trade effect, supply effect)

The third measure of trade channel is the Cheaper Import Effect (also called either bilateral trade effect or supply effect). Depreciation of the first-hit currency drives export prices down, which is equivalent to the decline in import price in its trading partners. With nominal income and other conditions held constant in a trading partner country, a decline in its import price raises

[26] See for example, Forbes (2000).

disposable income and, therefore, improves welfare of the country. It is also expected that the terms of trade in trade partner countries improve because the import price from the origin country decreases while the export price of these countries remains constant for the short-run.

In this case, in contrast to other two trade channel effects above, depreciation of the first-hit country may have positive effect on its trading partners. As shown in Corsetti, Pesenti, Roubini and Tille (2000) and Forbes (2000), speculative pressures may not be transmitted to trading partners through the trading channel if the import price effect in trading partner countries dominates over the two previous measures.

Table9 Figure 3-6

Table 9 presents the Cheaper Import Effect. The index is calculated as the import from the origin country divided by GDP. The larger the index, the larger the import from the origin country. The contagion coefficient (CC) and the index are expected to be negatively correlated because the large devaluation in the origin country may improve its trading partners' welfare in terms of the decline of import price, and therefore trading partners are less likely to suffer crisis.

Figure 3-6 plots the CC and the index. It is obvious from the figure that the index has positively related to CC. The correlation coefficient is 0.384. This result means that the cheaper import effect does not work as to improve welfare of affected countries. Rather, the negative effect of depreciation in the origin country, especially the effect from weakened price competition, has been dominant across international trade.

All of the tests above have a consistent account. The correlation coefficients between trade link index and contagion coefficient are summarized in Table 10. As seen in this table, various measures support our high-frequency contagion and trade link channel.

Table 10

8. Concluding remarks

Using the daily data for the period of Asian Currency Crises, this paper examines high-frequency contagion among Asian six countries.

By distinguishing the origin and affected countries in the causality relationship, we find evidence of statistically significant high-frequency contagion among Asian countries in both the exchange rate and the stock prices. The depreciation of Indonesia and of Korea has been found to have a significant high-frequency contagion effect on other currencies. We also find that the spillover effect in stock markets has been intensified after the crisis in most of the Asian countries.

Surprisingly, our high-frequency spillover effect is tied to the international trade channel. There is a positive relationship between the trade link indices and our contagion index. This implies that the bilateral trade linkage is an important variable in transmitting financial pressures across international borders.

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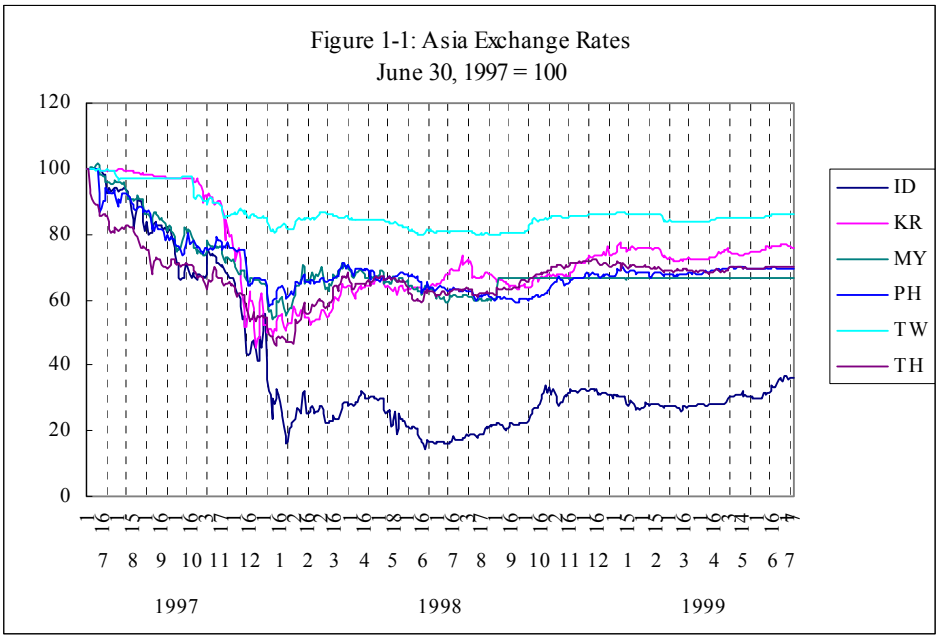


Figure 1-1: Asia Exchange Rates
June 30, 1997 = 100
120
100
80
60
40
20
0
7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7
1997
1998
1999
ID
KR
MY
PH
TW
TH

