High-Frequency Contagion of Currency Crises in Asia*

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Abstract

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

In this paper, we distinguishes "origin" (of exchange rate depreciation, or decline in stock prices) and "affected" (currencies, or stock prices) in a sense that the origin is defined as a currency (stock price) whose rate of depreciation over past five days is largest and also exceeds two percent. We find evidence of high-frequency causality: currency crisis appear to pass contagiously from "origin" to "affected".

Then we use various trade link indices to fine that the causality of high-frequency contagion is tied to the international trade channel. There is a positive relationship between trade link indices and the contagion coefficient. This implies that the bilateral trade linkage is an important means of transmitting speculative pressures across international borders.

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1. Introduction

The collapse of Thai Baht's peg on July 2, 1997 has had devastating effects on East Asian countries, even to panic of currency and financial crises in the region. In January 1998, when the crisis was in its most serious period, the cumulative depreciation rate since early July 1997 was about 50 percent for most of the currencies in the region. Among them, Indonesia Rupiah devalued by almost one sixth.

The main interpretations have emerged in the aftermath of the crises. That is, a sudden and a huge capital outflow was one of the key sources of the initial currency crisis. Then it caused a devaluation of currency, soar in interest rate, and clash of stock price to launch a financial crisis. (Corsetti, Pesenti and Roubini (1998a, b), Flood and Marion (1998), Radelet and Sachs (1998), Yoshitomi and Ohno (1999), Ito (1997), Ito (1999), to name a few.) Unlike the typical currency crisis that resulted mainly from the current account and fiscal imbalances as the case of Mexico in 1994-94, the Asian crisis was rooted mainly in financial sector fragilities. This type of currency crisis is followed by Russian crisis and then Brazil crisis in 1998.

In case of the Mexican Peso crash of 1994, several emerging markets fell as investors "ran for cover" because vulnerable countries like Argentina and Brazil were expected to be next in a series of currency crises. IMF support program in March 1995 turned out to be useful to prevent 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 attributed to Russia's default.[1] The contagion effect to Argentina was also avoided in case of financial crisis of Brazil in 1998-1999.

What was striking in case of Asia was (1) crises to be contemporaneous in time, and

[1] 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.

(2) unprecedented rapid spread across the region. Within 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.

In this paper we examine high-frequency contagious effects among Asian six countries (Indonesia, Korea, Malaysia, Philippines, Taiwan and Thailand) for the period of Asian Currency Crises.[2] We use daily data in analysis to capture the day-to-day movements in the financial market and the shift of "first victim" currency (stock price).

We attempt to answer the following questions: Given a large depreciation in the first attacked currency, to which extent the neighboring countries suffer and how fast? Which country is most likely to affect its depreciation to other countries during turbulent times?

Our paper is the first in studying contagious effect that distinguishes "origin" (of exchange rate depreciation, or decline in stock prices) and "affected" (currencies, or stock prices) in a sense that "origin" is the first victim on one day. More specifically, we classify daily depreciation of each country into two groups: a currency that showed the largest depreciation among six currencies as origin and others as affected. In our benchmark regression, we set the origin as explanatory variable. The estimated coefficient in this regression can be interpreted as spillover from a country with the largest depreciation to others. We find evidence of high-frequency causality: currency crisis appear to pass contagiously from "origin" to "affected". In order to see whether our classification of origin and affect reflects empirics, we check country-specific news form Bloomberg of the date we refer to the country as origin.

The structure of the paper is as follows. In section 2, we survey previous studies on

[2] 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.

currency crises and contagion. Section 3 summaries exchange rate and stock price of the region during the crisis period. In section 4 we define “origin” and “affected”. 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 since 1990s: for example, Collins (1992) and Oker 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 hypothesis and interpretations of the causes and the spread 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 series behave abnormally during periods prior to a crisis. In these cases, it may be necessary to impose strict macroeconomic conditionality on these countries.

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., an 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 traders in other markets as an eventual occurrence of a crisis in the near future. 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 capitaloutflows should be rescued with financial aid from the international community without any conditionality.

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.

In addition to the crises literature, there is a lot of literature on contagion in currency crises. There is a number of channels through which instability in financial markets might be transmitted across countries.

One channel for contagion is the trade links. The interpretation emphasizing trade links suggests that currency crises will spread contagiously among countries that trade disproportionately with one another. A currency devaluation gives a country a temporary boost in its competitiveness, in the presence of nominal rigidities. Then its trade competitors are at a competitive disadvantage. Deterioration in terms of trade will also worsen competitors' economic performance in the mid- and long- run. Those most-adversely-affected countries are likely to be attacked next. Glick and Rose (1998) find the crisis spread and trade links.

Trade links may not be the only channel of crises transmission, of course. Macroeconomic or financial similarities are not exclusive. A crisis may spread from the initial target to another if the two countries share various economic features. Sachs, Tornell and Velasco (1995) work on contagion in this light.[3]

[3] Literature based on Macroeconomic fundamentals, see Collins (1992), Flood and Marion

Another approach, "Common Creditor hypothesis" approach is based on the changes in sentiment of investors and lending agencies.[4] 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 default. Kaminsky and Reinhart (2000) provide related analysis.

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

We can think of a currency crisis as being contagious if it spreads from the initial target, whatever reason.[5] Masson (1999a) argues based on multiple equilibria model that crisis contagion can be referred as equilibrium switch under some economic fundamentals conditions.[6]

The alternative view is that the contagion 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.

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

In this paper, we measure the contagion as the ratio of devaluation of currency (decline in stock price) of one country to that of the initially targeted country. Our definition of contagion is in line with two viewpoints above in that it is measured on the

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(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.

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

[5] 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).

[6] 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.

occurrence of crisis.

Our objective in this paper advances these viewpoints to analyze intra-day spillover effect from the first attacked country, namely the high frequency contagion. We do not take a stance on whether the initial attack is by bad fundamentals (first generation model) or is the result of a self-fulfilling attack (second generation model). Instead, we estimate the size of contagious effect from "ground zero", given the incidence of the initial attack. We then find that the high-frequency phenomenon is supportive from trade linkage within Asia.

One of the most significant weaknesses of earlier literatures on contagion is the absence of distinguishing "outset" from "affect" in causality relationship. In 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. In this respect, using monthly or quarterly data, even weekly data, on which many previous analyses based, may restrict to test the existence of correlations among countries during crisis period.

Our measure of contagion is also notable in that we can find systemically important countries, that is, whose contagion effects are significant and sizable. In this paper we focus on the high-frequency contagion in geographic proximity and find evidence that the contagious channel is supported by the bilateral trade. The results are consistent with those of Glick and Rose (1999) and Eichengreen, Wyploz and Rose (1996).

3. Exchange Rate and Stock Price during the crisis period

In the analysis of this paper we use both nominal exchange rate (against US dollar) and stock price daily data of Indonesia, Korea, Malaysia, Philippines, Taiwan and

Thailand.[7] The sample period begins from January 3 1997 for exchange rate and January 3 1994 for stock price and extends up to July 7 1999. Both the exchange rate and stock prices data are obtained from Datastream.

Our analysis is notable in the following respects: (1) data frequency, and (2) definition of origin. First, we use daily data in our analysis. The problem of using low frequency data (semi-annual, quarterly, and monthly) is that it smoothes out a lot of shorter duration interactions between the markets. Low frequency data makes it difficult to capture every small but important event for the sample period. For instance, a large depreciation in Thai baht had a substantial impact on Philippines peso and Indonesia rupiah and then feed back to Thai baht. These feedback movements are, however, diminished by the use of monthly or quarterly data. On the other hand, we should note that it is not always appropriate to analyze with only daily data. It is often observed a large depreciation followed by a large recovery to correct the overshooting. Detailed data construction for regression will be shown in the following section.

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

Figure 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 baht) in July 1997, there were a series of smaller, but still substantial depreciation over a prolonged period, culminating in 16-17 percent depreciations at the end of August. The pressures were eased in September in response to measures to prevent further depreciation and a

[7] 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).

deterioration of economic activity. The exchange rate finally bottomed out in early 1998.

In contrast, Indonesia's exchange rate depreciated fairly steadily starting in July 1997. Pressure on the Indonesia rupiah intensified in late September in view of increasing strains in the financial and political sector. With the rupiah falling further against the U.S. dollar, by early October, IMF-supported programs for Indonesia were announced on October 31, 1997.[8] Then, Indonesia rupiah recovered temporarily in response to the program. The limited recovery in the next few months 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 through July-October 1997. However, as Korean banks began to face difficulties related to their short-term foreign liabilities, the exchange rate fell precipitously during late November 1997-January 1998.

Figure 2, stock prices

Figure 2 plots stock price indices of 6 countries from January 3 1994 to July 7 1999, with January 3, 1994=100. Stock market paints a different picture from exchange rate market. Stock price of Thailand was at its peak in early 1990s. On the other hand, stock prices of Indonesia, Korea, Malaysia, 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 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 still exceeds the 1994 price level. In October 1997, stock prices of Korea and Malaysia dropped

[8] 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.

significantly.[9] The declines in stock prices continued until September 1998, then headed for recovery except Thailand and Malaysia.

4. Definitions of "origin" and "affected"

In this paper, we try to statistically analyze the size of contagion. Our basic regression is :

Affected=const + a*Origin + e,

where Affected is a measure of change in exchange rate (stock price) of country i, and Origin is that of first attacked country. We estimate this equation using Dynamic OLS across countries.

We first construct an indicator that distinguishes "origin" from others that are referred to as "affected". To sketch our idea briefly, we first show the weekly (Friday to Friday) origin. It is calculated based on the weekly change in exchange rate. Weekly origin is a currency that depreciated most in a week and, on top of that, whose depreciation rate exceeds 4%. This cut off value is arbitral.

Table1-1 plots weekly origin of exchange rate depreciation. Sample period is 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 depreciation starting on Friday does not pick this currency as

[9] 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.

origin; while, Monday-to-Monday origin does.

Now we proceed further to determine daily origin of exchange rate (stock price). The daily origin is derived based on weighted change of exchange rate (stock price) for previous 5 working days. The advantage of this daily origin is that it is not sensitive to the choice of the day of the week.

First, daily percentage change of the exchange rate 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 weighted average cumulative change, DRR(t,j), as follows:

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

The DRR is derived based on the declining weight of DRs.[10]

The rationale for our measurement of origin based on DRR, not on DR is as follow; It is often observed a large recovery of exchange rate (stock price) following a day with large depreciation. 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 of

[10] The weights are arbitral and 0.25 for lag 1, 0.125 for lag 2, 0.0625 for lag 3 and 4. 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.

depreciation.

