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IMPACT OF MACROECONOMICS FACTORS IN SAUDI RIYAL EXCHANGE RATES

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ABSTRACT:
Factors influencing the exchange rate are so many and vary from one country to another. This study attempts to examine the influence of inflation, oil prices and GDP on the Saudi Riyal exchange rate. The study hypothesized that there would be a negative impact of inflation on the exchange rate. Oil prices and the gross domestic product growth rate would have a positive impact on the exchange rate. In finding whether to accept or reject the null hypothesis, three types of regression analysis were used. The data was used on a quarterly basis for the period ranging from 2002 to 2015. The scope of this investigation found a significance relationship between oil prices and GDP on the exchange rate while insignificance relationship between inflation on exchange rate. The findings of the study would intake a great value in forecasting the exchange rate regarding inflation, oil prices and GDP.

INTRODUCTION:

Exchange Rate is the price at which one country's currency can be converted into another's. It importance relies on to which a country's balance of trade would increase or decrease. Therefore, it is an important factor in determining the economic health of a country [1]. Currencies are floating freely against each other made governments, tourists and everyone who buy's, sell's or invest overseas faces an enormous uncertainty about out looking profits and losses of returns. However, fixed exchange rates reduce the risk of future revenue estimations by decreasing the volatility of Exchange Rates. It will be mirrored in decreased transaction costs, high encourage of global investments

and would provide long-term growth of an economic system [2]. Both regimes have advantages and disadvantages, having volatile exchange rates would result in the higher supremacy of the economy. Likewise, to reduce volatility; the free float exchange rates must join a monetary policy, and it will lead to decrease of the uncertainty of both inflation and output [2]. On the other hand, pegged rates have its cons as well, even though they will show better inflation performance but in a slower form of productivity growth. The trade-off between both regimes is dependable on the country's criteria and choosing a system is necessary for better inflation and growth [3]. The government sets economic objectives and the goals varied from time to time, and different policy instruments are configured to attain these aims. Monetary policy set the choice of exchange rate regimes, and the primary objectives are: Magnifying national income and employment stabilize prices and keep a fined functioning financial system. Monetary policy has more sovereignty on prices rather than the output, profound estimation on production and jobs can't be certain, and proper policy tools are for attaining financial settlement than short term interest rates. Hence, economists agree that price steadiness is the most important aim of the monetary policy [2].

The purpose of this study is to investigate drivers of the exchange rate in Saudi Riyal exchange rate for the period of January 2002 to December 2015 through regression analysis for model testing using fifteen years' quarterly data of the SAR/SDR exchange rates, inflation, oil prices and GDP growth rate. Data is obtained from the IMF and the World Bank. The findings of this study will alight investors and policy producers for better planning, forecasting and decision making regarding the Saudi riyal exchange rate.

METHODOLOGY

This study attempts to testify the effect of inflation, oil prices and GDP on the Saudi Arabian Riyal exchange rates.

The Data

Secondary data is collected to test the effect of inflation, GDP and oil prices on the SAR exchange rate. Based on the availability of the statistics, fifteen years' quarterly data is obtained starting from 2002 to the year of 2015, and all data attained from the IMF and the World Bank website. The study will measure the SAR exchange rate to the value of the SDR. A special drawing right is a global reserve asset that has a value measured by a set of five prime currencies: Japanese yen, US dollar, euro, the Chinese renminbi and pound sterling. The currency is created by the IMF for its members; it can be exchanged for freely compatible currencies [4]. Variables are used in the study as follows: SAR/SDR exchange rate, Saudi Arabian Consumer Price Index (CPI) Inflation Rates, GDP of Saudi Arabia and Brent Oil Prices.

Models

Regression method for data analysis will be applied to examine the relationship between the exchange rate (dependent variable) and the (independent variables) Inflation, Oil prices and GDP. The models of this study are:

Univariate Model

To evaluate the relationship between variables is the primary objective of linearity. Through explaining the variability between two variables, where the response equates to a model and an error. The univariate regression model is the models that are used to measure variability for a single response or an effect of a single variable. In this study, univariate model is used to evaluate the influence of the variables on the exchange rate separately.

