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Investigating the Causes of inflation in Saudi Arabia: An Application of Autoregressive Distributed Lag (ARDL) Model

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Abstract

This paper aims to investigate the causes of inflation in Saudi Arabia over the period (1980-2018), for this purpose, the Auto Regressive Distributed Lag (ARDL) model was used to examine the short run and the long-run relationships between inflation, broad money supply, the stock price index, the real GDP, the oil prices, and the world inflation rate. The model proves a co-integrating relationship between the variables of the study. The empirical results reveal that inflation in Saudi Arabia is positively determined by broad money supply, oil prices, and real GDP in both the short and long run. It is negatively determined by the stock price index. The world inflation rate shows a significant positive effect in the long run but it does not influence inflation in the short run, while the exchange rate does not affect inflation in both the short and long run. The impulse response functions and the variance decomposition analysis test were employed; the findings showed that inflation in Saudi Arabia, in the long run, is mostly determined by broad money supply and the world inflation rate.

Keywords: Inflation, Consumer price index, Money supply, World inflation rate, oil prices, Cointegration, ARDL Approach.

1. INTRODUCTION

Saudi economy witnessed low rates of inflation during the eighties and nineties of the last century, not exceeding 1%, but by the beginning of the year 2000 the rate started to increase remarkably to reach its maximum in 2008 exceeding the limits of 9.8%,(SAMA Annual reports), this was due to a number of both internal and external factors characterizing the period (1980-2018) which witnessed the rise of reserve requirements by the Saudi Arabian monetary authority (SAMA) during 2007 and 2008 four times after being held unchanged for 27 years, also the establishment of the new electronic *Tadawul* trading system during the stock market crash of 2008 in line with international stock market declines, the period was also characterized by the rise of commodity prices worldwide associated with an oil price boom and the decline in the value of the US dollar which led to a growth in domestic demand and increased in food and rental prices.

Understanding inflation causes in Saudi Arabia during the the study period (1980 – 2018) become vital since the rising rates of inflation and the large variation in rates, raise serious concerns about the potential effects on economic stability and activity, what makes it imperative for the decision-makers to addressed these determinants with the aim to maintain a climate of price stability and inflationary levels, as well as the nature of economic policies that can be adopted to maintain economic development.

This study aims to determine the causes of inflation in the Saudi economy and to empirically investigate them in both the short and long run.

The paper is organized as follows, the second part clarifies the theoretical causes and impact of inflation, the third part reviews the literature on the causes of inflation and its economic effects, the fourth part specifies the model and empirically investigates results. The paper concludes with some concluding remarks and policy implications.

2. CAUSES AND IMPACT OF INFLATION

Several economic theories dealt with the nature and determinants of inflation, Different schools have different causes of inflation based on the stability of the output and the speed of money circulation. The classical economic theory (quantity theory of money) states that money supply and price levels increase at the same rate in the long run. Consumers will respond insensitively to price changes at the time when interest rates fall or taxes decrease that ease the access to money and thus the consumer will have a higher propensity to consume. This will result in a shift of the aggregate demand curve to the right; therefore, the equilibrium price level will shift up. In order to model the relationship between price levels and money supply economists use the following equation: $M.V=P.Q$

Where: (M) indicates the money supply, (V) denotes the Velocity of Money, (P) is the prevailing price level, (Q) stands for the number of goods and services produced in the economy [1].

The theory represents a review of the monetarist theory which states that any increase in money supply, given Q and V constant, in the long run, will cause price levels to increase, thus causing inflation.

Fisher equation explains the relationship between nominal and real interest rates, mathematically it is shown as:

$$(1 + i) = (1 + r)\,(1 + \pi);$$

Where: (i) denotes the nominal interest rate, (r) is the real interest rate, and (π) the inflation rate. The equation specifies the nominal interest rate as the sum of the real interest rate and inflation, it defines the extra reward requested by investors and lenders to compensate for losses in purchasing power a situation resulted from higher inflation. Fisher equation is commonly used in calculating returns on investments or in projecting the nominal and real interest rates react; it assumes that the monetary policy changes inflation and nominal interest rate together in a similar manner [2].

