



## **Gulf Cooperation Council Stock Returns and the Effect of Domestic Monetary Policy Shocks**

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### **ABSTRACT**

The aim of this paper is to analyze the effect of monetary policy on stock returns and stock return variability in the Gulf Cooperation Council (GCC) countries namely; Bahrain, Kuwait, Oman, Qatar and Saudi Arabia (United Arab Emirates was excluded for non-availability of the data). The empirical results reveal that the impact of policy interest rates on stock markets varies among GCC countries. These results have an important policy implication for the single market project and monetary union between GCC countries.

**Keywords:** Stock Market, Monetary Policy, Gulf Cooperation Council Countries

**JEL Classifications:** G17, G18, E43, E47

### **1. INTRODUCTION**

The interdependence between stock market and monetary policy is a fundamental issue in financial economics, in which great interest has been renewed in light of the latest global financial crisis. Financial market participants allocate significant amount of resources in analyzing and forecasting the actions of central banks. Similarly, policymakers closely watch the developments in the financial markets. As stated by Bernanke and Kuttner (2005) "The most direct and immediate effects of monetary policy actions,....., are on the financial markets." Thus, understanding the effects of monetary policy on stock returns is crucial for both financial economists and macroeconomists.

In this paper, we examine the effect of monetary policy shocks on stock returns in the Gulf Cooperation Council (GCC henceforth) countries. We are interested in GCC countries for many reasons. First of all, the GCC countries namely Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates (UAE) have approximately the same size<sup>1</sup> and the same

socioeconomic and cultural characteristics. Secondly, during the past decade the GCC region has experienced an unprecedented economic performance thanks to the windfall of oil revenues. The growth was on par with other emerging markets, with average growth rates exceeding 5-6%, and much faster than advanced economies. Thirdly, from a monetary policy point of view, the GCC countries are still among the few countries relying on the fixed exchange rate regime, notably the peg to the US dollar<sup>2</sup>. The choice of this monetary policy has increased confidence and external stability, which are crucial to stimulate investment and capital inflows. In this case, the lower flexibility of the exchange rate regime causes the monetary policy to become largely endogenous where adjustments in the interest rate follow monetary policy changes in the United States to maintain the currency peg under liberalized capital accounts (Kandil and Morsy, 2009)<sup>3</sup>. Therefore, GCC countries have to permanently adjust their internal interest rates in response to the US monetary reaction.

1 Four have <4 million residents. The biggest is Kingdom of Saudi Arabia with about 25 million residents.

2 With the exception of Kuwait that has a peg to an undisclosed basket most likely dominated by the dollar since May 2007.

3 Kandil M and Morsy H (2009) Determinants of Inflation in GCC IMF WP/09/82.

Analyzing the reaction of stock returns to monetary policy is crucial in understanding the transmission mechanism of monetary policy. Changes in stock returns significantly alter the wealth of both firms and individuals which have real economic impacts. Hence, the design of optimal monetary policy calls for better understanding of the relationship between stock returns and monetary policy. As presented by the extensive media coverage of the central banks; monetary policy has considerable influence on the financial markets. Also several studies like Thorbecke (1997), Rigobon and Sack (2004), Bernanke and Kuttner (2005), Chen (2007) and Bennaceur et al. (2009) conclude that there is a significant and negative relationship between stock returns and central bank policy rates. Contractionary monetary policy significantly decreases stock returns.

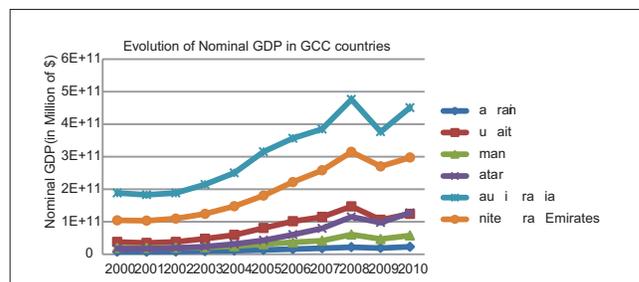
Although understanding this relationship is very important, very few studies investigate the effect of monetary policy shocks on stock returns in the MENA countries<sup>4</sup>. Sourial (2002) analyze the impact of monetary policy on the Egyptian stock market returns. The paper concludes that there is no significant relationship in Egypt. Bennaceur et al. (2009) argues that the responsiveness of stock markets differs across these MENA countries. In some countries, stock market returns depict an upward tendency while in other countries they decline or do not react at all. We contribute to the limited literature mentioned above by examining the relationship between monetary policy and stock returns in five GCC countries: Bahrain, Kuwait, Oman, Qatar and Saudi Arabia. Our analysis uses the most recent data set which includes the 2008 financial crisis. In addition, to best of our knowledge, this is the first study that examine the time-varying correlation between monetary policy and stock returns in GCC countries.

We construct a vector error correction (VEC) model in order to analyze the reaction of stock returns to policy interest rates. VEC model is used because of nonstationarity of the variables. We conclude that monetary policy shocks have significant negative effects on stock returns in Bahrain, Qatar and Saudi Arabia. Whereas, there is no significant relationship in Oman and Qatar. The analysis is conducted with alternative model specifications. The results are robust to different model specifications. We calculate the time-varying contemporaneous correlation between stock returns and monetary policy using a dynamic conditional correlation multivariate generalized autoregressive conditional heteroskedasticity (DCC-GARCH) model. We conclude that the correlation changes significantly over time and among countries.