Our declining weight scheme is intended to avoid effect of large changes of days ago. We do not think of a crisis as "severe" even if the rate of depreciation (decline in stock price) is large but one-time-only. Assume even weights in calculation. A very large depreciation 5 days ago might affect determination of the current origin. But it turns out that the currency does not appear as origin the following day when the large one-time depreciation days ago is excluded from the calculation. There is a possibility that a large change in exchange rate (stock price) days ago might lead a currently non-volatile currency as "origin" if we use even weight in calculation. Imposing declining weight avoids this misspecification.

Our origin measure is defined analogous to our DRR as;

DOR(t,0) = "origin" = the largest DRR at each t and whose depreciation rate also exceeds 2%.[11]

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

Table 1-2, Daily origin(exchange rate), Table 1-3 （Stock price）.

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

[11] The threshold of 2% is arbitral.

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 decline. The stock in the region was at its peak in early 1990s and then head off downward in most of countries. The rate of stock price decline often exceeded 2 percent in early 1994. Since late 1996, 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. The abruptly slipping exchange rates, together with tremors in the financial and economic activities, culminated in a financial (stock) market crisis that led to the decline in the stock prices in the region. In Korea, the decline of stock price was temporarily interrupted in the first half of the year but continued in the second half in the wake of 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.

In wake of crisis, market sentiment is likely to be more volatile. Investors respond to news and events that cover market fragilities and deteriorating economies of attacked and expected-target countries. The news works as a signal to investors. In this respect, the eruption of a signal provides investors sufficient and supportive information that an attack would be successful; then they will concentrate their attacks on currencies (stock price) that are expected to depreciate to very low.

Table 2 lists news release from Bloomberg. Every news release corresponds to the timing and date of origin in Table 1-1 and Table 1-2, respectively.

Table2, exchange rate, daily origin-News

The table shows the news release of origin countries. 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 was rather related to the vulnerability of financial and economic systems, bankruptcies and political instability. A case can be seen that concerns on banking systems in Korea intensified the devaluation pressure at this stage. It is also argued that exchange rate movement was highly sensitive to political instability in Indonesia.

5. Matrices of Cumulative Contagion

In order to make our ideas of high-frequency contagion more concrete, we provide a new indicator of contagion: contagion coefficient. This is the ratio of depreciation rate of origin to that of affected country. This contagion coefficient measures high-frequently spreading of financial crisis (depreciation, or decline in stock prices) from origin (first attacked country) across other affected countries.

The contagion coefficient is calculated 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 July 1 1997 and ends July 7 1999.[12]

[12] 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 on Malaysia when we run regressions in the following section.

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

Table3-1 plot of CC (exchange rate), 3-2～3-5 (stock price)

Table 3-1 shows CC(t,i) for exchange rate. As shown in Table 1-2, frequency of origin drastically decreases since June 1998. Exchange rates had been back on recovery track by the summer 1998. Most of crisis (large depreciation) after July 1998 were from Indonesia. Therefore, we divide sub-sample period into two in the case of Indonesia.[13] Specifically, for origin of Indonesia, we calculate CC(t,i) for two sub-sample periods, crisis period (1997/7/1-1998/6/17) and recovery period (1998/6/18-1999/7/7), in addition to whole sample period (1997/7/1-1999/7/7).

In the case of exchange rate, there are 87 instances that are regarded as origin in terms of our definition. Out of them, 61 instances are of Indonesia, 14 instances of Korea and 6 instances of Thailand.

Stat (statistics) in Table 3-1-Table 3-4 tests the null of zero.[14] The null measures insignificant difference of the rate of depreciation (decline) between origin and affect countries: that is, there exists no significant high-frequency contagion from origin to affected.

[13] After June 1998, most of currencies in East Asia went back on the recovery track, while Indonesia rupiah was trending down. So, the sign of CCs on Indonesia at this period is likely to be negative.

[14] 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).

The significance of estimated coefficients varies according to sample periods and countries. The coefficients of contagion originating from Thailand and from Philippines are, in many cases, negative. Shortly after the onset of currency crisis when Thai baht and Philippines peso, two first-hard-hit currencies, devalued, other currencies were not severely hit and remained their value to US dollar. The contagion coefficients of them are, however, not significantly different from zero.

The sign of coefficients of affected countries, a case for either Indonesia or Korea is origin, are positive and significantly different from zero: depreciation of Indonesia and of Korea induces high-frequency contagion effect. 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.

The contagion coefficients originating from Indonesia are positive and significant in all but Korea over the sample period up to June 17, 1998. After June 17, 1998, the results reverse: the contagion coefficient is significantly positive only in Korea and insignificantly different from zero or significantly negative in other countries.

In sum, depreciation of Indonesia and of Korea has significant high-frequency contagion effect on other currencies but not vice versa.

Table 3-2 - Table 3-4 presents CC(t,i) of stock prices. Table3-2 shows CC for whole sample period; Table3-3 and Table3-4 report pre-crisis and post crisis period, respectively.

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

On the other hand, for Philippines and for Thailand, the instances do not make a big change. For Philippines, there are 12 instances for pre-crisis period and 15 instances

for post- crisis period. For Thailand, 17 for pre-crisis and 16 for post-crisis. For Taiwan, in contrast to other countries, the instances surprisingly decreased from 16 for pre-crisis period to 6 for post-crisis period. The instances as origin as a whole dramatically increase for post-crisis.

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

In sum, we may conclude that high frequency contagion of stock prices has been intensified through currency crises period.

6. Regression

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

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

The regressions are estimated using Dynamic OLS (DOLS) method in the following specification:

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

where $i \neq 0$. Here, affect(t,i) is DRR, origin(t,0) is DOR defined in section 4 above, and dorigin(t,0) = DOR(t,0)-DOR(t-1,0). DOLS 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 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 is arbitral; we set 1 in the analysis below. Standard error for point estimate of *a1* is recalculated based on the DOLS residuals and then adjusted to the sample period of recalculated augmented cointegrating regression.[15]

For purposes of comparison, 2 types of estimation are done: (1) the regressor, origin(t,j), includes every "origin". That is, we do not distinguish the first attacked "country". We call this regressor "pooled origin". And, (2) country specific origin(t,j). That is, we run regression on origin according to country. We call this "country-specific origin".

The expected sign of point estimate of a1 is positive if there exists high-frequency contagion. Estimation results are summarized in Table 4-1 and Table 5-1～ Table 5-8.

Table4-1 exchange rate, DOLS

Table 4-1 shows the estimates for exchange rate. Sample period covers from July 1 1997 to July 7 1999. The dependent variables are "affected" countries and independent is "origin". The first row of the table shows the regression results on pooled origin. The second and the third rows of the table show the estimation results with country-specific origin of Indonesia and Korea, respectively.[16]

Estimation results show that estimated coefficients in Korea, Malaysia, Philippines and Thailand on 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 behavior of Indonesian rupiah is slightly different from others.

[15] See Hayashi (2000) for details.
[16] 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.

For example, most of the currencies in East Asia are back on recovery track around April 1998, while Indonesia rupiah has been trending down.

Estimated coefficients in Korea, Malaysia and Philippines are significantly different from zero and range from 0.12 to 0.19. In contrast, estimated coefficient is not significant in Taiwan; that is, the high-frequency contagion is not significantly seen in Taiwan. This finding is consistent with the fact that Taiwan is one of the least hit and the least contagious suffered countries in 1997.

Now we see estimation results on country-specific origin. A case for Indonesia as origin, contagion coefficients in Philippines and Taiwan are significant. Contagion coefficients in Malaysian and Thailand are small but significantly different from zero. In contrast, contagion coefficient in Korea is significantly negative. Indoneisa rupiah severely depreciated following the Korea won in early 1998. The movement of Korean won might be 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 origin. The estimated coefficient in Indonesia is 0.68 and significantly different from zero. The estimated coefficient in Philippines is 0.24 but is not insignificant. The estimated coefficient in Thailand, however, is significantly negative.

We find two important messages from Table 4-1. First, there exists high-frequency contagion among East Asian countries. Our contagion coefficients of affected countries are positive and statistically significant in most countries. Second, estimation results on country-specific origin show that contagion effects from Indonesia and from Korea are significant in some countries.[17]

[17] 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.

Table5-1～Table5-7　Stock Price　DOLS

Table 5-1-Table 5-7 presents the estimate 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, regressions for pre-crisis period for either Indonesia, Korea or Malaysia to be origin are excluded. The regression estimates on origin in the case of Taiwan is not shown for post-crisis period.

Estimates results of contagion coefficients on pooled origin are shown in Table 5-1. Contagion effects are significant 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.

The magnitude of estimated coefficient in Taiwan, on the other hand, declined sharply after the crisis. Taiwan was less influenced from high-frequency contagion.

Table 5-2 to 5-7 presents estimates results on country-specific origin.

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

Table5-3 is the case of Korea as origin. All estimated coefficients, except Thailand, are significantly negative. The magnitude of estimated coefficients for post-crisis period becomes larger (in negative) in Indonesia and Malaysia. These are consistent with the fact that Korean stock price index declined sharply in late 1997 while stock prices in other countries remained stable.

Table5-4 reports results on Malaysia origin. Estimated coefficient is significantly positive only in Thailand. Most of the estimates are significantly negative.

The results of Philippines 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. Sign of coefficient turns to be positive (but insignificant) in Thailand

for post-crisis period.

Table5-6 presents the results of Taiwan origin. The coefficients are significantly estimated.

The estimates results of Thailand origin are shown in Table 5-7. The sign of coefficient turns to be positive (insignificant) in Indonesia after the crisis. In contrast, they turn to be negative in Taiwan (significant) and in Malaysia (insignificant).

In sum, the regressions on pooled origin and on country-specific origin do not report significant difference. The sign and significance of estimated coefficients vary from country to country depending on origin by individual countries. The estimates results on pooled origin, however, clearly show the existence of high-frequency contagion in the stock market, especially after the crisis. This finding strongly reflects the change of exchange rate regime in Asian countries, among various factors in the markets.[18]

7. Contagion and Trade Link Channel

In this section we provide empirical support for high-frequency contagion channel. Why crises spread and why they tend to be regional are explained at least three ways: macroeconomic similarities, financial market integration and trade linkage. In financial market, investors pull their capital out of countries in the same region of the first-hit country soon after the country is targeted as a speculative attack. Their choice of countries relies on macroeconomic and financial fundamentals to some extent. From the perspective of most empirical speculative and crisis models, however, it is hard to understand why crises tend to spread be regional, 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.

