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## An Empirical Investigation of International Fisher Effect on 10 Asean Countries

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**Abstract:** In this study the empirical evidence of International Fisher Effect is investigated among ASEAN member countries and assuming Malaysia as the home country. In general the results of this study indicated that exchange rates movements do not follow the International Fisher Effect theory and nominal interest rate differentials cannot completely offset the currency value changes among ASEAN countries in the long run except the fact that this theory is partially held in Malaysia-Indonesia case for the surveyed period.

**Key words:** International fisher effect theory, ASEAN, purchasing power parity theory, fisher effect theory

### INTRODUCTION

Global growth has been derived significantly from fast increases in trade and investment among countries in recent decades. In addition, the way the trade is done has been altered because of emerging markets advents specially China, expansion in services tradability and change in the type of products which are traded like shares. Although the recent crises have had undesirable impact on this growing trend, factors such as emerging markets, income increase, taste variety increase and world trade integration have stimulated the rapid growth of the level of trade internationally. This can be seen in quadruple proliferation of goods traded between 1980 and 2008. However, this increase was not similar among developing and developed countries. Many developing countries in Asia regarded as emerging markets have been the fastest growing markets in supply of goods and services while not much increase has been seen in African, South American and central European countries. Yet the developed countries have been maintained to be the pioneers in trade and investment development. In recent years the emerging markets in Asia have been targeted as one of the main investment purposes as well as multinationals future investment plans. This will be more considerable because of the increase in regional liberalization and coordination among Asian countries such as ASEAN countries (Association of Southeast Asian Nations) (BIS, 2011).

Although, ASEAN countries have the prominent potentials for investment and trade purposes, there have been fluctuations in growth percentage and the

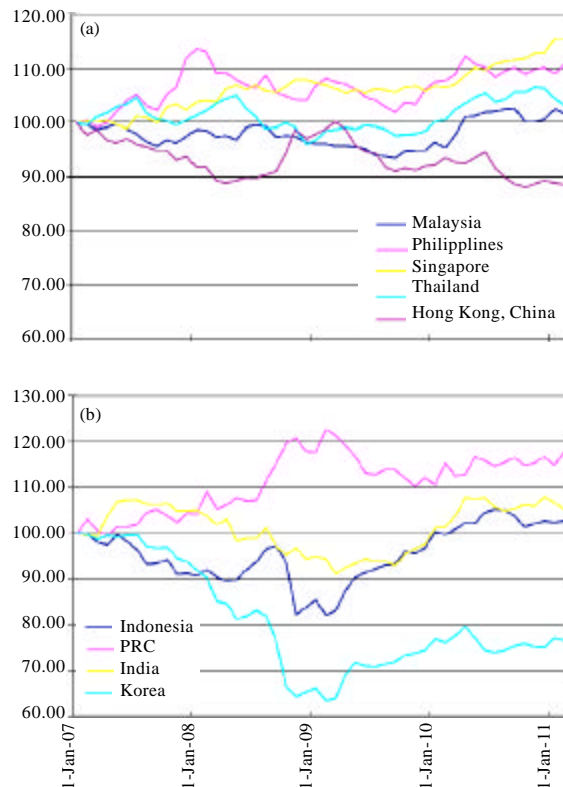


Fig. 1(a-b): Real exchange rate movements from, (a) 2002-2007 and (b) 2000-2007 = 100

real exchange rate movements in recent years. Above graphs (Fig. 1a-b) show real exchange rate movements in some of these countries from 2000-2007.

Therefore, it is important to forecast the changes in exchange rate in ASEAN members for investment and trade purposes because without this estimation there would be significant losses to the investment and trade in these countries despite the great potentials and opportunities in them (Grenville, 2012).

One of the theories which can be used for exchange rate appreciation or depreciation prediction which is widely used is International Fisher Effect (IFE). This theory illustrates the relationship between exchange, interest and inflation rates of the countries. Based on IFE, the future amount of spot exchange rate can be estimated by the nominal interest rate differential between two countries. The real interest rate is considered to be equal in all countries for more simplification. So, the nominal interest rate differential is affected by the inflation rate differential. Then, the inflation rate differential will affect the future spot exchange rate based on IFE. This study aims the IFE validity via exchange rate movements for ten ASEAN countries currencies relative to Malaysian currency within a period of ten years, from 2002 to 2012.