Figure 1-2: Asia Stock Price Index
January 3, 1994 = 100

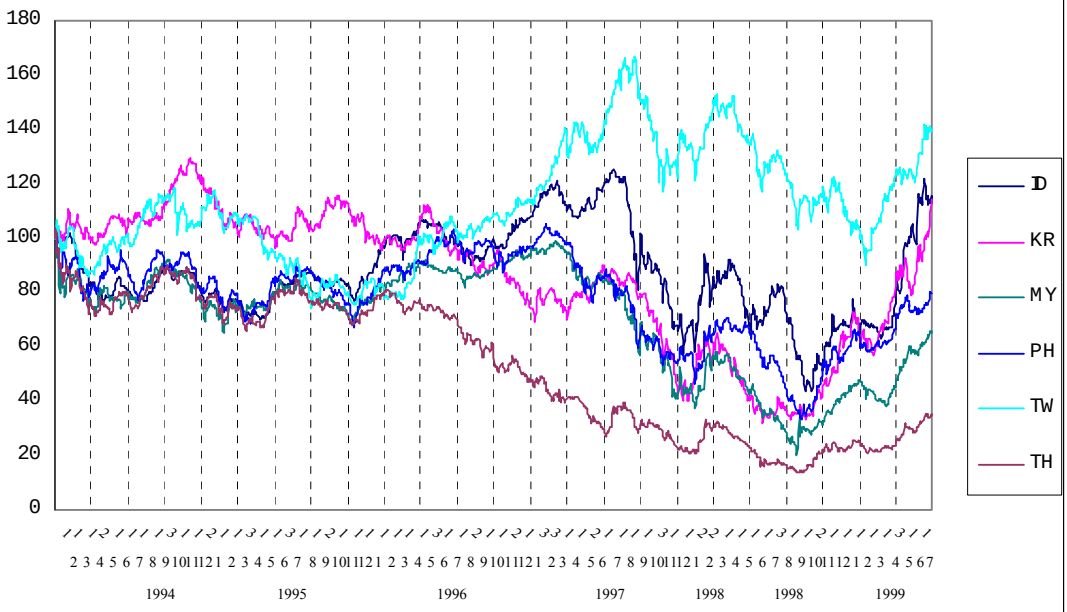


Figure 2-1

Exchange Rate Contagion Coefficient 1% ⟹, 5% ⟶, 10% ⇢

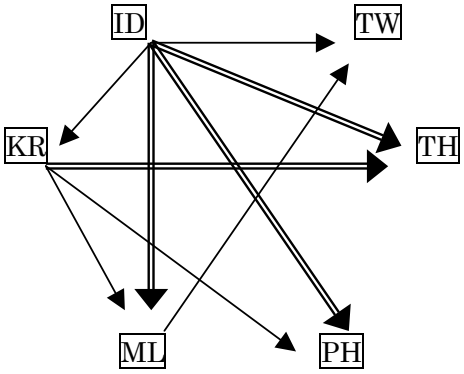


Figure 2-2

Stock Price Contagion Coefficient (before Crisis) 1% ⟹, 5% ⟶, 10% ⇢

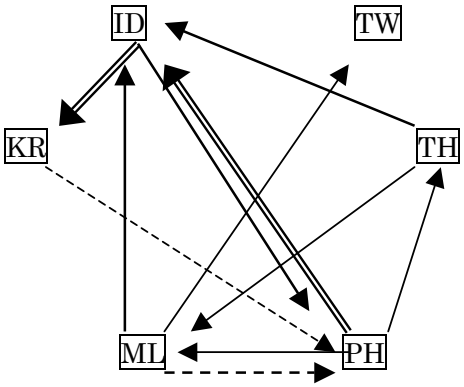


Figure 2-3

Stock Price Contagion Coefficient (after Crisis) 1% ⟹, 5% ⟶, 10% ⇢

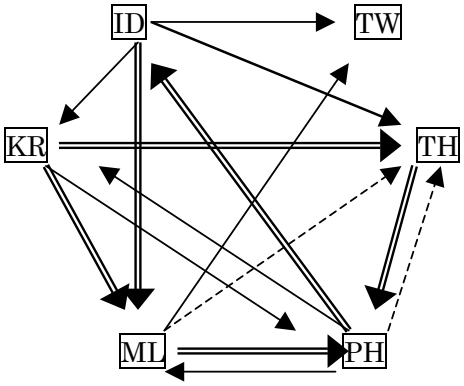
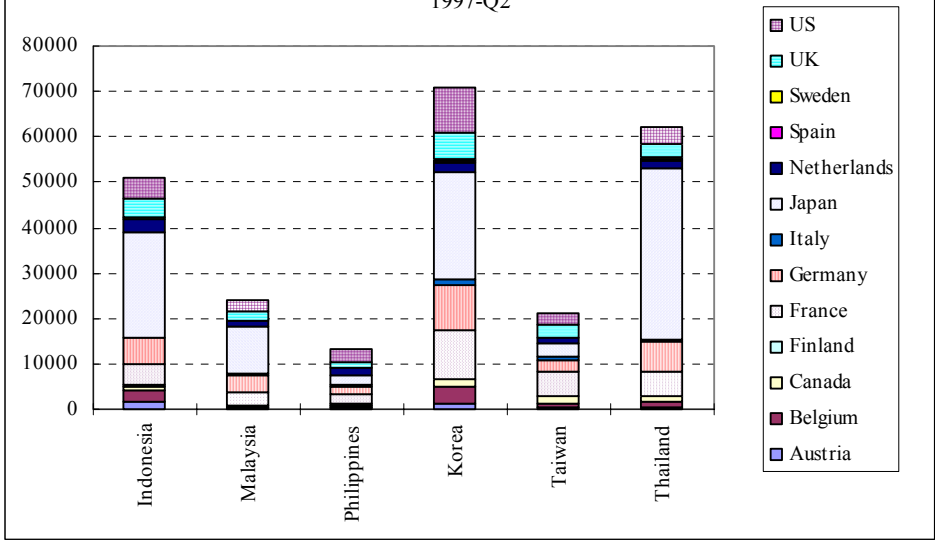


Figure 3-1
International Bank Lending to Asia (millions of USD)
1997-Q2



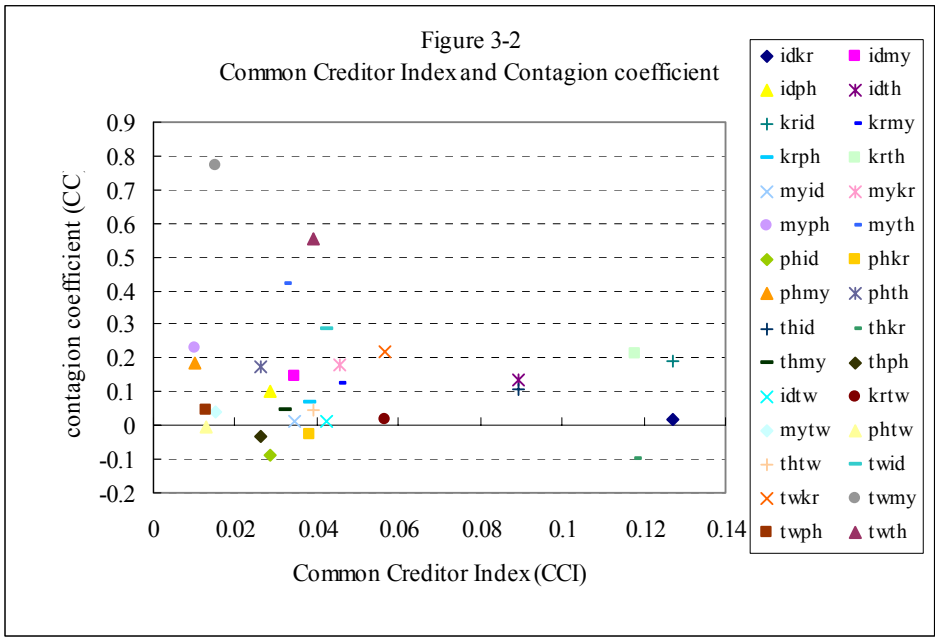


Figure 3-2
Common Creditor Index and Contagion coefficient
contagion coefficient (CC
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
Common Creditor Index (CCI)
idkr
idmy
idph
idth
krid
krmy
krph
krth
myid
mykr
myph
myth
phid
phkr
phmy
phth
thid
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thmy
thph
idtw
krtw
mytw
phtw
thtw
twid
twkr
twmy
twph
twth

