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**AN EMPIRICAL EVALUATION OF EXCHANGE RATES CHANGES:
ECONOMIC IMPLICATIONS IN OIL-EXPORTING COUNTRIES**

**EMPIRYCZNA OCENA ZMIAN STOPY WYMIANY WALUT I ICH EKONOMICZNYCH
IMPLIKACJI W KRAJACH EKSPORTUJĄCYCH ROPEŃ NAFTOWĄ**

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Summary

Subject and purpose of work: This paper examines empirical implications of exchange rates in the economy of the Kingdom of Saudi Arabia (KSA). In particular, it aims to identify and evaluate potential macroeconomic signs and symptoms of economic disturbance so as to determine macroeconomic variables that influence spot exchange rate (1GBP = SAR), and to examine how fixed exchange rate regime influences exports and imports in the Kingdom of Saudi Arabia (KSA).

Materials and methods: Multiple regression and simple linear regression models were used to analyze the data from 1975 to 2018.

Results: The study found a weak and insignificant relationship between spot exchange rate and unemployment rate, inflation rate, exports, and economic growth, along with strong relations with imports, investment, and current account variation in the KSA.

Conclusions: The study recommends the adoption of a floating exchange rate regime in the KSA. It has revealed the signs and symptoms of increases of the inflation rate with decreasing exports, increasing imports, decreasing of current account (current account deficit threat), and small increases of investment.

Keywords: exchange rate, spot exchange rate, fixed exchange rate, inflation rate

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Streszczenie

Przedmiot i cel pracy: W artykule przeprowadzono ocenę empiryczną implikacji zmian stopy wymiany walut w gospodarce Królestwa Arabii Saudyjskiej. Szczególnym celem artykułu jest identyfikacja i ocena potencjalnych sygnałów i symptomów makroekonomicznych zakłóceń w gospodarce i określenie makroekonomicznych zmiennych, które wpływają na stopę wymiany funta brytyjskiego na jednostkę waluty krajowej (1 GBP=SAR), a także dokonanie oceny w jakim stopniu system wymiany walut wpływa na rozmiary eksportu i importu Królestwa Arabii Saudyjskiej.

Materiały i metody: W pracy zastosowano statystyczne modele regresji liniowej i metody regresji wielorakiej przy wykorzystaniu danych liczbowych za okres 1975-2018.

Wyniki: W badaniach ujawniono słabe i mało znaczące powiązania między stopą wymiany waluty krajowej na waluty zagraniczne a stopą bezrobocia, stopą inflacji, wielkością eksportu, wzrostem ekonomicznym oraz silne relacje stopy wymiany walut na rozmiary importu, inwestycje oraz zmiany w bilansie obrotów bieżących Królestwa Arabii Saudyjskiej.

Wnioski: Badania rekomendują stosowanie systemu zmiennej stopy wymiany walut w Królestwie Arabii Saudyjskiej. W wyniku badań zaewidencjonowano powiązane ze stopą wymiany walut sygnały i symptomy, takie jak: wzrost stopy inflacji, spadek eksportu, wzrost importu oraz powiększenie deficytu obrotów bieżących, a także spowolnienie procesów inwestycyjnych. Autorzy rekomendują wprowadzenie w Królestwie Arabii Saudyjskiej zmiennej stopy wymiany waluty krajowej wobec walut zagranicznych.

Słowa kluczowe: stopa wymiany walut, krajowa stopa wymiany, stała stopa wymiany, stopa inflacji

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Introduction

The exchange rate has been the key determinant of the economic health of the Oil-Exporting Countries (OECs) for many years. The fluctuations of the exchange rate in these countries disturb the oil prices as the results affect the intensity of exporting transactions (SAMA, 2017). From this financial challenge, many of the OECs struggle to stabilize their local currencies for the purpose of reducing the risk of exchange rates. Cooper (1996) suggested that when the U.S. dollar depreciates against currencies of other major trading nations, oil-exporting countries often become concerned about both losses of purchasing power for their imports and capital losses on dollar-denominated assets.

Some studies are contradicting in each other and there is no empirical consensus achieved by researchers. Karam (2001), who studied exchange rate policies in Arab countries, concluded that changes of exchange rate cause substantial reallocation of resources and production between tradable and non-tradable sector of the economy, and emphasized that in achieving an optimal exchange rate regime in a country, no single exchange rate regime on its own will be adopted. Khathlan (2011) suggested that fixed exchange rate sometimes adversely affects the economy in the KSA by reducing the autonomy of a country's monetary policy. He concluded that Riyal's fixed exchange rate influences the price in positive ways. Westelius (2013) in his study found that the exchange rate in the KSA is likely to cause an expenditure switching effect as the imported goods became more expensive for domestic consumers while exports become less expensive or foreign consumers. On the other side of the debate, Gadanez and Mehrotra (2012) and found no correlation between exchange rate and economic growth in the KSA.

Some researchers challenge this system by stating that it harms the economy of the KSA, but others support the system by stating that it is good for economic growth in the Kingdom. This debate motivated this study to empirically examine the economic implications of the exchange rates in the KSA, as the existing empirical evidence are contradicting. Gadanez and Mehrotra (2012) concluded that exchange rate has no correlation with the economic growth, but Khathlan (2011), Karam (2001), Mirza, Naqvi, and Rizvi (2013), and others agree that the fixed exchange rate system harms the economy of the KSA.

This paper is important to be carried out to contribute more to the on-going debate. From these debate standings, this paper is aimed to empirically investigate the economic implications of the exchange rates in the KSA as the way of intervening to the on-going debate as literature failures to address the problems comprehensively.

The specific objectives of this study are:

1. To identify and appraise the potential macroeconomic *signs and symptoms* of the economic Challenge in the KSA.

2. To determine the macroeconomic variables that influence spot exchange rate (1GBP = SAR) in the KSA.
3. To examine how the fixed exchange rate regime influences the export and import of goods and services in the KSA.

Literature Review

The exchange rate system regime in the KSA has attracted many researchers to examine its effectiveness to the economic growth. The Saudi Arabia Monetary Agency (SAMA) is vested in the power of monitoring and controlling the exchange rate in the country (SAMA, 2017). Alkhareif, Albakr, and Alsayaary (2016) used a vector autoregressive model in their working paper and examined the price response to the change of the exchange rate in the KSA to find a weak and incomplete relationship. This means that the prices in the KSA are not significantly influenced by the fluctuations of the exchange rate. The study by Hussein and Mgamal (2012) on examining the effects of inflation rates, interest rates, and exchange rates on stock prices in the KSA, suggested that there is no association of both exchange rate and the inflation rate in stock prices.

Gomes (2016), who examined the influence of exchange rate in oil exports in the KSA, found that exchange rate influences positively on oil exporting. This means the higher exchange rate attracts more oil exporters in the KSA. The finding was supported by Mozayani and Parvizi (2016), who investigated the exchange rate misalignment in oil exporting countries, with a focus on Iran; they found misalignment effects the exporting of oil in positive ways. Aljazira Capital (n.d), who examined the currency wars and its impacts in the KSA, found that the exchange rate strongly correlated with the interest rate, unemployment rate, and inflation. Karam (2001), who examined exchange rate policies in Arab countries, concluded that changes in the exchange rate cause substantial reallocation of resources and production between tradable and non-tradable sectors of the economy. In order to achieve an optimal exchange rate regime in a country, no single exchange rate regime on its own will be adopted (Karam, 2001)

Nazer (2016) investigated the causes of inflation in the KSA and found that the exchange rate does not cause inflation. The findings contradict Aljazira Capital (n.d) who observed the strong relationship between exchange rate and inflation rate. Khathlan (2011), who studied the inflation in the KSA, suggested that fixed exchange rate sometimes adversely affects the economy in the Kingdom by reducing the autonomy of a country's monetary policy. In 2007, the KSA forced to cut its interest rate in order to match the interest rate parity, due to a reduction in the interest rate by the U.S. Federal Reserves from 5.25 to 2% (Khathlan, 2011). He concluded that the riyal's fixed exchange rate influences the price in the positive ways. Furthermore, the fixed exchange system followed by KSA with the U.S. dollar causes depreciation of against non-dollar currencies; this makes the import

costlier and puts pressure on domestic price level (Khathlan, 2011). The findings supported Westelius's study (2013), who examined the external linkages and policy constraints in the KSA, found the exchange rate is likely to cause an expenditure switching effect as the imported goods became more expensive for domestic consumers while exports become less expensive for foreign consumers.

