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Oil Dependency of GCC Stock Markets: Co-integration of GCC Stock Market Indices and Oil Price

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Abstract

Oil dependent economies of GCC countries had passed through various cycles of boom and trough of oil price. In the aftermath of the economic recession of 2008 and oil price, the GCC countries have been pursuing plans for diversifying to non-oil revenues. The oil of 2014-16 raised the issue of stock market cointegration to oil price movement in the background of non-oil diversification.

This research study analyzes long term cointegration of oil price and GCC stock indices, and also cointegration among the GCC stock indices *per se* in an attempt to investigate if there is any early sign of disintegration of GCC stock markets from oil price cyclicality. The study period is linked to cyclicality of oil price: the first period comprising of Jan 2006- Dec. 2011 that covers oil price cycle during economic recession of 2008, and the second period comprising of Jan 2012 –September 2016 which covers the post-economic recession oil price cycle. The null hypotheses is that oil price and stock market indices are co-integrated.

Based on Johansen Cointegration test on Box Cox transformed data of oil price and seven stock market indices of GCC countries, it is found that oil price and GCC stock markets are co-integrated. Analysis using Augmented Dickey- Fuller test and Phillips –Perron test shows that data series are all I (1). This study establishes that efforts to reduce oil dependency in GCC countries is yet to result in decoupling of financial markets from oil price cyclicality. This study also establishes that GCC stock markets *per se* are co-integrated but factors of cointegration beyond oil price are not explored.

Keywords: oil dependency, dollar pegging, box cox transformation, Theil index

1. Introduction

Gulf Cooperation Council (GCC) countries (see details in Appendix) except Kuwait are dollar pegged while Kuwait is pegged to a basket of currency. Oil dependency of these countries, measured in terms of 'Fiscal Oil Revenues' as per cent of 'Total Fiscal Revenues', has increased over the years despite planned attempt to increase non-oil revenues. The essential fall outs of the oil during 2014-16 in oil dependent nations are budget deficit and reduced Government spending. This caused decline in stock prices across GCC countries on the apprehension of lowered corporate earnings (Figure 1 & Table 1).

After years of large current account and fiscal surpluses, the main challenge that GCC countries face currently is the prolonged oil price. Since GCC economies are highly dependent on oil and gas exports (during 2011–14, hydrocarbons accounted for around 70 percent of total export earnings and around 80 percent of fiscal revenue, on an average), the lower oil revenues have now pushed the GCC fiscal balances into deficit. The drop in oil prices since mid-2014 has shifted the large aggregate current account surpluses of GCC countries in the past decade to a deficit of $35 billion (Dh128.5 billion) in 2015, and the deficit is expected to widen to $89 billion or 6.5 per cent of the GDP in 2016 - only the UAE and Kuwait seem likely to avoid current-account deficits. Prospects for a return to surplus rest heavily on a recovery in oil prices, and fiscal consolidation efforts.

Despite the economic commonness like oil dependency and dollar pegging, the GCC stock markets have differently reacted in the short run to the recent oil crisis (Table 1 & Figure 1). Stock market performance of Saudi Arabia is worst affected as compared to others. Also rating agencies changed credit ratings of various GCC countries differently indicating differential risk perception. The UAE, Qatar and Kuwait retained their AA ratings from S&P, whereas ratings of Saudi Arabia had been lowered from A+ to A, and of Oman from BBB+ to BBB-and of Bahrain from BBB- to BB. Observing different degrees of oil dependencies and budget deficits of GCC countries, it is observed in certain market reports [e.g. Samba (2016)] that GCC stock markets are perhaps disintegrating. However, there is a need to distinguish between short run divergence and long run association.

Financial linkages in the GCC countries amplify the effects of oil price movements with changes in fiscal spending. Equity markets have fallen on the investors' concern that lower government spending will impair corporate earnings. The reduced government spending has affected bank deposit growth, tightened liquidity and pushed up interbank rates. This has been exacerbated by government debt issuance. In some countries, private sector credit has also been squeezed, though in others delays in government payment have increased demand for additional credit lines. Consumption and investment are affected because of downward pressure on asset prices and battered confidence caused by sustained low oil price.

GCC stock markets suffered large losses (Table 1) during the short time horizon of 1 year. It has been observed in various market reports that oil price and stock market return are no longer correlated [Samba, 2016]. Even though oil prices continued to rise GCC bourses trended down. It could be because of the perception among the investors that the recovery of oil price is unlikely to signal a meaningful increase in Government spending at least during 2016. Given the close linkage between Government spending and private sector performance in GCC countries, corporate earnings are anticipated to remain under pressure.

