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Conference Paper

Financial Crises and Transmission Mechanisms

39th Congress of the European Regional Science Association: "Regional Cohesion and Competitiveness in 21st Century Europe", August 23 - 27, 1999, Dublin, Ireland

Provided in Cooperation with:

European Regional Science Association (ERSA)

Suggested Citation: Costa i Font, Joan; Pigem Vigo, Mònica (1999) : Financial Crises and Transmission Mechanisms, 39th Congress of the European Regional Science Association: "Regional Cohesion and Competitiveness in 21st Century Europe", August 23 - 27, 1999, Dublin, Ireland, European Regional Science Association (ERSA), Louvain-la-Neuve

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WORK IN PROGRESS

Paper for the European Regional Science Association Meeting , Dublin 23-26 August 1999.

FINANCIAL CRISES AND TRANSMISSION MECHANISMS
Are financial crises a regional phenomena?

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Abstract

The regional widespread financial turmoil transmission within the (east) Asian region and its contagion to a set of Latin-American countries introduces an extended debate about the effects of an globalisation in terms of its regional impact. That is, the effects of a financial deluge in a particular country were not constrained in to their regional area but usually expand their consequences to other areas , countries that regardless of their geographically distance share a similar macroeconomic and/or financial structure pattern. This paper analyses the transmission mechanisms distinguishing the regional effects of financial crises from what is commonly defined as contagion. Results confirm that regional effects are to be wider than contagion's effects .

Key words: financial crises, regional transmission mechanisms.

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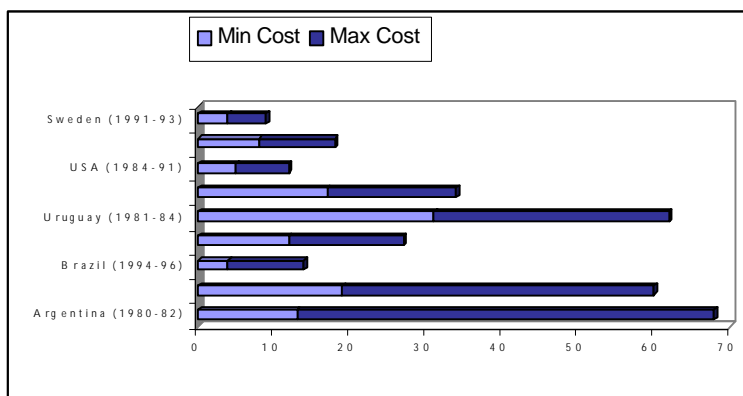
Barcelona (Spain)

1. Introduction

Although the international capital mobility reduces the country dependency from internal financial resources generation, introduces in turn additional constraints to those countries expanding external inflows when the external financing increases significantly during a large period of time, since in ultimate term increase the financial vulnerability and rises the probability of experiencing a financial turmoil. Financial crises are nowadays an extended phenomena conditioning not only economic performance but also the extent of the arrangements within a regional area.

One of the motives of this paper relies on the evidence that relates three variables: the vulnerability of a country, the regional integration pattern and the trade linkages as some explanatory variables of the global extent of a financial crises. Notice that the recent the financial crises, the larger its effects are. Figure 1 displays some evidence of the effects of financial crises from a set of selected countries. This prior evidence suggests that there are clearly differences in terms of the impact of different financial crises. *The “emerging countries” usually are to suffer larger consequences than developed countries* since are “vulnerable” to financial markets expectations. Moreover, *those countries that show larger regional integration patterns also show also larger regional effects* when a financial crises emerge. Furthermore, *trade linkages are to be contemplated as a relevant feature to take into account* since one of the main channel for transmission of financial crises is the exchange rate.

Figure 1.
Estimated re-structuring costs after a financial crises weighted by the GDP



Source : World Economic Outlook, May 1998.

Under this scenario, an interesting research tool is to analyse theoretically the regional and interregional transmission mechanisms such as to test empirically the underlying hypothesis in order to determine the magnitude of the regional effects according to the data prompted from the recent financial crises. We shed some light on this issue by means of an explanatory theoretical model and a confirmatory evidence obtained from cross correlation indicators and an econometric approach. The main question that this paper tries to give some answers is the following : are financial crises a regional phenomena?. Previous evidence from recent financial crises in Latin- American countries could support this issue. However, the extraordinary event that the (east) Asian countries have suffered during 1997 and half of 1998 suggests an opposite view. In effect, there are regional transmission mechanisms that encourage the financial crises to become a regional phenomena, this has based some of the most recent models on currency crises. However, what how can we explain why this events are to be transmitted outside a region if financial crises are just a regional phenomena. Obviously, there is a large amount of research to be done in this field before to explain accurately what commonly is known as “contagion effects”. Even though there have been strong improvements on identifying the causes of this phenomena such as the

microeconomic effects enhancing the diffusion inside the domestic financial system, there is not very much research on the contagion mechanisms.

