The Sources of Inflation in Qatar: An Empirical Study (1980-2010)

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ABSTRACT: The main objective of this Study is to determine the sources of inflation in Qatar. For achieving this objective a single-equation model of inflation in Qatar is specified and estimated. This model is based on the monetarist single-equation model of inflation. However, the model departs from the monetarist single-equation model of inflation by including the external factors that are expected to have impact on inflation in Qatar namely; the U.S. Dollar short-term market interest rate, world inflation and the movements of Qatari Riyal exchange rate against the major international currencies.

The empirical outcomes that emerge from estimating our single-equation model of inflation in Qatar indicate that all the explanatory variables bear the correct sign. Yet all the explanatory variables are found to be statistically significant, except the nominal effective Qatari Riyal exchange rate index which represents the Riyal exchange rate against the major international currencies.

The overall fit of the regression is very good (see the estimated equation #2) with four explanatory variables explaining large proportion of the total variations of inflation rate in Qatar ($R^2=0.735$). Moreover, four explanatory variables are found to exert strong impact on the inflation in Qatar, namely, the growth of money supply, the growth of real income, the changes in U.S Dollar market interest rate and the inflation rate in advanced economies.

One of the main conclusions of this study is that the inflation in Qatar can be considered as a monetary and structural phenomenon. This suggests that a serious anti-inflation monetary policy should include a reduction in the rate of monetary growth.

I- Introduction

Qatar represents an interesting case of studying inflation. It has small and oil-gas based economy. Moreover, it has a very open economy with complete capital mobility. Therefore, external monetary and financial factors such as foreign interest rate, particularly U.S interest rate, exchange rate movements and world inflation are expected to exert significant impact on the economic activities, price level and financial markets. Furthermore, almost all Qatar government’s revenue is derived from oil and gas exports. The other sources of government revenue, such as taxes and
government debt are still noticeably small comparing with the oil and gas revenues. This significantly reduces the effectiveness of the fiscal policy in Qatar. At present, government expenditure is only effective policy instrument. Moreover, the monetary authority in Qatar has a limited control over the monetary aggregate. This is largely due to the fact that Qatar has a very open economy operating under a pegged exchange rate regime. Furthermore, Qatar central bank lacks two important monetary tools, namely open market operation and discount window. Therefore, it seems that the behavior of these monetary aggregates has been determined largely by fiscal operations (i.e., increasing or decreasing government expenditure), factors which are out of monetary authorities control. Qatar therefore, can be seen as a good example of complete coordination between fiscal and monetary policy.

The Objective of the Study

The main objective of this study is to determine empirically the causes of inflation in Qatar. As it has been mentioned above, Qatar has a very open economy operating under a pegged exchange rate regime. This means that the inflation in Qatar is generated not only by domestic causes, but also by external causes.

The Methodology of the Study and the Data Sources

This study is based on a theoretical and empirical analysis. An econometrics model of inflation in Qatar will be specified and estimated. The model will be based on the monetarist single-equation model of inflation. However, it departs from the monetarist single-equation model by including the external factors such as, foreign interest rate, exchange rate movement and world inflation.

Yearly data that run from 1980-2010 will be used for estimating the model of this study. The Data Sources of this study are: 1. International Financial Statistics, IMF, 2010, 2009 Qatar Central Bank, Annual Report, different issues

The Organization of the study

This study consists of six sections: Section I, the introduction, explains the objective of the study, the methodology employed and the data sources. In Section II, the behavior of inflation in Qatar during 1980-2010 is analyzed. Section III, is devoted to the literature review of inflation. This Section is divided into two Subsections: the first subsection is focused on the theoretical background of inflation. In the Second subsection, several important empirical studies of inflation on some Gulf States are reviewed. Section IV is devoted to the specification of inflation model of Qatar economy. The empirical results that emerge from estimating the inflation model of Qatar economy are analyzed in Section V. the summary and conclusion of this study are presented in Section v1.

II-The Behavior of Inflation in Qatar During 1980-2009

Qatar witnessed relatively high inflation rates during the last few years of 1970s and early 80s (see Table #1). This may be due to the fact that the world inflation recorded high rates during that period (see Table # 1).

