On the Influence of Oil Prices on Stock Markets: Evidence from Panel Analysis in GCC Countries

MOHAMED EL HEDI AROURI
CHRISTOPHE RAULT

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Abstract

This paper implements recent bootstrap panel cointegration techniques and Seemingly Unrelated regression (SUR) methods to investigate the existence of a long-run relationship between oil prices and Gulf Corporation Countries (GCC) stock markets. Since GCC countries are major world energy market players, their stock markets are likely to be susceptible to oil price shocks. Using two different (weekly and monthly) datasets covering respectively the periods from 7 June 2005 to 21 October 2008, and from January 1996 to December 2007, our investigation shows that there is evidence for cointegration of oil prices and stock markets in GCC countries, while the SUR results indicate that oil price increases have a positive impact on stock prices, except in Saudi Arabia.

JEL Code: G12, F3, Q43.

Keywords: GCC stock markets, oil prices, panel cointegration analysis.

Mohamed El Hedi Arouri
University of Orléans
LEO, CNRS, UMR 6221
Rue de Blois-B.P.6739
45067 Orléans Cedex 2
France
mohamed.arouri@univ-orleans.fr

Christophe Rault
University of Orléans
LEO, CNRS, UMR 6221
Rue de Blois-B.P.6739
45067 Orléans Cedex 2
France
chrault@hotmail.com

1. **Introduction**

In recent years, a large body of literature has focused on the links between oil prices and macroeconomic variables. It has confirmed that oil price fluctuations have significant effects on economic activity in many developed and emerging countries [Cunado and Perez de Garcia (2005), Balaz and Londarev (2006), Gronwald (2008), Cologni and Manera (2008) and Kilian (2008)]. However, there has been relatively little work done on the relationship between oil price variations and stock markets. And the bulk of what little work has been done has focused on stock markets in developed countries. Very few studies have looked at the stock markets in emerging economies. These studies focus largely on the short-term interaction of energy price shocks and stock markets.

One rationale for using oil price movements as a factor affecting stock valuations is that, in theory, the value of stock equals the discounted sum of expected future cash flows. These cash flows are affected by macroeconomic events that may be influenced by oil shocks. Thus, oil price changes may influence stock prices. Most studies have investigated this relationship within the framework of a macroeconomic model, using low frequency (monthly or quarterly) data from net oil-importing countries. Using weekly data and new panel unit root and cointegration tests, this paper investigates the long-term relationship between oil price shocks and stock markets in the Gulf Cooperation Council (GCC) countries.

GCC countries are interesting for several reasons. First, as they are major suppliers of oil in world energy markets, their stock markets are likely to be susceptible to changes in oil prices. Second, GCC markets differ from those of developed and from other emerging countries in that they are largely segmented from international markets and are overly sensitive to regional political events. Finally, GCC markets are very promising areas for international portfolio diversification. Studying the influence of oil price shocks on GCC stock market returns can help investors make necessary investment decisions and may be of use to policy-makers who regulate stock markets. For these reasons, a study centred on GCC countries should be of great interest.

The pioneering paper by Jones and Kaul (1996) tests the reaction of international stock markets (Canada, UK, Japan and US) to oil price shocks on the basis of a standard cash flow dividend valuation model. They find that for the US and Canada this reaction can be accounted for entirely by the impact of the oil shocks on cash flows. The results for Japan and the UK were inconclusive. Using an unrestricted vector autoregressive (VAR), Huang *et al.* (1996) show a significant link between some American oil company stock returns and oil price changes. However, they find no evidence of a relationship between oil prices and market indices such as the S&P 500. By contrast, Sadorsky (1999) applies an unrestricted VAR with GARCH effects to American monthly data and shows a significant relationship between oil price changes and aggregate stock returns.

Some recent papers focus on major European, Asian and Latin American emerging markets. The results of these studies show a significant short-term link between oil price changes and emerging stock markets. Using a VAR model, Papapetrou (2001) shows a significant relationship between oil price changes and stock markets in Greece. Basher and Sadorsky (2006) use an international multifactor model and reach the same conclusion for other emerging stock markets. However, less attention has been paid to smaller emerging markets, especially in the GCC countries where share dealing is a relatively recent phenomenon. Using VAR models and cointegration tests, Hammoudeh and Eleisa (2004) show that there is a bidirectional relationship between Saudi stock returns and oil price changes. The findings also suggest that the other GCC markets are not directly linked to oil prices and are less dependent on oil exports and are more influenced by domestic factors. Bashar (2006) uses VAR analysis to study the effect of oil price changes on GCC stock markets and shows that only the Saudi and Omani markets have predictive power of oil price increase. More recently, Hammoudeh and Choi (2006) examined the long-term relationship of the GCC stock markets in the presence of the US oil market, the S&P 500 index and the US Treasury bill rate. They find that the T-bill rate has a direct impact on these markets, while oil prices and the S&P 500 have indirect effects.

