
Factors Affecting Inflation Rates in the Kingdom of Saudi Arabia: A standard study from 1980 to 2016

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Abstract:

This study aimed at identifying the factors affecting inflation rates in the Kingdom of Saudi Arabia for the period (1980-2016). To achieve the study purpose, the researcher adopted the descriptive analytical model as it suits this phenomenon. A group of variables that are expected to affect the inflation rate in the Saudi economy is selected. These variables are: money supply growth rate, imports of GDP, oil price growth rate, rate of exchange, income growth rate interest rate on the dollar and generate price level.

Besides that, a standard model was built based on a series of data of inflation determents for the Saudi economy (1980-2016). The researcher also used the EViews program to tackle the relation among the variables and to obtain the best results.

The study reached the following set of results: There is a direct relation between the inflation rate and money supply growth rate, imports of GDP, and general price level. Whereas the money supply growth rate has the strongest impact on inflation followed by imports of GDP, on the other hand, there is an inverse relation with both exchange rate. Meanwhile, the rest of the variables, oil price growth rate, income growth rate, and interest rate on the dollar have no effect on the inflation rate in Saudi Arabia.

Keywords: Inflation, Monitoring Monetary Policy, Money Supply, Saudi Arabia.

1. Introduction

Inflation is an economic phenomenon that has a large impact on economic and social aspects. Many developed and developing countries are suffering from inflation, and it has a major impact on the direction of monetary and fiscal policies. The most important characteristic of this phenomenon is the lack of consensus of economists on a specific interpretation of it, in addition to the different effects of inflation from one economy to another.

Saudi Arabia, like any other country, has experienced periods of high inflation. According to a study conducted by Al-Ghannam (2008), two periods of inflation were reported in Saudi Arabia, the first was in the second half of the 1950s due to the severe shortage of oil production, and the increase in government spending, forcing the government to borrow, during this period the shortage of the Saudi Arabia Riyal (SAR) exchange rate until it reached (6.25) to US Dollar (USD) Instead of (3.75), foreign assets also decreased and the government has become indebted of about half a billion USD. An indication of inflation in that period is the increase in the overall supply of means of payment and cash flow resulting from increased government spending and inadequate demand. The second period was in the mid-seventies, it was characterized by an increase in government spending due to basic development requirements, which led to an increase in the total demand for goods and services compared with the shortage of the total supply of goods and services which helped increase the prices of these goods and services (Al-Ghannam, 2008).

Saudi Arabia has an open economy, which makes global inflation specific in its effect on domestic inflation, it contributes to the overall inflationary pressures of the Saudi economy, were imports account for a large share of GDP. Imports of goods and services reached (38.8) of GDP in 2015, and with increasing demand for imported goods, this makes Saudi Arabia vulnerable to imported inflation. Saudi

Arabia relied on the oil sector for its economic growth, and its oil revenues take the largest share of the total government revenues, which leads to weak fiscal policy including government spending. The growth of government spending is considered one of the most important sources of money supply growth in Saudi Arabia, most of the studies showed it has a significant impact on the high inflation rates in Saudi Arabia.

Although the Kingdom of Saudi Arabia has achieved good economic growth rates, it is necessary to monitor the inflation and the possible challenges and risks for the Kingdom's economy, as the continued high level of inflation will obstruct economic programs, through which it seeks to diversity its economic base, increase the contribution of non-oil sectors in GDP, and reduce dependence on oil in future plans. Therefore, this study aims to clarify the factors affecting inflation rates based on annual series of data and known econometric methods.

2. Research problem and questions

Saudi Arabia faces a range of challenges that may hinder its development. One of these challenges is the inflation. The Kingdom suffers from fluctuations in inflation as shown in the consumer price index (figure 1).

The general cost of living index increased during the three decades from 1982 to 2015 by 45.7%, representing an annual growth rate of 1.3% in this period. Saudi Arabia's oil-based economy has contributed to the inflation. The use of oil revenues to build infrastructure through government spending has led to an increase in consumption and living standards. Because of the increase in oil prices, GDP has increased significantly. This increase has led to an increase in government spending, money supply, and the demand for goods and services. The increase in GDP is accompanied by an increase in inflation rates, while the increase in government

spending in various fields, in addition to the current expenditure, in which wages play an important role, creates inflationary pressures.