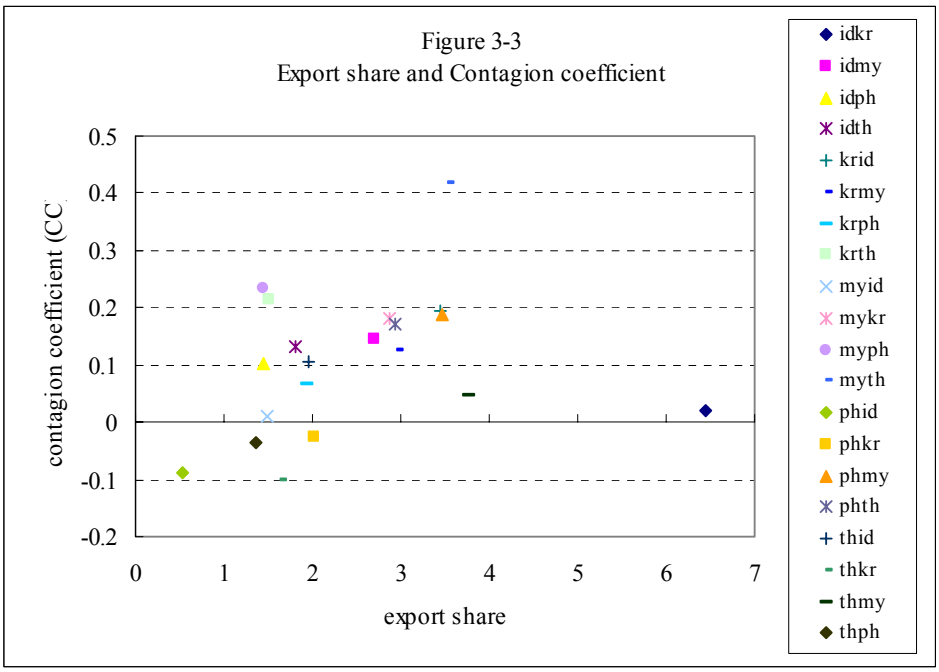
Figure 3-3
Export share and Contagion coefficient
contagion coefficient (CC
export share
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
0
1
2
3
4
5
6
7
idkr
idmy
idph
idth
krid
krmy
krph
krth
myid
mykr
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phth
thid
thkr
thmy
thph

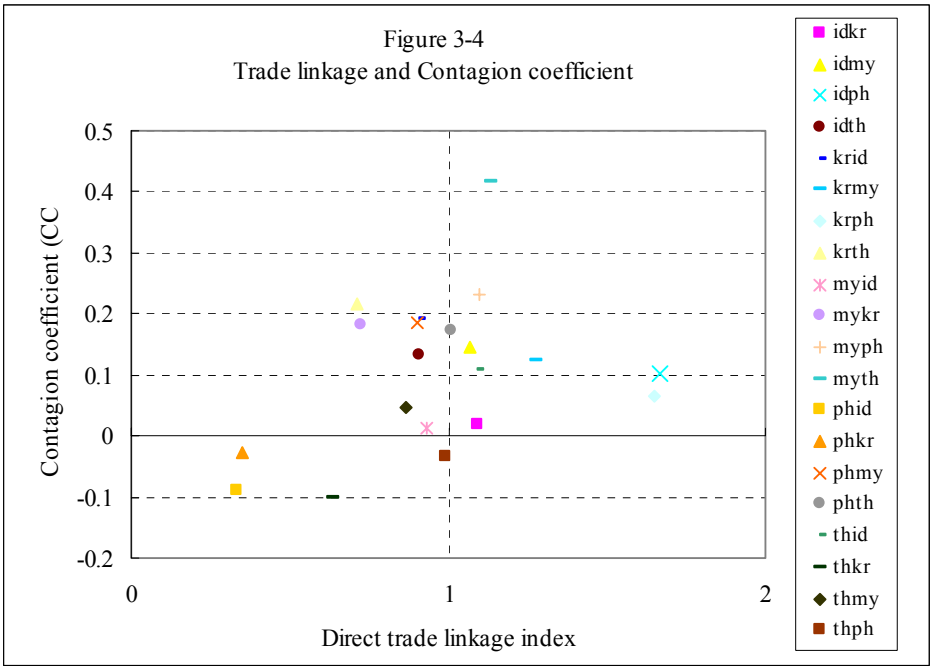
Figure 3-4
Trade linkage and Contagion coefficient
Contagion coefficient (CC
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
0
1
2
Direct trade linkage index
idkr
idmy
idph
idth
krid
krmy
krph
krth
myid
mykr
myph
myth
phid
phkr
phmy
phth
thid
thkr
thmy
thph

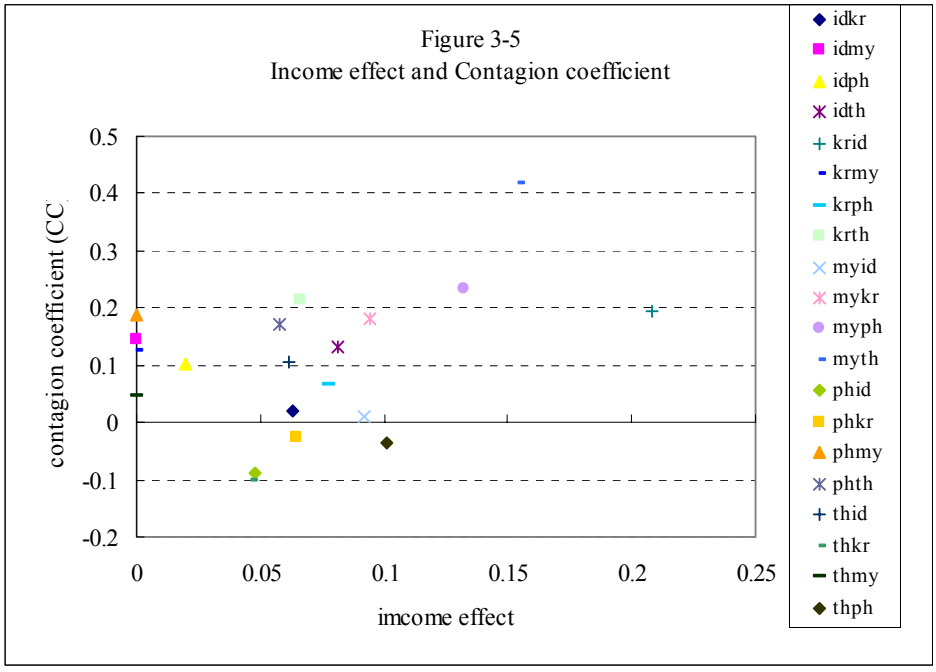
Figure 3-5
Income effect and Contagion coefficient
contagion coefficient (CC
imcome effect
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
0
0.05
0.1
0.15
0.2
0.25
idkr
idmy
idph
idth
krid
krmy
krph
krth
myid
mykr
myph
myth
phid
phkr
phmy
phth
thid
thkr
thmy
thph

