

行政院國家科學委員會專題研究計畫成果報告

金融風暴對東亞各國進出口值及景氣成長之影響

The Effect of the Asian Financial Crisis on the Relationships among Open Macroeconomic Factors for Asian Countries

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中文摘要

本研究運用多項時間序列方法，檢測亞太金融風暴對亞洲各國(以四小龍中之臺灣、南韓及四小虎中之馬來西亞、印尼等四國為例)之匯率波動、進口值、出口值及工業產值間之長短期互動關係。研究結果包括：(1)亞洲各國國際金融變數間之長期均衡關係不受風暴之影響；(2)因果關係測試，發現變數間之外生性強弱因風暴之發生而產生變化；(3)經衝擊反應關係得知，各國工業產值及出口值的衝擊對各變數的影響，於風暴前較巨，且延續較長；然風暴後便消失了；(4)各變數之波動被自我解釋之能力最佳，而風暴前之自我解釋比例又優於風暴後。

關鍵詞：亞太金融風暴、共整、因果關係、衝擊反應函數、變異數分解

Abstract

This study investigates the effect of Asian financial crisis on the relationships among exchange rate volatility, export, import, and productivity for Taiwan, Korea, Malaysia, and Indonesia. Cointegration tests show no change for the long-run equilibrium relationship among these variables throughout the crisis. Granger causality finds

that some exogeneity orderings alter from pre- to post-crisis periods for the countries considered. Impulse response functions (IRs) for the pre-crisis period demonstrate the primary importance of productivity, then second importance of export. For the post-crisis period, oscillatory paths around zero of the IRs imply an ambiguous finding for the direction of effect and relative exogeneity among variables studied. The variance decompositions in export for Taiwan, Korea and Malaysia, and in productivity for Malaysia and Indonesia did not change from the pre-crisis to the post-crisis era. Most of the rest of the forecast error variances in variables were decomposed into their own innovation more proportional in the pre-crisis period than in the post-crisis period.

Key Words: Asia financial crisis; cointegration; Granger causality; Impulse response function; Variance decomposition

1. Introduction

Sparked from Thailand in July 1997, the Asian financial crisis (AFC hereafter) has brought severe turmoil to Asian countries.

Except for China and Hong-Kong, the exchange rates have fluctuated dramatically since then.¹

The high degree of volatility and uncertainty of most major exchange rates has been widespread concerned since the beginning of the floating regime in March 1973. As De Grauwe (1988) argued, “the growth rate of international trade among industrial countries has declined by more than half since the inception of floating exchange rates.”

Since the exchange rate fluctuation had been significant during the period of the AFC in the Asian region, the examination of this study, based on the exchange rate stability, divides the test period into two sub-periods in order to investigate the impacts of this severe turmoil. Monthly data include two parts: (1) from 1973:12 to 1997:06 as the pre-crisis period and (2) from 1997:07 to 1999:12 as the post-crisis period, are employed. This paper firstly measures the exchange rate volatility followed the methods suggested by Chowdhury (1993) and Arize and Shwiff (1998). Secondly, it modifies the long-run equilibrium export and import demand models elaborated by Gotur (1985) to investigate the short-run causal and long-run equilibrium relationship among exchange rate volatility, export flows, import flows, and productivity in a multivariate framework.

This paper differs from those of previous studies in several ways. Firstly, being different from several previous

¹ In order to maintain the pegged exchange rate to the U.S. dollars, Hong-Kong introduced a huge jump in the short-run interest rate on October 27, 1997.

exchange rate volatility measures, this paper constructs a time-varying moving average standard deviation of the exchange rate volatility to measure the long-run exchange rate uncertainty. Secondly, it considers two sub-periods to investigate the effects of AFC. Finally, it constitutes a multivariate framework and incorporates a variety of newly developed methodologies (i.e., CI, GC, IR, and VD) to fully capture the short-run and long-run dynamic movements among variables considered.²

The organization of this paper is as follows: The following section specifies the models. Data are described in section III. Section IV introduces the various methodologies and discusses the empirical results. Section V concludes this study.

2. Model Specification

Traditional models, called import demand and export demand models, derived by Gotur (1985) can explain the long-run equilibrium of behavioral demand and supply functions for the volume of trade, exports or imports, in the flexible exchange rate regime. The reduced form of this model which describes the long-run relationship among real trade flows, the level real activity (real output), competitiveness (relative price) and exchange rate volatility is presented as follows:

² The strength of this paper is that it employs: (1) the Johansen (1988, 1990, and 1994) five multivariate vector autoregression (VAR) models for the maximum likelihood cointegration test for long-run equilibrium relationship (CI); and (2) the Granger contemporary causality test (GC) for precedence relation; and (4) the methodologies of impulse response (IR) and variance decomposition (VD) for dynamic short run response among variables.

$$X_t = \alpha_0 + \alpha_1 Y_t + \alpha_2 P_t + \alpha_3 \tau_t + \epsilon_t^x \quad [1]$$

$$M_t = \beta_0 + \beta_1 Y_t^* + \beta_2 P_t^* + \beta_3 \tau_t + \epsilon_t^m \quad [2]$$

where X_t and M_t denote the logarithm of real exports and imports, respectively, y_t and y_t^* are the measure of the logarithm of domestic and foreign productivity in constant prices (real term). The logarithm of relative prices are proxied by the ratio of export prices of domestic country to those of its major trading partners (p_t) and the ratio of import prices to the domestic price level (p_t^*), respectively, all denominated in domestic currency. The notation of τ_t in both equations is the measure of exchange rate volatility.