As can be seen, the results of the few available works on GCC countries are too heterogeneous. These results are puzzling because the GCC countries are heavily reliant on oil export (and thus sensitive to changes in oil prices) and have similar economic structures. The aim of this article is to add to the current literature on the subject by examining the long-term links between oil price changes and stock markets in GCC countries using two different complementary datasets (weekly obtained from the MSCI database and monthly sourced from the Arab Monetary Fund (AMF) database), respectively from 7 June 2005 to 21 October 2008, and from January 1996 to December 2007. There are two main reasons for using these two datasets. Firstly, our daily dataset, the MSCI dataset which deals with all the six GCC countries, only includes less than four years of data, which can be considered as too short to attempt to fit a cointegrating relationship. Indeed, cointegration is a long-term concept and a long-span data is therefore required to insulate the results from particular short-term factors that may have been influencing the relationship. Secondly, our monthly database, the AMF dataset which covers twelve years of data, only includes four GCC countries out of six and does not permit to draw any conclusion about Qatar and United Arab Emirates which are absent from the database. In addition, although the shortness of our weekly data we think that they may capture the interaction of oil and stock prices in the region better than monthly data.Thus, we choose to apply recent econometric techniques to the two datasets and to compare the results we obtain.

We take advantage of non-stationary panel data econometric techniques and seemingly unrelated regression (SUR) methods. More precisely, we use the recently developed bootstrap panel unit root test of Smith *et al.* (2004), which uses a sieve sampling scheme to account for both the time series and the cross-sectional dependencies of the data. In addition, we use the bootstrap second generation panel cointegration test proposed by Westerlund and Edgerton (2007), which makes it possible to accommodate both within and between the individual cross-sectional units. To the best of our knowledge, such an analysis has not been done to study the links between oil prices and stock markets. Adoption of such new panel data methods is preferred to the usual time series techniques to circumvent the well known problems associated with the low power of traditional unit root and cointegration tests in small sample sizes. Adding the cross-sectional dimension to the usual time dimension is indeed very important in the context of nonstationary series in order to increase the power of such tests. As noted by Baltagi and Kao (2000), "the econometrics of nonstationary panel data aims at combining the best of both worlds: the method of dealing with nonstationary data from the time series and the increased data and power from the cross-section".

On the other hand, and since the influence of oil prices on stock markets certainly needs to be tackled country by country, a country assessment is also necessary; it is therefore useful to have as many time series observations as possible. In this context, the SUR approach (another way of addressing cross-sectional dependence) provides additional country-specific results complementing the panel data.

The remainder of this paper is organized as follows. Section 2 briefly describes the GCC markets and the role of oil. Section 3 presents the data and discusses the results of the empirical analysis, which includes second-generation panel unit root tests, panel cointegration and SUR analysis, while section 4 provides summary conclusions and policy implications.

2. GCC stock markets and oil

Table 1 presents some key financial indicators for the stock markets in GCC countries. The GCC was established in 1981 and it includes six countries: Bahrain, Oman, Kuwait, Qatar, Saudi Arabia and the United Arab Emirates (UAE). GCC countries have several patterns in common. Together, they account for about 20% of global oil production, they control 36% of global oil exports and they have 47% of proven global reserves. Oil exports largely determine earnings, government budget revenues and expenditures and aggregate demand. The contributions of oil to GDP range from 22% in Bahrain to 44% in Saudi Arabia. Moreover, as Table 1 shows, the stock market liquidity indicator of the three largest GCC economies (Saudi Arabia, the UAE, and Kuwait) is positively associated with the oil importance indicator.