Table 1. Stock index performance in GCC countries

%	Saudi Arabia	UAE (1)	UAE (2)	Oman	Qatar	Kuwait	Bahrain	MSCI GCC
1 month	-4.61	-3.79	-3.32	-3.30	1.77	-1.42	-1.73	-4.06
3 month	-14.76	-6.89	-5.81	-4.38	-1.45	-1.07	0.56	-4.02
6 month	-13.22	-6.56	-5.79	-3.09	0.69	-0.17	-2.17	-7.86
1 year	-26.50	-6.33	-9.29	-6.04	-11.21	-8.33	8.43	-12.46

Notes to Table 1: Data as on 22nd October 2016

Saudi Arabia: Tadawul All Share Index (TASI)

UAE (1): Abu Dhabi Stock Exchange General Index (ADXG)

UAE (2): Dubai Financial Market General Index (DFM)

Oman: Muscat Securities MSM 30 Index (MSM)

Qatar: Qatar Exchange Index (QSI)

Kuwait: Kuwait Stock Exchange Index (KWSE)

Bahrain: Bahrain All Share Index (BAX)

MSCI GCC Index: The MSCI GCC Countries Index captures large and mid-cap representation across 6 GCC countries. The index includes 85 constituents, covering about 85% of the free float-adjusted market capitalization in each country.

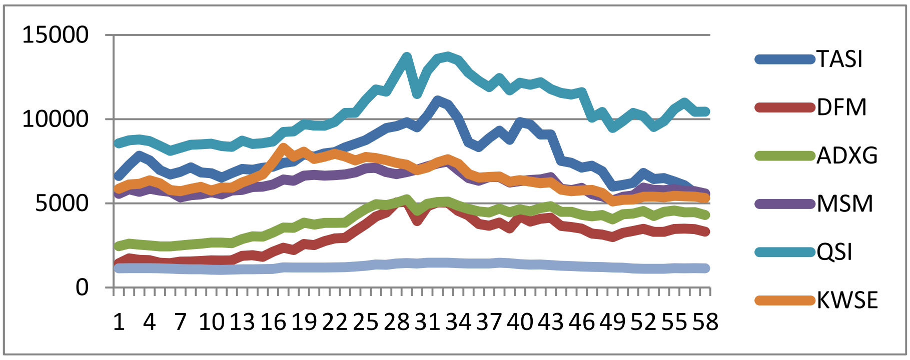

Figure 1. Movement of GCC Stock Indices during Jan 2012-Oct 2016

In view of the above economic syndrome, this research study has been adopted to analyze long run cointegration of oil price and GCC stock indices and also cointegration among the GCC stock indices *per se*. The study investigates if there is any early sign of disintegration of GCC stock markets from oil price cyclicality because of non-oil diversification efforts. For this purpose the study period is linked to cyclicality of oil price – the first period comprising of Jan 2006- Dec. 2011 that covers oil price cycle during economic recession of 2008 and the second period comprising of Jan 2012 –September 2016 which covers oil price peak of 2012, price stability during 2012-2014 and recent price slum. This study covers analysis of cointegration of oil price and GCC stock indices during 2006-2011 & 2012-2016 separately to assess if continued oil slum during the recent period causes disintegration of oil price and stock market.

2. Literature Review

Literature in stock market cointegration has been thoroughly explored in the existing literature. The large body of research focused on using the Johansen (1988) test towards finding cointegration across the various international stock markets. Few important studies are cited below:

(i) Arshanapalli and Doukas (1993) examined relationships and interactions among the stock markets of New York, Japan, Paris, Frankfurt, and London, from January 1980 to May 1990 using unit root and cointegration analyses. They concluded that there has been an increasing interdependence among these stock markets after the crash of 1987, except for Japanese stock market. The French, UK, and German markets are significantly affected by the US market. The Japanese market performance has no links at all with any market in the US, France, Germany, and UK.

(ii) Koutmos (1996) found evidence that the stock markets of France, Germany, Italy, and the UK are integrated because they are affected not only by local news, but also by international news, especially unfavorable, stemming from other markets.

(iii) Friedman and Shachmurove (1997) found that the larger markets of the EU comprising France, Germany, the Netherlands, and UK are highly related, but the smaller markets are more independent, implying larger benefits from short-run diversification by extending stock investment into those smaller countries.

(iv) Serletis and King (1997) found evidence of two common stochastic trends in ten EU stock markets using quarterly data from 1971 to 1992. They suggested that complete integration of, or a single shared common trend in EU stock markets is not observed potentially because of some existing differences in fiscal and monetary policies across EU countries.

(v) Komlavi (2010) while analyzing the cointegration properties of major capital markets indices during the September, 2008 / August, 2009 episode of the financial and banking crises found that OECD group, Pacific group and East Asia group indices were co-integrated. He concluded that the U.S economic and financial conditions may impact in the long-run the performance of other markets because the increasing globalization favors the transmission effect on either major or emerging markets.

Turning back to GCC stock market, various researchers carried out cointegration tests to establish long run association among various stock markets in the GCC. Analyzing relationship between Saudi Arabia's TASI and eight other international stock markets of emerging and developed nations and applying Engle Granger test of cointegration, Al-Zalabani and Menon (2012) concluded that there is no relationship between the TASI and the indices of emerging economies and developed countries except that S&P 500 of US and TASI were co-integrated

Arouri et al. (2013) found that there is a high level of cointegration between four countries of the Middle East countries and that inflation rates and exchange rate changes were the most significant determinants of integration. Paskelian, Nguyen and Jones (2013) explored the existence of cointegration of nine countries of the Middle East and North Africa (MENA) region with S&P 500 of US using Johansen test and Granger causality test. They concluded that markets in the MENA region are co-integrated with each other but not with the U.S. They attributed the level of cointegration to the MENA region policy efforts to remove capital flow barriers. They observed that the cointegration level could also be partly attributable to similarities in MENA countries in respect of dominant oil and gas sectors as well as fixed exchange rate system. This might be responsible for similar risk/return relationships within the region.