The paper proceeds as follows. Section 2 briefly describes the economic structure of GCC countries. Section 3 reviews the literature about the effect of monetary policy on stock returns. Section 4 explains the data and the methodology. Section 5 presents the empirical results and finally section 6 concludes and discusses the policy implications of the empirical results.

4 The MENA Region includes: Algeria, Bahrain, Djibouti, Egypt, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Libya, Malta, Morocco, Oman, Qatar, Saudi Arabia, Syria, Tunisia, United Arab Emirates, West Bank and Gaza, Yemen.

**Figure 1:** Nominal gross domestic product in Gulf Cooperation Council countries



Source: WDI (2012)

## 2. OVERVIEW OF THE GCC ECONOMIES

The GCC has been established in 1981 with the aim of establishing coordination, integration and inter-connection among the member states in all fields in order to achieve unity (Article 4, GCC charter). The GCC countries display many common features as culture, religion, large share of foreign workers in the work force and hydrocarbons-based economy. However, substantial differences appear in terms of size of the economy, the size population and the oil and gas productions and reserves. Saudi Arabia leads the GCC countries in terms of nominal gross domestic product (GDP). According to the World Bank development indicators (2012), Saudi Arabia's nominal GDP reached 451 billion dollars in 2010, followed by UAE with 298 billion dollars. Qatar, Kuwait, Oman and Bahrain follow with 127, 124, 57.8 and 22.9 billion dollars respectively.

Figure 1 shows that GCC countries' outputs follow the same trend. Furthermore, they react to shocks (positive and negative) in the same way with different magnitude i.e. the subprime crisis.

As explained above the GCC economies largely depend on production of hydrocarbons. According to the BP statistical report (2011), the GCC countries produce 21.1% and 9.5% of World oil and gas production respectively. Furthermore, they own 35.8% and 22.5% of all known reserves of oil and gas respectively. After the oil shock of the late 1980s, GCC governments launched long-term diversification strategies to reduce hydrocarbons dependency risks by the mean of increasing the non-oil sectors shares in the economy. The targeted sectors were mainly manufacturing, agriculture, services, banking and tourism. Additionally, stock market reforms, privatization, financial liberalization and increased access by foreign investors has been promoted (Arouri et al., 2010). However, these structural reforms were derailed by periods of high oil prices.

Although many of these objectives have been achieved, GCC stocks markets remain relatively small comparing to developed and emerging countries. The GCC stock markets are classified as frontier markets<sup>5</sup>. They are also different comparing to each other in terms of size and degree of development.

Table 1 reveals that in terms of market capitalization, Saudi stock market leads the region stocks markets with an amount exceeding

5 Morgan Stanley Capital International (MSCI) classification.

**Table 1: GCC capital market indicators (2011)**

GCC	Market	Total value traded (\$ million)	Total shares traded (\$ million)	Market capitalization (\$ billion)	Number of listed companies
Bahrain	Bahrain Stock Exchange <sup>6</sup>	245.92	486.57	16.59	49
Kuwait	Kuwait Stock Exchange	20,844.91	37,877.47	100.93	216
Oman	Muscat Securities Market	346.75	2,341.97	19.69	130
Qatar	Doha Securities Market	21,589.79	2,162.66	128.44	42
Saudi Arabia	Tadawul	286,945.15	47,640.18	338.79	150
UAE	Abu Dhabi Securities Market	6644.59	15,601.53	64.44	67
	Dubai Financial Market	8,693.29	25,018.05	49.55	62

Source: AMF (2012). GCC: Gulf Cooperation Council

338 billion of dollars in 2011, followed by Qatar security market with less than a half (128.44 billion). Kuwait comes in third place with more than 100 billion dollars. In terms of number of listed companies, Kuwait takes the leadership with 216 companies, followed by Saudi Arabia with 150 companies and Oman with 130 companies.

Nevertheless, the GCC stock markets have performed well in returns sustained by important public investment and wealthy citizens (Simpson, 2008). Major part of oil windfalls is invested locally which contributed to the performance of the GCC stock markets. Moreover, different economic reforms including enhanced governance and transparency have been implemented (Simpson, 2008).

### 3. EFFECT OF MONETARY POLICY ON STOCK MARKETS

There are numerous empirical and theoretical studies that show that stock returns are affected by implementations of monetary policy. Empirically, Thorbecke (1997) concludes that monetary policy shocks have a large effect on ex-ante and ex-post stock returns and that monetary shocks have larger effects in smaller firms than large firms. Patelis (1997) uses long-horizon regressions and short-horizon vector autoregressives (VARs) to conclude that monetary policy indicators can be used to predict stock returns. Rigobon and Sack (2004) indicate that an increase in short-term interest rates results in a decline in stock prices. Bernanke and Kuttner (2005) document a strong response of the stock market to unexpected monetary policy actions, using Fed funds futures data to gauge policy expectations. Bjorland and Leitemo (2009) investigate the interdependence between US monetary policy and the S&P 500 using structural VAR methodology. They conclude that stock prices immediately fall by seven to nine percent due to a monetary policy shock that raises the federal funds rate by 100 basis points.

Iglesias and Haughton (2011) analyze the interaction between monetary policy and stock prices in Barbados, Jamaica and Trinidad and Tobago using structural VARs.