Furthermore, GCC countries are importers of manufactured goods from developed and emerging countries. So oil price fluctuations can indirectly impact GCC markets through their influence on the prices of imports, and increases in oil prices are often indicative of inflationary pressure in GCC economies; inflationary pressures, in turn, could dictate the future of interest rates and of investment of all types. So, in GCC countries, oil price fluctuations should affect corporate output and earnings, domestic prices and share prices. However, unlike net oil-importing countries, where the expected link between oil prices and stock markets is negative, GCC countries may be subject to other phenomena: the transmission mechanism of oil price shocks to stock market returns is ambiguous and the total impact of oil price shocks on stock returns depends on which positive and negative effects offset each other.

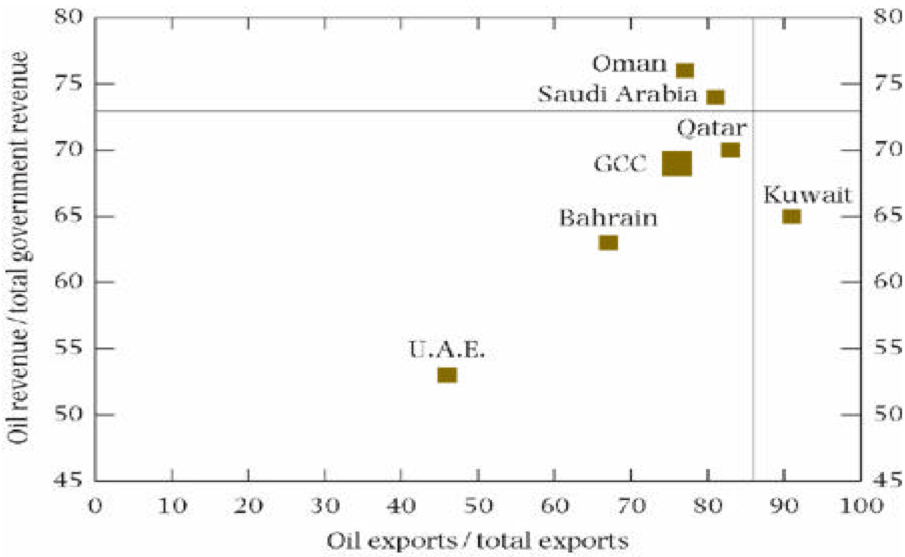
Table 1- Stock markets in GCC countries in 2007

Market	Number of companies*	Market Capitalization ($ billion)	Market Capitalization (% GDP) *	Oil (% GDP)+
Bahrain	50	21.22	158	22
Kuwait	175	193.50	190	35
Oman	119	22.70	40	41
Qatar	40	95.50	222	42
UAE	99	240.80	177	32
S. Arabia	81	522.70	202	44

Sources: *Arab Monetary Fund and Emerging Markets Database. * Numbers in 2006.*

Saudi Arabia leads the region in terms of market capitalization. However, by percentage of GDP, Qatar is the leader. Stock market capitalization exceeded GDP for all counties except Oman. Kuwait has the largest number of listed companies, followed by Oman. Overall, GCC stock markets are limited by several structural and regulatory weaknesses: relatively small numbers of listed firms, large institutional holdings, low sectoral diversification, and several other deficiencies. In recent years, however, a broad range of legal, regulatory, and supervisory changes has increased market transparency. More interestingly, GCC markets are beginning to improve their liquidity and open their operations to foreign investors. In March 2006 Saudi authorities lifted the restriction that limited foreign residents to dealing only in mutual investment funds; the other markets have followed the Saudi lead.[3]

Figure 1: Dependence on oil of GCC countries



Source: Fasano and Iqbal (2003), International Monetary Fund.

Finally, although GCC countries have several economic and political characteristics in common, they depend on oil to differing degrees; likewise, efforts to diversify and liberalize the economy differ from country to country. The UAE and Bahrain, for example, are less reliant on oil than Saudi Arabia and Qatar (Figure 1). Besides, we have to mention that several other institutional differences remain between GCC countries. For instance, unlike other GCC stock markets, the Saudi market is highly dominated by State entities that are not active traders. In fact, in Saudi Arabia state-controlled companies dominate the listing. The stock market capitalization thereby heavily concentrates on banks, telecoms and materials. Moreover, perception of insider trading is widespread. These elements are likely to undermine normal market operations such as arbitrage and speculation in the Saudi stock market. Thus, the comparison of GCC stock markets makes for an interesting subject. The panel data econometric tools we use in this paper take into account these different features.

[3] For interested readers, further information about and discussion of the market characteristics and financial sector development of these countries can be found in Creane *et al.* (2004), Neaime (2005), and Naceur and Ghazouani (2007).