Gadanecz and Mehrotra (2012), who studied the exchange rate, real economy, and financial markets in the KSA, found no correlation between exchange rate and economic growth. The finding contradicts Aljazira Capital (n.d), who suggested that low exchange rate boosts economic growth. Mirza, Naqvi, and Rizvi's study (2013) on the dynamics of the exchange rate regime in the KSA confirms that a fixed exchange rate regime is ineffective in controlling inflation. These findings are supported by Mahmood, Tawfik, and Alkhateeh (2017), who focused on the effects of the exchange rate in the Saudi service sector and found it to have little influence on the inflation rate. Ossman (2014) studied the effects of the unemployment rate fluctuation on the exchange rate, interest rate, and inflation rate in the KSA. Using Ordinary Least Squares (OLS) methods found no significant effects of the unemployment rate and exchange rate. The finding contradicts Aljazira Capital (n.d), who confirmed the strong relationship between the exchange rates and unemployment rates in the KSA.

The KSA highly relies on imported goods, therefore, changes in the exchange rate of the Saudi riyal against other currencies will directly influence the cost of many goods coming from the U.S. as the SR/\$ rate is fixed (Ramady, 2009). Abdelaziz, Chortareas, and Cipollini (2008) studied the stock prices, exchange rates, and oil in the Middle East Oil-Exporting countries and found that in Egypt and Oman the real exchange rate is positively related to stock prices and negatively related in the KSA. The finding is supported by Anlas (2012), who found the stock price is negatively related to the exchange rate in the KSA. Parsva and Tang (2017) examined the interaction between stock prices and exchange rates in the Middle East economies and found stock prices and exchange rates affect each other, so they have bi-directional causality. On the other hand, Hassanain (2017) confirmed Abdelaziz, Chortareas, and Cipollini (2008) and Hassan (2007). Al-Hamid and Banafe (2017), who studied the foreign exchange intervention in the KSA, found that the interest rate has the cost implications for business, investments, and economic growth.

The review of past studies reveals some empirical contradictions in the KSA in relation to exchange rates and economic health. The literature does not examine the economic implications of the exchange rate in the KSA comprehensively. The study by Ossman (2014) on the unemployment rate fluctuation and exchange rate, interest rate, and the inflation rate in the KSA found no significant effects of the unemployment rate and exchange rate. The finding contradicted Aljazira Capital (n.d) who confirmed the strong relations of exchange rates and unemployment rates in the KSA.

Gadanecz and Mehrotra (2012) studied the exchange rate, real economy, and the financial markets in Saudi Arabia and found no correlation between the exchange rate and the economic growth, but Aljazira Capital (n.d) found the low exchange rate boosts economic growth. Furthermore, Nazer (2016) investigated the causes of inflation in the KSA and found that the exchange rate does not cause inflation. The finding contradicts Aljazira Capital (n.d), who observed the strong relationship between the exchange rate and inflation rate.

Based on these empirical contradictions, this paper aimed to fill the research gap by intervening in the debate on whether some macroeconomic variables are influenced by the fluctuation of the exchange rate or not.

Conceptual Framework and Research Hypothesis

In relation to the identified research gap, we assume that the exchange rate influences some macroeconomic variables in the KSA.

Let us assume the real exchange rate (Φ) has an influence on the economic health (H) in a country. In this model, the elements of the economic health for this study are unemployment rate (ψ), inflation rate (Υ), export variation (Ev), import variation (Iv), current account per GDP (ω), investment variation (A), and GDP variation (Gv).

Then, the real exchange rate (Φ) is directly proportional to economic health (H).

This means, $\Phi \propto H$

And, $\Phi = \kappa H$, where κ is *variable sensitivity factor* (VSF).

Thus, $\Phi = \kappa(\psi, \Upsilon, Ev, Iv, \omega, A, Gv)$

The null hypotheses that guided this study are:

- H_{0,1}: There is no significant relationship between the real exchange rate and the unemployment rate in the KSA
- H_{0,2}: There is no significant relationship between the real exchange rate and the inflation rate in the KSA
- H_{0,3}: There is no significant relationship between the real exchange rate and the export annual variation in the KSA
- H_{0,4}: There is no significant relationship between the real exchange rate and the import annual variation in the KSA
- H_{0,5}: There is no significant relationship between the real exchange rate and the current account per GDP in the KSA
- H_{0,6}: There is no significant relationship between the real exchange rate and the investment variation in the KSA
- H_{0,7}: There is no significant relationship between the real exchange rate and GDP variation in the KSA

Data and Methodology

This study uses exploratory research design that offers a high flexibility exploration of the nature of the problem by examining the empirical facts. The

research population is the KSA. This study uses panel data from 1975 to 2018 extracted from the Islamic Development Bank - Statistical Yearbook - 2018 database, Focus Economics, Saudi Arabia Monetary Authority, Saudi Arabia Monetary Agency, and World Banks.

The real exchange rate (Φ) is the independent variable and it is a measure of the competitiveness of the currencies in a country. It is given by:

The study examines the following macroeconomic factors as the explanatory variables:

$$\text{Real Exchange Rat (SR/GBP)} = \text{Nominal Exchange Rate} \times \frac{\text{Domestic Price Level (SR)}}{\text{Foreign Price Level (GBP)}}$$

- (a) Unemployment Rate (ψ): a measure of the prevalence of unemployment. It is calculated as a percentage by dividing the number of unemployed individuals by all individuals currently in the labor force. That is,

$$\psi = \frac{\text{unemployed individuals}}{\text{labour force}} \times 100$$

But,

$$\text{labour force} = \text{unemployed} + \text{employed individuals}$$

- (b) Inflation rate variation percentage (Υ): the overall percentage increase in the prices that makes people poorer because it outpaces wage increases. It is given by:

$$\text{Inflation rate (Ir)} = \frac{\text{Price level in Year 2} - \text{Price level in base year} \times 100}{\text{Price level in base year}}$$

Therefore, the inflation rate variation in percentage is:

$$\Upsilon = \frac{Ir_2 - Ir_1}{Ir_1} \times 100$$

Where Ir_1 and Ir_2 are the inflation rate in year 1 and year 2 respectively.

- (c) Export annual variation percentage (Ev): a percentage changes of money received from the exportation of goods and services in term of Saudi riyal in the KSA. It is given by:

$$Ev = \frac{E_2 - E_1}{E_1} \times 100$$

Where E_1, E_2 are the exportation values in Saudi riyal in year 1 and year 2 respectively.

- (d) Import annual variation percentage (Iv): a percentage changes of money expended from the importation of goods and services in term of U.S. dollars in the KSA. It is given by:

$$Iv = \frac{Im_2 - Im_1}{Im_1} \times 100$$

Where Im_1, Im_2 are the importation costs in U.S. dollars in year 1 and year 2 respectively.

- (e) Current account in percentage of GDP (ω): a part of the Balance of Payment account of a country. It is calculated as the sum of goods and services exported fewer imports, net income from abroad and net current transfers.