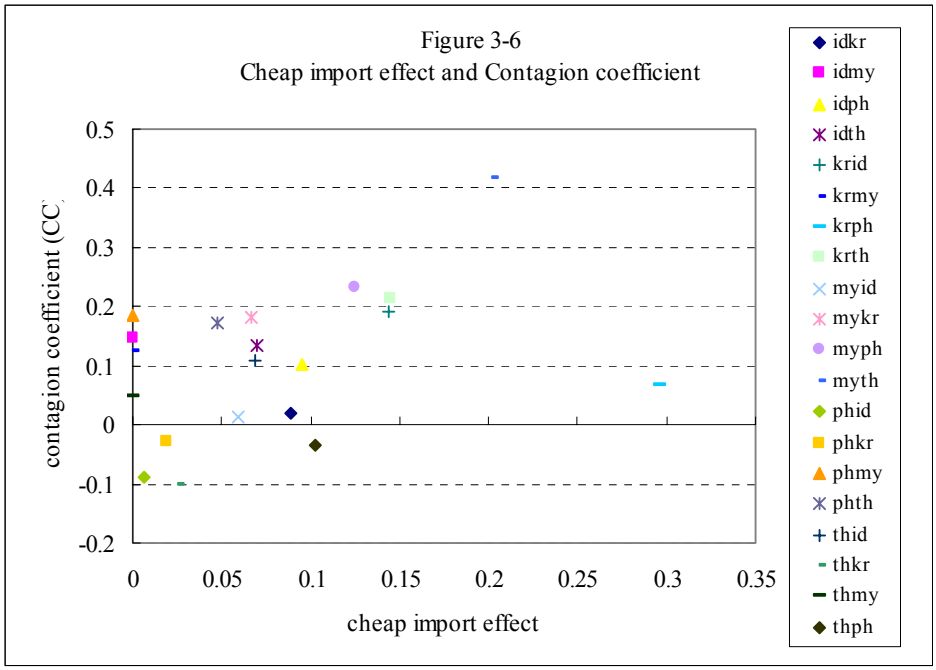
Figure 3-6
Cheap import effect and Contagion coefficient
contagion coefficient (CC
cheap import effect
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
idkr
idmy
idph
idth
krid
krmy
krph
krth
myid
mykr
myph
myth
phid
phkr
phmy
phth
thid
thkr
thmy
thph

Table 1-1
Weekly Origin (Friday to Friday change), July 1997-January 19

Week	Origin	devaluation rate(%)
July-1	TH	-10.11
July-2	PH	-7.95
July-4	TH	-5.75
August-3	ID	-10.13
August-4	TH	-4.52
August-5	ID	-7.51
September-1	TH	-9.40
September-3	PH	-4.81
October-1	ID	-13.84
October-5	TH	-5.99
November-2	TH	-4.94
November-3	KR	-4.85
November-4	KR	-8.13
December-1	ID	-7.76
December-2	ID	-32.93
January-1	KR	-17.63
January-2	ID	-18.32
January-4	ID	-57.18

Notes : Authors' calculation.
Data source: Datastream

Table 1-2
Daily Origin of Exchange Rate, July 1997-March 1999

			Origin	devaluation rate(%)				Origin	devaluation rate(%)				Origin	devaluation rate(%)
1997	7	2	TH	-3.40	1997	12	11	KR	-8.02	1998	3	6	ID	-4.24
1997	7	3	TH	-2.22	1997	12	12	ID	-10.97	1998	3	9	ID	-2.40
1997	7	4	TH	-2.06	1997	12	15	ID	-6.72	1998	4	16	ID	-2.23
1997	7	14	PH	-5.30	1997	12	16	TH	-3.66	1998	4	21	PH	-2.49
1997	7	21	ID	-2.83	1997	12	22	KR	-10.12	1998	5	6	ID	-6.12
1997	7	23	TH	-2.06	1997	12	23	KR	-10.12	1998	5	7	ID	-4.99
1997	8	15	ID	-2.99	1997	12	24	ID	-4.32	1998	5	13	ID	-10.37
1997	8	18	ID	-3.23	1997	12	25	ID	-2.34	1998	5	14	ID	-3.24
1997	8	27	ID	-2.93	1997	12	31	KR	-3.96	1998	5	19	ID	-12.50
1997	8	28	ID	-3.19	1998	1	2	ID	-14.38	1998	5	28	ID	-5.17
1997	9	2	ID	-2.39	1998	1	5	ID	-13.08	1998	6	10	ID	-5.08
1997	9	3	TH	-2.81	1998	1	6	ID	-11.93	1998	6	11	ID	-4.66
1997	9	4	TH	-3.74	1998	1	7	ID	-7.57	1998	6	12	ID	-4.02
1997	9	18	PH	-2.06	1998	1	8	ID	-18.31	1998	6	15	ID	-4.48
1997	9	29	ID	-2.38	1998	1	12	TH	-2.39	1998	6	16	ID	-4.32
1997	9	30	ID	-2.33	1998	1	16	ID	-4.01	1998	6	17	ID	-6.82
1997	10	1	ID	-3.19	1998	1	19	ID	-7.87	1998	6	29	MY	-2.01
1997	10	3	ID	-4.32	1998	1	20	ID	-4.72	1998	8	6	KR	-3.21
1997	10	6	ID	-2.56	1998	1	21	ID	-11.10	1998	8	11	ID	-2.27
1997	10	20	TW	-2.45	1998	1	22	ID	-12.87	1998	9	8	ID	-3.44
1997	11	20	KR	-5.52	1998	1	23	ID	-12.77	1998	9	9	ID	-2.22
1997	11	25	KR	-2.24	1998	1	26	ID	-3.85	1998	10	27	ID	-2.08
1997	11	28	KR	-2.92	1998	2	12	MY	-3.04	1998	11	2	ID	-2.74
1997	12	1	KR	-2.21	1998	2	13	ID	-9.30	1998	11	3	ID	-4.26
1997	12	2	KR	-2.82	1998	2	16	ID	-3.99	1998	11	4	ID	-3.98
1997	12	3	TH	-3.66	1998	2	17	KR	-2.17	1998	12	15	ID	-2.29
1997	12	8	KR	-5.39	1998	2	23	ID	-2.62	1998	1	13	ID	-3.84
1997	12	9	KR	-6.88	1998	3	4	ID	-3.31	1999	1	14	ID	-2.08
1997	12	10	KR	-6.73	1998	3	5	ID	-6.84	1999	3	11	ID	-2.17