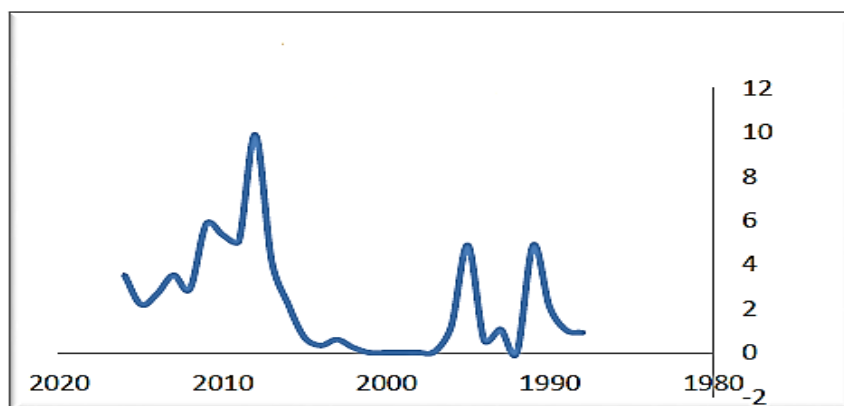


Figure 1: Consumer price index in Saud Arabia (Saudi Arabia Monetary Agency, Annual statistics, 2016).

On the other hand, the policy of Saudi Arabia, which focuses on linking the SAR to the USD, has an effect on inflation. On the one hand, it limits the role of monetary policy and the control of the local interest rate on inflation as it follows the interest rate on the USD. On the other hand, inflationary pressures, the changes in the exchange rate of the riyal against other currencies will directly affect the cost of many commodities, except for goods coming from the United States of America. The Kingdom imports a large part of the goods from other countries, which means that Inflation will rise. High inflation rates have negative effects on investment. Many foreign investors are reconsidering the possibility of remaining in the market as the cost of living continues to rise. Most of the Kingdom's foreign exchange reserves and foreign investments are denominated in US dollars, which makes inflation and interest rates low. It is clear from the above that inflationary pressures pose a challenge to Saudi Arabia and to fully control this phenomenon, the causes

and limitations of inflation must be identified and understood by the monetary authority.

The present paper aims to answer the following questions:

- What are the determinants of inflation in Saudi Arabia?
- What are the most influential factors on inflation in Saudi Arabia?
- What inflationary periods have passed in the Kingdom during the period of study?
- What are the most important tools used by the government to counter inflation in the Saudi economy?

3. Research hypothesis

The present paper seeks to validate the following hypotheses:

- There is a positive relationship between the growth rate of money supply and the inflation rate in Saudi Arabia.
- There is a direct correlation between imports of GDP and the inflation rate in Saudi Arabia.
- There is a positive relationship between the rate of growth of oil prices and the rate of inflation in Saudi Arabia.
- There is an inverse relationship between the riyal exchange rate index and the inflation rate in Saudi Arabia.
- There is a positive correlation between the GDP growth rate (domestic income) and the inflation rate in Saudi Arabia.
- There is a positive correlation between the interest rate of the USD and the rate of inflation in Saudi Arabia.
- There is a positive relationship between the general level of prices and the inflation rate in Saudi Arabia.

4. Literature review

4.1 The concept of inflation

Different theories and economic schools explained the phenomenon of inflation and its causes. There are several theories about the causes of inflation, which differed in the statement of the causes of the phenomenon, where some theories attributed to the factors of the demand side or because of the attraction of inflationary demand, and other theories to the supply side factors or because of inflationary costs. These schools include Keynesian school, monetarist school, neoclassical school, and Structuralist school (Alhajouj, 2009).

The Keynesian School focused on the demand side to explain the phenomenon of inflation as it indicated that the labor market was playing a role in raising prices through high demand for goods and services. While the monetarist school sees inflation as a predominantly monetary phenomenon, the increase in money supply leads to a relative increase in domestic prices, which means that the balance of real money and production will not be affected. Friedman (1970) defined inflation as a purely monetary phenomenon, due to the growth of money in greater quantity than the growth of production.

While the neoclassical school in its analysis of the phenomenon of inflation adopted the Philips curve method, where the low unemployment rate increases the level of inflation and vice versa, since inflation is a function of the level of unemployment. As a result, the low level of unemployment is the result of increased demand for labor, which is mainly the result of increased demand in the commodity market, leading to higher prices. The structuralist school defined this phenomenon as an economic and social phenomenon due to the structural imbalance that exists in particular in different economies. The school sees structural, economic, social, and

political factors as the reason for the increase in demand and the poor monetary and financial management in these countries.

