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# DYNAMIC RELATIONSHIP BETWEEN EXCHANGE RATES AND STOCK PRICES IN ASIA, 2009-2013

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**JEL Classification**

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**ABSTRACT**

There are two different and contrary models to determine the relationship between exchange rates and stock prices. The first model, “Flow-Oriented”, states that the currency or exchange rate changes affect the competitiveness of a company, which in turn affect the company's revenue or cost of funds and the subsequent impact on the company's stock price, while according to the second model, ”Stock-oriented”, which emphasizes the role of capital account transactions stated that the increase in stock return (rising stock market) will attract capital flows which in turn will increase the demand for domestic currency and cause the appreciation of exchange rate. This study was conducted to test both theories using cointegration relationships and methods of causal relationship between exchange rates and stock prices in Asia. The objects of this research are Indonesia, Singapore, Taiwan, Malaysia, China, South Korea, Japan, Hong Kong, Thailand, and India in January 2009 - December 2013 period. The data that used are secondary data from the monthly data from foreign exchange market (exchange rate) and capital markets (stock index) obtained from the publication of the foreign exchange market and the stock market through the website. Methods of data analysis consists of several stages of the data, there are stationary test, the degree of integration test, the determination of lag length, Johansen cointegration test, Granger causality test, and Vector Error Correction Model (VECM). All stages of data analysis were analyzed using the software E-views 7. From the analysis of the data, it was found that there is a cointegration relationship (long-term balance) between the exchange rate and stock prices in Asia. This indicates that between Exchange Rate and Stock Prices in Asia have a stability relationships or balance and equality movement in the long run. The second finding is that there is a causal relationship (causal) in both directions between the exchange rate and stock prices in Asia, both short term and long term. This indicates that the volatility that occurred in the exchange rate will cause volatility in stock prices.

## 1. INTRODUCTION

The movement of Exchange rate resulted in companies facing uncertainty in the financial aspects that will affect cash flow, profit, assets and liabilities of the company. According to Evelyn (2010) companies that cannot manage foreign exchange risk can suffer significant losses, and will ultimately have an impact on the value of the company and the stock price. Therefore, the company's stock price and the stock market will react to changes in the exchange rate.

Theoretically, there are two different and conflicting models in determining the relationship between exchange rate and stock prices. The first model, "Flow-Oriented" model, states that the changes of currency or exchange rate affect the competitiveness of a company, which in turn affects the company's revenue or cost of funds and the subsequent impact on the company's stock price (Dornbusch & Fischer, 1980). Meanwhile, according to the second model, "Stock-oriented" model, which emphasizes the role of capital account transactions stated that the increase in stock return (rising stock market) will attract capital flows which in turn will increase the demand for domestic currency and cause the exchange rate to appreciate (Frankel, 1993).

The results of empirical studies that were conducted recently also show inconsistency. Some researchers found that there was a long-term equilibrium relationship (cointegration) between exchange rates and stock prices that are BAPEPAM Study Team (2008); Liang, Lin and Hsu (2013); Tsagkanos & Siriopoulos (2013). While some of the results of other studies stating that there was no cointegration relationship between exchange rates and stock prices that Rahman and Udin (2009); Zhoi (2010); Yoon and Kang (2011).

There is also some inconsistency in causality test. The researchers that stated there was causality relationship between exchange rates and stock prices are Bapepam Study Team (2008); Zhoi (2010); Yoon and Kang (2011); Liang, Lin and Hsu (2013); Tsagkanos & Siriopoulos (2013). While researchers Rahman and Uddin (2009); and Zia and Rahman (2012) found that there was no causal relationship between exchange rates and stock prices.

Asia is the potential market in the world. The extent of the area and the large number of residents of some countries in Asia make Asia as an investment destination for international business people, particularly through Foreign Direct Investment (Foreign Direct Investment). Currencies are often used in international business; particularly in Asia is US Dollar (Yuono 2010).

Based on the phenomenon, theories, and inconsistency of previous studies, the researchers formulate two main issues that will be tested in this study, namely: Is there a cointegration relationship (long-term equilibrium) and causality (causal) between the exchange rate and stock prices in Asia?