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

One of the reasons why investors withdraw capital not only from the first targeted country but also from neighboring countries lies in the regional trade linkage. Devaluation of the first-hit country results in price advantage in the short run. Then, countries lose competitiveness when their trading partners devalue. They are therefore more likely to be attacked in prospect of their worsened trade balance associated with its trade competitors' devaluation that might create expectation of deterioration of the economy in the future. In practice, it takes some time until current trade balance deterioration will be reflected in GDP and other economic data. In theory, however, investors predict the future devaluation at the onset of speculative attack based on the trade linkage mechanism. Investors are likely to sell currencies of trading partners in anticipation of a fall and induce devaluation pressure in the market at the time. This is the trade link channel that devaluation of the first-hit currency contemporaneously spills over to regional countries.

For many Asian countries, a large portion of their goods is directed to the United States, Japan, EU, and Intra Asia.[19] 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 are 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 check evidence of the contagion and trade link channel using three measures.

[19] Export share within Asia varies between countries, but it ranges from 25% to 45%.

7. 1 Compete Effect

There are at least three different types of explanations for why contagion spreads in geographic proximity, especially by international trade. The first relies on competitive effect analyzed by Gerlach and Smets (1995), Corsetti, Pesenti, Roubini and Tille (2000). Devaluation of hard hit country raises the relative export price of its trading partners and competitors. Then, market participants may expect declining trade balance due to weakened price competitiveness and are likely to withdraw capital out of these countries. We provide two indices, export share and Direct Trade Linkage Index (DTLI), for analysis.

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.[20] 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*.

Next, we define Direct Trade Linkage Index（DTLI） as [21]

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

Here, x_{mn} denotes bilateral exports from country *m* to *n*. Subscript *o* and *i* indicate home country and its direction of trade, respectively. 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.

[20] IMF、Direction of Trade, CD-Rom (2000).
[21] See Glick and Rose (1999).

For example, when the bilateral trade balance between countries *o* and *i* are positive, then devaluation of country *o* accelerates the export of country *o* and, in contrast, depresses the export of country *i* to country *o.* Thus, contagion coefficient (CC) is expected to be positively related to $DTLI_{0i}$ for $DTLI_{0i} > 1$. On the other hand, for $DTLI_{0i} < 1$, CC may be small and/or negative.

Table 7

Table 7 summarizes $DTLI_{0i}$.

Figure 3、 Figure 4

Figure 3 plots the contagion coefficients (CC) and the export share, and figure 4 plots the CCs 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 and figure 4, respectively.

In each figure, there exists positive relationship between CCs and export share, and between CCs and DTLI. The correlation coefficient of each figure is 0.329 and 0.258, respectively.

7. 2 Income Effect

The second measures to relate trade links to spread of crisis is income effect. (See for example, Forbes(2000).) Imports of crisis country declines 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 hard hit country. Countries with large export share to first hit country suffer negative income

effect of the crisis country and, therefore, they are also likely to be attacked.

Table8 Figure 5

Table8 reports the income effect index. The index is represented by the export (from "affected" to "origin") to GDP ratio. Figure 5 plots the index on the horizontal axis and 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 Cheap Import Effect (bilateral trade effect, supply effect)

The third measure of trade channel is the Cheap Import Effect (also called either bilateral trade effect or supply effect). Devaluation of hard hit currency drives export price down, which is equivalent to the decline in import price in its trading partners. With nominal income and other conditions held constant, a decline in import price raises disposable income and, therefore, improves welfare of the countries. It is also expected that the terms of trade in affected countries improve because the import price from origin country decreases while the export price of these countries held constant.

In this case, in contrast to other two explanations above, devaluation of hard hit country may affect positive effect to 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 this channel if the import price effect in affected countries dominates.

Table9 Figure 6

Table 9 presents the Cheap Import Effect. The index is calculated as the import from 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 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 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 cheap import effect does not work asto improve welfare of affected countries. Rather, the negative effect of devaluation in origin country, especially the effect from weakened price competition, has been dominant across international trade.

correration coefficient	
export share	0.329
DTLI	0.258
income	0.357
cheap import	0.384

All of the tests above are consistent. Various measures support our high-frequency contagion and trade link channel.

8. Concluding remarks

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

We find evidence of high-frequency contagion among Asian countries in both exchange rate and stock prices markets. We also find the significant contagious effects originating from Indonesia and Korea.

Surprisingly, our high-frequency contagion is tied to the international trade channel.

There is a positive relationship between trade link indices and our contagion index. This implies that the bilateral trade linkage is an important means of transmitting speculative pressures across international borders.

References

Agenor, Pierre-Richard and Joshua Aizenman, 1998, Contagion and Volatility with Imperfect Credit Markets, IMF Staff Papers Vol. 45, No.2, 207-235.

Baig, Taimur and Ilan Goldfajn, 1999, Financila Market Contagion in the Asian Crisis, IMF Staff Papers Vol. 46, No.2, 167-195.

Berg, Andrew and Catherine Pattillo, 1999, Are Currency Crises Predictable? A test, IMF Staff Papers Vol.46, No.2, 107-138.

Collins, Susan, 1992, The Expected timing of EMS realignments: 1979-83, NBER Working Paper No. 4068.

Corsetti, Giancarlo, Paolo Pesenti, and Nouriel Roubini, 1998a, What Caused the Asian Currency and Financial Crisis? Part I: A Macroeconomic Overview, NBER Working Paper No. 6833.

Corsetti, Giancarlo, Paolo Pesenti, and Nouriel Roubini, 1998b, What Caused the Asian Currency and Financial Crisis? Part II: The Policy Debate, NBER Working Paper No. 6834.

Corsetti Giancarlo, Paolo Pesenti, Nouriel Roubini and Gerdric Tille, 2000, Competitive Devaluations: Toward a Welfare-Based Approach, Journal ofInternational Economics 51, 217-241.

Eichengreen, Barry, Andrew Rose and Charles Wyplosz, 1994, Speculative Attacks on pegged exchange rates: an empirical exploration with special reference to the European monetary system, NBER Working Paper No. 4898.

Eichengreen, Barry, Andrew Rose and Charles Wyplosz, 1996, Contagious Currency Crises: First Tests, Scandinavian Journal of Economics 98(4), 463-484.

Flood, Robert and Nancy Marion, 1994, The size and timing of devaluations in capital-controlled developing economies, NBER Working Paper No. 4957.

Flood, Robert and Nancy Marion, 1998, Perspectives on the Recent Currency Crisis literature, NBER Working Paper No. 6738.

Flood, Robert and Nancy Marion, 2000, Self-Fulfilling risk predictions: an application to speculative attacks, Journal of International Economics 50, 245-268.

Forbes, Kristin, 2000, The Asian Flu and Russian Virus: Firm-Level Evidence on How Crises are Transmitted Internationally, NBER Working Paper No. 7807.

Gerlach, Stefan and Frank Smets, 1995, “Contagious Speculative Attacks”, European Journal of Political Economy 11, 45-63.

Glick, Reuven and Andrew Rose, 1999, “Contagion and trade Why are currency crises regional?”, Journal of International Money and Finance 18, 603-617.

Ito, Takatoshi, 1997, Capital flow and Emergin market, Lessons from Mxico crisis (Sihon ido to sinkou sijou- Mexico crisis no kyoukun), Keizai kenkyu 48(4), 289-305, in Japanese.

Ito, Takatoshi, 1999, Capital Flows in Asia, NBER Working Paper, No. 7134.

Kaminsky, Graciela, Saul Lizondo and Carmen M. Reinhart, 1998, Leading Indicators of Currency Crises, IMF Staff Papers Vol.45, No.1, 1-48.

Kaminsky, Graciela, and Carmen M. Reinhart, 2000, On crises, contagion, and confusion**,** Journal of International Economics Vol. 51, No. 1, 145-168.

Malliaropulos, Dimitrios, 1998, International stock return differentials and real exchange rate changes, Journal of International Money and Finance 17, 493-511.

Masson, Paul, 1999 a, Contagion: macroeconomic models with multiple equilibria, Journal of International Money and Finance 18, 587-602.

Masson, Paul, 1999 b, Contagion: monsoonal effects, spillovers and jumps between multiple equilibria, in Agenor, P.R., M. Miller, D.Vines and A. Weber (eds.), *The Asian Financial Crisis: Causes, Contagion and Consequences*, Cambridge University Press.

Obstfeld, Maurice, 1996, Models of Currency crises with self-fulfilling features, European Economic Review 40, 1037-1047.

Otker, Inci and Ceyla Pazarbasioglu, 1997, Speculative attacks and macroeconomic fundamentals: evidence from some European Currencies, European Economic Review 4, 847-860.

Radelet, Steven, and Jeffrey Sachs, 1998, The Onset of the East Asian Financial Crisis, NBER Working Paper No. 6680.

Sachs, Jefrrey, Aaron Tornell and Andres Velasco, 1996, Financial Crises in Emerging Markets: The Lessons from 1995, NBER Working Paper, No. 5576.

Yoshitomi, Masaru and Kenichi Ohno, 1999, Capital-Account Crisis and Credit Contraction: The New Nature of Crisis Requires New Policy Responses, ADBI Working Paper No.2.