(Model 1) includes inflation only as the independent variable and we are going to assess the way it is going to drive the dependent variable which is the exchange rate. The study speculates a negative impact will result on the exchange rate by the cause of inflation. (Model 2) contains the change oil prices as the independent variable on the dependent variable. The expected relationship is a positive correlation between the independent variable on the dependent variable. The last univariate model (Model 3) will measure GDP as the independent variable. It is estimated to have a positive influence of the GDP on exchange rates.

$$Y_i = \beta_0 + \beta_1 X_i + \mu_i$$

Where;
u_i = Error term
Y_i = Quarterly exchange rate (SAR/SDR)
X_i = Quarterly inflation (consumer prices rates) (for Model 1)
X_i = Quarterly Brent % change from year ago (for Model 2)
X_i = Quarterly GDP growth (for Model 3)

Bivariate Model

Model 4 assess both variables: inflation and percentage change in oil prices together to verify if joining between both variables has more fundamental impact on the exchange rate.

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \mu_i$$

Impact of Macroeconomic on Saudi Riyal Exchange Rates, Where;
Y_i = Quarterly exchange rate (SAR/SDR)
X_{1i} = Quarterly inflation rate
X_{2i} = Quarterly Brent % change from year ago
u_i = Error term

1.1.1 Multivariate Model

Model 5 contains all three variables together, to best verify the significant impact on these independent variables on the exchange rate.

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \mu_i$$

Where,
Y_i = Quarterly exchange rate (SAR/SDR)
X_{1i} = Quarterly inflation rate
X_{2i} = Quarterly Brent % change from year ago
X_{3i} = Quarterly GDP growth
u_i = Error term

Model Testing

The study models are following the regression analysis, which shows a measurement of the strength of linearity associated by studying the dependency of one variable on one or more variables [5]. The reaction of the SAR exchange rates on the explanatory variables: inflation, oil prices and GDP are to be estimated. Using the coefficient of determination shall estimate the goodness of how well does the explanatory data fit the regression line by finding the value of (R2). The coefficient of determination gives a summery value of measurements that explains the strength of adequacy of the data, the higher value the better the model representation of the data. From its definition, it is distinguished by dividing the ESS (Explained sum of squares) by TSS (Total sum of squares). While, ESS is the total sum of estimated values of Yi based on the given Xi and TSS is the squared deviation of the values of Yi from its mean.

Hypothesis Testing

Regression analysis aims to allow taking decisions on forecasting the value of the dependent variable in relation to the explanatory variables. In explaining the statistics, the null hypothesis denoted by H0 is the indicated hypothesis of the study. However, the alternative hypothesis is usually the composite hypothesis which is denoted by H1 and the null hypothesis is tested against it. The study will use the test of significance approach in all its models. The univariate models will be evaluated by testing the significance of regression coefficients through t-statistics and is obtained from the gathered data. To determine whether to reject or accept the null hypothesis, a critical value of $\alpha = 5\%$ compared to the t-statistics significance level. To accept the null hypothesis, the utter value of the t-test must be less than $\alpha = 1.96$ in a two-sided-test as the value referred from the z-table [5]

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The multivariate models joint hypotheses of the regression coefficients will be tested using the F-statistics. In the bivariate model the F-statistics combines two t-statistics t1 and t2, caused by both coefficient in the bivariate regression of (model 4) $\beta 1$ and $\beta 2$. F-statics is the average of the square of the t-statistics and in this model the null hypothesis has two restrictions of both coefficients values equated to zero. The decision of accepting or rejecting the null hypothesis H0 will be determined by evaluating F-statistics to the F- critical value taken from the F-distribution with the significance level of 5%. To accept the alternate hypothesis, the F-statistics required greater than the F-critical value.

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RESULT AND DISCUSSION

Based on the results the several models produced upon regression; this section will present and interpret the models with the use of empirical data to validate the speculated effect on the exchange rate of the study. The numerical and graphical results will be in the following order: The univariate models, bivariate model and the multivariate model.

