An Empirical Investigation of the International Fisher Effect: Mexican Peso and United States Dollar

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Abstract: The main purpose of this study is to examine if the International Fisher Effect holds between Mexico and the United States for the period from Q1: 2005 through Q3: 2016. The results of the test indicate a significant relationship between the interest rate differentials and the changes in the currency value between the two countries. The finding of this study is consistent with some of the earlier research while signifying the importance of other variables in improving the explanatory power of the independent variable.

Keywords: International fisher effect.

1. Introduction

Numerous studies have sought to explain changes in exchange rates. Some of these studies have focused on interest rate differential and inflation as possible explanatory variables while others have identified a number of other macroeconomic factors to predict the exchange rate. Despite the plethora of studies that have been completed, the determinants of the currency values vary depending on time period, country under study, and data points captured. This study aims to shed more light on this heavily scrutinized subject by testing the International Fisher Effect (IFE) for the Mexican Peso relative to the U.S. Dollar in recent years. The Literature Review of the paper is presented in part 2, followed by the Methodology and Data in Part 3. The Empirical Result of the study is presented in Part 4. Finally, Part 5 offers the conclusion of the study.

2. Literature Review

A study conducted by Fama in 1975 explores the relationship between nominal interest rates and inflation rates, looking specifically at the one to six-month interest rates on bonds between 1953 and 1971. The study found the market to be efficient and that changes in the nominal rate of interest were affected by changes in purchasing power (Fama, 1975). These results support the Fisher Effect. Conversely, Mishkin's 1992 study of U.S. Treasury Bills for the period February 1964 to December 1986 found the Fisher Effect did not hold in the short-run, but the study did find evidence to support that the Fisher Effect holds in the long-term (Mishkin, 1991).

In 1975, Aliber and Stickney studied thirteen countries from 1966 to 1971, looking for the relationship between nominal interest rates and exchange rates. They used the average annual deviation and maximum annual deviation to measure short-term and long-term validity in developed and developing countries. They found that the International Fisher Effect holds only in the long run (Aliber and Stickney, 1975). A later study by Robinson and Warburton (1980), found no evidence to support the International Fisher Effect; the research goes on to provide four key rules of arbitrage (Robinson and Warburton, 1980).

Sundqvist tested the International Fisher Effect for the United States and a number of developed countries for the period from 1993 to 2000. The study found that the International Fisher Effect only held in Japan. However, the study hypothesized that during different time periods, the International Fisher Effect could hold in other countries. Ultimately, the study concluded that no stable, predictable relationship could be determined between exchange rate changes and nominal interest rates, especially in the short-term (Sundqvist, 2002). Furthermore, a study by Sala-ortiz and Gomez-monge in 2015 tested this theory for the United States and Mexico from 1996 to 2012. The study found that returns were higher in Mexico in the long-run. The study also concluded that the International Fisher Effect did not hold in the short-run (Salas-ortiz and Gomez-monge, 2015).

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Alizadeh *et al.* (2014) have also tested the International Fisher Effect among ASEAN member countries, using Malaysia as the home country. They have found that exchange rate movements do not follow the IFE theory. They claimed that, except for the case of Malaysia-Indonesia, interest rate differentials did not completely offset the changes in currency values.

3. Methodology and Data

The International Fisher Effect (IFE) suggests that, for the flexible exchange rate regimes, changes in the spot exchange rate will be about equal to the interest rate differential between the two countries. The hypothesis suggests the country which has the lower nominal interest rate will experience currency appreciation; the country with the higher nominal interest rate will conversely experience currency depreciation. The formula for the International Fisher Effect is as follows:

$$e_f = [(1+ i_h)/(1+i_f)] - 1$$

where e_f is the change in exchange rate, i_h is the nominal home interest rate and i_f is the nominal interest rate in the foreign country. The time period under study is Q1 of 2005 through Q3 of 2016; excluding Q1 of 2011 and Q1 of 2012 due to data restrictions. Historical data regarding nominal interest rates for the United States and Mexico were collected from the World Bank. Historical Peso/USD exchange rates were also gathered using the World Bank database. Adjustments are made by the World Bank when international standards are not used in data collection and reporting. The study uses the equation below to test the effect of the interest rate differential between the United States and Mexico on the value of their currency:

$$e_f = a_0 + b_1[(1+ i_h)/(1+i_f)-1] + \mu$$

where a is the y-intercept, b is the slope coefficient and u is the error term with zero expectations. All other variables were defined earlier. For the IFE to hold, a has to be close to zero, b has to be equal to one and the error term is expected to be zero.

The null hypothesis of the regression tests was that the International Fisher Effect held, and the theory was a good predictor of the movement in the exchange rates of the U.S. and other ten foreign countries. The alternative hypothesis was that the International Fisher Effect did not hold, and the theory did not provide a good forecast in the movement of the exchange rates. The independent variable was the interest rate differential, and the dependent variable was the percentage change in spot exchange rate.

The historical spot exchange rate of Peso/USD was used to track changes in exchange rate. The direct quotation is used, and the prevailing exchange rate at the end of each quarter was used as the quarterly exchange rate. The World Bank adjusts data where it sees fit in order to remedy discrepancies between collection methods and guidelines.

