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An Empirical Analysis on the Weak-Form Efficiency of the GCC Markets Applying Selected Statistical Tests

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This paper tests for market efficiency across the seven stock markets in the GCC (Gulf Co-operation Council) countries. The GCC countries, of late, have been striving to strengthen their capital markets by introducing various innovative changes in relation to listing, regulatory, trading and settlement norms in order to improve transparency and informational efficiency. Using daily indices of the above markets between October 2001 and October 2006 and Kolmogorov –Smirnov test, we find that all the above seven markets reject the null hypothesis that the returns follow a normal distribution. Again, based on runs test for randomness, we find that the hypothesis pertaining to random walk and weak-form efficiency of the GCC markets is rejected for all the seven markets during the study period. This conclusion corroborates with the conclusions of the past studies carried out in GCC context and the developing and underdeveloped markets. The paper reiterates the need for an integrated GCC Stock market. The results and suggestions have wider implications for security analysts, investing community, stock exchanges, and other regulatory authorities in their policy decisions to improve their capital market functioning.

Field of Research: Market efficiency, Random Walk, Kolmogorov – Smirnov test, Runs test for Randomness

1. Introduction

Stock markets play a crucial role in cementing the relationship between investors and the corporate sector. In this process, they help mobilizing the savings of people and direct them to the growth of trade, commerce and industrial sectors of an economy. In a nutshell, stock markets play an important role in capital formation and help fuel economic growth in the country. Looking at it from the investors' point of view, stock market operations are often compared to operations in gambling dens, and the investors look for the right winning strategies applying innumerable techniques and methods (Ranganatham, Madhu mathi R, 2005)The ultimate objective, of course, is to beat the market despite the fact that most often investors are guided by the sentiments of faith and phobia.

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However, rational investors like to play safe and invest their hard-earned money optimally. Those investors look for organized information and logical reasoning backed by scientific methods and techniques. Since the two prime considerations of a judicious investor are the risk and return inherently present in a security, a guidance on choosing the right stock based on a scientific method would be a boon to the investors.

Efficient Market Hypothesis (EMH)

The principal issue from an academic viewpoint is market efficiency (Fama 1970, 1991). The Efficient Market Hypothesis (EMH) assumes that stock prices adjust rapidly to the new information, and thus, current prices fully reflect all available information. (Fama 1970), formalized the theory, organized empirical evidence and divided the EMH into three sub-hypotheses depending on the information set involved.

It is an important concept, both in terms of an understanding of the working of stock and in their performance and contribution to the development of a country's economy. If the stock market is efficient, the prices will represent the intrinsic values of the stocks and in turn, the scarce savings will be optimally allocated to productive investments in a way that benefits both individual investors and the country economy (Copeland and Weston, 1988).

The efficient market theory further asserts that if markets are efficient, then it should be virtually impossible for an investor to outperform the market on a sustained basis. Even though deviations will occur and there will be periods when securities are over or undervalued, these anomalies are expected to disappear as quickly as they appeared, thus making it almost impossible to profit from them consistently.

The weak form of market efficiency theorizes that the current price does not reflect fair value and is only a reflection of past prices. It further states that the future price cannot be determined using past or current prices. The semi-strong form of market efficiency theorizes that the current price reflects all readily available information. This information might include annual reports, annual filings, earnings reports, announcements, and other relevant information that can be readily gathered. The strong form efficiency states that the stock prices reflect all information from historical, public and private sources, so that no investor can realize abnormal rate of return.

Though theoretical literature talks of market efficiency, in practical terms the market is not perfectly efficient. Anomalies do exist and there are investors and traders who outperform the market. So, the EMH has very important implications for both investors and authorities that regulate and control the market.

The rest of the paper is organized as follows: Section II, gives the theoretical background of the Random Walk Hypothesis and the three forms of market efficiencies. Previous research studies on market efficiencies and the different statistical tools applied by the researchers are also reviewed. Section III gives an overview of the GCC markets. Its emergence, major characteristics, peaks and falls faced by the seven markets in the GCC have also been explained. Section IV deals with the data and methodology. Null hypotheses, data, variables used in the study and statistical tools have been explained in this section. The empirical results of the present study are given in Section V. Section VI, the last section, discusses the policy implications of the present research study and gives a conclusion of the study.

