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Testing the predictability of the Saudi market indices returns: Evidence from TADAWUL market

Farouq Altahtamouni
Financial Sciences Department, Applied College,
Imam Abdulrahman Bin Faisal University,
Dammam, Saudi Arabia
fraltahtamouni@iau.edu.sa
ORCID 0000-0001-7207-6221

Abstract. The purpose of this study is to determine whether the market index returns and sectoral indices returns in the Saudi stock market (TADAWUL) follow a random walk process as stated by the efficient market hypothesis for the years 2011-2020. The normal distribution test, runs test, variance ratio test, and Augmented Dickey-Fuller (ADF) were used to check the study hypotheses. At the weak-form level, the empirical findings reject the random walk hypothesis, indicating proving that not all historical data is completely reflected in stock prices. The study's conclusions are significant for Saudi stock market investors who are forming investment portfolios resemble to the market's portfolio.

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1. INTRODUCTION

For investors, the financial market is essential, where they gather and exchange securities based on the market price determined by supply and demand for those securities, which reflects their fair price.

Any scholar understands that financial markets play a significant role in the processes of social and economic development, in addition to the growth of individual and institutional savings; this role is also played by global stock markets.

Although any investor would hope to be able to predict the direction of some commodity price movement, the Random Walk hypothesis contends that this is not a practical possibility. As the name suggests, the Random Walk Hypothesis (RWH) postulates that prices fluctuate and travel in an unpredictable manner.

Kendall (1953) was one of the first to speak about market efficiency, stating that stock price fluctuations are random. Fama (1965) also concluded that prices change randomly and that past changes do not predict future changes. The hypothesis of financial market efficiency states that for financial markets to be efficient, they must reflect the prices of securities in which all information is traded. The current price of securities

must therefore consider all information that is currently accessible. Furthermore, Investors can also be certain that the current price accurately reflects all information currently available regarding the security and that, based on this price, the anticipated returns are consistent with the risks they are taking. (Fama, 1970).

As a result, when we discuss market efficiency, we also discuss market information. In an efficient market, the security's market value must reflect its intrinsic value (fair price).

When financial products are traded at prices that accurately reflect their genuine economic value to investors, this is referred to as market efficiency (Chance, 2001). This efficiency is measured by the market's capacity to update stock prices in response to fresh information. This prevents the situation wherein some investors make unusual profits by utilizing information that is not accessible to others. There are three form for the efficient market hypothesis (Fama, 1970; Roberts, 1967):

1- Weak form

2- Semi strong form

3- Strong form

The first form, which is the focus of our research, assumes that the current price fully reflects all historical information.

This implies that past prices cannot be used to forecast future prices, and price changes must be random and independent. The reason for this is that the expected value of the random variable must be zero, and the "random walk hypothesis" as well as all previous studies that looked at market efficiency relied on this randomness in prices (Blasco et al, 1997).

Despite the fact that this model assumes that share prices accurately represent all previous returns and historical market data, it also assumes that no historical information has any relationship with future rates of return and that any use of historical information by investors does not allow them to achieve an extraordinary return.

The second form implies that current share price accurately reflects all information available to general investors, contain economic news and published financial data, in addition to historical information. Finally, the third form refers to a market in which share prices fully and fairly represent not only publicly available and historical information, but also all private information (internal company information). As a result, it assumes that no investor can make extraordinary profits by obtaining information from private sources. The efficient market theory, according to Samuelson (1965) and Fama (1970) assumes that the share price is adjusted in response to new information received by the market. Efficient market hypothesis considers whether share prices fully reflect historical prices. The following equation proves that the present price is identical to the prior price and other variables, supporting the random walk hypothesis:

$Pit = Pit\text{-}1 + E(R)it + \varepsilon it$

Pit = Current stock price for firm i

Pit-1 = Last closing price to current time t-1

E(R)it = Expected return (price change) at time t, also called drift

εit = Random Error

The following inquiries are addressed by this research:

1- Is the return of TASI, as well as the returns of the sectors operating in the Saudi market, characterized by a normal distribution?

2- Are the Saudi market indices' returns random?

