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Original Article

The Effects of American Monetary Policy on GCC Economies

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Abstract **-** *The GCC countries maintain a policy of open capital accounts and a pegged exchange rate, thereby reducing their freedom to run an independent monetary policy. In this paper, the effects of monetary policy shocks on real economic variables in the GCC economies are examined separately from 1990 to 2017, based on Vector Auto Regression (VAR) approach using data collected from World Development Indicators (WDI), World Bank database. The findings show that Saudi Arabia's monetary policy has a strong and statistically significant impact on broad money, oil rent, and GDP in the GCC region. The Vector Auto-Regressive results illustrate that, when government expenditure is included in the model, contemporaneous coefficients indicate that in most countries (except Kingdom of Saudi Arabia- KSA) the interest rate responds negatively to an unexpected increase in monetary aggregate. On the other hand, it is also true that the monetary aggregate decreases with an unexpected increase in the federal fund rate. The result shows that, in GCC countries, oil price fluctuations are primarily affected by monetary policy shocks while the remaining components of economic growth and federal funds rates are the other variables frequently affected by monetary policy shocks.*

Keywords **-** *Monetary Policy, VAR, GCC, Federal Fund Rate, Broad Money*

JEL Classification: E52, C01, C32, E4, E

I. INTRODUCTION

The paper's objective is to examine the implications of monetary policy shocks for the Persian Gulf Cooperation Council (GCC) economies, which include Bahrain, Kuwait, Oman, Qatar, and Saudi Arabia. Since GCC countries have maintained pegged exchange rates and liberal movements of cross-border capital flows for a long period, theoretically, the freedom for monetary autonomy has been lost in these economies[7]. Given this, it is quite relevant to determine the effects of monetary policy shocks on the domestic variables in these countries.

In this paper, the VAR model is employed separately to evaluate the effect of monetary policy shocks on domestic variables in each country. This paper contributes to the existing literature by filling the gap that examines how different domestic variables respond to monetary policy shocks in each of the GCC countries.

II. LITERATURE REVIEW

One primary concern in the monetary economics area is the quantification of how sensitive the economy is to policy instruments. For quantifying the sensitivity of the economy to monetary policy shocks, it is important to separate the policy instrument changes that are both endogenous and exogenous [6]. For this, the control of central bank responses to economic conditions and monetary policy shocks is sometimes limited[1]. The standard approach used for analyzing the effects of monetary policy shocks on economic variables in the literature has been the Vector Auto Regression (VAR) approach [8].

According to the conventional approach, as long as the objective of price stability is maintained by the monetary policy, the stability of the financial system is taken care of. Monetary policy affects the real economy through various channels identified in the literature; namely credit channel, interest rate channel, monetarist channel, and exchange rate channel [17].On the other hand, recent studies show the critical role of financial intermediaries in the working of the transmission mechanism of monetary policy and its impacts on the real economy [14]. Reference 15highlighted that monetary policy plays have a significant impact on both GDP per capita and investments in the GCC, in the short and long-run.

One set of empirical studies based on the VAR approach shows monetary policy shocks as the main drivers of fluctuations in output and prices [5]while the other set of studies [19] find a very little role for monetary policy shocks in influencing macroeconomic fluctuations in the developed nations.

Empirical studies on the effects of monetary policy shocks on GCC economies have been very limited. One study [3]finds significant co-integration between the GCC rates and the U.S. rate. Other studies [20] show significant effects of monetary policy shocks on output and prices in GCCcountriesbased on the VAR approach. A recent paper [15] examined monetary policy dependence between two GCC economies United Arab Emirates and Saudi Arabia Using the SVAR model. However, none of the above-mentioned studies examined how the monetary policy shocks affect real economic variables other than

output and prices in the GCC countries. Our study attempts to fill this gap.

III. DATA AND VARIABLES

To find the relationship between monetary policy shocks and interest rate with other variables, empirical work and study is done. Based on the data availability, the study time period of 28 years i.e. 1990-2017 is covered. There is a total of five variables, including Federal fund rate (FFD), Broad money (M2), Economics Growth (EG), Oil rent (OILR), and Government Expenditure (GXP). The analysis is done for five different countries: Bahrain, Kuwait, Oman, Qatar, and Kingdom Saudi Arabia (KSA).

