EMERGING INSIGHTS: UNVEILING MARKET EFFICIENCY IN MONGOLIA'S TRANSFORMING ECONOMY

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ABSTRACT

The Efficient Market Hypothesis (EMH) posits that stock prices reflect all available information, preventing consistent outperformance in strong-form efficient markets. However, in inefficient markets, investors can achieve higher returns by exploiting informational advantages. This study evaluates whether the Mongolian capital market is weak-form efficient. Although the Mongolian Stock Exchange (MSE) has grown since its 1991 inception, it remains under-researched. Our analysis focuses on the MSE Top 20 Index's most frequent constituents between 2012 and 2023, assessing if their returns are independent and align with the random walk model—a characteristic of developed markets like the U.S. Using daily stock returns, we conducted statistical tests, including non-parametric (Kolmogorov-Smirnov for normality, Run test) and parametric analyses (autocorrelation under the random walk model). Results compellingly reject the random walk hypothesis, indicating weak-form inefficiency. This inefficiency implies a potential for investors to realize abnormal returns, especially through momentum-based strategies, challenging the EMH. Findings were consistent across three market cycles, enhancing robustness. Future research could apply advanced econometric models and compare results with other markets, offering deeper insights into the MSE's characteristics. This study opens new directions for strategic trading and market analysis within the Mongolian capital market.

Keywords: Mongolian Stock Exchange; Efficient Market Hypothesis (EMH); Transparency; Random Walk theory

DOI: https://doi.org/10.15549/jeecar.v11i6.1834

INTRODUCTION

The impact of the global financial crisis has been amplified by the heightened focus on transparency and open data (Shambaugh & Shen, 2018). This underscores the inclination of investors to scrutinize companies with a wealth of accessible information, enabling them to assess risks within their portfolios. The efficient capital market hypothesis, as posited by Fama & French (1988), contends that stock prices are essentially stochastic, precluding profitable speculation in the market based on past security prices. Consequently, market efficiency historically correlates with the unpredictability of returns, as the presence of predictable returns would incentivize profit-maximizing investors to exploit such opportunities. The efficient market hypothesis (EMH), articulated by Busse & Green (2002), asserts that security prices reflect all pertinent information available. Moreover, the robustness of securities market development hinges significantly on the establishment of a well-structured and efficient market, facilitating informed investment decisions among traders and market participants. This capacity for informed decision-making is inherently intertwined with the quality of accessible information.

The vast majority of studies on this topic have focused on economically developed nations, especially countries in the markets of the Americas. Nevertheless, there is a need for further research in emerging markets, including central Asian countries, particularly the Mongolian Stock Exchange (MSE), which serves as a representative of such developing markets. Mongolia's GDP per capita has tripled since 1993, partly due to the economic growth of large neighboring countries such as China (Chu et al., 2020). The MSE has experienced significant expansion in market value, trading volume, and the number of listed firms. Thus, the purpose of this research is to close these gaps by offering insights into the application—or lack thereof—of the Efficient Market Hypothesis (EMH) and by advancing the discussion about capital market transparency in developing countries.

Central to the Mongolian securities market is the MSE, established in 1991 with the objective of facilitating the privatization of state-owned enterprises. It is central to the growth of Mongolia's economy due to its key role in the financial market (Lim et al., 2012). Since its inception, the Mongolian stock market has been subject to fluctuations driven by fundamental economic conditions, a pattern reminiscent of many other developing countries. For instance, past instances of low liquidity, high levels of public company ownership, and diminished confidence among local and foreign investors have impacted trading volumes. Nonetheless, in 2021, the MSE Top 20 Index surged by nearly 130%, marking it as the most impressive performance among primary equity indexes tracked by Bloomberg.

The Mongolian stock market has been marked by volatility from its early days, notably during the government's acquisition of vouchers to procure 475 state-owned companies through the MSE. This led to a significant decline for 96.1 million vouchers, representing half of the total population, eroding investor and citizen confidence in the capital market. In response, regulators and the stock exchange implemented reforms, introducing the Millennium IT integrated system for trading, settlement, surveillance, and custody in 2012. The objective was to scrutinize information and price efficiency, particularly assessing potential enhancements resulting from the integrated trading and settlement system at the MSE.