## RESEARCH BACKGROUND

**Overview of ASEAN:** ASEAN was established in 8 August 1967 to form an economic, political organization of Southeast Asian countries including Indonesia, Malaysia, the Philippines, Singapore and Thailand. From that time onwards, five more countries (Brunei, Myanmar, Cambodia, Laos and Vietnam) were added to this membership. The motivations of making this organization are economic growth enhancement, cultural elaboration, safeguarding the stability in the region and talking about differences in a calm and peaceful manner. If ASEAN was considered as a unique commodity, it would have the eighth grade among the largest economies in the world (EC. Europa.eu, 2010).

However, ASEAN members have faced some challenges for having a proliferated trade. The main challenge is the competitive competitions which are imposed by China and India in the market either in the region or in the other parts of the world. ASEAN countries ought to provide an appropriate political environment to improve their competition and competitive advantages. This environment must offer more profitability and productivity for ASEAN members so as to fit themselves with the changes and needs of the markets. These challenges will be mitigated by initiating liberalization in trade among ASEAN members via offering facilities in transportation, logistics, policies and the proper and enhanced usage of information technology in trade (Intal, 2010).

## LITERATURE REVIEW

**Empirical evidence:** The analysis of International Fisher Effect has offered different results for validity of this theory. On one hand, some researchers have shown that IFE can be applicable empirically (Hill, 2004) in declared that IFE exists in the long run while it does not hold in the short run. Moreover, in the long run inflation rate differential can be used to predict exchange rate movement, however, there is no exact relationship between them (Hakkio, 1986). In addition, currency realignment in European Monetary System is able to have significant influence on maintaining Purchasing Power Parity theory among European countries (Cheung *et al.*, 1995). Aliber and Stickney (1975) stated that IFE can be useful in a long run. This is supported by Kane and Rosenthal (1982) in about the validity of International Fisher Effect in long run (Madura, 2012).

On the other hand, Cumby and Obstfeld (1981) illustrated that IFE is not an appropriate indicator for currency movements in short time horizon. The profit of more than a half of the transactions resulted from buying high interest future contracts with discount and selling low interest future contracts with premium proves the fact that IFE may not come true in reality (Thomas, 1985). Others including Adler and Lehmann (1983) as well as Adler and Dumas (1983) have come to conclusion about lacking significant results for IFE to hold. Also, Madura and Nosari (1984) designed an investment strategy which refuted IFE in practice because of the profit this strategy gained by borrowing from low interest rate currency and investing in high interest rate currency.

However, in one study to test IFE, this theory was valid for Japan while there was no significant relationship between nominal interest rate differentials to offset the exchange rate movements in other countries. These mismatches clarify that other factors such as foreign exchange supply and demand, balance of payments problems, rising inflation, interest rate, national income, monetary policy, expectations and speculations have significant influences on currency movements as well (Khalwaty, 2000).

## RESEARCH FRAMEWORK AND HYPOTHESIS

**Theoretical framework:** The combination of Fisher Effect (FE) and Purchasing Power Parity (PPP) theories will make the International Fisher Effect (IFE). First, FE is used to measure the expected inflation rates for a certain country. Then, exchange rate movement is estimated by using PPP theory.

So, the equation presenting IFE is derived as follows:

$$\text{Fisher effect equation} = \frac{(1+r_{ht})}{(1+r_{ft})} = \frac{(1+i_{ht})}{(1+i_{ft})}$$

$$\text{Purchasing power parity equation } e_f = \frac{(i_{ht}-i_{ft})}{(1+i_{ft})}$$

$$\text{Purchasing power parity equation } e_f = \frac{(r_{ht}-r_{ft})}{(1+r_{ft})} \approx r_{ht}-r_{ft} \quad (1)$$

where,  $e_f$  is foreign currency percentage change,  $r_{ht}$  is home country nominal interest rate,  $r_{ft}$  is foreign country nominal interest rate,  $i_{ht}$  is home country inflation rate,  $i_{ft}$  is foreign country inflation rate.

Laconically speaking, IFE suggests that future spot exchange rates between two countries can be forecasted by the difference between their nominal interest rates. Based on this theory, investors will gain the same return on their investment in a foreign country with higher nominal interest rate in comparison to their home country. This is because of the foreign exchange rate depreciation occurred due to higher nominal interest rate suggested by IFE.

