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Reexamining the relationships between stock prices and exchange rates in ASEAN-5 using panel Granger causality approach

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ABSTRACT

We revisit the relationships between the equity market and currency market in ASEAN-5 using the panel Granger causality and panel DOLS methodologies. Our results support the "stock-oriented" hypothesis of exchange rates proposed by Branson (1983) and Frankel (1983), which states that exchange rates impact stock prices negatively via capital mobility. Meanwhile, on a per country and panel basis, the testing results using the DOLS approach match those of the short-run and long-run causal relations running from exchange rates to stock prices. These findings suggest that the monetary authorities for the ASEAN-5 should keep allowing their currency values of being determined by the economic fundamentals instead of interrupting them only in order to stimulate export growth unless a great deal of short-term speculative funds (hot money) flow into the currency markets.

1. Introduction

The 1997 Asian financial crisis has stimulated the monetary authorities of the ASEAN to undertake a crucial reform in the exchange rate regimes. The tremendous changes in exchange rates since then have raised a higher risk of international economic transaction. Meanwhile, the rapid integration of various international financial markets in this region has promoted interactive relations among macroeconomic factors (see Hatemi and Roca, 2005; Pan et al., 2007; Tai, 2007). Faced with the high integration of these financial markets, the investors of the ASEAN seemed to have more opportunities to diversify their investment portfolios internationally (see Doong et al., 2005; Lin, 2012; Tsai, 2012). In addition, such a rapid integration of capital and currency markets also has attracted much attention to academicians and practitioners since the late 1990s for these economies. However, as mentioned above, when international investors in capital markets are engaged in cross-border transactions, they are potentially exposed to foreign exchange risk. Hence, for researchers, there has been an increasing concern and interest in the dynamic relationships among the prices of financial assets.

Recently, some academic studies on financial asset prices mainly focused on stock prices and exchange rates. Two theoretical models linking equity markets and currency markets can account for this relationship. First, the "flow-oriented model" states that exchange rates influence stock prices positively based on the hypothesis that exchange rate changes influence real output and hence stock prices via international competitiveness and trade balance in general (see Dornbusch and Fischer, 1980). The empirical evidence supported the flow-oriented hypothesis of exchange rates (see Chiang et al., 2000; Fang, 2002; Phylaktis and Ravazzolo, 2005; Wongbangpo and Sharma, 2002; Wu, 2000). Second, the "stock-oriented model" states that stock prices impact exchange rates negatively, and vice versa, via (short-term) capital mobility in capital accounts (see Branson, 1983; Frankel, 1983). The empirical evidence favored the stock-oriented hypothesis of exchange rates (see Aggarwal, 1981; Gavin, 1989; Ibrahim and Aziz, 2003; Kwona and Shinb, 1999; Maysami and Koh, 2000; Soenen and Hennigar, 1988; Tai, 2007; Tsai, 2012).

Furthermore, in the short-run causality test there were several previous studies surveying unusual and unexpected movements in the equity market and the currency market. So far, the empirical findings on the causal relationship between the two variables have been mixed. One group of researches supported the result that exchange rates Granger cause stock prices (see Abdalla and Murinde, 1997; Doong et al., 2005; Hatemi and Roca, 2005; Ibrahim, 2000; Pan et al., 2007). Other studies provided some evidence that stock prices Granger cause exchange rates (see Ajayi et al., 1998; Doong et al., 2005; Granger et al., 2000; Hatemi and Roca, 2005; Lin, 2012; Pan et al., 2007). As indicated in the above literature, however, there has been a proliferation of such studies using different techniques, time periods and sample of countries.[1]

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[1] If the referenced papers are cited in this study, this represents that there exists a uni-directional or bi-directional causal relationship between exchange rates and stock prices.

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Table 1
Panel heterogeneous unit root test results.

Variables	IPS	
	Level	First difference
SP	1.5661	−11.8393**
EX	2.1636	−10.5291**

** Denote significance at the 5% level.

Table 2
Pedroni's heterogeneous panel cointegration test results.

Within-dimension	Test statistic	Between-dimension	Test statistic
Panel v-statistic	1.2777*		
Panel rho-statistic	−1.5164*	Group rho-statistic	−0.4877
Panel PP-statistic	−1.8741**	Group PP-statistic	−1.5139*
Panel ADF-statistic	−2.2811**	Group ADF-statistic	−1.7082**

Note: The null hypothesis is that the variables are not cointegrated. Under the null tests, all variables are distributed normal (0, 1).
* Indicate statistical significance at the 1% level.
** Indicate statistical significance at the 5% level.

The aim of this paper, therefore, is to reexamine the relationship between stock prices and exchange rates for the ASEAN-5 economies using panel methodology. Our paper differs from previous works in that we apply panel methods to test for unit roots, cointegration and short-run and long-run Granger causality relationships between the variables in this study. The group of novel methods has three advantages: (i) to increase the sample size and power of test, (ii) to allow for heterogeneity among countries, and (iii) to check for robustness of the empirical results by contrasting the panel short-run and long-run causality results with those from the individual estimation using a vector error correction model (VECM) for each country.