Concerning the supply side of the economy, there are two main reasons for inflation, both of which represent some kind of market power exercised by labor unions and entrepreneurship. The first reason is the high wages that unions provide to their employees this resulted in what so-called wage inflation, while the second which is called profit inflation resulted from the high prices that businessmen provide for themselves in monopolistic industries, both types of inflation occur in conditions of non-competitive markets.

The Keynesian theory of inflation is known as Demand-pull inflation, which explains inflation as the situation when aggregate demand exceeds the total supply due to expansionary monetary policy by increasing the money supply or decreasing the discount rate, also due to expansionary fiscal policy by increasing government expenditure or decreasing tax.

The structural inflation theory contends that inflation is not a phenomenon of monetary nature. According to this theory structural features of LDCs and the supply bottleneck such as food bottleneck, resources bottleneck, foreign exchange bottleneck, infrastructural and social and political constraint and corruption of explains inflation in these economies [3].

In the context of external factors influencing inflation, the literature suggests that the developing economies depend heavily on the economies of advanced countries, not only for consumer goods but also for production inputs. As long as the cost of output is one of the factors influencing inflation, the higher the cost of imported input will increase inflation, that type of inflation is known as imported inflation.

3. LITERATURE REVIEW

Naseem, S in [4] examined inflation in Saudi Arabia concerning the macroeconomic determinants, employing the regression model with inflation consumer price index as the dependent variable and fixed the exchange rate, money supply, oil prices, export value, import value, and unemployment as explanatory variables. Her study showed statistical significance of all explanatory variables suggested except for unemployment, which is found to be insignificant and hence does not directly explain inflation rates in Saudi Arabia. The study argued that inflation in Saudi Arabia in the last 13 years become more globalized since the effect of domestic factors on Saudi inflation is eroded.

Adayleh, R.M in [5] applied the Fully Modified Ordinary Least Square (FMOLS) approach to assess the factors determining inflation in the Jordanian economy during the period 2000 to 2017, the variables used were money supply, credit, oil price, interest rate, and the output gap. Empirical findings showed a significant positive impact of credit, money supply, and oil price variables, and whereas the output gap and interest turned to have an opposing significant effect. The used tests of impulse response function and variance decomposition indicated that oil prices, hence the supply side, explain the long-run inflation in Jordan's economy.

Aljowaie, N in [6] assessed both long and short-run behavior of inflation for GCC countries using Vector Error Correction (VEC), results revealed that money growth and government spending have a positive effect on inflation as internal causes of inflation in the GCC countries, where the nominal effective exchange rate which reflects the external factor, is found to be insignificant.

Mahmood and Alkhteeb in [7] took the case of the Kingdom of Saudi Arabia (KSA) using the ARDL model to evaluate the short and the long run internal and external factors inducing inflation. In light of his empirical results, he concluded that money supply and world inflation have a positive significant effect on inflation in KSA, whereas there is a negative effect of the growth in GDP. He suggested tight monetary policy, encouragement of import substitutes, and reorienting sources to the production sector to control inflation in KSA.

Laura Moretti in [8] estimated the effect of labor and product market regulations on inflation persistence in the Eurozone for 11 countries during the period 1990- 2007. He came to conclude that the inflation rate was reduced significantly after the adoption of the euro due to product market deregulation, while inflation persistence increases due to higher labor market regulation; moreover, it reduces the responsiveness of inflation to the output gap.

Hamad A. Altowaijri in [9] utilized a model for Saudi Arabia that combines the internal and external factors that determine the rate of inflation. Results propose that inflation is due to external factors, which are consistent with the high degree of openness of the Saudi economy since most goods and services are imported. The rise in world prices coupled with the decrease in the Dollar value determinate inflation in the short run as well as in the long run. Similarly, inflation results from the increase in oil prices, which leads to an increase in domestic demand.