2. The Random Walk Hypothesis (RWH)

a. Research in Different Markets

The empirical testing of this random walk hypothesis was initially mixed. Early studies by (Working 1934, 1960; Samuelson, 1965; and Fama, 1965) examined it and could not refute a random walk. RWH were tested heavily in both developed and developing markets. The developed markets are found to be weak-form efficient. That means that successive returns are independent and follow random walk (Fama 1965, 1970). These results of weak-form efficiency are confirmed considering a low degree of serial correlation and transaction cost (Kendall, 1943; 1953, Cootner; 1962, Osborne, 1962; Fama 1965). All these research works support the proposition that price changes were random and past changes were not useful in forecasting future price changes particularly after transactions costs were taken into account. (Fama and French, 1988; Potera and Summers, 1988; Granger, 1975, Hawawini, 1984; Fama, 1991 and Lo, 1997). Though the studies confirmed the weak-form, yet they could not guide the investors with any clear-cut trading rules to make abnormal profits.

b. Comparative Studies

While a few studies have tested the efficiency of individual markets, quite a few studies have compared the efficiency of several markets. For example, (Solink, 1973) analyzed 234 stocks from eight European stock markets; (Ang and Pohlman, 1978) studied 54 stocks from eight European Stock markets. (Cooper, 1982) examined 50 stock markets scattered throughout the world. (Urrutia, 1995) tested the RWH in four Latin American emerging equity markets. (Huang, 1995) studied the stock markets of nine Asian countries; and finally (Dahel and Laabas, 1999) examined the efficiency of four GCC (Gulf Co-operation Council) markets. As stated earlier, the primary objective of the present study is to

examine the efficiency of the Gulf markets. Dahel and Laabas (1999) carried out the first test of RWH on the capital markets of Bahrain, Kuwait, Oman and Saudi Arabia. They applied three tests on Random Walk Hypothesis, i.e., Unit Root, Variance Ratio, and Auto Correlation of Returns. While the results of Kuwait market supported the concept of RWH, other markets analyzed have rejected the concept of RWH. (Rao and Shankaraiah, 2003) investigated the stock market efficiency and endeavored to develop strategies for GCC stock markets. Apart from finding that these markets were neither developed nor informationally efficient, their view was that the markets needed to build on the experiences of developed financial markets. They recommended that apart from better networking, co-operation and the creation of investor awareness, the simultaneous listing of GCC countries to reduce the thin trading problem need to be implemented. (Sharma, 2005) in his study, tested whether daily returns series of Gulf Co-operation Council (GCC), stock markets are an approximation of normal distribution or not. Saudi, Qatar, Kuwait, and Oman stock market indices were examined by him in his study. Chi-square, Kolmogorov-Smirnov test, Autocorrelation Function and Partial Autocorrelation Functions were applied by him to test for randomness. The results revealed that the distribution of daily returns on these markets significantly deviated from the normal distribution during the study period. Unlike the above, the present study examines the RWH in a wider perspective covering all the markets with a different time period. The research findings of weak-form efficiency on the developing and less developed markets have produced mixed results and are controversial too. There are a few limitations associated with less developed and emerging markets. They generally suffer from the problem of thin trading. Also, they give wider room for market manipulations. In general, developing and developed markets are believed to be less efficient. However, empirical evidence does not always support the same. The study conducted by (Blasco and Santamar, 1997) in the Spanish stock market provided evidence against the random walk hypothesis. In the same way, the study carried out by (Smith, Jefferis and Ryoo, 2001) have tested the Random Walk Hypothesis in five medium-sized markets, Egypt, Morroco, Kenya, Nigeria and Zimbabwe and two smaller markets, Botswanna and Mauritius. The research indicated that the RWH does hold good in all the seven capital markets.

c. Statistical tools applied

Coming to the statistical testing, a wide variety of statistical tests have been used in the literature to examine the validity of weak-form EMH and the RWH. Those tests fall into two groups. The first group entails a comparison of risk-return results for trading or filter rules that make investment decisions based on past market information versus results from a simple buy and hold strategy. The second group involves statistical tests of independence between rates of return. Autocorrelation and runs tests are the most popular ones in this group (Reilly and Brown, 2003, p. 179-181). Some studies have used the spectral analysis, which shows any isolated deviation from the random walk model and can be used to

identify cycles that are responsible for inefficiencies identified in a series. A few studies have used AR (Auto Regression Test) and ARIMA (Auto Regressive Integrated Moving Average). But these tests warrant assumptions of normality of the distributions. Variance ratio test is yet another test introduced by (Lo and Mackinlay 1988), which tests the randomness in a time series of stock price taking into consideration, the problem of heteroscedasticity. Jacques-Bera test and Kolmogorov-Smirnov tests are the other tests used in testing the weak-form efficiency. Of late, Simulation tests are also used in testing the weak form efficiency. Simulation tests generate a random series of numbers as returns and compare them with the actual price changes in the market. The similarity between the two establishes the relevance of technical analysis as a stock market price predictor since random numbers can be generated to know the future movement of prices. Runs test is yet another non-parametric test used to test for randomness.

