

# **CO-INTEGRATION OF THE SAUDI ARABIAN STOCK MARKET WITH OTHER MARKETS FROM EMERGING AND DEVELOPED ECONOMIES**

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## **Abstract**

The purpose of this paper is to explore cointegration between the leading Saudi Stock market index (TASI) with leading indices from China, India, UK, Malaysia, Japan Singapore, USA and Hong Kong. The theory of cointegration techniques are used to study the dependency between these indices. TASI shows a significant relationship with S & P, and no dependence with other stock indices, it becomes clear that the Saudi stock market and investor sentiments move with the American economic trends rather than with better performing markets.

JEL Classification: G120

## **I Introduction**

The changing financial environment of Saudi Arabia requires a revisit to the topic of stock market efficiency. The economic boom resulting from favorable oil price movement has resulted in the gradual expansion of Saudi stock market as the steady flow of petrodollars initiated a much larger scale of economic activity, capital expenditure and strengthening supporting institutions.

However, various commentators have expressed doubts about the health of the local stock market. Many small time investors have lost millions due to free fall of market capitalization of Saudi stocks. It is a matter of concern and confusion for the average investor and raises questions of quality of investment. Any increase in capital investment must be balanced by incremental factor productivity increases.

Further, the combination of rapid introduction of IT and globalization has significantly encouraged capital flow across national boundaries contributing to integration of international stock markets. Saudi Arabia has ambitious plans to develop economic cities across the country in the future. The resulting infrastructure development will throw open enormous opportunity across the board. The support of the investing public is crucial. Saudi Arabia is a member of WTO, which enhances its integration with major trading countries. Integrated markets tend to share common economic fundamentals (Phengpis and Apilado, 2004) and it may be possible that the benefits and investment diversification are inversely related in those markets (Kearney and Lucey, 2004). On the other hand, lack of dependency across international stock markets minimizes portfolio risk by international diversification.

In brief, Saudi Arabia's stock market is no longer isolated and the repercussions of international events will have a cascading effect on the movement of share markets and other investments. Its economy is oil driven and dependent on its leading trading partners' economic fortunes. Stock markets are indicators of economic activity. Saudi stock market cannot be an exception. The market has undergone wide variations leading to huge wealth losses to many investors. A comprehensive study of the Saudi capital market has not been undertaken for quite sometime mainly due to the difficulties of data collection and the avoidance of this market by global investors. In spite of economic boom and rapid infrastructure development global investors have not shown much interest in the Saudi stock market.

However this is an important market of the future with plenty of opportunities. It is important to make the investors understand the significance of this market and how much it is integrated with the global market, to make meaningful comparisons and investment decision making. This study looks at the level of linkage of the Saudi Arabian capital market with markets of the world.

The study will capture the current level of dependency between the Saudi stock market, and markets in both developed and emerging markets. The importance of cointegration of capital markets for the operation of free market economy is well-known. However, the influence of emerging markets on the global markets is a new problem. The growing importance of emerging economic powerhouses like China and India poses a serious challenge to the global economy; even to the extent of challenging the US economic dominance. How does this affect Saudi Arabia? A very important question that needs to be answered is that whether the Saudi market is prepared to face the challenges these emerging markets bring and how can it benefit from them? This study will look at one aspect of the problem that is the

dependency of the emerging markets with the Saudi stock market. It can provide a good understanding of the current relationship between markets and provide a preliminary framework for future studies.

The All Shares Index of Saudi Arabia (TASI<sup>1</sup>) computational methodology includes only securities that can be traded on Tadawul<sup>2</sup> as well as adopt conventions known internationally.

The shares owned by government, the foreign partner and the founding partner during restriction period are excluded from all Tadawul index calculations. Market capitalization weighted method is used in index calculation The Tick Size<sup>3</sup> for all shares is measured based on the share price, at three bands. Band 1; share value below SR25 with tick size SR0.05, Band 2 share value of SR50 to SR25.10 with tick size SR0.10 and Band 3 for shares above SR50.25 with tick size SR0.25.