Mohamed A. Ramady in [10] described some of the plausible causes of inflation in Saudi Arabia such as interest rate, money supply, and the Saudi riyal exchange rate, which was pegged to the US dollar since 2003. Results indicated that the riyal depreciation linked to the depreciation of the US dollar and money supplies are the key sources of inflation in Saudi Arabia. Yet, these causes are all eventually tied to the pegging of the riyal, representing imported inflation.

The above reviewed literature is just a part of a large number of different studies exploring causes and consequences inflation such as [11],[12], [13],[14],[15],[16],[17][18],[19] and [20].

4. METHODOLOGY

4.1. Model Specification:

The model of the present study is formulated in alignment with the economic theory, available literature, and empirical previous evidence. The selected explanatory which are believed to determine inflation, reflect the different features characterizing the Saudi economy, the consumer price index (CPI) represents the dependent variable, while the broad money supply (BMS), the stock price index(SPI), the real GDP (RGDP), the oil prices(OILP), and the world inflation rate(WINF) represent the selected explanatory variables.

The following equation describes the model:

$$CPI=f\,(BMS, SPI, RGDP, OILP, EXR, WINF) \qquad (1)$$

$$\frac{\partial CPI}{\partial BMS}>0, \frac{\partial CPI}{\partial SPI}<0, \frac{\partial CPI}{\partial RGDP}>0, \frac{\partial CPI}{\partial OILP}>0, \frac{\partial CPI}{\partial EXR}>0, \frac{\partial CPI}{\partial WINF}>0$$

With:

Where:

CPI = Consumer price index.

BMS= Broad money supply (M3)

SPI = Stock price index

RGDP= Real GDP

OILP = Oil prices

WINF = World inflation rate.

Since the behavior of the macroeconomic explanatory variables is likely to be a non-linear relationship, the model is converted to a linear form by taking natural logarithm values of the variables, by doing so, the parameters of the model turn out to be elasticity, and the variables become in the growth rate form. The econometric model in logarithm format is:

$$\ln CPI = b_0 + b_1 \ln BMS - b_2 \ln SPI + b_3 \ln RGDP + b_4 \ln OILP + b_5 \ln EXR + b_6 \ln WINF + \varepsilon t \quad (2)$$

Using time-series data covering the period (1980 - 2018), the Autoregressive Distributed Lag (ARDL) model will be utilized to estimate the existence of the short and long-run relationships between the consumer price index (CPI) as dependent and the rest of explanatory variables. The data is obtained from the Saudi Arabia Monetary Agency (SAMA), Annual Report, Different issues, World Bank Report, and International Monetary Fund (IMF).

4.2. ARDL Bound Test

The ARDL bounds testing approach developed Pesaran et al. (2001). The authors in [21] found to be appealing since it works irrespective of the order of integration of the time series under consideration, in other words, it applies to a set of time series of both I(1) and/or I(0). The general ARDL (p, q) functional form model of X_t as independent and Y_t as a dependent is given by:

$$\Delta \boldsymbol{Y_t} = \boldsymbol{\alpha_0} + \boldsymbol{C_0 t} + \sum_{i=1}^{p} \beta_i \Delta \boldsymbol{Y_{t-i}} \sum_{j=0}^{q} \gamma_j \Delta \boldsymbol{X_{t-j}} + \boldsymbol{\delta_1 Y_{t-1}} + \boldsymbol{\delta_2 X_{t-1}} + \boldsymbol{\epsilon_t} \quad (3)$$

Where:

ΔY_t and ΔX_t are the differences of Y_t and X_t

p and q are the respective lags: i=1, 2, …, p; q=1, 2, …, q

t indicates the periods t=1, 2, …, T

The coefficients α_0, C_0 are the drift and trend coefficients respectively $\in_t$ is the white noise error.

The coefficients β_i and γ_j for all j correspond to the short-run relationship while the δ_j corresponds to the long-run relationship.