3. Empirical investigation

3.1. Data

Our goal is to investigate the existence of a long-term relationship between oil prices and stock markets in GCC countries. Unlike previous studies, which use low-frequency data (yearly, quarterly or monthly), our study uses both weekly and monthly data for the reasons discussed in the introduction of the paper.

Weekly data are obtained from MSCI and covered the six GCC members. We think that weekly data may more adequately capture the interaction of oil and stock prices in the region than low-frequency data. We do not use daily data in order to avoid time difference problems with international markets. In fact, the equity markets are generally closed on Thursdays and Fridays in GCC countries, while the developed and international oil markets close for trading on Saturdays and Sundays. Furthermore, for the common open days, the GCC markets close just before US stocks and commodity markets open. Accordingly, we opt to use weekly data and choose Tuesday as the weekday for all variables because this day lies in the middle of the three common trading days for all markets. Moreover, the data used in all the analyses predate the end of 2005, so previous studies missed the spectacular evolutions that took place in the GCC and oil markets in the last three years. Therefore, our sample period goes from 7 June 2005 to 21 October 2008 for the six GCC members.

As for our second dataset, we use monthly data obtained from Arab Monetary Fund (AMF) over the period January 1996 – December 2007. Note that stock exchanges in UAE and Qatar are newly established and did not participate in the AMF database when it began in 2002. Thus, the AMF data we use include only four of the six GCC stock markets: Bahrain, Kuwait, Oman and Saudi Arabia.[4]

For oil, we use the weekly and monthly OPEC spot prices. These prices are weighted by estimated export volume and are obtained from the Energy Information Administration (EIA). OPEC prices are often used as benchmarks for crude oil, including oil produced by GCC countries.[5] All prices are in American dollars.

3.2. Bootstrap panel unit root analysis

[4] Data for 2008 are not available in AMF database. Furthermore, weekly data are not available.

[5] Very similar results are obtained with West Texas Intermediate and Brent spot prices. Oil prices are in US dollars per barrel. Note also that GCC currencies have been officially pegged to the U.S. dollar since 2003. However, Kuwait has recently moved back to pegging its currency to a basket currency.

The body of literature on panel unit root and panel cointegration testing has grown considerably in recent years and now distinguishes between the first-generation tests [Maddala and Wu (1999), Levin *et al.* (2002) and Im *et al.* (2003)] developed on the assumption of the cross-sectional independence of panel units (except for common time effects), the second-generation tests [Bai and Ng (2004), Smith *et al.*(2004), Moon and Perron (2004), Choi (2006) and Pesaran (2007)] allowing for a variety of dependence across the different units, and also panel data unit root tests that make it possible to accommodate structural breaks [Im and Lee (2001)]. In addition, in recent years it has become more widely recognized that the advantages of panel data methods within the macro-panel setting include the use of data for which the spans of individual time series data are insufficient for the study of many hypotheses of interest. To determine the degree of integration of our series of interest (oil price index and stock market indices) in our panel of GCC countries, we employ the bootstrap tests of Smith *et al.* (2004), which use a sieve sampling scheme to account for both the time series and cross-sectional dependencies of the data. The tests that we consider are denoted $\bar{t}$, $\overline{LM}$, $\overline{\max}$, and $\overline{\min}$. All four tests are constructed with a unit root under the null hypothesis and heterogeneous autoregressive roots under the alternative, which indicates that a rejection should be taken as evidence in favour of stationarity for at least one country.[6] The results, shown in Tables 2a and 2b (associated respectively to our weekly and monthly datasets), suggest that for all the series (taken in logarithms) the unit root null cannot be rejected at any conventional significance level for the four tests.[7] We therefore conclude that the variables are non-stationary[8] in our country panel.[9]

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[6] The $\bar{t}$ test can be regarded as a bootstrap version of the well known panel unit root test of Im *et al*. (2003). The other tests are modifications of this test. For further details on the construction of the four tests, we refer the reader to Smith *et al*. (2004).

[7] The order of the sieve is permitted to increase with the number of time series observations at the rate $T^{1/3}$ while the lag length of the individual unit root test regressions are determined using the Campbell and Perron (1991) procedure. Each test regression is fitted with a constant term only.