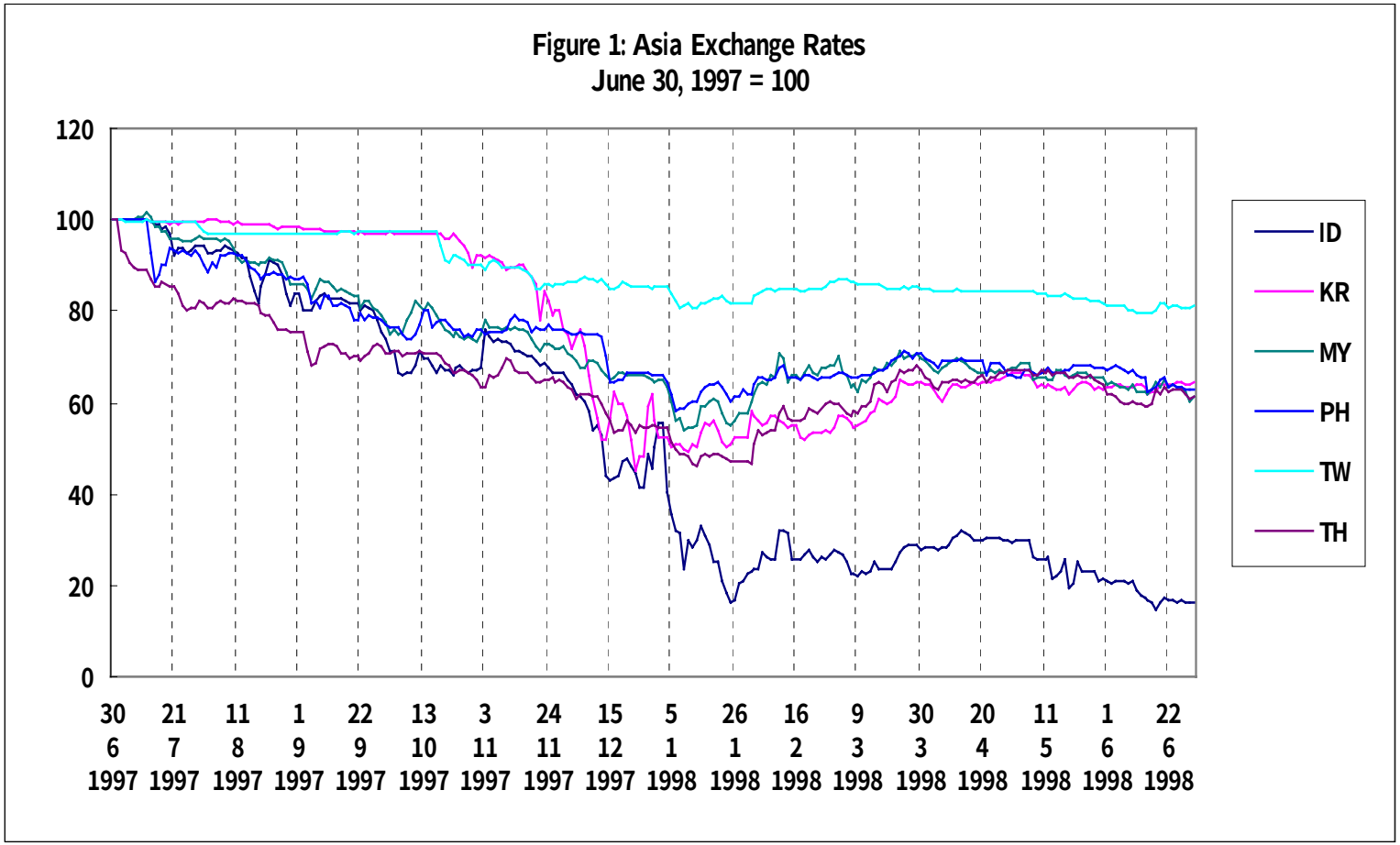


Figure 1: Asia Exchange Rates
June 30, 1997 = 100
120
100
80
60
40
20
0
30 6 1997
21 7 1997
11 8 1997
1 9 1997
22 9 1997
13 10 1997
3 11 1997
24 11 1997
15 12 1997
5 1 1998
26 1 1998
16 2 1998
9 3 1998
30 3 1998
20 4 1998
11 5 1998
1 6 1998
22 6 1998
ID
KR
MY
PH
TW
TH

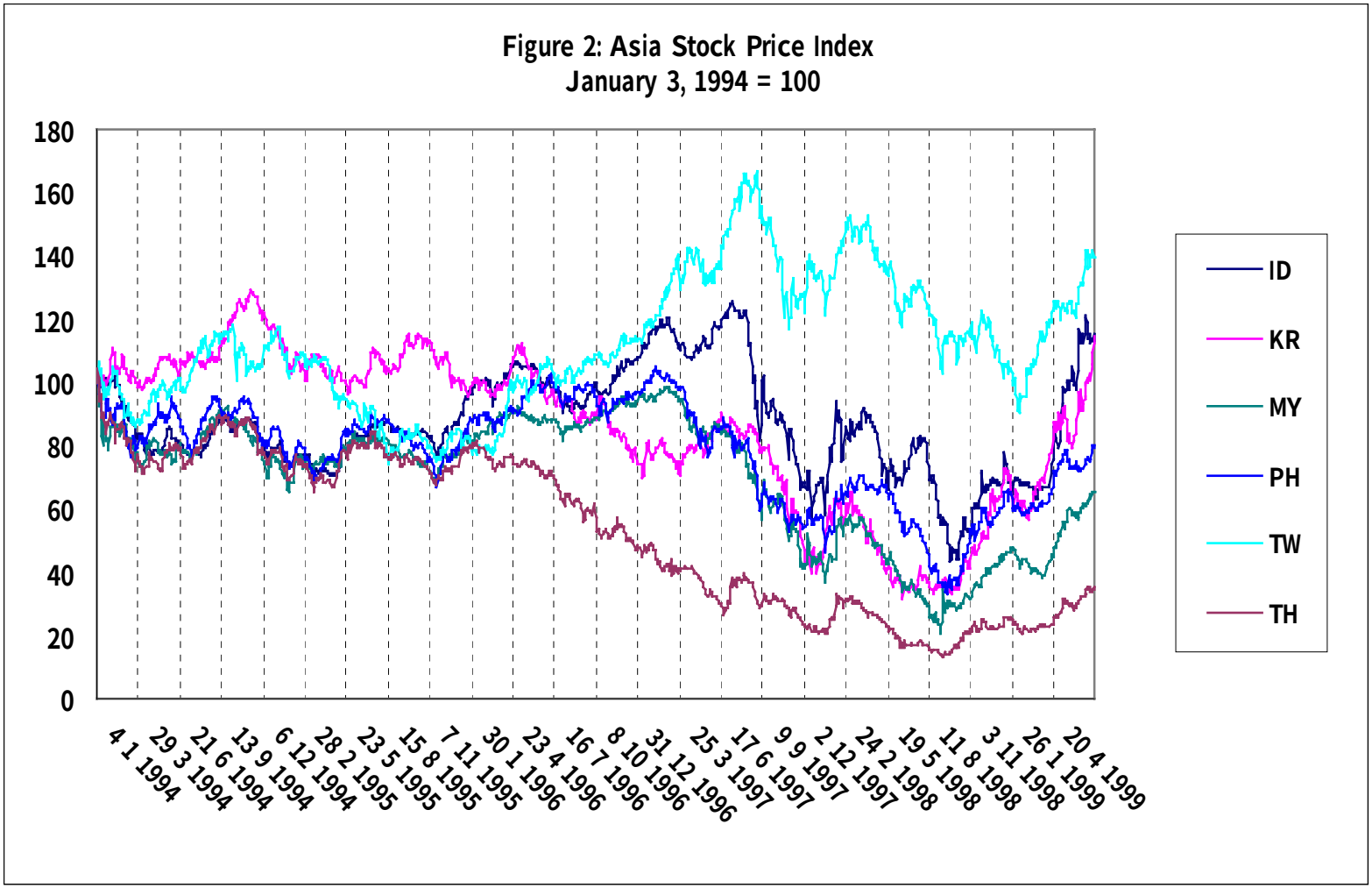
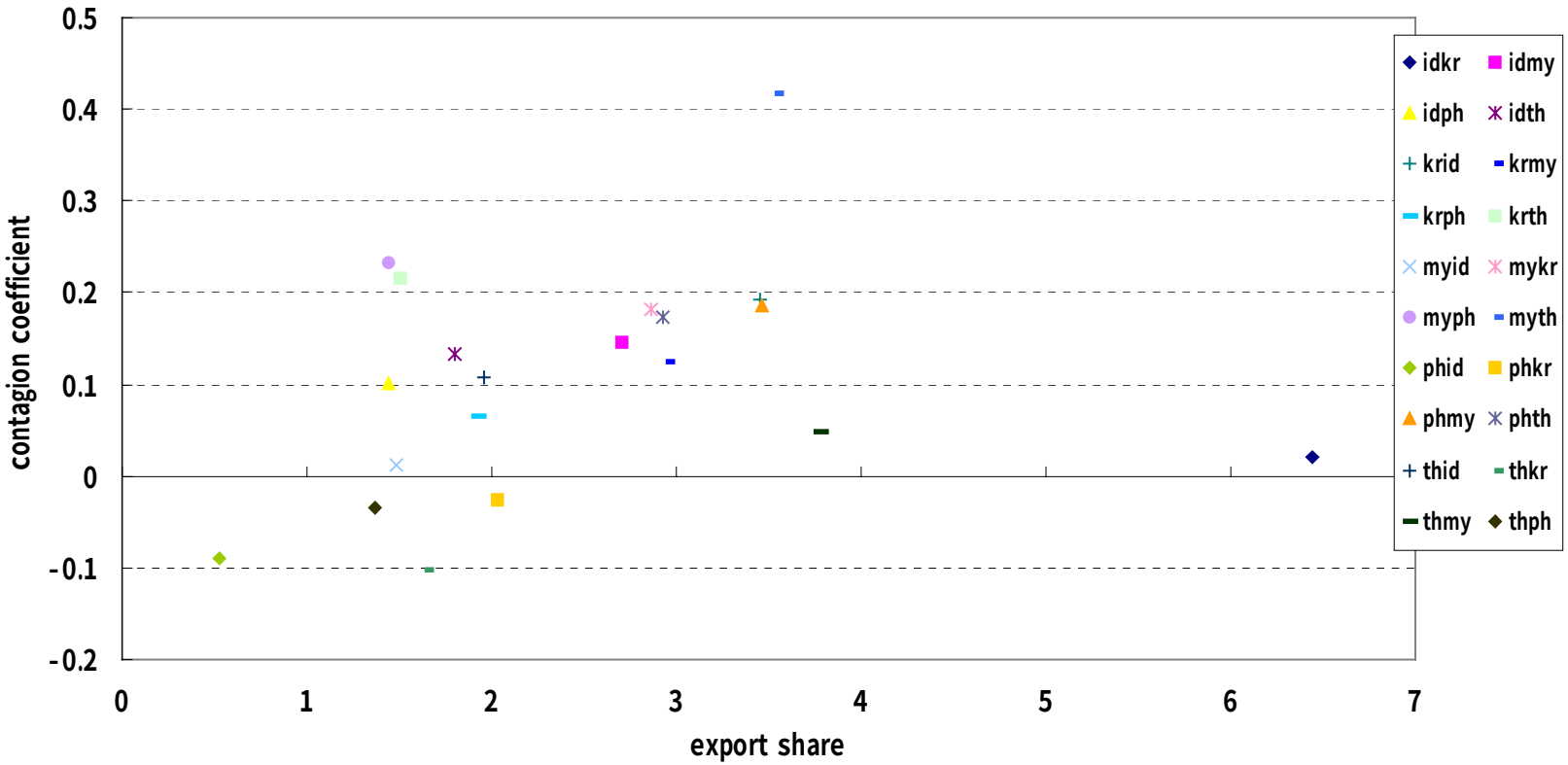


