

# **The Behavior of Stock Prices in the GCC Markets**

**Riad Dahel and Belkacem Laabas**

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### Abstract

The paper examines the behavior of stock prices in four GCC markets: Bahrain, Kuwait, Oman and Saudi Arabia. The data consists of weekly stock price indexes from September 1994 to April 1998. Three tests of the weak form of the efficient market hypothesis are applied. The first two, unit root and variance ratio, test the hypothesis that price indexes follow a random walk; and the third, regression, tests for autocorrelation of returns. In the case of the Kuwaiti market, the results strongly support weak form of efficiency. As to the other three markets, only one of the tests (regression of returns) rejects the weak form of the EMH when the total period is considered. However, when the sample is split into two, the efficiency hypothesis is not rejected for the second subperiod in two of the markets and only by a small margin in the case of the Saudi Arabian market.

تبحث الورقة سلوك أسعار الأسهم في أسواق أربعة من دول مجلس التعاون وهي البحرين، الكويت، عمان والسعودية. تتألف البيانات من المؤشرات الأسبوعية لأسعار الأسهم خلال الفترة من سبتمبر 1994 إلى إبريل 1998. وتطبق الدراسة ثلاث اختبارات للصيغة الضعيفة لفرضية كفاءة السوق. يركز الاختبار الأول والثاني، أي الجذر الأحادي ونسبة التباين، على التحقق من مدى صحة اتباع مؤشرات أسعار الأسهم لنموذج المسيرة العشوائية. أما الاختبار الثالث، أي الانحدار، فيركز على بنية الارتباط الذاتي للعوائد. ففي حالة السوق الكويتي، تدعم نتائج الاختبارات الصيغة الضعيفة لفرضية كفاءة السوق. أما بالنسبة للثلاث أسواق الأخرى، فترفض الصيغة الضعيفة عندما تؤخذ في الاعتبار فترة الدراسة الكاملة إلا في حالة اختبار الارتباط الذاتي للعوائد. وتتغير نتائج هذا الاختبار عندما تقسم هذه الفترة إلى مرحلتين. فترفض الصيغة الضعيفة لفرضية كفاءة السوق بالنسبة للفترة الثانية في حالة سوق السعودية فقط وبهامش ضئيل.

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## **Introduction**

The efficient market hypothesis (EMH) is the idea that the prices of securities quickly and fully reflect all available information. Fama (1970) divides the EMH into three forms: (a) weak, where prices reflect all historical data; (b) semi-strong, where prices reflect all publicly available information; and (c) strong form, where prices reflect all information, public and private.

Because of its significance to investors, the EMH has been tested extensively over the last three decades and testing continues as more advanced techniques are being developed. With respect to the weak form of the EMH, one major type of testing is based on the random walk hypothesis. If stock prices follow a random walk, price changes over time are random. These tests involve the question of whether all information contained in the sequence of past prices is fully reflected in the current price.

Historically, most tests were conducted on the markets in industrial countries. However, in the last few years, there has been a growing interest in emerging markets. Research on these markets has focused on the issue of efficiency as well as on their integration in international markets.<sup>2</sup> With respect to Arab countries, a few studies have been undertaken to date. El Erian and Kumar (1995) provide an overview of the state of equity markets in some Middle Eastern countries. Darrat and Hakim (1997) test price linkages among three Arab stock markets (Amman, Cairo and Casablanca) and with international markets, and find that these markets are integrated within the region but not at the international level. Dahel (1999) focuses on the issue of volatility of returns in a study that also includes emerging and developed markets, and finds that Arab markets exhibit the lowest level of volatility and emerging markets the highest.

The purpose of this study is to test the weak form of the EMH in four Gulf Cooperation Council (GCC) stock markets: Bahrain, Kuwait, Oman and Saudi Arabia. Three different tests are applied to this end: unit root, variance ratio and a regression of returns. The data set consists of weekly stock price indexes of those markets over almost a four-year period (September 1994 - April 1998).