Between 1984-2003, Qatar's inflation rate, were relatively modest (see Table # 1). The annual average inflation rate of that period was 2.4%. This may be because Qatar economy experienced noticeably slow growth during most of that period (see Table # 1). Accordingly, the local aggregate demand recorded low growth rates throughout most of the period. In the period 2004-2009, the inflation rates rose sharply. In 2008, the inflation in Qatar reached to highest rate (see Table # 1). The sharp increases in the inflation rates can be attributed to the fast growth of local aggregate demand (see Table # 1). Moreover, the money supply grew sharply during the period. It recorded exceptional high growth rates (see Table #1)
Before ending this section, it is important to shed light on the relationship between the money supply and government expenditure in Qatar. As it was mentioned earlier, almost all Qatar government’s revenue is derived mainly from oil and gas exports. The other sources of government revenue, such as taxes and government debt are still noticeably small comparing with the oil and gas revenues. This significantly reduces the effectiveness of the fiscal policy in Qatar. At present, government expenditure is the only effective fiscal policy instrument available to Qatar government. Moreover, the monetary authority in Qatar has a very limited control over the monetary aggregates and Riyal interest rate. This is largely due to the fact that Qatar Central Bank lacks two important monetary tools, namely open market operations and discount window. Furthermore, Qatar has a very open economy operating under a pegged exchange rate regime. Therefore, it seems that the behavior of these monetary aggregates has been determined largely by fiscal operations (i.e., increasing or decreasing). Qatar, therefore, can been seen as a good example of complete coordination between fiscal and monetary policy.

The following estimated single-equation model represents the relationship between the money supply and government expenditure in Qatar.

\[
\ln M_2 = -1.313 + 0.966 \ln GE \\
(2.28) \quad (19.83)
\]

\[R^2 = 0.933, \quad F = 392.9, \quad D-W = 0.612\]

Where:

- \(M_2\) = Money supply defined as currency in circulation + demand deposits at Qatari commercial banks + time and saving deposits.
- \(GE\) = Government expenditure.

Yearly data running from 1981 to 2010 was used in estimating the above relationship. The above estimated equation indicates that the government expenditure exerts a significant and strong effect on the money supply. Yet, there are other variables such as the commercial bank’s claims on the private sector, and the net private sector balance of payment deficit or surplus could have a significant impact on the money supply.

The exclusion of these variables is reflected in the large and highly significant and negative constant term and reflected also in a low value of the Durbin-Watson d-statistic.

**Sources:**

2. Qatar Central Bank, Annual Report, different issues

**Key to Abbreviation:**

- \(P\) = inflation rates in Qatar. CPI was used to calculate the inflation rates
- \(M_2\) = Growth rate of money supply.
- \(G\) = Growth rate of government expenditure.
- \(IP\) = Inflation rates in advance economies.
- \(Y\) = Growth rate of real income (real GDP).
- \(Ad\) = Growth rate of local aggregate demand.

**III- Review of Literature on Inflation**

Among key economic issues, the inflation problem has received a great deal of attention both in public and policy circles alike due to its significant economic and social costs. Furthermore, in the last five decades, inflation has been a serious problem world-wide. Consequently, several theories have been advanced in the economic attempting to explain the causes of inflation and proposing policies to contain it. Moreover, a considerable amount of empirical studies have been carried out by many economists all over the world. The main aims of these studies are to specify the sources of inflation and suggesting ways to contain it.

This section is divided into two subsections. The first subsection will be focused on theoretical background of inflation. In this subsection several important theories of inflation will be reviewed. Moreover, several prominent studies on the inflation world-wide will be reviewed. In the second subsection, several important empirical studies of inflation on several Gulf States will be reviewed.
Table No (1): The Growth Rates of Money Supply (M\(_2\)), Government Expenditure, Real Income, Local Aggregate Demand and the Inflation rates in Qatar and in advance economies.

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**The Theoretical Background of Inflation**

Fan (1970) used the quantity theory model to test empirically the effect of monetary policy on real income and price level in less-developed countries. He divided these countries into two sets, Asian and Latin American countries. He regresses two different equations. The first was the rate of growth of real income as a function of the rate of growth of money supply. The second was the rate of change in price level as a function of the rate of growth of money supply. His findings suggest that for Asian countries monetary policy can stimulate real income. At the same time, this increase in real income is accompanied by a substantially less than one-to-one relationship between the rate of growth of money supply and the rate of growth of price level. For Latin American countries he found that the effect of monetary policy on real income is negligible. On the other hand, the relationship between growth rate of money supply and inflation rate in the Latin American countries is more than unity, which suggests that a one percent increase in the rate of growth of money supply results in more than one percent increase in inflation rate. He attributed this result to the hyperinflation existing in some of Latin American countries. He concluded that the quantity theory model yields a good prediction in the case of hyperinflation. Keynes (1936), on the other hand, argued that inflation originates in the goods market and money has no significant relationship with it. He suggested the "inflationary gap" model to explain the change in price level. According to this model, the inflation gap is caused by an upward shift in the expenditure function. This shift is not necessarily caused by money supply expansion but by other factors such as the business sector's expectations becoming more optimistic leading to an increase in the investment function or a tax cut which results in an increase in consumption. Some economists like Harris (1981) have argued that this inflationary gap would not be sustained unless the money supply increased. That is because price increases result in increases in the nominal demand for money, if this increase is not matched by an increase in money supply, interest rates will increase resulting in the expenditure function returning to its original position. Thus, the inflationary gap is eliminated.