- (f) Investment variation percentage (A): a percentage changes of money invested in long term projects per year, in term of the Saudi riyal in the KSA. It is given by:

$$A = \frac{Inv_2 - Inv_1}{Inv_1} \times 100$$

- (g) Economic Growth (GDP), annual variation percentage (Gv): a percentage change of Domestic Gross Productions (GDP) per year, in term of the Saudi riyal in the KSA. It is given by:

$$Gv = \frac{GDP_2 - GDP_1}{GDP_1} \times 100$$

Econometric Model

The study is explained by the following empirical model:

$$\Phi = a + b_1\psi + b_2Y + b_3Ev + b_4Iv + b_5\omega + b_6A + b_7Gv$$

Where,

a = Constant empirical values that represent *natural settings value* of the exchange rate at which the country has no influence (all values of b's are equal to zero)

b's = Represents empirical constants values or sensitivity variable factors of the macroeconomic variables that have been examined or tested.

Φ = Independent variable (real exchange rate) that change depending on the macroeconomic variables explained, and the unemployment rate (ψ), inflation rate (Y), export variation (Ev), import variation (Iv), current account per GDP (ω), investment variation (A), and GDP variation (Gv).

The Economic Health Indicators in the KSA

This study selected some of the economic health indicators for the purpose of diagnosing the health of the KSA (KSA)'s economy. These indicators are later tested for their sensibility on influencing the exchange rates in the country. The study evidenced that the general economic health of the KSA is not good as its key economic indicators are seemingly poorly scored. Inflation rates are increasing by almost 2.96% per year (Table 1).

Table 1 shows the selected indicators of economic health in the KSA. The table profiles the empirical

facts on how the economy of the KSA is performing worse now in exportation and investments.

The figure profiles the acute drop of the current account and economic growth in 2015. Importation continues to drop from 2012 to 2016.

The study empirically evidenced that the employment rate is kept almost constant at a change of 5.66% per year. Exporting is dropping by 11.32% per year and this weakens the economy healthiness of the KSA. The exporting in the KSA has continued to drop since 2013. The importation is dropping from year to year from 2012 at a rate of 1.58%. This economic illness in the country results to harm in the current account that is dropping year to year from 22.4 to -15.9% of GDP in 2012 and 2016 respectively. The economic growth has dropped acutely in 2016 to be 1.4% from 4.1% in 2015 (Table 1).

Fixed Exchange Rate Regime Advantage Analysis in the KSA

This study aims to examine the financial advantage of the fixed exchange rate regime in the KSA by using historical exchange rate movements. For this study, the data from 1975 to 2018 (44 years) is collected and the *historical financial gains* from U.S dollars fixed is calculated. The Great British Pound (GBP) is used as the selected among the stronger and more stable currency in the world. The study shows that the KSA is always saving or gaining 2.5327 Saudi Arabian riyal per 1 U.S. dollar spends on international transactions per year from 1975 to 2018, in spite of the GBP transactions (Table 2). This means that the KSA saves 2.5327 SAR per each USD spent on international transactions instead of GBP transactions per year.

Table 1. The selected economic health indicators in the KSA (2012-2017)

Economic Health indicators in KSA	2012	2013	2014	2015	2016	WAM
Exchange Rate (SR vs USD)	3.75	3.75	3.75	3.75	3.75	3.75
Exchange Rate (SR vs GBP)	5.9617	6.1988	5.8571	5.5629	4.6146	5.637
Unemployment Rate	5.6	5.6	5.8	5.7	5.6	5.66
Inflation Rate (CPI, annual variation in %)	2.9	3.5	2.7	2.2	3.5	2.96
Exports (annual variation in %)	6.5	-3.2	-8.9	-40.6	-10.4	-11.32
Imports (annual variation in %)	18.2	8.1	3.3	0.5	-22.2	1.58
Current Account (% of GDP)	22.4	18.1	9.8	-8.7	-3.9	7.54
Investment (annual variation in %)	5	5.6	7.5	3.6	-15.9	1.16
Economic Growth (GDP, an. Variation %)	5.4	2.7	3.7	4.1	1.4	3.46

Source: Islamic Development Bank - Statistical Yearbook – 2017 Database.

Table 2. Descriptive Statistics of Exchange rate and fixed advantages in KSA

	N	Range	Minimum	Maximum	Mean	Std. Deviation
GBP v SAR	44	4.1972	4.0952	8.2924	6.206755	0.870491
USD v SAR	44	0.4595	3.295	3.7545	3.674018	0.136609
USD adv. GBP	44	4.2222	0.5202	4.7424	2.532736	0.916647
Valid N (listwise)	44					

Source: Bank of England (2018).

Table 2 shows the descriptive statistics of the exchange rate and fixed advantages in the KSA. The table profiles the spot exchange rate 1 GBP = SAR from 1975 to 2018 and it is averaged at 6.206755 with a range of 4.1972. The spot exchange rate 1 USD = SAR is fixed at 3.7545.

Temporal and Periodogram Analysis of the Exchange Rate in the KSA

For the purpose of understanding the time-based behavior of the panel data of exchange rates in the

KSA, the trend and periodogram analysis were done on the exchange rate sampled data from 1975 to 2018. The Figure 1 shows how exchange rates vary each year in the period from 1975-2018.

The figure 1 shows the exchange rate of SAR in relation to 1 GBP and 1 USD. The comparative advantage values of the USD fixation instead of GBP is evidenced.

The periodogram analysis shows that spot exchange rate (1GBP = SAR) has a strong sinusoidal signal for some frequency. This indicates spot exchange rate (1GBP = SAR) is purely a random series

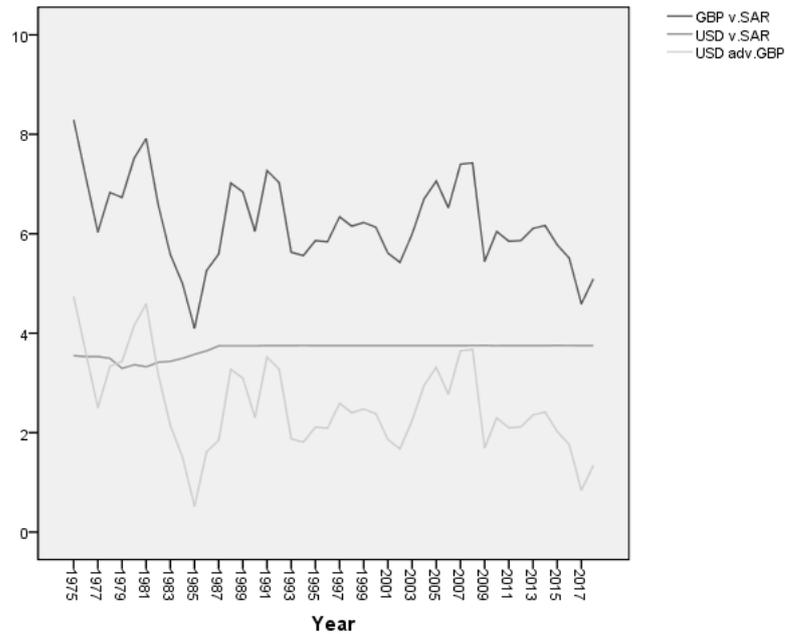


Figure 1. Trend analysis of the spot exchange rate from 1975-2018 in the KSA
Source: SPSS Output for field Data (2018).