So, a wide variety of both parametric and non-parametric tests are used in examining the efficiency of the markets.

3. An overview of Capital Markets in GCC Countries

Stock markets functioned formally and informally from 1970 in GCC countries but the organized stock market activity started only after the late 80's. The following table gives a summary of the commencement of organized stock market activities in various GCC countries.

Table 1
Emergence of Capital Markets in GCC Countries

Country	Stock Market	Year of Commencement
Oman	Muscat Securities Market	1988
Bahrain	Bahrain Stock Exchange	1989
UAE	Abu Dhabi Sec. Market	2000
UAE	Dubai Financial Market	2000
Qatar	Doha Securities Market	1997
Saudi Arabia	Tadawul Saudi Stock Market	1989-2001*
Kuwait	Kuwait Stock Exchange	1977

*Automated Clearing system was introduced in 1989
and Tadawul was started in 2001
Source: FINCORP, Corporate Research Division, GCC Markets, 10th Nov, 2005

With the inauguration of Dubai Financial Market in March 2000, all six of the GCC member states now have officially regulated stock exchanges. Another noteworthy development is that since 1999 the International Finance Corporation has included the stock exchanges of Bahrain, Oman and Saudi Arabia in its IFC

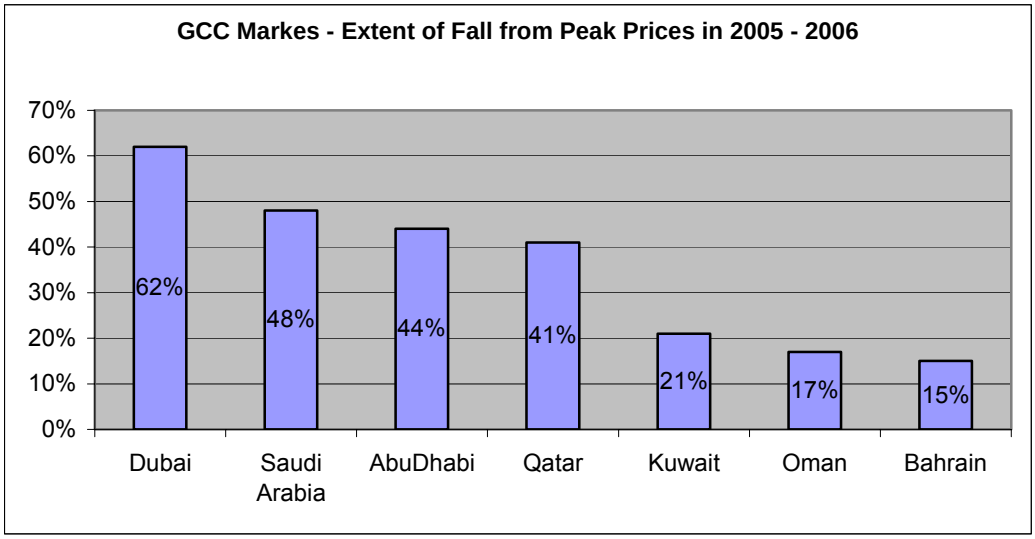
Global Index and has begun to assemble and publish key indicators of most of the stock markets in the GCC.

[1]The Market capitalization in the GCC markets increased from $120 billion in 2000 to $522 billion in 2004. The aggregate volume of shares traded similarly increased from 7.9 billion to 50.9 billion in the same period, with the cumulative value of the shares increasing from $22.9 billion to 551.9 billion respectively. Most GCC countries have similar financial systems, which mainly consist of the central bank, commercial banks, insurance companies, stock broking firms, stock exchanges, etc. Most of the GCC stock markets are relatively small and virtually closed to foreign investors, leading to block of foreign portfolio investment inflows. However, this scenario has been changing rapidly. For instance, in recent years resident expatriates are allowed to invest in funds especially in domestic stock markets.