## **GCC Markets**

Of the four GCC markets, the Saudi Arabian market is the only one where trading does not take place on an exchange but over the counter. Commercial banks trade in shares through an electronic system established by the Saudi Arabian Monetary Authority (SAMA) which also monitors activities. The Saudi Arabian market is the largest of the four and also of all Arab stock markets in terms of market capitalization, which reached over \$59 billion in the last quarter of 1997 before decreasing to a little over \$50 billion in March 1998. As to the trading value on the GCC markets, the Kuwaiti market has traditionally been the most active except in the last few months when the Saudi Arabian market surpassed it. Table 1 presents these indicators for all four markets.

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<sup>2</sup> See, for instance, Bekaert (1995), Buckberg (1995) and Harvey (1995).

Table 1. GCC Stock Markets: Some Indicators (March 1998)

Country	Market Capitalization (millions of US\$)	Monthly Trading Value (millions of US\$)	Number of Listed Companies
<b>Bahrain</b>	<b>7280.92</b>	<b>36.33</b>	<b>40</b>
<b>Kuwait</b>	<b>25622.36</b>	<b>1224.63</b>	<b>75</b>
<b>Oman</b>	<b>6603.81</b>	<b>305.18</b>	<b>126</b>
<b>Saudi Arabia</b>	<b>50649.28</b>	<b>1830.26</b>	<b>71</b>

Source: *Arab Financial Markets Data Base Quarterly*, Arab Monetary Fund, First Quarter 1998.

In 1995, Bahrain and Oman linked their stock exchanges, thus allowing cross listing of local companies. Kuwait joined in this arrangement in 1997. One common feature of the GCC markets is that they are not open to foreign investors and only partially to GCC nationals and residents.<sup>3</sup> Another common feature of these markets is that they are sensitive to changes in world oil prices. This is explained by the fact that, despite efforts to diversify their economies, these countries remain dependent on the oil sector.

Only a handful of studies have so far focused on GCC markets. One early study undertaken by Gandhi, Saunders and Woodward (1980) focuses on the Kuwaiti stock market and attempts to measure its efficiency through the use of some empirical tests. The authors find a high correlation in the market index and conclude that the market is inefficient. In a more recent study, Butler and Malaikah (1992) examine individual stock returns in the Kuwaiti and Saudi Arabian markets over the second half of the 1980s. Their results indicate market inefficiency in both markets, but significantly more in the Saudi Arabian market.

Over the last few years, two studies have examined the efficiency of the Kuwaiti stock market using the same data set (205 weekly observations on the Al-Shall composite index extending from August 27, 1986 to August 1, 1990). In the first study, Al-Loughani (1995) tests the weak form of the EMH in the market by using various methods, both traditional and advanced. The author finds that when using traditional methods, the results provide evidence of weak form efficiency. However, when using more recent methods, he obtains opposite results in the sense that the evidence clearly indicates market inefficiency. In the second study, Al-Loughani and Moosa (1997) test the efficiency of the market by using a set of moving averages of different lengths. The results obtained by the authors indicate market inefficiency.

The present study also covers the Kuwaiti stock market, in addition to three other GCC markets. Furthermore, it applies tests not very different from those applied

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<sup>3</sup> For a discussion of this feature as well as other characteristics of these markets such as the legal and institutional framework, the listing requirements or the operating procedures, see Arab Monetary Fund (1997).

in previous studies. However, it uses the most recent data set, thus reflecting any impact institutional and operational changes that took place in the markets under investigation may have had on efficiency since the beginning of this decade (such as the electronic trading system introduced in the Saudi Arabian market in 1990).

### Methodology

This study aims at testing the validity of the weak form of the EMH for four GCC stock markets: Bahrain, Kuwait, Oman and Saudi Arabia. The data consist of weekly stock price indexes of these markets, covering the period September 1994 to April 1998.