On the basis of ARDL general functional form model shown above, our study model will be specified in such a way that the dynamic relationship between dependent variable *LOG(CPI)* and independent variables *LOG(BMS), LOG(SPI), LOG(RGDP), LOG(OILP), LOG(EXR), and LOG(WINF),* is defined as follows:

$$\Delta LnCPI_t = \alpha_0 + \alpha_1 t + \sum_{i=1}^{p} \alpha_{2i} \Delta LnCPI_{t-i} + \sum_{i=1}^{q1} \alpha_{3i} LnBMS_{t-i} + \sum_{i=1}^{q2} \alpha_{4i} \Delta LnSPI_{t-i} + \sum_{i=1}^{q3} \alpha_{5i} \Delta LnRGDP_{t-i} + \sum_{i=1}^{q4} \alpha_{6i} \Delta LnOILP_{t-i} + \sum_{i=1}^{q5} \alpha_{7i} \Delta LnEXR_{t-i} + \sum_{i=1}^{q6} \alpha_{8i} \Delta LnWINF_{t-i} + \alpha_{10} LnCPI_{t-1} + \alpha_{11} LnBMS_{t-1} + \alpha_{12} LnSPI_{t-1} + \alpha_{13} LnIRGDP_{t-1} + \alpha_{14} LnOILP_{t-1} + \alpha_{15} LnGEXR_{t-1} + \alpha_{16} LnWINF_{t-1} + \epsilon_t \quad (4)$$

Where:

$\Delta LnCPI_t$, $\Delta Ln\ BMS_{t-i}$, $\Delta Ln\ SPI_{t-i}$, $\Delta Ln\ RGDP_{t-i}$, $Ln\ OILP_{t-i}$, $\Delta Ln\ EXR_{t-i}$, and $\Delta Ln\ WINF$ represent Explanatory variables respective difference values; α_2, α_3, α_4, α_5, α_6, α_7, α_8 and α_9 represent the short-run dynamic relationships; α_{10}, α_{11}, α_{12}, α_{13}, α_{14}, α_{15}, α_{16} and α_{17} denote long-run dynamic relationships; P shows the lag period of the dependent variable; q_1, q_2, q_3, q_4, q_5, q_6 and q_7 indicate the lag period of the independent variables, respectively; and ϵ_t is the error term.

5. EMPIRICAL ANALYSIS

5.1. Unit root test

The first step is to check for the stationarity of the variables, for this purpose Augmented Dickey-Fuller (ADF) test is applied; the results are reported in Table: 2 below:

Table 1: Unit root tests results:

The Null hypothesis: variable is non- stationary

variable	ADF Test statistic	t- statistic	Prob.	Test critical values		Decision
LOGCPI	1st Difference (Intercept)	-2.397**	0.017	1% level	-2.6289	I(1)
				5% level	-1.95011	
				10% level	-1.6113	
LOGBMS	1st Difference (Intercept)	-4.044*	0.003	1% level	-3.6267	I(1)
				5% level	-2.94584	
				10% level	-2.61153	
LOGSPI	1st Difference (Intercept)	-6.819*	0.000	1% level	-3.6537	I(1)
				5% level	-2.9571	
				10% level	-2.6174	
LOGRGDP	Level (Trend and intercept)	-3.844**	0.024	1% level	-4.2191	I(0)
				5% level	-3.533	
				10% level	-3.1983	
LOGOILP	1st Difference (Intercept)	-5.789*	0.000	1% level	-3.6210	I(1)
				5% level	-2.9434	
				10% level	-2.6102	
LOGEXR	Level (Intercept)	-12.27*	0.000	1% level	-3.646	I(0)
				5% level	-2.9540	
				10% level	-2.6158	
LOGWINF	1st Difference (Intercept)	-6.017*	0.000	1% level	-3.6210	I(1)
				5% level	-2.9434	
				10% level	-2.6102	
LOGINTR	Level (Trend and intercept)	-3.582**	0.045	1% level	-4.2349	I(0)
				5% level	-3.5403	
				10% level	-3.2024	

Source: Own calculation

Note: *, ** and denote the rejection of the unit root hypothesis at the 1% and level 5% level of significance, respectively

According to the results represented in Table 1: LOGRGDP and LOGEXR are stationary and integrated at the level I (0), while LOGCPI, LOGBMS, LOGSPI, and LOGOILP are stationary at the first difference I(1) suggesting that they are integrated at I(1). Accordingly, we reject the null hypothesis of the non- stationary of the study variables.