Major Characteristics of the GCC markets

- GCC markets enjoy moderate stock market volume compared to their US and European counterparts. The daily average volume ranges between 2 Million US dollars (with Bahrain being the lowest) to 4 billion US dollars (with Saudi Arabia being the highest). On the contrary, the average daily volume in New York Stock Exchange is 55 billion dollars and daily volume in London is 35 billion dollars.
- Most of the GCC countries have put surveillance mechanism in place to control the stock market operations. Adequate powers are vested with regulatory authorities to protect and safeguard investor interest.
- GCC markets put a lot of restrictions on foreign ownership. The larger markets, notably those of Kuwait, Saudi Arabia and the UAE place considerable obstacles in the way of foreign investment. Only the smaller markets like Oman and Bahrain are lenient in this regard.
- [2]Since the currencies in these countries are pegged to US dollar, the currency risk is avoided while stock trading. This is the greatest strength of GCC markets. Investors in other emerging markets will have to take both currency risk and stock market risk while trading in equities.
- GCC Markets are known for high volatility. These markets have witnessed fall from their peak prices a few times. A sample fall from the peak prices in 2005-2006 is given below:

Figure 1



Source: FiNCORP Research Division, "GCC Markets, Are we close to the bottom?" (22 May 2006)

The fall is very steep in the case of Dubai with the index losing 62% of the value and more moderate in the case of Bahrain with the index losing only 15% of its value.

4. Data and Methodology

a. Hypotheses:

There are two hypotheses tested in the study. The first Ho examines whether the stock returns follow a normal distribution or not.

Null Hypothesis Ho: The stock returns in the Gulf markets follow a normal distribution

Alternate Hypothesis Ha: The stock returns in the Gulf markets do not follow a normal distribution

The reason as to why normality was tested was due to the fact that unless the time series data are normal, parametric test such as serial correlation test cannot be applied. So, first normality test would be applied and if the distribution proved to be normal, serial correlation test would be used. Otherwise, 'runs test' which ignores normality assumptions would be used. Normality was tested using Kolmogorov-Smirnov test.

The second Ho examines whether the stock returns follow a random walk (weak-form efficiency) during the study period.

Null Hypothesis Ho: The stock returns in the Gulf markets are random during the study period.

Alternate Hypothesis Ha: The stock returns in the Gulf markets are not random during the study period.

b. Data

FINCORP, one of the leading brokerage and Asset Management Companies in Muscat, Oman provided the data needed for the study. This company has a Corporate Research Division that collects data pertaining to the GCC and other Middle East markets. Our data are related to all the seven GCC markets. Our data starts from October, 2001 to October 2006. It uses the daily prices of all the seven indices for which data were collected by FINCORP. The country, index, period covered and the number of observations are given in Table 2.

Table 2

Data Details

Sl. No	Stock Market	Country	Index	Period From	Period To	Number of Observations
1	Abu Dhabi	UAE	ADSM	13.10.2001	11.10.2006	1399
2	Bahrain	Bahrain	SICO	13.10.2003	11.10.2006	746
3	Doha	Qatar	DSM	14.10.2001	11.10.2006	1257
4	Dubai	UAE	DFM	20.09.2003	11.10.2006	901
5	Kuwait	Kuwait	KWSE	13.10.2001	11.10.2006	1232
6	Muscat	Oman	MSM	14.10.2001	11.10.2006	1248
7	Saudi	Saudi Arabia	TASI	13.10.2001	11.10.2006	1456

c. Statistical Methods

As far as analytical tools are concerned, we use both parametric and non-parametric tests for analysis. As mentioned in the literature, there are several tests that are used to test for randomness. We use, 'runs test for randomness'. This technique is widely used to examine whether there is randomness in successive price changes. First, conversion of the time series data into logarithmic data and then computing return percent were done using MSExcel. SPSS (Statistical Package for Social Sciences Version 12) was used to compute Runs test and Kolmogorov-Smirnov test. Although the researcher intended to use Auto Correlation Function and Partial Auto Correlation Function using SPSS, he

could not do so as the distribution failed the normality test in all the seven cases. A brief explanation of the tools used is given in the following lines.