Figure 2: Asia Stock Price Index
January 3, 1994 = 100
180
160
140
120
100
80
60
40
20
0
4 1 1994
29 3 1994
21 6 1994
13 9 1994
6 12 1994
28 2 1995
23 5 1995
15 8 1995
7 11 1995
30 1 1996
23 4 1996
16 7 1996
8 10 1996
31 12 1996
25 3 1997
17 6 1997
9 9 1997
2 12 1997
24 2 1998
19 5 1998
11 8 1998
3 11 1998
26 1 1999
20 4 1999
ID
KR
MY
PH
TW
TH

Figure 3
Export share and Contagion coefficient



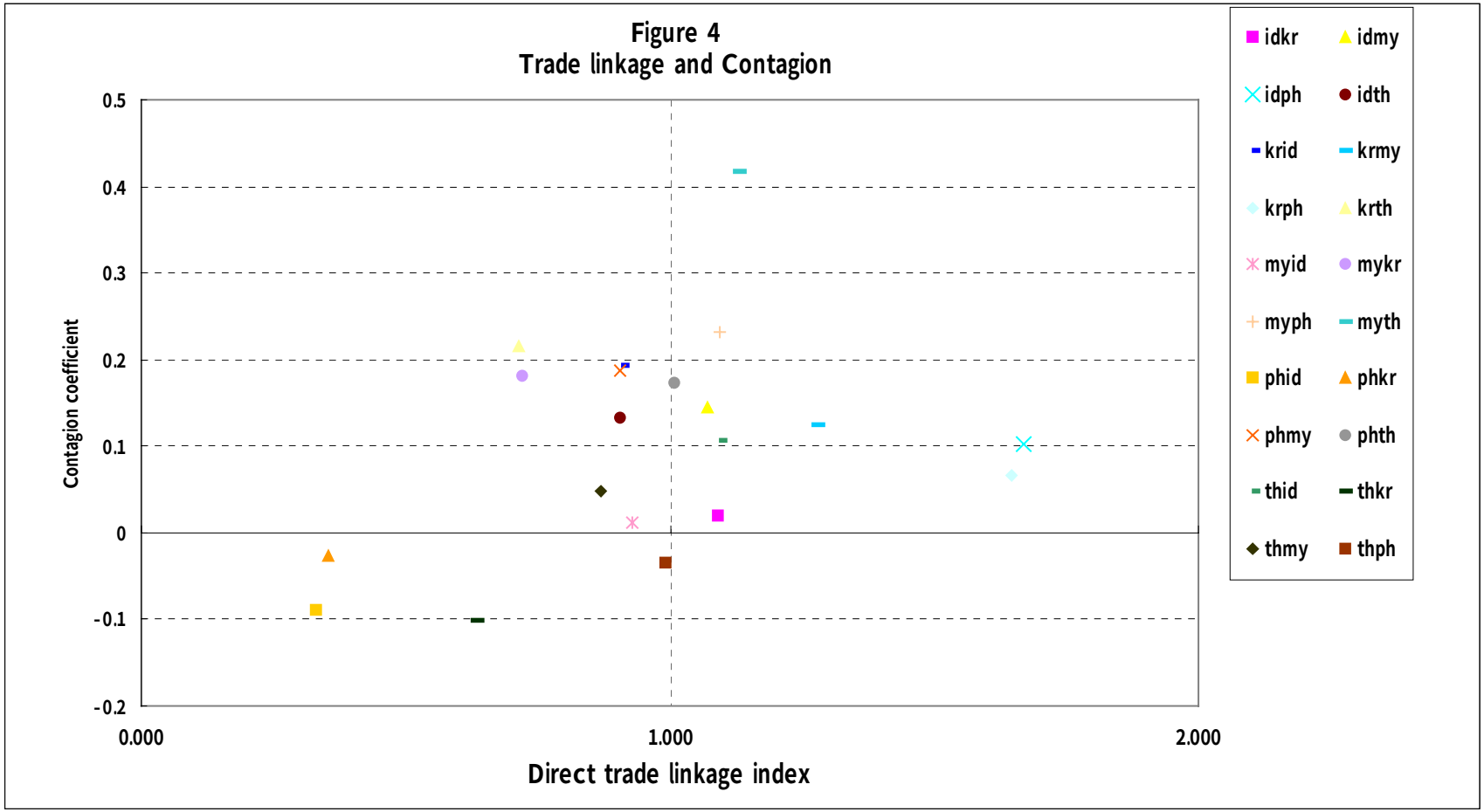


Figure 4
Trade linkage and Contagion
Contagion coefficient
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
0.000
1.000
2.000
Direct trade linkage index
idkr
idmy
idph
idth
krid
krmy
krph
krth
myid
mykr
myph
myth
phid
phkr
phmy
phth
thid
thkr
thmy
thph