Table 1 shows the results of the first univariate regression model for the predicted SAR/SDR exchange rate and the inflation rate. The adjusted R2 of the model is 0.00719 or 0.719% which means the model has low power to the data obtained. So, the deviation in the regression has low value against the total deviation. Inflation had a P-value of more than 0.05 at 0.2422. Hence, inflation rate of consumer price index does not have a significance effect on the movement of exchange rate of the economy of Saudi Arabia. The null hypothesis H0 has been accepted because the t-statistics has a value of -1.18246, very small in terms of the critical value at the significance level of 5%, -1.18 < 1.96. Also, the value of the coefficient β1 is less than zero but close to it as it can be notable clearly from Figure 1

Table 1: Linear regression for SAR/SDR exchange rate and the inflation rate

Regression statistics					
R	0.15887				
R-square	0.02524				
Adjusted R-square	0.00719				
S	0.29843				
N	56				
SAR/SDR = 5.59587 – 0.02128 * Inflation, CPI%					
ANOVA					
	d.f.	SS	MS	F	p-level
Regression	1	0.12452	0.12452	1.39820	0.24221
Residual	54	4.80922	0.08906		
Total	55	4.93374			

	Coefficient	Standard Error	LCL	UCL	T Stat	p-level	H0 (5%)
Intercept	5.59587	0.03991	5.51585	5.67590	140.19670	0	Rejected
Inflation, CPI%	-0.02128	0.01799	-0.05735	0.01480	-1.18246	0.24221	Accepted
T(5%)	2.00488						

LCL – Lower value of a reliable interval

UCL – Upper value of a reliable interval

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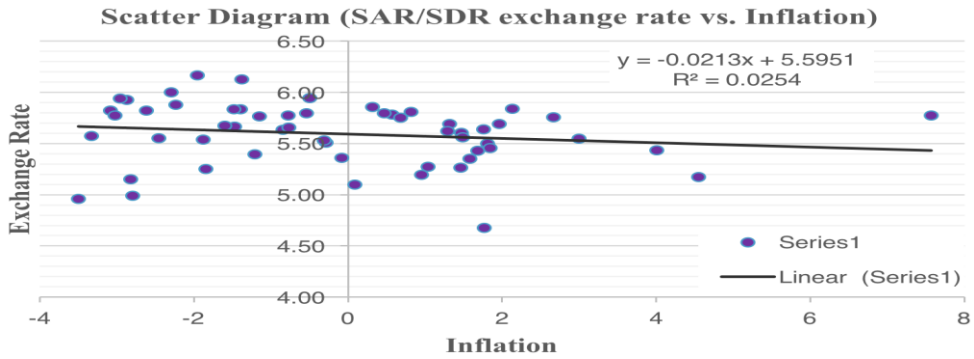

Figure 1: Scatter diagram of SAR/SDR exchange rate versus the inflation rate

The regression outcomes of the second univariate model are tabulated in Table 2. The coefficient of determination r-squared is 0.09852 where it provides the model 9.852% explanation of the variation on exchange rates. The P-value of the percentage change of oil prices is less than 0.05 at 0.01849. This makes the independent variable significant to the dependent variable. The t-statistics indicated a value of 2.42930 that is higher than the critical value $\alpha = 5\%$, 2.43 > 1.96. So, the null hypothesis has been rejected and it is clear in Figure 2 the coefficient of the slope does not equal zero.

Table 2: Linear regression for SAR/SDR exchange rate and the Brent percent change from year ago

Regression statistics					
R	0.31388				
R-square	0.09852				
Adjusted R-square	0.08183				
S	0.28699				
N	56				
SAR/SDR = 5.5661 + 0.0028 * Brent Percent Change from Year Ago					
ANOVA					
	d.f.	SS	MS	F	p-level
Regression	1	0.48607	0.48607	5.90149	0.01849
Residual	54	4.44767	0.08236		
Total	55	4.93374			

	Coefficient	Standard Error	LCL	UCL	T Stat	p-level	H0 (5%)
Intercept	5.56610	0.04052	5.48487	5.64734	137.37661	0	Rejected
Brent Percent Change from Year Ago	0.00280	0.00115	0.00049	0.00511	2.42930	0.01849	Rejected
T(5%)	2.00488						

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LCL – Lower value of a reliable interval
UCL – Upper value of a reliable interval