Saudi Arabia's membership in the Group of Twenty, which contains the world's largest economies, makes this research extremely important. The importance of this study comes from the significance of market indices and their uses, and the possibility of achieving extraordinary profits by investors when speculating on the market index (market portfolio), with the assumption that there are investment portfolios similar to the market portfolio in the hands of some investors and the possibility of predicting the return of

the index and thus the possibility of predicting the return of their investment portfolios, as well as the market sectors indices, through which it is possible to identify the hypothesis of random movement in the Saudi stock market. Due to the fundamental function played by the Saudi stock market generally, as well as the function played by all sectors in the action of this market, the efficiency of the Saudi stock market is being studied.

2. LITERATURE REVIEW

Many studies have been performed to test market efficiency, which has been applied to many markets around the world and measured using different methods. Some research supported the random walk hypothesis, while others did not. (Fama, 1965) is one of the earliest of these studies, which looks at market efficiency using a weak form. The researcher applied serial autocorrelation and ran tests on a sample of American companies, concluding that stock prices behave randomly and that there is no correlation between the data used in the study.

(Moustafa, 2004) used the run test to test his model on 43 shares in the UAE market. The results revealed that 40 of those shares follow the efficient market theory at weak level.

(Rawashdeh & Sqaualli 2006) aimed to test market efficiency at the weak level by using ratio-of-variance tests and runs test on the general index of the Amman Stock Exchange and sectoral indices. The researchers reached a conclusion that the Amman Stock Exchange is inefficient for all indices.

(Asiri, 2008) studied the behavior of the shares of the Bahraini stock market, which are anticipated to move in a random walk. The study's goal was to determine the efficiency of the weak level. As basic stochastic tests for the nonstationarity of daily prices for all BSE listed companies, random walk models such as unit root and Dickey-Fuller tests are used. According to the study, the Bahraini stock market is efficient.

(Kim & Shamsuddin, 2008) used weekly and daily data to investigate multiple variance ratios based on the wild bootstrap and signs to test market efficiency in several Asian markets. They discovered that Hong Kong, Japanese, Korean, and Taiwanese markets were efficient at weak level. The markets of Indonesia, Malaysia, and the Philippines showed no signs of market efficiency, but they discovered evidence that the markets of Singapore and Thailand had become efficient following the Asian crisis.

Al-Jafari and Altaee (2011) examined the random walk hypothesis using unit root, runs, and variance ratio tests on the daily values of the Egyptian stock market index. They concluded that the Egyptian stock market did not follow the random walk hypothesis.

Market efficiency was examined by (Salameh et al., 2011) in Saudi Arabia, Amman, Kuwait, Dubai, Abu Dhabi, Egypt, Morocco, Tunisia, Qatar, Oman, Bahrain, and Palestine. The only market that exhibited random behavior in both the serial autocorrelation and runs experiments was the Saudi Market.

Al-Jafari and Abdulkadhim (2012) examined whether the Bahrain Bourse's share prices adhere to the efficient market theory at the weak level. On the daily price of all Bahraini share indexes, they used unit root, runs, and variance ratio tests. The results came by rejecting the random walk hypothesis, as the current prices do not reflect the historical data.

(Gimba, 2012) investigated the efficiency of the Nigerian stock market at a weak level by applying it to daily market index prices and five stocks of the oldest Nigerian banks. For the market index and four of the five chosen individual stocks, the empirical findings of the autocorrelation tests for observed returns categorically reject the null hypothesis of the existence of a random walk.

Similarly, by modifying and estimating Dockery and Kavussanos' multivariate model with panel data, (Nguyen et al., 2012) investigated whether the Taiwanese stock market follow the weak market efficiency theory. As a result, they discovered that the Taiwan stock market was inefficient at the time.

The Unit Root, Dickey-Fuller, Pearson Correlation, Durbin-Watson, and Wald-Wolfowitz runs-tests were used in the research (Asiri & Alzeera, 2013) to test the random walk hypothesis on the general index and sectoral indices of fifteen sectors of the Saudi stock market. They found that the results of the four tests supported the weak-form market efficiency of the Saudi stock market for all share prices and 11 individual sectors.

(Mathivannan and Selvakumar, 2015) investigated the efficiency of national stock exchange using the run and serial correlation tests. The findings confirm that the national stock exchange is efficient market at weak level

Two structural breakdowns and three unit root tests were employed by (Mishra et al., 2015) to examine the random walking hypothesis in the Indian stock market. The findings emphasize the significance of considering heteroskedasticity when testing for a random walk with high frequency financial data.