Akl (1994) described inflation as an imbalance between total supply and aggregate demand as the definition states that the continuous rise in prices is due to an imbalance between total supply and aggregate demand. Al-Kubaisi (2008) defined inflation as a phenomenon of imbalance between total supply and aggregate demand leading to continuous rise in the general level of prices for monetary, cost, or structural reasons. The present study is based on the concept of inflation known by al-Kubaisi. This definition includes all variables that cause inflation. On the one hand, it deals with the demand side factors which represent the monetary and financial expansionary policy, and the supply side factors resulting from higher production costs. Therefore, the definition combined the concepts of monetary school and structural school.

4.2 Factors affecting inflation

Many studies have dealt with inflation and have tried to explain it in different economies. The study of Assaf (2015) aimed at measuring the effect of macroeconomic variables on basic inflation and general inflation in Jordan during the period (1994- 2014). In his study, Assaf focused on the following variables: the index of quantities of industrial production as a representative indicator of economic activity, the supply of money in the broad sense of the representation of monetary policy, taxes to represent the fiscal policy, and international oil prices, which was used as an indicator of world prices. The study showed a long-term equilibrium relationship between the basic inflation rate and other variables used, so basic inflation is a better indicator of total inflation in the interaction between domestic economic variables and foreign compared with total inflation, which is more affected by the macro variables.

Yahya's study (2014) aimed to identify the main determinants of inflation in the Algerian economy over a period of time (1970-2012), the study applied multiple self-regression vectors, variance analysis, and response functions. The study included the following variables: Monetary variables: monetary mass, interest rate, exchange rate, and non-monetary variables represented in GDP, wage mass, revenue, expenditure, and import value. The results of this study showed that the wage mass is the main determinant of inflation in Algeria. Inflation rates in the short term are linked to both import prices, real domestic output, monetary mass, and government agreement. In the medium and long term, the monetary mass becomes the main variable interpreting changes in prices as well as imports, wages, and revenues. Interest rates are not an effective tool in Algeria.

The study of Masoud and Al-salhi (2014) aimed at identifying sources of inflation in Libya using the method of Johansen during the period (1980 - 2012). The study included the following variables: domestic prices, money supply, exchange rate, GDP at constant prices, real income, and change in domestic prices. The results of the study confirmed the existence of a common integration relationship between the variables of the study, and the expected inflation has a significant impact on inflation in the current period. The study also concluded that the main inflationary factors were the exchange rate, the USD price, imported inflation as well as changes in liquidity or money supply, and gross national product.

Andersson et al (2009) examined the determinants of inflation differentials and price levels in euro area countries (1999-2006), using the method of common integration based on the following variables: labor cycle, changes in product market regulations, changes in actual exchange rates, energy intensity, fiscal policy, price variations managed in the euro zone, changes in product regulations, Changes in wages and rental rates. The results of the study showed that the level of prices in each euro zone country is governed by the per capita GDP levels determined by levels of

productivity and consumption. The results generally confirm that cyclical positions appear to be important determinants of inflation variation, external factors, such as the exchange rate have a secondary role. The results of combined integration of price level estimates show that long-term price levels are only a long-term equilibrium if developments in GDP per capita are sustainable. In addition, wage growth is partly linked to the persistence of inflation differentials.

Based on the above, this study relied on the following variables: growth rate of money supply, imports of GDP as a measure of imported inflation, oil price growth rate, SAR exchange rate, income growth rate, USD interest rate, and general price level.

5. Methodology

The study used a descriptive analytical approach in addition to the standard approach. The descriptive approach is used to describe the variables and the nature of the relationship between them. The standard approach is to describe the reality and analyze it based on the variables. Linear regression models are used to analyze the time series to reach logical results. The standard model of factors affecting inflation in Saudi Arabia during the period 1980 - 2016 was constructed as follows:

$$Y = B_0 + B_1x_1 + B_2x_2 + B_3x_3 + B_4x_4 + B_5x_5 + B_6x_6 + B_7x_7 + u_i$$

We then turned this function into a semi-logarithmic function as follows:

$$Y = B_0 + B_1LNx_{1i} + B_2LNx_{2i} + B_3x_3 + B_4LNx_{4i} + B_5x_5 + B_6LNx_{6i} + B_7LNx_{7i} + u_i$$

Y = Inflation rate of prices.

x_1 : Money supply growth rate.

x_2 : Imports from GDP.

x_3 : The rate of growth of real oil prices.

x_4 : Real exchange rate of SAR.

x_5 : GDP growth per capita.

x_6 : Interest rate in USD.

x_7 : The general level of consumer prices.