## II Review of Empirical Evidence

Groenewold's (1997) first used cointegration technique to examine semi-strong form of market efficiency. Aggregate share price index data of Australia and New Zealand stock markets for the period of 1975-1992 are tested for efficiency using this approach. By relating past prices in New Zealand and Australian markets and vice versa, he found the two indices were not cointegrated and conclude that the finding is consistent with market efficiency.

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<sup>1</sup> Tadawul All Share Index.

<sup>2</sup> The Saudi Stock Exchange (146 listed companies across 15 sectors)

<sup>3</sup> The quantum of change in share prices (included in the basket), to make a unit change in the index. Shanghai and the Shenzhen market and found that the two stock markets were collectively inefficient.

Chan et.al (1992) used cointegration techniques to examine the relationship between major Asian markets and US markets and found no cointegration between these markets. Their findings suggest that the stock prices in these countries are efficient collectively in the long run. Chelley-Steeley and Pentecost (1994) examined the issue of stock market efficiency using share prices of both large and small UK firms by applying cointegration test and found that small firms have a greater tendency for their share prices to be cointegrated indicating, market inefficiency in the absence of thin trading. Liu et.al. (1997) used cointegration and causality test to examine the relationship between the

Arshanapalli, Doukas and Lang (1995) examined the linkage of Asian markets with developed markets of the US and Japan. Using cointegration and error-correction model, they conclude that Asian markets are more integrated with the US than the Japanese stock market and that the cointegration was greater during post 1987 period. Leo and Kendall (1996) studied the cointegration of Malaysian, Singapore and Indonesian markets using data collected from 1975 to 1994. For Singapore and Malaysia, the cointegration yields mixed results after the year 1987. Singapore and Indonesia are cointegrated in the period 1988 to 1991. Collectively the three countries provided mixed results for cointegration after the year 1987. Before that, they were cointegrated. Overall, they suggest that these markets are on the path to greater efficiency even though efficiency is lower for Indonesia and Singapore. Masih and Masih (1999) studied stock markets of eight countries for the period February to June 1997 and found evidence of linkage. Their study confirms the short term and long term leadership of the US stock market. Further, they found a significant relationship, both short and long term, between OECD and emerging Asian stock markets. As far as Southeast Asia markets are concerned, they emphasized Hong Kong market's leading role. Another co relationship study

of US and Southeast Asian stock markets was undertaken by Manning (2002) for the period 1998 to 1999. He identifies two common trends among these markets. Azman-Sani et al. (2002) found presence of causality among ASEAN-5 equity market in the long run except for the Singapore market. They further conclude that the Singapore market was only affected by Philippines in the long run. A similar study by Click and Plummer (2005) on ASEAN-5 using time series technique of cointegration further suggests the integration of ASEAN markets. However, they found only one significant cointegrating vector and concluded that the markets are economically integrated but integration is far from complete. This view is consistent with Royfaizal, Lee and Azali (2009) who found the Asian, stock markets are more interrelated before and during Asian Financial Crisis rather than after the crisis. Their weekly data series runs from January 1990 to February 2009. It also identifies close linkage between Asian and US stock markets in the post-crisis period.

**Recent studies in the Gulf region have pointed to some level of market integration.**

Studies by Ibrahim (2009) showed strong evidence of bivariate and multivariate cointegration between five GCC stock market returns in the long run. However, his non parametric test showed that Bahrain stock market is segmented from the rest of the GCC markets. The study further showed a bivariate non-linear cointegrating relationship linking the Kuwait stock market with each of the Saudi and the Dubai markets and the Saudi stock market to that of Dubai and Abu-Dhabi markets, as well as between the Muscat and the Kuwait stock markets. An earlier study by Naeem (2008) evidenced a similar relationship between GCC (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates) markets but their linkage with developed economies (United States, United Kingdom and Japan) brought some mixed results for the period January 2003 to November 30, 2007 with

weekly stock price data. His other finding indicates that the Saudi stock market, the largest GCC stock market in terms of market capitalization, is not the leader in the GCC region as was expected.