Figure 5
Income effect and Contagion coefficient

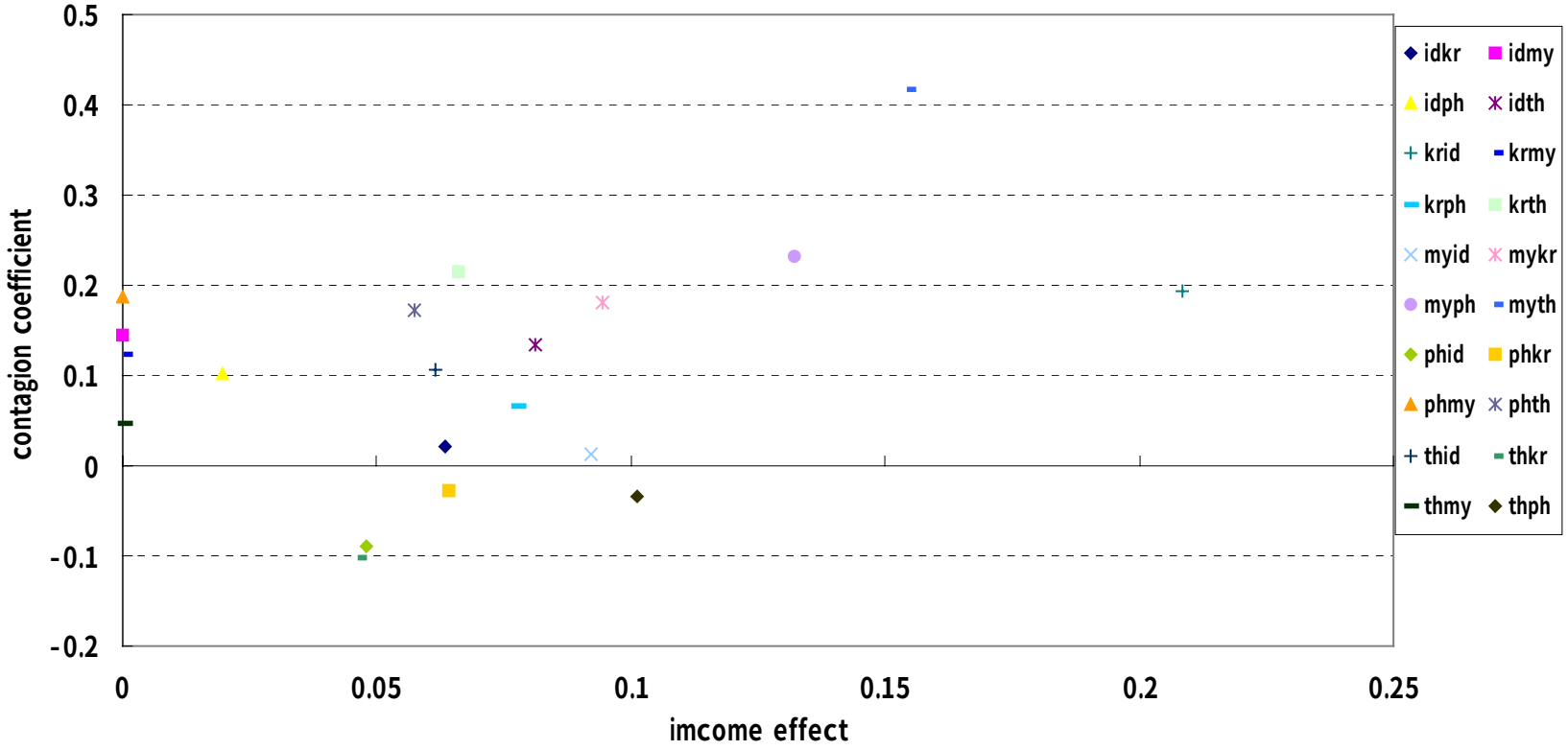


Figure 6
Cheap import effect and Contagion coefficient

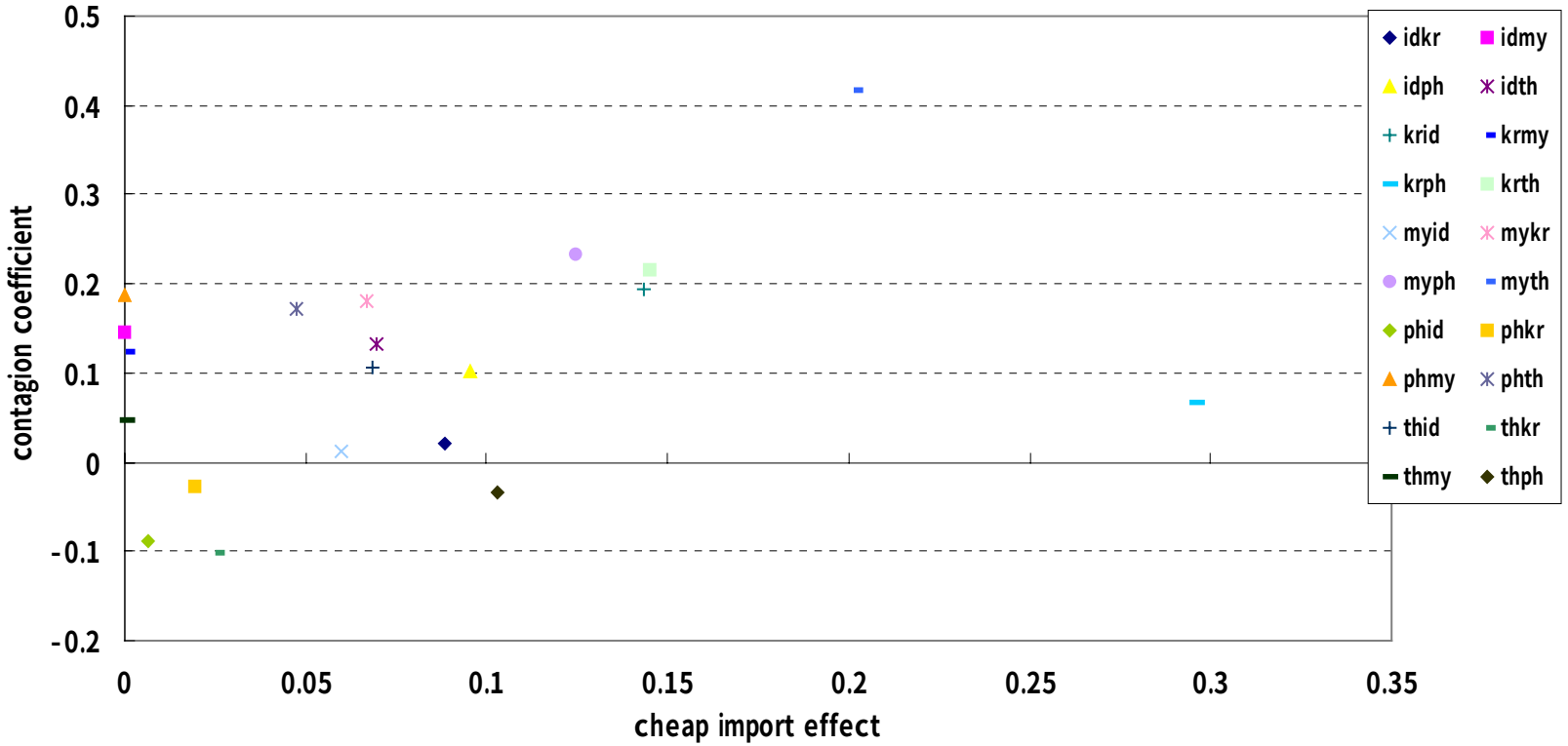


Table 1-1
Weekly Origin (weekly change,
Friday close to Friday close)
July 1997-January 1998

Week 1997-98	Origin	devaluation rate(%)
Jul-1	TH	-10.11
Jul-2	PH	-7.95
Jul-3		
Jul-4	TH	-5.75
Aug-1		
Aug-2		
Aug-3	ID	-10.13
Aug-4	TH	-4.52
Aug-5	ID	-7.51
Sep-1	TH	-9.40
Sep-2		
Sep-3	PH	-4.81
Sep-4		
Oct-1	ID	-13.84
Oct-2		
Oct-3		
Oct-4		
Oct-5	TH	-5.99
Nov-1		6.44
Nov-2	TH	-4.94
Nov-3	KR	-4.85
Nov-4	KR	-8.13
Dec-1	ID	-7.76
Dec-2	ID	-32.93
Dec-3		
Dec-4		
Jan-1	KR	-17.63
Jan-2	ID	-18.32
Jan-3		
Jan-4	ID	-57.18
Jan-5		

Notes: Authors' calculation.
Data source: Datastream

Table 1-2

Daily Origin (cumulative weighted daily change)

July 1997-January 1998

			Origin	devaluation rate(%)
1997	7	2	TH	-3.40364
1997	7	3	TH	-2.21693
1997	7	4	TH	-2.05508
1997	7	14	PH	-5.2999
1997	7	21	ID	-2.82547
1997	7	23	TH	-2.06453
1997	8	15	ID	-2.9887
1997	8	18	ID	-3.23057
1997	8	27	ID	-2.92794
1997	8	28	ID	-3.19417
1997	9	2	ID	-2.39097
1997	9	3	TH	-2.80691
1997	9	4	TH	-3.74387
1997	9	18	PH	-2.06418
1997	9	29	ID	-2.38314
1997	9	30	ID	-2.32572
1997	10	1	ID	-3.19195
1997	10	3	ID	-4.31997
1997	10	6	ID	-2.56053
1997	10	20	TW	-2.45012
1997	11	20	KR	-5.51712
1997	11	25	KR	-2.24082
1997	11	28	KR	-2.92259
1997	12	1	KR	-2.2079
1997	12	2	KR	-2.8175
1997	12	3	TH	-3.65745
1997	12	8	KR	-5.38599
1997	12	9	KR	-6.87652
1997	12	10	KR	-6.73185
1997	12	11	KR	-8.01844
1997	12	12	ID	-10.97388
1997	12	15	ID	-6.71699
1997	12	16	TH	-3.65745
1997	12	22	KR	-10.11797
1997	12	23	KR	-10.11797
1997	12	24	ID	-4.32178
1997	12	25	ID	-2.33994
1997	12	31	KR	-3.96039

Notes: Authors' calculation.

Data source: Datastream

Table 1-2(continued)
Daily Origin (cumulative weighted daily change)
February 1998-June 1998

			Origin	devaluation rate(%)
1998	1	2	ID	-14.37747
1998	1	5	ID	-13.08051
1998	1	6	ID	-11.93489
1998	1	7	ID	-7.57216
1998	1	8	ID	-18.30871
1998	1	12	TH	-2.38745
1998	1	16	ID	-4.00955
1998	1	19	ID	-7.87132
1998	1	20	ID	-4.71656
1998	1	21	ID	-11.09844
1998	1	22	ID	-12.86577
1998	1	23	ID	-12.77398
1998	1	26	ID	-3.84552
1998	2	12	MY	-3.03541
1998	2	13	ID	-9.30181
1998	2	16	ID	-3.99048
1998	2	17	KR	-2.16761
1998	2	23	ID	-2.61681
1998	3	4	ID	-3.307
1998	3	5	ID	-6.84013
1998	3	6	ID	-4.23576
1998	3	9	ID	-2.39798
1998	4	16	ID	-2.2276
1998	4	21	PH	-2.49426
1998	5	6	ID	-6.11776
1998	5	7	ID	-4.98501
1998	5	13	ID	-10.36807
1998	5	14	ID	-3.2399
1998	5	19	ID	-12.50292
1998	5	28	ID	-5.1719
1998	6	10	ID	-5.0761
1998	6	11	ID	-4.6555
1998	6	12	ID	-4.01549
1998	6	15	ID	-4.48073
1998	6	16	ID	-4.31504
1998	6	17	ID	-6.81719
1998	6	29	MY	-2.01444
1998	8	6	KR	-3.20523
1998	8	11	ID	-2.26848
1998	9	8	ID	-3.43974
1998	9	9	ID	-2.22311
1998	10	27	ID	-2.07862
1998	11	2	ID	-2.74073
1998	11	3	ID	-4.25925
1998	11	4	ID	-3.97825
1998	12	15	ID	-2.29293
1998	1	13	ID	-3.83816
1999	1	14	ID	-2.07814
1999	3	11	ID	-2.17183

Notes: Authors' calculation.
Data source: Datastream

Table 1-3

Stock Price Daily Origin (cumulative weighted daily change)

			origin	devaluation rate(%)
1994	1	11	ml	-3.3822
1994	1	12	ml	-5.06761
1994	1	13	ml	-4.24952
1994	1	14	tw	-2.39103
1994	1	18	th	-2.15163
1994	1	20	th	-2.17558
1994	1	25	ml	-2.63904
1994	2	7	th	-3.86392
1994	2	14	tw	-2.21533
1994	2	28	tw	-2.47017
1994	3	1	ph	-2.75025
1994	3	2	ph	-2.42355
1994	3	4	ph	-2.39153
1994	3	9	ph	-2.60937
1994	3	22	id	-2.02489
1994	10	6	tw	-2.85036
1994	10	11	tw	-4.2723
1994	11	1	tw	-3.17495
1994	11	23	th	-3.43327
1995	1	12	th	-2.11554
1995	1	13	ph	-3.18647
1995	1	23	th	-2.88642
1995	2	27	ph	-2.07777
1995	4	17	tw	-2.31135
1995	7	19	tw	-2.52705
1995	7	20	tw	-2.62011
1995	8	9	tw	-2.25965
1995	8	11	tw	-2.73884
1995	11	20	ph	-2.03895
1995	12	14	kr	-2.11663
1995	12	18	kr	-2.32253
1996	1	5	tw	-3.43013
1996	1	29	tw	-2.69999
1996	5	20	tw	-2.39078
1996	7	29	id	-2.30501
1996	10	4	th	-2.0531
1996	10	8	th	-4.18852
1996	10	28	ph	-2.63339
1997	1	7	kr	-2.24188
1997	2	4	th	-3.42741
1997	2	14	th	-2.147
1997	3	4	th	-2.27917
1997	3	7	th	-4.5627
1997	3	24	tw	-2.40579
1997	4	8	ph	-2.24415
1997	4	29	ph	-2.62167
1997	4	30	ph	-2.48924
1997	5	15	th	-2.54045
1997	5	16	th	-2.46437
1997	5	19	ph	-2.08318
1997	6	9	th	-2.02262
1997	6	19	th	-2.31282
1997	6	20	th	-3.08485

Notes: Authors' calculation.