[8] We also show in Appendix 1 the results of the well known time series Kwiatkovski-Phillips-Schmidt-Shin (KPSS, 1992) test. However, as recently stressed by Carrion-i-Silvestre and Sanso (2006), the main drawback of stationarity tests is the difficulty entailed by the estimation of the long-run variance needed to compute them. To deal with this issue we therefore follow their recommendations and apply the KPSS test using the procedure developed by Sul-Phillips-Choi (SPC, 2005) to estimate the long-run variance. This strategy involves less size distortion than that of the LMC test, while preserving reasonable power. The results obtained in a country-by-country approach are in accordance with those of the panel data tests in the sense that all series are found to be integrated of order one for all GCC countries and for the oil price in our two (weekly and monthly) datasets.

[9] We have of course also checked using the bootstrap tests of Smith *et al*. (2004) that the first difference of the series are stationary, hence confirming that the series expressed in level are integrated of order one.

Table 2a –Panel Unit Root Tests for Oil Price Index and Stock Price series (weekly dataset on the 6 GCC countries)*

	Oil Price Index				Stock Price Indices			
Test	Statistic (a)	Bootstrap P-value*	Statistic (b)	Bootstrap P-value*	Statistic (a)	Bootstrap P-value*	Statistic (b)	Bootstrap P-value*
$\bar{t}$	-1.668	0.452	-1.693	0.745	-1.375	0.650	-1.641	0.928
$\overline{LM}$	2.916	0.454	3.021	0.745	2.005	0.816	2.931	0.959
$\overline{\max}$	-1.290	0.387	-1.725	0.567	-1.183	0.379	-1.511	0.824
$\overline{\min}$	1.756	0.400	3.021	0.573	1.627	0.556	2.437	0.898

Notes: *a- Model includes a constant.*
b- Model includes both a constant and a time trend.
** Test based on Smith* et al. *(2004). Rejection of the null hypothesis indicates stationarity at least in one country. All tests are based 5,000 bootstrap replications to compute the p-values.*

Table 2b –Panel Unit Root Tests for Oil Price Index and Stock Price series (monthly dataset on 4 GCC countries)*

	Oil Price Index				Stock Price Indices			
Test	Statistic (a)	Bootstrap P-value*	Statistic (b)	Bootstrap P-value*	Statistic (a)	Bootstrap P-value*	Statistic (b)	Bootstrap P-value*
$\bar{t}$	1.588	0.998	-0.703	0.967	-1.195	0.880	-1.852	0.874
$\overline{LM}$	2.602	0.474	0.522	0.968	1.795	0.832	2.751	0.964
$\overline{\max}$	2.602	0.259	0.517	0.940	-1.684	0.321	-1.741	0.784
$\overline{\min}$	1.184	0.994	-0.576	0.967	1.821	0.521	2.337	0.983

Notes: *a- Model includes a constant.*
b- Model includes both a constant and a time trend.
** Test based on Smith* et al. *(2004). Rejection of the null hypothesis indicates stationarity at least in one country. All tests are based 5,000 bootstrap replications to compute the p-values.*

3.3. Panel cointegration

The series of oil price index and stock market indices being integrated of order one, we now use the bootstrap panel cointegration test proposed by Westerlund and Edgerton (2007) to test for the existence of the cointegration of oil prices and GCC stock markets (in conjecture with equation (1): $Lstock_{it} = a + b \;\; Loil_{it} + e_{it}$, where i $(i = 1,..., N)$ is the country, t $(t = 1,...,T)$ the period, $Lstock$ the stock index price in logarithm, and $Loil$ the oil price in logarithm).[10] This test relies on the popular Lagrange multiplier test of McCoskey and Kao (1998), and makes it possible to accommodate correlation both within and between the individual cross-sectional units. In addition, this bootstrap test is based on the sieve-sampling scheme, and has the advantage of significantly reducing the distortions of the asymptotic test. Note that this test

[10] A large system including GCC stock markets, oil price and interest rate leads to very similar results.

has the appealing advantage that the joint null hypothesis is that all countries in the panel are cointegrated. Therefore, in case of non-rejection of the null, we can assume there is cointegration of oil prices and stock markets for the whole set of GCC countries.

The panel cointegration results shown in Tables 3a and 3b for a model including either a constant term or a linear trend clearly indicate the absence of a cointegrating relationship between oil prices and stock markets for our panel of six and four GCC countries (according to the database considered). This result, however, is based on conventional asymptotic critical values that are calculated on the assumption of cross-sectional independence of countries, an assumption that is probably absent for the oil price and stock market indices time series for GCC countries for which strong economic links exist (see section 2).