Non- Parametric Tests:

i. Kolmogrov Smirnov Goodness Of Fit Test:

The One-Sample Kolmogorov-Smirnov Test procedure compares the observed cumulative distribution function for a variable with a specified theoretical distribution, which may be normal, uniform, Poisson, or exponential. The Kolmogorov-Smirnov Z is computed from the largest difference (in absolute value) between the observed and theoretical cumulative distribution functions. This goodness-of-fit test tests whether the observations could reasonably have come from the specified distribution

ii. The Runs test for randomness:

As stated earlier, in order to test for weak-form efficiency, we use *'runs test'* as it does not require returns to be normally distributed. This provides a solid alternative to parametric serial correlation tests in which distributions are assumed to be normally distributed. In the present study, as stated earlier, since all the seven markets failed the normality test, the only alternative, 'runs test for randomness' was used. A 'run' is defined by (Siegel, 1956), as *"a succession of identical symbols which are followed or preceded by different symbols or no symbol at all" (p. 52)*. The number of runs is computed as a sequence of the price changes of the same sign (such as; ++, --, 00). When the expected number of run is significantly different from the observed number of runs, the test reject the null hypothesis that the daily returns are random. As defined by Poshokwale, (1996); *"a lower than expected number of runs indicates market's over reaction to information, subsequently reversed, while higher number of runs reflect a lagged response to information. Either situation would suggest an opportunity to make excess returns."* To perform a runs test, both the expected runs and the actual runs are computed for the sample returns. The expected number of runs is represented by:

$$E(r) = \frac{n + 2n_a n_b}{n}$$

Where n represents the number of observations, n_a and n_b respectively represent observations above and below the sample mean (or median), and r represents the observed number of runs. The standard error can therefore be written as:

$$\sigma(r) = \left[\frac{2n_a n_b(2n_a n_b - n)}{n^2(n-1)}\right]^{1/2}$$

The asymptotic (and approximately normal) Z-statistic can be written as follows:

$$Z(r) = \frac{r - E(r)}{\sigma(r)}$$

The null hypothesis for this test is for temporal independence in the series (or weak-form efficiency). Because returns are not normally distributed, the presence of structural breaks or outliers in the series can bias the test results. To control for such issues, I complete the runs test using a mean and a median as the base. The latter can yield more reliable results when 'outliers' exist.

Parametric Test:

Auto-Correlation and Partial Auto Correlation Function

Auto-correlation and Partial Auto Correlation Functions are reliable measures for testing of either dependence or independence of random variables in a series. (Kendall, 1943, p. 412) compute the price changes at different lagged 1,2,3,4, time periods. This test is used very popularly (e.g., Laurence, 1986; Claessens, Dasgupta and Glen, 1995; Poshokwale, S. 1996; Nicolaas, 1997; Nourredine Khaba, 1998). This test expects the returns to be normally distributed. So, before applying the test, 'outliers' in the distribution need to be removed. In this test, the serial correlation coefficient measures the relationship between the values of a random variable at time *t* and its value during the previous period. Auto correlation test evidence whether the correlation coefficients are significantly different from zero. For a large sample, the Ljung—Box statistic follows the chi-square distribution with *m* degrees of freedom:

$$LB = n(n+2)\sum_{k-1}^{m} (P\hat{}^2_k / n-k) \sim \chi^2$$

Where, $P\hat{}_k$ = Auto-correlation coefficients at lag k:
n = Sample size.

d. Variables Used

First, the daily share price index of the individual sample markets was converted into logarithmic form using *fx function* (statistics sub-menu). Then the logarithmic values were used to compute daily market return percent. The variables used are as follows:

$$Log\ Rjt = ln\left[\frac{Pt - P_{t-1}}{P_{t-1}}\right]$$

Where,
Log *Rjt* = *Daily Logarithmic Market Return percent of index j and time period t,*

Log Pjt = Logarithmic Market Index j at time period, day t,
Log P_{t-1} = Logarithmic Market Index j at time period, day t-1

For example, consider the index values of Abu Dhabi Stock Market on the following dates.