Data source: Datastream

Table 1-3(continued)
Stock Price Daily Origin (cumulative weighted daily change)

			origin	devaluation rate(%)
1997	7	9	ph	-2.56226
1997	7	10	ph	-2.74411
1997	8	5	ml	-2.55106
1997	8	7	id	-2.16303
1997	8	15	id	-2.75588
1997	8	18	id	-2.73805
1997	8	20	id	-2.08823
1997	8	22	id	-2.18169
1997	8	25	id	-3.81031
1997	8	26	th	-3.98655
1997	8	27	th	-2.33111
1997	8	28	ph	-5.40243
1997	8	29	id	-4.74583
1997	9	2	tw	-2.45735
1997	9	3	ml	-3.41847
1997	9	4	ml	-2.91546
1997	9	12	id	-2.11419
1997	9	18	ml	-2.16508
1997	9	22	ml	-2.32124
1997	9	23	kr	-2.00402
1997	10	3	id	-2.25863
1997	10	8	kr	-2.03669
1997	10	16	kr	-2.55564
1997	10	17	tw	-2.10783
1997	10	20	tw	-4.35698
1997	10	24	ml	-2.59266
1997	10	27	kr	-4.46329
1997	10	29	th	-3.5352
1997	10	30	kr	-3.16926
1997	10	31	kr	-3.10744
1997	11	7	kr	-2.30762
1997	11	11	id	-2.29143
1997	11	17	kr	-2.23406
1997	11	18	ml	-3.89982
1997	11	19	ml	-3.44032
1997	11	20	ml	-7.22939
1997	11	21	id	-2.26589
1997	11	24	kr	-4.85422
1997	11	25	kr	-3.58846
1997	11	26	ml	-2.88236
1997	11	28	kr	-3.62857
1997	12	1	kr	-3.82461
1997	12	2	kr	-3.91368
1997	12	9	kr	-2.99559
1997	12	12	kr	-5.24203
1997	12	15	id	-6.21472
1997	12	16	ml	-2.67736
1997	12	23	kr	-4.23118
1997	12	24	kr	-4.26047
1997	12	25	kr	-2.29056

Notes: Authors' calculation.
Data source: Datastream

Table 1-3(continued)

Stock Price Daily Origin (cumulative weighted daily change)

			origin	devaluation rate(%)
1998	1	5	ml	-2.86437
1998	1	6	ml	-3.4442
1998	1	8	ph	-3.95985
1998	1	9	ph	-6.20974
1998	1	22	ph	-3.08425
1998	2	5	th	-2.19492
1998	2	11	id	-3.40639
1998	2	12	id	-6.17823
1998	2	13	id	-2.59521
1998	2	16	kr	-3.76704
1998	2	17	kr	-2.48831
1998	3	5	kr	-2.65581
1998	3	6	kr	-2.54522
1998	3	9	kr	-2.85915
1998	3	30	kr	-2.20714
1998	4	1	kr	-2.00103
1998	4	2	kr	-2.48799
1998	4	3	kr	-3.50227
1998	4	16	ml	-2.06815
1998	4	23	kr	-2.43189
1998	4	29	id	-2.35019
1998	5	1	id	-2.12288
1998	5	4	kr	-3.19894
1998	5	5	id	-2.00219
1998	5	6	id	-3.26368
1998	5	11	kr	-2.10037
1998	5	12	kr	-2.51847
1998	5	13	id	-3.24024
1998	5	14	th	-2.18074
1998	5	18	id	-2.37928
1998	5	20	th	-2.58695
1998	5	25	kr	-3.72992
1998	5	26	kr	-4.83785
1998	5	29	th	-2.01034
1998	6	1	tw	-2.65902
1998	6	2	th	-2.99644
1998	6	11	ph	-2.51619
1998	6	12	kr	-4.309
1998	6	15	kr	-4.5518
1998	6	16	kr	-3.77527

Notes: Authors' calculation.

Data source: Datastream

Table 1-3(continued)
Stock Price Daily Origin (cumulative weighted daily change)

			origin	devaluation rate(%)
1998	7	10	ml	-2.96722
1998	7	13	ml	-2.37744
1998	7	22	ml	-2.06513
1998	7	23	kr	-2.38592
1998	7	29	ml	-2.83863
1998	8	4	ph	-2.13067
1998	8	5	id	-3.06332
1998	8	6	id	-2.42231
1998	8	10	ml	-2.47277
1998	8	11	ml	-3.91713
1998	8	12	ph	-3.85026
1998	8	13	ml	-2.72077
1998	8	17	ml	-2.44769
1998	8	18	kr	-2.08139
1998	8	21	ml	-2.42579
1998	8	24	id	-3.31244
1998	8	25	id	-2.01832
1998	8	27	ml	-2.0052
1998	8	28	ph	-3.74894
1998	9	10	ph	-3.17338
1998	9	11	ph	-2.24209
1998	9	15	id	-4.88403
1998	9	17	id	-2.2781
1998	9	18	id	-3.55915
1998	9	21	id	-4.75428
1998	9	22	ph	-2.22079
1998	10	2	tw	-2.6448
1998	10	27	kr	-2.30388
1998	11	9	ph	-2.2985
1998	11	10	ph	-3.25874
1998	11	11	th	-3.62361
1998	11	13	th	-2.69491
1998	11	25	id	-2.96115
1998	12	3	th	-2.82066
1998	12	4	th	-2.18331
1998	12	17	kr	-2.65629
1999	1	5	tw	-2.12999
1999	1	26	th	-2.36775
1999	2	8	ml	-3.78259
1999	2	9	kr	-2.45088
1999	2	10	th	-2.06937
1999	2	19	kr	-2.02235
1999	5	13	kr	-2.72969
1999	5	17	kr	-2.32377
1999	5	26	th	-2.58649

Notes: Authors' calculation.
Data source: Datastream

Table 2 News and Events (Daily Origin) :July, 1997-January, 1998

			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	26	ID	Moody's raises specter of indonesia corporate debt moratorium.
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	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	6	10	ID	IMF top official arriving in Jakarta for review of economic targets under IMF loan disbursement p
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	11	ID	Indonesia Refutes Report That it Failed to Make Debt Paymen.
1998	9	8	ID	Students descended on Indonesia's House of Representatives calling for the resignation of Presi
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 Matrix of Cumulative Contagion: plots of CC(t,i) of Exchange Rate 1997:1-1999:7

		Affected					
	(nob)	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
Origin	ID(61)		0.020	0.145	0.102	0.015	0.133
	stat		0.440	4.528	3.049	1.765	5.377
	ID till 98/6/17 (49)		0.008	0.180	0.147	0.024	0.157
			0.139	4.667	3.900	2.594	5.448
	ID after 1998/8/11 (12)		0.063	0.004	-0.079	-0.023	0.038
			2.045	0.085	-1.072	-1.146	0.792
	KR(14)	0.193		0.124	0.066	0.016	0.215
	stat	1.067		2.643	2.283	0.795	3.593
	ML(2)	0.012	0.181		0.233	0.041	0.418
	stat	0.024	1.032		1.552	5.490	2.388
	PH(3)	-0.089	-0.027	0.186		-0.006	0.173
	stat	-0.598	-0.535	1.083		-0.480	1.609
	TH(6)	0.107	-0.102	0.047	-0.034	0.043	
	stat	1.055	-1.051	0.554	-0.708	1.211	
	TW(1)	0.286	0.218	0.770	0.047		0.552
	stat	-	-	-	-		-

Table 3-2 Matrix of Cumulative Contagion: plots of CC(t,i) of Stock Price Full sample(1994:1-1999:7)

		Affected					
	(nob)	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
Origin	ID(30)		0.170	0.276	0.078	0.066	0.187
	stat		2.526	3.790	0.687	1.473	2.813
	KR(47)	0.011		0.215	0.114	0.031	0.286
	stat	0.192		3.731	2.378	0.781	6.181
	ML(29)	0.227	0.049		0.276	0.139	0.153
	stat	2.929	0.472		3.752	2.943	2.118
	PH(27)	0.266	0.171	0.188		0.076	-0.067
	stat	2.543	1.503	2.009		1.310	-0.490
	TW(22)	0.074	0.086	0.112	0.124		0.153
	stat	1.001	0.874	1.273	1.901		1.885
	TH(33)	0.133	0.027	0.062	0.205	0.044	
	stat	2.204	0.340	0.645	2.850	0.736	

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

		Affected					
	(nob)	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
Origin	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	

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

		Affected					
	(nob)	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
Origin	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	

Table 4-1
Dynamic OLS estimation Results (exchange rate)

origin: all

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
Origin	-0.2745	0.1202	0.1548	0.1977	0.0785	0.1439
replaced s.e.	0.0103	0.0161	0.0111	0.0105	0.5887	0.0089
replaced t	-26.6686	7.4522	13.9628	18.8396	0.1334	16.1375

origin: Indonesia

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
Origin		-0.1135	0.0281	0.0445	0.0203	0.0165
replaced s.e.		0.0634	0.0161	0.0149	0.0021	0.0101
replaced t		-1.7902	1.7451	2.9938	9.9229	1.6350

origin: Korea

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
Origin	0.6754		0.2499	0.2361	-0.0272	-1.4427
replaced s.e.	0.3255		0.0457	0.3633	0.4988	0.2267
replaced t	2.0750		5.4705	0.6499	-0.0545	-6.3648

Table 5-1
Dynamic OLS estimation results (stock price)

origin: all full sample

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
Origin	0.4928	-0.0526	0.6497	0.4248	0.0762	0.2526
replaced s.e.	0.0086	0.0108	0.0081	0.0067	0.0034	0.0102
replaced t	57.5051	-4.8807	80.3863	63.5823	22.3790	24.6975

origin: all before crisis

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
Origin	0.0648	-0.2095	-0.1639	0.5348	0.3137	-0.1192
replaced s.e.	0.0107	0.0115	0.0118	0.0227	0.0172	0.0246
replaced t	6.0388	-18.1924	-13.9198	23.5317	18.2456	-4.8500

origin: all after crisis

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
Origin	0.5245	-0.0575	0.6851	0.3867	0.0249	0.2706
replaced s.e.	0.0191	0.0253	0.0162	0.0096	0.0044	0.0152
replaced t	27.5095	-2.2773	42.2091	40.0764	5.6040	17.7667

Table 5-2
Dynamic OLS estimation results (stock price)

origin: Indonesia full sample

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
Origin		-0.0414	1.7127	0.6798	-0.3393	-0.5019
replaced s.e.		0.0411	0.1172	0.5391	0.1836	0.6517
replaced t		-1.0064	14.6173	1.2611	-1.8481	-0.7702

origin: Indonesia after crisis

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
Origin		0.0429	1.7817	0.7583	-0.3861	-0.6235
replaced s.e.		0.0412	0.1170	0.5390	0.1833	0.6504
replaced t		1.0410	15.2293	1.4070	-2.1065	-0.9587