Therefore, it seems more reasonable to use bootstrap critical values (which are valid if there is some dependence among individuals). In this case the conclusions of the tests are now much more straightforward, and retaining a 10% level of significance, we conclude that there is a long-run relationship between oil prices and stock markets for our panel of six and four GCC countries included respectively in our two (weekly and monthly) datasets, whatever the specification of the deterministic component. This implies in particular that over the longer term oil prices and stock market indices move together in GCC countries. The forces that move markets in GCC countries are basically the forces that move oil prices, mainly OPEC intervention policy, global economic growth, changes in oil inventories and other global, regional and domestic political and economic events.

Table 3a – Panel cointegration test results between oil price index and stock index series (weekly dataset on the 6 GCC countries) #

	LM-stat	Asymptotic p-value	Bootstrap p-value
Model with a constant term	40.539	0.000	0.250
Model including a time trend	41.300	0.000	0.104

Notes: the bootstrap is based on 2000 replications.
a - The null hypothesis of the tests is cointegration of current Oil Price Index and Stock Index series.
 # Test based on Westerlund and Edgerton (2007).

Table 3b – Panel cointegration test results between oil price index and stock index series (monthly dataset on 4 GCC countries) #

	LM-stat	Asymptotic p-value	Bootstrap p-value
Model with a constant term	10.813	0.000	0.773
Model including a time trend	38.596	0.000	0.161

Notes: the bootstrap is based on 2000 replications.
a - The null hypothesis of the tests is cointegration of current Oil Price Index and Stock Index series.
 # Test based on Westerlund and Edgerton (2007).

The estimated coefficients of equation (1) are shown in Tables 4a and 4b.

Table 4a – Estimated coefficients for the GCC panel (weekly dataset on the 6 GCC countries, average relation)

Coefficients a, b in equation (1)		t-Statistic	Probability
a	3.312	25.267	0.000
b	0.308	10.021	0.000

Note: Balanced system, total observations: 1062.

Table 4b –Estimated coefficients for the GCC panel (monthly dataset on 4 GCC countries, average relation)

Coefficients a, b in equation (1)		t-Statistic	Probability
a	2.918	25.821	0.000
b	0.629	19.054	0.000

Note: Balanced system, total observations: 575.

Panel estimates show, as expected, significant positive coefficient b . The elasticity of stock prices to oil prices is less than one, but the stock price effect of oil changes is great: a 10% increase in oil prices leads to an average appreciation of the stock markets in GCC countries by 3.08% if the reference period is the week, and of 6.29% if the reference period is the month.

3.4. SUR estimates

As a cointegrating relationship exists for our panel of six GCC countries we now estimate the system: $Lstock_{it} = a_i + b_i \ Loil_{it} + e_{it}$, *i=1,…,N; t=1,…,T* (2), by the Zellner (1962) approach to handle cross-sectional dependence among countries using the SUR estimator. This way of proceeding enables us to estimate the individual coefficients *ßi* in a panel framework and hence to investigate the influence of oil prices on the stock market for each country taken individually. The SUR estimation results are shown in Tables 5a and 5b.

Table 5a – SUR estimation for the GCC panel (weekly dataset on the 6 GCC countries)

Country	Coefficients a_i, b_i in equation. (2)		t-Statistic	Probability
Bahrain	a_1	2.728	25.398	0.000
	b_1	0.419	16.638	0.000
Kuwait	a_2	2.503	16.964	0.000
	b_2	0.585	16.908	0.000

Oman	a_3	1.761	11.194	0.000
	b_3	0.680	18.443	0.000
Saudi Arabia	a_4	5.593	18.466	0.000
	b_4	-0.262	-3.7005	0.000
Qatar	a_5	2.741	10.757	0.000
	b_5	0.443	7.4218	0.000
United Arab Emirates	a_6	4.548	18.275	0.000
	b_6	0.201	3.1251	0.000

Notes: Seemingly unrelated regression, linear estimation after one-step weighting matrix. Balanced system, total observations: 1062.

Table 5b – SUR estimation for the GCC panel (monthly dataset on 4 GCC countries)

Country	Coefficients a_i, b_i in equation. (2)		t-Statistic	Probability
Bahrain	a_1	3.776	27.46	0.000
	b_1	0.322	8.023	0.000
Kuwait	a_2	2.405	16.79	0.000
	b_2	0.827	19.76	0.000
Oman	a_3	4.183	20.94	0.000
	b_3	0.195	3.346	0.000
Saudi Arabia	a_4	1.311	7.139	0.000
	b_4	-0.384	-21.83	0.000

Notes: Seemingly unrelated regression, linear estimation after one-step weighting matrix. Balanced system, total observations: 575.