Date 13.10.2001 1099.63 Dirhams log value 3.041247

Date 15.10.2001 1092.61 Dirhams log value 3.038465

$$\text{So, based on the log values, the return would be} = \frac{3.038465 - 3.041247}{3.041247}$$

$$= -0.000914756$$

5. Empirical Results and discussion

a. Descriptive statistics of daily market return of the sample indices

Table 3 presents the descriptive statistics of the daily returns % (after conversion to log form). Interestingly, all the seven markets have reported positive mean returns during the study period. Dubai (Mean 0.00022) has registered the highest return followed by Kuwait (0.00018) and Doha (0.00016). Dubai, again is found to be the high-risk market as its standard deviation (0.00294) is the highest among all the seven markets followed by Saudi Arbia (0.00178) and Doha (0.00152) Bahrain (S.D 0.00079), Muscat (S.D 0.00082) and Kuwait (0.00104) are considered to be safest markets based on standard deviation. Standard deviation, which is a measure of volatility should be lower in order to ensure reasonable return, as claimed by many financial analysts. Except Abu Dhabi (0.262), all other markets have a negative skewness. Another interesting aspect is that all the seven markets have leptokurtic (Kurtosis > 2.58) distribution of returns with flatter tails than normal distribution(Hair, Anderson, Tatham, Black, 2005),. Generally, values for skewness zero and kurtosis > 2.58 represent that the observed distribution is perfectly normally distributed. Kurtosis either much higher or lower indicates extreme leptokurtic or extreme platykurtic distribution(Parkinson, 1987). These results are consistent with the early study made by (Sharma, 2005).

So, it could be stated that the GCC markets do not follow a normal distribution. These could be attributed to the high degree of volatility (see Figure 1 given above) witnessed by these markets during the study period.

Table 3

Descriptive statistics of daily market return of the sample indices (%)

Test	Abu Dhabi	Bahrain	Doha	Dubai	Kuwait	Muscat	Saudi
Mean	0.00011	0.00010	0.00016	0.00022	0.00018	0.00012	0.00013
Median	0.00008	0.00005	0.00012	0.00026	0.00022	0.00008	0.00017
Variance	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Std. Deviation	0.00136	0.00079	0.00152	0.00294	0.00104	0.00082	0.00178
Minimum	-0.00761	-0.00303	-0.00643	-0.01904	-0.00502	-0.00363	-0.01067
Maximum	0.00784	0.00468	0.01139	0.01462	0.00548	0.00466	0.01019
Range	0.01545	0.00771	0.01782	0.03365	0.01050	0.00829	0.02088
In.Quar.Range	0.00067	0.00068	0.00102	0.00229	0.00112	0.00067	0.00123
Skewness	0.262	-0.726	-0.359	-0.318	-0.5357	-0.447	-0.789
Kurtosis	6.611	4.656	4.540	4.698	3.684	3.966	8.722
Observations	1398	745	1256	900	1231	1247	1455

* Observations given are (n-1) as the first year is taken as the base year in the computation of daily return %

b. Results of 'Kolmogorov-Smirnov Normality Test'

As stated earlier in the methodology, the K-S test examines whether the returns follow a normal distribution or not. The test results are presented in Table 4. The results reveal that all the seven markets have had asymmetric distributions during the study period. The P- Value is invariably significant (0.000 < 0.001) at 0.001% level of significance for all the seven markets. So, the results of the descriptive statistics based on skewness and kurtosis and the K-S test results are similar. Also, the index returns deviate from the normality. So, the empirical distributions of the index returns on the GCC markets resemble as found in other markets such as Australia and New Zealand (Nicolaas 1997), India (Poshokwale, S, 1996), Japan, the US and the Asian NICs (Ko and Lee, 1991) and Kuala Lumpur and Singapore (Lawrence, 1986) Stock markets.

Table 4

Results of Kolmogorov-Smirnov Normality Test

Sl.No	Stock Market	Absolute	Positive	Negative	K-S Z	N	P Value
1	Abu Dhabi	0.127	0.126	-0.119	4.717	1398	0.000**
2	Bahrain	0.097	0.097	-0.085	2.659	745	0.000**
3	Doha	0.106	0.095	-0.100	3.733	1256	0.000**
4	Dubai	0.100	0.083	-0.106	3.015	900	0.000**
5	Kuwait	0.069	0.051	-0.069	2.413	1231	0.000**
6	Muscat	0.088	0.088	-0.062	3.091	1247	0.000**
7	Saudi	0.145	0.116	-0.115	5.543	1455	0.000**

** Highly significant at 0.001 level of significance

c. Results of 'runs test for randomness' with the mean and median as the base

Since the indices of all the seven markets have non-normal distribution, the researcher has applied the runs test for randomness in order to examine the efficiency of the markets, as this test does not require the distribution to be normally distributed. The results of runs test with both mean and median as the base are presented in tables 5 and 6.