Despite the vast literature, the effect of monetary policy on stock market in the GCC region has not analyzed. The work of Bennaceur et al. (2009) is an attempt to evaluate the linkage

between monetary policy and stock markets in the region MENA region. The countries under study are Bahrain, Oman, Egypt, Jordan, Morocco, Oman, Saudi Arabia, Tunisia, and Turkey. However, major shortcoming of the study is that it ignores economies in the region as Kuwait and Qatar. Sourial (2002) has studied the Egyptian single case. Hence, our paper tries to fill the gap by exploring the consequences of monetary policy on stock market in GCC region.,

### 4. DATA AND METHODOLOGY

We use the central bank interest rate as an indicator of monetary policy actions following Thorbecke (1997) and Bernanke and Kuttner (2005). The stock market indices are from MSCI (www.MSCI.com). Inflation is calculated as the monthly percentage change in consumer price index and oil production growth is used as a proxy for output growth. Stock return is calculated as the monthly percentage change of the stock market index. The data period is monthly and 2005:5-2012:3.

We examine the stationarity of the variables using augmented Dickey–Fuller (ADF), Phillips–Perron (PP) and Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) unit root tests. Since the test concludes that interest rate and inflation has a unit root, we constructed a VEC model to analyze the reaction of stock returns to monetary policy (policy interest rate) shocks. Two alternative models are implemented with different sets of variables. The first model contains interest rate and stock returns whereas the second model contains inflation, output, interest rate and stock returns. The VEC model can be described as the following:

$$\Delta Y_t = \sum_{i=1}^{2(4)} \Gamma_i \Delta Y_{t-i} + \alpha \beta Y_{t-1} + \varepsilon_t$$

Where,  $\Delta \equiv 1 - L$  is the first difference operator. Assuming normality, this model can be estimated using maximum likelihood. The cointegrating relationship is identified using Johansen cointegration test.

The second research question of the paper investigates the time-varying correlation between stock returns and monetary policy. To analyze this question we use a DCC-GARCH model developed by Engle (2002). Engle (2002) presents that the DCC-GARCH methodology perform well in a variety of situations and provide

6 Now is Bourse of Bahrain

sensible empirical results. Recent studies like Filis et al. (2011) implement the DCC-GARCH methodology to investigate the time-varying correlation of stock returns with economic variables. In this paper, we analyze the time-varying correlation between stock returns and the policy interest rate in GCC countries. The DCC-GARCH model can be written as:

$$\begin{bmatrix} \text{return}_t \\ \text{interest}_t \end{bmatrix} = C \begin{bmatrix} \text{return}_{t-1} \\ \text{interest}_{t-1} \end{bmatrix} + \epsilon_t$$

$$\epsilon_t = H_t^{1/2} v_t$$

$$H_t = D_t^{1/2} R_t D_t^{1/2}$$

$D_t$  is a diagonal matrix of conditional variances. Conditional variances are modeled using a GARCH (1,1) model.  $R_t$  is the matrix of conditional quasicorrelations.

## 5. EMPIRICAL RESULTS

Before implementing the empirical analysis we conducted three different unit root tests to examine whether the variables are stationary or not. ADF, PP and KPSS are implemented. The unit root test results are presented in Table 2.

Table 2 presents that policy interest rate and inflation are not stationary. This result dictates that standard econometric methods like VAR cannot be implemented. Thus, we use a VEC model which takes into account the nonstationarity of variables by using cointegrating relationships. Implementation of VEC requires several diagnostic tests including tests for optimal lag length of the model (Akaike, Schwarz and Hannan-Quinn information criterion) and tests to select the appropriate model regarding the deterministic components (Pantula Principle Test). The results of these diagnostic tests are presented in the Appendix Tables 1-3. The VEC estimation is implemented using the lags and models suggested by these diagnostics tests.

### 5.1. Effect of Monetary Policy Shocks on Stock Returns

We implement two different methodologies to examine effect of monetary policy shocks on stock returns. First, we determine the order of cointegration by using Johansen cointegration test. We use two alternative regression specifications with different sets of variables. The first specification contains four variables: production growth, cpi inflation, interest rate and stock return. The second specification contains only the variables of interest: Interest rate and stock return. Both alternative specifications are used to display the robustness of our results. Table 3 presents the cointegration rank tests for both specifications. For all GCC countries we conclude that there is at least one cointegrating vector. The number of cointegrating vectors determined in Table 3 are used for VEC analysis.

The VEC analysis presents the response to the research question presented above. Figure 2 shows the impulse responses of stock

**Table 2: Unit root test results<sup>7</sup>**

Country	Test	Variable			
		Inflation	Production growth	Interest rate	Stock return
Bahrain	ADF	-8.78***	-15.27***	-2.77	-5.41***
	PP	-8.75***	-15.27***	-2.91	-5.33***
	KPSS	0.77	0.11	0.15**	0.073
Kuwait	ADF	-1.62	-16.98***	-4.7***	-5.94***
	PP	-1.63	-16.81***	-8.82***	5.94***
	KPSS	0.15**	0.08	0.12*	0.07
Oman	ADF	-2.79	-1.33	-3	-3.87**
	PP	-1.73	-29.01***	-2.93	-6.67***
	KPSS	0.17**	0.07	0.13**	0.04
Qatar	ADF	-5.15***	-2.82	-2.47	-8.57***
	PP	-5.12***	-20.36***	-2.42	-8.6***
	KPSS	0.13*	0.04	0.08	0.04
Saudi Arabia	ADF	-2.29	-29.56***	-1.96	-11.26***
	PP	-3.11	-30.44***	-1.72	-11.52***
	KPSS	0.19**	0.04	0.14**	0.1