## 2. LITERATURE SURVEY

### 2.1. Flow Oriented

The theory of "Flow-Oriented" that presented by Dornbusch and Fischer (1980) stated that the currency or exchange rate movements affect the competitive ability of a company internationally, will further affect the company's revenue, cost of funds, output and ultimately share price which is interpreted as a reflection of the present value of future cash flows of the company. This influence is in accordance with the theory of transaction and translation exposure where the exchange rate will have an impact on corporate transactions that are converted into units of another currency, such as exports, imports, interest income and so on (Transactions Exposure), as well as the impact on the consolidated financial statements of the parent company (Translation Exposure) (Madura, 2008).

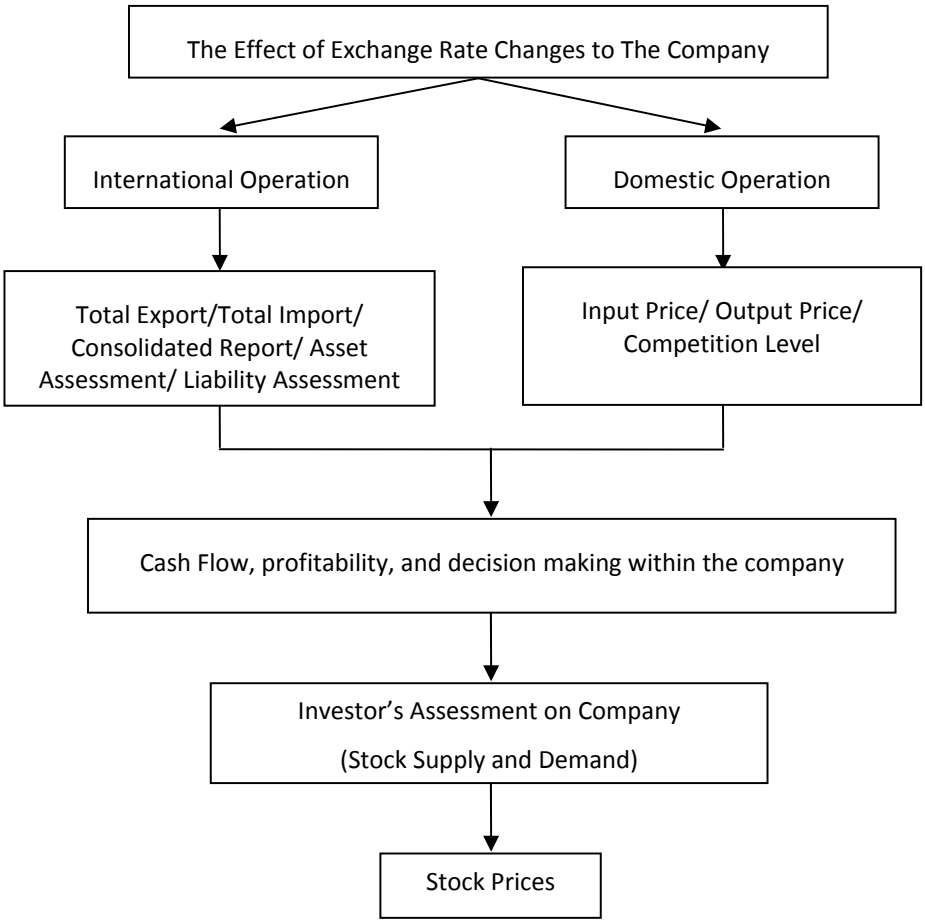
As stated in the theory of investment, according to Evelyn (2010), exchange rate movements will cause the change in book value of the company. Changes in book value will affect investors' assessment of the performance of the company's current and expected performance in the next period are reflected in the strength of demand and supply in the company's stock exchange (Market Value). Thus, changes in demand and supply of shares will result in changes in the stock price.

The depreciation of the local currency will stimulate export growth, increasing revenues, and pushed its stock price level. On the pther hand, the company which is dominated by imports, the depreciation of the local currency resulted in increased production costs which impact on the company's earnings and its stock price decline (Yucel and Kurt, 2003).

