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THE IMPACT OF INFLATION AND REAL INTEREST RATES IN SAUDI ARABIA ON THE SAR/SDR EXCHANGE RATES

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ABSTRACT

Many factors influence the exchange rate; this study will attempt to examine two of these factors, inflation and interest rates. This study is concerned with assessing the extent and the nature of the impact of inflation and interest rates in Saudi Arabia on the SAR/SDR exchange rate, to which the study hypothesized that there would be a negative relationship between inflation and the exchange rate and a positive relationship between the interest rates and the exchange rate. A regression analysis was used to on the monthly SAR/SDR exchange rate, inflation, and interest rates for the period ranging from January 2004 to September 2015. The study has found that there is a significant relationship between the SAR/SDR exchange rate and inflation, while there is no significant relationship between the exchange rate and interest rates, furthermore the finding has also confirmed the hypotheses of the study. The finding could have important implications that would assist in making well-informed and more prudent investment and financing decisions.

INTRODUCTION

Exchange rates are an important part of any economy. They allow countries to exchange goods and services amongst each other. Exchange rates influence the supply and demand of internationally traded goods as well as Foreign Direct Investment (FDI) flows [1, 2]. There are many countries that have decided to fix their currencies to an anchor currency. Among the reasons for that is to shield against major swings in the exchange rate as well as to lessen the effect of inflation. Another important reason for fixing the exchange rate is to try to sustain competitive prices especially when the anchor currencies are also their main trade partners. Some countries try to depreciate their currencies for fear of the loss of trade competitiveness [3]. In many cases, when allowed to float, exchange rates can reflect a certain economy's health.

Many currencies are pegged to the US dollar; one of the reasons would be is that the US dollar is the world's reserve currency [4, 5]. Among the countries that pegged their currency to the US dollar is Saudi Arabia. The Saudi Arabian Riyal (SAR) was practically pegged, but not yet officially, to the USD since 1986 at a rate of 1$ = SAR 3.75. The rate had become official in 2003 [6]. The importance of the exchange rate to economies leads to numerous quantitative studies conducted to forecast it or assess the factors that influence it. Among the methods used by many researchers is the regression analysis, which is what this study has used. Alizadeh, Nassir and Masoudi [7] use a regression analysis to test the relationship between the exchange rates for ASEAN countries and interest rate differentials.

One of the most widely used methods of forecasting or establishing new par values for currencies is the Purchasing Power Parity (PPP) [8]. The PPP identifies the relationship between domestic and foreign price levels. The PPP in its absolute version states that prices of goods and services everywhere should be the same when expressed in one currency. The PPP in its relative version is the version that is most commonly used in forecasting currency values. This version states that the exchange rates of two currencies will move to adjust for changes in each country's price levels. That means if inflation in home currency is higher than in foreign currency, this will result in the depreciation of the home currency value [1]. Al-Zyoud [9] employed a co-integration test on monthly data on the period ranging from 1995 to 2008. The results indicated that the PPP does not hold in either the absolute or the relative version in the case of the Canadian dollar-US dollar exchange rate. Alizadeh, Nassir and Masoudi [7] investigate the relationship of exchange rates and interest rate differentials using the International Fisher Effect (IFE) framework. The authors investigated these relationships in ASEAN country members, while considering Malaysian ringgit as the home currency in the analysis. The data that they have used in their regression analysis is for a ten-year period (from 2002 to 2012). The authors found that in the case of Malaysia and Indonesia the IFE theory partially holds. As for the rest of the eight ASEAN country members, the theory fails to hold.

Strong economic growth leads to currency appreciation [1]. This growth is due to the increase in foreign investment flows, which leads to increased demand of the growing country's currency. This appreciation will continue until the exchange rate reaches equilibrium. This positive relationship between economic growth and currency value is illustrated in Bussierè, Claude, and Lopez's [10] paper that included 68 countries for the period from 1960 through 2011.

Not knowing the impacts of economic variables on the exchange rate in Saudi Arabia can result in investors and traders making fewer ideal decisions [11, 12]. The knowledge would be helpful to people engaging in foreign trade and investments in Saudi Arabia to know the influence of some of these variables. The purpose of this study is to investigate the impact of inflation and interest rates in Saudi Arabia on the Saudi riyal exchange rate. The study will use a regression analysis on monthly data of the SAR/SDR exchange rate, inflation rates, and interest rates obtained from the IMF, ranging from the period January 2004 to September 2015. The method will be employed with inflation and interest rates being the influencers (independent variables) on the SAR/SDR exchange rate (dependent variable).