\*\*\*Significant at 1%, \*\*Significant at 5%, \*Significant at 10%. ADF: Augmented Dickey-Fuller, PP: Phillips-Perron, KPSS: Kwiatkowski, Phillips, Schmidt, and Shin

returns to shocks monetary policy shocks (changes in policy interest rates.) The identification of the VEC is achieved through cholesky ordering. We conclude that the reaction of stock returns is negative in all of the analyzed countries. The magnitude is highest in Saudi Arabia and lowest in Oman. After determining the magnitude of the reaction of stock returns to monetary policy shocks we continue with the analysis of the significance of these effects. For this analysis we examine the significance of the coefficient of interest rates in the stock return equation of the VEC model. Table 4 presents the coefficient and t-statistics for all countries.

Table 4 concludes that the relationship is significant in Bahrain, Qatar and Saudi Arabia and insignificant in Oman and Qatar. This result is robust to alternative model specifications.

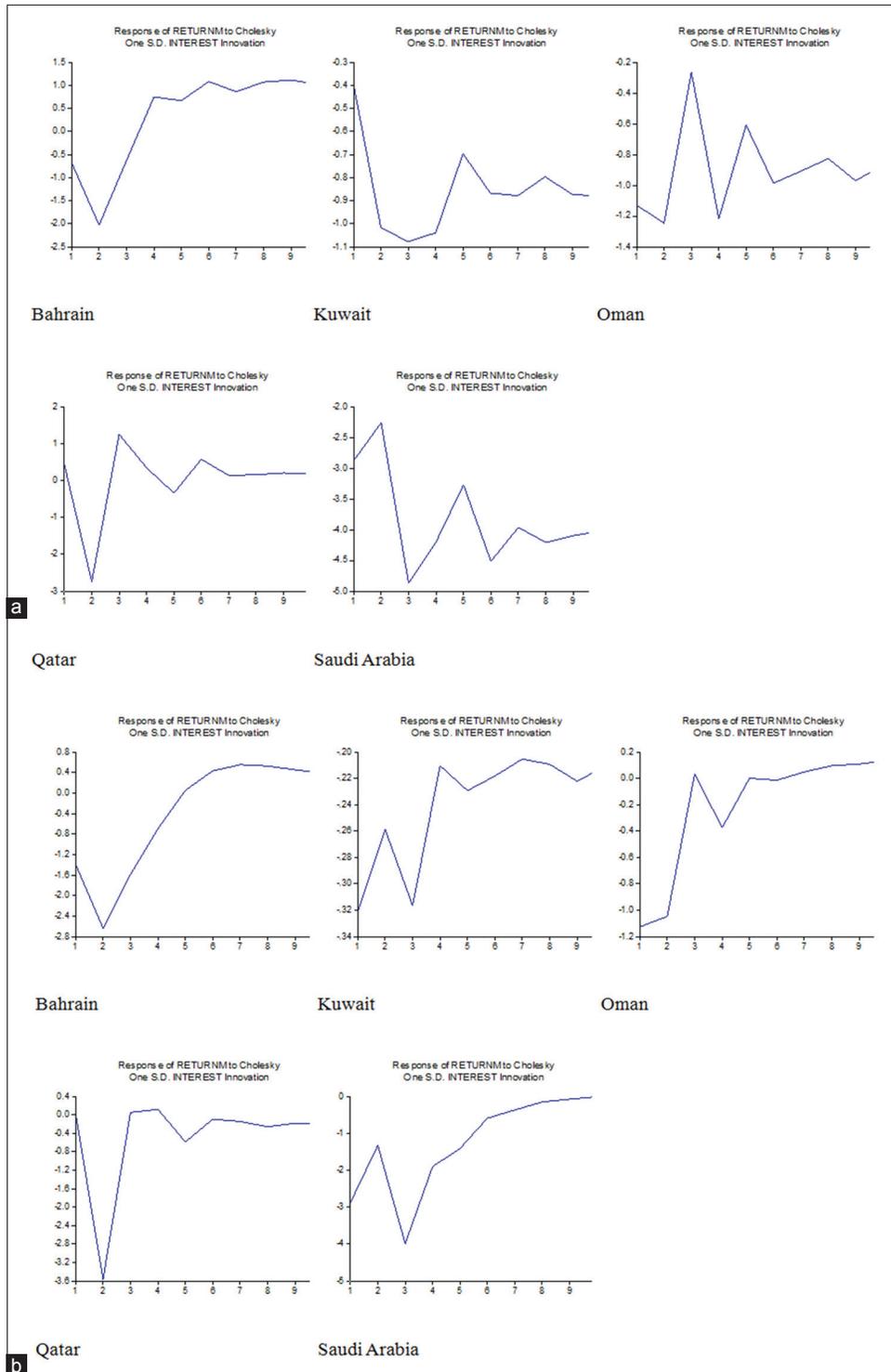
### 5.2. Time-varying Contemporaneous Correlation of Monetary Policy and Stock Returns

The VEC analysis in Section 5.1 investigate the dynamic relationship between stock returns and monetary policy. We investigate the contemporaneous time-varying relationship by examining the time-varying correlation calculated using the DCC-GARCH methodology. Figure 3 displays the contemporaneous correlation between stock returns and monetary policy (policy interest rate) at each month of the analyzed time period.

