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Random walk tests for the MENA stock returns

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ABSTRACT

Purpose — *The current study seeks to understand whether individual stock returns exhibit random movement and are not dependent (efficient at weak form) on fourteen out of sixteen actively traded Arab stock markets in the Middle East and North Africa (MENA) region, based on the size of the market value.*

Method — *Various non-parametric methods, including autocorrelation test, variance ratio test, Phillips-Perron unit root test, and runs test, are used to assess the random walk hypothesis for daily data following the Covid-19 vaccination program. This analysis covers the period from January 3, 2021, to March 28, 2023.*

Result — *The study results present evidence that all individual stock returns deviate from random walk behavior. However, only Kuwait, Jordan, and Palestine stock returns follow the random walk based on the run test results at a significance level of 10%. Therefore, it can be concluded that all stock returns are inefficient at the weak-form, suggesting that investors have opportunities for unexpected gains..*

Practical implications — *The findings of this study suggest that investors in the MENA region may have opportunities for unexpected gains, as individual stock returns deviate from random walk behavior, highlighting the importance of considering market dynamics and employing informed investment strategies. Additionally, policymakers could benefit from understanding the inefficiencies in stock returns to implement measures that promote market stability and efficiency.*

Keywords: *random walk, market efficiency, stock market, MENA region, non-parametric method*

INTRODUCTION

Despite the stock market's response to a range of significant occurrences, including but not limited to pandemics, political incidents, acts of terrorism, and warfare (Asaad, 2021), market efficiency is still widely defined, remaining a contentious subject within finance literature (Bonga et al., 2023). Therefore, understanding the dynamics of stock markets relies heavily on grasping the fundamental role of the market efficiency concept (Saleem et al., 2023). For several decades, the random walk concept has been a topic of extensive research and debate in finance, particularly in the context of stock market returns (Sangvinatsos, 2017). The Efficient Market Hypothesis, introduced by Fama (1970), posits that prices fully incorporate all available information in an efficient market (El-Diftar, 2024; Jethwani & Achuthan, 2013).

In essence, the importance of testing the efficient market hypothesis asserts that stock prices incorporate all available information, so the arrival of new information leading to changes in stock prices is inherently unpredictable. This unpredictability arises because anticipated future events are already factored into current prices (Marsani et al., 2022). When new information emerges, stock prices fluctuate randomly, rising or falling. This concept is known as the random walk hypothesis, referring to stock price movements following a random and unpredictable pattern (Smerkolj & Jeran, 2023). The debates surrounding EMH in empirical finance literature stem from its importance and implications for investors' returns. Hence, researchers and professionals have extensively analyzed the efficient market hypothesis in emerging and established stock markets (Angelovska, 2018). Mixed results found in previous studies. For

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instance, some studies reject the random walk hypothesis (Dias et al., 2022; Houfi, 2019); at the same time, others found the existence of random walk behaviors (Zebende et al., 2022). The need for more consensus or agreement among researchers and studies is apparent.

Numerous studies provide empirical evidence supporting the validity of the random walk model of stock returns in developed markets (Chiwira, 2012). While many scholars suggest that developed markets generally exhibit weak efficiency (Hkiri et al., 2021), Haroon (2012) reveals that the Karachi stock exchange was weak-form efficient from November 1991 to November 2011. Bonga et al. (2023) confirm these efficiency results from January 2020 to February 2022. Faisal et al. (2022) found that the Indonesian Stock Exchange was efficient during COVID-19. Marsani et al. (2022) demonstrate empirical evidence of an efficient market in Malaysia's extreme stock returns during the financial crisis and recovery period. Zebende et al. (2022) show that the stock markets in the world's wealthiest countries (G-20 group) tend to be efficient for less than five days. Vural & Hailu (2020) found evidence of some parts of weak-form efficiency, such as in VAKBAN and YAKBNK, and all indexes using runs test except for AKBANK and GARAN. According to Kok & Geetha (2023), the ASEAN stock market composite indices before and during the COVID-19 pandemic cannot be predicted in both periods. Pontoh & Budiarso (2023) assert that obtaining extraordinary returns by investing in the Indonesian stock market is impossible. Smerkolj & Jeran (2023) show that only the Indian (BSE Sensex 30 Index) return is efficient. Gozbasi et al. (2014) report that the Turkish stock markets are weak-form efficient, while Chen & Metghalchi (2012) found that the Brazilian stock index is a strongly weak form of market efficiency. Singh & Sapna (2013) conclude that the Hong Kong and Bombay stock exchanges are weakly efficient, and the results of Patel et al. (2012) show that the daily closing prices in HANSENG and SSE Composite are efficient at weak form. Lahmiri (2013) found that the Jordan and Saudi stock markets are not predictable and follow a random walk, with similar results addressed by Moustafa (2004) in a study of the United Arab Emirates stock market involving forty individual stocks.