The EMH is based on the notion that stock returns are unpredictable. Testing of the weak form of the EMH requires the use of only past values of the series while testing of the semi-strong and strong forms necessitates the use of a broader information set. If stock prices are indicated as  $P_t$ , then one-period returns are simply computed by first differences of  $\ln(P_t)$ , that is

$$R_t = (1 - L)\ln P_t \quad (1)$$

where  $L$  is the lag operator.

The random walk model with drift  $\mu$  and trend  $t$  may be formulated as:

$$\Delta \ln P_t = \mu + \alpha_1 \ln P_{t-1} + \alpha_2 t + \varepsilon_t \quad (2)$$

where  $\varepsilon_t$  is a white noise with  $E(\varepsilon_t) = 0$ ,  $E(\varepsilon_t^2) = \sigma_\varepsilon^2$  and  $E(\varepsilon_t \varepsilon_{t+s}) = 0$  for  $s \neq 0$ .

The validity of the EMH may be verified by testing for stationarity, and for the presence of a unit root in Equation 2. Except for drift and trend factors, returns follow a purely white noise process ( $H_0: \alpha_1 = 0$ ). The orders of integration are tested using Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) tests (Dickey and Fuller, 1979 and 1981). The DF test consists of running a regression on Equation 2 while for the ADF test, the equation is augmented by lagged difference terms (Equation 3).

$$\Delta \ln P_t = \mu + \alpha_1 \ln P_{t-1} + \sum_{j=1}^n \delta_j \Delta \ln P_{t-j} + \alpha_2 t + \varepsilon_t \quad (3)$$

If  $\mu$  is not significantly different from zero, the zero mean assumption is satisfied. The serial independence of the residuals may be tested by a Lagrange Multiplier (LM) test. Stock return normality may be tested by the Bera-Jarque (1980) test applied either to the residuals or to the returns.

In each case, the test for a unit root is a test of the coefficient of  $\ln P_{t-1}$  in the regression, using the critical values calculated by Dickey-Fuller. If the coefficient is

significantly different from zero, then the hypothesis that  $Ln P_t$  contains a unit root is rejected and the hypothesis that  $Ln P_t$  is stationary rather than integrated, is accepted.

The ADF test uses the t-statistic of the coefficient of the lagged variables and the critical value for the test of a zero coefficient. A large negative t-statistic means rejection of the hypothesis of a unit root and suggests that the series is stationary. Under the null hypothesis of a unit root, the reported t-statistic does not have the standard t distribution. If the calculated Dickey-Fuller t-statistic is smaller than the critical value, the hypothesis of non-stationarity and the existence of a unit root cannot be rejected.

An alternative test (PP) for a unit root was developed by Phillips and Perron (1988). Like the ADF test, the PP is a test of the hypothesis of  $\rho = 1$  in the equation

$$\Delta Ln P_t = \mu + \rho Ln P_{t-1} + \varepsilon_t \quad (4)$$

However, unlike in the ADF test, the equation tested in the PP test does not include the difference terms. The equation is estimated by ordinary least squares and the t-statistic of the coefficient is corrected for serial correlation in t.

The random walk model (Equation 2) focuses on short-period return predictability. However, evidence of long-period return predictability provided by Fama and French (1988), Poterba and Summers (1988) and Lo and MacKinlay (1988) points out to the possible existence of negative correlation in long-horizon returns, known as mean reversion.

This phenomenon is usually tested by variance ratio tests which are also regarded as tests of the random walk hypothesis. These tests are based on the fact that variances between observations of random walks are the same at all lags. Based on the Lo and MacKinlay test and following Huber's (1997) notation, if a random walk model is considered for returns with drift and a sample size of  $nq + 1$  (where  $q$  is the number of lags),  $\varepsilon_t$  may either be assumed IID or its variance may be assumed to be time-varying. A variance ratio test in the case of both homoscedastic and heteroscedastic random disturbances is carried with the use of two statistics,  $Z_1$  and  $Z_2$  respectively, where