Figure 3 shows that the correlation changes significantly over time and among countries. For Bahrain, the correlation is negative most of the time. For Kuwait, Oman, Qatar and Saudi Arabia there are periods of negative and positive correlations. The cross-country differences coincide with the findings of Bennaceur et al. (2009). They conclude that in some MENA countries stock returns increase when monetary policy interest rates increases whereas in other

<sup>7</sup> Unit root test lag length is selected using Schwartz Information criteria. Unit root tests are conducted by including a time trend and the intercept in the test equation. The null hypothesis for ADF and PP are  $H_0$ : The variable has a unit root. The null hypothesis for KPSS is  $H_0$ : The variable is stationary.

**Figure 2:** (a) Impulse response of stock returns to interest rate (four variable model), (b) impulse response of stock returns to interest rate (two variable model)

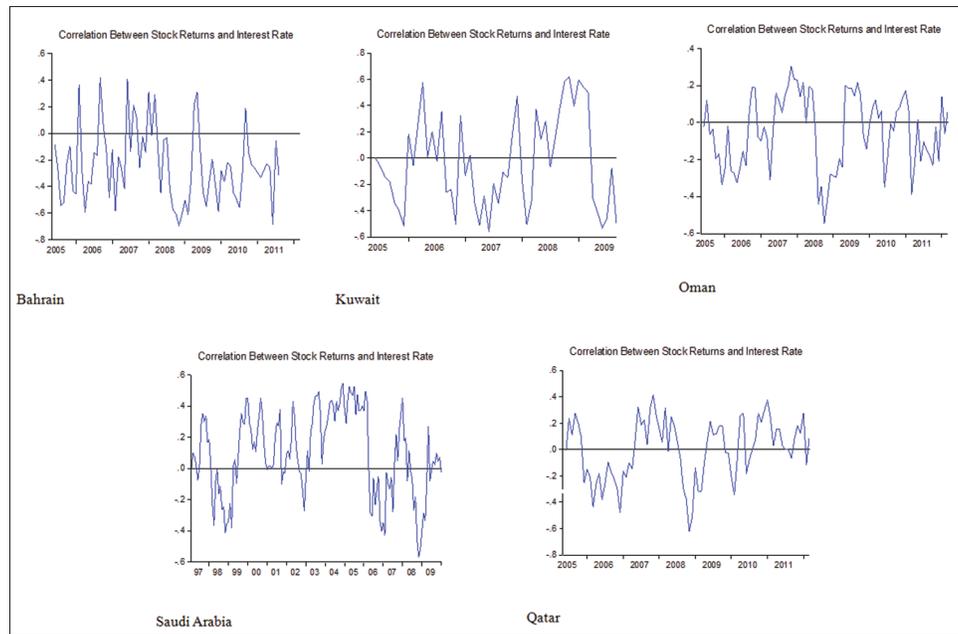


countries stock returns decline or do not react at all. Figure 3 also presents that the recent correlations are either negative or very close to zero.

These changes in the sign of the correlation between stock returns and interest rates can be explained by the asymmetric reaction of stock returns as presented by Boyd et al. (2005).

Boyd et al. (2005) show that the effect of macroeconomic news on stock returns changes over time depending on the state of the economy.<sup>8</sup>

8 Analysis of the causes of time-variation is not the focus of this study. We identify that as an interesting research topic and leave that question for future research

**Figure 3:** Dynamic correlation between stock returns and interest rates in Gulf Cooperation Council Countries**Table 3: Co-integration rank test**

Hypothesized number of CE (s)	Country															
	Bahrain			Kuwait			Oman			Qatar			Saudi Arabia			
	Eigen	Trace	Max-Eigen	Eigen	Trace	Max-Eigen	Eigen	Trace	Max-Eigen	Eigen	Trace	Max-Eigen	Eigen	Trace	Max-Eigen	
Four variables: Production growth, CPI inflation, interest, stock return																
None	0.6	66.34**	32.29*	0.3	52.51*	27.64*	0.36	74.48**	34.44**	0.3	57**	27.91*	0.31	53.14*	21.73	
At most 1	0.41	34.04*	18.66	0.16	24.87	13.5	0.25	40.04**	22.4*	0.22	29.07	18.71	0.27	31.41*	17.97	
At most 2	0.3	15.39	12.48	0.08	11.37	6.01	0.18	17.65*	15.35*	0.11	10.36	8.72	0.19	13.44		
At most 3	0.08	2.91	2.91	0.07	5.35*	5.35*	0.03	2.3	2.3	0.02	1.64	1.64	0.02	1.41		
Two variables: Interest, stock return																
None	0.25	21.51**	20.79**	0.17	19.12*	14.43*	0.24	29.82**	21.19**	0.22	22.4**	19.23**	0.24	16.15*	15.79*	
At most 1	0.01	0.72	0.72	0.06	4.67*	4.67	0.11	8.62**	8.62**	0.04	3.16	3.16	0.01	0.36	0.36	

\*\*Significant at 1%, \*Significant at 5%. CPI: Consumer price index

Table 5 displays the summary statistics of time-varying correlation coefficients. The mean is  $-0.24$  for Bahrain with a standard deviation of  $0.27$  indicating that most of the contemporaneous correlation is negative with a minimum of  $-0.69$ . For Kuwait, Oman and Qatar the mean is close or equal to zero. Hence, there are periods of negative and positive correlations in these countries. The mean of the time-varying correlations is positive in Saudi Arabia. This result shows that for a significant amount of time the correlation is positive. Figure 3 displays that the correlation is positive between 1999 and 2005 in Saudi Arabia.