The remainder of this study is structured as follows. Section 2 describes the data and methodology used in this study. Section 3 contains empirical results and interpretations. Finally, Section 4 concludes with policy implications.

2. Data and methodology

The monthly data on the series of stock prices (SP) and exchange rates (EX) are sourced from DataStream covering the period 2008/8–2011/6 for the ASEAN-5. The ASEAN-5 countries include Indonesia, Malaysia, Philippines, Singapore and Thailand. The stock indices of the stock exchange of the ASEAN-5 are used for stock prices. The exchange rates are denominated in terms of the US dollar. The two variables surveyed here take a logarithm form.

To re-investigate the causal relationships between stock prices and exchange rates for the ASEAN-5, we propose to conduct three tests such as the panel unit-root test, the panel cointegration test and the panel causality test, and the estimation of panel dynamic ordinary least squares (DOLS). In examining the causal relationships between the two variables, the long-run and short-run causality testing methods are employed in this study.

3. Empirical results

First, this paper employs the Im, Persaran and Shin (IPS) (Im et al., 2003) panel unit-root test.[2] The results of these tests are reported in Table 1, indicating that the statistics significantly confirm that the level values of all series are non-stationary; that is, all variables are I(1). After the first differencing, all the variables are stationary at the 5% significance level.

The next step is to test whether a long-run relationship exists between them. Here, the panel cointegration tests developed by Pedroni (2000, 2004) are conducted to test the long-run cointegrating relation of stock prices with exchange rates. The test allows for heterogeneity in the intercepts and slopes of the cointegration equation. Pedroni (2000, 2004) provides seven statistics for the test of the null of no cointegration in heterogeneous panels. Pedroni's seven statistics are based on the estimated residuals from the panel cointegration regression as follows:

$$SP_{i,t} = \alpha_i + \delta_i t + \beta_i EX_{i,t} + \nu_{i,t} \quad (1)$$

where *SP* and *EX* are the natural logarithms of stock prices and exchange rates, respectively, and α_i and δ_i are the country and time fixed effects, respectively. $\nu_{i,t}$ is an error term.[3]

Table 2 summarizes the results of Pedroni's heterogeneous panel test. The cointegration tests of Pedroni indicate a significant cointegration relationship between the variables. At the 1% or 5% significance level, except for the panel group rho-statistic the other six statistics strongly reject the null hypothesis of no cointegration. Thus, we conclude that a long-run relationship exists between the stock price and the exchange rate for the ASEAN-5.

Since the two variables are cointegrated, we proceed to estimate the long-run cointegration coefficients using the panel DOLS approach (see Kao and Chiang, 2000). As shown at the bottom of Table 3, the panel parameter is −3.9555 for exchange rates. Because the cointegration coefficient is statistically significantly negative at the 5% level, this means that a 1% increase in exchange rates raises stock prices by around −3.96%. On a per country basis, exchange rates all have significantly negative impacts on stock prices at the 5% level. Our negative finding is able to support the "stock-oriented" hypothesis of exchange rates proposed by Branson (1983) and Frankel (1983), which states that exchange rates influence stock prices negatively via capital mobility in the capital accounts. More importantly, the long-run equilibrium negativity result implies that the appreciating (depreciating) currencies of the ASEAN-5 encouraged international funds searching for investment opportunity and portfolio management to flow into (out of) these economies. Therefore, the capital mobility based on portfolio balance would be really one of the crucial determinants influencing the performance and stability of the equity markets in the ASEAN-5, which is consistent with Doong et al. (2005), Lin (2012) and Tsai (2012).[4]

A two-step procedure to estimate a panel-based error correction model is employed based on Engle and Granger (1987) for the short-run and long-run relationships between the variables:

$$\Delta SP_{it} = \phi_{1i} + \sum_{L=1}^{p} \phi_{11L} \Delta SP_{it-L} + \sum_{L=1}^{p} \phi_{12L} \Delta EX_{it-L} + \kappa_1 ect_{it-1} + \varepsilon_{1it} \quad (2)$$

$$\Delta EX_{it} = \phi_{2i} + \sum_{L=1}^{p} \phi_{21L} \Delta EX_{it-L} + \sum_{L=1}^{p} \phi_{22L} \Delta SP_{it-L} + \kappa_2 ect_{it-1} + \varepsilon_{2it} \quad (3)$$

where Δ denotes first difference and *L* is the optimal lag length determined by the Schwarz Bayesian Criterion (SBC), $\phi_{ji} (i = 1, 2; j = 1, 2)$ represents the fixed country effect, ect_{it-1} is the error term, κ_j is the adjustment coefficient, and ε_j is the disturbance term. First, in the short-run analysis, the exchange rate does not Granger cause the

[2] IPS test allows for heterogeneity in these dynamics. Furthermore, slope heterogeneity is more reasonable in the case where cross country data are used. In this study, heterogeneity arises because of differences in economic conditions and degree of development in each country.

[3] Following Gavin (1989), Kwona and Shinb (1999) and Maysami and Koh (2000), the stock price served as the dependent variable. The estimation result is not significant and hence not shown here if we regress *EX* on *SP* using the panel DOLS method.

[4] The scales of trading volume in equity shares in the ASEAN-5 are small relative to those in the developed economies.