Since the variables of the model are a combination of first difference and level series, the Autoregressive Distributed Lag (ARDL) is the appropriate methodology compelling for long-run analysis (Pesaran, Shin & Smith in [21]).

The next step is to determine the lag order for the model using the standard VAR model as shown below:

5.2. The Standard VAR model for Lag order determination:

Table 2: The Results of Standard VAR Model:

Lag	Logl	LR	FPE	AIC	SIC	HQ
0	183.006	NA	3.94e-14	-11.00038	-10.67975	-10.89410
1	434.02165	376.5234*	1.40e-19*	-23.62635*	-21.0613*	-22.77612*

Source: Own calculation

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion

Table2: summarizes the results of the standard VAR model with Akaike Information Criterion (AIC), and Schwarz Information Criterion (SIC) to determine the lag order of p and qi before performing the ARDL bound test. According to the results obtained from the Standard VAR model using Schwarz Information Criterion (SIC) the optimal lag order of the study model is 1.

5.3. ARDL Bound Test

Based on the values of the ARDL Bounds Test presented in the table (3), the F-statistic is 11.3128, which indicates 1% Significance; this implies the rejection of the null hypothesis and confirmation of the long-run cointegration. i.e. the model equation is cointegrated at 1%.

Table: 3 ARDL Bounds Test

Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	11.3128	6

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	1.99	2.94
5%	2.27	3.28
2.5%	2.55	3.61
1%	2.88	3.99

Source: own calculations.

As verified by the unit root test and the ARDL bounds testing procedures, the study variables have meaningful cointegrating relationships; consequently, the study model is viable to be used to examine the long-run relationships as well as the error correction short-run dynamics.

5.4. Estimated Long-run Effects

The long-run cointegration relationship between the LOGCPI and the explanatory variables is estimated by the ARDL (1, 0, 1, 0, 0, 0, 1) bound test, summarized in Table: 5 below:

Table: 4 ARDL long-run effects:

ARDL Cointegrating and Long Run Form

Original dep. variable: LOGCPI

Selected Model: ARDL (1, 0, 1, 0, 0, 0, 1)

Sample: 1980 2018

Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGBMS	0.21031	0.03630	5.79376	0.0000
LOGSPI	-0.13577	0.01807	7.51211	0.0000
LOGRGDP	0.373243	0.08623	4.3284	0.0003
LOGOILP	0.04463	0.0250	1.7786	0.0891
LOGEXCR	1.93572	2.83625	0.68249	0.5021
LOGWINF	0.03347	0.01280	2.61480	0.0158
C	-13.3774	3.6709	-3.6441	0.0014

Source: own calculations.

Cointeq = LOGCPI - (0.2103*LOGBMS - 0.1358*LOGSTOCKPINDEX + 0.3732 *LOGREALGDP + 0.0446*LOGOILPRICE + 1.9357*LOGEXCHRATE + 0.0335*LOGWINF -13.3774) (5)

According to the results of estimated long-run effects of ARDL (1, 0, 1, 0, 0, 0, 1) shown in table 4, and equation (5), the coefficients of LOGBMS, LOGRGDP, and LOGWINF are positive and statistically significant at 1% showing a positive robust impact on inflation (LOGCPI) in Saudi economy in the long- run. The estimated coefficient of LOGSPI is negative and statistically significant at 1% showing a strong counter effect on inflation. LOGOILP also has a positive effect on LOGCPI at an 8% level of significance. LOGEXR is statistically insignificant.