METHODOLOGY

This study used qualitative approach to determine the impact of inflation and real interest rates in Saudi Arabia on the SAR/SDR exchange rates though Ordinary Least Square (OLS).

The Data

This study will attempt to test the effect of inflation and interest rates on the Saudi Arabian riyal (SAR) exchange rate using data obtained from the IMF website. The SAR will be tested against the Special Drawing Rights (SDR). The study used monthly data for the period starting from January 2004 to September 2015, using the following variables:

i. SAR/ SDR exchange rate
ii. Inflation rates based on Saudi Arabian Consumer Price Index (CPI)
iii. Interest rates in Saudi Arabia

The SDR is an international reserve asset. The IMF created the SDR in 1969 for the purpose of supporting the Bretton-Woods system of fixed exchange rates. After the collapse of the Britton-Woods system the SDR was redefined as a basket of currencies. It comprises of four key currencies, which are: the euro, Japanese yen, Pound sterling, and UD dollar. The SDR serves and a supplementary reserve asset, and a unit account of the IMF and a few other international organizations. The SDR is not a currency in the conventional sense, but SDR units can be exchanged for the currencies in the SDR basket [13].

Models

To investigate the relationship between the exchange rate and the variables, this study used the Univariate models and Multivariate model.

Univariate Models

These models will be used to assess the impact of each variable on the exchange rate individually. The first model (Model 1) includes inflation alone as the independent variable, which is the variable that acts as a possible predictor for the exchange rate. The expected relationship is that inflation has a negative effect on exchange rates, because it depreciates the currency relative to other currencies [1].

Model 1, $Yi = \beta 0 + \beta 1Xi + \mu i$

Where, Yi = Monthly exchange rate (SAR/SDR), Xi = Monthly inflation, μi = Error term

The second model (Model 2) contains interest rates as the independent variable. The study hypothesizes that the interest rates (specifically the nominal interest rates) have a positive relationship because of the International Fisher Effect, which states that changes in interest rates differentials between two countries is equal changes in the exchange rate differential.

Model 2, $Yi = \beta 0 + \beta 1 Xi + \mu i$

Where, Yi = Monthly exchange rate (SAR/SDR), Xi = Monthly interest rates, μi = Error term

Multivariate Model

This model shall include both of the inflation and the interest rates, to see if a combination of the two variables has a more significant impact on the exchange rate.

Model 3, $Yi = \beta 0 + \beta 1 X1i + \beta 2 X2i + \mu i$

Where, Yi = Monthly exchange rate (SAR/SDR), $X1i$ = Inflation, $X2i$ = Interest rate, μi= Error term

Model Testing

The models of the study are tested using regression also called Ordinary Least Square (OLS). The response (dependent) variable is the monthly SAR/SDR exchange rate, and the explanatory (independent) variables are the monthly inflation rates and interest rates. The explanatory power of the model will be tested using the coefficient of determination ($R2$), which is the ratio of the sum of squared deviations of the predicted values of Yi ($\hat{Yi}$), from their mean value, and the sum of squared deviations of Yi from its mean [14]. In the context of this study Yi is the values exchange rate and $\hat{Yi}$ is the predicted values of the exchange rate.

$$\text{R2} = \frac{ESS}{TSS}$$

Where:

ESS = The squared deviations of the predicted values $\hat{Yi}$ from their mean (Explained Sum of Squares).

TSS = The squared deviations of the values Yi from its mean (Total Sum of Squares). The higher the $R2$ the better the data fits the model, and the more it can explain or predict the deviations of the exchange rate.

Hypothesis Testing

T-statistic is used to test the hypotheses about the coefficients in the regression. In the case of the univariate models the coefficients in the equations $\beta1$, determine the slope of the regression line. If the regression line is flat that means that the regression coefficient ($\beta1$) is equal to zero. That would mean that independent variable could have no effect on the dependent variable, and that would result in accepting the null hypothesis ($H0$). The alternate hypothesis ($H1$) would be the one being accepted if $H0$ was not. Accepting $H1$ would mean that coefficient $\beta1$ is not equal to zero, which suggests that the independent variables have an effect on dependent variable. The t-test will determine whether one should accept or reject the null hypothesis [14].

$H0$: $\beta1 = 0$ or $\beta1,0$

$H1$: $\beta1 \neq 0$ or $\beta1,0$

Where $\beta1,0$ is some specific value.

The t-statistic is calculated using $t = (\beta\hat{}1 - \beta1,0)/\ [SE\ (\beta\hat{}1)]$
Where, $\beta\hat{}1$ = The estimator, ($\beta\hat{}1$) = The standard error of the estimator, $\beta1,0$ = Hypothesized value

The critical value will be compared with the calculated t-statistic at significance level of 5%, to determine where to reject or accept the null hypothesis. Which means the null hypothesis is rejected, if the absolute value of the t-statistic is greater than 1.96 in a two-sided-test (value obtained from the z-table) [14].