Alsuhaibani (2004) employed the Johansen cointegration test among the GCC stock markets and between each market and chosen international stock markets. He found positive correlation between the BAX and MSM and among the stock markets of Dubai, Saudi Arabia and Kuwait. Al-Khazali, Darrat and Saad (2006) studied the impact of market liberalization measures on cointegration in the GCC by analyzing the extent of market linkages prior to and after the implementation of liberalization measures using stock market indices of Saudi Arabia, Bahrain, Kuwait and Oman. Using Johansen–Juselius test of cointegration, they found long run relationship among these stock markets. Sadouni (2013) studied four stock markets, Saudi Arabia, Kuwait, Bahrain and Qatar, during 2005-2013. The result of his study show positive and statistically significant correlation between markets. He concluded that these markets might be integrated.

On the other hand, Rengasamy (2012) researched into the GCC stock markets and found no long term cointegration.

Therefore, cointegration studies on the GCC market indices showed a mixed result leaving scope for further research. This will help to appreciate influence of oil price on GCC stock market performance, and decide upon degrees of non-oil diversification. A primary investigation into stock market returns shows no similarity of return during short tenors. Also fund managers in the GCC region have started believing that the oil dependency is not exactly reflected in the stock market performance.

3. Theoretical Analysis

Oil dependency in GCC countries implies that Government spending are primarily dependent of oil revenue. Mostly the GCC economies are free from corporate tax and personal income tax. Also there is no VAT on sale of goods. Several steps are taken to improve non-oil revenue adopting non- tax route. On the contrary, the IMF has recently outlined three-pint agenda for GCC countries in the tax-route:

(i) introduction of VAT which could contribute up to 2% of GDP;

(ii) introduction of corporate tax;

(iii) introduction of property taxes and excise.

Pending Government action on diversification of revenue base using tax route, economic activities of GCC mostly hover around oil surplus and the level of Government spending on infrastructural development. In times of oil slum reduction in Government spending to rationalize budget deficit directly impacts corporate earnings. Banking activities and performance are also predominantly guided by the oil revenue surplus. Most affected sector in times of oil slum is the real estate with resultant impact on employment, size of migrant labor force and related ancillary sectors. This explains that unless oil dependency is sufficiently reduced through diversification of fiscal sources, it is expected the stock market performance will remain reliant on oil price. Thus from the theoretical perspective it is expected that oil price and GCC stock market indices should remain co-integrated till such time the oil dependency is adequately reduced. The flipside of this cointegration is market indices would follow the oil price cyclicality which investors have to hedge.

4. Research Methodology

Research Hypotheses

H0 Oil price and GCC stock market indices are co-integrated

H1 GCC stock markets broke away from long term cointegration because of non-oil diversification.

Study period of 2006-2016 has been divided into two oil price cycles 2006-2011 & 2012-2016. Data for seven stock market indices of GCC countries , namely Tadawul All Share Index (TASI), Abu Dhabi Stock Exchange General Index (ADXG), Dubai Financial Market General Index (DFM), Muscat Securities MSM 30 Index (MSM), Qatar Exchange Index (QSI), Kuwait Stock Exchange Index (KWSE) and Bahrain All Share Index (BAX) are sourced from www.investing.com historical data and oil price data from www.indexmundi.com.

Cointegration test is adopted since data series are I (1). Correlation analysis in non-stationery data series, i.e. data series which contain unit root, may reflect spurious relationship. Economic time series are dominated by smooth, long term trends, i.e. the variables behave individually as non-stationary random walks. In case the series are I (1), then the hypothesis of no relationship between them often gets rejected when there exists no relationship. In those cases existence of long run relationship among the variables is appropriately explored through cointegration test.

Selected data are transformed using Box - Cox transformation to achieve normality. Box and Cox (1964) developed a procedure to identify an appropriate exponent (λ= l) to use to transform data into normality. The λ value indicates the power to which all data should be raised. The Box-Cox power transformation searches from λ = -5 to +5 until the best value is found. However, there is no in-built normality check; the Box –Cox method checks for the smallest standard deviation. The underlying assumption is that among all transformations within λ = -5 to +5, transformed data have the highest likelihood to be normally distributed when standard deviation is the smallest. [Also refer to Jason, (2010)]. Hence Jarque -Bera test of normality is deployed.

Jarque -Bera test as developed by Jarque and Bera (1980) is based on the sample skewness and kurtosis. The Jarque-Bera (JB) test statistic is defined as:

$$\mathrm{JB} = \frac{N}{6}\left(S^2 + \frac{(K-3)^2}{4}\right)$$

with S, K, and N denoting the sample skewness, the sample kurtosis, and the sample size, respectively. JB statistics (Table 2) is compared to χ2 (chi - square) distribution with 2 degrees of freedom. The null hypothesis of normality is rejected if the calculated JB value exceeds the critical value from the χ^2 distribution i.e. JB should be less than the critical value from the χ^2 distribution. A p - value for the test statistic is calculated as a chi - square distribution probability which signifies risk of rejection of the null hypothesis of normality.