The Keynesian assumption concerning the demand for money does not permit the above conclusion. According to this assumption, demand for nominal money is not a stable function in prices and interest rates. Therefore, a rise in price level does not imply an upward shift in the function of nominal demand for money so that interest rate increases and expenditure returns to its original level. This instability in the nominal demand for money is due to the unstable propensity of the private sector to replace money with credit as a medium of exchange. As a result, the inflationary gap would be sustained and the excess expenditure would be financed by extending credit within the sector.

Pigou (1949) did not accept the inflationary gap theory. He attributed inflation to the increase in money income. Inflation, according to him, exists when money income increases more than the income caring capacity. He distinguished between three types of inflation: wage-induced inflation, deficit-induced inflation, and galloping inflation. The first type is the increase in money stock due to an increase in wages, which requires entrepreneurs to have more money to pay workers in order to maintain the working capacity. The second type of inflation occurs when government expenditures exceed its revenues from taxes and borrowing and as a result it finances its excess expenditures by creating money. The last type is a result of the increase in money stock which can lead to distrust in currency and therefore increase the rate of change of prices. In other words, Pigou
considered that an increase in money stock is a necessary and sufficient condition for inflation.

Another theoretical framework to explain inflations is the well-known Phillips curve which was developed by Philips (1958). He empirically investigated the relationship between the change in money wages and unemployment for Great Britain; he found that a negative correlation exists between these two variables. Solow (1960) has further investigated this relationship. He has modified this curve to represent the relationship between the rate of price change and the rate of unemployment. As a result, this curve has been utilized as a policy instrument by the policy makers who have to make a compromise between unemployment and inflation rates.

However, Friedman (1969a) argued that the trade-off between inflation and unemployment is a temporary one, stemming from unanticipated inflation. This means high inflation does not decrease unemployment but a rising inflation does because of the different expectations of the employees and employers. Friedman states:

…. Selling prices of products typically respond to an unanticipated rise in nominal demand faster than prices of factors of production, real wages received have gone down-though real wages anticipated by employees went up, since employees implicitly evaluated the wages offered at the earlier price level. Indeed, the simultaneous fall ex post in real wages to employers and rise ex ante in real wages to employees is what enabled employment to increase (Friedman 1969b, p. 103-4).

Another theoretical approach dealing with inflation was developed in the 1960s by some economists, such as Matchup (1960), which is cost-push. According to this approach the cause of inflation is rising money wages. Money wages increase independent of the labor market because of social pressure caused by unions. Inflation results because these wages increase faster than productivity. The result of inflation is a decrease in the real value of money stock and unemployment. As the government tries to maintain full employment it expands money supply. According to this approach, the causation runs from prices to money supply and not the reverse.

Finally, the monetary approach to inflation has been widely investigated and gained empirical support of many economists, especially when both unemployment and inflation exist in contrast with the Phillips curve hypothesis. This approach was developed by monetarists such as Friedman who redefined the quantity theory as a theory of demand for money and not for prices. Unlike the crude quantity theorists, the advocates of this approach did not assume demand for money to be a constant fraction of nominal income. Instead, they argued that the real demand for money is a stable function in some limited variable such as relative rate of return on assets, wealth and the expected change in price level.

Friedman (1969a) developed this approach by equating money supply multiplied by its velocity to nominal income which implied equilibrium in the money market. Even though this equity is not very different from the crude version of the quantity theory, it has two new assumptions. The first is that the quantity theory is a theory of demand for money; the second is that the velocity of money is not constant but stable. According to this identity, if money supply increases, the price level increases when there is full employment. However, the relationship is not one-to-one between money supply and absolute price level. Friedman stated that:

The relationship between changes in the stock of money and changes in prices, while close, is not of course precise or mechanically rigid. Two major factors produce discrepancies: change in output and changes in the amount of money that the public desires to hold relative to its income (Friedman, 1969b, p. 174).
According to this approach the change in the real output in the long-run is due to basic factors such as resources availability, technological change and growth of population. Taking these factors into consideration with the fact that demand for money is a stable function, inflation can be explained by the variations in the supply of and demand for money since the latter depends on output in a stable manner.