- ***Co-integration Hypothesis Test***

$H_0: There\ \ is\ \ no\ \ co-integration\ \ exists\ \ between\ \ variables > 0.05$

$H_1: There\ \ is\ \ co-integration\ \ exists\ \ between\ \ variables \le 0.05$

The trace statistic co-integration tests explain whether co-integration exists between variables or not. The null hypothesis is" there are no cointegrating relations between variables against the alternative", while the alternative hypothesis tests if there are cointegrating relations between variables. The trace statistics results can be seen in table 1. The results show that in the first two equations co-integration exists between all variables because the probability value is less than 0.05 and we will reject the null hypothesis which is no co-integration between variables.

IV. EMPIRICAL METHODOLOGY

In this study, we are using the estimating technique Vector auto-regression (VAR), to view the impulse response function and variance decomposition. Sims (1980) emphasized time series data VAR models as a substitute to multivariate simultaneous equation models.

- ***Vector Auto-Regression (VAR)***

Sims (1980) emphasized on time series Vector Auto-Regression (VAR) model as suitable to multivariate simultaneous equation models. In the VAR model variables are treated as endogenous and different statistical procedures are applied to find the separate impact of exogenous shock in the system. Specified below is the simple bivariate system used in our analysis:

$$FFR_t = b_{10} - b_{12}M2_t + \gamma_{11}FFR_{t-1} + \gamma_{12}M2_{t-1} + \nu_{ffrt}$$

$$M2_t = b_{20} - b_{21}FFR_t + \gamma_{21}FFR_{t-1} + \gamma_{22}M2_{t-1} + \nu_{m2t} \quad (1)$$

(2)

Transform the equation (1) and (2) into matrix form(3)

$$\begin{bmatrix} 1 & b_{12} \\ b_{21} & 1 \end{bmatrix}\begin{bmatrix} FFR_t \\ M2_t \end{bmatrix} = \begin{bmatrix} b_{10} \\ b_{20} \end{bmatrix} + \begin{bmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \end{bmatrix}\begin{bmatrix} FFR_{t-1} \\ M2_{t-1} \end{bmatrix} + \begin{bmatrix} \nu_{ffrt} \\ \nu_{m2t} \end{bmatrix}$$

or $$Bx_t = \phi_o + \phi_1 x_{t-1} + \nu_t \quad (4)$$

where

$$B = \begin{bmatrix} 1 & b_{12} \\ b_{21} & 1 \end{bmatrix}, x_t = \begin{bmatrix} FFR_t \\ M2_t \end{bmatrix}, \varphi_o = \begin{bmatrix} b_{10} \\ b_{20} \end{bmatrix}, \varphi_1 = \begin{bmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \end{bmatrix}, \nu_t = \begin{bmatrix} \nu_{ffrt} \\ \nu_{m2} \end{bmatrix}$$

So B^{-1} allows us to obtain the standard form of the VAR model:

$$x_t = A_o + A_1 x_{t-1} + \upsilon_t \quad (5)$$

Where

$$A_o = B^{-1}\phi_o, A_1 = B^{-1}\phi_1, \upsilon_t = B^{-1}\nu_t$$

Equation (1) and equation (2) is the structural form of VAR and equation (5) is the standard form of VAR. We can solve equation (5) for order (*p*)

$$x_t = A_o + A_1 x_{t-1} + A_1 x_{t-2} + ... + A_p x_{t-p} + \upsilon_t \quad (6)$$

The right side of equation (6) covers only predetermined variables and assumes that the error terms are serially uncorrelated with the constant variance. Hence, every equation in the model can be estimated separately by using the Ordinary Least Square (OLS) method.

V. EMPIRICAL RESULTS

- ***Johansson C-integration***

The Johansen cointegration test assists in confirming whether the variables used in the equations are cointegrated or not. It helps determine what model should be used in our analysis. For the optimal number of lags, we run the VAR model and then use the Akaike information criterion (AIC) to find the appropriate lag length as presented in table 1.