These results suggest that there is a long-run positive relationship between LOGCPI and LOGBMS, LOGRGDP, LOGOILP, and LOGWINF specifically 1% increase in LOGBMS, LOGRGDP, LOGOILP, and LOGWINF leads to about 21.03%, 37.32%, 4.46% and 3.34% increase in LOGCPI in the long term respectively. The LOGSPI is negatively related to LOGCPI - (13.57%), a 1% increase in LOGSPI leads to about -13.57%, decrease in LOGCPI, while LOGEXR has no impact on LOGCPI in the long term.

5.5. The Error Correction Model (ECM)

The error correction term (ECT) indicates the speed of adjustment restoring the equilibrium in the dynamic model; the ECM term should satisfy two conditions, first; to be statistically significant, second; to have a negative sign. Bannerjee et al. in [22].

Table (5) below shows the short-run coefficient estimates from the error correction ECM version of the ARDL model. The ECT in the model is -0.472116, which is negative, and statistically significant at 1%, it states that the speed of correcting the long-run deviations in inflation is approximately 47.2 percent in the following periods.

Table: 5 Short-run Error Correction Model (ECM)

Variable	**coefficient**	**Std. Error**	**t-statistics**	**Prob.**
D(LOGBMS)	0.085908	0.032341	2.656295	0.0144
D(LOGSPI)	-0.034251	0.006709	-5.104906	0.0000
D(LOGRGDP)	0.190677	0.043835	4.349865	0.0003
D(LOGOILP)	0.021276	0.008912	2.387242	0.0260
D(LOGEXR)	0.915517	0.647898	1.413057	0.1716
D(LOGWINF)	0.002735	0.007434	0.367889	0.7165
ECT(-1)	-0.472116	0.058023	-8.136707	0.0000
R^2	0.99	F-statistic		768.45
D.W stat	2.04	Prob.(F-statistic)		0.0000

Source: Own calculations

The coefficients in the short-run model suggest that variables with the greatest influence on LOGCPI are LOGSPI, LOGRGDP, LOGBMS, and LOGOILP; a 1% change in the LOGBMS, LOGSPI, LOGRGDP, and LOGOILP causes 8.59%, (-3.42%), 19.0655, and 2.60 change in LOGCPI respectively; on the other hand, LOGEXR and LOGWINF seem to have the least influence on LOGCPI.

5.6. Diagnostic Tests

In this regard serial correlation, heteroscedasticity, and stability diagnostic tests will be performed:

1- Breusch-Godfrey Serial Correlation LM Test:

The Null Hypothesis: No serial correlations exist.

F-statistic	0.058195	Prob. F(1,21)	0.8117
Obs*R-squared	0.088432	Prob. Chi-Square(1)	0.7662

Based on the values obtained we accept the null hypothesis that no serial correlations exist in the time series residuals signifying that residuals are normally distributed.

2- Breusch-Pagan-Godfrey Heteroskedasticity Test:
The Null Hypothesis: No autocorrelations exist.

F-statistic	0.595881	Prob. F(9,22)	0.7867
Obs*R-squared	6.271762	Prob. Chi-Square(9)	0.7124
Scaled explained SS	1.770902	Prob. Chi-Square(9)	0.9946

According to the values of the Breusch-Godfrey LM in the table above, we accept the null hypothesis of no autocorrelations meaning that the residuals are Heteroskedastic.

3- CUSUM Recursive Estimates Test for stability:

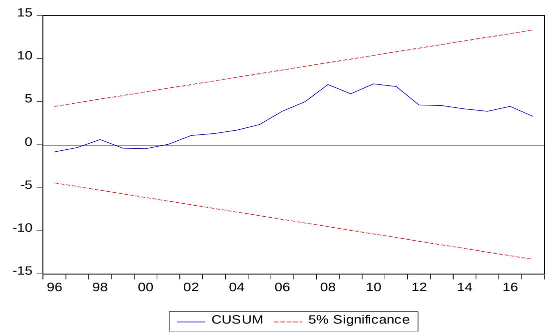


Fig.1: The cumulative sum (CUSUM Test)