Notes : Authors' calculation.
Data source: Datastream

Table 1-3
Daily Origin of Stock Price, January 1994-June 1999

			origin	devaluation rate(%)				origin	devaluation rate(%)				origin	devaluation rate(%)
1994	1	11	ml	-3.38	1997	8	29	id	-4.75	1998	5	6	id	-3.26
1994	1	12	ml	-5.07	1997	9	2	tw	-2.46	1998	5	11	kr	-2.10
1994	1	13	ml	-4.25	1997	9	3	ml	-3.42	1998	5	12	kr	-2.52
1994	1	14	tw	-2.39	1997	9	4	ml	-2.92	1998	5	13	id	-3.24
1994	1	18	th	-2.15	1997	9	12	id	-2.11	1998	5	14	th	-2.18
1994	1	20	th	-2.18	1997	9	18	ml	-2.17	1998	5	18	id	-2.38
1994	1	25	ml	-2.64	1997	9	22	ml	-2.32	1998	5	20	th	-2.59
1994	2	7	th	-3.86	1997	9	23	kr	-2.00	1998	5	25	kr	-3.73
1994	2	14	tw	-2.22	1997	10	3	id	-2.26	1998	5	26	kr	-4.84
1994	2	28	tw	-2.47	1997	10	8	kr	-2.04	1998	5	29	th	-2.01
1994	3	1	ph	-2.75	1997	10	16	kr	-2.56	1998	6	1	tw	-2.66
1994	3	2	ph	-2.42	1997	10	17	tw	-2.11	1998	6	2	th	-3.00
1994	3	4	ph	-2.39	1997	10	20	tw	-4.36	1998	6	11	ph	-2.52
1994	3	9	ph	-2.61	1997	10	24	ml	-2.59	1998	6	12	kr	-4.31
1994	3	22	id	-2.02	1997	10	27	kr	-4.46	1998	6	15	kr	-4.55
1994	10	6	tw	-2.85	1997	10	29	th	-3.54	1998	6	16	kr	-3.78
1994	10	11	tw	-4.27	1997	10	30	kr	-3.17	1998	7	10	ml	-2.97
1994	11	1	tw	-3.17	1997	10	31	kr	-3.11	1998	7	13	ml	-2.38
1994	11	23	th	-3.43	1997	11	7	kr	-2.31	1998	7	22	ml	-2.07
1995	1	12	th	-2.12	1997	11	11	id	-2.29	1998	7	23	kr	-2.39
1995	1	13	ph	-3.19	1997	11	17	kr	-2.23	1998	7	29	ml	-2.84
1995	1	23	th	-2.89	1997	11	18	ml	-3.90	1998	8	4	ph	-2.13
1995	2	27	ph	-2.08	1997	11	19	ml	-3.44	1998	8	5	id	-3.06
1995	4	17	tw	-2.31	1997	11	20	ml	-7.23	1998	8	6	id	-2.42
1995	7	19	tw	-2.53	1997	11	21	id	-2.27	1998	8	10	ml	-2.47
1995	7	20	tw	-2.62	1997	11	24	kr	-4.85	1998	8	11	ml	-3.92
1995	8	9	tw	-2.26	1997	11	25	kr	-3.59	1998	8	12	ph	-3.85
1995	8	11	tw	-2.74	1997	11	26	ml	-2.88	1998	8	13	ml	-2.72
1995	11	20	ph	-2.04	1997	11	28	kr	-3.63	1998	8	17	ml	-2.45
1995	12	14	kr	-2.12	1997	12	1	kr	-3.82	1998	8	18	kr	-2.08
1995	12	18	kr	-2.32	1997	12	2	kr	-3.91	1998	8	21	ml	-2.43
1996	1	5	tw	-3.43	1997	12	9	kr	-3.00	1998	8	24	id	-3.31
1996	1	29	tw	-2.70	1997	12	12	kr	-5.24	1998	8	25	id	-2.02
1996	5	20	tw	-2.39	1997	12	15	id	-6.21	1998	8	27	ml	-2.01
1996	7	29	id	-2.31	1997	12	16	ml	-2.68	1998	8	28	ph	-3.75
1996	10	4	th	-2.05	1997	12	23	kr	-4.23	1998	9	10	ph	-3.17
1996	10	8	th	-4.19	1997	12	24	kr	-4.26	1998	9	11	ph	-2.24
1996	10	28	ph	-2.63	1997	12	25	kr	-2.29	1998	9	15	id	-4.88
1997	1	7	kr	-2.24	1998	1	5	ml	-2.86	1998	9	17	id	-2.28
1997	2	4	th	-3.43	1998	1	6	ml	-3.44	1998	9	18	id	-3.56
1997	2	14	th	-2.15	1998	1	8	ph	-3.96	1998	9	21	id	-4.75
1997	3	4	th	-2.28	1998	1	9	ph	-6.21	1998	9	22	ph	-2.22
1997	3	7	th	-4.56	1998	1	22	ph	-3.08	1998	10	2	tw	-2.64
1997	3	24	tw	-2.41	1998	2	5	th	-2.19	1998	10	27	kr	-2.30
1997	4	8	ph	-2.24	1998	2	11	id	-3.41	1998	11	9	ph	-2.30
1997	4	29	ph	-2.62	1998	2	12	id	-6.18	1998	11	10	ph	-3.26
1997	4	30	ph	-2.49	1998	2	13	id	-2.60	1998	11	11	th	-3.62
1997	5	15	th	-2.54	1998	2	16	kr	-3.77	1998	11	13	th	-2.69
1997	5	16	th	-2.46	1998	2	17	kr	-2.49	1998	11	25	id	-2.96
1997	5	19	ph	-2.08	1998	3	5	kr	-2.66	1998	12	3	th	-2.82
1997	7	9	ph	-2.56	1998	3	6	kr	-2.55	1998	12	4	th	-2.18
1997	7	10	ph	-2.74	1998	3	9	kr	-2.86	1998	12	17	kr	-2.66
1997	8	5	ml	-2.55	1998	3	30	kr	-2.21	1999	1	5	tw	-2.13
1997	8	7	id	-2.16	1998	4	1	kr	-2.00	1999	1	26	th	-2.37
1997	8	15	id	-2.76	1998	4	2	kr	-2.49	1999	2	8	ml	-3.78
1997	8	18	id	-2.74	1998	4	3	kr	-3.50	1999	2	9	kr	-2.45
1997	8	20	id	-2.09	1998	4	16	ml	-2.07	1999	2	10	th	-2.07
1997	8	22	id	-2.18	1998	4	23	kr	-2.43	1999	2	19	kr	-2.02
1997	8	25	id	-3.81	1998	4	29	id	-2.35	1999	5	13	kr	-2.73
1997	8	26	th	-3.99	1998	5	1	id	-2.12	1999	5	17	kr	-2.32
1997	8	27	th	-2.33	1998	5	4	kr	-3.20	1999	5	26	th	-2.59
1997	8	28	ph	-5.40	1998	5	5	id	-2.00					

Notes : Authors' calculation.