## 6. CONCLUSION

In this paper, we analyze the effect of monetary policy on stock returns in GCC countries. We conclude that the reaction of stock market to policy interest rates varies among GCC countries. Specifically, the relationship is significant in Bahrain, Qatar and

Saudi Arabia and insignificant in Oman and Kuwait. The time-varying contemporaneous correlations present the differences among GCC countries. For Bahrain, the contemporaneous correlation is negative most of the time. For Kuwait, Oman, Qatar and Saudi Arabia there are periods of negative and positive correlations.

These empirical results have important policy implications. They indicate that the dollar peg has served the overall GCC economies well in sustaining macroeconomic stability especially for countries with relatively flexible peg (Bahrain, UAE, Qatar and Kingdom of Saudi Arabia). In these countries, results reveal that the dollar peg provides an added value for their stock markets. In the Omani case, there is no positive consequence as the fixed exchange rate is rigid. The strategy of Kuwait to adopt a basket seems to be not fruitful as stock market respond negatively to its monetary policy.

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Table 4: VEC results

Variable	Country				
	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia
Four variable model					
Interest <sub>(t-1)</sub>	-10.06** (2.91) [-3.45]	2.305 (2.6) [0.89]	-2 (1.82) [-1.1]	-7.47** (3.07) [-2.44]	-2.12 (4.19) [-0.51]
Interest <sub>(t-2)</sub>	-4 (3.04) [-1.32]	1.36 (2.46) [0.55]	1.56 (1.82) [0.86]	7.702** (3.09) [2.49]	-9.18* (4.23) [-2.17]
Two variable model					
Interest <sub>(t-1)</sub>	-5.71** (1.92) [-2.97]	0.67 (2.17) [0.31]	-2.21 (1.8) [-1.23]	-9.11** (2.64) [-3.45]	-0.94 (3.66) [-0.26]
Interest <sub>(t-2)</sub>	-1.14 (2.06) [-0.56]	0.22 (2.2) [0.1]	0.75 (1.81) [0.41]	3.74 (2.7) [1.38]	-9.92** (3.67) [-2.7]

Standard errors in ( ) and t-statistics in [ ]. \*\*Significant at 1%, \*Significant at 5%.  
VEC: Vector error correction

Table 5: Summary statistics of DCC between stock returns and interest rates

Country	Mean	Standard deviation	Minimum	Maximum
Bahrain	-0.24	0.27	-0.69	0.42
Kuwait	-0.03	0.36	-0.56	0.62
Oman	-0.05	0.2	-0.55	0.31
Qatar	0	0.23	-0.62	0.42
Saudi Arabia	0.1	0.27	-0.57	0.55

Our findings indicate that monetary shock on GCC capital markets diverges from one market to another. This empirical result reveals the significant differences in the type and nature of the internal factors characterizing each market. These differences might decrease the chance of a successful economic unification aimed by the establishment of the GCC. The GCC countries should focus on the liberalization of their respective stock markets and harmonize their economic and financial strategies toward financial integration. Furthermore, there is an urgent need for stock markets liberalization to foreign investors. Only Bahrain and Oman have fully unlocked their markets to foreign investor. This may reduce oil dependency and extend the diversification of sources of revenue.

Disclaimer: The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of the Ministry of Finance in the UAE.

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## APPENDIX

Table Appendix 1: Optimal lag length: AIC, SIC and HQ information criterion

Lag	Country														
	Bahrain			Kuwait			Oman			Qatar			Saudi Arabia		
	AIC	SIC	HQ	AIC	SIC	HQ	AIC	SIC	HQ	AIC	SIC	HQ	AIC	SIC	HQ
0	2.16	2.23	2.19	-1.49	-1.43	-1.46	1.03	1.10	1.06	2.02	2.09	2.05	2.20	2.24	2.21
1	-1.32	-1.12*	-1.24	-1.63	-1.43	-1.55	-1.44	-1.25*	-1.36	-0.78	-0.59	-0.70	-1.40	-1.28*	-1.35
2	-1.38*	-1.04	-1.25*	-1.56	-1.23	-1.43	-1.51*	-1.19	-1.39*	-0.95*	-0.63*	-0.82*	-1.43	-1.23	-1.35
3	-1.30	-0.82	-1.11	-1.92	-1.47*	-1.75*	-1.43	-0.98	-1.25	-0.89	-0.44	-0.71	-1.49	-1.21	-1.37*
4	-1.27	-0.65	-1.02	-1.89	-1.31	-1.66	-1.36	-0.78	-1.13	-0.85	-0.27	-0.62	-1.49	-1.12	-1.34
5	-1.22	-0.47	-0.93	-1.88	-1.18	-1.60	-1.29	-0.58	-1.01	-0.76	-0.06	-0.48	-1.49	-1.04	-1.31
6	-1.20	-0.32	-0.85	-1.97*	-1.13	-1.63	-1.29	-0.45	-0.96	-0.73	0.11	-0.40	-1.49	-0.96	-1.27
7	-1.14	-0.12	-0.73	-1.87	-0.90	-1.48	-1.20	-0.23	-0.82	-0.72	0.24	-0.34	-1.45	-0.84	-1.21
8	-1.08	0.07	-0.63	-1.84	-0.75	-1.41	-1.10	0.00	-0.66	-0.68	0.41	-0.25	-1.51	-0.82	-1.23
9	-1.09	0.21	-0.58	-1.79	-0.57	-1.30	-1.07	0.15	-0.58	-0.58	0.64	-0.10	-1.56	-0.79	-1.25
10	-1.17	0.26	-0.61	-1.78	-0.43	-1.24	-1.05	0.30	-0.52	-0.51	0.84	0.02	-1.60	-0.75	-1.26
11	-1.10	0.46	-0.48	-1.70	-0.22	-1.11	-1.05	0.43	-0.46	-0.64	0.84	-0.05	-1.61*	-0.67	-1.23
12	-1.00	0.70	-0.33	-1.79	-0.19	-1.16	-0.98	0.63	-0.34	-0.59	1.01	0.04	-1.58	-0.56	-1.17