Table 1: Unrestricted Cointegration Rank Test (Trace)

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.232522	76.67213	60.06141	0.0011
At most 1 *	0.190555	45.17937	40.17493	0.0144
At most 2	0.114493	20.02202	24.27596	0.1568
At most 3	0.045366	5.552161	12.32090	0.4927
At most 4	0.000230	0.027331	4.129906	0.8925

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Source: Author's own calculations based on S. Johansen, *Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models*, "Econometrica" 1991, No. 59, pp. 1551-80.

The Johnson co-integration is conducted in e-views and variables are tested on the first level. The results show that in the first two equations co-integration exists between all variables because the probability value is less than 0.05 and we will reject the null hypothesis of no co-integration between variables. So far, the literature on monetary policy on the various transmission mechanism channels with suitable econometric strategy and available quantity for these variables in form of data and variable construction is elaborated. In this section, the empirical findings of VAR, impulse response, and variance decomposition are being reported.

The results of Contemporaneous Coefficients and Standard Error for all five countries are given in table 2 which shows clearly the relationship between our studied variables. In the case of Bahrain, broad money (M2) first lag is positive with the federal fund rate but in the case of second lag, it is negatively correlated with interest rate. Oil prices have a negative monetary policy shock because the coefficient value of oil rent is negative in the case of Bahrain.

The federal fund rate has a negative shock on monetary policy in the cases of Bahrain, Kuwait, Oman, and Qatar; however, in the case of KSA, the shock in monetary policy is positive due to its remarkable sovereign wealth. The Government expenditure has a negative impact on monetary policy in the case of all five countries, however, in the second lag there is a positive shock in monetary policy as the increase in government expenditures, is causing the real exchange rate to depreciate.

Table 2: Contemporaneous Coefficients and Standard Error for GCC countries

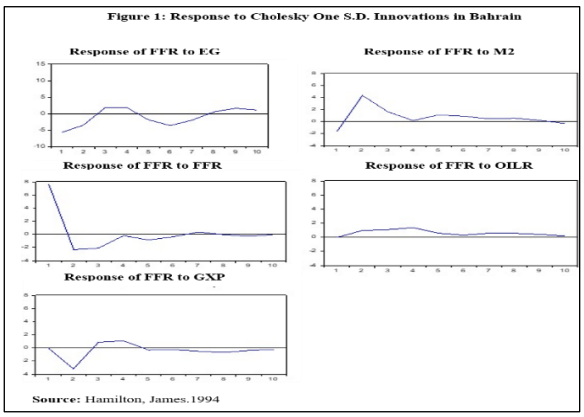
Variables	BAHRAIN	KUWAIT	OMAN	QATAR	KSA
EG (-1)	1.080062 (0.31616)	1.335823 (0.29995)	0.555574 (0.10195)	0.953557 (0.34385)	0.719888 (0.34879)
EG (-2)	0.204651 (0.38468)	-0.258259 (0.30496)	0.136224 (0.08875)	0.330367 (0.40925)	-0.369444 (0.31607)
M2 (-1)	0.674723 (0.28458)	1.006863 (0.31159)	1.741514 (0.31276)	1.899534 (0.27633)	0.907959 (0.33728)
M2 (-2)	-0.294390 (0.29389)	-0.062093 (0.25504)	-0.948215 (0.35262)	-1.044793 (0.47220)	0.292840 (0.31750)
FFR (-1)	-0.161036 (0.35683)	-0.132620 (0.37859)	-1.036155 (0.56866)	-0.791816 (0.31127)	0.332129 (0.24956)
FFR (-2)	-0.377856 (0.37434)	-0.323372 (0.37310)	-0.497334 (0.39953)	-0.244024 (0.26495)	0.071484 (0.22790)
OILR (-1)	-0.050713 (0.57039)	-0.157729 (0.35055)	0.613008 (0.55099)	0.190927 (0.23263)	0.429938 (0.38836)
OILR (-2)	-0.056881 (0.26444)	-0.577378 (0.29526)	0.015049 (0.33303)	-0.442552 (0.16336)	0.243249 (0.28416)
GXP (-1)	0.838621 (0.29074)	0.482257 (0.21953)	0.512051 (0.28675)	0.409326 (0.36692)	1.047420 (0.32199)
GXP (-2)	-0.158461 (0.28593)	-0.472670 (0.21908)	0.040369 (0.31450)	-0.347186 (0.20837)	-1.288904 (0.33069)
R^2	0.997998	0.979695	0.999056	0.992793	0.988541