Table 2
News and Events (Daily Origin of Exchange Rate) July 1997-June 1999

			Origin	News
1997	7	2	TH	Devaluing baht.
1997	7	3	TH	Thai credit agency downgrades most ratings on devaluation. IMF welcomes Thai baht float.
1997	7	4	TH	Thai central bank sets baht-dollar reference rate at 28.189.
1997	7	14	PH	Philippine bankers group lifts volatility band on peso trading.
1997	7	21	ID	Indonesian Minister of Finance says Indonesia won't change Rupiah's managed float.
1997	7	23	TH	Thai finance minister says no need for financial aid from Japan and IMF.
1997	8	15	ID	Indonesian central bank called an emergency meeting with country's largest banks.
1997	8	18	ID	Bank Indonesia raises SBI interest rate.
1997	8	27	ID	Many indonesian not making new loans because fear of high interest rate.
1997	8	28	ID	Suharto worried high interest rates hurt economy.
1997	9	2	ID	Inflation rate rises to 5.7%, eight-month high.
1997	9	3	TH	Tahi won't seek increase in IMF package.
1997	9	4	TH	Thai finance minister syas Government won't intervene in market.
1997	9	18	PH	The EYCO group of companies, Appliance Maker, to stop debt payments.
1997	9	29	ID	S&P degrades Malaysia, and will degrade Indonesia.
1997	10	1	ID	Tradeand industry minister said Rupiah decline won't boost exports.
1997	10	3	ID	Bank Indonesia to provide Swaps facilities for exporters.
1997	10	6	ID	Suharto calls emergency meeting with top economic ministers.
1997	10	20	TW	Taiwan authority won't support Taiwaniese dollar.
1997	11	20	KR	South Korean finance minister to resign due to a failure in the passage of financial reform bills.
1997	11	25	KR	Korea asks IMF for standby credit, Finance minister says.
1997	11	28	KR	Korean Oct. CA deficit widened to $680.6 mln from $498.4 mln.
1997	12	1	KR	Korea and IMF at odds over bailout.
1997	12	2	KR	Korean stocks fell for a ninth day as the abrupt closure of 9 merchant banks.
1997	12	3	ID	Indonesia may be headed for double-digit inflation this year.
1997	12	9	KR	Korea may shut down 2 commercial banks as part of IMF bailout.
1997	12	16	TH	Thai currency reserves may be halved.
1997	12	22	KR	Korean Crisis deepens as Moody's Cuts rating.
1997	12	23	KR	Korea debt payment's delay mulled by foreign banks.
1997	12	24	ID	Indonesia's foreign debt payment may reach 323 trillion rupiah.
1997	12	31	KR	Korea's Total external debt estimated at $156.9 bln, up $41 bln.
1998	1	2	ID	Indonesian State Banks to Merge.
1998	1	5	ID	Indonesia to increase generic Drug prices 15% in April.
1998	1	6	ID	Indonesia's December inflation seen rising 2% from November.
1998	1	7	ID	Indonesia sees inflation of 9% in fiscal 1998-1999.
1998	1	8	ID	US official Rubin says Indonesia must do more to meet IMF goals.
1998	1	12	TH	Thai Govt to brief Creditors of closed 56 insolvent finance firms .
1998	1	16	ID	Suharto's promises to revise the budget fail to impress.
1998	1	19	ID	Indonesia reserves fall 8.2% to $20.38 bln in month to Jan.15.
1998	1	20	ID	Bank International INdonesia's credit rating may be cut by S&P.
1998	1	21	ID	Indonesia state ratings company cut ratings on 17 companies.
1998	1	23	ID	Indonesia's Budget Plan for 1998 revised.
1998	1	26	ID	Moody's raises specter of indonesia corporate debt moratorium.

Source: Bloomberg

Table 2(continued)
News and Events (Daily Origin) July 1997-June, 1999

			Origin	News
1998	2	12	MY	Foreign reserve in January down.
1998	2	13	ID	Rubin Concerned Over Pegging Rupiah to Dollar.
1998	2	16	ID	Camdessus Says It's Too Soon for Indonesian Currency Peg.
1998	2	17	KR	Korea accepts Labor Law revisions.
1998	3	4	ID	GS prospects the Pegging Rupiah to Dollar.
1998	3	5	ID	IMF Officials Say Indonesia Aid Payment Likely to Be Postponed.
1998	3	6	ID	Indonesia's Finance Minister Warns of Consequences if IMF Aid Withheld.
1998	3	9	ID	IMF Says Indonesia Won't Receive Next Loan Before April.
1998	4	16	ID	Indonesia's Suharto Pledges to Adhere to Reforms.
1998	4	21	PH	Philippines Polls Tainted By Fears of Fraud.
1998	5	6	ID	Indonesian Fuel Prices to Rise Tomorrow.
1998	5	7	ID	Palm Oil Rises to Record High on Weak Ringgit, Likely Shortage.
1998	5	13	ID	Students burn effigies of President Suharto in the capital and surging prices trigger riots.
1998	5	14	ID	Thousands Protest Indonesia University Killings, a second day of violence in Jakarta.
1998	5	19	ID	House of Representatives calls for the resignation of President Suharto.
1998	5	28	ID	President Suharto and IMF did not reach agreement on conditions for IMF support.
1998	6	10	ID	IMF official arrive in Jakarta for review of economic targets under the IMF loan disbursement plan.
1998	6	11	ID	Indonesian Banks Cut Deposit Rates Yesterday.
1998	6	12	ID	Indonesian Army Parliamentary Seats to Be Cut.
1998	6	16	ID	IMF Sees Indonesian Deficit of More Than 4% of GDP.
1998	6	17	ID	Indonesian Banks' Bad Loans Surged to 25% at End April.
1998	6	29	MY	Malaysia Plans New Ways to Plug Ringgit Outflow.
1998	8	6	KR	Korea's Big Five Cheabols need debt payment amount to 28billion of USD.
1998	8	11	ID	Indonesia Refutes Report That it Failed to Make Debt Paymen.
1998	9	8	ID	Students descended on House of Representatives calling for resignation of President B.J. Habibie.
1998	9	9	ID	Indonesian Military Breaks Up Student Protest With Tear Gas.
1998	10	27	ID	Indonesia Mulling Return to Currency Band System.
1998	11	2	ID	Indonesia August Trade Surplus Narrows to $1.85 Billion.
1998	11	3	ID	Indonesian Companies Unlikely to Get Large Debt Write-offs.
1998	11	4	ID	Indonesian Panel Says Security Agents Linked to Riots in May.
1998	12	15	ID	Indonesia Sees Tourism Revenues about half of targeting.
1999	1	13	ID	Indonesia Unveils Law to Narrow Central Bank's Role.
1999	3	11	ID	Indonesia Mulls Merger Of five of the largest private banks.