On a per county basis, oil price increases have a positive impact on stock prices, except for Saudi Arabia. Several economic and institutional differences between the Saudi market and the other GCC markets could explain this result. In fact, Saudi Arabia is the largest GCC market, but its economy is overly dependent on oil-importing countries and suffers from imported inflation and economic pressures. Moreover, the annual turnover in Saudi Arabia is low and the Saudi stock market is considered shallow when compared to other emerging markets. There are two main reasons behind this low trading volume. First, unlike other GCC markets, the Saudi governments still hold a large chunk of listed firms that they rarely trade. Second, strategic shareholders hold another large chunk. This makes shares available for trading very limited in the Saudi's stock market, causing investors to shy away from these companies. These elements are likely to undermine normal market operations such as arbitrage and speculation in Saudi Arabia.

Finally, we also use a Wald test, which may in principle be useful to uncover any common behaviour for some country sub-groups, to test the homogeneity of b_i across countries. For instance, one could consider that it is more likely to pair countries with smaller estimated b_i, and countries with higher estimated b_i coefficients. The results of these tests are shown in Tables 6a and 6b.

Table 6a – Testing the homogeneity of ß across countries (weekly dataset on the 6 GCC countries)

Panel/country group	Chi-square statistic	Probability
b_i =1 for all GCC countries	1550.83	0.0000
b_i =β for all GCC countries	1008.61	0.0000
b_i =1 for all GCC countries except Saudi Arabia	1831.55	0.0000
b_i =β for all GCC countries except Saudi Arabia	1002.16	0.0000
$b_1 = b_5$ and $b_2 = b_3$	4.59	0.1003

Table 6b – Testing the homogeneity of ß across countries (monthly dataset on 4 GCC countries)

Panel/country group	Chi-square statistic	Probability
b_i =1 for all GCC countries	501.06	0.0000
b_i =β for all GCC countries	238.17	0.0000
b_i =1 for all GCC countries except Saudi Arabia	490.647	0.0000
b_i =β for all GCC countries except Saudi Arabia	107.79	0.0000
$b_1 = b_5$ and $b_2 = b_3$	4.59	0.1003

While the null hypothesis of homogeneity (as well as of a unit coefficient) in the cointegration relationship is always rejected for the overall panel set of GCC countries in our two (weekly and monthly) datasets, it holds for some specific country pairings. For instance, it is possible to see that the null of homogeneity for b_i, that is the similarity in the responses of GCC stock markets to changes in oil prices, is not rejected jointly for Bahrain, and Qatar or for Kuwait, and Oman in the weekly and monthly datasets. Thus, despite the several similarities and economic links between GCC countries, their stock markets do not have similar sensitivities to oil price changes. Finally, our results suggest that GCC markets have the potential to yield different stock returns and are therefore candidates for regional portfolio diversification.

4- Policy Discussion

Theoretically, oil price changes affect stock prices through their effects on both expected earnings and discount rate. In the last decade, researchers and market participants have attempted to find a practical framework that identifies how oil prices affect stock prices. However, they do not reach any general consensus. Using robust new econometric techniques, our results show the existence of strong significant long run relationships between oil prices and stock markets in GCC countries and that oil price increases have a positive impact on stock prices in most GCC countries. This finding is not unexpected given the fact that GCC countries are heavily reliant on oil export (and thus sensitive to changes in oil prices) and have similar economic structures. Our results have important implications for researchers and market participants.

First, our findings suggest that international diversification benefits can be achieved by including assets from both net oil importing countries (such as most developed countries) and net oil exporting countries (such as GCC countries). In fact, a portfolio constituted of assets with both positive and negative sensitivities to oil is weakly affected by oil price shocks. Alternatively, global investors may consider hedging for oil price shocks using oil-based derivatives.

Second, the existence of a long term stable relationship between oil prices and stock prices in GCC countries suggests, from the perspective of investments, that oil and stock market can be considered integrated rather segmented markets implying that expected benefits from diversification within the GCC region by holding assets in both the oil and stock markets are decreasing. Thus, investors in the region should search abroad for new investment opportunities in order to hold diversified portfolios. However, global investors from developed and emerging markets can invest a part of their wealth in GCC countries if they want to reduce the effects of oil price rises on their profitability.