*Standard errors in ( )

Source: Author's own calculations based on Selya, R. M., Taipei, J. Wiley, New York 1995. XXVIII, pp. 266.

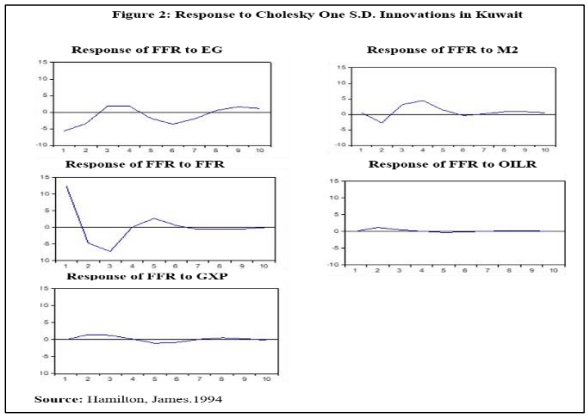
○ *Impulse Response Function*

In this section, we present the empirical results of federal fund rate, M2, Economic Growth, Oil rent shocks, and government expenditure by investigating the impulse responses achieved from the VAR process. The response of the federal fund rate (FFR) due to Economic growth can be seen from Bahrain impulse response function graphs (Figure 1). A steady increase was noted in the first three periods; after that, it started to decline between period third to period fifth. Subsequently, a smooth trend can be seen till the last period and shock ends above the baseline.

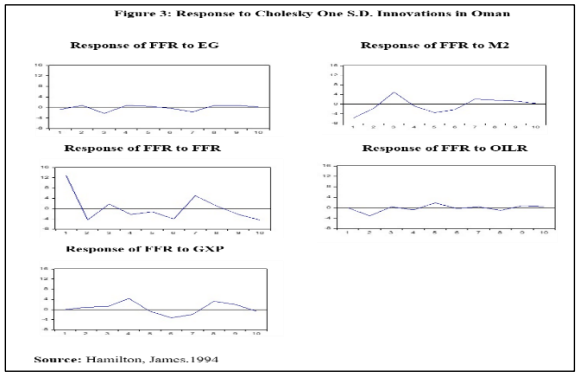


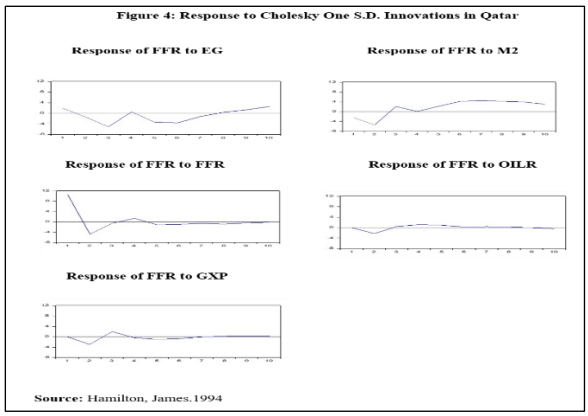
The same variables response in the case of Kuwait (Figure 2) shows that the same trend can be seen in the first three periods as it was in the case of Bahrain

but after that, a sharp decline was noted and shock crossed the baseline between period fourth and five. After that, it starts to recover, and once again it passes through the baseline, and shock finishes above the baseline.



The next two countries Oman and Qatar (Figure 3 & 4) almost have the same trend as Kuwait have because shock ends above the baseline. On the other hand, KSA has a negative shock in response to the federal fund rate (FFR) due to Economic growth (Figure 5).