Theoretically, the demand for exports and imports rises when foreign income and domestic income increase, respectively. Thus, both α_1 and β_1 are expected to be positive. On the other hand, the relative prices in both equations will have a negative impact on the volume of trade for both exports and imports, so α_2 and β_2 are expected to carry a negative sign. However, the relationship between trade flows and exchange rate volatility has been found ambiguous. If hedging is costly or impossible, the higher exchange rate volatility raises trade risk and thus decreases the foreign trade for risk-averse traders. Whereas, De Grauwe (1988) theoretically elaborated on the phenomenon that the dominance of income effects over substitution effects can lead to a positive association of trade volume with volatility. Therefore, which direction of trade flows will be affected by the exchange rate volatility is a crucial issue to be explored (i.e., the sign of α_3 and β_3).

Assume there exists a generalized law

of one price-GLOOP (purchasing power parity). Since the world income is the summation of domestic and foreign income, the equation [1] and [2] can be rearranged as:

$$\tau_t = f(X_t, M_t, Y) \quad [3]$$

The exchange rate volatility can be measured as a proxy for uncertainty in several ways.³ Following Chowdhury (1993) and Arize and Shwiff (1998), this paper incorporates a time-varying proxy defined as τ_t , which is calculated by the moving average deviation of the growth rate of the nominal exchange rate, to measure the exchange rate volatility.⁴⁵

$$\tau_t = \left[(1/m) \sum_{i=1}^m (\log e_{t+i-1} - \log e_{t+i-2})^2 \right]^{0.5} \quad [4]$$

where $m=3$ is taken for the seasonal consideration.

5. Conclusion :

This study profoundly investigates the pre- and post-AFC effect on the relationships among exchange rate volatility, export, import and productivity for Taiwan, Korea, Malaysia and Indonesia. The overall conclusion from cointegration test proves that the AFC did not significantly affect the long-run equilibrium relationship among

³ See Pagan, Hall and Trivedi (1983), Akhtar and Hilton (1984), Chowdhury (1993), Arize (1995), Arize and Shwiff (1998), and Arize, Osang and Slottje (2000).

⁴ Koray and Lastrapes (1989) have shown that this measure captures the temporal variation in the absolute magnitude of changes in real exchange rates, and therefore exchange rate risk, over time.

⁵ There has been an argument about the preference of using real or nominal exchange rate volatility to measure exchange rate uncertainty. Thursby and Thursby (1987) and Lastrapes and Koray (1990) empirically found similar results by using both terms. In this paper, only the nominal term is used since it is more intuitive for the practical traders..

exchange rate volatility, export, import and productivity for all Asian countries considered in this paper. The results of the GC test, from pre- to post-crisis periods, show that the productivity from the relatively exogenous position became more endogenous and the exchange rate volatility became relatively exogenous for Taiwan, Korea and Indonesia; whereas, the exogeneity ordering does not change too much for Malaysia (only exchange rate volatility shift a little to precede M). The relative exogeneity of the exchange rate volatility after crisis implies that policymakers became more sensitive to the innovation of exchange rate volatility and the international traders are more likely to be risk-averse. Moreover, the IRs for the pre-crisis period demonstrate that the productivity had severe effects on export, import and itself, for all four Asia countries considered. Export's shock played a secondarily important role, which affects the volume of export and import for countries except Korea. A surprising finding from IR is that, before the crisis, the shock from exchange rate volatility did not yield any significant effect on export, import and productivity, which illustrates a similar result as from the GC test. Exchange rate volatility's shock merely affected itself in the short-run and died out gradually. However, for the post-crisis period, oscillatory paths around zero of the IRs imply the dynamic effects among variables, which assert an ambiguous finding for the direction of effect and the relative importance (exogeneity) among these variables. This ambiguous

finding after the Asian financial crisis dictates that international traders are more likely to be risk-averse and policymakers kept a more aggressive attitude toward the outcome of the turmoil since their control power over variables' shock are dampened thereafter. They kept changing their trade behaviors and shifting the economic policy decisions during the post-crisis period, and thereafter the shock from each variable to others was not firmly predicted well. Finally, the VDs in export for Taiwan, Korea and Malaysia, and in productivity for Malaysia and Indonesia did not change from pre-crisis to post-crisis era. Most of the rest FEVs in variables were decomposed into their own innovation more proportional in pre-crisis period than in post-crisis period.

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