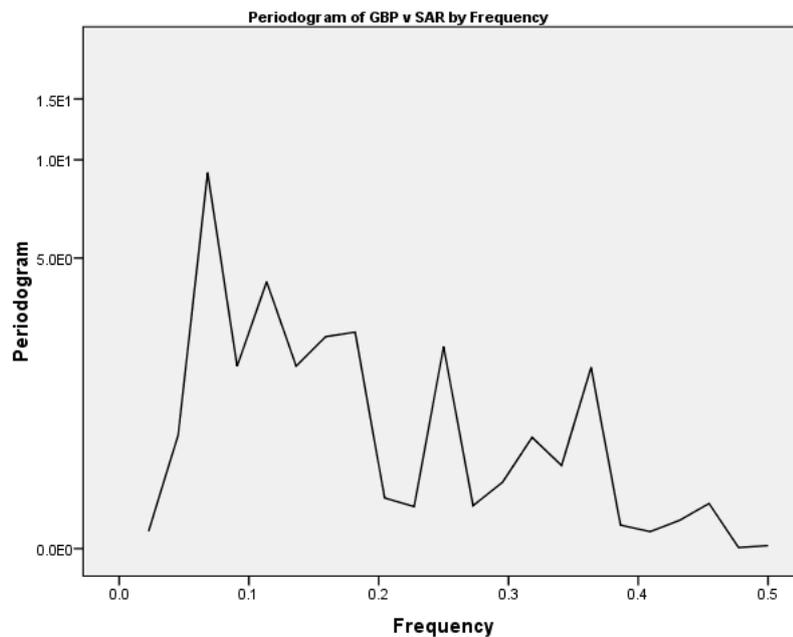


Figure 2. Periodogram of GBP versus SAR by Frequency of sport exchange rate (1975-2018)
Source: SPSS Output for field Data (2018).

and all of the sinusoids should be of equal importance and thus the periodogram will vary randomly around a constant (Figure 2). The spot exchange rate (1USD = SAR) shows to have a strong no sinusoidal signal for some frequency, followed by a peak in the periodogram at that frequency, but also peaks at other multiples of that frequency. This indicates that the spot exchange rate (1GBP = SAR) is not a purely random series and has no time effect on USD transactions (Figure 3).

Figure 2 shows the periodogram of the spot exchange rate (1GBP =SAR) from 1975-2018. The graph profiles the existence of the time effects, as well as the low frequency indicated.

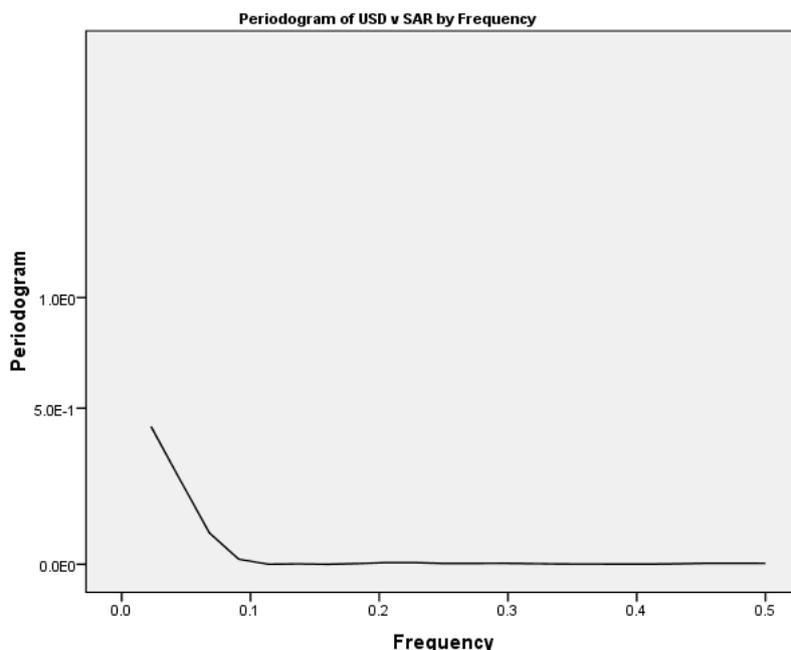


Figure 3. The periodogram of spot exchange rate (1USD = SAR) from 1975-2018
Source: SPSS Output for field Data (2018).

Figure 3 shows the *periodogram* of the spot exchange rate (1USD = SAR) from 1975-2018 in the KSA. The graph profiles no time series effect; there are random, impure effects on U.S. dollar transactions. This is the effect of a U.S dollar-fixed exchange rate in the KSA. The graph shows more frequency and no variations from the constant.

Collinearity Test of Variables

For the purpose of eliminating the variables that have the same effect with explanatory variables,

Table 3. The Multicollinearity Test

Excluded Variables ^b										
Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics				
									Tolerance	
1	Import Variation	.a	.		.				0	
2	Current Account	.a	.		.				0	

a. Predictors in the Model: (Constant), GDP variation, Export variation, Investment variation, Inflation rate

b. Dependent variable: Exchange rate

Source: SPSS Output for field Data (2018).

the multicollinearity (collinearity) was carried out (Table 3). Multicollinearity is a tendency of one variable representing other variables in a multiple regression models and it shares the same effects to the dependent variable.

Regression analysis

The exchange rate is regressed to economic health indicators for the purpose of examining the causality effects of the indicator to the exchange rate. The data used is for five years. The analysis found that the exchange rate is significantly influenced by the

inflation rate, export, investment, and GDP variations. The model is determined at 100% (Table 4).

$$Exchange\ Rate\ (\Phi) = 2.383 + 0.854Y - 0.011Ev + 0.068Iv + 0.152Gv$$

Table 4 shows the coefficients of the regression models. The significant value of the model is 0.000 and the standard error is 0.000, which indicates that there is a 100% coefficient of the model that is non-zeros.

Table 4. The coefficients of the regression model of Exchange rate and EH indicators

Model B	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	Std. Error	Beta				
1	(Constant)	2.383	0		9.73E+03	0
2	Inflation Rate	0.854	0	0.771	1.44E+04	0
3	Export Variation	-0.011	0	-0.306	-7.56E+03	0
4	Investment Variation	0.068	0	1.067	4.91E+04	0
5	GDP Variation	0.152	0	0.371	8.61E+03	0

a. Dependent Variable: Exchange Rate
Source: SPSS Output for field Data (2018).

Table 5. Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics			df1	df2	Sig. F Change
					R Square Change	F Change				
1	1.000 ^a	1.000	1.000	1.83E-05	1.000	1.13E9	4	1	0	

a. Predictors: (Constant), GDP variation, Export variation, Investment variation, Inflation Rate
Source: SPSS Output for field Data (2018).

ANOVA Test

The analysis of variance is used as an exploratory tool to explain the observations. The test evidenced the equally weighted distribution of data as the residual of the sum of squares is found to be 0.000 (Table 6). This means the error between observed and estimated data is 0.000.

line of best fit is determined at 2.7%, *F-Value* at 0.110 significance level 75.7% (Figure 4).

Figure 4 shows the regression line of the spot exchange rate and unemployment rate. The figure shows the weak positive relations between the two variables. The prediction model has a constant value of -0.730 and a coefficient value of 1.125, which indicates each unit increase of the unemployment

Table 6. Analysis of Variance of the data regressed

ANOVA ^b						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.514	4	0.378	1.14E+09	.000 ^a
2	Residual	0.000	1	0.000		
	Total	1.514	5			

a. Predictors: (Constant), GDP variation, Export variation, Investment variation, Inflation rate
b. Dependent Variable: Exchange rate
Source: SPSS Output for field Data (2018).

Table 6 shows the ANOVA test of the dependent and explanatory variables data sampled from the KSA. The table profiles that the model fits the data with 100% level of confidence, as its both residual of the sum of squares and the mean square is 0.000. This indicates the perfect or maximum level of fitness of the model.