Normality and white noise tests of the two data series are presented in Table 2. It is found that JB test of normality is satisfied in respect of all variables except DFM & ADXG in 2006-11 series and for DFM for 2012-16 series. However, normality test is satisfied in respect ADXG for the sample period of 2012-16.

The other three tests **(**Box-Pierce**,** Ljung-Box**,** & McLeod-Li**)** are computed at different time lags. These tests are also based on the χ^2 distribution. They are used to test whether the data are generated by a white noise or not. The null hypothesis is that the data is assumed to be generated by a white noise process. Box – Pierce test [Box and Pierce (1970)] indicates that if residuals are white noise , Box-Pierce Q statistic would follow a χ^2 distribution with (h – m) degrees of freedom. If a model is fitted, then m is the number of parameters and if no model is fitted m=0.

$$Box\ Pierce\ Q = n\sum_{k=1}^{h} r_k^2$$

Q is the Box-Pierce test statistic, which is compared against the χ^2 distribution; n is the total number of observations; h is the maximum lag and r_k is correlation of data series at k-lag.

It is observed from Table 2 that the Box Pierce Q is much higher than the critical values from χ2 distribution at both 6 and 12 degree of freedom at 95% level of significance. Therefore, the null hypothesis is rejected; the data cannot be assumed to be generated by white noise. Ljung - Box test and McLeod – Li test also arrive at the same conclusion.

Ljung and Box [Ljung and Box (1978)] believed there was a closer approximation to the χ^2 distribution than the Box-Pierce Q statistic, so they developed the alternative Q^* statistic. The formula for the Ljung-Box Q^* statistic is:

$$Ljung\ Box\ Q^* = n(n+2)\sum_{k=1}^{h}(n-k)^{-1}\, r_k^2$$

McLeod-Li test [McLeod and Li (1983)] is portmanteau test for non-linear dependence. The same hypothesis testing procedure is followed:

$$McLeod - Li\ Q_{xx}^{k} = T(T+2)\sum_{m}(T-m)^{-1}\,\rho_{xx}^{2}(m)$$

All the three tests reject that residuals are generated by white noise, and hence the data series are non-stationary.

Table 2. Normality test and white noise tests

2A. Transformed Data Series 2006-2011									
		OIL		**TASI**		**DFM**		**ADXG**	
Statistic	DF	Value	p-value	Value	p-value	Value	p-value	Value	p-value
Jarque-Bera	2	1.205	0.548	2.185	0.335	22.619	< 0.0001	17.037	0.000
Box-Pierce	6	160.869	< 0.0001	214.389	< 0.0001	267.419	< 0.0001	274.617	< 0.0001
Ljung-Box	6	170.479	< 0.0001	229.466	< 0.0001	287.116	< 0.0001	294.920	< 0.0001
McLeod-Li	6	171.991	< 0.0001	230.605	< 0.0001	286.035	< 0.0001	295.055	< 0.0001
Box-Pierce	12	167.152	< 0.0001	264.100	< 0.0001	333.468	< 0.0001	350.019	< 0.0001
Ljung-Box	12	178.087	< 0.0001	287.727	< 0.0001	364.284	< 0.0001	383.039	< 0.0001
McLeod-Li	12	179.491	< 0.0001	289.227	< 0.0001	360.540	< 0.0001	382.585	< 0.0001
		MSM		**QSI**		**KWSE**		**BAX**	

Statistic	DF	Value	p-value	Value	p-value	Value	p-value	Value	p-value
Jarque-Bera	2	2.374	0.305	1.307	0.520	3.470	0.176	2.076	0.354
Box-Pierce	6	166.867	< 0.0001	222.428	< 0.0001	187.787	< 0.0001	273.690	< 0.0001
Ljung-Box	6	177.498	< 0.0001	238.208	< 0.0001	201.215	< 0.0001	294.302	< 0.0001
McLeod-Li	6	178.402	< 0.0001	240.166	< 0.0001	199.756	< 0.0001	291.754	< 0.0001
Box-Pierce	12	174.091	< 0.0001	279.674	< 0.0001	226.393	< 0.0001	379.797	< 0.0001
Ljung-Box	12	185.826	< 0.0001	305.420	< 0.0001	246.038	< 0.0001	418.891	< 0.0001
McLeod-Li	12	186.995	< 0.0001	307.511	< 0.0001	244.331	< 0.0001	415.507	< 0.0001