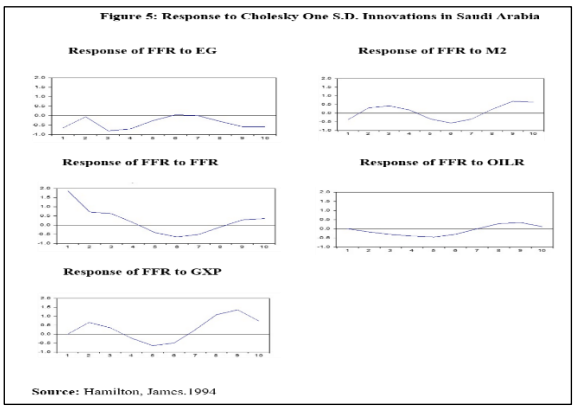




The impact of FFR on M2 in the case of Bahrain (Figure 1): In the first three periods a sharp increase was noted followed by a steep decline till the tenth period. The shocks touch the baseline in nine periods and in the tenth period its crosses the baseline. Graphs of the remaining four countries have a positive response in FFR due to M2.

The response of FFR due to OILR in the case of Bahrain reveals a steep increase in the period between the first and fourth periods. This decline rapidly reduces the impact of shock and almost touches a baseline in the tenth period. The same trend can be seen from (Figure 2) in the case of Kuwait, while the case of Oman has a different trend. Figure 3 reveals a steady decrease from the baseline in the first two periods and this gradually rose and hit the baseline at the third period. The same trend was noted after every two periods, for this, the graph has a zigzag trend. The shock ends above the baseline and the other two countries' graphs also have the same trend.

The response of FFR due to GXP in the case of Bahrain shows a sharp decline in the first two periods and then it starts to rise and crosses the baseline in period third. After that, it starts to decline and crosses the baseline again, and the shock finishes below the baseline.



The response of FFR due to GXP in the case of Kuwait almost has a smooth trend till the tenth period but shock crosses the baseline in the last period. In the case of Oman (Figure 3), a steady increase was noted between the first to fourth periods and a steep decrease in periods four to six. Subsequently, it decreases below the baseline in period six after it rose sharply till period eight. This period also witnessed subsequent levels of convergence. Consequently, a decline was noticed in the nine periods, which reached the baseline at close to tenth periods and this remain steady down until the tenth period. It means a divergence is noted in period tenth if we give a shock of FFR to GXP. On the other hand, in the case of Qatar and KSA (Figure 4& 5) convergence was noted because both graphs end up to the baseline.

VI. CONCLUSION

This paper examined the Output Composition of the Monetary Policy Transmission Mechanism in five GCC countries (Bahrain, Kuwait, Oman, Qatar, and Saudi Arabia). The Federal Fund Rates are found to have a positive impact on all five nations' monetary policy. Our findings demonstrate that when government consumption is incorporated into the

model, contemporaneous coefficients show that in many nations (except KSA) the federal fund rate reacts adversely to an unexpected increment in monetary aggregate. At the same time, M2 diminishes with an unanticipated increase in the FFR.

Monetary policy FFR (except for Kuwait and KSA) in the short run has more impact on private settled capital arrangement as the proxy of investment in GCC states. In Kuwait, the remaining segments of economic growth are influenced more by loan cost in contrast with different segments of economic growth in the short run. In Oman and Qatar, monetary aggregate accounts for the majority of oil price fluctuations. Monetary policy shocks account for most developments of residual segments of economic growth in the case of Bahrain, and government expenditure in the case of Kuwait.

As a result of the negative shock impact of the FFR on monetary policy in the cases of Bahrain, Kuwait, Oman, and Qatar; we can ensure from this paper the shallowness of the money market in the most of GCC nations. Unconventional monetary policy reveals imperfect asset substitution because observed correlations of market rates across GCC countries were unable to explain in standard models with perfect substitution. Indeed, the presence of discretionary cutoff points on lending and federal funds rate ceilings would limit the transmission of interest rate movement. For this, continuous efforts to develop domestic financial markets should be the key focus of increasing FFRto reinforce monetary policy transmission in GCC economies and validate and stabilize the role of the financial market in the region.

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