In the context of the Mongolian capital market, various studies have been undertaken by both foreign and domestic experts such as Badamvaanchig et al. (2021), Enkhbaatar et al. (2019) and Batmunkh et al. (2020). However, these studies have predominantly revolved around macroeconomic policies and the impact of the securities market, with little to no focus on market efficiency issues. This study explicitly aims to evaluate the weak form efficiency of the Mongolian capital market. Given the substantial growth and transformation of the Mongolian economy since 1991 (Bekaert & Harvey, 2003). Coupled with the shortage of research in this domain, this investigation not only addresses a critical void in the existing literature but also furnishes valuable insights into the distinctive dynamics of an emerging market. By delving into the Mongolian stock market, this paper endeavors to deepen comprehension of market efficiency within a rapidly evolving economic milieu.

This paper is organized as follows in the sections that follow: In Section 2, previous empirical results on weak-form efficiency are

reviewed. The sample and technique used in this study are then described in Section 3. The research's empirical findings are explained in Section 4. The paper is finally concluded and a summary is provided in Section 5.

LITERATURE REVIEW

The validity of the weak and strong forms of the Efficient Market Hypothesis (EMH) in capital markets across developed and emerging economies has garnered widespread scholarly consensus The EMH, proposed by economist Eugene Fama, is based on the supposition that all applicable information is factored into a security's price, and, therefore, financial markets are rational (Le Tran & Leirvik, 2019).

Prior to proceeding further, it is essential to delineate precise definitions for the key terminology utilized in this study. The EMH postulates three distinct levels of market efficiency: the weak form, semi-strong form, and strong form (Le Tran & Leirvik, 2019). The weak form efficiency asserts that all historical information is already impounded in prevailing market prices. Subsequently, the semi-strong form efficiency posits that the prices of securities instantaneously reflect all publicly available information, encompassing both past and present data. Finally, strong form efficiency implies that the market is entirely efficient, with security prices reflecting all information, whether public or private. In his seminal work, Fama & French (1988) conducted a comprehensive analysis of daily prices, scrutinizing the 5-year changes in the value of 30 industrial stocks constituting the Dow-Jones Industrial Average. The primary findings of the study indicated that price changes were independent and followed a pattern consistent with random variables.

The theoretical underpinnings of the Efficient Market Hypothesis are rooted in the random walk theory, which postulates that current stock prices fully and instantaneously incorporate all available information. The random walk model shows mathematically that efficient market prices are impossible to predict, since each fluctuation is independent from those before and after (Le Tran & Leirvik, 2019). Hence, future stock price movements fluctuate randomly irrespective of past stock price movements Lim et al. (2012), rendering stock price prediction unfeasible. The Efficient Market Hypothesis is predicated upon the notion of stock prices following a random walk, analogous to a fair game. Under the precepts of a fair game, there exists no discrepancy between the actual return realized and the expected return prior to the game's commencement, as encapsulated in the following equation (1) (Minoya, 2001).

$$r_{i,t} = E(r_{i,t}|I_{t-1}) + \varepsilon_{i,t} \quad (1)$$

Where $r_{i,t}$ is the actual rate of return of security i in period t, $E(r_{i,t}|I_{t-1})$ is the expected return of security i in period t given the information available I_{t-1} in period t-1, and $\varepsilon_{i,t}$ is the error term in period t for security. In general, the best predictor of $x_{i,t}$ under information I_{t-1} is $E(x|I_{t-1})$. That is, if the efficient market hypothesis is correct, all information contained in I_{t-1} is reflected in $x_{i,t-1}$ and I_{t-1} that is incorporated all information available at the t-1 that is, t -1, the time point and $x_{i,t-1}$, which is the best predictor of $x_{i,t}$, and can be written as follows.

$$E(x_{i,t}|I_{t-1}) = x_{i,t-1} \quad (2)$$

Consequently, the random walk process can be mathematically expressed as follows:

$$x_{i,t} = x_{i,t-1} + \varepsilon_{i,t} \quad (3)$$

by substituting equation (2) into equation (1). This is similar to the AR (1) model $x_{i,t} = \delta x_{i,t-1} + \varepsilon_{i,t}$ when δ=1 and is called a random walk model. The random walk model delineated in equation (3) is employed to derive the variance ratio of the rate of return.