$$Z_1(q) = \sqrt{nq} M(q) (2(2q-1)(q-1)/3q)^{-1/2} \quad (5)$$

$$Z_2(q) = \sqrt{nq} M(q) (V(q))^{-1/2} \quad (6)$$

with

$$M(q) = ((\sigma^2(q)/\sigma^2(1)) - 1) \quad (7)$$

$$V(q) = \sum_{j=1}^{q-1} (A(j))^2 \frac{(nq) \sum_{k=j+1}^{nq} ((R(k) - R(k-1) - \bar{R})^2 (R(k-j) - R(k-j-1) - \bar{R})^2)}{\left[ \sum_{k=1}^{nq} (R(k) - R(k-1) - \bar{R})^2 \right]^2} \quad (8)$$

$$\sigma^2(q) = (q(nq - q + 1)(1 - q/nq))^{-1} \sum_{k=q}^{nq} (R(k) - R(k - q) - q\bar{R})^2 \quad (9)$$

$$A(j) = 2(q - j)/q \quad (10)$$

$$\bar{R} = (nq)^{-1}(R(nq) - R(0)) \quad (11)$$

In this test,  $\bar{R}$ ,  $\sigma^2(1)$  and  $\sigma^2(q)$  are the maximum likelihood estimators of the mean and the variance of the random walk model specified in Equation 4. Under the null hypothesis that  $R_t$  is a random walk,  $M(q)$  should equal zero; henceforth  $Z_1$  and  $Z_2$  are asymptotically normal distributed  $N(0,1)$ .

In the weak form of the EMH, the autocorrelations provide evidence of return predictability. The test is carried by considering the lag structure between current and past returns.

$$\Delta \text{Ln } P_t = \mu + \sum_{j=1}^n \delta_j \Delta \text{Ln } P_{t-j} + \varepsilon_t \quad (12)$$

Using the above model and testing for the significance of the lag parameters,  $\delta_j$ , a random walk model should have insignificant parameters. These are tested by the overall null hypothesis,  $H_0 : \delta_1 = \delta_2 = \dots = \delta_j = 0$ , using a standard F test.

### Data and Summary Statistics

The data set used in this study consists of weekly stock price indexes of the four GCC markets covered, and the sample period extends from September 27, 1994 to April 6, 1998. The indexes used for each of the four markets are:

Bahrain: Bahrain Stock Exchange (BSE) Index (June 1989 = 1000)

Kuwait: Kuwait Stock Exchange (KSE) Index (December 1993 = 1000)

Oman: Muscat Securities Market (MSM) Index (July 1990 = 100)

Saudi Arabia: National Center for Financial and Economic Information (NCFEI) Index (February 1985 = 100)

Unlike the Kuwaiti market which has three published indexes, (i.e. the KSE which is used in this paper, Al Shall and NBK), the Bahraini, Omani and Saudi Arabian markets, have only one published index each.

The data are taken from the *Middle East Economic Digest* (MEED), and the start of the sample period coincides with MEED's introduction of its weekly survey on the region's stock markets. Figure 1 depicts the weekly behavior of each of the four stock price indexes over the sample period.