The remainder of the paper is composed as follows. In section two we discuss the meaning of the contagion and regional effects. In section three we provide some preliminary explanations for contagion. In section four we develop a theoretical framework aiming to explain theoretically the meaning of a currency crises and the possible ex -ante regional effects. Finally, section five shows some results confirm the hypothesis framed out in this introductory section.. The paper ends with some concluding remarks.

2. Contagion and Regional effects

The regional widespread financial turmoil transmission within the (east) Asian region and its contagion to a set of Latin-American countries introduces an extended debate about the effects of an globalisation in terms of its regional impact¹. The effects of a financial deluge in a particular country are not constrained in to its regional area but usually expand their consequences to other areas , countries that regardless of their geographically distance share a similar macroeconomic and/or financial structure pattern. That is , financial crises are not an isolated phenomena, but by the contrary draws a set of countries within geographical region, generally showing similar financial vulnerability , relative industrial similarities and in turn reflecting a strong sensibility in its terms of trade, and finally some holding kind of rigid monetary arrangement, such as a currency board .

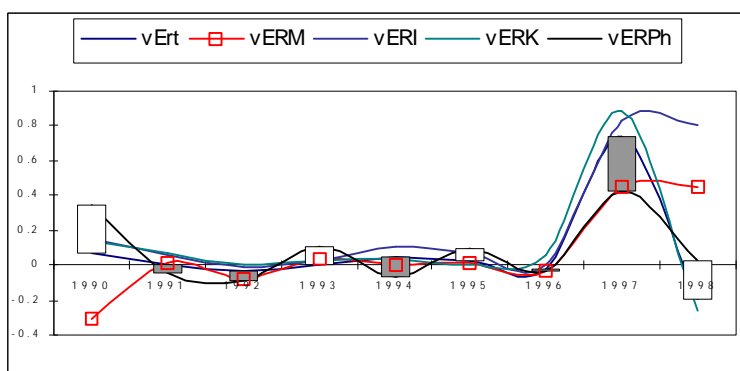
The time coincidence of the financial crisis en the East-Asian and their immediate impact over other regional areas, commonly named as “fragile emerging economies” lead to identify the regional effects and test them empirically. However, as a first exercise we should encounter an operative concept basing the analysis of regional effects. Hence, we should

¹ After the Thai collapse (July, 1997) the financial market reaction in the east Asia held a similar downward pattern during the 1997 and 1998. In Particular the effects were especially relevant in the stock and the foreign exchange market.

distinguish between *the regional effects* from contagion. Regional effects appear due to a historical pattern explaining the presence of co-movements among different fundamentals. Contagion implies that there is no integration within an area, whereas regional effects are to imply some kind of integration. These two effects are to be important determinants of the extent of a financial crisis, however the relevant question to determine theoretically and empirically is which of the two effects is expected to be larger and under which conditions would appear.

The seminal explanation of the appearance of currency crises was set by the first generation models (Krugman, 1979) based on the inconsistencies surrounding the maintenance of a fixed exchange rate to a “hard currency” such as the DM or the US \$. More recently, the second generation models (Obstfeld, 1991) introduce the economic policy decisions as a weighting mechanism of the positive and negative consequences of maintaining an exchange rate. However, this extended literature was not trying to explain the regional effects and therefore its contagion, probably because the magnitude of the contagion consequences before the recent phenomena were not large enough during the period of analysis, however the existence of similarities, defined by Choueiri (1999) as “co-movements” in some fundamental variables such as capital flows and asset prices have changed considerably this scheme. This co-movements usually emerge as co-movements in terms of exchange rates, since pressures in the money market in an open economy are in ultimate term reflected in the interest rates. This can be viewed in figure 2, where there is a clear co-movement or similarity in the exchange rate pattern for the ASEAN-4 and Korea during the 90s. The most relevant feature of this figure is the exchange rate depreciation due to the currency crises derived from the financial turn oil during 1997. *As we can observe, the exchange rate similarity increases during the financial crises period whereas it reduced before and afterwards.* This phenomena constituted a first indicator of the asymmetric effects of a currency crises within a regional area.