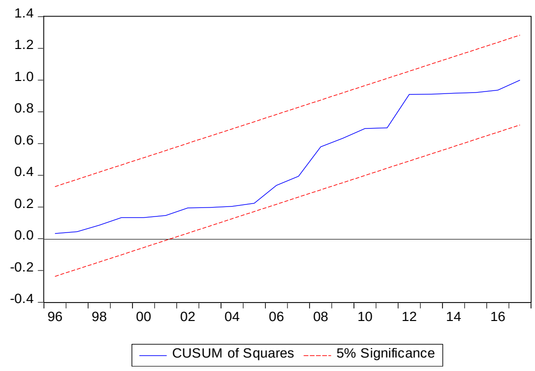


Fig.2: Cusum of Squares Test

Fig.1 and Fig.2 plots of the two tests show that graphics are moving within the critical boundaries of a 5% significance level. Therefore, the observed evidence from CUSUM and CUSUM Square tests support the stability of the estimated coefficients parameter of the ARDL model.

Based on the results of the diagnostic tests conducted, we can conclude that the model passes all of the reported diagnostic tests and hence it can be used for policy-related decision-making.

5.7. Variance Decomposition(VD):

The variance decomposition determines how much of the forecast error variance of each of the variables can be explained by exogenous shocks to the other variables. Using a ten years forecast horizon, Table 6: explains how much of an inflation in Saudi Arabia predicated error variance is defined by the innovation (shock) from each of broad money supply (BMS), the stock price index(SPI), the real GDP (RGDP), exchange rate(EXR) the oil prices(OILP), and the world inflation rate(WINF)

In the long run (at period 10) broad money supply (BMS) and world inflation rate(WINF) explained 38.8% and 21.8% of focus error variance in inflation rate respectively, whereas the stock price index(SPI), the real GDP (RGDP), and oil prices(OILP) explained 1.9%, 6.2%,4.4%, and 12.0% respectively. Therefore, the long run major shocks to the inflation rate in Saudi Arabia are principally from broad money supply (BMS) and world inflation rate (WINF). In the short run (at period 2) influences from the explanatory variables together contribute only to 7.883% showing weak influence in predicting the inflation rate.

Table 6: Variance Decomposition

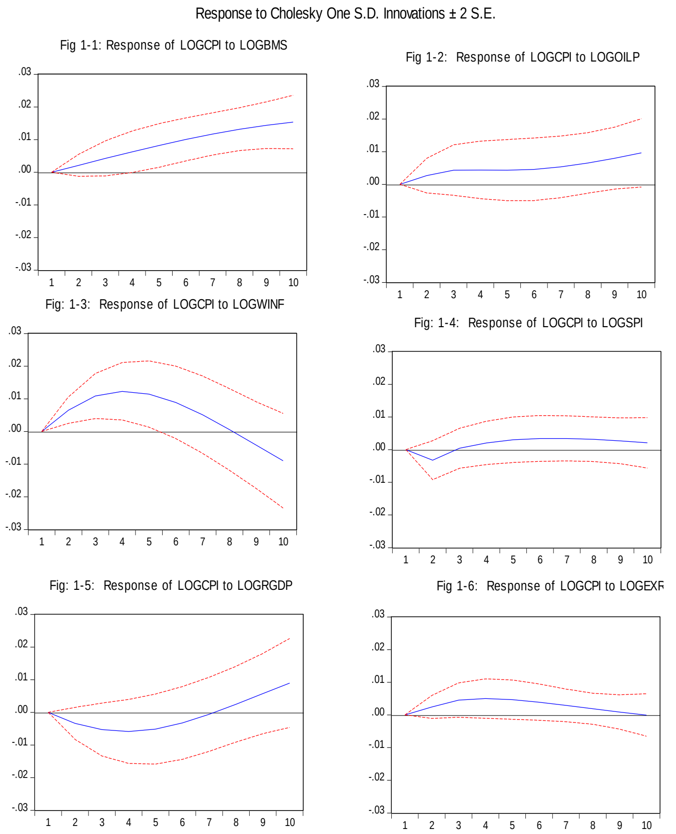
Period	S.E	LOG CPI	LOG RGDP	LOG BMS	LOG EXR	LOG WINF	LOG OILP	LOG SPI
1	0.016	100.000	0.000	0.000	0.000	0.000	0.000	0.000
2	0.023	92.117	3.2460	0.0357	2.857	3.375	0.124	1.100
3	0.029	74.544	4.9475	0.4527	2.350	18.119	0.757	1.178
4	0.034	61.863	3.6585	0.8268	4.044	30.952	1.782	0.916
5	0.039	50.752	4.1597	3.1945	3.694	36.830	3.864	1.198
6	0.0449	39.836	5.3775	9.3862	2.939	36.185	7.553	1.660
7	0.0504	31.649	6.0810	17.727	3.273	31.903	10.673	1.965
8	0.0552	26.554	6.2751	26.092	4.426	27.116	12.013	1.946
9	0.0596	23.303	5.9955	33.412	6.413	23.391	12.138	1.758
10	0.0644	20.918	5.4399	38.820	9.134	21.860	11.446	1.513