According to Adler and Dumas (1984) the company which is the overall operations are in the domestic sphere is also influenced by the exchange rate. The influence lies in the company input and output price changes due to changes in macro-economic conditions that are caused by changes in the exchange rate. In addition, the change in the exchange rate of the local currency against foreign currencies will also affect the company's competitive position in the country against foreign competitors.

To summarize in the scheme, then the effect of exchange rates on stock prices can be shown in Figure 1 below.

**Illustration 1:The Effect Of Exchange Rate to Stock Prices Scheme**



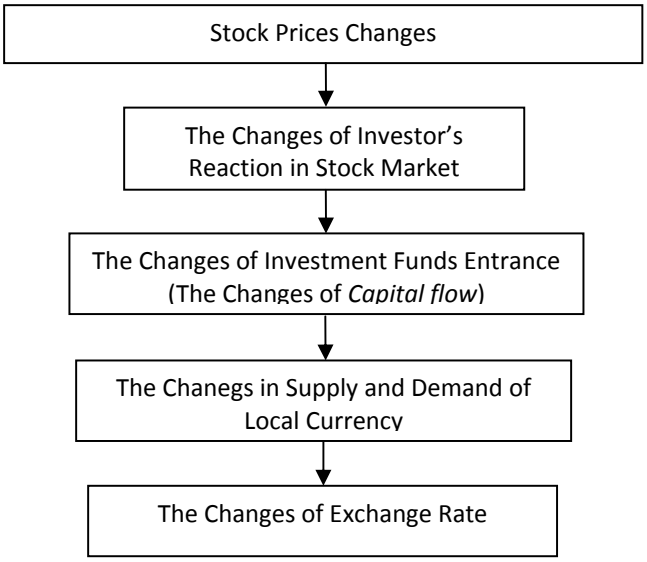

Sources: Dornbusch & Fischer (1980), Ball & Brown (1988), Yucel & Kurt, (2003), Evelyn (2010)

## 2.2. Stock-Oriented

The theory of "Stock-Oriented" presented by Frankel (1993) which is emphasizes the role of capital account transactions. The increase in stock return (rising stock market) will attract capital flows which in turn will increase the demand of the domestic currency and cause the exchange rate to appreciate.

Price movements of stocks, bonds, and so on in the stock market of a country are also caused by the perception of investors on capital market conditions. This perception will ultimately affect investment funds coming into the country, thus affecting the economic situation of the country, including the exchange rate of the country.

**Illustration 2: The Effect of Stock Prices to Exchange Rate Scheme**




Source: Frankel (1993)

This model is in accordance with the portfolio balance theory which states that if the domestic stock price rises, will persuade investors to buy more domestic assets by selling foreign assets in order to obtain local currency. Increased demand for domestic currency will lead to an appreciation of the domestic currency. On the other hand, if the domestic asset prices rise, it will result in the growth of wealth, which also will increase the demand for money by investors. More foreign capital will be attracted in this situation that will increase foreign demand for domestic currency and the final result will be an appreciation of the local currency.

The Relations of exchange rate and stock prices can also be viewed from the link between currency exchange and stock exchanges. This relationship is in form of short-term relationships, where investors react quickly to changes in exchange rates and stock prices. The exchange rate which is traded in currency exchange will lead to substitution effects with shares traded on stock exchanges. For example, when the Rupiah depreciated against the US Dollar, investors tend to invest in the US Dollar because it is more profitable. With lower rates of return, the investment in the stock exchange becomes less attractive; otherwise they will transfer funds to the currency exchange (Anis, 2013).

## 3. DATA AND METHODOLOGY

The data that were used are secondary data from the monthly data from the foreign exchange market (exchange rate) and capital markets (stock index) in Indonesia, Singapore, Taiwan, Malaysia, China, South Korea, Japan, Hong Kong, Thailand, and India, from January 2009 - December 2013 period.

This data were obtained from the publication of the foreign exchange market and the stock market through the web site http://www.oanda.com/currency/historical-rates/ and www.finace.yahoo.com.