(Hawaldar et al. 2017) carried out a research to assess the weak form of market efficiency of specific stocks listed on the Bahrain Bourse. The Kolmogorov-Smirnov goodness of fit test, run test, and autocorrelation test were all used. The findings have come inconsistent with randomness.

The study by Roy (2018) sought to test the random walk hypothesis by applying it to several market indices. It is observed that the null hypotheses of the daily return of the indices are rejected and in few cases are accepted based on various test statistics.

(Fadda, 2019) investigated the random walk hypothesis for several European, American, and Asian indices using the ratio-of-variance test. Based on the test results, the random walk hypothesis for the American, French and British indicators was rejected. However, the German, Spanish, and all three Asian indices—Japanese, Chinese, and Indian—did not reject the random walk hypothesis.

This study is important because it adds to the literature important information about one of the most important markets in the Arabian Gulf and in the G20 countries. What distinguishes this study from other studies that it is a modern study testing all indices of market sectors, especially after reclassifying the market sectors into twenty one sectors after it was classified into 16 sectors.

3. METHODOLOGY

3.1. Population and sample

The population of the study is the Saudi stock market, which includes all indices. The study sample included the daily returns of TASI and the daily returns of 19 sectoral indices for the period 2011-2020, which are as follows: Tadawul All Share Index: TASI, Capital Goods, Energy, Materials, Commercial and Professional Services, Transportation, Consumer Durables and Apparel, Consumer Services, Media and Entertainment, Retailing, Food and Staples Retailing, Food and Beverages, Health Care Equipment and Services, Pharma, Biotech and Life Science, Diversified Financials, Insurance, Telecommunication Services, Utilities, Real Estate Management and Development, Banks.

3.2. Study hypotheses

Based on the study objectives, the following study hypotheses can be developed to test the efficiency of Saudi market indices as follows:

H01: Market index and sectoral indices follow a normal distribution.

H02: Market index and sectoral indices returns follow random walk hypothesis.

3.3. Statistical technique used

With the help of the statistical analysis application EViews, the researcher conducted the following statistical tests:

1- Normality Test

According to Fama (1970), changes in stock prices must be Independently and Identically Distributed (IDD); thus, price directional movement or dependence cannot be used to predict future movements or prices.

The Kolmogorov-Smirnov and non-parametric Jarque-Bera tests will be used to determine whether the general index return series and sectoral index return series are consistent with a normal distribution. The P value was used to evaluate the hypothesis in this test. If the value of P is less than 5%, it indicates that the series of returns does not follow a normal distribution and that the directional movement of prices or its reliability can be used to predict future movements or prices.

2- Run Test

The run test, a non-parametric analysis, is used to determine the randomness of an observed sequence. The test assumes that if a data series is random, the observed number of runs in the series should be close to the expected number of runs.

According to Fama (1965), this test investigates the sequential dependence of stock price movements. Prices are said to be independent if there is no effect. The nonparametric runs test examines the degree of independence in market returns because it is one of the tests that examines how closely the random variable values are related to one another. The goal is to assess the randomness of those values and, as a result, the market's efficiency in the absence of these values. This test is based on the repetitions in the variable's values. If values are repeated in the same direction, whether the change is positive or negative, this indicates a correlation between values. To calculate the value of Z and compare it to the value of Z at the level of significance of 0.05, the following equations must be used:

$$E(r)=\frac{2n_1n_2}{n_1+n_2}+1$$

whereas:

E(r): is theanticipated value of runs.

n1: the number of observations that are higher than the sample mean.

n2: The number of observations that fall below the sample mean.

$$\sigma^2(r)=\frac{2n_1n\ (2n_1n_2-n_1n_2)}{(n_1+n_2)^2(n_1+n_2-1)}$$

whereas:

σ^2: variance of runs

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

3- Variance Ratio Test

This test is also one of the most important for testing the random walk hypothesis of time series, and it has attracted the interest of numerous researchers who want to use it to investigate the efficiency of financial markets. A model for this evaluation was suggested by Lo and MacKinlay. (1988). By determining whether the series of returns follows the random walk hypothesis, the test assumes that the variance of a time series that runs randomly increases linearly with time. This means that when the variance of the qth

difference equals q times the variance of the first difference, the returns will follow a random walk. It is determined as follow:

$$VR(q) = \frac{\sigma^2(q)}{\sigma^2(1)}$$

where σ^2 (q) is the unbiased estimator of 1/q of the variance of the qth difference and σ^2 (1) is the variance of the first difference. The variance ratio is calculated in the case of homoscedasticity and heteroscedasticity. Z(q) is the standard normal test statistic used to test the null hypothesis of the random walk under the assumption of homoscedasticity, and Z*(q) is the standard normal test statistic used under the assumption of heteroscedasticity.