In an efficient market, the introduction of new information invariably leads to fluctuations in share prices and impacts returns on share investments. Consequently, within such a market, whenever new information emerges, prices swiftly adjust to reflect the significance of that information accurately. In essence, the 'efficient market hypotheses characterize a market wherein securities' prices instantaneously and fully encapsulate all available information at any given point in time. Consequently, if prices consistently mirror available information, market participants cannot consistently achieve returns surpassing the normal market average. Fama (1970) has delineated three prerequisites for a market to attain efficiency: ① the absence of transaction costs, ② unfettered access for all market participants to all available information, and ③ a consensus among all market participants

regarding the impact of received information on prices and a consensus on future expectations.

It is imperative to acknowledge the plethora of empirical studies buttressing the Efficient Market Hypothesis (EMH). Regarding weak-form efficiency, research such as that by Sharma & Kennedy (1977) showcases its presence in the Bombay Stock Exchange, as well as in the New York and London Stock Exchanges, where a comparison of the three indices reveals closely aligned observed runs. Analogously, Dawson's (1981) investigation of the Kuala Lumpur Stock Exchange (KLSE) yielded compelling evidence substantiating the weak-form efficiency, wherein the results of the runs test were congruous with those obtained from the serial correlation coefficient test conducted on the KLSE. Research on the Efficient Market Hypothesis (EMH) shows mixed results. Developed markets tend to follow weak-form efficiency and sometimes semi-strong-form efficiency, while emerging markets often do not exhibit any level of market efficiency, reflecting the lack of attention given to them by investors. A strong form of market efficiency has hitherto not been empirically observed in any global financial market (Lim et al., 2012).

Furthermore, Laurence (1986) contributes corroborating evidence to this corpus. Ojah & Karemera's (1999) investigation into weak-form efficiency across four emerging markets in Latin America lends credence to the notion that stock prices in major Latin American equity markets, with the exception of Chile, adhere to a random walk pattern, thereby largely exhibiting weak-form efficiency. This finding implies that both domestic and international investors in these markets lack the capability to systematically devise profitable trading strategies predicated on historical return information. Chan et al. (1992) posit that stock prices in major Asian markets and the U.S. market conform to weak-form efficiency. They further propound that indices such as the Hang Seng Index (Hong Kong), Composite Index (South Korea), Fraser's Industrial Index (Singapore), and Weighted Index (Taiwan) are unpredictable, indicating independence across these markets. Moreover, Dickinson & Muragu (1994) find that price series in the Nairobi Stock Exchange conform to EMH, precluding the formulation of profitable trading strategies based on past stock market price information. Furthermore, a recent study by Duong (2024) unveiled that the incremental risk level associated with value portfolios is substantially higher than that of growth portfolios in the Vietnamese equity market, a finding that lends credence to the presence of the inefficiency market hypothesis.

However, lingering questions persist regarding weak form efficiency, particularly concerning the predictability of share prices based on past data, a query as yet unanswered by existing research. Gilbertson (1978) suggests potential deviations from the random walk model in the Johannesburg Stock Exchange (JSE), warranting further investigation.

Moreover, a seminal study conducted by Mobarek et al. (2008) investigated whether the return series of the Dhaka Stock Exchange (DSE) in Bangladesh conforms to the random walk model, with the empirical evidence suggesting a deviation from the random walk behavior, thereby rejecting the null hypothesis of weak-form efficiency. Similarly, documented evidence on the Kuwaiti stock market by Gandhi et al. (1980) indicates systematic movements in stock prices over time, permitting investors capable of identifying price changes to "beat the market" despite the market's relatively thin trading volume compared to others.

The outcomes of research on markets in less developed and developing countries are frequently contentious. However, a discernible pattern emerges wherein developing and emerging markets tend not to adhere to the weak form efficient hypothesis, contrasting with the supportive stance observed in developed markets. For instance, Harvey (1995) noted that the returns of various countries including Colombia, Indonesia, Mexico, Pakistan, the Philippines, Portugal, Turkey, and Venezuela exhibit predictability based on past information. Additionally, significant autocorrelation in equity returns was observed in 21 developed markets from Morgan Stanley Capital International and 20 emerging markets from the International Finance Corporation of the World Bank. Similarly, Claessens et al. (1995) reported analogous findings, indicating that the Ljung-Box Q test demonstrated the joint significance of the first twelve autocorrelations from the composite indices of twenty economies, encompassing both Latin American and Asian nations. A truly efficient market is unachievable; the most that can typically be observed is weak form efficiency,