\*Significant at 5%. AIC: Akaike information criterion, SIC: Schwarz information criterion, HQ: Hannan–Quinn information criterion

Table Appendix 2: Model selection for cointegration tests and VEC: The Pantula Principle test results

(a) Bahrain					
Selected (0.05 level*) number of cointegrating relations by model					
Data trend	None	None	Linear	Linear	Quadratic
Test type	No intercept	Intercept	Intercept	Intercept	Intercept
	No trend	No trend	No trend	Trend	Trend
Trace	1	1	1	1	2
Max-Eig	1	1	1	0	2
*Critical values based on MacKinnon-Haug-Michelis (1999)					
Information criteria by rank and model					
Data trend	None	None	Linear	Linear	Quadratic
Rank or	No intercept	Intercept	Intercept	Intercept	Intercept
Number of CEs	No trend	No trend	No trend	Trend	Trend
Log Likelihood by rank (rows) and model (columns)					
0	53.45467	53.45467	53.77111	53.77111	53.84553
1	61.43730	63.05751	63.36567	63.36621	63.41297
2	62.07267	63.71740	63.71740	67.11941	67.11941
AIC by rank (rows) and model (columns)					
0	-1.262630	-1.262630	-1.215864	-1.215864	-1.162376
1	-1.373258	-1.390486*	-1.371269	-1.343506	-1.317027
2	-1.279797	-1.269928	-1.269928	-1.308872	-1.308872
SIC by rank (rows) and model (columns)					
0	-1.009667*	-1.009667*	-0.899661	-0.899661	-0.782931
1	-0.993814	-0.979422	-0.928584	-0.869200	-0.811101
2	-0.773871	-0.700761	-0.700761	-0.676465	-0.676465

AIC: Akaike information criteria, SIC: Schwarz information criteria, \*is the number of cointegrating relations

<b>(b) Kuwait</b>					
<b>Selected (0.05 level*) number of cointegrating relations by model</b>					
Data trend	None	None	Linear	Linear	Quadratic
Test type	No intercept	Intercept	Intercept	Intercept	Intercept
	No trend	No trend	No trend	Trend	Trend
Trace	1	1	2	1	2
Max-Eig	1	1	2	1	2
*Critical values based on MacKinnon-Haug-Michelis (1999)					
Information criteria by rank and model					
Data trend	None	None	Linear	Linear	Quadratic
Rank or	No intercept	Intercept	Intercept	Intercept	Intercept
Number of CEs	No trend	No trend	No trend	Trend	Trend
Log likelihood by rank (rows) and model (columns)					
0	80.20369	80.20369	80.23233	80.23233	80.30570
1	91.02664	91.02871	91.05661	91.27318	91.34111
2	92.57901	94.08704	94.08704	97.38401	97.38401
AIC by rank (rows) and model (columns)					
0	-1.827941	-1.827941	-1.778034	-1.778034	-1.729258
1	-2.000674*	-1.975410	-1.950800	-1.930967	-1.907370
2	-1.938709	-1.926254	-1.926254	-1.959089	-1.959089
SIC by rank (rows) and model (columns)					
0	-1.587997	-1.587997	-1.478104	-1.478104	-1.369342
1	-1.640758*	-1.585501	-1.530898	-1.481071	-1.427482
2	-1.458821	-1.386380	-1.386380	-1.359229	-1.359229

AIC: Akaike information criteria, SIC: Schwarz information criteria, \*is the number of cointegrating relations

<b>(c) Oman</b>					
<b>Selected (0.05 level*) number of cointegrating relations by model</b>					
Data trend	None	None	Linear	Linear	Quadratic
Test type	No Intercept	Intercept	Intercept	Intercept	Intercept
	No trend	No trend	No trend	Trend	Trend
Trace	0	0	0	0	0
Max-Eig	0	0	0	0	0
*Critical values based on MacKinnon-Haug-Michelis (1999)					
Information criteria by rank and model					
Data trend	None	None	Linear	Linear	Quadratic
Rank or	No intercept	Intercept	Intercept	Intercept	Intercept
Number of CEs	No trend	No trend	No trend	Trend	Trend
Log likelihood by rank (rows) and model (columns)					
0	67.76506	67.76506	67.89450	67.89450	68.03967
1	72.87979	73.05905	73.18663	73.61590	73.75916
2	73.40084	73.61498	73.61498	76.70402	76.70402
AIC by rank (rows) and model (columns)					
0	-1.513040	-1.513040	-1.465684	-1.465684	-1.418726
1	-1.541260*	-1.520482	-1.498396	-1.483947	-1.462257
2	-1.453186	-1.407974	-1.407974	-1.435545	-1.435545
SIC by rank (rows) and model (columns)					
0	-1.273095*	-1.273095*	-1.165753	-1.165753	-1.058810
1	-1.181344	-1.130573	-1.078493	-1.034052	-0.982369
2	-0.973298	-0.868100	-0.868100	-0.835685	-0.835685