**Hypothesis:** The null hypothesis based on IFE hypothesizes the fact that when there is no difference in nominal interest rates between two countries, their exchange rates should not have any alternations. Consequently, the nominal interest rate differentials would be exactly the same as the appreciation or depreciation of the currency for the country with higher nominal interest rate.

### MATERIALS AND METHODS

This study illustrates the theory of International Fisher Effect and also describes the description of this theory as comprehensive as possible according to the purpose of this research. Moreover, a general outline of IFE which was depicted can clarify the method employed in statistical analysis.

A statistical test will be used to check the relationship between nominal interest rates and exchange rate movements. Nominal interest rates of ASEAN members in a period of past ten years will be found through the data bases. Then, the nominal interest rate differentials relative to Malaysia as the home country will be measured in this period. Consequently, exchange rate differentials of the other nine countries relative to Malaysia will be measured in the same period of time. These figures will be analyzed by employing a Regression

model to identify if IFE holds or not. The regression method which will be applied is Ordinary Least Squares (Coppock and Poitras, 2000). OLS will show if the estimates are the same as what happened in reality. To support, this regression examines if exchange rate changes can be forecasted by using nominal interest rate differentials among ASEAN countries and assuming Malaysia as the home country in the period of time chosen.

So, this research investigates the relationship between annual data of nominal interest rates of the ASEAN countries exchange rates from 2002 to 2012. The exchange rates chosen here are floating rates because this study has assumed that exchange rates fluctuate without government's intervention.

The countries which are scrutinized are ASEAN countries including Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam. The home country chosen is Malaysia, therefore the nominal interest rate differentials and exchange rate changes will be measured relative to Malaysian nominal interest rate and Malaysian currency (Ringgit Malaysia, RM), respectively.

**Regression model:** Based on the EMH theory, exchange rate is moved based on the information effect on it. The foreign currency expected future value at time t+1 with the available information at time t can be shown as:

$$E(e_{t+1}, \Phi_t) \quad (2)$$

So, the future spot rate at time t+1 should be equal to Eq. 2:

$$e_{t+1} = E(e_{t+1}, \Phi_t) \quad (3)$$

In case of a discrepancy in the amount of the real future spot rate and expected future spot rate,  $\mu_{t+1}$  is considered to show the error which may affect Eq. 2 as follows:

$$e_{t+1} = E(e_{t+1}, \Phi_t) + \mu_{t+1} \quad (4)$$

By referring to the concept of International Fisher Effect,  $\Phi_t$  can be replaced by nominal interest rate differentials.

$$e_{t+1} = (r_{ht}-r_{ft}) + \mu_{t+1} \quad (5)$$

The following equation shows the regression model:

$$e_{t+1} = \alpha + \beta (r_{ht}-r_{ft}) + \mu_{t+1} \quad (6)$$

According to the regression model used, the null hypothesis would be true if:

- $H_0: \alpha = 0, \beta = 1$

The null hypothesis estimates that Alfa must equal to zero. This is inferred that exchange rates ought to be constant for two countries provided that they have similar nominal interest rates. Null hypothesis pinpointed amount of 1 for  $\beta$ . This implies that the same percentage change in nominal interest rates have to occur for exchange rate between the home country and foreign country.

**Data:** The data is collected from the World Bank database for all ASEAN members. This data includes the nominal interest rates, exchange rates and inflation rates for 10 countries in ASEAN community from 2002 until 2012. All the exchange rates are based on US dollar. Having Malaysia as the home country in this research, these currencies values are divided by the Malaysian currency (RM) per USD for each year and then the percentage change of each country currencies are measured relative to RM from 2001 until 2012. In addition, the nominal interest rate differentials are calculated with respect to Malaysia nominal interest rates for the chosen period of time. These nominal interest rates should reflect the amount of depreciation or appreciation of the ASEAN countries currencies relative to RM as proposed by International Fisher Effect Theory.

**RESULTS AND DATA ANALYSIS**

This study aimed to investigate the empirical validity of International Fisher Effect among ASEAN members in a period of ten years. This was done by analyzing the relationship of nominal interest rate differentials and exchange rate changes between each country and Malaysia as considered as the home country in the long run. Regression method was used for this analysis and in the following the results are presented. The null hypothesis was considered to be  $\alpha = 0$  and  $\beta = 1$  for the linear regression model. The results of the analysis are summarized over the Table 1-9.