2B. Transformed Data Series 2012-2016

		Oil		**TASI**		**DFM**		**ADXG**	
Statistic	DF	Value	p-value	Value	p-value	Value	p-value	Value	p-value
Jarque-Bera	2	7.268	0.026	1.249	0.535	10.036	0.007	3.160	0.206
Box-Pierce	6	226.582	< 0.0001	160.037	< 0.0001	168.490	< 0.0001	146.366	< 0.0001
Ljung-Box	6	248.246	< 0.0001	174.101	< 0.0001	183.271	< 0.0001	158.495	< 0.0001
McLeod-Li	6	251.172	< 0.0001	175.768	< 0.0001	183.517	< 0.0001	157.821	< 0.0001
Box-Pierce	12	304.994	< 0.0001	172.360	< 0.0001	179.292	< 0.0001	170.749	< 0.0001
Ljung-Box	12	344.372	< 0.0001	189.304	< 0.0001	196.398	< 0.0001	189.792	< 0.0001
McLeod-Li	12	351.550	< 0.0001	191.319	< 0.0001	196.722	< 0.0001	190.479	< 0.0001
		MSM		**QSI**		**KWSE**		**BAX**	
Statistic	DF	Value	p-value	Value	p-value	Value	p-value	Value	p-value
Jarque-Bera	2	1.756	0.416	2.966	0.227	4.598	0.100	2.362	0.307
Box-Pierce	6	210.784	< 0.0001	136.256	< 0.0001	200.319	< 0.0001	188.318	< 0.0001
Ljung-Box	6	230.307	< 0.0001	147.616	< 0.0001	218.721	< 0.0001	205.350	< 0.0001
McLeod-Li	6	230.548	< 0.0001	147.243	< 0.0001	218.852	< 0.0001	206.385	< 0.0001
Box-Pierce	12	256.552	< 0.0001	164.543	< 0.0001	239.903	< 0.0001	218.103	< 0.0001
Ljung-Box	12	286.015	< 0.0001	183.958	< 0.0001	266.821	< 0.0001	241.398	< 0.0001
McLeod-Li	12	284.999	< 0.0001	184.103	< 0.0001	267.030	< 0.0001	242.954	< 0.0001

Notes. (i) For 5% level of significance and 2 DF, the critical value from the χ^2 distribution is 9.21

(ii) For 5% level of significance and 6 DF, the critical value from the χ^2 distribution is 12.59

(iii) For 5% level of significance and 12 DF, the critical value from the χ^2 distribution is 21.03.

Both the set of transformed data series comprising of OIL, TASI, DFM, ADXG, MSM, QSI, KWSE and BAX are then tested for unit root using Augmented Dickey Fuller (ADF) and Philips Perron (PP) tests. These tests show high risk of rejection of null hypothesis that there is unit root in various data series (Table 3). The testing procedure for the ADF test as developed by Dickey and Fuller (1979) is applied to the following model:

$$\Delta y_{t=}\ \alpha + \beta_1 t + \beta_2 t^2 + \gamma y_{t-1} + \phi_1\ \Delta y_{t-1} + \cdots + \phi_{p-1}\Delta y_{t-p+1} + \epsilon_t$$

Where Δ is the first different operator, α is a constant, β_1 is the coefficient on a time trend and β_2 is the coefficient on a squared time trend.

Unit root testing is equivalent to testing that$\gamma = 0$. Null hypothesis H_0: $\gamma = 0$ (i.e. y_t has a unit root) and H_1:$\gamma < 0$ (i.e. y_t does not have unit root). The test statistics (τ) value is calculated as follows:

$\tau = \frac{\hat{y}}{\sigma_{\hat{y}}}$ where ŷ is the estimated coefficient and $\sigma_{\hat{y}}$ is the standard error in the coefficient estimate.

The test statistics value (i.e. observed value of τ) is compared to the relevant critical value of τ. If the test statistic is less than the critical value, the null hypothesis that y_t has a unit root is rejected and it is concluded that no unit-root is present. It is observed from the Unit Root Test result presented in Table 3 that data series have unit roots.

Phillips and Perron (1988) test has the advantage that it is *parametric*, i.e. it does not require to select the level of serial correlation as in ADF. It rather takes the same estimation scheme as in DF test, but corrects the statistic to conduct for autocorrelations and heteroscedasticity.

Table 3. Unit Root test result

3A. Transformed Data Series 2006-11								
Dickey-Fuller test (ADF(stationary) / k: 4)								
	OIL	TASI	DFM	ADXG	MSM	QSI	KWSE	BAX
τ (Observed value)	-3.089	-1.867	-0.509	-0.875	-2.585	-2.215	-1.361	-0.322
τ (Critical value)	-0.725	-0.725	-0.725	-0.725	-0.725	-0.725	-0.725	-0.725
p-value (one-tailed)	0.106	0.645	0.969	0.934	0.271	0.457	0.843	0.978
α	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Phillips-Perron test (PP(intercept+ trend) / Lag: Short)								
	OIL	TASI	DFM	ADXG	MSM	QSI	KWSE	BAX
τ (Observed value)	-2.337	-2.393	-1.318	-1.507	-2.495	-2.962	-2.704	-1.289
τ (Critical value)	-3.474	-3.474	-3.474	-3.474	-3.474	-3.474	-3.474	-3.474
p-value (one-tailed)	0.409	0.380	0.875	0.818	0.330	0.150	0.239	0.883
α	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05

3B. Transformed Data Series 2012-16								
Dickey-Fuller test (ADF(stationary) / k: 3)								
	OIL	TASI	DFM	ADXG	MSM	QSI	KWSE	BAX
τ (Observed value)	-2.063	-1.518	-1.398	-2.090	-2.491	-1.943	-1.088	-1.644
τ (Critical value)	-0.734	-0.734	-0.734	-0.734	-0.734	-0.734	-0.734	-0.734
p-value (one-tailed)	0.545	0.799	0.835	0.530	0.320	0.611	0.904	0.752
α	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Phillips-Perron test (PP(intercept+ trend) / Lag: Short)								
	OIL	TASI	DFM	ADXG	MSM	QSI	KWSE	BAX
τ (Observed value)	-2.182	-1.363	-1.051	-1.616	-1.649	-1.889	-0.737	-1.193
τ (Critical value)	-3.492	-3.492	-3.492	-3.492	-3.492	-3.492	-3.492	-3.492
p-value (one-tailed)	0.490	0.861	0.928	0.774	0.760	0.647	0.965	0.902
α	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05

As the computed p values in Table 3 are greater than the significance level α =.05, one cannot reject the null hypothesis that there is unit root in the different series. So the series are I (1).

