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Links and Volatility Transmission Among the GCC Stock Markets and the **NYMEX** Oil Futures

Shawkat Hammoudeh

Drexel University

E-mail: Hammousm@drexel.edu

Eisa Al-Eisa

Saudi Arabia Monetary Agency

Rami AL-Nsour

National Bank Of Abu Dhabi

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1. Introduction

During 2002, almost all the stock markets of the member countries of the Gulf Cooperation Council (GCC) moved north while the World's major markets went south. During this year, the total GCC market return increased by more than 9%, ranging from 32% for Qatar to less than –1% for Saudi Arabia, whereas the S&P 500, FTSE and DAX declined by about 23%, 21% and 44%, respectively. Therefore, these GCC markets can provide an alternative avenue for stock diversification and portfolio formation. However, the performance of these markets was not alike and their link to oil prices is not the same, and therefore they are worthy of further study and examination.

Three factors account for the strong and different performances of the GCC markets in 2002: The increase in the price of oil; the decline in interest rates; and the relative political stability of the GCC area in most of this period**.** The major mover of these markets is the increase in the price of oil that, as represented by the WTI, has hovered around $25 a barrel in this period. Given the structure of these countries' economies, the price of oil will continue to play an important role in shaping the movements of the stock markets of these countries for many years to come. These countries collectively account for about 16% of the world's 76 million barrels-a-day total production in January 2002, and possess 47% of the world's 1,018.8 billion barrels of proven oil reserves [1]. For these countries, oil exports largely determine their foreign earnings and their governments' budget revenues and expenditures. Thus, they are the primary determinant of aggregate demand. The aggregate demand effect influences corporate output and domestic price levels, which eventually impact corporate earnings and stock market prices. This demand effect can also indirectly impact share prices through its influence on expected inflation, which in turn affects the expected discount rate. Oil prices also have a more direct effect on the GCC domestic interest rates through their effects on the availability of liquidity. The best example of this effect is the increase in Saudi Arabia's liquidity from $87.5 billion to $91 billion, an increase of about 4%, in the first half of 2002.

The second factor is sensitivity of the GCC interest rates to changes in the US rates as a result of effectively fixing their national currencies to the US dollar, whether one-on-one or through a basket of currencies dominated by the dollar [2]. This dollar fixing of exchange rates ties the movements of the domestic interest rates to the US rates, which have been low recently**,** contributing to lower rates in the GCC countries.

The third factor is the sensitivity of these factors to political news around the globe, especially those emanating from the region. The best example of this sensitivity is the sensitivity of the Kuwait market to news regarding the relation (or lack thereof) between Iraq and the United States. Political stability has contributed to the gains in the these markets in the first half of this year, while rumors about the United States' plans towards Iraq on July 27, 2002 led to a 4% drop in the Kuwait market on that day.

This article, which summarizes a larger study (Hammoudeh and Aleisa, 2002), has three objectives. First, it provides institutional analysis of the financial valuations of the individual GCC markets. Second, it examines whether any long-run relationship(s) exists among these markets, using a time series technique for cointegration [3]. Third, it investigates the transmission of changes and volatility in oil prices, as represented by NYMEX oil futures prices, to the individual GCC stock markets, using time-series techniques known as the vector error-correction models and the GARCH models [4]. The third objective aims at examining the possibility of a leader among those GCC markets.

2. Financial Valuations of the GCC Stock Markets

The year of inception for individual GCC stock markets differs, but the early 1990s mark the real beginning of these markets. Share trading in Saudi Arabia, for example, dates back to 1935, but it was not until 1984 when organized and supervised trading began in this country. Moreover, the Bahrain stock market was established in 1987 but organized and regulated trading started in 1989. Similarly, Oman's Muscat stock market was established in 1989 and the UAE market started in 1988.

Each individual country's effort to diversify the economy, privatize public sectors, utilize advances in trading technology, and improve the legal and financial institution infrastructures brought about the real developments of these markets in the 1990s. As a result, the GCC markets have managed to entice foreign individual and institutional investors to redirect some investments to them. However, these markets still face financial impediments, including dealing with financial derivatives, online trading, venture capital and initial public offerings.