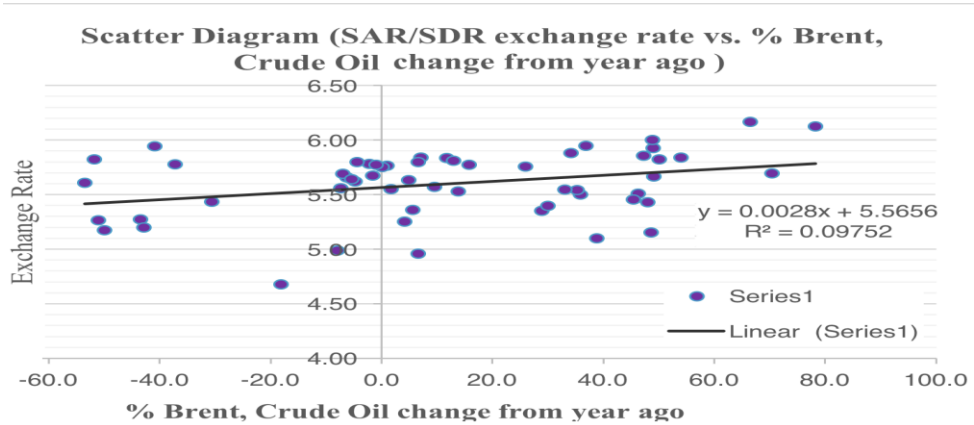

Figure 2: Scatter diagram of SAR/SDR exchange rate versus the Brent percent change from year ago

The last model of the univariate regression analysis where GDP is tested on the exchange rate results in Table 3. The r-squared of the model is quite low explaining 0.16998 or 6.998% of difference in the data. On the other hand, the P-value of GDP is less than 0.05 at 0.00159. Therefore, the GDP has a significant effect on the movement of exchange rates in the economy of Saudi Arabia. There is quite evidence in rejecting the null hypothesis H0 from Table 3 where β1 equal zero. T-statistics has a value of 3.32549 and is greater than the critical value of α = 5%, 3.33 > 1.96 this propose that accepting the null hypothesis is highly unlikely. The regression line in Figure 3 is evidence for the coefficient of the slope not equal zero.Based on the results given above in Table 4, the adjusted r-square is quite low. It predicts 7.094 % of the deviances in the data. It gives somewhat progress to the inflation but still it is not considered as high prediction to the exchange rate. P-value is at 0.05332 and it is typically alike to α = 0.05 and F-value is at 3.09969 in comparing it with α = 0.05 it is greater in value. Therefore, the null hypothesis will be rejected. In addition, it is the reason for rejecting H0 in result β1 is equal to zero.

Table 3: Linear regression for SAR/SDR exchange rate and the GDP Quarterly

Regression statistics			
R	0.41229		
R-square	0.16998		
Adjusted R-square	0.15461		
S	0.27538		
N	56		
SAR/SDR = 5.35959 + 0.17551 * GDP Quarterly			
ANOVA			

	d.f.	SS	MS	F	p-level
Regression	1	0.83865	0.83865	11.05887	0.00159
Residual	54	4.09509	0.07584		
Total	55	4.93374			

	Coefficient	Standard Error	LCL	UCL	T Stat	p-level	H0 (5%)
Intercept	5.35959	0.08055	5.19810	5.52108	66.54006	0	Rejected
GDP Quarterly	0.17551	0.05278	0.06970	0.28133	3.32549	0.00159	Rejected
T(5%)	2.00488						

LCL – Lower value of a reliable interval

UCL – Upper value of a reliable interval

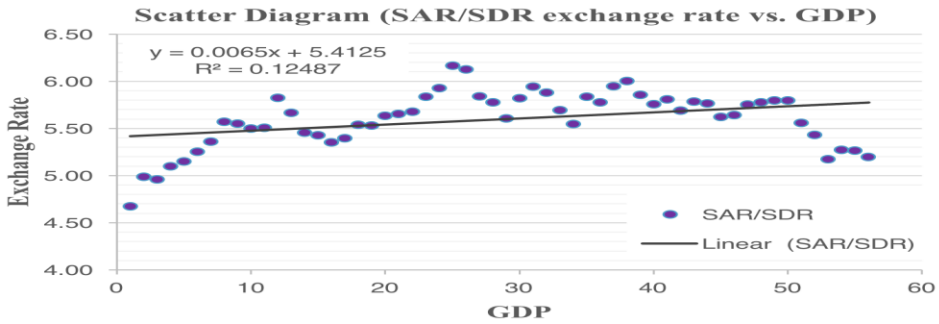

Figure 3: Scatter diagram of SAR/SDR exchange rate versus the GDP Quarterly

Table 4: Linear regression for SAR/SDR exchange rate, inflation rate and the Brent percent change from year ago