The monetarist approach to inflation in its simplest form states that inflation rate ($P_t$) is equal to the difference between the growth rate of the nominal money supply ($M_t$) and the growth rate of the real money demand ($dP_t$).

\[
\dot{P}_t = \dot{M}_t - \left(\frac{M}{P}\right)^d
\]

Several important issues related to the implementation of this approach are important to be highlighted here:

1. According to this approach, for any factor to exert a significant and lasting influence on inflation, it must affect the growth rate of real money supply and/or growth rate of real money demand. Given a reasonably stable money demand, substantial swing in the price level would likely be associated with similar movements in the money supply. It is obvious, therefore, why monetarists have generally placed heavy emphasis on the role of monetary growth in explaining the inflation process. This implies that inflation can be effectively controlled by restrictive monetary policies.

2. Despite some claims to the contrary, most theoretical and empirical studies of inflation that have used this approach have concluded that the nominal money supply is predominantly policy-controllable. Therefore, in deriving the monetary model of inflation, money supply is typically assumed exogenous (policy controllable). Real money demand and, on the other hand, is dependent on the behavior of the public. Therefore, it requires a behavioral specification. Established theory suggests that real money demand depends positively on a scale variable like GDP, and negatively on the opportunity cost of holding money instead of physical assets or financial assets. Moreover, in open economies, the foreign factors such as the changes in the foreign interest rate and expected changes in the exchange rate could have significant influence on the demand for money.

3. The deficiency of the various applications of the monetarist approach to inflation is that they are closed-economy models where external factors play no role in determining domestic inflation. Essentially, the closed-economy nature of the monetarist inflation model is partly the result of ignoring the influence of international monetary factors in the (implicit) underlying money demand function. Obviously, this view is inappropriate particularly in the case of highly open economies.

Two other theoretical approaches are reviewed here which deal with price stability and monetary policy in small open economies such as that of Qatar. The first one related to monetarists who argue that under certain assumptions the small open country inflation equals the world inflation. That is because any change in domestic money stock will be transmitted by the dynamic adjustment process to become part of the world money stock wherein national and world inflation will have risen in proportion to the increase in the world money supply. The policy implication of this approach is that monetary policy is ineffective under a system of fixed exchange rates and that its only function is to determine the composition of money supply, such as shares of domestic credit and international reserves in domestic money supply.
The second is the structural approach, which has two views, the Scandinavian model and the Latin American experience. The first one deals with the small open developed economy. This model was developed by Otani, J., (1975). According to this model the economy of the home country is divided into two sectors: the open competitive sector, which produces goods, traded in the world market, and the sheltered sector, which is not exposed to the world market. Inflation in the competitive sector is exogenous and equal to the world inflation. The inflation rate, along with an increase of labor productivity, determines the increase in wage rate within this sector. The wage rate in the competitive sector is equal to the wage rate in the sheltered sector. Because productivity is greater in the competitive sector, then inflation rate in the home country depends on the difference in productivities between the two sectors, and can be written as:

\[ p_i = p_w + a (q_c - q_s) \]

Where:
- \( p_i \) = inflation rate in the home country.
- \( p_w \) = world rate of inflation.
- \( a \) = the share of sheltered sector in the economy.
- \( q_c \) = rate of increase of labor productivity in the Competitive sector
- \( q_s \) = rate of increase of labor productivity in the sheltered Sector.

Some economists criticized this model on the grounds of its silence on the demand conditions (Frisch, 1976).

The Latin American view was developed by Campos (1967) and concerned the less-developed countries. According to this view the economy of the home country is also divided into two sectors: the open sector, which produces goods for export, and the domestic sector, which produces domestically consumed goods. Structuralists such as Campos claimed that inflation is a result of transition of the less-developed countries from outward-based economies to inward-oriented domestic market-based economies. This transition requires a change in the structure of the economy, which the price mechanism is unable to achieve due to an imperfect market structure. Kirkpatrick and Nixon (1976) identified three structural constraints: the inelastic supply of foodstuffs, the foreign exchange bottleneck, and the financial constraint.