4. Empirical Results

The main goal of the study is to test the International Fischer Effect in order to provide more insight on the relationship between the Peso/USD exchange rate and the nominal interest rate differential between the United States and Mexico. As the descriptive part of the results (Table 1) shows, there was a wide range of movement in the currency rate (about 80% increase from its low point) as well as the interest rate variation (about 100% change between the high and the low values) during the duration of this study. One could easily observe that the country with higher nominal interest rate (Mexico) has experienced about the same percentage decline in the value of its currency (Peso) during this period.

Table-1. Descriptive Statistics

|	**Peso/USD Exchange Rate**	**Interest Rate Differential**
Mean	12.88	4.00
Standard Deviation	2.11	0.69
Maximum	18.73	5.78
Minimum	10.3	2.78

The analytical result of the study is based on the regression analysis and is presented in Table 2. As the IFE theory expects, the value of the y-intercept is not significantly different from zero while the value of the beta coefficient is not statically different from one and is, therefore, highly significant at 5%.

Table-2. The Results of the Regression

	Y-intercept	**Beta**
Coefficient	0.013	0.80
T-Value	1.71	9.42***
p-Value	0.09	0. 01

Therefore, the values of the both coefficients are consistent with the expectation of the IFE model. The value of the coefficient of determination, R-squared, is 12.34% signifying that more than 12% of the variations in the spot

exchange rate could be explained by the interest rate differential between the two couturiers for the duration of this study. The F-Statistics also shows the significant relationship between the dependent variable and the interdependent variable. Graph 1 serves as a visual representation of the correlation shown by the regression model. The trend line in Graph 1 shows a positive correlation between the change in interest rate differential and change in exchange rate.

Graph 1
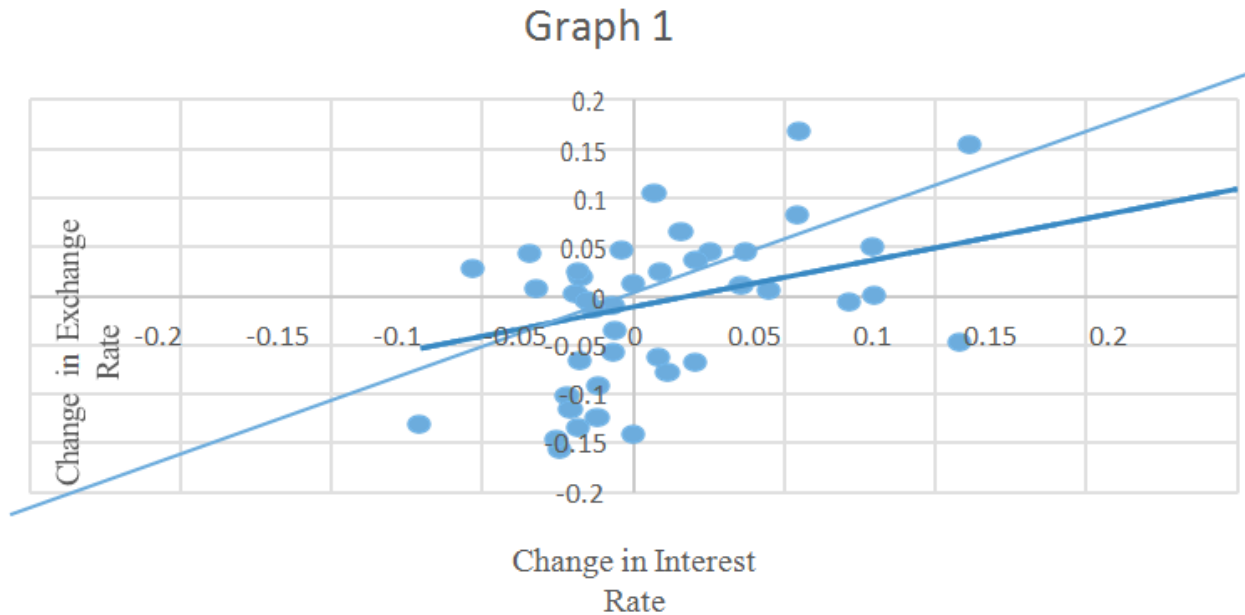
The result of this study is consistent with a number of earlier studies in supporting the International Fisher Effect in the short run. However, as other researchers have outlined, a number of other variables affect the change in a country's exchange rate, but they are not included in this study to the focus of this research on testing the validity of the International Fisher Effect. If other relevant variables such as GDP growth rate differential, trade indicators, inflation rates and the role of expectations are included as independent variables, the explanatory power of the model will increase. However, such a model is beyond the scope of this study.

5. Conclusions

The regression model would suggest that the independent variable, change in interest rate differential, has a correlation to change in exchange rates over the period observed. Even though the result of this study provides some support in favor of the International Fisher effect, the low value of the R-squared would suggest there are other left-out variables that have an effect on change in exchange rates between the two countries. These variables could be inflation, confidence in the currencies, expectations, currency risk, transaction costs, current account on balance of payments and economic growth, among others. Despite the existence of such factors that could positively and negatively affect the changes in exchange rate between the United States and Mexico, the change in interest rate differential must be included as an important determinant of the currency value.

The results of the regression tests in this paper indicate that the foreign exchange market is volatile, and hence, international businesses and investors should take precautious actions to hedge against unfavorable movement in the market. However, it also means that arbitrage opportunities that benefit currency traders do exist.

This study could be replicated or expanded in a number of different ways. One could include other economic variables as independent variables or choose other countries or even longer time period.

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