Prediction Models of Spot Exchange Rates (1GBP =SAR)

The predication of the spot exchange rate (1GBP = SAR) in the KSA was done by using the regression lines. The regression lines of spot exchange rate and the selected economic health indicators were established. The spot exchange rate was compared with unemployment rate, inflation rate, export variations, current amount variation, investment annual variation and economic growth variation. The simple regression models for each indicator were used to estimate the specific lines of best fit. The spot exchange rate (1GBP = SAR) was regressed to the unemployment rate at 5% of the significant level. The

rate is likely to increase the spot exchange rate by 1.125 and reduced by 0.730 as the empirical natural values of the spot exchange rate at this setting. Note this value is mathematically applied and empirically determined, managed, and changes as time passes.

The spot exchange rate (1GBP =SAR) was regressed to the inflation rate at 5% of the significant level. The line of best fit is determined at 3.9%, *F-Value* at 0.161 significance level 70.9% (Figure 5).

Figure 5 shows the regression line of the spot exchange rate and inflation rate. The figure shows the weak negative relations between the two variables. The prediction model has a constant value of 6.285 and the coefficient value of - 0.218, which indicates each unit increase of the inflation rate is likely to reduce the spot exchange rate by 0.218 and increased by 6.285 as the empirical constant values of the spot exchange rate at this setting.

The spot exchange rate (1GBP = SAR) was regressed to export variation at 5 percent of significant level. The line of best fit is determined at 7.7 percent, *F-Value* 0.335 significance level 59.4 percent (Figure 6).

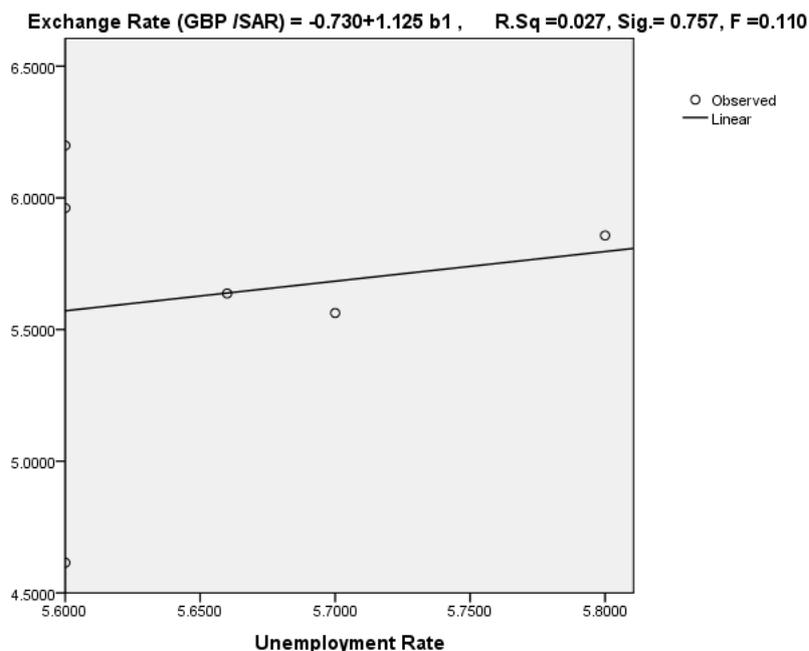


Figure 4. The regression line between spot exchange rate and unemployment rate
Source: SPSS Output for field Data (2018).

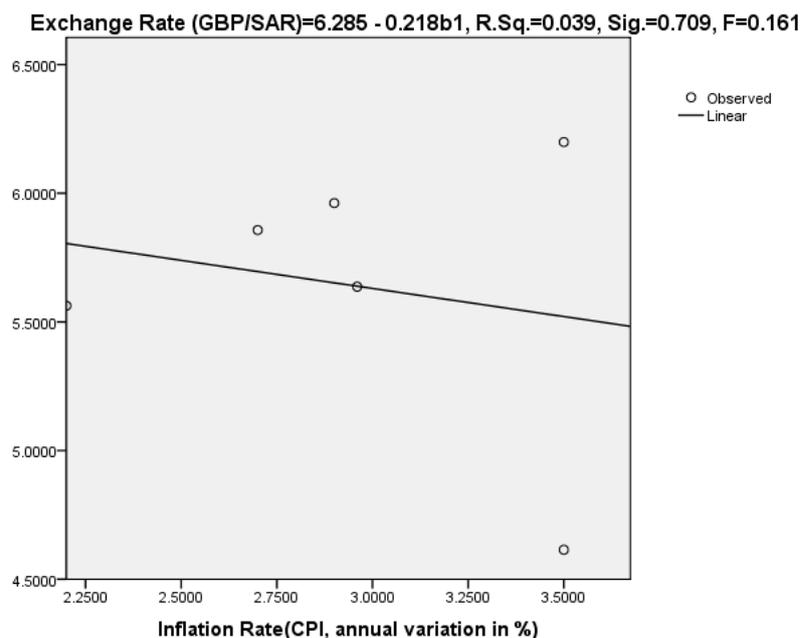


Figure 5. The regression line between spot exchange rate and Inflation Rate
Source: SPSS Output for field Data (2018).

Figure 6 shows the regression line of the spot exchange rate and the export variation percentage. The figure shows the weak positive relationship between the two variables. The prediction model has a constant value of 5.749 and the coefficient value of 0.010, which indicates each unit increase of the export variation percentage is likely to increase the spot exchange rate by 0.010 and then increased by 5.749 as the empirical constant values of the spot exchange rate at this setting.

The spot exchange rate (1GBP = SAR) was regressed to the import variation percentage at 5% of the significant level. The line of best fit is determined at 84.7%, *F-Value* at 22.223 significance level 0.009% (Figure 7).

Figure 7 shows the regression line of the spot exchange rate and import variation percentage. The figure shows the strong positive relationship between the two variables. The prediction model has a constant value of 5.579 and the coefficient value of 0.038, which indicates each unit increase of

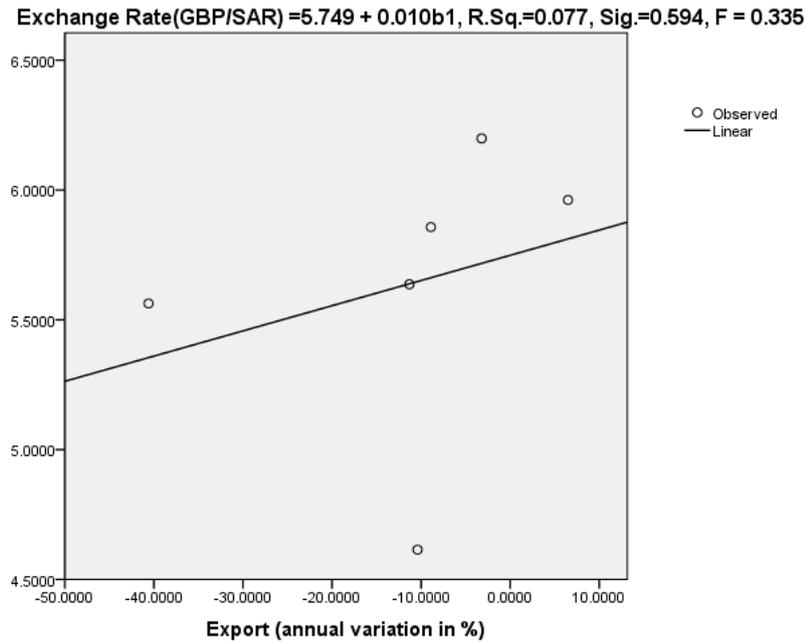


Figure 6. The regression line between spot exchange rate and export variations
Source: SPSS Output for field Data (2018).