A close look at the results would reveal that the expected number of runs is significantly different from the observed number of runs. Also, the z values of all the seven indices are greater than the critical value of $\pm$ 1.96. So, the null hypothesis that the stock returns in the gulf markets are random during the study period has been rejected at 0.001% level of significance for both mean and median based analysis except for Saudi Arabia. This market also does not follow a random walk but the level of significance is 1% when median is taken as the base. These results are also consistent and similar to the findings of previous studies of (Poshokwale, 1996) on the share price returns of Philipphines, Malaysia, and Thailand exchanges which are also developing markets in Asia.

Table 5

Results of Runs Test for Randomness with the Mean as the Base

S.No	Stock Market	Total Cases (n)	n_a	n_b	No.of runs	Test-value	Z	P - Value
1	Abu Dhabi	1398	669	729	548	0.00011	-8.079	0.000**
2	Bahrain	745	345	400	314	0.00018	-4.237	0.000**
3	Doha	1256	628	628	417	0.00016	-12.021	0.000**
4	Dubai	900	456	444	363	0.00022	-5.866	0.000**
5	Kuwait	1231	639	639	592	0.00018	-6.431	0.000**
6	Muscat	1247	583	664	454	0.00012	--9.552	0.000**
7	Saudi	1455	770	685	674	0.00013	-2.738	0.006*

** Highly significant at 0.001 level of significance
* Significant at 0.01 level of significance

Table 6

Results of Runs Test for Randomness with the Median as the Base

S.No	Stock Market	Total Cases (n)	n_a	n_b	No.of runs	Test-value	Z	P - Value
1	Abu Dhabi	1398	699	699	556	0.00008	-7.705	0.000**
2	Bahrain	745	373	372	316	0.00005	-4.216	0.000**
3	Doha	1256	628	628	417	0.00012	-11.969	0.000**
4	Dubai	900	450	450	363	0.00026	-5.870	0.000**
5	Kuwait	1231	616	615	501	0.00022	-6.587	0.000**
6	Muscat	1247	624	623	454	0.0008	-9.660	0.000**
7	Saudi	1455	728	727	680	0.00017	-2.544	0.011*

** Highly significant at 0.001 level of significance
* Significant at 0.01 level of significance

6. Summary, Policy Implications and Conclusion

a. Summary

The present study analyzed the market efficiency of all the seven GCC stock markets during the period between October, 2001 and October 2006 based on the data availability of the individual exchanges. 'Kolmogorov Smirnov test' and 'Runs test were applied for examining the normality and randomness respectively. The summarized highlights of the major findings are as follows:

- Dubai (Mean 0.00022) has paid the highest mean return to the investors followed by Kuwait (Mean 0.00018) and Doha (Mean 0.00016). Dubai, (S.D σ 0.00294) again could be considered as the high-risk market as it has reported the highest standard deviation during the study period.
- Dubai, is followed by Kuwait (S.D σ 0.00022) and Saudi Arabia (S.D σ 0.00178). These mean return and standard deviation based results confirm that high-risk is associated with high-returns and low-risk with low returns.
- Looking at the other side of returns, Bahrain Exchange paid a low mean return (Mean 0.00010) and Muscat Securities Market (Mean 0.00012) and both the markets have recorded the lowest standard deviations (Bahrain S.D σ 0.00079 and Muscat σ 0.00082) during the study period. So, the index returns deviate from normality. High volatility based on daily index return indicate that short-term would not be a suitable strategy to make profit from the market. So, to earn a reasonable return they should identify good companies and stay in the market medium to long-term.
- Muscat appears to be the safest market with the higher mean return (0.00012) and a comparatively lower standard deviation (0.00082) followed by Bahrain (Mean return 0.00010 and S.D σ 0.00079).
- Kolomogorov-Smirnov test indicates that all the seven markets have registered asymmetric distributions during the study period. So, the index returns deviate from normality. Based on the results, the Ho that the Gulf Stock markets follow a normal distribution is rejected.
- Runs test for randomness with both mean and median has revealed that the share price index returns from GCC markets follow non-random behavior during the study period. Runs test results further confirm that the deviations from observed and actual number of runs in the series of index returns is significant. Based on these, the second Ho the stock returns in the Gulf markets are random during the study period is also rejected. This evidence corroborates with the results of the previous studies.
- While Abu Dhabi market has a positive skewness (skewness 0.262), all other markets have reported negative skewness. So, all the markets have registered leptokurtic distribution. (kurtosis > 2.58) This result is in conformity with a previous study conducted by Sharma (2005)