Integration of GCC markets is further supported by other studies. Assaf (2003) using VAR modeling as well as using the Granger causality tests found relationship between these markets. Using weekly data from January 1997 to April 2000, he further found that Bahrain plays a dominant role in influencing the GCC stock markets. Hassan (2003) found a long-term relationship between the stock markets of Kuwait and Bahrain in his studies on three GCC countries Oman, Bahrain and Kuwait using Johansen cointegration method on the weekly data from October 1994 to August 2001. However his study using error correction modeling approach, for the short run, found no association between these markets.

Simon and Evans' (2004) research supports the view that GCC markets are linked in both the short and the long term. Johansen, cointegration method was applied to examine the long run associations and Granger causality test and VAR approaches were employed to examine the short-term associations for data indices developed by Gulf Investment Corporation for the GCC countries.

### **III. Research Methodology**

The TASI share index data is obtained from Tadawul along with other major stock indices from China, India, UK, Malaysia, Japan Singapore, USA and Hong Kong from their respective Web sites. These indices are quoted and published on a daily basis at the end of each trading day.

The period of study is from the first quarter of 2003 to the last quarter of 2009. The daily index values are used for the

analysis. No adjustments are made for non trading days and when the stock exchange is closed for holidays.

The theory of cointegration techniques are used to study the dependency between the Saudi stock market and the markets of its business partners from emerging and developed countries. The Engle-Granger approach (1983, 1987) is used to test for cointegration among leading indices of stock markets from these countries.

Two variables are said to be cointegrated when a linear combination of the two variables is stationary implying that there is a long term relationship existing between them. The lack of cointegration suggests that no such relationship exists.

Testing for cointegration involves testing the residuals from an Ordinary Least Square regression for the time series and residuals.

$$Y_t = \beta_0 + \beta_1 x_t + \beta_2 z_t + \hat{a} \quad (1)$$

Regress y on x and z. The residuals are obtained from the Ordinary least square and a Dicky-Fuller unit root test is carried out to check for unit root. If a unit root is not present the residuals are stationary and the variables are cointegrated. The first difference of the residuals “ $Y_t$  is regressed against the first lag of the residual  $Y_{t-1}$  and sufficient lags of  $Y_t$ ”

$$\Delta Y_t = (Y_t - Y_{t-1}) = u_t \quad (2)$$

The results of the unit root test, t-statistics have to be compared with specially calculated critical values. If the estimated |t| exceeds any of these critical values the null hypothesis (no dependency among the variables) can be rejected. Otherwise the null hypothesis is accepted.



The following hypotheses are formulated:

**(i) Emerging Market:**

1. There is no linear dependence between the Saudi stock market (TASI) index and the Indian stock exchange (BSE SENSEX) index.
2. There is no linear dependence between Saudi Stock Market (TASI) index and the Chinese Stock Exchange (SSEC) index.
3. There is no linear dependence between Saudi Stock Market (TASI) index and Kuala Lumpur Stock Exchange (KLCI) index.

**(ii) Developed Economies:**

1. There is no linear dependence between Saudi Stock Market (TASI) index and the Singapore Stock Exchange (STI) index.
2. There is no linear dependence between Saudi Stock Market (TASI) index and the Japanese Stock Exchange (NIKKEI) index.
3. There is no linear dependence between Saudi Stock Market (TASI) index and the US Stock Exchange (NASDAQ, DOW JONES, S&P 500, New York SE) indices.

4. There is no linear dependence between Saudi Stock Market (TASI) index and the UK Stock Exchange (FTSE) index.

#### **IV. Results and Discussions**

The daily closing prices of TASI (Saudi Arabia Stock Market Index) and Stock market indices of developed and emerging markets are taken to see whether there is any relationship between these indices. The Engle-Granger test is applied at 1 percent, 5 percent and 10 percent significance level.