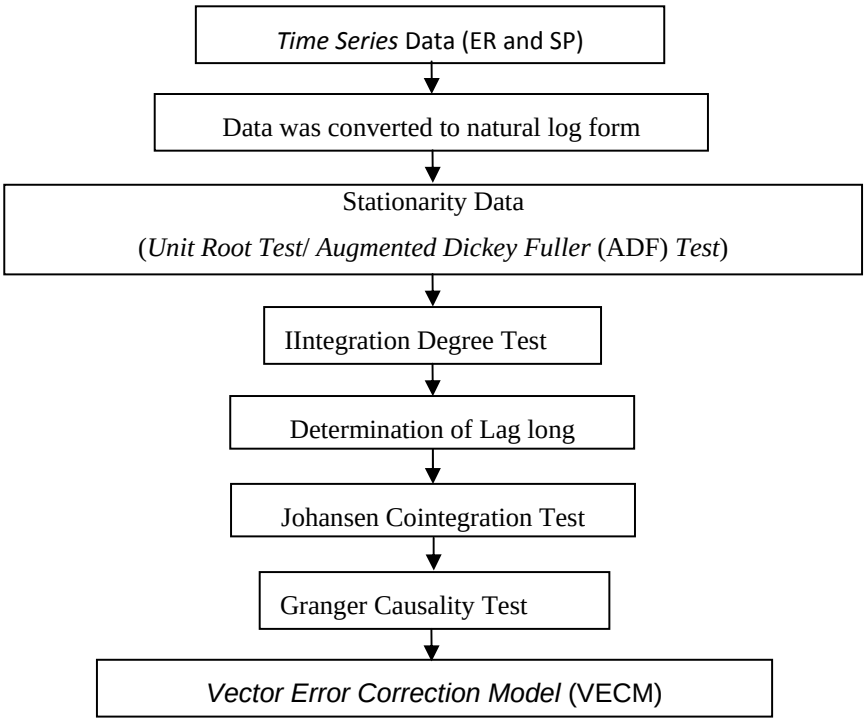
The variables in this study are Exchange Rate (X1) which is proxied by the monthly data exchange rates of each country against US Dollar and Stock Price (X2) which is proxied by the closing price of monthly data for stock indices used in each country.

The hypotheses that will be tested are:

a. Hypothesis 1: There is a cointegration relationship between the exchange rate and stock prices in Asia.
b. Hypothesis 2: There is a causal relationship both short-term and long-term between the exchange rate and stock prices in Asia.

The data analysis methods in this study consist of several stages. All stages of data analysis were performed by using a software tool E-views 7. In general the stages of data analysis in this study can be shown in the following scheme:

**Illustration 3:Data Analysis Methods Processes Scheme**




Source: Data Processed, 2013

One method that is widely used to test stationary is through the unit root test. This is a test that is popular which was developed by David Dickey and Wayne Fuller (1981) called the Augmented Dickey-Fuller (ADF) test. The equation of Augmented Dickey-Fuller (ADF) test is obtained as follows:

$$\Delta X_t = \beta_1 + \beta_2 t + \delta X_{t-1} + \alpha_i \sum_{i=1}^{m} \Delta X_{t-1} + \varepsilon_t$$

Where $\Delta X_t$ is a variable in t period, t is a time trend, *β1*, *β2* are constants, δ is a autoregressive constant, α1 is the coefficient, m is the optimum lag length, and εt is the residual.

If a non stationary time series data in zero order, I (0), then the stationary data can be searched through the next order to obtain stationary in level-n (first difference), I (1), or the second difference, I (2), and so on. In other words, it is necessary to test the degree of integration. Test the degree of integration is intended to look at the degree or order differentiation into how the data were observed to be stationary.

The next step, the determination of the optimal lag length to see information criteria (criterion lag length), as stated by Ajija, et al (2011), namely the Schwarz Information Criterion (SIC). The Equation of Schwarz Information Criterion (SIC) is shown as follows:

$$SIC\,(k) = T \ln\left(\frac{SSR\,(k)}{T}\right) + n \ln\,(T)$$

Where *T* is the number of observations, *k* is the length of the lag, the *SSR* is the sum square residual, and *n* is the number of estimated parameters.

Then proceed with first hypothesis testing which is to test the cointegration relationship between exchange rates and stock prices by applying Johansen's Cointegration Test. The equation is as follows:

$$\Delta X_t = C + \sum_{i=1}^{m} \Gamma \Delta X_{t-1} + \Pi X_{t-1} + \varepsilon_t$$

Where *C* is a constant, *Γ* is the coefficient, *m* is the length of the lag, and *Π* is the coefficient matrix dimensions.