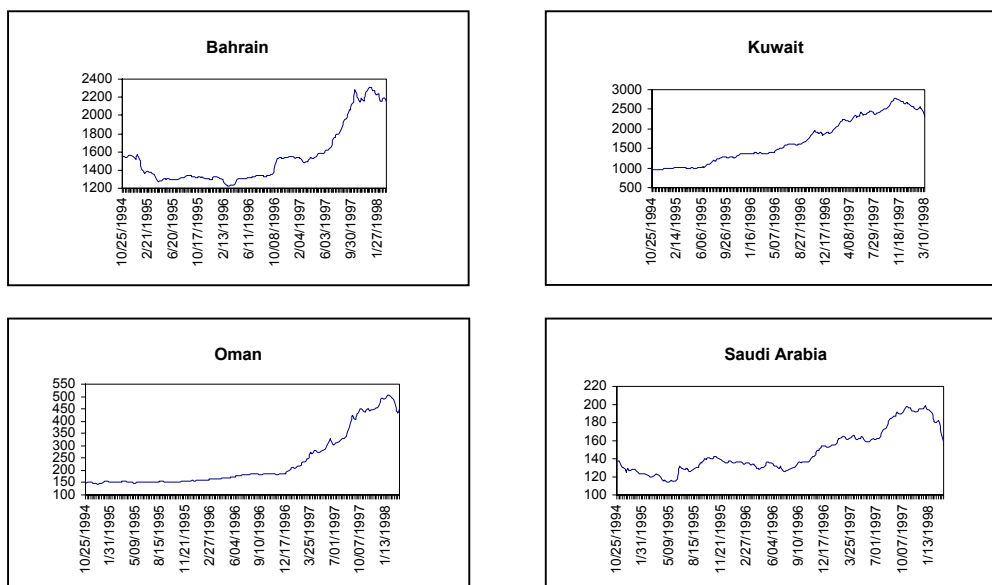


Figure 1. GCC weekly stock price indexes.

The main observation that could be made from a comparison of the four plots is that the indexes behaved differently in the first half of the sample period and rather similarly in the second half. Over the first two years, the BSE Index experienced a downward trend from the start of the study period until March 1996, after which it turned around and began to increase. The KSE Index was on an upward trend basically from the start. The MSM Index was very stable in the first two years while the NCFEI Index was the most erratic of the four over the period of study although a slight upward trend may be noticed. This difference in the behavior of the price indexes between the GCC markets may reflect the characteristics of these markets. The low trend in the Bahraini and Omani Indexes may be explained by the small size of these markets and their low trading value (see Table 1 and Footnote 5). As to the Saudi Arabian market index, its erratic behavior may have been driven by trading value which has gone through a series of sharp increases and decreases over the period (Arab Monetary Fund).

Over the last two years, all four markets experienced a boom period until late 1997 and early 1998 when the indexes started decreasing at a fast rate. This latest trend was led by the KSE Index which started decreasing in November 1997, first followed by the BSE and NCFEI Indexes in early January 1998 and then by the MSM Index one month later. This recent decline in the indexes may indicate how much of an impact the decrease in world oil prices over the last several months had on the GCC markets. During the expansion period, the BSE Index grew at the highest rate, followed by the MSM Index, while the KSE Index maintained its momentum from the first two years and the NCFEI remained volatile. Figure 2 provides a snapshot of the behavior of the weekly returns in the GCC markets, as measured by the difference in the log of the price indexes.



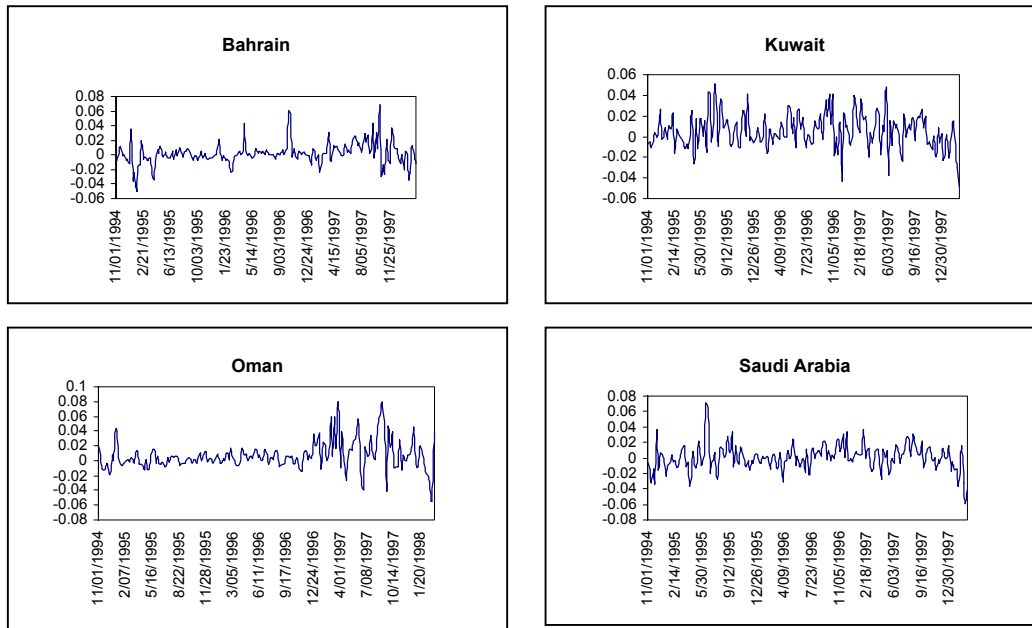


Figure 2. GCC weekly market returns.