H0: The variance ratio is equal to one, which means that the series follows a random walk hypothesis.

H1: The variance ratio is not equal to one, which means that the series does not follow a random walk hypothesis.

If VR = 1, this means that the series takes a random walk. If VR > 1, then computed Z(q) and Z*(q) are positive, and returns are positively correlated, and the null hypothesis is rejected. If VR < 1, then computed Zq and Z*q are negative, and returns are negatively correlated; thus, the null hypothesis is rejected.

4- Augmented Dickey-Fuller Test

This test is one of the most important tests for unit root testing (Engle and Granger, 1987). With serial correlation, the Augmented Dickey-Fuller test can be used. The null hypothesis of the ADF test is that there is a unit root, which means that the chain is nonstationary and the market is efficient, and vice versa.

The following equations form the basis of the model:

With intercept: $\Delta R_t = \alpha + \rho R_{t-1} + \varepsilon_t$

With intercept & with trend: $\Delta R_t = \alpha + \beta t + \rho R_{t-1} + \varepsilon_t$

Where:

R_t: Time series of market returns on day t and day t-1

ρ: Coefficient of market return variable per day t-1 (root of the time series Rt)

β: time direction coefficient

ε: random error

4. EMPIRICAL RESULTS AND DISCUSSION

4.1. Normality test

Table 1 shows the results of the normal distribution of all Saudi market indices. The results show that the calculated z values are statistically significant at the 5% significance level, indicating that none of the indices follow a normal distribution. Therefore, the null hypothesis H01 was disproved. This contradicts the random walk model and indicates market inefficiency at the weak level.

Table 1

Normality test results

Index	**Jarque-Bera**	**Kolmogorov-Smirnov**	**H01 Test Results**
TASI	732.8700*	8.438*	Reject
Capital Goods	1231.842*	8.731*	Reject
Energy	1021.757*	8.293*	Reject
Materials	765.0874*	8.557*	Reject
Commercial and Professional Services	652.3456*	9.062*	Reject
Transportation	1606.651*	8.761*	Reject
Consumer Durables and Apparel	2395.221*	8.740*	Reject
Consumer Services	1703.889*	9.044*	Reject
Media and Entertainment	569.8035*	10.122*	Reject
Retailing	1238.560*	9.054*	Reject
Food and Staples Retailing	1000.528*	9.118*	Reject
Food and Beverages	1451.554*	9.135*	Reject
Health Care Equipment and Services	1516.916*	9.079*	Reject
Pharma, Biotech and Life Science	1866.287*	9.449*	Reject
Diversified Financials	4812.740*	9.319*	Reject
Insurance	1155.379*	8.441*	Reject
Telecommunication Services	473.1499*	8.554*	Reject
Utilities	1438.653*	9.258*	Reject
Real Estate Management and Development	422.6086*	8.914*	Reject
Banks	768.1249*	8.631*	Reject

Source: own calculation. * Indicates Significance level at 1% level.

4.2. Run test

As shown in Table 2, at the 1% and 5% level of significance, TASI daily returns and 15 sectors returns follow random walk, whereas four sectors daily returns do not: Commercial and Professional Services, Consumer Services, Media and Entertainment, and Pharma, Biotech and Life Science. As a result, the null hypothesis H02 was rejected, this result confirms that the indicators do not follow the random walk hypothesis.

Table 2

Run test results

Index	**Z Statistic**	**H02 Test Results**
TASI	-3.927*	Reject
Capital Goods	-3.230*	Reject
Energy	-2.027**	Reject
Materials	-3.420*	Reject
Commercial and Professional Services	-1.583	Fail to reject
Transportation	-3.040*	Reject
Consumer Durables and Apparel	-2.977*	Reject
Consumer Services	-1.584	Fail to reject
Media and Entertainment	.380	Fail to reject
Retailing	-2.280**	Reject
Food and Staples Retailing	-2.280**	Reject
Food and Beverages	-2.977*	Reject
Health Care Equipment and Services	-2.470**	Reject
Pharma, Biotech and Life Science	.290	Fail to reject
Diversified Financials	-2.53**	Reject
Insurance	-2.977*	Reject
Telecommunication Services	-2.407**	Reject
Utilities	-3.101*	Reject
Real Estate Management and Development	-4.624*	Reject
Banks	-4.307*	Reject