Since the transformed data are normalized, data series are non-stationery, and there is a unit root in each of the data series, Johansen cointegration test is applied to study whether there exists long run association between oil price and stock market indices in the two selected oil price cycles.

Johansen cointegration test [Johansen (1991)] is a procedure of cointegration test of multiple variables. This test permits more than one co-integrating relationship when compared to the Engle–Granger test which is based on the Dickey–Fuller (or the augmented) test for unit roots in the residuals from a single (estimated) co-integrating relationship. It is seen as a multivariate generalization of the augmented Dickey Fuller test. The Johansen test estimates all co-integrating vectors when there are more than two variables. In general, if there are n variables which all have unit roots, there are at most (n – 1) co-integrating vectors. There are two types of Johansen test either with trace or with eigenvalue. If the 'Trace Statistic' or 'Max-Eigen Statistic' is lower than the 'α level Critical Value' that denotes acceptance of the hypothesis that co-integrating equations.

5. Findings

Johansen cointegration test is conducted on Eviews on the selected variables for Data series 2006-2011 and 2012-2016. The result of the Cointegration tests are presented in Table 4A and 4B respectively.

Table 4. Result of cointegration test

4A Data Series: 2006-2011

Sample (Adjusted): 472 Included Observations: 69 after adjustments

Trend assumption: Linear deterministic trend

Series: OIL, TASI, DFM, ADXG, MSM, QSI, KWSE, BAX

Lags Interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test

		Trace			Maximum Eigenvalue		
Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob**	Max-eigen statistics	0.05 Critical Value	Prob**
None*	0.485631	206.8377	159.5297	0.0000	45.87219	52.36261	0.1981
At most 1*	0.472496	160.9655	125.6154	0.0001	44.13228	46.23142	0.0826
At most 2*	0.423050	116.8332	95.75366	0.0008	37.94997	40.07757	0.0852
At most 3*	0.365604	78.88325	69.81889	0.0079	31.40063	33.87687	0.0960
At most 4	0.317903	47.48261	47.85613	0.0542	26.39828	27.58434	0.0703
At most 5	0.149862	21.08433	29.79707	0.3524	11.20264	21.13162	0.6271
At most 6	0.110514	9.881685	15.49471	0.2899	8.080693	14.26460	0.3706
At Most 7	0.025764	1.800992	3.841466	0.1796	1.800992	3.841466	0.1796
		Trace test indicates 4 cointegrating eqn(s) at the 0.05 level			Max-eigenvalue test indicates no cointegration at the 0.05 level		

* denotes rejection of null hypothesis at 0.05 level

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

4B Data Series 2012-2016

Sample (Adjusted): 357 Included Observations: 55 after adjustments

Trend assumption: Linear deterministic trend

Series: OIL, TASI, DFM, ADXG, MSM, QSI, KWSE, BAX

Lags Interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test

		Trace			Maximum Eigenvalue		
Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob**	Max-eigen statistics	0.05 Critical Value	Prob**
None*	0.650599	202.2797	159.5297	0.0000	57.83449	52.36261	0.0125
At most 1*	0.525327	144.4452	125.6154	0.0021	40.98210	46.23142	0.1641
At most 2*	0.400345	103.4631	95.75366	0.0133	28.12706	40.07757	0.5528
At most 3*	0.357925	75.33600	69.81889	0.0169	24.36775	33.87687	0.4290
At most 4	0.335795	50.96825	47.85613	0.0248	22.50406	27.58434	0.1957
At most 5	0.226690	28.46419	29.79707	0.0706	14.13912	21.13162	0.3537
At most 6	0.156585	14.32507	15.49471	0.0744	9.366285	14.26460	0.2569
At Most 7	0.086215	4.958784	3.841466	0.0260	4.958784	3.841466	0.0260
		Trace test indicates 5 cointegrating eqn(s) at the 0.05 level			Max-eigenvalue test indicates 1cointegration eqn at the 0.05 level		

* denotes rejection of null hypothesis at 0.05 level

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

Cointegration tests establish that:

(1) For the data series 2006-2012, there are 4 cointegration equations as per Trace test at 0.05 level but no cointegration as per Maximum Eigen value test at 0.05 level. The result is mixed.

(2) For data series 2012-2016, there are 5 cointegration equations as per Trace test at 0.05 level and 1 cointegration equation as per Maximum Eigen value test at 0.05 level.

Thus null hypothesis that 'Oil price and GCC stock markets are co-integrated' is not rejected. It establishes that there exists long run association between oil price and stock markets. So the stock market investment decision in GCC will continued to be guided by ups and down in the oil price.