The random walk hypothesis has been extensively tested in developing or emerging markets. While many studies indicate that emerging markets generally exhibit nonefficiency at the weak form, particularly evident in seven emerging stock markets (China, India, Mexico, Russia, South Korea, Taiwan, Turkey) (Smerkolj & Jeran, 2023), Kok & Geetha (2023) demonstrate nonefficiency of the weak form in the ASEAN stock market before and during the COVID-19 pandemic. El-Diftar (2024) found evidence of non-random stock price behavior in nine major emerging markets, while the findings of Rahimah et al. (2018), Nikita & Soekarno (2012) corroborated by Lee & Ande (2022), concluded that the Indonesian stock market (particularly in the pharmaceutical and telecommunication sectors) is predictable and nonefficient at the weak form both pre and during the pandemic. Additionally, the rejection of the random walk hypothesis was demonstrated by Dias et al. (2022) for stock markets in Botswana, Egypt, Kenya, Morocco, Nigeria, South Africa, the UK, Japan, and the USA during the pandemic. Khoj & Akeel (2020) found that the Tadawul All Share Index (TASI) of the Saudi stock market is inefficient at the weak form, a result consistent with the findings of Al-Faryan & Dockery (2021) study, which rejected the random walk hypothesis of the Saudi stock market, with both studies presenting evidence of stock price predictability.

Diallo et al. (2021) reject the efficient market hypothesis in the regional stock exchange (West African Economic and Monetary Union), while Elangovan et al. (2022) indicate that the Indian stock market does not follow a random walk and is inefficient at the weak form. Akwolaga (2020) finds that the Mauritius stock exchange is weak-form inefficient, and Pervez et al. (2018) similarly suggest that the Bangladesh stock exchange is not efficient in weak form, consistent with the findings of Ahmed & Hossain (2019), implying that arbitrage profit may be possible for investors in the Bangladesh stock market. Wen et al. (2010) demonstrate that both the Shenzhen and Shanghai Chinese stock markets are not weak-form efficient. Jethwani & Achuthan (2013) conclude that the Indian stock market did not follow a random walk during, before, and after the financial crisis. Khan & Vieito (2012) show that the Portuguese stock market could be more efficient in weak form. Recent studies highlight that stock markets do not follow weak-form efficiency, such as Al-Ajmi & Kim (2012) in the Gulf Cooperation Council (GCC), Asaad (2014) for

listed banks in the Iraq stock market, Asaad et al. (2015) for the daily closing price of the Iraqi stock index, Hawaldar et al. (2017) for Bahrain Bourse, and Houfi (2019) for the Tunisian stock market. Meanwhile, Lahmiri (2013) suggests that the Kuwait, Tunisia, and Morocco markets are inefficient among twelve Arab stock markets from January 2009 until November 2010. Al-Nassar (2021) focuses on the Saudi Arabia stock market, and Almujamed (2018) examines the Qatari stock exchange from 2014 to 2017.

This study focuses on the weak form of efficiency because various studies suggest that stock prices in emerging market economies do not follow a random walk pattern (Akwolaga, 2020; Al-Faryan & Dockery, 2021; Elangovan et al., 2022), given the continued popularity of emerging markets among investors. Furthermore, the study aims to determine weak-form efficiency by investigating the random walk hypothesis, addressing whether individual stock returns exhibit random movement and are not dependent (efficient), with the aim of encouraging both domestic and foreign investors to increase their investments in a selection of stock markets in the MENA region. This is particularly relevant as some investors are optimistic about the economies of these countries and may view declines in stock markets as investment opportunities. In summary, there is a need for greater consensus among scholars regarding whether stock markets follow a random walk or become efficient at weak forms in emerging or developing countries. Therefore, this study seeks to explore the efficiency at weak form of 14 out of 16 actively traded Arab stock markets in the MENA region. The novelty lies in addressing a gap identified in the literature, where insufficient attention has been given to this topic in the MENA region, primarily due to mixed results found in past studies regarding investors' ability to achieve abnormal profits using historical data.