Table 1 Result of Engle Granger Test of Cointegration

Symbol	X variable	std error	t statistic	CR	1% EG Critical Value	5% EG Critical Value	10% EG Critical Value
TASI -BSE SENSEX	-0.00116	0.001338	-0.86498		Not sig	Not sig	Not sig
TASI - DOW/JONES INDEX	-0.00399	0.002126	-1.87464		Not sig	Not sig	Sig
TASI-FTSE INDEX	-3.8E-07	0.003958	-9.7E-05		Not sig	Not sig	Not sig
TASI-HANGSENG	-0.00145	0.001327	-1.08958		Not sig	Not sig	Not sig
TASI -KLCI	-0.00122	0.001257	-0.97435		Not sig	Not sig	Not sig
TASI- NASDAQ	-0.00208	0.001695	-1.22434		Not sig	Not sig	Not sig
TSI-NEWYORK SE	-0.00351	0.002028	-1.73		Not sig	Not sig	Sig
TASI -NIKKEI 225	-0.00386	0.002119	-1.82207		Not sig	Not sig	Sig
TASI-S&P 500	-0.01607	0.004025	-3.9925		Sig	Sig	Sig
TASI-SHANGHAI	-0.00111	0.001072	-1.0345		Not sig	Not sig	Not sig
TASI-SINGAPORE STI	-0.00168	0.001449	-1.1616		Not sig	Not sig	Not sig

**Test Results for Emerging Market:**

There is no linear dependence among the indices of Saudi Stock Market (TASI) and the Indian Stock Exchange (BSE SENSEX) at all the three levels.

There is no linear dependence among the indices of Saudi Stock Market (TASI) and the Chinese Stock Exchange (SSEC) at all the three levels.

There is no linear dependence among the indices of Saudi Stock Market (TASI) and Kuala Lumpur Stock Exchange (KLCI) at all the three levels.

**Tests Results for Developed Economies:**

There is no linear dependence among the indices of Saudi Stock Market (TASI) and the Singapore Stock Exchange (STI) at all the three levels.

There is no linear dependence among the indices of Saudi Stock Market (TASI) and the Japanese Stock Exchange (NIKKEI) at the 1 and 5 percent levels; however there is evidence of dependency at 10 percent level.

There is no linear dependence between the indices of Saudi Stock Market (TASI) and NASDAG across all three levels.

There is no linear dependence between the indices of Saudi Stock Market (TASI) and DOW JONES at the 1 and 5 percent levels; however there is evidence of dependency at 10 percent level.

There is no linear dependence between the indices of Saudi Stock Market (TASI) and NEW YORK; however there is evidence of dependency at 10 percent level.

There is significant dependence between the indices of Saudi Stock Market (TASI) and S&P 500 across all three levels.

There is no linear dependence between the indices of Saudi Stock Market (TASI) and FTSE across all three levels.

There is no linear dependence between the indices of Saudi Stock Market (TASI) and HANG SENG across all three levels.

The results support the hypotheses that the Saudi Arabian Stock Market and the stock markets of emerging markets are not interrelated over the long run. The leading indices of India, China and Malaysia do not show any evidence of dependency at all levels throughout the test period.

The outlook is also generally true for stock markets of the developed nations. However, some developed markets have shown evidence of dependency at 10 percent level. The US based stock market indices of DOW JONES and NEW YORK SE do show evidence of dependency at 10percent. Further, the Japanese index NIKKEI 225 also shows evidence of linkage at 10 percent level.

The only index that has shown strong linkage with TASI is the US based index S&P 500. There is significant dependency of TASI and S&P indices across all three test levels. The two indices are cointegrated, implying that there is a long term relationship between these two indices.

### Conclusion

The study examined the extent of interdependency between the Saudi Stock Index and indices of emerging and developed economies which has significant trading relationship with the Kingdom. The Engle-Granger test of cointegration is applied at three levels of significance; namely one, five and ten percentage levels from first quarter of 1993 to last quarter of 2009. The result of the tests showed absence of cointegration between Saudi Stock Market (TASI) and emerging markets. TASI operates independently of the SHANGAI, BSE SENSEX and KLCI stock indices. There is some amount of integration between TASI with developed economies' stock indices of DOW JONES and NEW YORK at the 10 percent level only. The only index that has shown significant integration with TASI is S&P index.

S & P 500 is widely regarded as the best measure of large cap U.S. equities; which includes 500 leading companies in leading industries of United States. S & P is estimated to represent 25% of U.S. equities. Viewing from this angle at the results of cointegration between S & P 500 and Saudi stock market index, it can be inferred that the Saudi stock market moves in tandem with the U.S. markets rather than with any of the emerging market indices or developed economy indices.