The extremely low R-squared for some cases has led to rejection of the IFE to forecast exchange rate movements. The lowest R-squared was for Malaysia-Vietnam case with only 0.2% for the overall performance of the model. Then, Malaysia-Thailand regression resulted to solely 2.6% R-squared amount for empirical testing of IFE in the long run. Malaysia-Myanmar with 3% R-squared also illustrated that IFE cannot predict Myanmar currency changes. Having

Table 1: Regression output for Malaysia-Brunei

Variables	Values
R-squared	0.122
Constant $\alpha$	-2.005
Constant $\beta$	-0.528
p-value at 5% significance level for $\alpha$	0.109
p-value at 5% significance level for $\beta$	0.323

Table 2: Regression output for Malaysia-Cambodia

Variables	Values
R-squared	0.052
Constant $\alpha$	0.106
Constant $\beta$	0.175
p-value at 5% significance level for $\alpha$	0.888
p-value at 5% significance level for $\beta$	0.525

Table 3: Regression output for Malaysia-Indonesia

Variables	Values
R-squared	0.341
Constant $\alpha$	-1.258
Constant $\beta$	0.151
p-value at 5% significance level for $\alpha$	0.025
p-value at 5% significance level for $\beta$	0.076

Table 4: Regression output for Malaysia-Laos

Variables	Values
R-squared	0.230
Constant $\alpha$	1.008
Constant $\beta$	-0.177
p-value at 5% significance level for $\alpha$	0.147
p-value at 5% significance level for $\beta$	0.161

Table 5: Regression output for Malaysia-Myanmar

Variables	Values
R-squared	0.030
Constant $\alpha$	-0.040
Constant $\beta$	-0.114
p-value at 5% significance level for $\alpha$	0.971
p-value at 5% significance level for $\beta$	0.656

Table 6: Regression output for Malaysia-Philippines

Variables	Values
R-squared	0.067
Constant $\alpha$	-0.216
Constant $\beta$	-0.121
p-value at 5% significance level for $\alpha$	0.668
p-value at 5% significance level for $\beta$	0.500

Table 7: Regression output for Malaysia-Singapore

Variables	Values
R-squared	0.406
Constant $\alpha$	-2.392
Constant $\beta$	-0.938
p-value at 5% significance level for $\alpha$	0.105
p-value at 5% significance level for $\beta$	0.124

Table 8: Regression output for Malaysia-Thailand

Variables	Values
R-squared	0.026
Constant $\alpha$	0.094
Constant $\beta$	-0.114
p-value at 5% significance level for $\alpha$	0.868
p-value at 5% significance level for $\beta$	0.703

R-squared of just above 5% for Malaysia-Cambodia is an evidence for weak performance of the linear regression

Table 9: Regression output for Malaysia-Vietnam

Variables	Values
R-squared	0.002
Constant $\alpha$	-1.499
Constant $\beta$	0.039
p-value at 5% significance level for $\alpha$	0.340
p-value at 5% significance level for $\beta$	0.918

model used for this case. Malaysia-Philippines R-squared had 6.7% of the total changes to the Philippines currency caused by nominal interest rate differentials between this country and Malaysia which is not acceptable to forecast this country's currency. Besides, for all of these pairs the null hypothesis was rejected due to not having acceptable amounts for  $\alpha$  and  $\beta$  in the 5% significance zone.

However, R-squared showed higher amounts of 12.2, 23 and 40.6% for Malaysia-Brunei, Malaysia-Laos and Malaysia-Singapore, respectively. Though, the null hypothesis for these paired were rejected as well and the amounts for the constant and coefficient of the regression model for all of them did not fall in the 5% significance level.

On the contrary, Malaysia-Indonesia was the only pair which had a different story. R-squared displayed for this regression was 34.1%. Furthermore,  $\alpha = 1.258$  was significant in 5% acceptance level. This means that if there was no nominal interest rate differential between Malaysia and Indonesia, the Indonesian rupiah would be depreciated by 1.258%. Moreover,  $\beta = 0.151$  could be considered acceptable in 10% significance level. This renders the fact that with each 1% nominal interest rate differentials between Malaysia and Indonesia, Indonesian currency would be appreciated by 0.151% relative to Malaysian ringgit. Ultimately, International Fisher Effect can be partially accepted for Malaysia-Indonesia case empirically. However, this result shows that exchange rate movements of IDN rupiah/MR was not completely offset by the discrepancy in nominal interest rates between these two countries.