As can be seen from the above discussion, the structuralists built their models on an unrealistic assumption in the monetary approach for the global inflation, namely, that all goods are mobile and traceable.

From the above brief review, it is obvious that there is a wide variety of theoretical frameworks to explain inflation. This indicates the differences among economists in explaining this economic phenomenon. However, some of these theories, such as cost-push are static and cannot explain the continuation of inflation without extra assumptions about the economy, such as increasing money supply in order to be able to pay for the factors of production in order to sustain the level of output.

In general, these theoretical frameworks can be divided into two main categories: the structuralist and the monetarist. The advocates of the former believe that the increase in prices can be sustained without increasing money stock because of the ability of the private sectors to create credit within each sector to finance the increased price level. The monetarists, on the other hand, argue that increasing money stock is the main cause of inflation because of the stability of the private sector’s demand for money. As result, inflation can only be sustained by increasing money stock.

These two frameworks also provide two different explanations for the rate of change of prices in the small open economies. The structuralist inflation, which is close to the Keynesian, refers to the intra-inflation for this
kind of economy according to the different productivities between traded and non-traded goods since both productivities pay equally. In contrast, the monetarists argue that a small, open economy operating under a fixed exchange rate has an inflation rate equal to the world rate. The reasoning is that the country concerned has no control over its money stock. As a result, the monetary policy is ineffective and there is no reason for this kind of economy to have a different rate of change in prices from the world.

**Empirical Studies of Inflation in Several Gulf States**

An empirical Study about the inflation in Saudi Arabia was conducted by Al-Bassam, K.A. (1999). The main aim of this study is to determine the sources of inflation in Saudi Arabia. For fulfilling this aim, a single-equation model of inflation in Saudi Arabia is specified and estimated.

This model is based on the monetarist single-equation model of inflation. Yet the model departs from the monetarist single-equation model of inflation by including the external factors that are expected to have influence on inflation in Saudi Arabia, namely; the U.S. Dollar short-term market interest rate, the movements of Riyal exchange rate against the major international currencies and imported inflation. The single-equation model of Al-Bassam's study includes three more explanatory variables beside the external variables. These variables are, nominal money supply, real income (real GDP) and the lagged dependent variable.

The empirical findings that emerge from estimating Al-Bassam's single-equation model of Saudi inflation revealed that all the explanatory variables, except the U.S. Dollar short-term interest rate, bear the correct sign and are statistically significant at the 5% level of significance. The overall fit of the regression is very good with five explanatory variables jointly explaining large proportion of the total variations in inflation rate ($R^2 = 0.95$). This means that the model of this study fits the actual data remarkably well. The empirical results also indicated that among the various explanatory variables, three are found to exert strong impact on the behavior of inflation in Saudi Arabia, namely, the growth rate of money supply, the growth rate of real income and the changes of the Saudi Riyal exchange rate against the major international currencies. Moreover, the empirical outcomes of Al-Bassam's study revealed the growth of money supply is an important source of inflation in Saudi Arabia.

In 2007, Ommar carried out an empirical study of inflation in Kuwait. The objective of this study is to determine the causes of inflation in Kuwaiti economy. To achieve this objective, a single-equation model of inflation in Kuwaiti economy was specified and estimated. This model contained three explanatory variables, namely, money supply, non-oil GDP and imported inflation as external variable. The model of this study was estimated using annual data run from 1972 to 2004.

The empirical results of this study indicated that the money supply exerted significant and strong impact on the behavior of inflation in Kuwait. The other variables were found to have insignificant effect on the behavior of inflation in Kuwaiti economy. Therefore the main conclusion of this study is that the inflation in Kuwait can be considered as a monetary phenomenon.

An empirical study on the inflation in the Gulf States was conducted by Al-Shetry (2003). The main purpose of this study is to specify the factors (variables) that influence the behavior of inflation in these countries. To accomplish this purpose, Al-Shetry used causality test and Co-Integration method to analyze the behavior of inflation in these countries. The study indicated that the behavior of inflation in these countries is expected to be
affected by external and internal factors. The external factors are the imported inflation, world inflation and foreign interest rate, particularly U.S interest rate. Whereas, the internal factors are nominal money supply and real income (real GDP).

The major empirical findings of this study are:
The coefficients of the following explanatory variables: money supply, real income (real GDP) and world inflation were found to be statistically significant with right signs. The study indicated that the variations of these variables are the main sources of inflation in these states.