Granger's Causality is used to examine the relationship of causality between the two variables (hypothesis 2). The predictive power from the previous information may indicate a causal relationship between the y and z in the long term. Use of the amount of lag (delay effect) is recommended in a longer time, according to the allegations of causality. Granger's Causality test equation can be expressed as follows:

$$\Delta X1_t = \beta_0 + \sum_{i=1}^{m} \beta_{1i} \Delta X1_{t-1} + \sum_{i=1}^{m} \beta_{2i} \Delta X2_{t-1} + \varepsilon_t$$

Where $\beta_0$ is a constant vector, $\beta_1$, $\beta_2$ is the coefficient matrix.

VECM method can explain the short-term and long-term relationship. If the variable is cointegrated in the short-term, the distribution from the long-term balance to the changes in the dependent variable moves towards long-term equilibrium.

Terma parameterized error correction z is a parameter adjustment in which he measured the distribution of short-term from long-term equilibrium. In the short term, the variable may be spread from one to another and cause an imbalance in the system. The VECM equation in this study is as follows:

$$\Delta X1_t = \beta_0 + \sum_{i=1}^{m} \beta_{1i} \Delta X1_{t-1} + \sum_{i=1}^{m} \beta_{2i} \Delta X2_{t-1} + \lambda_1 z_{t-1} + \varepsilon_{2t}$$

Where $\lambda_1$ is the loading matrix and $Z_{t-1}$ is a cointegration vector (error correction in the form of cointegration equation).

## 4. EMPIRICAL FINDINGS

In this study, the hypothesis 1 aims to determine the existence of a cointegration relationship between the exchange rate and stock prices in Asia from January 2009 - December 2013. Testing was conducted using Johansen's Cointegration Test with two categories: Trace Statistics and Maximum Eigenvalue Statistic. The test results are presented in the following table:

**Table 1: Johansen's Cointegration Test Result (Trace Statistic)**

| Null Hipotesis | Eigenvalue | Trace Statistic | 5% Critical Value | Prob. |
|---|---|---|---|---|
| **r = 0** | 0.044354 | 31.39911 | 20.26184 | 0.0010*** |
| **r ≤ 1** | 0.009672 | 5.539667 | 9.164546 | 0.2294 |

Information: Signifcant at level 1%

Sourcer: Data processed, 2014 (attachment 8)

**Table 2: Johansen's Cointegratin Test Result (Maximum Eigenvalue Statistic)**

| Null Hipotesis | Eigenvalue | Max-Eigen Statistic | 5% Critical Value | Prob. |
|---|---|---|---|---|
| **r = 0** | 0.044354 | 25.85944 | 15.89210 | 0.0010*** |
| **r ≤ 1** | 0.009672 | 5.539667 | 9.164546 | 0.2294 |

Information: *** Significant at significance level 1%

Source: Data processed, 2014 (attatchment 8)

Based on Johansen's Cointegration Test testing with trace category statistic and Maximum Eigenvalue Statistic in Table 1 and Table 2 was found that the probability value of 0.0010. These results indicate that the null hypothesis, which is stated there is no cointegration relationship between exchange rates and stock prices, is rejected and accept the alternative hypothesis as the probability value is less than 0.05 (0.0010 <0.05). These results prove that there is a cointegration relationship (long-term balance) between the exchange rate (ER) and the stock price (SP) in Asia with significance level at 1%.

This means that there is a relationship of balance and similarity movement in the long term between the exchange rate and stock prices in Asia.

In other words, in every period of short-term, the exchange rate and stock prices variable tend to be mutually adjust to achieve its long-term equilibrium.

The changes in the exchange rate will always be followed by changes in stock prices. For example, when the exchange rate Singapore Dollar (SGD) to US Dollar changed, then the Singapore Stock Index (STI) will be amended to achieve the long-term equilibrium.