Source: own calculation. * indicates significance level at 1% level, ** indicates significant level at 5% level

4.3. Variance ratio test

The variance ratio was calculated in the case of homoscedasticity and heteroscedasticity. It is noticed that the variance values decrease with the increase in the number of slowdown periods for the returns of the market index and sectoral indices. The results of the variance ratio (VR) test shown in table 3 also showed that the TASI returns and sectoral indices returns do not follow the random walk model, where the Z-Statistic value was significant at a level less than 1%. Accordingly, the null hypothesis H02 was rejected for TASI and for sectoral indices in the case of homoscedasticity and heteroscedasticity.

Table 3

Variance Ratio results

Index	***q***	**VR(*q*)**	**Z**	**Z***
TASI	2	0.611472	-12.26790*	-6.327928*
	4	0.294103	-11.91392*	-6.465694*
	8	0.145251	-9.123932*	-5.479118*
	16	0.076639	-6.623662*	-4.373228*
Capital Goods	2	0.603447	-12.52127*	-6.704636*
	4	0.284588	-12.07452*	-6.828167*
	8	0.150779	-9.064924*	-5.686676*
	16	0.073324	-6.647444*	-4.551985*
Energy	2	0.495067	-15.94342*	-6.893761*
	4	0.253117	-12.60567*	-5.845639*
	8	0.135606	-9.226888*	-4.752120*
	16	0.059884	-6.743856*	-3922078*
Materials	2	0.572105	-13.51091*	-6.193819*
	4	0.280415	-12.14495*	-6.051523*

	8	0.134263	-9.241230*	-5.194638*
	16	0.069813	-6.672628*	-4.162917*
Commercial and Professional Services	2	0.528384	-14.89143*	-8.341161*
	4	0.254607	-12.58053*	-7.788264*
	8	0.132637	-9.25879*	-6.523155*
	16	0.064822	-6.708431*	-5.239437*
Transportation	2	0.595215	-12.78120*	-6.599192*
	4	0.275413	-12.22936*	-6.541786*
	8	0.138940	-9.191300*	-5.337536*
	16	0.069190	-6.677100*	-4.202378*
Consumer Durables and Apparel	2	0.558341	-13.94553*	-7.075451*
	4	0.269242	-12.33352*	-6.745957*
	8	0.136638	-9.215877*	-5.654394*
	16	0.068781	-6.680035*	-4.500218*
Consumer Services	2	0.597531	-12.70808*	-6.889466*
	4	0.283206	-12.09785*	-6.608162*
	8	0.136536	-9.216962*	-5.483708*
	16	0.072553	-6.652977*	-4.306389*
Media and Entertainment	2	0.543811	-14.40431*	-8.147542*
	4	0.250697	-12.64651*	-8.189617*
	8	0.138199	-9.199212*	-6.864635*
	16	0.067106	-6.692050*	-5.498695*
Retailing	2	0.592253	-12.87475*	-7.555171*
	4	0.302032	-11.78009*	-7.035617*
	8	0.156645	-9.002310*	-5.758942*
	16	0.078401	-6.611024*	-4.462479*
Food and Staples Retailing	2	0.536789	-14.62602*	-7.745272*
	4	0.273588	-12.26017*	-6.988866*
	8	0.139608	-9.184174*	-5.910070*
	16	0.069411	-6.675511*	-4.911512*
Food and Beverages	2	0.567655	-13.65142*	-6.991848*
	4	0.292853	-11.93502*	-6.501410*
	8	0.137113	-9.210800*	-5.414203*
	16	0.068761	-6.680173*	-4.216702*
Health Care Equipment and Services	2	0.606537	-12.42370*	-6.169108*
	4	0.300192	-11.91116*	-6.245291*
	8	0.149102	-9.082825*	-5.314070*
	16	0.073469	-6.646400*	-4.284576*
Pharma, Biotech and Life Science	2	0.502624	-15.70480*	-7.927572*
	4	0.244728	-12.74727*	-6.358040*
	8	0.119478	-9.399047*	-4.902955*
	16	0.059239	-6.748479*	-3.813793*
Diversified Financials	2	0.603153	-12.53058*	-6.122708*
	4	0.272894	-12.27189*	-5.396616*
	8	0.129487	-9.292205*	-4.330665*
	16	0.065454	-6.703898*	-3.526037*
Insurance	2	0.590117	-12.94217*	-6.612931*
	4	0.281864	-12.12049*	-6.668300*
	8	0.137086	-9.211093*	-5.643473*
	16	0.069798	-6.672733*	-4.562912*
Telecommunication Services	2	0.606475	-12.42566*	-8.103272*
	4	0.292432	-11.94213*	-7.983389*
	8	0.147554	-9.099357*	-6.416361*
	16	0.074712	-6.637487*	-4.987346*
Utilities	2	0.552681	-14.12424*	-7.715208*