Table 2 presents the summary statistics of the weekly returns in the four GCC markets.

Table 2. Summary Statistics: Weekly Returns In GCC Markets (September 27, 1994-April 6, 1998)

	<b>Bahrain</b>	<b>Kuwait</b>	<b>Oman</b>	<b>Saudi Arabia</b>
<b>Mean</b>	<b>0.001629</b>	<b>0.004782 *</b>	<b>0.006066 *</b>	<b>0.000812</b>
<b>Median</b>	<b>0.000432</b>	<b>0.003933</b>	<b>0.003769</b>	<b>0.000470</b>
<b>Maximum</b>	<b>0.066477</b>	<b>0.050054</b>	<b>0.076696</b>	<b>0.068292</b>
<b>Minimum</b>	<b>-</b>	<b>-0.049943</b>	<b>-0.076849</b>	<b>-0.060713</b>
	<b>0.051501</b>			
<b>Std. Dev.</b>	<b>0.014835</b>	<b>0.016307</b>	<b>0.020103</b>	<b>0.016756</b>
<b>Coef. of Var.</b>	<b>9.106813</b>	<b>3.410079</b>	<b>3.314045</b>	<b>20.635467</b>
<b>Skewness</b>	<b>0.804237</b>	<b>0.024482</b>	<b>0.305632</b>	<b>0.163451</b>
<b>Kurtosis</b>	<b>7.246625</b>	<b>3.801020</b>	<b>6.474373</b>	<b>5.244373</b>
<b>Bera-Jarque</b>	<b>157.2352</b>	<b>4.910731</b>	<b>94.89244</b>	<b>39.22357</b>
<b>Probability</b>	<b>0.000000</b>	<b>0.085832</b>	<b>0.000000</b>	<b>0.000000</b>
<b>ARCH (1)</b>	<b>10.44455</b>	<b>4.97933</b>	<b>31.14030</b>	<b>28.7297</b>
<b>Probability</b>	<b>0.001230</b>	<b>0</b>	<b>0.000000</b>	<b>8</b>
		<b>0.025652</b>		<b>0.000000</b>
<b>Observations</b>	<b>183</b>	<b>183</b>	<b>183</b>	<b>183</b>

\* Statistical significance at the 5 percent level.

Source: MEED, various issues.

The results indicate that the MSM Index realized the highest average return over the sample period, but its associated risk in terms of the standard deviation of these returns, was also the highest. However, a comparison of the coefficients of variation clearly shows that the NCFEI Index experienced the highest amount of risk per unit of return. Its mean return is the lowest. It is also not significantly different from zero.

Regarding the distribution of returns, the results show that those for the BSE and, to a lesser extent, the MSM and NCFEI Indexes, are highly skewed to the right. Furthermore, the measure of peakedness (kurtosis) indicates a leptokurtic distribution of the returns in those three markets. Under the null hypothesis of normality in returns, the Bera-Jarque statistic confirms the results on distribution. The null hypothesis is rejected in all but the case of the KSE Index. Following Engle (1982), the results of a standard LM test for Autoregressive Conditional Heteroskedasticity (ARCH [1]) are also presented. For the returns in all four markets, there is strong evidence of ARCH.

### Empirical Results

In this section, the results of the three tests of the weak form of the EMH conducted in this study are reported and discussed. The first two (unit root and variance ratio) test the hypothesis that the price index follows a random walk, and the third (regression) tests for autocorrelation of returns.