METHOD

Sampling and data collection

The study sample was collected from secondary sources. The study scope focused on 14 out of 16 actively traded Arab stock markets in the MENA region, divided into three groups based on the size of the market value. The Saudi Exchange and the Abu Dhabi Securities Exchanges are considered mega markets (more than $200 billion), while ten markets are considered large markets (between $10 to $200 billion), such as the Qatar Stock Exchange, Dubai Financial Exchange, Bourse Kuwait, Muscat Stock Exchange, Casablanca Stock Exchange, The Egyptian Exchange, Bahrain Bourse, Amman Stock Exchange, and Iraq Stock Exchange. The remaining three markets are considered small markets (value less than $10 billion), including the Bourse de Tunis, Palestine Exchange, and Damascus Stock Exchange. The other two markets, the Beirut Stock Exchange and the Khartoum Stock Exchange, are excluded due to unavailable data. Additionally, the study hypotheses were tested using various statistical methods with the Eviews12 and SPSS26 software packages after converting the daily closing price of the stock markets to return. In general, the data were obtained from Yahoo Finance for the period between January 3, 2021, to March 28, 2023, totaling 5272 daily stock returns. The study's stock market background is shown in Table 1.

Table 1. Stock markets information

No.	Country	Market	Index	Market Type	Period		Observation
1.	Saudi	TDWL	TASI	Mega 1	3-1-2021	28-3-2023	558
2.	UAE	ADI	FTSE ADGI	Mega 2	3-1-2021	28-3-2023	562
3.	Qatar	QE	QE All Share	Large 1	3-1-2021	28-3-2023	555
4.	UAE	DFM	DFMGI	Large 2	3-1-2021	28-3-2023	561
5.	Kuwait	BK	Premier Market	Large 3	4-1-2021	28-3-2023	546
6.	Oman	MSX	MSX30	Large 4	25-5-2021	28-3-2023	454
7.	Morocco	CSE	MASI Free Flout	Large 5	4-1-2021	28-3-2023	551
8.	Egypt	EGX	EGX30	Large 6	3-1-2021	28-3-2023	447
9.	Bahrain	BSE	BASI	Large 7	1-8-2021	28-3-2023	408
10.	Jordan	ASE	ASE100	Large 8	28-3-2021	28-3-2023	494

11.	Lebanon	BSE	BLOM	Large 9	-	-	-
12.	Iraq	ISX	ISX60	Large 10	28-3-2021	28-3-2023	528
13.	Sudan	KSE	KSE30	Large 11	-	-	-
14.	Tunis	TSE	TUNINDEX	Small 1	4-1-2021	28-3-2023	558
15.	Palestine	PSE	Al-Quds	Small 2	3-1-2021	28-3-2023	540
16.	Syria	DSE	DWX	Small 3	3-1-2021	28-3-2023	532

Source: Authors' compilation (2024)

Study measurements and data analysis

The random walk hypothesis was used as a key measurement for checking the efficiency of the stock market at the weak form (Saleem et al., 2023). Firstly, the movement of stock market returns was determined through visual inspection and descriptive statistics using skewness, kurtosis, and the Jarque-Bera test to assess the normality of the data. Secondly, to strengthen the results, some nonparametric methods were applied to examine the random walk hypothesis, such as autocorrelation tests, variance ratio tests, Phillips-Perron unit root tests, and runs tests.

The data for the study variable consisted of all index closing prices converted to the index returns of the selected stock market, representing the differences between two consecutive prices based on the equation:

$$R_t = \text{Log}\ (P_t/P_{t\text{-}1})$$

Where:
R_t = index return for period t
Log = Natural Logarithm
P_t = market price index for period t
$P_{t\text{-}1}$ = market price index for period t-1>

Hypotheses development

In the random walk model, a non-efficient stock market reveals that consecutive stock price changes are non-independent and do not follow a similar distribution. Fama (1970) indicated that investors cannot use past stock prices or market changes to predict future changes. The current study attempts to test the random walk approach to determine the efficiency of stock returns at the weak form using non-parametric methods to discover deviations from the random walk in stock returns. If the market does not follow a random walk process, it can reject the Efficient Market Hypothesis, suggesting that future stock market changes are predictable by investors due to the possibility of using historical data to achieve abnormal profits.