Source: own calculations.

5.8. Impulse Response Analysis:

The impulse response functions indicate how the inflation in Saudi Arabia responds to one standard deviation shock caused by broad money supply (BMS), the stock price index(SPI), the real GDP (RGDP), exchange rate(EXR) the oil prices(OILP), and the world inflation rate(WINF).

(Fig: 1-1): below shows that a positive broad money supply shock results in a steady increase in the inflation rate, similarly the inflation rate reacts to the shocks in the oil price (Fig: 1-2), but the magnitude of response is smaller compared to the broad money supply. A one stander deviation shock in the world inflation rate (Fig: 1-3) temporarily increases inflation rate in the first periods until period five when it starts to decline until it hits its steady-state value beyond which world inflation rate is in the negative region. The shocks in the stock price index (Fig: 1-4) starts from the negative region affecting inflation rate negatively until period three when it crosses to the positive region, the same response occurs with shocks in the real GDP (Fig:1-5) which remains in the negative region until the seventh period. Lastly the exchange rate shocks (Fig:1-6) slight increase in the first period then it has no noticeable impact on inflation rate until period nine when it hits its steady-state value.



6. CONCLUSIONS

The main objective of this paper was to investigate the short run and the long-run determinants of inflation in Saudi Arabia for the period (1980-2018) using the Auto Regressive Distributed Lag (ARDL) model. The consumer price index (CPI) was utilized as the dependent variable and the broad money supply (BMS), the stock price index(SPI), the real GDP (RGDP), the oil prices(OILP), and the world inflation rate(WINF) were considered as independent variables.

The estimated model confirms the existence of a co-integrating relationship among the variables under study which bear to have the expected sign; the model passes the serial correlation, heteroscedasticity, and stability diagnostic tests. The error correction coefficient (ECT) is statistically significant at 1%, and it takes the right sign, its magnitude suggests that about 47.2 % of any deviation is corrected within the period.

The empirical results reveal a long-run positive relationship between inflation and broad money supply, GDP, oil prices and world inflation rate, specifically 1% increase in broad money supply, RGDP, oil prices and world inflation rate, leads to about 21.03%, 37.32%, 4.46% and 3.34% increase in inflation rate in the long term respectively. The stock price index is negatively related to the inflation rate, a 1% increase in the stock price index leads to about -13.57%, decrease in the inflation rate, while the exchange rate shows no impact on the inflation rate in the long term.

In the short run, inflation in Saudi Arabia is influenced negatively by the stock price index, and positively by broad money supply, RGDP, and oil prices; on the other hand, the exchange rate and world inflation rate have no impact on the inflation rate.

The findings of the variance decomposition analysis showed that inflation, in the long run, is mostly determined by broad money supply and the world inflation rate. In the light of these findings, the study suggests adopting a tight monetary policy, reallocating resources towards the production sector, and encouraging import substitutes to control inflation in Saudi Arabia.

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