#### Unit Root Tests

Both the ADF and the PP tests were carried on the log of the price index of each of the four GCC markets. Price indexes were tested in levels and in first differences, including a constant and a trend and with lags of up to seven weeks. The results are reported in Table 3.

Table 3. Unit Root Tests

	<b>Bahrain</b>	<b>Kuwait</b>	<b>Oman</b>	<b>Saudi Arabia</b>
<b>Price Indexes in Levels</b>				
<b>ADF</b>	<b>-2.23</b>	<b>-1.47</b>	<b>-1.68</b>	<b>-2.59</b>
<b>PP</b>	<b>-2.07</b>	<b>-1.59</b>	<b>-1.49</b>	<b>-3.01</b>
<b>Price Indexes in First Differences</b>				
<b>ADF</b>	<b>-4.12*</b>	<b>-3.99*</b>	<b>-3.97*</b>	<b>-4.07*</b>
<b>PP</b>	<b>-10.96*</b>	<b>-13.12*</b>	<b>-11.12*</b>	<b>-11.03*</b>

\* Statistical significance at the 5 percent level.

For all four markets, the results show that the series (log of the price index) are non-stationary in levels and stationary in first differences. Therefore, the results are

consistent with the weak form of the EMH which predicts that the log of the price index has a unit root.

### Variance Ratio Tests

Table 4 displays the results of the variance ratio tests for the weekly returns on all market indexes. For each market, the first column reports the test statistic in the case of homoscedastic errors ( $Z_1$ ) and the second column the test statistic after correcting for possible heteroskedasticity in the random disturbances ( $Z_2$ ). Tests were carried with lags of up to 32 weeks.

Table 4. Variance Ratio Tests

Weeks	Bahrain		Kuwait		Oman		Saudi Arabia	
	$Z_1$	$Z_2$	$Z_1$	$Z_2$	$Z_1$	$Z_2$	$Z_1$	$Z_2$
4	2.68*	1.12	1.98*	0.95	2.58*	0.77	2.66*	0.99
8	2.37*	0.94	1.53	0.69	1.97*	0.55	2.21*	0.77
16	2.24*	1.07	0.72	0.39	1.31	0.45	1.26	0.53
32	1.64	1.04	0.31	0.22	1.49	0.67	0.55	0.31

\* Statistical significance at the 5 percent level.

The results show a similar pattern for all four indexes. The null hypothesis that variances are the same at all lags is rejected across all markets in the case of a homoscedastic error process. However, when using the heteroskedasticity-robust test statistics, the null hypothesis is no longer rejected for the returns on all four market indexes.

### Regression Tests

Table 5 presents the results of the third test of the weak form of the EMH carried in this study, a regression of the weekly return for each index on a set of its lagged values with lags of up to seven weeks.

Table 5. Regression Tests of Weekly Returns

Lag	Bahrain	Kuwait	Oman	Saudi Arabia
1	0.239120*	0.065073	0.207072*	0.259453*
2	0.134085	0.149502	0.046783	-0.013376
3	-0.053855	-0.017530	0.080912	-0.034681
4	0.126230	0.123482	0.094255	0.116980
5	-0.053518	0.024543	-0.113250	0.061457
6	0.031844	-0.000313	0.117169	-0.148967
7	0.040927	0.032428	-0.037961	0.162105*
F-Statistic	3.01*	1.31	2.16*	2.96*
R <sup>2</sup>	0.1190	0.0616	0.0811	0.1191

\* Statistical significance at the 5 percent level.

Under the random walk null hypothesis, the regression coefficients should be statistically insignificant. The F-statistic is appropriate for this test. At the 5 percent level of significance, the critical F (175,7) is equal to about 2.06. Thus, the results shown in Table 5 indicate that the random walk null hypothesis is not rejected only for Kuwait - although the outcome would have been different in the case of Oman if a 1 percent level of significance had been used. However, the results in the cases of rejection of the null were investigated a little further. Firstly, in an attempt to detect a potential structural change that these markets may have experienced halfway through the sample period, around October 1996, a Chow (1960) test was applied.<sup>4</sup> The results of the test, as presented in Table 6, do not support this hypothesis at the 5 percent level of significance.