Regression statistics			
R	0.32361		
R-square	0.10472		
Adjusted R-square	0.07094		
S	0.28869		
N	56		

SAR/SDR = 5.56727 – 0.01093 * Inflation, CPI% + 0.00261 * Brent Percent Change from Year Ago

ANOVA

	d.f.	SS	MS	F	p-level
Regression	2	0.51666	0.25833	3.09969	0.05332
Residual	53	4.41708	0.08334		
Total	55	4.93374			

	Coefficient	Standard Error	LCL	UCL	T Stat	p-level	H0 (5%)
Intercept	5.56727	0.04080	5.48543	5.64911	136.44645	0	Rejected

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Inflation, CPI%	-0.01093	0.01805	-0.04713	0.02526	-0.60586	0.54720	Accepted
Brent Percent Change from Year Ago	0.00261	0.00120	0.00020	0.00502	2.16916	0.03458	Rejected
T(5%)	2.00575						
LCL – Lower value of a reliable interval							
UCL – Upper value of a reliable interval							

The final models results are given in Table 5 are for the multivariate model of all three independent variables together. The adjusted R2 for this model at 0.15236 is describing or predicting 15.236% of the deviation in the data. The model also had a P-value of less than 0.05 at 0.00881 and it resulted in significance effect on exchange rate. F-statistics has a value of 4.29523 and it is greater than a = 0.05. The null hypothesis H0 has been rejected.

Table 5: Linear regression for SAR/SDR exchange rate, GDP Quarterly, inflation rate and the Brent percent change from year ago

Regression statistics							
R	0.44564						
R-square	0.19859						
Adjusted R-square	0.15236						
S	0.27575						
N	56						
SAR/SDR = 5.37238 + 0.15974 * GDP Quarterly – 0.01908 * Inflation, CPI% + 0.0006 * Brent Percent Change from Year Ago							
ANOVA							
	d.f.	SS	MS	F	p-level		
Regression	3	0.97980	0.32660	4.29523	0.00881		
Residual	52	3.95395	0.07604				
Total	55	4.93374					
	Coefficient	Standard Error	LCL	UCL	T Stat	p-level	H0 (5%)
Intercept	5.37238	0.08806	5.19567	5.54909	61.00711	0	Rejected
GDP Quarterly	0.15974	0.06473	0.02986	0.28962	2.46796	0.01692	Rejected
Inflation, CPI%	-0.01908	0.01755	-0.05430	0.01614	-1.08717	0.28198	Accepted
Brent Percent Change	0.00060	0.00141	-0.00222	0.00342	0.42948	0.66935	Accepted

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from Year Ago							
T(5%)	2.00665						
LCL – Lower value of a reliable interval							
UCL – Upper value of a reliable interval							

CONCLUSION

This study dedicated to assessing the impact of inflation, oil prices and GDP in Saudi Arabia on the SAR/SDR exchange rate. The models of regression that has been implemented dedicated to showing the effect of appreciation or depreciation on the dependent variable. This study has found that inflation in Saudi Arabia has an impact on the exchange rate and it would be important in analyzing expected exchange rates. However, it showed the very small amount in relating its explanatory variable to the exchange rate as well as it has a negative effect on the exchange rate. Oil prices and GDP had the positive effect on the exchange rate and so their value in explaining the dependent variable was better in relation to inflation. The increase in inflation would result in a decrease in the exchange rate and it would appreciate the local currency, and the decrease of inflation will increase the exchange rate and so the SAR value will drop. In the other hand, a positive relation in the increase of oil prices and GDP will increase the exchange rate and the SAR value will depreciate. This study concludes by the regression of multivariate models, it improved the significance and the descriptive power of the independent variables. Many factors affecting the exchange rate and to assess more variables it would give a great highlight in forecasting the exchange rate.

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