Based on the discussion above, the first hypothesis is that individual stock returns move randomly and are dependent (not efficient). The second hypothesis is that market size does not influence individual stock market returns.

RESULT AND DISCUSSION

Descriptive statistics

In general, the visual inspection by plotting the stock returns, as depicted in Figure 1 for the period between January 3, 2021, to March 28, 2023, in the MENA region, indicates that the movements of returns are deviating from normality. This observation is further supported by the Q-Q plot, shown in Figure 2, where the points diverge significantly from the line. Additionally, the skewness, kurtosis, and Jarque-Bera test, conducted at a significance level of less than 1%, confirm the abnormal distribution, as presented in Table 2. These preliminary investigation results demonstrate that the assumption of normality cannot be accepted for daily returns in all stock markets. Therefore, the study applies non-parametric techniques to account for the substantial deviations from normality in the return distribution.

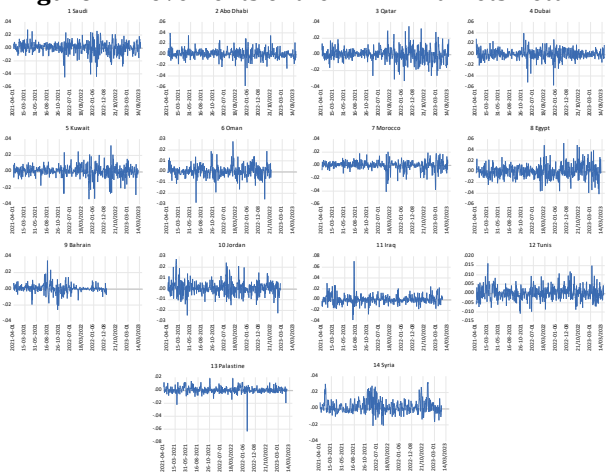
Table 2. Descriptive statistics of the MENA markets' return

Market	Index	Mean	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Observation
Saudi	TASI	0.0004	0.0091	-0.7331	6.0004	258.831*	557
Abu C	FTSE ADGI	0.0012	0.0085	-0.0707	9.0609	859.1369*	561
Qatar	QE All Share	0.0002	0.0084	0.0083	5.2965	121.7482*	554
Dubai	DFMGI	0.0006	0.0091	-0.5686	8.8175	819.8572*	560
Kuwait	Premier Market	0.0005	0.0072	-0.7657	7.5521	523.8099*	545
Oman	MSX30	0.0005	0.0055	0.0515	7.6435	407.1847*	453
Morocco	MASI Free Flout	-0.0001	0.0069	-1.1624	8.7834	890.3793*	550
Egypt	EGX30	0.0008	0.0126	0.277	4.7492	76.5927*	546
Bahrain	BASI	0.0004	0.0054	0.2065	10.5438	967.981*	407
Jordan	ASE100	0.0008	0.0064	0.4788	5.5055	147.7816*	493
Iraq	BLOM	0.0005	0.0084	1.4694	14.7327	3212.342*	527
Tunis	ISX60	0.0003	0.0035	0.4204	4.6222	77.4855*	557
Palestine	KSE30	0.0006	0.0053	-3.2294	44.1364	38940.98*	539
Syria	TUNINDEX	0.0027	0.0081	0.8238	4.6347	119.1831*	531

Note: Asterisk (*) denotes the rejection of the normality hypothesis at the 1% significance level.

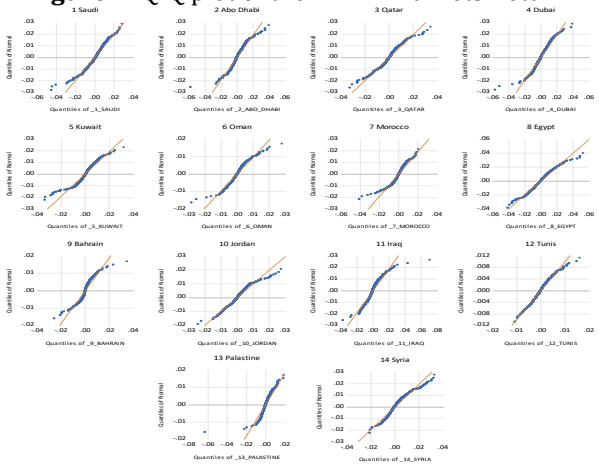
Source: Processed data (2024)

Figure 1. Movements of the MENA markets' return



Source: Processed data (2024)

Figure 2. Q-Q plot of the MENA markets' return



Source: Processed data (2024)

Non-parametric methods

The results of the non-parametric autocorrelation test are presented in Table 3, which aligns with the findings from visual inspection and descriptive statistics output. It indicates that the movement of all stock returns for one period is correlated with the return movements in the previous period.