Source: Bloomberg

Table 3-1 CC(t,i) of Exchange Rate

1997:1-1999:7

Origin	Affected					
(nob)	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
ID (July-Dec 1997) (16)		0.056	0.290***	0.193**	0.012	0.303***
t-stat		1.138	4.685	2.858	1.155	6.349
ID (Oct-Dec 1997) (8)		0.094	0.256*	0.249*	0.036*	0.332***
t-stat		1.025	2.079	1.868	1.873	3.508
ID (Jan-June 1998) (32)		0.061**	0.121**	0.090***	0.023**	0.069***
t-stat		2.119	2.576	3.244	2.083	2.938
ID (after July 1998) (12)		0.063*	0.004	-0.079	-0.023	0.038
t-stat		2.158	0.178	-1.527	-1.330	0.945
KR(14)	0.193		0.124**	0.066**	0.016	0.215***
t-stat	1.067		2.643	2.283	0.795	3.593
ML(2)	0.012	0.181		0.233	0.041**	0.418
t-stat	0.024	1.032		1.552	5.490	2.388
PH(3)	-0.089	-0.027	0.186		-0.006	0.173
t-stat	-0.598	-0.535	1.083		-0.480	1.609
TH(7)	0.183	-0.322	0.064	0.085	0.057	
t-stat	1.241	-1.080	0.396	0.461	1.329	
TW(1)	0.286	0.218	0.770	0.047		0.552
t-stat	-	-	-	-		-

Note: Values tabulated are Contagion coefficients and t-statistics, calculated under the null hypothesis of cc equals zero; there exists no significant high frequency contagion from the origin to affected country.

***, ** and * indicate significant at 1%, 5% and 10%, respectively.

Table 3-2 CC(t,i) of Stock Price

Full sample(1994:1-1999:7)

Origin	Affected					
(nob)	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
ID(30)		0.170**	0.276***	0.078	0.066	0.187***
t-stat		2.526	3.790	0.687	1.473	2.813
KR(47)	0.011		0.215***	0.114**	0.031	0.286***
t-stat	0.192		3.731	2.378	0.781	6.181
ML(29)	0.227***	0.049		0.276***	0.139***	0.153**
t-stat	2.929	0.472		3.752	2.943	2.118
PH(27)	0.266**	0.171	0.188*		0.076	-0.067
t-stat	2.543	1.503	2.009		1.310	-0.490
TW(22)	0.074	0.086	0.112	0.124*		0.153*
t-stat	1.001	0.874	1.273	1.901		1.885
TH(33)	0.132**	0.027	0.062	0.205***	0.044	
t-stat	2.204	0.340	0.645	2.850	0.736	

Note: Values tabulated are Contagion coefficients and t-statistics, calculated under the null hypothesis of cc equals zero; there exists no significant high frequency contagion from the origin to affected country.

***, ** and * indicate significant at 1%, 5% and 10%, respectively.

Table 3-3 CC(t,i) of Stock Price
Before Crises (1994:1-1997:6)

Origin (nob)	Affected					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
ID(2)		0.409***	0.302	0.556**	-0.100	0.182
stat		40.146	1.678	6.543	-0.995	0.685
KR(3)	-0.068		-0.104	-0.086*	-0.283	0.127
stat	-0.343		-0.790	-2.549	-2.196	1.275
ML(4)	0.265**	-0.123		0.359*	0.318	0.254
stat	3.680	-0.532		2.628	1.974	1.280
PH(12)	0.251***	0.095	0.188**		0.122	0.261**
stat	4.123	0.440	2.321		1.178	2.813
TW(16)	0.013	0.140	-0.025	0.074		0.136
stat	0.289	1.288	-0.267	1.291		1.439
TH(17)	0.155**	0.028	0.226**	0.122	0.040	
stat	2.267	0.341	2.535	1.137	0.532	

Note: Values tabulated are Contagion coefficients and t-statistics, calculated under the null hypothesis of cc equals zero; there exists no significant high frequency contagion from the origin to affected country.

***, ** and * indicate significant at 1%, 5% and 10%, respectively.

Table 3-4 CC(t,i) of Stock Price
After Crises (1997:7-1999:7)

Origin (nob)	Affected					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
ID(28)		0.153**	0.274***	0.044	0.077	0.187**
stat		2.152	3.534	0.367	1.660	2.676
KR(44)	0.017		0.237***	0.128**	0.053	0.297***
stat	0.271		3.963	2.525	1.313	6.094
ML(25)	0.222**	0.076		0.263***	0.111**	0.136*
stat	2.469	0.642		3.165	2.326	1.738
PH(15)	0.278***	0.232**	0.187**		0.039	-0.329*
stat	5.127	2.352	2.301		0.434	-1.948
TW(6)	0.238	-0.058	0.478	0.256		0.199
stat	1.605	-0.409	1.263	1.901		1.263
TH(16)	0.109	0.026	-0.113	0.293***	0.049	
stat	1.060	0.185	-0.689	3.144	0.502	

Note: Values tabulated are Contagion coefficients and t-statistics, calculated under the null hypothesis of cc equals zero; there exists no significant high frequency contagion from the origin to affected country.

***, ** and * indicate significant at 1%, 5% and 10%, respectively.

Table 4 Results of Dynamic OLS: Exchange Rate

Panel A: all(pooled) origin

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
coefficient	-0.274	0.120	0.155	0.198	0.079	0.144
replaced s.e	0.010	0.016	0.011	0.010	0.589	0.009
replaced t	-26.669	7.452	13.963	18.840	0.133	16.138

Panel B: Indonesia origin

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
coefficient		-0.113	0.028	0.044	0.020	0.017
replaced s.e.		0.063	0.016	0.015	0.002	0.010
replaced t		-1.790	1.745	2.994	9.923	1.635

Panel C: Korea origin

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
coefficient	0.675		0.250	0.236	-0.027	-1.443
replaced s.e	0.326		0.046	0.363	0.499	0.227
replaced t	2.075		5.471	0.650	-0.055	-6.365

Table 5-1 Results of Dynamic OLS: Stock Price

Panel A: all(pooled) origin, full sample

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
coefficient	0.493	-0.053	0.650	0.425	0.076	0.253
replaced s.e	0.009	0.011	0.008	0.007	0.003	0.010
replaced t	57.505	-4.881	80.386	63.582	22.379	24.698

Panel B: all(pooled) origin, pre-crisis period

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
coefficient	0.065	-0.209	-0.164	0.535	0.314	-0.119
replaced s.e	0.011	0.012	0.012	0.023	0.017	0.025
replaced t	6.039	-18.192	-13.920	23.532	18.246	-4.850

Panel C: all(pooled) origin, post-crisis period

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
coefficient	0.525	-0.058	0.685	0.387	0.025	0.271
replaced s.e	0.019	0.025	0.016	0.010	0.004	0.015
replaced t	27.510	-2.277	42.209	40.076	5.604	17.767

Table 5-2 Results of Dynamic OLS: Stock Price

Panel A: Indonesia origin, full sample

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
coefficient		-0.041	1.713	0.680	-0.339	-0.502
replaced s.e.		0.041	0.117	0.539	0.184	0.652
replaced t		-1.006	14.617	1.261	-1.848	-0.770

Panel B: Indonesia origin, pre-crisis period

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
coefficient						
replaced s.e.						
replaced t						

Panel C: Indonesia origin, post-crisis period

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
coefficient		0.043	1.782	0.758	-0.386	-0.624
replaced s.e.		0.041	0.117	0.539	0.183	0.650
replaced t		1.041	15.229	1.407	-2.106	-0.959

Note: Estimation for pre-crisis period is excluded due to the lack of d.f.