Third, the significant relationship between oil prices and stock markets implies some degree of predictability in the GCC stock markets. On the base of demand and supply expectations in oil and oil related products markets one may expect the evolution of oil prices and then their effects on stock market prices in GCC countries. Thus, profitable speculation and arbitrage strategies can be built based of our results.

Finally, our results show that oil price changes affect significantly stock markets in GCC countries. Stock markets are the barometer of economic activity and are strongly related to both consumer and investors confidence. Thus, GCC countries as major OPEC policy-makers should pay attention to how their actions impact oil prices and to the effects of oil price fluctuations on their own economies and stock markets.

5- Conclusion

This paper uses recent bootstrap panel cointegration techniques and seemingly unrelated regression methods, which, to the best of our knowledge, have never been used in this context, to look into the existence of long-term relationships between oil prices and GCC stock markets. Since GCC countries are major oil producers and exporters, their stock markets are likely to be susceptible to oil price shocks. Based on two different (weekly and monthly) datasets covering respectively the periods from 7 June 2005 to 21 October 2008, and from January 1996 to December 2007, our results show that there is evidence for cointegration of oil prices and stock markets in GCC countries. Our findings should be of interest to researchers, regulators, and market participants. In particular, GCC countries as OPEC policy-makers should keep an eye on the effects of oil price fluctuations on their own economies and stock markets. For investors, the significant relationship between oil prices and stock markets implies some degree of predictability in the GCC stock markets.

There are several avenues for future research. First, the long-run link between oil and stock markets in GCC countries can be expected to vary from one economic industry to another. A sectoral analysis of this long-run link would be informative and an investigation of asymmetric reactions of sectoral indices to oil price changes should be relevant. Second, the panel unit root and panel cointegration models applied in this article could be used to examine the effects of other energy products, such as natural gas. Third, further research could examine the links of causality binding oil and stock markets in GCC countries and other oil-exporting countries.

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Appendix 1 – Individual stationarity tests for series (in logarithm) [(a)]

Table 1 – Results for the daily dataset on 6 GCC countries

Series	KPSS with constant (b)	KPSS with time trend (b)
Oil Price Index	1.302	0.252
Bahrain Stock Index	0.948	0.259
Kuwait Stock Index	1.396	0.299
Oman Stock Index	0.843	0.339
Saudi Arabia Stock Index	0.899	0.245
Qatar Stock Index	0.798	0.364
United Arab Emirates Stock Index	0.899	0.245
	Critical Values	Critical Values
cv (1%)	0.741	0.217
cv (5%)	0.463	0.148
cv (10%)	0.348	0.120

a – We follow here the recommendations given by Carrion-i-Silvestre and Sanso (2006) and apply the KPSS test using the procedure developed by Sul *et al.* (2005) to estimate the long-run variance.
b – We have used the AIC criterion to select the order of the autoregressive correction with pmax=int[12 $(T/100)^{(1/4)}$]. Regarding the critical values, we report the finite sample critical values drawn from the response surfaces in Sephton (1995).
Note that the null hypothesis of the Kwiatkowski-Phillips-Schmidt-Shin test is stationarity around a constant, or around a (linear) time trend.

Table 2 – Results for the monthly dataset on 4 GCC countries

Series	KPSS with constant (b)	KPSS with time trend (b)
Oil Price Index	1.190	0.307
Bahrain Stock Index	1.001	0.313
Kuwait Stock Index	0.985	0.286
Oman Stock Index	0.841	0.486
Saudi Arabia Stock Index	0.871	0.256
	Critical Values	Critical Values
cv (1%)	0.741	0.217
cv (5%)	0.463	0.148
cv (10%)	0.348	0.120

a – We follow here the recommendations given by Carrion-i-Silvestre and Sanso (2006) and apply the KPSS test using the procedure developed by Sul *et al.* (2005) to estimate the long-run variance.
b – We have used the AIC criterion to select the order of the autoregressive correction with pmax=int[12 $(T/100)^{(1/4)}$]. Regarding the critical values, we report the finite sample critical values drawn from the response surfaces in Sephton (1995).
Note that the null hypothesis of the Kwiatkowski-Phillips-Schmidt-Shin test is stationarity around a constant, or around a (linear) time trend.

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