Table 5-3
Dynamic OLS estimation results (stock price)

origin: Korea full sample

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
Origin	-0.2442		-0.8312	-4.3166	-0.2285	1.6557
replaced s.e.	0.6812		0.1214	0.6108	0.1174	0.7756
replaced t	-0.3585		-6.8489	-7.0668	-1.9463	2.1347

origin; Korea after crisis

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
Origin	-1.8099		-1.7219	-4.5535	-0.5320	2.1661
replaced s.e.	0.6909		0.1260	0.6500	0.1288	0.8603
replaced t	-2.6196		-13.6701	-7.0049	-4.1305	2.5179

Table 5-4
Dynamic OLS estimation results (stock price)

origin: Malaysia full sample

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
Origin	-1.6294	-0.4216		-0.2906	-0.7256	1.0465
replaced s.e.	0.9864	0.1934		0.8171	0.1355	0.6004
replaced t	-1.6518	-2.1802		-0.3556	-5.3539	1.7428

origin: Malaysia after crisis

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
Origin	-0.9508	-0.3651		-1.7786	-1.2484	1.2640
replaced s.e.	0.9657	0.2273		0.6344	0.1546	0.7342
replaced t	-0.9846	-1.6065		-2.8035	-8.0747	1.7217

Table 5-5
Dynamic OLS estimation results (stock price)

origin: Philippines full sample

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
Origin	0.4737	0.6599	1.7336		0.5446	0.1356
replaced s.e.	1.1148	0.0791	0.2248		0.1413	0.8448
replaced t	0.4249	8.3445	7.7120		3.8531	0.1606

origin: Philippines before crisis

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
Origin	5.2982	2.3729	4.1518		0.0599	-3.3578
replaced s.e.	2.8180	0.0329	1.9195		0.3250	11.4663
replaced t	1.8801	72.1742	2.1630		0.1842	-0.2928

origin: Philippines after crisis

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
Origin	0.8472	0.5612	2.2921		0.6950	0.1646
replaced s.e.	0.2302	0.2581	0.2936		0.4977	0.9496
replaced t	3.6797	2.1743	7.8078		1.3965	0.1734

Table 5-6
Dynamic OLS estimation results (stock price)

origin: Taiwan full sample

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
Origin	7.7006	-0.0725	0.9578	-0.5702		2.8019
replaced s.e.	1.5847	0.0243	0.0884	0.4354		1.2694
replaced t	4.8593	-2.9817	10.8287	-1.3095		2.2073

origin: Taiwan before crisis

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
Origin	12.5972	1.2730	2.6296	-4.5437		8.1364
replaced s.e.	0.3443	0.0420	0.0932	0.5978		2.8824
replaced t	36.5889	30.3456	28.2144	-7.6005		2.8228

Table 5-7
Dynamic OLS estimation results (stock price)

origin: Thailand full sample

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
Origin	-0.6381	0.8392	1.8733	0.9398	1.3125	
replaced s.e.	0.7264	0.0412	0.0992	0.5891	0.1447	
replaced t	-0.8785	20.3537	18.8806	1.5953	9.0725	

origin: Thailand before crisis

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
Origin	-3.0635	1.2938	2.5083	-0.9537	0.9914	
replaced s.e.	1.7643	0.0833	0.4712	0.3671	0.0576	
replaced t	-1.7364	15.5275	5.3234	-2.5982	17.2066	

origin: Thailand after crisis

	Affected countries					
	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand
Origin	0.0540	0.5669	-0.0443	-2.5134	-1.2459	
replaced s.e.	2.7935	0.1263	0.1504	0.8779	0.4253	
replaced t	0.0193	4.4892	-0.2943	-2.8632	-2.9291	

Table 6
Export share as a percent of total exports in millions of US dollars.
Selected East Asian countries: 1996-1999

1996

Country	Destination of Exports						
	Indonesia	Korea	Malaysia	Philippines	Thailand	Japan	US
Indonesia		6.587	2.228	1.381	1.652	25.866	13.641
Korea	2.458		3.351	1.482	2.059	12.336	16.779
Malaysia	1.556	3.046		1.199	4.094	13.403	18.194
Philippines	n.a.	1.818	3.366		3.822	17.973	34.134
Thailand	1.518	1.818	3.614	1.132		16.821	17.993

1997

Country	Destination of Exports						
	Indonesia	Korea	Malaysia	Philippines	Thailand	Japan	US
Indonesia		6.478	2.539	1.486	1.587	23.361	13.386
Korea	2.601		3.203	1.912	1.650	10.855	15.846
Malaysia	1.556	3.202		1.458	3.644	12.678	18.482
Philippines	0.860	1.752	2.572		3.440	16.856	35.592
Thailand	2.399	1.767	4.327	1.216		15.217	19.436

1998

Country	Destination of Exports						
	Indonesia	Korea	Malaysia	Philippines	Thailand	Japan	US
Indonesia		5.257	2.780	1.447	1.931	18.662	14.425
Korea	7.015		2.724	2.151	1.097	9.274	17.454
Malaysia	1.376	2.281		1.578	3.161	10.526	21.670
Philippines	0.377	1.730	3.883		2.155	14.388	34.490
Thailand	1.811	1.150	3.269	1.408		13.727	22.357

1999

Country	Destination of Exports						
	Indonesia	Korea	Malaysia	Philippines	Thailand	Japan	US
Indonesia		7.447	3.282	1.434	2.051	23.571	18.997
Korea	1.754		2.520	2.161	1.199	10.959	20.450
Malaysia	1.458	2.945		1.536	3.266	11.649	21.944
Philippines	0.336	2.822	4.044		2.302	12.741	28.688
Thailand	2.103	1.831	3.891	1.703		15.282	22.772

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

Table 7
Direct Trade Linkage Index

1996

Country	Countries export to and import from				
	Indonesia	Korea	Malaysia	Philippines	Thailand
Indonesia		1.014	0.953	n.a.	0.986
Korea	0.986		1.291	1.677	0.723
Malaysia	1.047	0.709		1.155	1.229
Philippines	n.a.	0.323	0.845		1.106
Thailand	1.014	0.550	0.771	0.894	

1997

Country	Countries export to and import from				
	Indonesia	Korea	Malaysia	Philippines	Thailand
Indonesia		0.989	1.051	1.575	0.762
Korea	1.011		1.267	1.713	0.756
Malaysia	0.949	0.733		1.284	1.072
Philippines	0.425	0.287	0.716		1.102
Thailand	1.238	0.622	0.928	0.898	

1998

Country	Countries export to and import from				
	Indonesia	Korea	Malaysia	Philippines	Thailand
Indonesia		1.180	1.147	1.729	0.978
Korea	0.820		1.366	1.696	0.722
Malaysia	0.853	0.634		1.007	1.131
Philippines	0.271	0.304	0.993		0.905
Thailand	1.022	0.603	0.869	1.095	

1999

Country	Countries export to and import from				
	Indonesia	Korea	Malaysia	Philippines	Thailand
Indonesia		1.176	1.129	1.700	0.896
Korea	0.824		1.189	1.504	0.656
Malaysia	0.871	0.811		0.934	1.096
Philippines	0.300	0.496	1.066		0.917
Thailand	1.104	0.763	0.904	1.083	

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

Table 8
Imcome Effect (GDP share, %)

1996

origin	Affected countries				
	Indonesia	Korea	Malaysia	Philippines	Thailand
Indonesia		0.06128	0.00012	n.a.	0.04571
Korea	0.14430		0.00024	0.04479	0.05474
Malaysia	0.04882	0.08356		0.08294	0.10883
Philippines	0.03026	0.03697	0.00009		0.03410
Thailand	0.03620	0.05135	0.00032	0.09416	

1997

origin	Affected countries				
	Indonesia	Korea	Malaysia	Philippines	Thailand
Indonesia		0.07434	0.00013	0.02602	0.09236
Korea	0.16046		0.00026	0.05301	0.06801
Malaysia	0.06290	0.09152		0.07782	0.16654
Philippines	0.03680	0.05465	0.00012		0.04682
Thailand	0.03930	0.04716	0.00029	0.10408	

1998

origin	Affected countries				
	Indonesia	Korea	Malaysia	Philippines	Thailand
Indonesia		0.05568	0.00014	0.01705	0.08857
Korea	0.27274		0.00023	0.07817	0.05623
Malaysia	0.14423	0.11230		0.17539	0.15989
Philippines	0.07509	0.08867	0.00016		0.06890
Thailand	0.10015	0.04524	0.00032	0.09737	

1999

origin	Affected countries				
	Indonesia	Korea	Malaysia	Philippines	Thailand
Indonesia		0.06239	0.00016	0.01605	0.09882
Korea	0.25647		0.00032	0.13463	0.08603
Malaysia	0.11302	0.08964		0.19294	0.18284
Philippines	0.04940	0.07687	0.00016		0.08000
Thailand	0.07063	0.04264	0.00035	0.10984	

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

Table 9
Cheap Import effect

1996

origin	Affected countries				
	Indonesia	Korea	Malaysia	Philippines	Thailand
Indonesia		0.07707	0.00014	n.a.	0.05074
Korea	0.10604		0.00041	0.19835	0.14503
Malaysia	0.03620	0.05773		0.09561	0.19485
Philippines	0.00396	0.01117	0.00008		0.03107
Thailand	0.04816	0.02339	0.00026	0.06942	

1997

origin	Affected countries				
	Indonesia	Korea	Malaysia	Philippines	Thailand
Indonesia		0.08414	0.00015	0.09399	0.05929
Korea	0.10763		0.00042	0.27906	0.15098
Malaysia	0.04009	0.06302		0.12366	0.20250
Philippines	0.00589	0.01219	0.00009		0.03676
Thailand	0.04019	0.02554	0.00032	0.10518	

1998

origin	Affected countries				
	Indonesia	Korea	Malaysia	Philippines	Thailand
Indonesia		0.09571	0.00020	0.10106	0.08058
Korea	0.16228		0.00046	0.35217	0.13438
Malaysia	0.06659	0.06890		0.15051	0.19744
Philippines	0.00690	0.02519	0.00019		0.05614
Thailand	0.08943	0.02522	0.00031	0.13024	

1999

origin	Affected countries				
	Indonesia	Korea	Malaysia	Philippines	Thailand
Indonesia		0.09751	0.00022	0.09197	0.08821
Korea	0.19766		0.00043	0.35522	0.15052
Malaysia	0.09582	0.07753		0.12771	0.21235
Philippines	0.00962	0.02848	0.00021		0.06537
Thailand	0.09561	0.02624	0.00031	0.10723	

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