Table 3. Autocorrelation test results for the MENA markets' return

Lag	Saudi		Abu Dhabi		Qatar		Dubai		Kuwait		Oman		Morocco	
	AC	Q-Stat	AC	Q-Stat	AC	Q-Stat	AC	Q-Stat	AC	Q-Stat	AC	Q-Stat	AC	Q-Stat
1	.142	11.232*	.140	11.114*	.212	25.097*	.099	5.522*	.164	14.664*	.198	17.852*	.165	15.011*
2	.071	14.063*	.054	12.761*	.081	28.739*	-.012	5.604*	.031	15.185*	.093	21.791*	.152	27.826*
3	.063	16.294*	-.031	13.301*	.050	30.137*	.059	7.575*	-.052	16.656*	.161	33.599*	-.021	28.067*
4	.017	16.448*	-.042	14.305*	.051	31.577*	-.027	7.984*	.057	18.459*	.151	44.062*	-.022	28.339*
5	.018	16.634*	.005	14.317*	-.030	32.087*	-.026	8.369*	.007	18.485*	.080	47.020*	-.034	28.982*
6	-.064	18.929*	-.055	16.016*	-.078	35.474*	-.053	9.947*	-.006	18.507*	.015	47.128*	-.006	29.003*
7	-.074	21.988*	.009	16.058*	-.082	39.239*	.035	10.645*	-.008	18.539*	.022	47.349*	.025	29.364*
8	.010	22.050*	.006	16.078*	-.110	46.072*	.032	11.220*	.055	20.198*	.062	49.154*	-.064	31.645*
Lag	**Egypt**		**Bahrain**		**Jordan**		**Iraq**		**Tunis**		**Palestine**		**Syria**	
	AC	Q-Stat	AC	Q-Stat	AC	Q-Stat	AC	Q-Stat	AC	Q-Stat	AC	Q-Stat	AC	Q-Stat
1	.197	21.351*	.162	10.720*	.176	15.354*	.195	20.217*	.211	24.837*	.117	7.379*	.475	120.373*
2	.081	24.996*	.188	25.313*	.081	18.593*	.034	20.844*	.079	28.295*	.114	14.473*	.227	148.049*
3	.062	27.083*	.040	25.960*	.034	19.170*	-.019	21.030*	.004	28.304*	.027	14.872*	.188	167.021*
4	-.010	27.140*	.012	26.020*	.086	22.860*	.006	21.052*	.005	28.320*	-.068	17.385*	.138	177.281*
5	-.043	28.154*	.016	26.120*	.054	24.335*	-.086	25.022*	.098	33.769*	.033	17.965*	.099	182.588*
6	.025	28.501*	-.122	32.276*	-.017	24.486*	-.091	29.484*	.014	33.881*	.021	18.208*	.124	190.941*
7	.032	29.074*	-.032	32.706*	-.007	24.509*	-.067	31.921*	-.058	35.767*	-.014	18.312*	.128	199.752*
8	.056	30.815*	.062	34.307*	-.029	24.918*	-.073	34.778*	.019	35.968*	.061	20.382*	.079	203.104*

Note: Asterisk (*) denotes the rejection of the random walk hypothesis at the 1% significance level.

Source: Processed data (2024)

The result of the second non-parametric variance ratio test is displayed in Table 4, and it is consistent with the output of the autocorrelation test.