B_0 : The fixed function section.

B_1 : Measures the effect of change in the dependent variable (inflation rate in Saudi Arabia) as a result of change in the independent variable (Money supply growth rate)

B_2 : Measures the effect of change in the dependent variable (inflation rate in Saudi Arabia) as a result of change in the independent variable (The rate of imports of goods and services out of GDP).

B_3 : Measures the effect of change in the dependent variable (inflation rate in Saudi Arabia) as a result of change in the independent variable (Real oil price growth rate).

B_4 : Measures the effect of change in the dependent variable (inflation rate in Saudi Arabia) as a result of change in the independent variable (Real Exchange Rate).

B_5 : Measures the effect of change in the dependent variable (inflation rate in Saudi Arabia) as a result of change in independent change (Per capita income growth rate)

B_6 : Measures the effect of change in the dependent variable (inflation rate in Saudi Arabia) as a result of change in the independent variable (Interest rate in US \$).

B_7 : Measures the effect of change in the dependent variable (inflation rate in Saudi Arabia) as a result of change in the independent variable (The general level of consumer prices)

u : Measurement error.

6. Analysis

The research uses modern standard techniques for time series analysis using multiple linear regression tests, stationary tests for variables, and joint integration, where we reach real results, and logical analysis of economic relations.

- Multiple linear regression test OLS:

Multiple linear regression analysis is used to study the relationship of several independent variables to the dependent variable. The use of multiple linear regression also helps to identify the following: Predicting the values of the dependent variable by knowing the values of independent explanatory variables with statistical significance and determine the amount of variance and difference in the dependent variable in the regression model that explained by independent variables of statistical significance.

Results of standard model estimation using linear method:

$$Y = -8.84 + 14.62x_1 + 0.19x_2 + 1.66x_3 - 0.04x_4 + 1.61x_5 + 0.30x_6 + 0.07x_7$$

Table 1: Results of standard model estimation using leaner method

Variables	Coefficient	Std. Error	t-statistic	p-value
C	-8.844201	3.337754	-2.649746	0.0129
x ₁	14.62316	5.098192	2.868303	0.0076
x ₂	0.192267	0.069486	2.766982	0.0097
x ₃	1.665442	1.502056	1.187857	0.2445
x ₄	-0.041864	0.013364	-3.132460	0.0039
x ₅	1.617118	0.932228	1.734681	0.0934
x ₆	0.306601	0.204916	1.496228	0.1454
x ₇	0.075042	0.032850	2.284386	0.0299
$R^2 = 0.597758$			F-statistic= 6.156547	
Adjusted $R^2 = 0.50065$			Prop(F-statistic)= 0.000181	
Durbin-watson stat= 1.378051				

The results of the multi-linear standard model show the following:

- $B_0 = 8.84$ represents the fixed limit which is negative when all the independent variables in the function are zero.
- $B_1 = 14.6$ represents the growth rate of the positive parameter which indicates a direct correlation between the growth rate of the money and the rate of inflation in the Kingdom.
- $B_2 = 0.19$ The import parameter of the total output in Saudi Arabia is positive, which indicates that there is a direct correlation between imports of the Kingdom's total output and the rate of inflation.
- $B_3 = 1.66$ represents the parameter of the growth of oil prices, which is positive, indicating a direct relationship between the growth of oil prices and inflation.

- $B_4 = -0.04$ The exchange rate parameter is negative, indicating an inverse relationship between the price rate SAR exchange rate Inflation means that the higher the rate of exchange rate the lower the rate of inflation by B_4 .
- $B_5 = 1.61$ represents the per capita income growth parameter and is positive, indicating a positive correlation between per capita income growth and inflation.
- $B_6 = 0.30$ The USD interest rate parameter is positive, indicating a relationship between the interest rate on the dollar and the rate of inflation.
- $B_7 = 0.07$ represents the general price level parameter which is positive indicating a positive relationship between the level of prices and inflation.
- The results of the t values shown in the previous table show that the independent variable (X_1, X_2, X_4, X_7) has a significant effect because the value p-value of the variables is less than 0.05. For the independent variable (X_3, X_5, X_6) the effect is insignificant because the value P-value is greater than .05.
- The results of the model analysis show that R^2 is (0.5977) and this means that the independent variables explain the changes in the dependent variable by (59.7%), and for the modified limiting factor that takes into account the scores Freedom is (0.5006). This means that the independent variables explain (50.06%) of the changes occurring in the remaining variable is due to other reasons. As for the significance of the model, the model is of statistical significance P-value (F) = .000181.
- Results of standard model estimation using the logarithmic method:

$$Y = -27.58 + 1.11 \ln x_1 + 6.5 \ln x_2 + 1.77 x_3 - 5.60 \ln x_4 + 2.05 x_5 + 2.25 \ln x_6 + 7.40 \ln x_7$$