The collective market capitalization of the GCC markets exceeded US $132 billion at the end of 2000. Saudi Arabia, the market largest in the region, accounts for about fifty percent of the six GCC stock markets, one third of the Arab countries' stock market, and ranks eleventh among the emerging markets [5]. Table 1 presents the market capitalization, other financial valuations, and the percentage of capitalization in their respective GDP's for individual GCC markets and the US markets. It is evident from this table that these stock markets display low to moderate valuations compared to the stock markets in the United States (see also footnote, Table 1). Therefore, these markets may have a great potential because of these reasonable valuations and because of their link with the price of oil.

Comparing the GCC markets among themselves and excluding Qatar, Table 1 indicates that at the end of year 2000 the most expensive markets were the Kuwaiti market based on the P/E ratio, and the Saudi market based on the price to book value (P/BV) ratio. The least expensive were the UAE market on the basis of the P/E ratio and the Omani market based on the P/BV ratio. Table 2 presents the market capitalization and the other financial indicators by sector for each country. It is evident from this table that the sectoral evaluations differ significantly within the same market and across markets in the GCC region.

The Bahrain stock exchange index (BSE) has 25 listed companies distributed among six sectors at the end of 2001. Bahrain's overall market has 42 listed companies with a market capitalization of more than $6 billion. It includes five banks, ten investments firms, seven insurance companies, eight service companies, three companies in the industrial sector and four companies in the hotels and the tourism sector (see Table 2). Eight additional companies, all banks which constitute 19% of the market capitalization, are offshore companies.

The Kuwait stock exchange index (KSE) has 35 listed companies and the overall market includes 90 registered companies with a market capitalization valued at $25 billion. There are eight companies in the banking sector, twenty in the investment sector, four in the insurance sector, thirteen in the real estate sector, sixteen in the industrial sector, fifteen in the service sector, four in the food industry, and ten non-Kuwaiti companies.

Oman's general market index (MSM) has 33 listed companies, of which thirteen companies represent the Banks & Investment Companies Index sector, eleven represent the Industry Index sector, and nine represent the Services Index sector. The service sector contains two oil-related companies (Shell Oman Marketing & BP Oman), one airline company (Oman Aviation Services), and two port services (Salalah Port Services & Port Services Corporation).
The Saudi Index (denoted by General) is an all-share index constructed by the central bank SAMA, and it includes the shares of all of the listed companies in the Saudi market. There were 76 companies listed in this market in 2001, including nine financial institutions in the banking sector valued at $35.12 billion, 23

companies in the industrial sector valued $17.40 billion, eight companies in the cement sector valued $7.64, 17 companies in the service sector valued at $3 billion, five companies in the electricity sector valued at $9.8 billion, and nine companies in the agriculture valued at $302 million.

The UAE market is represented by the National Bank of Abu Dhabi index (NBAD). The index, which is market capitalization weighted, has 38 listed companies in both the Abu Dhabi and Dubai stock markets, representing about 75% of the overall active market. The UAE stock market has 52 registered and active companies with a market capitalization of more than $22 billion. The sectoral distribution of this market indicates that there are eighteen financial institutions in the banking sector, twelve insurance companies and twenty-two service companies.
The WTI spot price is the price quoted for immediate delivery of crude oil at the Cushing, Oklahoma trading center. The oil futures prices on NYMEX are quoted for delivery of a specified quantity of any of WTI crude oil at a specific future time and place. The traded oil futures contracts range from one to four delivery months. Crude oil futures data came from the New York Mercantile Exchange, while the data for spot crude oil came from Reuters. The prices of crude oil are expressed as US dollars per barrel.

Daily data for the GCC stock indices and the oil prices cover the period from 2/15/1994 to 12/25/2001. The length of this period is limited by the availability of GCC data, which was collected piece by piece directly from individual exchanges. Because of the different weekends between NYMEX and the GCC markets, we arranged the data at seven-days a week to account for these differences.

The crude oil spot price (*WTIS*) is the price of the West Texas Intermediate (WTI-Cushing), which is a crude stream produced in Texas and southern Oklahoma. It is traded in the domestic spot market at the Cushing, Oklahoma center. In addition to North Sea Brent, it serves as a reference or a marker for pricing a number of other crude streams.