b. Policy Implications

Our analysis reveals that the index returns of all the seven markets do not follow a normal distribution. Also, the returns are not random. Except Dubai, the mean returns of all the seven markets fall within a range of 0.00010 (Bahrain) and 0.00018 (Kuwait). So, the difference cannot be considered too high. Also, the runs test results show that all the markets follow a non-random behavior. So, it is high time that the GCC market authorities had thought of a common inter-connected Gulf stock market. This view is further supported by the fact a noted expert Dr Azzam[3] states that a high degrees of contagion exists across Gulf stock markets. Panic sales, triggered in one market, affect other markets in the region, regardless of the significantly different valuation multiples that exist across markets and listed companies. Robert Gary[4], Chairman, HSBC, made the following observation in the above conference. "I will argue that the commonality in the economic structure and ambition, together with a need to broaden the range of local currency products, all argue for a unified GCC capital market in the run-up to currency union. In the run upto a single GCC currency there are practical steps that can be taken today to boost the prospects for a genuine regional capital market.

Also, the Gulf region's GDP (Gross Domestic Product) is projected to rise from $ 600 billion in 2006 to $1000 billion in 2010, an increase of 75% and would enjoy an unprecedented growth and prosperity in the near future.

As a prelude to this, the impending agenda of Common Gulf Currency by the year 2010, need to be necessarily achieved in order to avoid exposure to currency risk and exchange rate-risk related problems.

Another interesting commonality is that all the six countries in the GCC are predominantly oil based economies. Economists are of the view that the demand and supply gap in crude oil is likely to widen in the near future and it would have a positive effect on the oil prices. This situation would create a stable economic growth in the GCC region attracting more foreign fund flows. So, the imminent need of the hour is that the Gulf markets need to lift the restrictions on foreign investments in the Gulf stock markets. This would help the GCC markets to equate and compete themselves with the developed markets thus paving the way for an informationally efficient markets. Another interesting common aspect is that these economies enjoy increased budgetary surplus and accelerated GDP growths. So, the growth and outlook for corporate sector would be more promising.

c. Conclusion

Analysis of the daily stock index returns of the GCC markets indicate that there are larger variations in returns during the study period and the markets are not efficient in the weak-form. Runs test shows that the successive price changes are not random. So, RWH does not hold good in GCC markets and the authorities need to make far reaching changes to attract more investors from across the globe and make the markets more informationally efficient.

The analytical results of the current study support the results of many studies by confirming the weak form efficiency of thinly traded markets such as, Norway and Sweden, (Jennergren and Korsvold 1975), China; (Mookerjee and Yu 1999) and Amman; (Al-Kuqudah, 1997), among other studies.

However, the results have surprised some of the previous studies. For instance, (Buttler and Malaikah, 1992), examined the stock market efficiency in both Kuwait and Saudi Arabia over the period 1985 to 1989. According to the runs test, their research concludes that the Kuwait market is similar to the active markets as only 14 of the 36 stocks (39%) violate the independence assumptions at the 5% confidence level. However, their study is based on the returns of individual stocks while our study is based on index returns. Yet another study by (Rao and Shankaraiah 2003) is a third example that supports the weak-form efficiency of the Bahrain stock market using auto-correlations and runs tests applied to the daily prices of 12 stocks traded during the year 2000. However, our study period and data are different.

Based on the above results and comparisons of the previous similar studies, we strongly feel that there arises a need to use more sophisticated tests with longer time-series data pertaining to the markets. Also, instead of index returns, individual share price data of the markets might turn better results in terms of market efficiency.

Notes

[1]Fincorp, Corporate Research Division, “GCC Markets, A Special Review”, 10th November, 2005

[2]Fincorp, Corporate Research Division, GCC Markets, A Special Review, 10th November, 2005

[3]Dr Henry T.Azzam, Chairman, Dubai International Financial Exchange and Founder CEO, Amwal Invest, speech delivered at MEED’s Middle East Capital Markets Conference 2006, held at Dubai, United Arab Emirates, Tuesday, November 21-2006

[4]Robert Gary, Chairman-Debt Finance & Advisory, HSBC Bank, speech delivered at MEED’s Middle East Capital Markets Conference 2006, held at Dubai, United Arab Emirates, Tuesday, November 21-2006

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