Johansen cointegration test is also conducted on the seven stock market indices for the data series 2006-2011 and 2012-2016. The cointegration test shows that –

(1) For the data series 2006-2012, there are 3 cointegration equations as per Trace test at 0.05 level but no cointegration as per Maximum Eigen value test at 0.05 level. The result is mixed.

(2) For data series 2012-2016, there are 4 cointegration equations as per Trace test at 0.05 level and 1 cointegration equation as per Maximum Eigen value test at 0.05 level.

There may exist other co-integrating variables arising out of common economic policies pursued by the GCC countries to maintain dollar peg that causes long run association among the GCC stock markets. This study did not explore the causes of long run association among GCC stock markets beyond cyclicality of oil price which can be the subject matter of further research. A critical shortcoming of this empirical research is that the transformed DFM data series failed test of normality.

However, the Johansen (1988) test does not account for structural breaks in the stock market data, which can be caused by major political or economic events or policy changes. Hence, they might falsely signal cointegration when there is none. The Gregory and Hansen (1996) residual-based cointegration analysis is applied when there is a structural break. Diversification efforts in the GCC countries could provide a structural break. The important limitation of this study is that Gregory –Hensen test is not deployed to validate the Johansen cointegration of oil price and GCC stock market indices.

6. Summary and Conclusions

This paper re-establishes that GCC stock cointegrated with oil price during the periods of two recent oil slumps. This explains that non-oil diversification impact is not strong enough to decouple stock market performance from cyclicality of oil price. After the economic recession of 2008, several attempts were made to reduce oil dependency. But those are found inadequate to avoid oil price cyclicality.

The GCC countries experienced a similar oil price during the early 1980s which caused a prolonged decline in consumption per capita that on average fell by more than 30 percent from the early 1980s peak and recovered to the early 1980s level only in the late 2000s as oil prices recovered. To avoid the oil dependency and decoupling stock markets from oil price, diversification to non-oil revenue seems urgent. Governments of various GCC countries are actively pursuing diversification policies to reduce oil dependency. Cointegration between oil and stock market indices proves that the diversification policies could not neutralize the impact of oil slum. Corporate earnings in the region remained dependent to oil surplus and government spending. Surprisingly, despite sufficient progress in non-oil diversification in the UAE, oil price and DFM and ADXG remain cointegrated subject to non-normality of the data series.

Aggregate export diversification can be disaggregated into two distinct dimensions: the extensive margin, which "measures the number of different export sectors," and the intensive margin, which "represents the diversification of export volumes across active sectors". Diversification in non-oil exports rose from 13% in 2000 to 30% in 2013 of non-oil GDP. Within non-oil exports of goods, manufacturing exports (in percent of non-oil GDP) have increased the most in the United Arab Emirates and Saudi Arabia, followed by Oman, and less so in other countries However, applying Theil index, a measure of concentration in a country's export structure (a higher value of the index means a more concentrated exports), the IMF (2014) found lack of diversification at the extensive margin, given that not many new non-oil export products have been created over the years. For break the economic cyclicality, the GCC countries need to achieve both extensive margin and intensive margin.

At the policy making level, recent meeting of IMF Managing Director and US Treasury Chief to Gulf (27 Oct 2016) reflects similar concern. Jacob Lew, US Treasury Chief remarked that the challenges provide an opportunity for the GCC "to diversify its economy, expand opportunities …and widen financial base in order to make available additional resources to meet growing development needs." IMF recommendations of diversification through tax revenue is the fallout of lack of diversification at extensive margin.

7. Appendix

Economic Parameters and Demographics of GCC Countries

GCC countries comprising of Saudi Arabia, United Arab Emirates (UAE), Oman, Qatar, Kuwait and Bahrain a political and economic alliance of all Arab countries in the Persian Gulf except Iraq. GCC was established in Abu Dhabi on 25 May 1981. The GCC states as important oil exporters achieved high growth in times of high oil price. The oil price slum (see Figure -2) costs GCC states their growth because of high oil dependency and resultant fiscal imbalance. Budget deficit of GCC countries arising out of low oil price forced various GCC Governments to cut Government spending.