The futures crude oil prices traded on the NYMEX are for futures contracts ranging from one-month to four-months. WTI is the underlying physical asset to be delivered (in parcels of 50,000 or 100,000 barrels) at the end of the domestic pipeline at the Cushing, Oklahoma center. The futures prices of these one-month to four-month contracts are denoted by *NYCOF1* to *NYCOF4*, sequentially.

The descriptive statistics for all five GCC equity indices and the five crude oil prices are given in Table 3. Examination of relative volatility, as defined by the coefficient of variation, reveals that Oman's MSM index is the most volatile, followed by Kuwait's KSE. Bahrain's BSE index, which includes offshore companies, is the least volatile, followed by Saudi Arabia's General index. In the oil market, the Cushing WTI spot price has the greatest volatility compared to NYMEX futures prices; and the futures price volatility decreases with the increase in the length of the maturity of oil futures contracts.

3. Long Run Equilibrium Relationships Among GCC Indices and NYMEX Futures

Next, we examine whether the five GCC stock markets (Bahrain, Kuwait, Oman, Saudi Arabia and UAE) are co-moved by common economic and political forces, and thus whether they exhibit equilibrium relationships over time. In this case, the movements of the individual stock indices of these markets can be explained within this long run relationship. It could also mean that contagion exists in this group of stock markets and that a problem in one market can be the precursor of problems in the others. The technique that is used in this regard is formally known as the Johansen co-integration test (Johansen, 1996; and Hendry and Juselius, 2000). The findings of this test suggest that the five GCC markets are strongly co-integrated or have many long run relations and are co-moved over time by three common forces. They include the price of oil, which trickles down through the economic structure to affect corporate earnings and availability of liquidity; the effect of

US interest rates on the GCC domestic; and political news.

We repeated this test after adding one of the four NYMEX futures prices to the five GCC stock indices and found that the new mixed system, which includes six variables, is still influenced by three common forces. This suggests that the five GCC stock indices and the NYMEX futures prices are influenced (or co-moved) by the same three forces that affect the GCC markets when oil futures prices are excluded.

4. Predictability Among the GCC indices and the NYMEX Futures

The existence of long run relationships among the five individual GCC indices as a group and between them and NYMEX oil futures prices as another group is not sufficient to explain or predict the movements of one another. It is also not sufficient in providing information on whether any of these markets lead the others. Therefore, we have to use another technique known as the error correction model (VECM) to achieve this objective.

By first applying VECM to the five GCC indices and excluding any of the NYMEX oil futures prices, we can conclude that although similarities and strong co-integration in GCC markets lead to long-run relationships, among them they do not have strong explanatory and predictive power for each other. There is one exception: the Saudi market, which can explain and lead the future movements of the other GCC markets because of its strong relationship with NYMEX futures prices. This means movement in the Saudi General index leads and predicts the movement in the other four general indices.

By applying the VECM technique to an expanded system that includes the five GCC indices and one NYMEX oil futures price, the findings suggest that these main conclusions still hold in this expanded system, regardless of which NYMEX futures price is used. Distinctively, the Saudi market is still the true leader and has the most inter-relationships with the other markets, while the Kuwaiti market has the weakest links.

If we include two trading-day effects at NYMEX, that is Mondays and Fridays, for this expanded system, the GCC markets on the next day show different sensitivity to Mondays than to Fridays trading at NYMEX. Two GCC markets, namely, Bahrain and Oman display some negative sensitivity to Monday trading. This means the movements of the indices of these markets on Tuesdays take a different direction from the path of trading at NYMEX on Mondays. However, since Monday trading is not significant in the oil futures price equations in a system that contains the oil prices alone without any GCC indices, the GCC two's negative sensitivity to Monday trading is perhaps due to its own regional factors or to trading on the world stock (not commodity such as NYMEX) markets. This is consistent with the financial literature, which shows that the day-of-the week effect for Monday is negative. The policy implication for Monday trading is that investors in those GCC markets should on Mondays watch carefully trading at the world stock markets and not at the NYMEX market for clues before making investment or trading decisions in their own markets on Tuesdays, which are likely to be down days.