**Table 3:Long Term Coefficient Based on Vector Error Correction Estimates**

| Dependent Variable (Stock Price) | Independent Variable | | |
|---|---|---|---|
| | Stock Price (SP) | Exchange Rate (ER) | Constant (C) |
| **Coefisien** | 1.000 | -0.025354 | -8.263499 |
| **t-statistic** | - | -0.20453 | - |

Source: Data Processed, 2014

Stock Price = -8.263499 - 0.025354 Exchange Rate$_{it}$

Table 3 and equation above shows that the constant value is -8.263499, meaning that when the exchange rate is constant, then the period of long-term stock price will decline by 8.263499 points. It was also found that the coefficient of the exchange rate is equal -0.025354, with a t-statistic of -0.20453. So it can be concluded that there is a negative long-term balance between the exchange rate and stock prices, meaning that the increase in the exchange rate of 1 point, then the long-term period will lower the share price of 0.025354 points.

This finding is consistent with research conducted by Obeen, et al (2007), the BAPEPAM Study Team (2008), Tsuji (2011), Chien (2012), liang, et al (2013) and Tsangkanos & Siriopoulos (2013), which states that there is a cointegration relationship between exchange rates and stock prices. However, these findings are contradict with the research from Morales (2007), Rahman & Uddin (2009), Zhoi (2010), Yoon and Kang (2011), as well as Zia and Rahman (2012).

Hypothesis 2 in this study aims to determine the causal relationship between the exchange rate and stock prices in Asia from January 2009 - December 2013. Granger Causality Test results are shown in the following table.

**Table 4: Granger Causality Test Result**

| Null Hypothesis | F-Statistic | Prob. |
|---|---|---|
| SP does not Granger Cause ER | 3.45780 | 0.0322** |
| ER does not Granger Cause SP | 32.7152 | 0.0000*** |

Information: *** Significant at level 1%
** Significant at level 5%

Source: Data Processed, 2014

Based on the table 3 above it can be seen that the null hypothesis states that stock price (SP) does not cause a change in the Exchange Rate (ER) is rejected and accept the alternative hypothesis. This is because the first null hypothesis probability value is smaller than 5% (0.0322 <0.05). Thus, it is proved that stock price (SP) causes a change in the Exchange Rate (ER) with a significance level of 5%. Table 3 above also shows that the null hypothesis which states Exchange Rate (ER) does not cause a change in the stock price (SP) is also rejected and accept the alternative hypothesis. This decision making is based on the probability value of the null hypothesis is smaller than 5%, even less than 1% (0.000 < 0,01). This proves that the Exchange Rate (ER) causes a change in the stock price (SP) is significant at the 1% significance level.

These results indicate that the variations that occur in the exchange rate will cause a variation in stock prices, and vice versa, variation that occurs in the stock price will lead to variations in the exchange rate. If the exchange rate of the local currency strengthened, the interest from investors to invest in Asian stock markets will be rising and the Asian stock indexes will be increasing. The reason is the price of the local currency is lower than the foreign currency so that investors require little capital to invest in the stock market of Asia.

This finding strengthen the findings from previous studies conducted by Obeen, et al (2007), the BAPEPAM Study Team (2008), Tsuji (2011), Chien (2012), liang, et al (2013) and Tsangkanos & Siriopoulos (2013) which states that there is a causal relationship (causal) between exchange rates and stock prices. However, this research is contradictory with the findings from Rahman & Uddin (2009), as well as Zia and Rahman (2012) which states that there is no causal relationship between exchange rates and stock prices.

## 5. CONCLUSION

Based on the results of research and discussion that has been described above, it can be take some conclusions as follows:

There is a cointegration relationship between the exchange rate and stock prices in Asia. This indicates that the exchange rate and stock prices in Asia have a relationship of balance and equality movement in the long run. So that in each period the short term, variable exchange rate and stock prices tend to be mutually adjust to achieve its long-term equilibrium.

There is a two-way of causal relationship between the exchange rate and stock prices in Asia, both short term and long term. This indicates that the variations that occur in the exchange rate will cause a variation in stock prices, and vice versa, variation that occurs in the stock price will lead to variations in the exchange rate. If the exchange rate of the local currency strengthened, the interest from investors to invest in Asian stock markets will be rising and the Asian stock indexes will be increasing.

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