The F-statistic will be used to test joint hypothesis about the regression coefficients for the multivariate model. The F-statistic combines the two t-statistics $t1$ and $t2$, resulting from each coefficient in the regression, $\beta1$ and $\beta2$. In the case of this model the null hypothesis has two restrictions $\beta1 = 0$ and $\beta2 = 0$. The F-statistic is the average of the square t-statistics [14].

$$F = \left(\frac{1}{2}\right)\frac{(t12 + t22 - 2\widehat{pt}1, 2t1t2)}{(1 - \widehat{pt}1, t2)}$$

The F-statistic tests the joint hypothesis that all the coefficients in the regression are equal to zero. The null and alternate hypotheses are as follows:

$H0$: $\beta1 = 0$, $\beta2 = 0$,

$H1$: $\beta j \neq 0$, $at\ least\ one\ j$,

To determine whether to reject or accept $H0$, the F-statistic will be compared to the F critical value (from the F-distribution) at a significant level of 5%. Accepting $H1$ if the F-statistic value is greater than the F critical value.

RESULT AND DISCUSSION

The regression analyses have yielded the following numerical and graphical outputs. They will be in the following order: the two univariate models (model. 1) and (model. 2), and the multivariate (model. 3).

The regression output for the first univariate model is tabulated in Table 1. The coefficient of determination, which tests the explanatory power of the model, is relatively low R2=0.11133. This means that the model explains 11.133% of the variance in the exchange rate. This is due to the high variability of the actual data (exchange rate) from the predicted data (predicted exchange rate) as shown in Figure 1. In other words, inflation in this model may not account for most of the exchange rate movement in the time series.

It can be inferred from the t-statistic and p-value (Table. 2), there is strong evidence against the null hypothesis $H0$ of $\beta1$ equal zero. Table 3 shows that the t-statistic = 4.14 is greater than the critical value at the significance level of α = 0.1%, t-statistic > 2.575. This suggests that a type I error in the hypothesis rejection is highly unlikely. This is also evident in the slope of the regression line (Figure. 1), that $\beta1$ (coefficient of inflation) in not equal to zero. Therefore, the null hypothesis is not accepted and $\beta1$ is not equal to zero.

Table 1: Regression Statistics

R	0.33366
R-Square	0.11133
Adjusted R-Square	0.10484
S	0.20003
N	139

Table 2: ANOVA Analysis

	df	SS	MS	F	Sig. F
Regression	1	0.68667	0.68667	17.16229	0.00006
Residual	137	5.48139	0.04001		
Total	138	6.16805			

Table 3: Coefficients, T Stat and the P-value of variables

	Coefficients	T Stat	P-value
Intercept	5.62954	253.83308	0
Inflation	18.83525	4.14274	0.00006

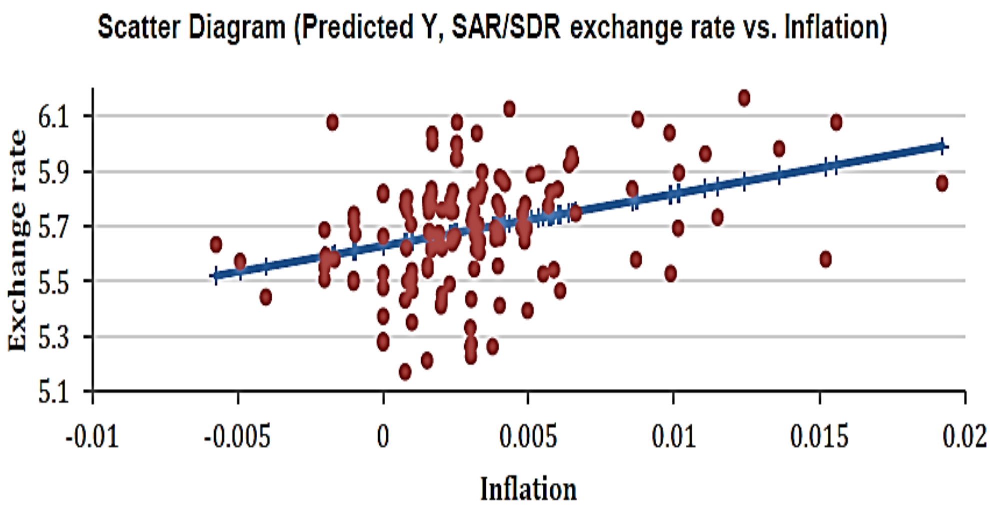

Figure 1: Scatter Plot Of SAR/SDR Exchange Rate Vs Inflation

The regression output for the second univariate models is tabulated in Table 4. The R2 is very low, indicating that the regression model explains only 1.996% of the variation in the data. In other words, the deviation explained by the regression is very low compared to the total deviation. This means that interest rates in this model may not be able to explain or predict the deviation in the exchange rate.