Figure 2
Exchange rate similarities (Thailand, Malaysia, Indonesia Korea and Philippines)



Source: International Financial Statistics, 1999.

The impact of a currency crises has also its reflection in the variability of the exchange rate . Accordingly, a possible analysis would be to select a country inside and outside the regional area the two being subjected to the effects of the same currency crises in order to set out some previous evidence form the difference between contagion and regional effects. From the figure 3 above described we can notice that following the speculative attacks to the Thailand bath during the first quarter 1997, despite the economic policy instruments applied in order to prevent the Tai currency from devaluation – increasing interest rates, introducing capital controls etc- resulted in the thai devaluation in July. The consequences of this devaluation where nearly immediate 10% fall down of the Philippine peso and the Malaysian ringgit. Other related currencies suffer a similar pattern, since one year later the exchange rate did not recover its previous stability. The net consequences, however where not to be depicted to the Asian countries, but rather other “emergent economies” suffered the consequences of this financial turmoil, such as Mexico. *Empirical evidence suggests that*

the effects expressed in terms of exchange rate volatility were higher for those countries within the same regional area rather than those countries outside.

Figure 3
Exchange rate variability the (east) Asian 1996-1999

The financial crises is more than a regional phenomena and this is the difference between the current and the former financial turmoil's. In effect, there have been significant regional effects within the (east) Asian region , however this effects are in fact asymmetric within the region. Whereas in output effects over Malaysia can be defined by a decline of a 2%, the effects over the Indonesian economy where larger, estimated on a 12% fall down of the GDP during 1998 (World Economic Outlook, 1998). Out side the region other the (east) Asian turmoil displayed relevant consequences, explained by a deterioration in the terms of trade of some basic commodities, but especially in terms of the financial markets transmission. The (east) Asian countries have been countries showing large differences in terms of size, and small differences in terms of growth. However , since the impact of the financial deluge has been different within the regional area, they currently show large differences in terms GDP growth , especially comparing the growth rates with the former 1980 growth rates. An appealing evidence , is that these countries have been showing large

current account imbalances during the 90s, there fore a question that emerges is how many years can a regional area be holding a current account imbalance, the answer , at least for the (east) is that a current account imbalances are not sustainable in the long run.

Table 1
Basic Indicators of the “regional effects” induced from financial crises

	SIZE	ECONOMIC GROWTH	EXTERNAL INBALANCES	FINANCIAL PERFORMANCE
ASEAN-5				
<i>Singapore</i>	3	5.6	13.8	-20.3
<i>Thailand</i>	58.4	0.4	-8.6	-16
<i>Malaysia</i>	20.2	-1.8	-4.8	-11.5
<i>Philippines</i>	67.2	1.7	-4.3	3.2
<i>Indonesia</i>	196.8	-6.2	-6.8	-2.3
Other East Asian Countries				
<i>Japan</i>	125.2	-5.3	106	0.6
<i>Korea</i>	45.1	-3.8	9.1	-11.7

a. Population(million) 1995

b. GDP Growth 1998

c. Current Account (billions US\$) 1998

d. Equity market index variation 1998

3. Explanations for financial crises transmission in the (East) Asia

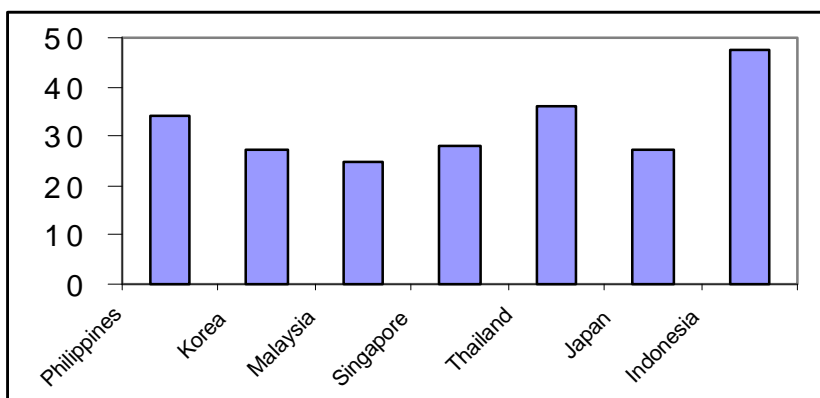
Form this point, we are interested on set up some of the main variables that can lead to explain the contagion mechanisms. The variables considered are the following:

a) Output similarities

East Asian countries have been specialising in similar exports such as display similarities in their industrial sector participation. This is shown in figure, what indicates that despite there

are some countries more industrialised than others, the presence of similarities in the source of exports can induce to explain some part of the story about the contagion effects (Diwan and Hoekman, 1999). Figure 4, shows that an important feature of the (east) Asian countries is the presence of large output similarities. The explanation of this feature can be founded in the competition mechanism underlying in the (east) Asia.