The Saudi and Kuwaiti markets show positive sensitivity to Friday trading. This result should not be a surprise once we know that two of the three futures prices, namely the one-month and the four-month prices, are also positively sensitive to Friday trading and that the Saudi index is the only GCC index that has consistent linkages with all NYMEX oil prices. The literature also found Friday to a positive trading day in international stock markets. Therefore, investors and traders at the Saudi and Kuwaiti stock markets should on Fridays look at the NYMEX for investing or trading clues on Saturdays. In conclusion, investors and traders in the GCC stock may have different clues from the trading days at NYMEX and the world stock markets.

5. Volatility Transmission from the NYMEX Oil Futures to the GCC Indices

Volatility transmission is usually studied through the GARCH models (Hammoudeh and Al Eisa, 2002). We constructed GARCH models for each of the five GCC indices, first using the one-month futures price, and second using the four-month futures price. The outcome showed clearly that four-month futures prices give more meaningful and more statistically significant results than all the other future prices, including the one-month futures price. This finding is also consistent with the correlation analysis showing the Saudi index, which is the price leader, having a much higher correlation (association) coefficient with the four-month futures price than with any other futures price.

Oil price volatility spillover is significant in all the GCC markets, although with varying lags. This volatility moves these markets in the same direction with the oil volatility at NYMEX, which means that if the oil prices become more volatile in NYMEX, the share prices in the GCC markets feel some of this volatility, although the transmitted volatility is very small on a daily basis.

6. Conclusions

This summary paper examines the links between the stock market indices of five member countries of the oil-rich Gulf Cooperation Council (GCC) and NYMEX oil futures prices, using daily data for the period February 15, 1994 through December 25, 2001. These countries include Bahrain, Kuwait, Oman, Saudi Arabia and the UAE. Anecdotal evidence indicates that Oman's MSM is the most volatile as defined by the coefficient of variation, while Bahrain's BSE is the least volatile. In terms of market valuation, the most expensive markets at the end of 2000 are the Kuwaiti market on the basis of the P/E ratio and the Saudi market based on the P/BV ratio, excluding Qatar. The least expensive are the UAE market based on the P/E ratio, and the Oman's Muscat market based on the P/BV ratio. These market valuations suggest that there is room for traders to move from one market to another and that such moves, if they occur, could increase both long-term relationships between these markets and their inter-explanatory power of each other.
The findings of the study also suggest that Saudi Arabia's index has the most causal linkages with the other GCC markets, and it can explain and predict the movements of all other GCC equity indices at the 5% significance level. Those GCC indices move in the same direction as the Saudi index, except for Oman's MSM index, which moves in opposite direction. This suggests that the Saudi stock market plays the leadership role in that region. Conversely, Kuwait's market, which is dominated by momentum traders, has the least causal linkages, followed by Oman's market. Therefore, developments in the Saudi market have much more significant repercussions on the other GCC markets than developments in the Kuwaiti and the Omani markets. Since most of the GCC market react to the volatility of oil prices, at times of heightened oil volatility at NYMEX, investors in GCC markets can hedge against the oil volatility transmitted to their stock markets by using derivatives such as options.

A final recommendation for the GCC countries is that as policy makers at OPEC they should keep an eye on the effects of changes in oil price levels and volatility on their own economies and stock markets. Changes in OPEC ceiling that lead to increases in oil price volatility is filtered through their economies and affect the volatility of their stock markets.

ENDNOTES

[1] See the US department of Energy's website: www.eia.doe.gov/index.html.

[2] For more information on the GCC exchange rate policies, see Karam (2001).