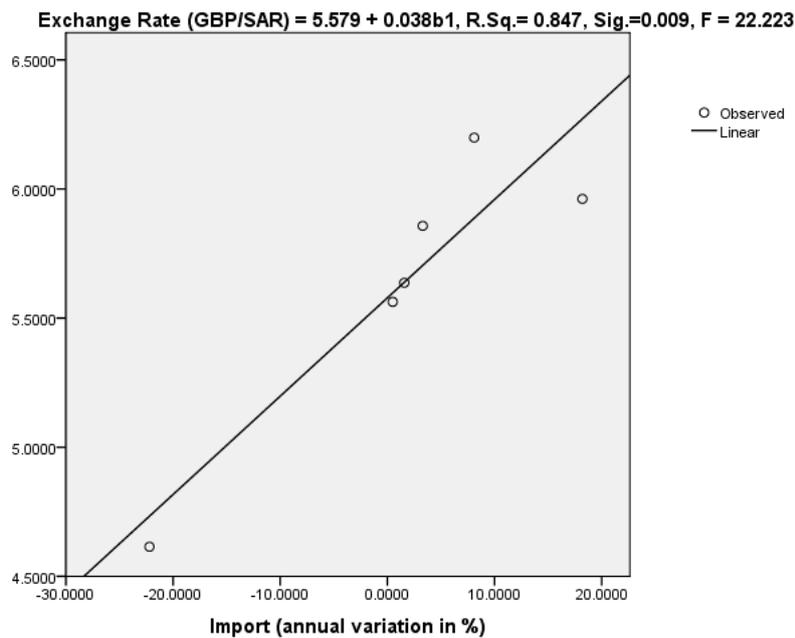


Figure 7. The regression line between spot exchange rate and import variation
Source: SPSS Output for field Data (2018).

the import variation percentage is likely to increase the spot exchange rate by 0.038 and then increased by 5.579 as the empirical constant value of the spot exchange rate at this setting.

The spot exchange rate (1GBP = SAR) was regressed to current account percent of GDP at 5% of significant level. The line of best fit is determined at 52.4%, *F-Value* of 4.408 significance level 10.4% (Figure 8).

Figure 8 shows the regression line of spot exchange rate and the current account percent of GDP. The figure shows the moderate positive relationship between the two variables. The prediction model has a constant value of 5.390 and the coefficient value of 0.033, which indicates each unit increase of current account percentage of GDP is likely to increase the spot exchange rate by 0.033 and then increased by 5.390 as the empirical constant value of the spot exchange rate at this setting.

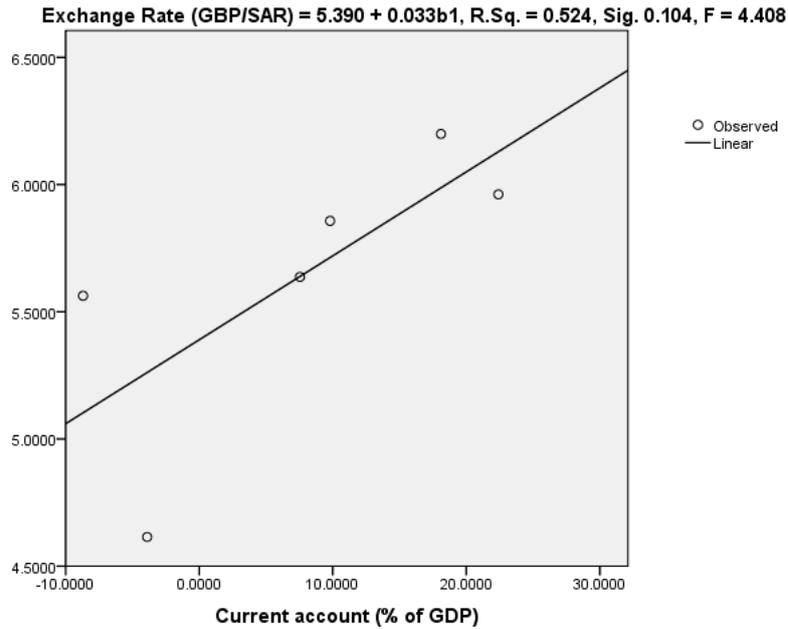


Figure 8. The regression line between spot exchange rate and current account percent of GDP
Source: SPSS Output for field Data (2018).

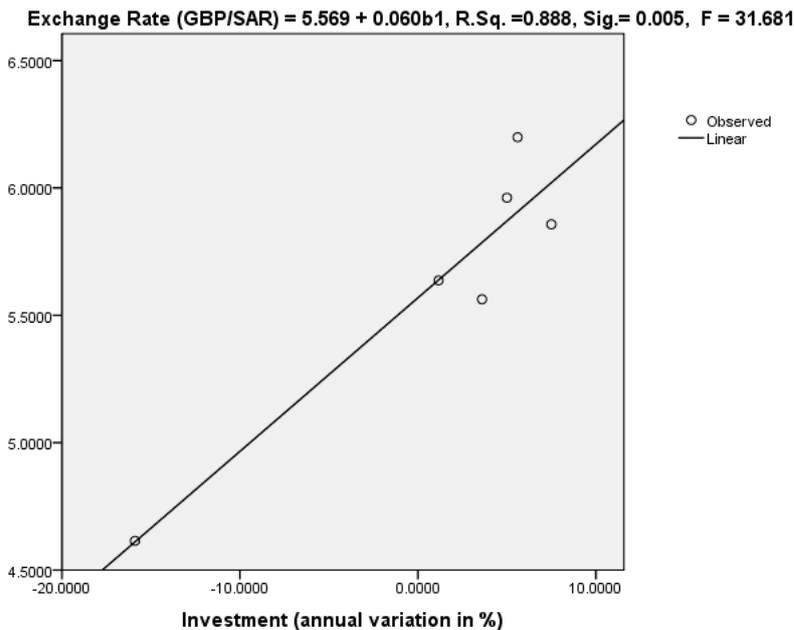


Figure 9. The regression line between spot exchange rate and investment annual variations
Source: SPSS Output for field Data (2018).

The spot exchange rate (1GBP = SAR) was regressed to the investment annual variation at 5% of significant level. The line of best fit is determined at 88.8%, *F-Value* of 31.681, significance level 0.005% (Figure 9).

Figure 9 shows the regression line of the spot exchange rate and the investment annual variation. The figure shows the strong positive relationship between the two variables. The prediction model has a constant value of 5.569 and the coefficient value of 0.060, which indicates each unit increase of investment annual variation is likely to increase

the spot exchange rate by 0.060 and then increased by 5.569 as the empirical constant value of the spot exchange rate at this setting.

The spot exchange rate (1GBP = SAR) was regressed to economic growth (GDP variation) at 5% of significant level. The line of best fit is determined at 88.8%, *F-Value* at 31.681, significance level 0.005% (Figure 10).

Figure 10 shows the regression line of the spot exchange rate and economic growth (GDP variations). The figure shows the moderate positive relationship between the two variables. The prediction model

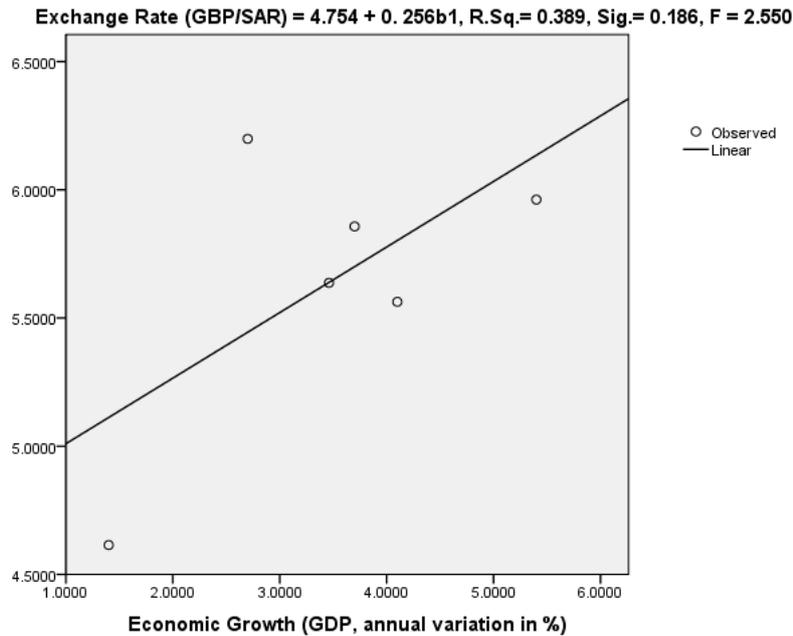


Figure 10. The regression line between spot exchange rate and GDP variation
Source: SPSS Output for field Data (2018).

has a constant value of 4.754 and the coefficient value of 0.256, which indicates each unit increase of GDP annual variation is likely to increase the spot exchange rate by 0.256 and then increase by 4.754 as the empirical constant value of the spot exchange rate at this setting.