Table 4. Variance ratio test results for the MENA markets' return

Market	Period	2	4	8	16
Saudi	VR	0.543073	0.289133	0.146553	0.074605
	Z	-6.08564*	-5.391954*	-4.415825*	-3.515361*
Abu Dhabi	VR	0.551802	0.305894	0.146391	0.071739
	Z	-5.195807*	-4.8077*	-4.336167*	-3.559728*
Qatar	VR	0.584580	0.302993	0.178957	0.076624
	Z	-6.728506*	-6.455615*	-5.143114*	-4.144552*
Dubai	VR	0.563413	0.287454	0.136246	0.072332
	Z	-5.662908*	-5.55768*	-4.843768*	-3.887990*
Kuwait	VR	0.580938	0.284317	0.144041	0.075677
	Z	-5.398518*	-5.158661*	-4.289121*	-3.508351*
Oman	VR	0.567882	0.267163	0.148178	0.087503
	Z	-5.720338*	-5.748394*	-4.740349*	-3.720471*
Morocco	VR	0.508475	0.308474	0.161331	0.078478
	Z	-5.642600*	-4.620719*	-4.077661*	-3.229922*
Egypt	VR	0.574206	0.315100	0.148369	0.075763
	Z	-6.792800*	-6.289895*	-5.407002*	-4.133317*
Bahrain	VR	0.483693	0.297346	0.143120	0.078568
	Z	-4.262302*	-3.498337*	-3.200449*	-2.651023*
Jordan	VR	0.559743	0.280115	0.158873	0.074352
	Z	-6.577567*	-6.380732*	-5.158986*	-4.077629*
Iraq	VR	0.602262	0.311418	0.170628	0.082947
	Z	-5.360304*	-4.848963*	-3.92346*	-3.230783*
Tunis	VR	0.584567	0.317049	0.158032	0.086560
	Z	-7.965313*	-7.350562*	-5.969349*	-4.526189*
Palestine	VR	0.500575	0.304101	0.133471	0.072957
	Z	-3.169944*	-2.898578*	-2.971815*	-2.758540*

Syria	VR	0.738575	0.413037	0.223704	0.117177
	Z	-4.502380*	-5.194058*	-4.260493*	-3.288377*

Source: Processed data (2024)

The third non-parametric Phillips-Perron unit root test is utilized to investigate whether the stock returns exhibit a unit root. Table 5 presents the results, which further corroborate the findings from the autocorrelation and variance ratio tests.

Table 5. Phillips-Perron test results for the MENA markets' return

Market	t-Statistics (Constant)	CV 1%	t-Statistics (Constant, Trend)	CV 1%
Saudi	-20.4176*	-3.4419	-20.6019*	-3.9746
Abu Dhabi	-20.5060*	-3.4418	-20.8018*	-3.9745
Qatar	-18.8023*	-3.4419	-18.8776*	-3.9747
Dubai	-21.4798*	-3.4418	-21.4766*	-3.9746
Kuwait	-19.7596*	-3.4421	-19.9003*	-3.9750
Oman	-17.3593*	-3.4446	-17.3412*	-3.9785
Morocco	-13.2551*	-3.4421	-13.3846*	-3.9749
Egypt	-19.0813*	-3.4421	-19.1483*	-3.9750
Bahrain	-10.9962*	-3.4463	-11.1178*	-3.9809
Jordan	-18.5209*	-3.4434	-18.5792*	-3.9768
Iraq	-18.8212*	-3.4426	-18.8099*	-3.9756
Tunis	-19.0587*	-3.4419	-19.0415*	-3.9746
Palestine	-13.9777*	-3.4423	-20.6908*	-3.9752
Syria	-13.6992*	-3.4425	-13.6866*	-3.9755

Note: Asterisk (*) denotes the rejection of the random walk hypothesis at the 1% significance level.

Source: Processed data (2024)

The fourth non-parametric runs test is employed to assess whether the movements in stock returns demonstrate randomness or systematic patterns. Table 6 displays the results, which further support the findings from the autocorrelation, variance ratio, and Phillips-Perron tests.

Table 6. Run test results for the MENA markets' return

Market	Test Value	Cases < Test Val.	Cases >= Test Val.	Total Cases	Runs No.	Z
Saudi	0.10%	278	279	557	252	-2.332**
Abu Dhabi	0.05%	280	281	561	248	-2.831*
Qatar	0.04%	277	277	554	247	-2.637*
Dubai	0.04%	280	280	560	261	-1.692***
Kuwait	0.08%	272	273	545	257	-1.415
Oman	0.05%	226	227	453	208	-1.834**
Morocco	0.02%	275	275	550	256	-1.707***
Egypt	0.04%	273	273	546	239	-2.998*
Bahrain	0.02%	203	204	407	187	-1.737***
Jordan	0.06%	246	247	493	248	0.045
Iraq	0.00%	259	268	527	244	-1.782***
Tunis	0.02%	278	279	557	243	-3.096*
Palestine	0.03%	269	270	539	271	0.043
Syria	0.15%	265	266	531	190	-6.646*

Note: Asterisk (*) denotes the rejection of the random walk hypothesis at the 1% (*), 5% (**), and 10% (***) significance level.