The above mentioned results exhibit the fact that Malaysian investors can make profit or losses in investing in other ASEAN members in comparison to local investment purposes. From these results, it is concluded that there are other factors such as political risk, currency risk, taxes, transaction costs and psychological barriers which have meaningful influences on the changes to these countries future currency spot rates.

In addition, it is difficult to make a decision about the changes to nominal interest rates changes. These changes can be because of either real interest rate differentials or inflation rates expectations. Any alternation of these two components of nominal interest rate has an opposite result. For instance, an increase in nominal interest rate in Indonesia relative to Malaysia

because of the higher real interest rate causes Indonesian rupiah to appreciate while if the rise in nominal interest rate in Indonesia is due to high inflation rate expectations relative to Malaysia leads to depreciation of rupiah per each Malaysian ringgit. It is seen that IFE is solely valid partially for Malaysia-Indonesia; however, with further investigations this validation can be inapplicable in other time horizons.

By having a concise glimpse over the aforementioned statistical results, International Fisher Effect appears to be valid for some countries pairs and only for some time horizons selected. Hence, the nominal interest rate differentials would not be applicable in predicting the changes in the relative future currency changes of countries.

## DISCUSSION AND RECOMMENDATIONS

**Summary of major findings:** The chief purpose of this study is to check the empirical evidence of International Fisher Effect among ASEAN countries from 2002 to 2012. According to the statistical method used as well as revealed results, this theory showed partial significant relationship between nominal interest rate differentials and the exchange rate change only for Malaysia-Indonesia case, whereas the difference in nominal interest rate for other eight ASEAN members with that of Malaysia did not offset the changes of their exchange rates relative to Malaysian Ringgit.

**Implications of study:** The findings of this study help investors to understand exchange rate behaviors via International Fisher Effect theory. Accordingly, the results clearly underscore that Malaysian investors require conducting in-depth practical scrutiny regarding other influential impacts on exchange rate movements, except nominal interest rates and inflation rates differentials, while deciding to invest in other ASEAN countries.

**Limitations of study:** IFE has some limitations which must be taken into attention. First, It is empirically proved that the difference between real interest rate and nominal interest rate in every country does not really measures expected inflation rate in that country. Base on this, Fisher Effect can be refuted. Then, inflation is not the only element which causes exchange rate movement in a particular country. Other factors such as government control and level of income are significantly influential in this regard. So, PPP theory is not practically useful in this occasion. Ultimately, when both components of IFE have these limitations, there would be more barriers for employing IFE in practice.

**Suggestions for future studies:** Although there are some problems in the methodology employed here, IFE is tested in a specific geographical area called ASEAN. So there is a possibility that the results will be only true for this especially chosen zone. This problem can be mitigated if this theory is tested in the other parts of the world. Another problem is that Malaysia is selected to be the home country and hence the comparison is done between other ASEAN countries relative to Malaysia. This causes that whatever analysed here become particularly applicable for Malaysia. One can analyse this theory by having other ASEAN countries as home country to settle this problem, however, these results can also be applicable for the surveyed country. The last factor which is an obstacle to the validity of the methodology is the time frame chosen. The results will show if IFE will hold in this time period or not. This problem will be solved by choosing other periods and reanalysing the data, but what will be measured here can be used to show the validity of IFE theory only between 2002 and 2012. Therefore the results will vary by choosing different periods of time for ASEAN countries. Notwithstanding all the suggested ideas, the authors are going to conduct a comprehensive scrutiny regarding the empirical evidence of this theory throughout nearly all the countries in the world, considering Malaysia as the home country over the previous decade commencing from 2000.

### CONCLUSION

By meticulously considering the results and statistical outcomes, it is evident that one cannot simply rely on a few macro-economical figures to predict the exchange rates fluctuations among countries, definitely in ASEAN region. The impact of the other factors; such as currency risks, transaction costs, psychological barriers, political risks and alike must be weighted as well as nominal interest rate differentials to offer a more realistic anticipation of foreign exchange rate movements in the long run.

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