Variable Sensitivity Factor (VSF) Analysis

The study is technically aimed to understand how each of the selected economic health indicators is sensitive to effect the spot exchange rate (IGBP = SAR) in the KSA, using VSF analysis. This empirical value of the coefficient (EVC) analysis was by applying a simple regression model. As the general rule, the higher the coefficient of the variable indicates the higher the influence or cause effects on the dependent variables. From this study, it was discovered that the most influential factors with its coefficient values in the brackets are the unemployment rate (1.125), economic growth (0.256), inflation rate (-218), investment variation (0.060), import variation (0.038), current account (0.033), and export variation (0.010). This helps in policy setting priorities in the KSA.

Testing the Research Hypotheses (Empirical Evidence)

The study tested the seven null hypotheses at 5% of the significance level, the method used to test the hypotheses statements was to enter if it is 5% and remove if it is greater than 10%.

The first null hypothesis is tested at a 5% level of significance. The regression model of the exchange rate and unemployment rate has a coefficient value of 1.125, R.Sq. of 0.027, F-statistic Value of 0.110, with

an empirical significance level of 75.7%. Since the empirical significance level of 75.7% is greater than the critical significance level of 5%, in this empirical evidence, we cannot reject the null hypothesis; it is accepted. That means that the real exchange rate is not influenced/related to the unemployment rate in the KSA.

The second null hypothesis is tested at a 5% level of significance. The regression model of the exchange rate and inflation rate has a coefficient value of -0.218, R.Sq. of 0.039, F-statistic Value of 0.161, with an empirical significance level of 70.9%. Since the empirical significance level of 70.9% is greater than the critical significance level of 5%, we cannot reject the second null hypothesis, it is accepted. This means that the real exchange rate does not influence/relate to the inflation rate in the KSA.

The third null hypothesis is tested at a 5% level of significance. The regression model of the exchange rate and export variation has a coefficient value of 0.010, R.Sq. of 0.077, F-statistic Value of 0.335, with an empirical significance level of 59.4%. Since the empirical significance level of 59.4% is greater than the critical significance level of 5%, we cannot reject the third null hypothesis, it is accepted. That is, the real exchange rate is not influenced by the export variation in the KSA.

The fourth null hypothesis is tested at a 5% level of significance. The regression model of the exchange rate and import variation has a coefficient value of 0.038, R.Sq. of 0.847, F-statistic Value of 22.223, with an empirical significance level of 0.9%. Since the empirical significance level of 0.9% is less than the critical significance level of 5%, we reject the fourth null hypothesis and the alternative fourth hypothesis is accepted. That is, the real exchange rate and the import variation are strongly related in the KSA.

The fifth null hypothesis is tested at a 5% level of significance. The regression model of the exchange rate and current account as the percent of GDP has a coefficient value of 0.033, R.Sq. of 0.524, F-statistic Value of 4.408, with an empirical significance level of 10.4%. Since the empirical significance level of 10.4% is greater than the critical significance level of 5%, we cannot reject the fifth null hypothesis, it is accepted. That is, the real exchange rate is not influenced by the current account in the KSA.

The sixth null hypothesis is tested at a 5% level of significance. The regression model of the exchange rate and the investment variation has a coefficient value of 0.060, R.Sq. of 0.888, F-statistic Value of 31.681, with an empirical significance level of 0.5%. Since the empirical significance level of 0.5% is less than the critical significance level of 5%, we reject the sixth null hypothesis and the alternative sixth hypothesis is accepted. That is, the real exchange rate is influenced by the investment variation in the KSA.

The seventh null hypothesis is tested at a 5% level of significance. The regression model of the exchange rate and the economic growth has a coefficient value of 0.256, R.Sq. of 0.389, F-statistic Value of 2.550, with an empirical significance level of 18.6%. Since the empirical significance level of 18.6% is greater than the critical significance level of 5%, we cannot reject the seventh null hypothesis. That is, the real exchange rate is not influenced by the economic growth in the KSA.

Interpretation and Findings of the Study

The study aimed to specifically answer three questions that are the foundation of the research problem. The study met its specific objectives by identifying and appraising the potential macroeconomic *signs and symptoms* of the economic illness in the KSA, determining the macroeconomic variables that influence the spot exchange rate (1GBP = SAR) in the KSA, and examining how the fixed exchange rate regime influences the export and import of goods and services in the KSA.

The Potential Macroeconomic Signs and Symptoms of the Economic Illness in the KSA

The study examined the selected strongest economic indicators for the purpose of appraising the economic health of the KSA. The macroeconomic indicators that are covered by the study are unemployment rate, inflation rate, exchange rate, export and import variations, current account as the percentage of GDP, investment annual variation, and GDP annual variations. The study identified and appraised the following signs and symptoms of the economic illness in the KSA:

a) *Increases of the inflation rate*: the Saudi riyal purchasing power is reducing by almost 3% per year. The study evidenced that from 2012 to 2016, the inflation rate has increased by 3% per year. These are the signs and symptom of

economic illness in the KSA. Persistent rising of prices, known as inflation, impacts the cost of living, the cost of doing business, borrowing money, mortgages, corporate and government bond yields, and every other facet of the economy.

b) *Low exports (decreasing)*: the KSA is not performing well now in international trade. The exports have been dropping yearly by 11.32% from 2012 to 2016. This indicates the signs and symptoms of illness in the economy of the KSA. The more country exports, the greater its competitive advantages, because they gain expertise in producing the goods and services. The country also gains knowledge about how to sell to foreign markets. Exports increase jobs, bring in higher wages, and raise the standard of living for residents. Exports also increase the foreign exchange reserves held in the nation's central bank. This is because foreigners pay for exports either in their own currency or in U.S. dollar.

A country with large reserves can use them to manage its own currency's value. This country has enough foreign currency to flood the market with its own currency. That lowers the cost of their exports in other countries. Countries also use currency reserves to manage liquidity. That means, they can control inflation better, otherwise, too much money is chasing too few goods. To control inflation, they use the foreign currency to purchase their own currency. Doing this lowers the supply, making the local currency worth more. This is true as the inflation in the KSA is increasing by 3% yearly because the export is now dropping by 11.32% per year. This harms the economy of the KSA.

c) *Increasing imports (high imports)*: the KSA has been trying to balance its export and imports transactions since 2012, but this still faces difficulties to achieve; the import is still averaged at annual increases of 1.58%, while exports have been reduced by 11.32% per year. In 2015 the imports variation was 0.5% and by 2016 they decreased by 22.2%, while the exports variation in 2015 was 40.6% and reduced to 10.4% in 2016. If a country imports more than it exports it runs a trade deficit. If it imports less than it exports it creates a trade surplus. When a country has a trade deficit, it must borrow from other countries to pay for the extra imports. The KSA is in an unsafe zone with high imports consequences.

d) *Current account decreasing (current account deficit sign)*: the study evidenced the slight increase of imports while exports are decreasing. This will cause the current account deficit as we are now evidencing the dropping of the current account from 9.8% increases in 2014 to -8.7% in 2015. High importation in a country will likely to harm the infant industries and increase the cost of consumed services. On the other hand, high importation weakens the local currency, SAR against non-dollar currencies. The export

strengthens the local currency, SAR against non-dollar currencies, and supports the growth of infant industries in the country. In this case, the KSA should support export by promoting exports with sweeteners such as subsidies and custom duty exemptions, etc.

e) *Small increases of investment*: Investment is the one of the strong economic health indicator. It is obvious, that if the country has less investments it will likely harm its economy, because it will have less export. The investment in the KSA has been dropping annually. The investment annual variation in 2014 was 7.5%, dropped to 3.6% in 2015, and further dropped to -15.9% in 2016. This sign indicates less conducive investments created by the KSA.