Figure 4
Industrial production weighted by the total GDP 1990-1995.



Source: International Financial Statistics, 1998.

b) Trade Linkages

Interregional trade among East Asian countries represents approximately the 40% of total exports in 1996, what is to reflect a large dependency on exports from one country to another. This is displayed in table 2, Malaysia and Thailand, two countries where the regional transmission of the financial turmoil was rapid and large, shows a high share of exports. Furthermore, Korea, despite is a country outside the ASEAN, shows a large share of exports with some of the countries of the region. This constitutes an additional variables explaining why a financial crises in a country may be transmitted to another neighbour country.

Table 2
Trade linkages (percentage of total exports East Asia-5, 1997)

	Thailand	Malaysia	Philippines	Indonesia	Korea
Thailand		4.6	1.2	2	1.8
Malaysia	3.7		1.3	1.5	3.2
Philippines	2.4	3.0		0.4	1.8
Indonesia	1.7	2.4	0.4		7.1
Korea	2	3.1	2.9	2.9	

Source : International Monetary Fund, 1998.

c) Competition and Capital Inflows

A suspecting explanation refers to the consequences of financial deregulation and the competition for capital inflows under the presence of the *trade linkages (trade spillovers)*, since trade linkages encourage contagion by means of the devaluation effects to the regional neighbours under a short run price rigidity context. Accordingly, a recent range of empirical studies such as Eichengreen, Rose and Wyplosz (1996) and Glick and Rose (1998) assign to this explanatory variable a strong evidence for this channel. The idea is that exchange rate shocks reflecting a reaction towards a trade balance disequilibrium, are transmitted to the whole region. As conditional hypothesis we could assert that if this variable explains the whole contagion effects then the political economy recommendation for the regional areas is to improve economic and financial co-operation as an instrument to offset exchange rate and trade shocks². However this cannot explain why this shocks are transmitted to other economies out-side the regional area. In order to explain this issue in the next section we develop a theoretical model.

4. Theoretical Model

In this section we develop a model based on three different countries in order to the asymmetry of the region effects or the contagion process across different regions. A small country *i* showing a regional integration pattern with its geographical neighbours *j* and

² An appealing argument that explaining the recent currency crises has been the devaluation of the dollar in order to reduce the large current account deficit.

another country k outside the region displaying similar macroeconomic fundamentals. The three countries fix its exchange rates (following a currency board system)³. We undertake a model based on speculative attacks where the fixed exchange rate is abandoned due to problems in economic fundamentals such as in terms of financial credibility⁴. We assert that the transmission mechanism differs between their impact on different regions. Accordingly, the basic improvement of this model is that we base the contagion mechanism on the variable explaining the regional transmission. The neighbour countries show a regional integration pattern relying on the synchronisation of fundamentals, that is exchange rate co-movements (explained basically due to trade and balance of payments channels), however those countries outside the region do not show this similarities, and therefore the contagion mechanisms are to be explained by trade linkages but by a financial fragility variable.

Let us depart from the domestic money market equilibrium for each country i,j,k :

$$m_t^{i,j,k} - p_t^{i,j,k} = -a_t^{i,j,k} - gE_t[s_{t+1} - s_t] \quad a, g > 0, d < 0 \quad (1)$$

where m_t is the logarithm of domestic money supply normalised by the domestic output ($m_t = \ln(M_t/Y_t)$), p_t refers to the logarithm of the domestic price level, i_t is the domestic currency interest rate in levels, E refers to the expectation and e_t^q refers to the productivity shocks affecting money demand. We reject the possibility of monetization of fiscal imbalances as causing currency crises⁵.

³ This was the case of Thailand, Malaysia and a third country as Mexico.

⁴ This type of models were first assessed by Krugman (1979) and recently developed by Flood and Marion (1998).

⁵ This assumption can be founded on Krugman (1998), since he explains that the recent currency crises cannot be explain with traditional models where the fiscal imbalances could explain joint with other related fundamentals the appearance of a currency crises.