The main conclusion of this study is that the inflation in Gulf states can be considered a monetary and structural phenomenon.

One of the main conclusions that can be drawn from this section is that there has been no single theory or model that can be used to explain fully the changes in the rate of inflation in every economy. Furthermore, there are several other considerations, such as the stage of economic development, economic and institutional setting, economic policies particularly the monetary and fiscal policies and external factors (i.e., imported inflation, exchange rate movement and foreign interest rate) should be taken into account in analyzing the inflation behavior in any economy.

IV- The Specification of Inflation Model of Qatar Economy

In the light of the literature review (see section III) and the preceding discussion, an attempt will be made to specify and estimate a single-equation model of inflation in Qatar. The specification of this model will be based on the monetarist approach of inflation.

As mentioned earlier, Qatar has a very open economy operation under a pegged exchange rate regime. This means that the inflationary pressures in Qatar are generated not only by domestic causes but can also be generated by external causes, such as foreign interest rate, particularly U.S Interest rate, Riyal exchange rate movements and import prices (imported inflation). Thus, this study's single-equation model of inflation in Qatar should be departed from the monetarist single-equation model of inflation by including the external factors (variables) in the model of this study. Accordingly, the proposed single-equation is:

\[ P = B_0 + B_1 M_2 + B_2 y + B_3 IP + B_4 r - B_5 E + \epsilon_t \]

Where:
- \( P \) = Inflation rate
- \( M_2 \) = Money supply defined as the currency in the hands of the non-banks public + demand deposits of the public at the Commercial banks + quasi money.
- \( y \) = Real income (real GDP)
- \( IP \) = Inflation rate in advance economies
- \( r \) = the U.S Dollar short-term market interest rate (three months deposit rate)
- \( E \) = Nominal effective Riyal exchange rate index which represents the ratio (expressed on the base of 2000 = 100) of an index of Riyal's period-average rate to a weighted geometric average of exchange rates for the currencies of selected countries and the euro area.
- \( B_0, B_1, B_2, B_3, B_4, B_5 \) = Regression coefficients
- \( \epsilon_t \) = Disturbance (error) term

Several issues related to the specification of this study's single-equation model of inflation in Qatar economy should be highlighted:

1- In this study, the money supply is assumed to be exogenous variable (policy Controllable). This assumption is based on the fact that the behavior of money supply in Qatar has been determined largely by fiscal operation (i.e., increasing or decreasing government expenditure)

2- As mentioned earlier, given a reasonable stable money demand function, substantial swings in the price level would likely be associated with similar movements in
money supply. It is obvious, therefore, why monetarists have generally placed heavy emphasis on the role of monetary growth in explaining the inflation behavior. Moreover, the growth of money supply has been found to exert significant and positive impact on the inflation process in many developed and developing counties. In short, it is expected that the growth in money supply should exert positive and strong impact on the inflation process in Qatar.

3- According to the monetarist approach to inflation, rises in real income (real GDP) should lead to increases in the aggregate demand, which in turn, should exert positive and strong influence on inflation. Therefore, it is expected that the growth of real income should exert positive and significant effect on the inflation process in Qatar.

4- Since Qatar has a highly open economy operating under a pegged exchange rate regime, one would expected that:

(a) An increase in the U.S Dollar interest rate would induce Qatari to increase their holdings of foreign assets (mainly U.S assets). The increases in foreign assets holding would be financed by drawing domestic money holdings. Hence, it can be assumed that an increase in the U.S Dollar interest rate should exert a negative impact on the demand for money in Qatar and, in turn, should exert positive impact on the inflation in Qatar.

(b) The increases in the Riyal nominal effective exchange rate index lead to decrease in the prices of imported goods. Accordingly, the overall domestic price level should decrease. Therefore, it can be assumed that the increases in the Riyal nominal effective exchange rate index should exert negative influence on the domestic inflation.