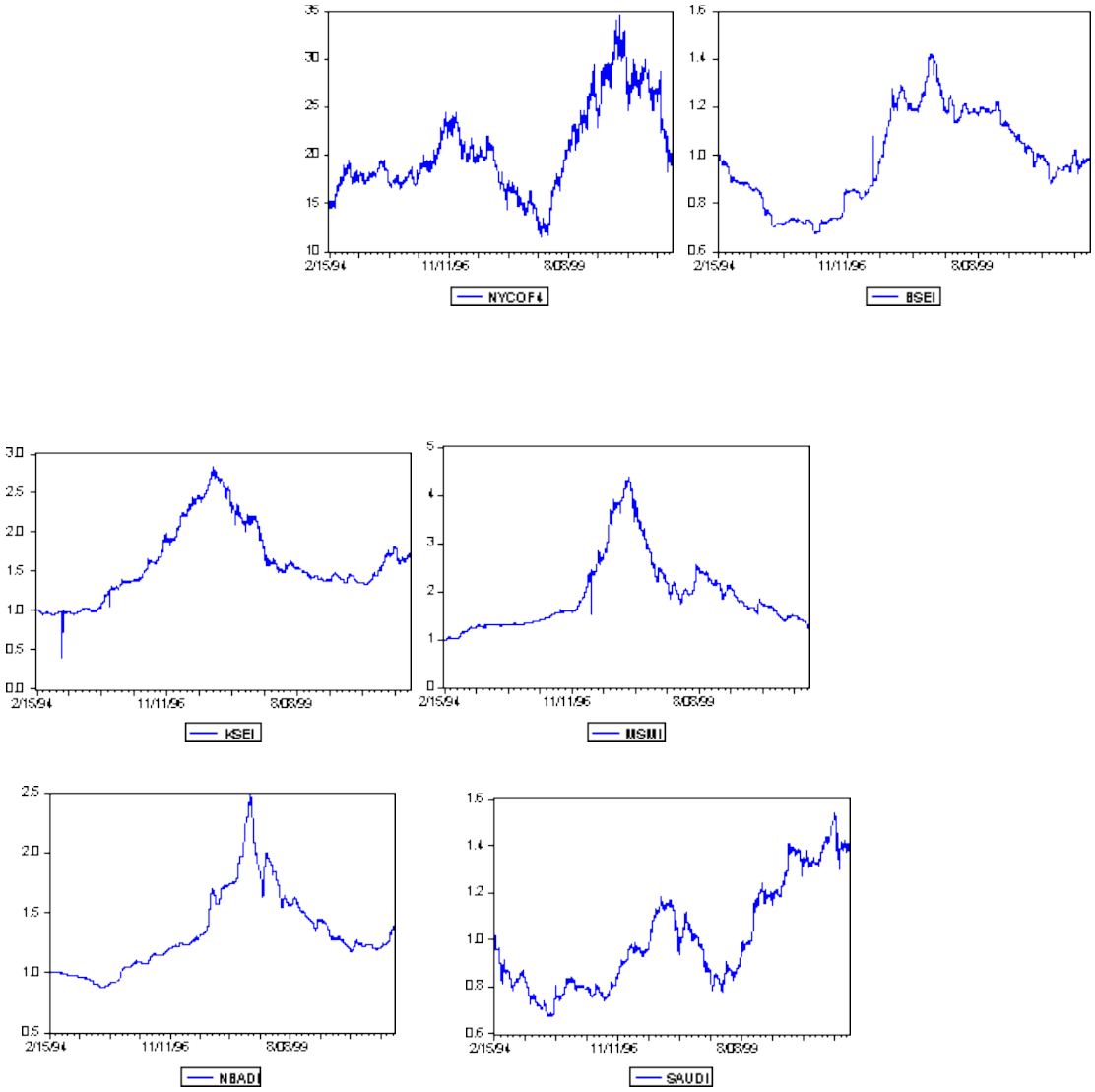
[3] For more information about this technique, see Johansen (1996).

[4] For more information, see Hammoudeh and Aleisa (2002).

[5] For comparison with market capitalization of a selected group of countries in Asia, Europe, and Latin America, see the footnote of Table 1.

Fig. 1: The NYMEX Four-Month Futures Price and the Five GCC Stock Indices

(Base period : February 15, 1994)



Footnote: BSEI denotes the Bahrain stock index, KSEI the Kuwait stock index, MSMI the

Muscat stock index, SAUDI the Saudi stock index and NBADI the UAE index.