The t-statistic and p-value indicate that there is strong evidence for the $H0$ of a zero $\beta1$ (Table 5, Table 6). The $H0$ has been accepted, because the t-statistic (= -1.67) much smaller than the critical value at a significance level α = 5%, -1.67 < 1.96. The value of coefficient $\beta1$ is very small and close to zero. The slope of the regression line in Figure 2 backs this; one can notice that it relatively flat.

Table 4: Regression Statistics

R	0.14127
R-Square	0.01996
Adjusted R-Square	0.0128
S	0.21006
N	139

Table 5: ANOVA Analysis

	df	SS	MS	F	Sig. F
Regression	1	0.1231	0.1231	2.78992	0.09714
Residual	137	6.04495	0.04412		
Total	138	6.16805			

Table 6: Coefficients, T Stat and the P-value of variables

	Coefficients	T Stat	P-value
Intercept	5.71513	239.89961	0

Interest rate	-0.01707	-1.6703	0.09714

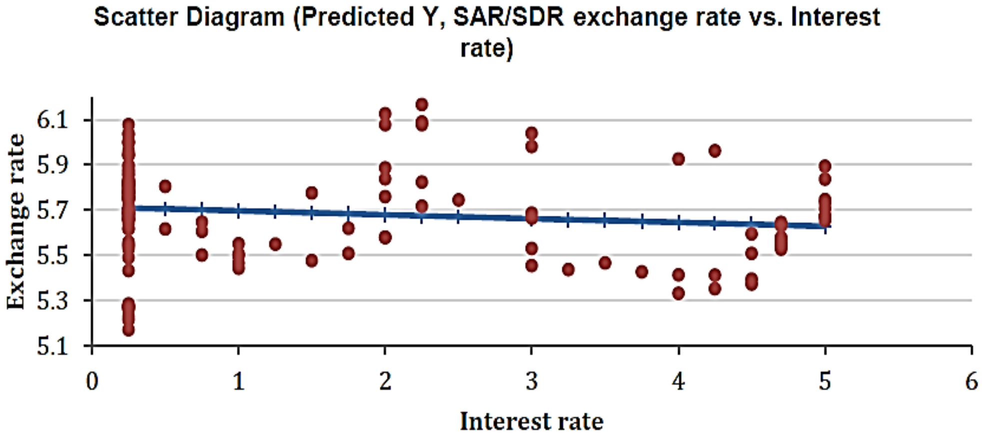

Figure 2: Scatter Plot Of SAR/SDR Exchange Rate Vs Interest Rate

The regression output for the multivariate model is tabulated in Table 7. The R2 for this model is relatively low, indicating that the model explains or predicts 13.99% of the deviations in the data. It is slight improvement over the model 1 but still doesn't account for the majority of the deviations in the exchange rate.

Table 8 and Table 9 tabulated the Anova analysis and Coefficients, T Stat and the P-value of variables. The F-statistic, which is generally the average of the two squared t-statistics, tests the hypothesis for the coefficients $\beta 1$ and $\beta 2$ jointly. The F critical value was found to be equal to 3.8891, which is smaller than the F-statistic value. This resulted in $H0$ not being accepted. It is highly likely that the coefficients are not equal to zero, and the chance of committing a type I error is highly unlikely.

One can notice in the finding that multivariate model may be a better predictor of exchange rate movements than univariate models. That finding was interesting because the model 2, the one containing the interest rate as a possible predictor, performed poorly compared to the other univariate model 1. In the multivariate model the inclusion of the interest rate seems to have marginally improved the model.