AIC: Akaike information criteria, SIC: Schwarz information criteria, \*is the number of cointegrating relations

<b>(d) Qatar</b>					
<b>Selected (0.05 level*) number of cointegrating relations by model</b>					
Data trend	None	None	Linear	Linear	Quadratic
Test type	No intercept	Intercept	Intercept	Intercept	Intercept
	No trend	No trend	No trend	Trend	Trend
Trace	1	1	1	1	2
Max-Eig	1	1	1	1	2
*Critical values based on MacKinnon-Haug-Michelis (1999)					
Information criteria by rank and model					
Data trend	None	None	Linear	Linear	Quadratic
Rank or	No intercept	Intercept	Intercept	Intercept	Intercept
Number of CEs	No trend	No trend	No trend	Trend	Trend
Log likelihood by rank (rows) and model (columns)					
0	39.61514	39.61514	39.78608	39.78608	40.02362
1	50.97486	50.97732	51.05899	51.75758	51.85069
2	51.53524	51.89031	51.89031	55.80396	55.80396
AIC by rank (rows) and model (columns)					
0	-0.800383	-0.800383	-0.754078	-0.754078	-0.709459
1	-0.986705*	-0.961451	-0.938202	-0.930572	-0.907613
2	-0.899626	-0.857983	-0.857983	-0.906429	-0.906429
SIC by rank (rows) and model (columns)					
0	-0.560439	-0.560439	-0.454148	-0.454148	-0.349543
1	-0.626789*	-0.571542	-0.518300	-0.480677	-0.427724
2	-0.419738	-0.318108	-0.318108	-0.306569	-0.306569

AIC: Akaike information criteria, SIC: Schwarz information criteria, \*is the number of cointegrating relations

<b>(e) Saudi Arabia</b>					
<b>Selected (0.05 level*) number of cointegrating relations by model</b>					
Data trend	None	None	Linear	Linear	Quadratic
Test type	No intercept	Intercept	Intercept	Intercept	Intercept
	No trend	No trend	No trend	Trend	Trend
Trace	1	1	1	1	1
Max-Eig	1	1	1	1	1
*Critical values based on MacKinnon-Haug-Michelis (1999)					
Information criteria by rank and model					
Data trend	None	None	Linear	Linear	Quadratic
Rank or	No intercept	Intercept	Intercept	Intercept	Intercept
Number of CEs	No trend	No trend	No trend	Trend	Trend
Log likelihood by rank (rows) and model (columns)					
0	131.0449	131.0449	131.4781	131.4781	131.5823
1	141.4709	141.9683	142.4015	143.5307	143.6281
2	142.3592	143.0717	143.0717	145.3268	145.3268
AIC by rank (rows) and model (columns)					
0	-1.494089	-1.494089	-1.473741	-1.473741	-1.449121
1	-1.577544*	-1.571017	-1.563656	-1.565334	-1.553612
2	-1.537132	-1.520412	-1.520412	-1.523725	-1.523725
SIC by rank (rows) and model (columns)					
0	-1.178561	-1.178561	-1.118773	-1.118773	-1.054711
1	-1.183134*	-1.156888	-1.129806	-1.111764	-1.080321
2	-1.063841	-1.007680	-1.007680	-0.971552	-0.971552

AIC: Akaike information criteria, SIC: Schwarz information criteria, \*is the number of cointegrating relations

**Table Appendix 3: Summary statistics of variables**

Country	Variable	Mean	Standard deviation	Minimum	Maximum
Bahrain	Production growth	0.38	8.63	-20.29	31.77
	Inflation	1.84	1.53	-2.31	5.12
	Stock return	-0.2	0.08	-0.33	0.16
	Interest rate	2.96	1.98	0.28	5.64
Kuwait	Production growth	0.41	5.41	-13.4	13.82
	Inflation	5.18	2.56	1.38	11.64
	Stock return	-0.02	0.08	-0.21	0.19
	Interest rate	0.17	0.33	0	1.19
Oman	Production growth	0.35	5.24	-10.34	13.61
	Inflation	5.03	3.53	0.74	13.73
	Stock return	-0.04	0.07	-0.36	0.13
	Interest rate	1.2	1.3	0.05	4.14
Qatar	Production growth	0.14	5.97	-18.61	22.2
	Inflation	4.02	3.18	-5.62	6
	Stock return	0	0.1	-0.31	0.21
	Interest rate	2.45	1.7	0.21	5.19
Saudi Arabia	Production growth	0.51	9.45	-1	6.6
	Inflation	1.45	2.95	-4.19	11.08
	Stock return	0.01	0.09	-3.64	0.3
	Interest rate	3.82	2.05	0.18	7.05