The domestic currency interest rate is defined as reflecting an amplified version of the interest parity, including the expected rate of depreciation where s is the logarithm of the exchange rate and an external effect impose to reflect the previous co-variation of the exchange rates weighted by the share of international loans respect to the GDP represented as d . This third parameter is capturing the slipover effects induced form imperfect information that lead to question the availability of pegging the exchange rate .

$$i^{j,i}_t = i^* + E_t(s^{j,i}_{t+1} - s^{j,i}_t) + dd_t^{i,j} Cov(s^{i,j}_{t-1}, s^{j,i}_{t-1}) \quad (2)$$

Therefore equation (2) suggests that an increase in the d , in the domestic exchange rate of in the co-variation between the exchange rates of two countries are to increase the interest rates what in ultimate terms explain the financial contagion mechanism, between two integrated regions.

$$i^k_t = i^* + E_t(s^k_{t+1} - s^k_t) + b(d_t^k Var(s^i_t)) \quad (3)$$

where b reflects risk aversion.

Domestic prices are set one period ahead an therefore the purchasing parity condition is the following :

$$p^{i,j,k}_t = E_{t-1} s^{i,j,k}_t \quad (4)$$

From the former equations a preliminary results indicate that the regional effects of a financial crises should be larger than the contagious effects depending on the magnitude of the regional integration defined in terms of trade and structural similarities.

5. Empirical Approach

In this section we apply two different instruments . First we test if there has been an increase in the exchange rate correlation during the 90s, respect to other periods. We argue that if there is an increase in the exchange rate correlation then its more likely to expect a higher probability and lager contagion effects over this countries. Second, we show some empirical evidence form a regression model in order to test the sensibility of two countries (Malasia and Thailand) the first one representative of the regional area and the second of a country suffering a contagious effects without being member of the regional area.

The empirical evidence has been obtained from diverse database sources (International Financial Statistics, 1999, Asian Developing bank, 1999 and the Penn Tables, 1998) suggests that the East –Asian countries display great historical similarities. The first empirical analysis aims to test if there is an increase in the correlation of the exchange and interest rates during the recent periods respect to the historical trend. During the last period 1990-1997, and an appealing results that there is spectacular increase of the cross-correlation. This result has been obtained computing the exchange rate volatility during the considered period . In particular this especially interesting results can be observed focusing on the Thailand correlation , since its significantly higher around a 0.98 for some countries, what provides an empirical support to the overview that there is a monetary common pattern explaining the direction of exchange rates shocks (see tables A, B,C in the APPENDIX).

Finally, a second analysis tries to capture by means of a regression model some variables that explain the regional association of fundamentals . From the IMF statistics 1999, we computed two models explaining the exchange rate variability of Malaysia and Mexico

depending on the exchange rate variability of Thailand and the interest rates as to accomplish the interest parity. The specification that seems more relevant is displayed in table 3 for Malaysia and table 4 for Mexico. For this results we should assert that despite the specification for Malaysia shows a significant effect of the Thailand exchange rate variability (ERTL), the model for Mexico does not seem well specified, what can be observed form high significance of the constant term.

Table 3
Regression Results Dependent variable Exchange Rate Ryggit
(monthly data 1995-1999)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.104759	0.126512	0.828057	0.4170
ERTL	0.666662	0.064897	10.27259	0.0000
IRTL	-0.099709	0.123528	-0.807177	0.4286
IRML	-0.003959	0.002556	-1.549188	0.1363
R-squared	0.857952	Mean dependent var		-0.012719
Adjusted R-squared	0.837659	S.D. dependent var		0.063813
S.E. of regression	0.025711	Akaike info criterion		-4.338124
Sum squared resid	0.013883	Schwarz criterion		-4.143104
Log likelihood	58.22655	F-statistic		42.27907
Durbin-Watson stat	2.041213	Prob(F-statistic)		0.000000

Table 4

Regression Results Mexico vs Thailand (monthly data 1995-1999)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.943320	0.590543	-3.290735	0.0035
IRMEX	1.295826	0.422901	3.064138	0.0059
IRTL	0.586457	0.549679	1.066908	0.2981
ERTL	0.475531	0.259232	0.018344	0.9855
R-squared	0.407995	Mean dependent var		-0.055647
Adjusted R-squared	0.323423	S.D. dependent var		0.138433
S.E. of regression	0.113867	Akaike info criterion		-1.361921
Sum squared resid	0.272281	Schwarz criterion		-1.166901
Log likelihood	21.02401	F-statistic		4.824227
Durbin-Watson stat	1.464800	Prob(F-statistic)		0.010425

5. Some preliminary conclusions

Evidence from this paper suggests that the regional effects of a financial crises seem to be higher than the contagion effects. The economic policy implications of this results clearly support the need of an economic policy co-ordination in east Asia since the kind of phenomena are more likely to appear when there is no regional financial co-ordination. A possible alternative to offset the former trends is to increase its co-operation in order to re-structure its financial system such as to increase its trade linkages.