Macroeconomic Determinants of Spot Exchange Rate of Non-Dollar Currencies in the KSA

The study closely examined macroeconomic factors that determine the spot exchange rate of the non-dollar currencies in the KSA. For this study, the GBP currency was used against SAR. The regression model and variable sensitivity factor analysis was done to determine the most influential macroeconomic factors. In this study we established the following empirical facts:

- a) Unemployment rate has a *weak positive relationship* with the spot exchange rate (1GBP = SAR) and is statistically insignificant at the range of 5-10% of significance levels. This means that the unemployment rate in the KSA has little positive influences on the spot exchange rate on GBP currency.
- b) Inflation rate has a *weak negative relationship* with the spot exchange rate (1GBP = SAR) and is statistically insignificant at the range of 5-10% of significance levels. This means that the inflation rate is hardly reduced by the increases of the spot exchange rate in the KSA.
- c) Export variation has a *weak positive relationship* with the spot exchange rate (1GBP = SAR) and is statistically insignificant at the range of 5-10% of significance levels. The exports increase in the KSA has little positive influence on the increases of the spot exchange rate on GBP currency.
- d) Import variation has a *strong positive relationship* with the spot exchange rate (1GBP = SAR) and is statistically significant at the 5% of significance level. This means that as the import increases in the KSA it is creating the environment to increase the spot exchange rate of the GBP on the SAR. Importation reduces the value of the local currency (SAR) against non-dollar currencies, leading to the depreciation of the SAR.
- e) Current account has a *moderate positive relationship* with the spot exchange rate (1GBP = SAR) and is statistically insignificant at the range of 5-10% of significance levels. This means that the current account has a moderate positive influence to the value of the SAR against non-dollar currencies.

f) Investment has a *strong positive relationship* with the spot exchange rate (1GBP = SAR) and is statistically significant at the 5% of significance level. This means that increases of the investment in the KSA will create a good environment to raise the spot exchange rate of non-dollar currencies. This also means that the investment encourages increasing exports and reducing imports so that it increases the demand for the SAR on an international level and its values also increases, leading to appreciations of the SAR.

g) Economic growth has a *moderate positive relationship* with the spot exchange rate (1GBP = SAR) and is statistically insignificant at the range of 5-10% of significance levels. This means that the increase of the GDP in the KSA has a moderate positive influence on the spot.

Discussion on the Findings

The study aimed to fill the empirical gaps on contradicting issues. This study provides empirical evidence on some economic areas that contradict in the KSA. The study evidenced that there is no significant relationship between economic growth and the exchange rate in the KSA. This finding supports Gadanecz and Mehrotra (2012), who studied the exchange rate, real economy, and financial markets in the KSA and found no correlation between the exchange rate and the economy growth. On the other hand, this finding contradicts Aljazira Capital (n.d), who found the low exchange rate boosts economic growth in the KSA.

This study found there is weak and insignificant negative relationship between the exchange rate and the inflation rate in the KSA. The review of past studies provided contradicting findings. This study supported Nazer (2016), who investigated the causes of inflation in the KSA and found exchange rate does not cause the inflation. The study also supported Mahmood, Tawfik, and Alkhateeh (2017), Mirza, Naqvi, and Rizvi (2013), and others. This finding contradicts Aljazira Capital (n.d), who observed the strong relationship of the exchange rate and the inflation rate. The study by Ossman (2014) on the unemployment rate fluctuation and exchange rate, and interest rate and the inflation rate in the KSA found no significant effects of the unemployment rate and the exchange rate. This finding comes contrary to Aljazira Capital (n.d), who confirms the strong relationship of the exchange rate and the unemployment rate in the KSA. This study found the weak and insignificant relation of the exchange rate and unemployment in the KSA, thus, supporting Ossman (2014) and disagreeing with Aljazira Capital (n.d).

This study found the cost implications of the exchange rate and imports in the KSA, and this finding confirms Mirza, Naqvi, and Rizvi (2013), and Khathlan (2011), who studied the inflation rate in the KSA and suggested that a fixed exchange rate sometimes adversely affects the economy by reducing the autonomy of a country's monetary

policy. Furthermore, this finding supported Karam (2001), who examined exchange rate policies in Arab countries and concluded that changes of the exchange rate cause substantial reallocation of resources and production between tradable and non-tradable sectors of the economy.

The study found a weak and insignificant positive relationship between exports and the exchange rate. This finding supported Gomes (2016), who examined the influence of the exchange rate in oil exports in the KSA and found that the exchange rate influences positively on the oil export. This means that the higher exchange rate attracts more oil exporters to Saudi Arabia. Also, this finding supported the finding of Mozayani and Parvizi (2016), who investigated the exchange rate misalignment in the oil exporting countries, focusing on Iran, and found misalignment affects the exporting of oil in positive ways.

Conclusions

The study aimed to meet its specific objectives, which were to identify and appraise the potential macroeconomic *signs and symptoms* of the economic illness, determine the macroeconomic variables that influence spot exchange rate (1GBP = SAR), and examine how a fixed exchange rate regime influences the export and import of goods and services in the KSA.

Based on the findings, the KSA is suffering from signs and symptoms of the increased inflation rate, having low exports (decreasing), the increase of imports (high imports), the decrease of its current account (current account deficit threat), and experiencing small increases of investment. On the other hand, the unemployment rate, inflation rate, export, and economic growth have no direct

influences on the determination of the exchange rate in the KSA. The exchange rate in the KSA is highly influenced by import intensity, investment, and current account. However, the U.S. dollar fixed exchange rate in the KSA has the cost implications on non-dollar international transactions, making high costs of importation from non-dollar dominations, high currency selectivity in trade, and it motivated or pulled in trade by U.S. dollar advantages.

Policy implication

The paper has one major policy implication on the Kingdom of Saudi Arabia. The implication is on the monetary policy change that is directly examined by this paper. The study found that the fixed exchange rate regime exercised in the KSA is now indicating some signs and symptoms of economic illness. It is observed that the U.S. dollar fixed exchange rate in the KSA has the cost implications on non-dollar international transactions, making high costs of importation from non-dollar dominations, high currency selectivity in trade, and it motivated or pulled in the trade by U.S. dollar advantages. Using this empirical evidence, the SAMA should change its monetary policy by cutting off the fixed exchange rate and adopting the new one, as recommended by this study, the floating exchange rate regime. The floating exchange rate, or fluctuating exchange rate, is a type of exchange-rate regime in which a currency's value is allowed to fluctuate in response to the market mechanisms of the foreign-exchange market. As the floating exchange rates automatically adjust, it enables a country to dampen the impact of shocks and foreign business cycles and to prevent the possibility of having a balance of payments crisis. This new policy will foster both the economic health and human development in the KSA.

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