### Table No (2): Correlation Matrix of Explanatory Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>E</th>
<th>IP</th>
<th>Y</th>
<th>r</th>
<th>M2</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>1</td>
<td>0.35</td>
<td>-0.08</td>
<td>-0.07</td>
<td>-0.30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.06</td>
<td>0.66</td>
<td>0.73</td>
<td>0.10</td>
</tr>
<tr>
<td>IP</td>
<td>0.35</td>
<td>1</td>
<td>-0.02</td>
<td>0.11</td>
<td>-0.26</td>
</tr>
<tr>
<td></td>
<td>0.06</td>
<td></td>
<td>0.92</td>
<td>0.58</td>
<td>0.18</td>
</tr>
<tr>
<td>Y</td>
<td>-0.09</td>
<td>-0.02</td>
<td>1</td>
<td>0.29</td>
<td>0.51</td>
</tr>
<tr>
<td></td>
<td>0.66</td>
<td>0.92</td>
<td></td>
<td>0.12</td>
<td>0.01</td>
</tr>
<tr>
<td>r</td>
<td>-0.07</td>
<td>0.11</td>
<td>0.29</td>
<td>1</td>
<td>0.37</td>
</tr>
<tr>
<td></td>
<td>0.73</td>
<td>0.58</td>
<td>0.12</td>
<td></td>
<td>0.05</td>
</tr>
<tr>
<td>M2</td>
<td>-0.30</td>
<td>0.25</td>
<td>0.51</td>
<td>0.37</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>0.11</td>
<td>0.18</td>
<td>0.01</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>
V- Empirical Results

Yearly data that run from 1980-2010 are employed for estimating the proposed single-equation model of inflation in Qatar (see Page#27). The empirical results that emerge from estimating the proposed single-equation model is presented in the following estimated single-equation model (see the estimated equation #1).

\[
P = 0.158 + 0.402M_2 + 0.324y + 0.308IP + 0.336r - 0.023E
\]

\[
(0.17) \quad (2.99) \quad (2.59) \quad (2.71) \quad (2.82) \quad (0.21)
\]

\[R^2 = 0.735 \quad F = 13.34 \quad D-W = 1.59 \quad SEE = 2.38403\]

Key to Abbreviations:
- P = Inflation rate generating by using consumer price index (CPI, 2005 = 100)
- M2 = Money Supply defined as the currency in the hand of the non-bank public + demand deposits of the public at the commercial banks + quasi money.
- Y = Real income (real GDP)
- IP = Inflation rate in advance economies
- r = the U.S Dollar short-term market interest rate (three months deposit rate).
- E = Nominal effective Riyal exchange rate index which represents the ratio (expressed on the base 2000 = 100) of an index of Riyal's period-average rate to a weighted geometric average of exchange rates for the currencies of selected countries and the euro area.

It can be seen from the above estimated single-equation model (see the estimated equation # 1) that the coefficients of the explanatory variables carry the right sign. Moreover, these coefficients are statistically significant except, the nominal effective Riyal exchange rate, which is found to be statistically insignificant. Therefore, this variable is excluded from the above estimated equation. Its exclusion has no significant effect on the overall goodness of fit (see the estimated equation # 2). Accordingly, the empirical analysis of this study will be based on the empirical results of the following estimated equation:

\[
P = 0.163 + 0.401M_2 + 0.324y + 0.304IP + 0.342r
\]

\[
(0.18) \quad (3.05) \quad (2.70) \quad (2.77) \quad (3.00)
\]

\[R^2 = 0.735 \quad F = 17.324 \quad D-W = 1.60 \quad SEE = 2.3379\]

The empirical results that emerge from the estimated equation above (The estimated equation # 2) revealed the following:
- All the coefficients of the explanatory variables bear the correct anticipated sign and all are statistically significant at the 5 percent level of significance.
- The correlation matrix of the explanatory variables indicate that there is no correlation among these variables (see table #2)
- \(R^2\) – square is noticeably high (\(R^2 = 0.735\)) and statistically significant (according to the F-test). Durbin-W indicates that there is no sign of first-order autocorrelation between the residuals (error terms), SEE (Standard error of the estimate) is noticeably low. All this indicates that the overall fit of the regression (the estimated equation #2) is very good with four explanatory variables explaining a very large proportion of the total variation in the Qatar inflation rate (around 0.735)

The coefficient of the growth of money supply is relatively high. Moreover the magnitude of this coefficient is within the bounds postulated by the theoretical consideration. This suggests that the monetary expansion in Qatar would lead to inflationary
pressures substantially. Thus, the growth of money supply is considered as prime source of inflation in Qatar. Therefore, a serious anti-inflationary monetary policy in Qatar must consist of a reduction in the rate of monetary growth.

The coefficient of the growth of real income is statistically significant at the 5% level of significance and relatively high. Thus the rapid growth of Qatar economy would increase the inflationary pressure through increasing the level of local aggregate demand.