The recent financial crises appears to be a regional phenomena that extends its effects over other regional areas (contagion) however, despite the short term effects over other economies outside the region can appear to be significant, the net effect over these economies is small compared with the regional impact of a financial crises.

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APPENDIX

Table A
Cross-Correlation Indonesia, Japan, Korea, Malaysia, Philippines, Singapore and Thailand 1990-97.

		Correlations						
		VERI	VERJ	VERK	VERM	VERPH	VERS	VERT
VERI	Pearson Correlation							
	Sig. (2-tailed)							
	N							
VERJ	Pearson Correlation	.339						
	Sig. (2-tailed)	.411						
	N	8						
VERK	Pearson Correlation	.989**	.363					
	Sig. (2-tailed)	.000	.377					
	N	8	8					
VERM	Pearson Correlation	.779*	.150	.775*				
	Sig. (2-tailed)	.023	.723	.024				
	N	8	8	8				
VERPH	Pearson Correlation	.760*	.353	.753*	.302			
	Sig. (2-tailed)	.029	.390	.031	.468			
	N	8	8	8	8			
VERS	Pearson Correlation	.875**	.628	.886**	.627	.777*		
	Sig. (2-tailed)	.004	.095	.003	.096	.023		
	N	8	8	8	8	8		
VERT	Pearson Correlation	.998**	.346	.993**	.808*	.741*	.886**	
	Sig. (2-tailed)	.000	.401	.000	.015	.035	.003	
	N	8	8	8	8	8	8	

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Table B

Cross-Correlation Indonesia, Japan, Korea, Malaysia, Philippines, Singapore and Thailand 1975-89.

Correlations

		VERI	VERJ	VERK	VERM	VERPH	VERS	VERT
VERI	Pearson Correlation							
	Sig. (2-tailed)							
	N							
VERJ	Pearson Correlation	-.212						
	Sig. (2-tailed)	.509						
	N	12						
VERK	Pearson Correlation	-.142	-.054					
	Sig. (2-tailed)	.659	.866					
	N	12	12					
VERM	Pearson Correlation	.364	-.648*	.103				
	Sig. (2-tailed)	.245	.023	.751				
	N	12	12	12				
VERPH	Pearson Correlation	.338	-.037	-.140	.068			
	Sig. (2-tailed)	.282	.909	.664	.834			
	N	12	12	12	12			
VERS	Pearson Correlation	.357	-.694*	.073	.965**	.001		
	Sig. (2-tailed)	.254	.012	.822	.000	.997		
	N	12	12	12	12	12		
VERT	Pearson Correlation	.003	-.485	-.036	.002	.635*	.046	
	Sig. (2-tailed)	.991	.110	.912	.994	.026	.887	
	N	12	12	12	12	12	12	

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table C

Cross-Correlation Indonesia, Japan, Korea, Malaysia, Philippines, Singapore and Thailand 1975-97.

Correlations

		VERI	VERJ	VERK	VERM	VERPH	VERS	VERT
VERI	Pearson Correlation Sig. (2-tailed) N							
VERJ	Pearson Correlation Sig. (2-tailed) N	-.171 .327 35						
VERK	Pearson Correlation Sig. (2-tailed) N	.370* .029 35	.001 .998 35					
VERM	Pearson Correlation Sig. (2-tailed) N	.396* .018 35	.120 .494 35	.264 .126 35				
VERPH	Pearson Correlation Sig. (2-tailed) N	.512** .002 35	.013 .939 35	.186 .284 35	.088 .615 35			
VERS	Pearson Correlation Sig. (2-tailed) N	.570** .000 35	-.115 .509 35	.303 .077 35	.365* .031 35	.261 .130 35		
VERT	Pearson Correlation Sig. (2-tailed) N	.613** .000 35	.012 .946 35	.595** .000 35	.519** .001 35	.464** .005 35	.456** .006 35	

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).