The U.S. economy is in the midst of recession. The S & P index is mirroring it by showing a negative return. When TASI shows a significant relationship with S & P, and no dependence with other stock indices, it becomes clear that the Saudi stock market and investor sentiments move with the American economic trends rather than with better performing markets.

### References

Arshanapalli, B., Doukas, J. and Lang, L.H.P. (1995). "Pre- and Post-October 1987 Stock Market Linkages Between US and Asian Markets", *Pacific-Basin Finance Journal*, Vol. 3, No. 1, pp57-73.

Assaf, A. (2003), "Transmission of Stock Price Movements: The Case of GCC Stock Markets", *Review of Middle East Economics and Finance*. Vol. 1 No. 2. pp 171-189.

Azman-Saini, W. N. W., Azali, M., Habibullah, M.S. and Matthews, K. G. (2002), "Financial Integration and The ASEAN-5 Equity Markets", *Applied Economics*, Vol. 34, No. 18, pp. 2283-2288.

Chan, K.C., Gupta, B.E. and Pan, M.S., (1992), "An Empirical Analysis of Stock Prices in Major Asian Markets and the United States," *The Financial Review* 27, 289-307.

Chelley-Steeley, P.L. and Pentecost, E.J., (1994), "Stock Market Efficiency, The Small Firm Effects and Cointegration," *Applied Financial Economics*, vol.4, Issue 6, pp405-411.

Click, R.W. and Plummer, M.G. (2005), "Stock Market Integration in ASEAN after the Asian Financial Crisis", *Journal of Asian Economics*, Vol. 16, no.1, pp.5-28.

Groenewold, N., and Mohamed Ariff, (1998), "The Effects of De-Regulation on Share-Market Efficiency in the Asia-Pacific," *International Economic Journal*, vol12,no.4, pp23-47.

Hassan, A. M. H, (2003), "Financial Integration of Stock Markets in the Gulf: A Multivariate Cointegration Analysis", *International Journal of Business*. Volume 8(3).

Ibrahim A. Onour, (2009), "Financial integration of GCC capital markets: evidence of non-linear cointegration," *Afro-Asian Journal of Finance and Accounting*, Inderscience Enterprises Ltd, vol. 1(3), pages 251-265, January.

Kearney, C. and Lucey, B.M. (2004), "International Equity Market Integration: Theory, Evidence and Implications", *International Review of Financial Analysis*, vol. 13, no. 5, pp. 571-583.

Leo, K.C. and Kendall, J.D., (1996), "An Empirical Analysis of Stock Indices in three Southeast Asian Countries," *Regional Issues in Economics*, vol.II, Singapore: Nanyang Technical University.

Liu, X.M. Song, H.Y. and Romilly, P., (1997), "Are Chinese Stock Markets Efficient? A Cointegration and causality Analysis," *Applied Economics Letter* 4, 511-515.

Masih, A.M.M. and Masih, R. (1999), "Are Asian Stock Market Fluctuations Due Mainly to Intra-Regional Contagion Effects? Evidence Based on Asian Emerging Stock Markets", *Pacific-Basin Finance Journal*, Vol. 7, nos. 3-4, pp. 251-282.

Naeem Muhammad (2008), "Short-term and long-term dynamic price linkages among the GCC stock markets and between the stock markets of the GCC countries and important western countries".

Phengpis, C. and Apilado, V.P. (2004), "Economic Interdependence and Common Stochastic Trends: A Comparative Analysis between EMU and Non-EMU Stock Markets", *International Review of Financial Analysis*, vol. 13, no.3 pp245-263.

Roy, R.C., Lee, C. and Azali, M. (2009), "The Linkages of Asian and the US Stock Markets", *The Icfai University Journal of Financial Economics*, Vol. VII, no. 2, 2009.

Simpson, J. and Evans, J. (2004), "Interdependence in Gulf Cooperating Stock Markets", Working Paper Series of the University of Wollongong in Dubai, U.A.E.

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