Table 5-3 Results of Dynamic OLS: Stock Price

Panel A: Korea origin, full sample

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
coefficient	-0.244		-0.831	-4.317	-0.229	1.656
replaced s.e	0.681		0.121	0.611	0.117	0.776
replaced t	-0.359		-6.849	-7.067	-1.946	2.135

Panel B: Korea origin, pre-crisis period

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
coefficient						
replaced s.e.						
replaced t						

Panel C: Korea origin, post-crisis period

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
coefficient	-0.244		-0.831	-4.317	-0.229	1.656
replaced s.e	0.681		0.121	0.611	0.117	0.776
replaced t	-0.359		-6.849	-7.067	-1.946	2.135

Note: Estimation for pre-crisis period is excluded due to the lack of d.f.

Table 5-4 Results of Dynamic OLS: Stock Price

Panel A: Malaysia origin, full sample

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
coefficient	-1.629	-0.422		-0.291	-0.726	1.046
replaced s.e	0.986	0.193		0.817	0.136	0.600
replaced t	-1.652	-2.180		-0.356	-5.354	1.743

Panel B: Malaysia origin, pre-crisis period

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
coefficient						
replaced s.e.						
replaced t						

Panel C: Malaysia origin, post-crisis period

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
coefficient	-0.951	-0.365		-1.779	-1.248	1.264
replaced s.e	0.966	0.227		0.634	0.155	0.734
replaced t	-0.985	-1.606		-2.804	-8.075	1.722

Note: Estimation for pre-crisis period is excluded due to the lack of d.f.

Table 5-5 Results of Dynamic OLS: Stock Price

Panel A: Philippines origin, full sample

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
coefficient	0.474	0.660	1.734		0.545	0.136
replaced s.e	1.115	0.079	0.225		0.141	0.845
replaced t	0.425	8.344	7.712		3.853	0.161

Panel B: Philippines origin, pre-crisis period

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
coefficient	5.298	2.373	4.152		0.060	-3.358
replaced s.e	2.818	0.033	1.920		0.325	11.466
replaced t	1.880	72.174	2.163		0.184	-0.293

Panel C: Philippines origin, post-crisis period

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
coefficient	0.847	0.561	2.292		0.695	0.165
replaced s.e	0.230	0.258	0.294		0.498	0.950
replaced t	3.680	2.174	7.808		1.397	0.173

Table 5-6 Results of Dynamic OLS: Stock Price

Panel A: Taiwan origin, full sample

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
coefficient	7.701	-0.073	0.958	-0.570		2.802
replaced s.e	1.585	0.024	0.088	0.435		1.269
replaced t	4.859	-2.982	10.829	-1.309		2.207

Panel B: Taiwan origin, pre-crisis period

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
coefficient	12.597	1.273	2.630	-4.544		8.136
replaced s.e	0.344	0.042	0.093	0.598		2.882
replaced t	36.589	30.346	28.214	-7.601		2.823

Panel C: Taiwan origin, post-crisis period

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
coefficient						
replaced s.e.						
replaced t						

Note: Estimation for post-crisis period is excluded due to the lack of d.f.

Table 5-7 Results of Dynamic OLS: Stock Price

Panel A: Thailand origin, full sample

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
coefficient	-0.638	0.839	1.873	0.940	1.313	
replaced s.e	0.726	0.041	0.099	0.589	0.145	
replaced t	-0.878	20.354	18.881	1.595	9.073	

Panel B: Thailand origin, post-crisis period

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
coefficient	-3.063	1.294	2.508	-0.954	0.991	
replaced s.e	1.764	0.083	0.471	0.367	0.058	
replaced t	-1.736	15.528	5.323	-2.598	17.207	

Panel C: Thailand origin, post-crisis period

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
coefficient	0.054	0.567	-0.044	-2.513	-1.246	
replaced s.e	2.794	0.126	0.150	0.878	0.425	
replaced t	0.019	4.489	-0.294	-2.863	-2.929	

Table 6
Export share as a percent of total exports in millions of US dollars.
1996-1999 average

Country	Destination of Exports				
	Indonesia	Korea	Malaysia	Philippines	Thailand
Indonesia		6.442	2.707	1.437	1.805
Korea	3.457		2.950	1.927	1.501
Malaysia	1.487	2.868		1.443	3.541
Philippines	0.525	2.031	3.466		2.930
Thailand	1.958	1.641	3.775	1.365	

Notes : Authors' calculation.
Data source: IMF, Direction of Trade (2000).

Table 7
Direct Trade Linkage Index
1996-1999 average

Country	Countries export to and import from				
	Indonesia	Korea	Malaysia	Philippines	Thailand
Indonesia		1.090	1.070	1.668	0.906
Korea	0.910		1.278	1.647	0.714
Malaysia	0.930	0.722		1.095	1.132
Philippines	0.332	0.353	0.905		1.007
Thailand	1.094	0.634	0.868	0.993	

Notes : Authors' calculation.

Data source: IMF, Direction of Trade (2000).

Table 8
Imcome Effect (GDP share, %)
1996-1999 average

Origin	Affected countries				
	Indonesia	Korea	Malaysia	Philippines	Thailand
Indonesia		0.06342	0.00014	0.01970	0.08137
Korea	0.20849		0.00026	0.07765	0.06625
Malaysia	0.09224	0.09426		0.13227	0.15453
Philippines	0.04789	0.06429	0.00013		0.05745
Thailand	0.06157	0.04659	0.00032	0.10137	

Notes : Authors' calculation.

Data source: IMF, Direction of Trade (2000).

Table 9
Cheap Import effect
1996-1999 average

Origin	Countries import from				
	Indonesia	Korea	Malaysia	Philippines	Thailand
Indonesia		0.08861	0.00018	0.09567	0.06970
Korea	0.1434		0.00043	0.29620	0.14523
Malaysia	0.0597	0.06680		0.12437	0.20178
Philippines	0.0066	0.01926	0.00014		0.04733
Thailand	0.0683	0.02510	0.00030	0.10302	

Notes : Authors' calculation.

Data source: IMF, Direction of Trade (2000).

Table 10
Correlation Coefficients between Trade Link Index and Contagion coefficient

Trade Index	
Export Share	0.329
DTLI	0.258
Income Effect	0.357
Cheap Import Effect	0.384