Source: Processed data (2024)

Discussion

According to the non-parametric tests including the autocorrelation test, variance ratio test, Phillips-Perron test, and runs test, the first null hypothesis, which suggests that stock returns exhibit random movement and are independent, cannot be accepted. This is because the p-value

is less than the significance level of 1%, indicating that consecutive stock return changes are non-independent. This implies that the market returns do not contain a unit root and become stationary, thus not following the random walk model. Consequently, these markets present the possibility of gaining abnormal profits by using historical returns to predict future changes in returns. Additionally, the study's second hypothesis is rejected, as all stock market returns in the current study failed to exhibit efficiency regardless of market size. Hence, stock market returns are not influenced by size categories, whether the market is mega, large, or small. These results may be attributed to various factors such as financial reforms, inadequate regulations, poor governance, political instability, low transparency, and weak trading conditions (El-Diftar, 2024; Hkiri et al., 2021; Saleem et al., 2023).

The results of the autocorrelation test presented in Table 3 are consistent with findings observed in other studies conducted in developing or emerging markets (Akwolaga, 2020; Jethwani & Achuthan, 2013; Patel et al., 2012) but inconsistent with results generated in studies by Chen & Metghalchi, 2012; Hkiri et al., 2021; Marsani et al., 2022; Vural & Hailu, 2020). Similarly, the results of the variance ratio test shown in Table 4 align with findings from other studies on market returns (Jethwani & Achuthan, 2013; Khan & Vieito, 2012; Patel et al., 2012) but differ from results observed in other studies in emerging markets such as Lahmiri, 2013; Marsani et al., 2022; Pontoh & Budiarso, 2023. Additionally, the Phillips-Perron test results in Table 5 are in line with findings from other studies on market returns (Al-Nassar, 2021; Z. Asaad, 2014; Z. Asaad et al., 2015; Saleem et al., 2023; Vural & Hailu, 2020) but not similar to results observed in other studies in emerging markets such as Al-Faryan & Dockery (2021), El-Diftar (2024), Bonga et al. (2023), and Marsani et al. (2022). Finally, the results of the runs test presented in Table 6 are consistent with findings from other studies on market returns (Akwolaga, 2020; Jethwani & Achuthan, 2013; Khan & Vieito, 2012; Lee & Ande, 2022; Patel et al., 2012; Smerkolj & Jeran, 2023) but contradict results observed in other studies such as Hkiri et al. (2021), Moustafa (2004), Pontoh & Budiarso (2023), Singh & Sapna (2013), Smerkolj & Jeran (2023), and Vural & Hailu (2020).

CONCLUSION

The study aims to investigate weak-form efficiency by testing the random walk hypothesis of several stock markets in the MENA region using four non-parametric methods. The findings of the study indicate that all individual stock returns deviate from random walk behavior, except for those of the Kuwait, Jordan, and Palestine stock markets, which demonstrate adherence to the random walk based on the run test results at a significance level of 10%.

Several practical implications can be inferred from this study. Firstly, it contributes to the body of knowledge concerning the validity of weak-form market efficiency in emerging economies. Secondly, it is relevant for regulatory bodies aiming to implement financial reforms to reduce information asymmetry and enhance market efficiency. Thirdly, investors seeking opportunities in emerging markets may benefit from the insights provided by the study.

For future research, it could be valuable to explore further the unpredictability of the fourteen stock market returns in the MENA region by employing tests that account for multiple structural shifts within the model. Break dates should be carefully examined for each market, and it may be preferable to use longer periods for analysis. Additionally, utilizing higher frequency data, such as intraday-based quotes per minute, could offer a more refined analysis and yield more robust results compared to the broad daily frequency indexes used in this study. Furthermore, investigating anomalies such as the January effect, Ramadan month, small firm effect, or election effect could provide additional challenges to the efficient market hypothesis.

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