Table 5. Demographics and economic parameter of GCC countries

	Saudi Arabia	**UAE**	**Oman**	**Qatar**	**Kuwait**	**Bahrain**
Capital	Riyadh	Abu Dhabi	Muscat	Doha	Kuwait City	Manama
Currency	Saudi Riyal	Dhiram	Omani Riyal	Qatari Riyal	Kuwaiti Dinar	Bahraini Riyal
Population[1]	32.5	8.0	4.2	2.4	4.1	1.2
2015						
Expats in population[2]	30%	88.5%	44%	85.7%	69.2%	52%
	UN 2013					
Oil dependency[3]						
2000-05						
2006-10	82.8	60.2	83.4	90.5	72.7	71.7
2011-14	88.3	65.1	83.4	88.3	79.2	82.2
	90.3	69.9	88.7	90.3	83.6	87.2
Oil dependency[4]						
2000-05						
2006-10	83.4	45.0	76.9	88.5	82.7	58.7
2011-14	83.1	38.7	69.4	85.9	80.5	60.5
	83.0	32.6	64.3	88.9	87.6	65.1
Nominal GDP in Billion US$[1]						
2013						
2014						
2015	744.3	388.9	79.3	201.9	175.8	32.5
2016F	746.2	408.2	81.7	210.1	165.5	35.0
	653.3	371.6	69.5	188.5	118.3	30.8
	624.1	365.2	70.3	186.8	122.5	33.2
Budget Balance % of GDP[1]						
2013						
2014						
2015	5.8	10.4	0.9	14.4	23.1	-3.3
2016F	-3.5	4.9	-3.4	9.6	20.5	-4.0
	-15.9	-2.3	-17.1	1.8	-11.0	-13.5
	-14.7	-3.8	-15.6	-5.8	-10.3	-14.3
CPI avg % Change						
2013						
2014	3.5	1.5	1.3	3.1	2.6	3.3
2015	2.7	2.33	1.0	3.0	2.9	2.5
2016F	2.1	4.1	0.1	1.5	3.3	1.8
	4.0	2.7	1.1	3.0	3.0	3.0

Notes. GCC Round Up 2016: Samba Report Series, September 2016

2. Gulf Labour Markets and Migration www.gulfmigration.eu

3. Fiscal oil revenues as percent of total fiscal revenues: IMF

4. Oil export revenues as percent of total exports of goods and services: IMF

Historical oil price chart in Figure 2 shows oil price movement during 2006-2016. Oil price reached historical high at $132.5/b in July 2008 when future oil price peaked at $140/barrel. During economic recession of 2008 oil price sharply fell to $41.53 in Dec 2008 and bottomed out. It retraced to $117.79 in March 2012, and thereafter it range bound during June 2012 to June 2014 at $90.73 -$108.37. Since then oil price fell continually and touched the bottom at $29.92 in Feb 2016. Thereafter it recovered to $ 45.06 in September 2016 and in October 2016 trading around $50 per barrel.

Dollar pegging in GCC countries (except Kuwait which is pegged to basket of currencies) has been working very well in periods of oil boom and slum. Recent speculative attack to Saudi Riyal had caused a temporary threat to

Saudi Riyal Peg. Sustained low oil prices have led to weakening of fiscal and external positions, and pushed various GCC Governments into large borrowings to fund deficits and support spending. The budgets of all GCC states are facing an average deficit of 13 per cent of gross domestic product (GDP) during 2016, of which budget deficit of Saudi Arabia is estimated to be in excess of 20 per cent.

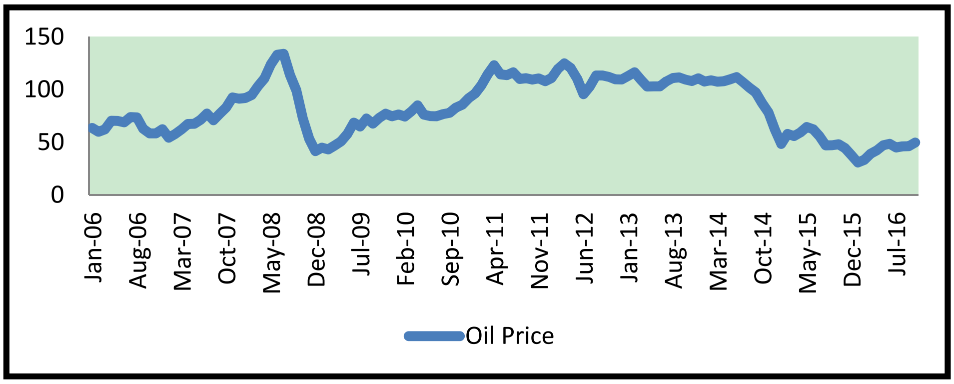

Figure 2. Historical oil price per barrel ($) chart Jan 2006-Oct 2016

In general, countries with larger buffers can afford to maintain fiscal deficits further into the future, so as to reduce the impact of lower oil prices on growth. Almost all GCC countries (except Bahrain) have ratings similar to those of the best-performing advanced economies, but their debt ratios are considerably below advanced economy peers by some 20–40 percentage points of GDP. Oil exporters have additional options to finance fiscal deficits, including borrowing against their oil reserves and selling ownership stakes in both oil and non-oil industries.

Saudi Arabia, the world's biggest oil exporting country sold 5, 10 and 30 –year bonds to global investors. It raised $17.5 billion on 19 October 2016. The Saudi 30-year bond 2.1% above U.S. treasuries. Oil-rich Abu Dhabi issued a $5 billion Euro bond in April 2016 at 85 basis points above US Treasuries. Qatar raised $ 9 billion Eurobonds in May 2016 across three maturities- $3.5 billion in five-year notes at 120 basis points over U.S. Treasuries, $3.5 billion in 10-year bonds at 150 basis points over Treasuries and $2 billion of 30-year paper at a 210 basis-point spread. Earlier Bahrain issued an additional $450 million of an existing bond due 2021 to yield 5.7 percent in Feb. 2016, along with $300 million more of an existing bond due 2026 to yield 7.4 percent. Kuwait is reportedly contemplating to tap the international debt market for as much as $10 billion. Low price has not only dampen the macro-economic scenario, it had also impacted corporate earnings causing decline in GCC stock market indices.

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