Table 1: Financial Valuations of the Six GCC Stock Markets (End 2000)

Market	Market Capitalization (US$ billion)	P/E	**P/BV**	**Dividend Yield %**	As % of GDP
Bahrain	$6.643	15.88	1.04	5.34%	83%
Kuwait	$25.615	17.64	1.91	2.58%	67.8%
Oman	$3.386	12.85	0.99	7.12%	10.0%
Qatar	$6.324	12.84	2.66	2.66	43.7%
Saudi Arabia	$68.000	17.63	2.25	3.50%	39.9%
UAE	$22.364	11.77	1.31	3.49%	38.2%
Total GCC	$132.332	14.5	1.87	4.34%	47.6%
S&P 500	$11,713. 754	26.40	6.20	1.21%	117%

Dow Jones	$3,472.541	22.2	8.20	1.60%	35%

Notes: This table includes Qatar's stock market, which is not analyzed in this study due to insufficient

data. P/E ratio stands for the price/earning ratio and P/BV for the price/book value ratio.

To compare the size of the GCC market capitalization with those of other countries at the end of 2000 in US$, here are some examples: Athens $107.502 billion; Brazil $226.152 billion; Budapest $11.908 billion; Buenos Aires $45.839; Copenhagen $107.665 billion; Helsinki $$293.634; Irish $81.886 billion; Istanbul $69.659 billion; Jakarta $26.812; Korea $148.36; Mexico $125.203; Oslo $65.266; Santiago $60.400; Singapore $155.125; Tehran $5.892 billion; Vienna 29.935 billion; Warsaw $31.428 billion. (Source: the Website of the World Federation of Exchanges).

Table 2. GCC Sock Market Valuations by Economic Sector (End 2001)

Sector	Market Capitalization (US$ Billion)	P/E Ratio	P/BV	Dividend Yield %
Bahrain				
Banks	$1.850	11.54	1.24	6.85%
Investment	$2.595	20.82	0.70	4.15%
Insurance	$0.236	-2.89	0.90	2.65%
Service	$1.891	10.73	2.03	6.86%
Industry	$0.033	-46.90	0.60	6.21%
Hotel & Tourism	$0.124	9.89	0.68	6.96%
Kuwait				
Banks	$12.375	13.0	2.1	5.8%
Investment	$3.224	15.6	1.2	5.3%
Insurance	$0.575	10.5	1.2	7.7%
Real Estate	$1.591	25.2	1.1	5.5%
Industry	$2.652	9.5	1.5	16.0%
Service	$4.500	12.5	2.8	7.1%
Food	$0.696	7.3	1.4	0.0%

Oman				
Banks	n.a.	n.a	n.a	n.a
Insurance	n.a	n.a	n.a	n.a
Service	n.a.	n.a	n.a	n.a
Saudi Arabia				
Banks	$35.123	17.47	3.72	5.24%
Industry	$17.398	12.70	1.63	2.83%
Cement	$7.641	22.51	3.45	4.04%
Service	$3.008	25.44	1.30	2.71%
Electricity	$9.810	0.00	1.55	0.00%
Agriculture	$0.302	37.06	0.44	0.9%
UAE				
Banks	$13.256	12.52	1.66	4.06%
Insurance	$1.301	14.24	1.39	5.18%
Service	$13.246	14.25	1.36	4.24%

Table 3: **Descriptive Statistics of the GCC Stock Indices and the WTI SPOT/Futures Oil Prices**

	BSEI	KSEI	MSMI	NBADI	SAUDI	WTIS	NYCOF1	NYCOF2	NYCOF3	NYCOF4
Mean	0.9837	1.6128	1.9316	1.3295	1.0018	21.1374	21.1012	20.8848	20.69406	20.53058
Median	0.9644	1.5049	1.6781	1.2390	0.9561	19.7800	19.7700	19.6700	19.51000	19.30000
Maximum	1.4207	2.8404	4.3755	2.4783	1.5367	37.2200	37.2000	35.7200	35.14000	34.56000
Minimum	0.6783	0.3934	0.9965	0.8767	0.6719	10.8200	10.7200	11.0200	7.500000	11.61000
Std. Dev.	0.1919	0.4785	0.7671	0.3368	0.2229	5.4539	5.4198	5.1422	4.917209	4.695018
C.V.[a]	0.1951	0.2967	***0.3971***	0.2533	0.2225	***0.2580***	0.2568	0.2462	0.237615	0.228684
Skewness	0.1557	0.6443	1.3795	0.9654	0.5975	0.5700	0.5623	0.5858	0.614080	0.653159
Kurtosis	1.8903	2.6338	4.2988	3.5436	2.1280	2.7024	2.6749	2.6495	2.669425	2.691779

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