Table 6. Chow Test (Break Point: October 16, 1996)

	<b>Bahrain</b>	<b>Kuwait</b>	<b>Oman</b>	<b>Saudi Arabia</b>
<b>F-Statistic</b>	<b>1.27</b>	<b>1.75</b>	<b>0.88</b>	<b>0.533</b>
<b>Probability Level</b>	<b>0.259</b>	<b>0.090</b>	<b>0.533</b>	<b>0.829</b>

Secondly, these two subsamples were used to test for different outcomes as to the EMH. The results are reported in Table 7.

Table 7. F-Statistic

	<b>Bahrain</b>	<b>Kuwait</b>	<b>Oman</b>	<b>Saudi Arabia</b>
<b>Total Period</b>	<b>3.01*</b>	<b>1.31</b>	<b>2.16*</b>	<b>2.96*</b>
<b>Subperiod 1</b>	<b>5.12*</b>	<b>0.93</b>	<b>2.47*</b>	<b>1.12</b>
<b>Subperiod 2</b>	<b>0.67</b>	<b>1.77</b>	<b>0.75</b>	<b>2.22*</b>

\* Statistical significance at the 5 percent level.

With the exception of the Kuwaiti market for which the results do not differ from those based on the total period, regression tests for the other three markets reveal

<sup>4</sup> During this period, the BSE Index for instance recorded its single largest two-week increase (159 points). Trading value went up from \$2.9 million with 6.7 million shares changing hands in the last week of September to \$12.6 million with 26 million shares changing hands in the second week of October. On a quarterly basis, trading value remained at least 100% higher for the rest of the sample period than the third quarter 1996 level (Arab Monetary Fund). Furthermore, a closer look at the returns on the MSM (Figure 2) indicates a sharp increase in volatility starting at about the same period and continuing throughout. The MSM Index increased by over 150% between October 1996 and December 1997 (Arab Monetary Fund).

different outcomes between the two subperiods. In the cases of the Bahraini and Omani markets, the weak form of the EMH is rejected in the first subperiod but not in the second. Increased volatility of returns in these two markets over the second half of this period, as shown in Figure 2, may explain why past returns have no predictive power for current returns. As to the Saudi Arabian market, the result for the first subperiod provides evidence of weak form of efficiency. However, the result for the second subperiod indicates inefficiency but this outcome would be reversed at the 1 percent level of significance (probability level is 0.04). Thus, an investigation of the two subperiods reveals efficiency in three of the markets in the second subperiod, and also in the Saudi Arabian market when the confidence level is increased.

### **Conclusion**

This study has tested the weak form of the EMH in four GCC markets: Bahrain, Kuwait, Oman and Saudi Arabia. The data set consisted of weekly stock price indexes over the period extending from September 1994 to April 1998. The weak form of efficiency was tested in three different ways: unit root, variance ratio and autocorrelation structure of returns.

In the case of the Kuwaiti market, results of the three tests provide evidence of weak form of efficiency. Although these results are not consistent with those of most previous studies on the Kuwaiti market mentioned earlier, they may reflect the institutional and operational changes that took place prior to or during the period of study.<sup>5</sup>

With respect to the other three markets, both the unit root and variance ratio tests provide evidence of weak form of efficiency. However, the regression results did not support this evidence. Suspecting a possible structural change in these markets halfway through the sample period, an appropriate test was applied. Although this test did not reveal a structural change, subsequent regression tests provided evidence of weak form of EMH in the second half of the sample period for both the Bahraini and Omani markets, but only at a higher confidence level for the Saudi Arabian market.

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<sup>5</sup> In effect, to mention just the main developments witnessed by the Kuwaiti market: in 1988, the settlement period was shortened and the market was opened to GCC nationals. In 1990, a law was introduced allowing investment funds; and in 1995, electronic trading was adopted (Arab Monetary Fund, 1997).

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