Table 7: Regression Statistics

R	0.37398
R-Square	0.13986
Adjusted R-Square	0.12721
S	0.19751
N	139

Table 8: ANOVA Analysis

	df	SS	MS	F	Sig. F
Regression	2	0.86268	0.43134	11.05713	0.00004
Residual	136	5.30538	0.03901		
Total	138	6.16805			

Table 9: Coefficients, T Stat and the P-value of variables

	Coefficients	T Stat	P-value
Intercept	5.65879	218.75083	0
Inflation	19.61226	4.35415	0.00003
Interest rate	-0.02048	-2.12415	0.03547

CONCLUSION

Exchange rates are dynamic and many factors have been found to have an influence on them. They are an important and influential part of the economy, and need to be considering when making decisions in investment and financing. The study focused on assessing the impact of inflation and interest rates in Saudi Arabia on the SAR/SDR exchange rate. The study has found that inflation in Saudi Arabia has an impact on the SAR/SDR exchange rate and may be an important factor to consider when analysing the exchange rate. Although the univariate inflation model may not have been able to explain the majority of the deviation of the exchange rate, the null hypothesis of a zero coefficient β was not accepted at a significance level of 0.1%. This suggests that there is an important relationship between inflation and the exchange rate. The study has also found that Saudi interest rates may not have a significant impact on the Saudi exchange rate. The explanatory power of the interest rate univariate model was very weak, and null hypothesis of a zero β was accepted. Therefore, there may not be a significant relationship between Saudi interest rates and the Saudi exchange rate. Lastly, the study has found that combining the two variables provides a slightly better prediction to the exchange rate movement, which means the explanatory power of the multivariate model is slightly stronger, although it does not account for most of the deviation of the exchange rate, the null hypothesis of a zero β has been rejected at a significance level of 0.1%. This could suggest that jointly these variables may have an important relationship with the exchange rate in the case of Saudi Arabia. Furthermore, the findings confirm the hypotheses of the study, of the SDR/SAR exchange rate having a negative relationship with the inflation rate and a positive relationship with the interest rate. That is evident in the equation in the first regression output where the coefficient of the variable of the inflation rate is positive; indicating that if inflation increases the value of the SAR (SAR/SDR exchange rate) would decrease. As for the conformation of the hypothesized relationship between the SAR/SDR exchange rate and the interest rate, it is also evident in the equation of the second regression output. The coefficient of the variable of the interest rate is negative indicating that if the interest rates decrease that would result in the decrease of the SAR/SDR exchange rate.

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REFERENCES

Shapiro, A. 2013. Multinational financial management. 10th Ed. New York: J. Wiley & Sons.

Lily, J., Kogid, M., Mulok, D., Thien Sang, L., and Asid, R. 2014. Exchange Rate Movement and Foreign Direct Investment in Asean Economies. Economics Research International, 2014, 1–10. https://doi.org/10.1155/2014/320949

Krugman, P. 1994. Competitiveness: a Dangerous Obsession. Foreign Affairs. 73, 2.

Amadeo, K., and Boyle, M. J. 2020. Why the US Dollar Is the Global Currency. Retrieved January 3, 2021 from https://www.thebalance.com/world-currency-3305931

Kirchner, S. 2019. The ‘Reserve Currency’ Myth: The Us Dollar’s Current and Future Role in The World Economy. Retrieved December 3, 2020 from https://www.ussc.edu.au/analysis/the-reserve-currency-myth-the-us-dollars-current-and-future-role-in-the-world-economy

Alkhareif, R. M., Barnett, W. A., and Qualls, J. H. 2017. Has the Dollar Peg Served the Saudi Economy Well? International Finance and Banking. 4, 1, 145-162.

Alizadeh, H. N., Nassir, A. M., and Masoudi, S. Y. S. A. 2014. An empirical investigation of international fisher effect on 10 Asian countries. Journal of Applied Sciences. 14, 6, 531-536.

Morgan, J. H. 1981. Forecasting Exchange Rates: Theory and Practice. Managerial Finance. 7, 1, 29-34. https://doi.org/10.1108/eb013483

Al-Zyoud, H. 2015. An empirical test of purchasing power parity theory for Canadian dollar- US dollar exchange rates. International Journal of Economics and Finance. 7, 3, 233-240.

Bussière, M., Lopez, C., and Tille, C. 2014. Do Real Exchange Rate Appreciations Matter for Growth? IHEID Working Papers 06-2014, Economics Section, The Graduate Institute of International Studies.

Barakat, M. R., Elgazzar, S. H., and Hanafy, K. M. 2016. Impact of Macroeconomic Variables on Stock Markets: Evidence from Emerging Markets. International Journal of Economics and Finance. 8, 1, 195-207.

Joshi, P. 2015. Relationship between Macroeconomic Variables and Stock Market Development: Evidences from the Indian Economy. Dissertation of Doctor of Philosophy. Birla Institute of Technology and Science, Pilani.

Special Drawing Right. 2019. IMF. Retrieved September 7, 2019 from https://www.imf.org/en/About/Factsheets/Sheets/2016/08/01/14/51/Special-Drawing-Right-SDR.

Stock, J., and Watson, M. 2007. Introduction to econometrics. 2nd ed. Boston: Pearson/Addison Wesley.