	4	0.280907	-12.13665*	-7.093471*
	8	0.135937	-9.223359*	-6.007610*
	16	0.071813	-6.658284*	-4.856506*
Real Estate Management and Development	2	0.584602	-13.11631*	-7.026732*
	4	0.290998	-11.96633*	-6.775926*
	8	0.146214	-9.113651*	-5.613671*
	16	0.072613	-6.652544*	-4.515315*
Banks	2	0.565010	-13.73495*	-6.622401*
	4	0.285524	-12.05873*	-6.364406*
	8	0.140522	-9.174417*	-5.448013*
	16	0.075478	-6.631992*	-4.418226*

Source: own calculation. * Indicates Significance level at 1% level.

4.4. Augmented Dickey-Fuller (ADF) Test

Table 4 shows the results, which show that all indices were stationary with the constant in the equation and with the constant and trend.

As a result, the null hypothesis H02 was rejected, that is, the indices do not have a unit root and are stationary. As a result, future prices can be predicted based on historical prices, which contradicts the random walk hypothesis and indicates the Saudi stock market's inefficient at the weak level.

Table 4

ADF results

Index	**ADF (With Intercept) At Level**	**ADF (With Intercept and Trend) At Level**	**H02 Test Results**
TASI	-26.39654*	-26.38604*	Reject
Capital Goods	-26.80089*	-26.78981*	Reject
Energy	-30.70559*	-30.73192*	Reject
Materials	-28.29010*	-28.28174*	Reject
Commercial and Professional Services	-29.03020*	-29.07163*	Reject
Transportation	-26.96494*	-26.96804*	Reject
Consumer Durables and Apparel	-27.60776*	-27.63174*	Reject
Consumer Services	-27.23331*	-27.35681*	Reject
Media and Entertainment	-28.26591*	-28.25209*	Reject
Retailing	-25.17888*	-25.22963*	Reject
Food and Staples Retailing	-28.43957*	-28.42857*	Reject
Food and Beverages	-27.19563*	-27.18508*	Reject
Health Care Equipment and Services	-26.93679*	-26.92953*	Reject
Pharma, Biotech and Life Science	-31.84689*	-31.83352*	Reject
Diversified Financials	-28.30031*	-28.31324*	Reject
Insurance	-27.88356*	-27.87063*	Reject
Telecommunication Services	-26.87180*	-26.88294*	Reject
Utilities	-28.72282*	-28.71862*	Reject
Real Estate Management and Development	-26.88922*	-26.88876*	Reject
Banks	-27.68039*	-27.67806*	Reject

Source: own calculation. * Indicates Significance level at 1% level.

5. CONCLUSION

The purpose of this study was to test the market efficiency hypothesis based on the weak form, also known as the random walk hypothesis, by applying it to the general index of the Saudi stock market TASI and the 19 sectoral indices out of 21 sectors for which data was available. The results of the normal distribution test revealed that all indices do not consistent with a normal distribution. The empirical results revealed that all indices did not behave randomly when subjected to the variance ratio and the Augmented Dickey-Fuller (ADF) tests. The runs test, on the other hand, confirmed that there are four indices follow on the random walk theory. Based on these results, this means that the Saudi stock market is characterized by randomness in some sectors. These findings support the findings of (Asiri and Alzeera, 2013) and (Salameh et al, 2011), which discovered that the Saudi market follows the random walk hypothesis based on the runs test. These findings confirm that a prudent investor in the Saudi market can achieve abnormal profits without relying on other investors, as current data is dependent on historical data. This research adds value to previous research on the Saudi stock market, which is one of the most important in the Arab Gulf region and the Middle East.

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