The coefficient of the U.S Dollar interest rate is statistically significant. Finally, the coefficient of inflation with respect to the inflation in advance economies is statistically significant at the 5% level of significance and relatively high. In short, this indicates the external variables (i.e. U.S Dollar interest rate and the inflation in advance economies) play an important role in explaining the changes in the inflation rate in Qatar.

VI – Conclusion and Recordation:

Qatar has a very open economy, with negligible restrictions on the movement of commodities and funds. This means that the inflation in Qatar is generated not only by domestic sources, but could also be generated by external factors such as, foreign interest rate, world inflation and the movements of Qatari Riyal exchange rate. The main objective of this study is to determine the sources of inflation in Qatar. For achieving this objective, a single-equation model of inflation in Qatar is specified and estimated. This model is based on the monetarist single-equation model of inflation. However, the model departs from monetarist single-equation model of inflation by including the external factors namely; the U.S. Dollar short-term market interest rate, inflation rate in advance economies and the Riyal nominal effective exchange rate index which represent the exchange rate of Riyal against the major international currencies. Moreover, our single-equation model of Qatar inflation includes two more explanatory variables (domestic variables) beside the external variable. These variables are, nominal money supply and real income (real GDP).

The following general conclusion is derived from this study:

- The empirical results that emerge from estimating our single-equation model of Qatar inflation reveal that all the explanatory variables bear the correct sign. Yet all the explanatory variables are found to be statistically significant at 5% level of significance. Except the nominal effective Qatari Riyal exchange index which represent Qatari Riyal exchange rate against the major international weenies. The overall fit of the regression (the estimated equation # 2) is very good with four explanatory variables jointly explaining large proportion of the total variations inflation rate ($R^2 = 0.735$). This means that our model fits the actual data very well.

- Four explanatory variables are found to exert strong effect on the inflation in Qatar, namely; the growth of money supply, the growth of real income, the changes in U.S. Dollar short-term market interest rate and inflation rate in advance economies.

- The empirical results of this study support our expectation that the growth in money supply is an important source of inflation in Qatar. This suggests that a serious anti-inflation monetary policy in Qatar should consist of a reduction in the rate of monetary growth.

- The main conclusion of this study is that the inflation in Qatar can be considered a monetary and structural phenomenon.
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مصادر التضخم في قطر: دراسة قياسية (1980-2010م)

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المستخلص:
هذا الهدف الرئيسي لهذه الدراسة هو تحديد مصادر التضخم في قطر خلال الفترة 1980م إلى 2010م ولتحقيق هذا الهدف أعد نموذج قياس مكون من معادلة واحدة، استخدم في تحديد نموذج هذه الدراسة على نموذج النقديين للتضخم ولكن نموذج هذه الدراسة يختلف عن نموذج النقديين من حيث أن هذا النموذج يشمل على متغيرات خارجية يتوقع أن تؤثر على المستوى العام للأسعار في قطر مثل التضخم العالمي وسعر الفائدة على الدولار بالإضافة إلى متغيرات داخليه مهمة ذات تأثير قوي على التضخم في قطر مثل عرض النقود والنتائج المحلي الحقيقي (الدخل المحلي الحقيقي).

تشير نتائج تقدير نموذج الدراسة (انظر إلى المعادلة المقدمة رقم 1) أن جميع معامل المتغيرات التفسيرية ماعدا التغيرات في مؤشر سعر صرف الريال بالنسبة للعملات الرئيسية العالمية ذات إشارات صحيحة ومعنوية إحصائية مرتفعة، وعلى ضوء ما تقدم أعلاه فإنه تم استبعاد هذا المتغير (انظر للمعادلة رقم 2).

تشير نتائج المعادلة المقدمة رقم 2 إلى ارتفاع قيمة معامل التحديد (R² = 0.735) هذا بالإضافة إلى أنه ذو معنوية إحصائية كما تشير قيمة اختبار F (17= 17) بالإضافة إلى أن اختبار D-W يؤكد على عدم وجود ارتباط بين الباقين، وأخيراً انخفاض قيمة الخطأ المعياري للإحصار. كل ذلك يدل على ارتفاع القدرة التفسيرية النموذج، حيث أن أربع متغيرات مستقلة تفسر نسبة مرتفعة (0.735) من التغيرات في معدل التضخم في قطر.

تشر النتائج أيضا إلى أن نمو عرض النقود ونمو الناتج المحلي الحقيقي ومعدل التضخم في الاقتصادات المتقدمة وأخيرا سعر الفائدة على الدولار ذات تأثير قوي على التضخم في قطر.