Table 2

Variables	Coefficient	Std. Error	t-statistic	p-value
C	-27.58777	16.74984	-1.647047	0.1103
LnX1	1.112631	0.398182	2.794275	0.0091
LnX2	6.500690	2.152557	3.019984	0.0052
X3	1.771565	1.380701	1.283090	0.2096
LnX4	-5.601031	1.808332	-3.097347	0.0043
X5	2.058006	0.965574	2.131381	0.0417
LnX6	2.251290	1.513814	1.487164	0.1478
LnX7	7.408060	3.545636	2.089346	0.0456
$R^2 = 0.605486$			F-statistic= 6.358314	
Adjusted $R^2 = 0.510259$			Prop(F-statistic)= 0.000141	
Durbin-watson stat= 1.232112				

The results of the logarithmic standard model show the following:

- $B_0 = -27.58777$ represents the constant limit which is negative when all the independent variables in the function are zero.
- $B_1 = 1.1126$ The parameter of the money supply growth is positive, indicating a direct correlation between the growth and the inflation rate in the sense that the higher the growth of money supply increase inflation rate B_1 .
- $B_2 = 7.408$ The import parameter of GDP in Saudi Arabia is positive.
- $B_3 = 2.2512$ represents the parameter of the rate of growth of oil prices which is positive, indicating a direct relationship between prices Oil and inflation.
- $B_4 = 2.058$ represents the exchange rate, which indicates a direct correlation between the exchange real inflation rate, meaning that the higher the exchange rate, the greater the inflation by B_4 .

- $B5 = -5.601$ The parameter represents the rate of growth of per capita income which indicates an inverse relationship between income growth rate Per capita and inflation rate.
- $B6 = 1.77$ represents the interest rate parameter on the USD which is indicative of a direct correlation between the rate interest on the dollar and inflation rate.
- $B7 = 6.5006$ represents the general price level parameter which indicates a direct correlation between the general level of prices and inflation.
- The results of the t values shown in the previous table show that the independent variable ($x1, x2, x4, x5, x7$) has a significant effect because the value p-value of the variables is less than .05 and the independent variables ($x3, x6$) have insignificant effects because the value P-value is greater than .05.
- The results of the model analysis show that $R2$ is worth (0.60548). This means that the independent variables explain the changes occurring in (60.5%), and for the modified selection factor that takes into account the degrees of freedom (0.51025). This means that the independent variables explain (51.02%) of the changes occurring in the dependent variable and 49% for other reasons, as for the significance of the model, the model is of statistical significance p-value $(F) = .00014$.

7. Results

This research project reached several results, most of which are in line with the expectations of the economic theory:

- Variables are identical to the study hypotheses. The relation between the dependent variable and the independent variables is shown that the variable is in direct correlation with the growth rate of money supply, imports of GDP, and growth rate, the price of oil, the growth rate of per capita income, the

interest rate on the dollar, the general level of prices and linked to the relationship in reverse with the exchange rate of the SAR.

- The variables that emerged at a high level of significance (exchange rate of SAR, growth rate of money, imports from (GDP) showed a clear impact on the inflation rate in Saudi Arabia at a level 5%, indicating the impact of monetary policy and imported inflation on the inflation rate.
- The rate of growth of money had a significant effect on the study model. This result is consistent with the results of previous studies, which means monetary policy the effect on inflation.
- Imports of GDP had an impact on the model at a significant 5%. Which proved the effect of inflation importer of inflation in Saudi Arabia.

8. Conclusion

This study dealt with the factors affecting inflation rates in the Kingdom of Saudi Arabia for the period (1980 – 2016). To achieve the objective of this study, standard methods were used through multiple linear regression models. Most of the results agree with the economic theory, while the regression coefficient was 59.7 and the researcher attributed the remaining percentage to the fact that this study neglected an important variable which is government expenditure as well as non-economic factors that may affect inflation, such as population growth and population structure. Most of the results showed a high level of significance the variables associated with the external world showed a significant effect at a significant level of 5% (exchange rate index, Imports of GDP) which shows that the Saudi economy is open to the outside world.

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