as prices tend to auto-correlate around global events and economic decisions (Alves et al., 2020). Under the EMH, if stock prices show autocorrelation, it suggests that past prices can predict future returns, violating weak-form efficiency. Testing for autocorrelation is a common method used in academic studies to assess weak-form market efficiency (Lim et al., 2012). Notably, a recent study conducted by Khoa and Huynh (2023) proffered evidence indicative of inefficient market behavior in the Vietnamese stock market, employing the Support Vector Machine (SVM), a machine learning approach. Given the heterogeneous outcomes across stock markets in different countries, it is plausible to anticipate that the Mongolian Stock Exchange (MSE) is not weakly efficient with a higher probability. Therefore, the primary objective of this study is to garner empirical evidence concerning whether the return series of the MSE index exhibits independence and adheres to the premises of the random walk model. Consequently, it poses a compelling empirical inquiry into the extent to which an emerging market such as the MSE manifests efficiency, thereby elucidating the underlying factors that govern its market dynamics.

METHODOLOGY

Our empirical analysis focused on the daily returns of the MSE Top 20 index spanning from January 2, 2012, to November 2, 2023, providing a total of 2951 observations per share. Data prior to 2012 are unavailable, as the MSE Top 20 index was officially published by the MSE starting from 2012. The chosen research period encompasses all significant economic events occurring in 2012. Stocks were selected from various sectors, including mining, banking, financial, trading, industrial, and national dairy producers. The composition of the MSE Top 20 index basket has evolved annually over the past decade, ensuring no duplication and resulting in a total of 50 companies being included in the index. The index is constructed using the equally weighted stock index methodology. To mitigate sample selection bias, the research focuses on the 21 most frequently included companies in the MSE Top 20 index over the past decades. For the returns of the MSE Top index, we identified three primary regimes. Estimations were conducted independently for each of these specified samples.

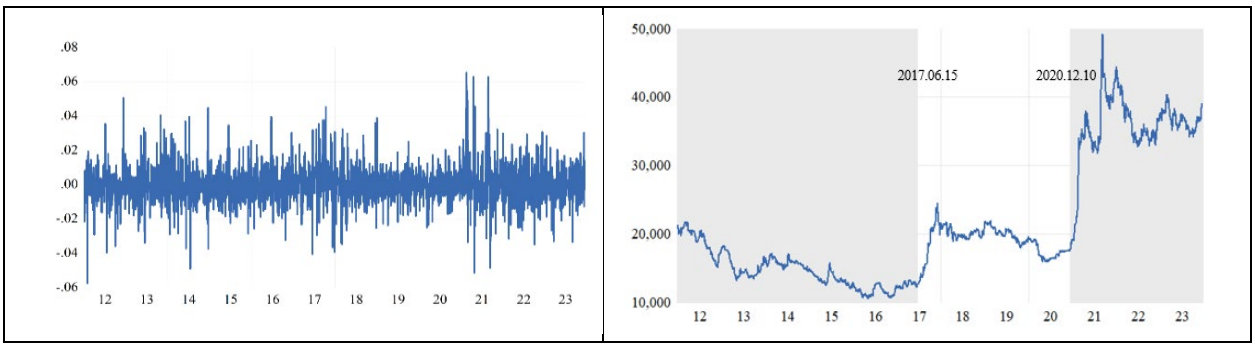

Figure 1: MSE Top 20 Index Return Series.
Source: author's work.

As noted earlier, this study will focus on the daily returns of the MSE Top 20 index. Top-20 indices consist of the top leading company stocks that are listed on the MSE. Daily market returns are derived from these daily price indices, as elaborated below:

$$Ret = Ln\left(\frac{Top\ 20\ Index_t}{Top\ 20\ Index_{t-1}}\right) \qquad (4)$$

Where, Ret – returns of the MSE Top 20 index, in period t ; $Top\ 20\ Index_t$ – MSE Top 20 index, in period t; $Top\ 20\ Index_t$ – MSE Top 20 index, in period $t-1$ and Ln – natural log. A compound return time series is created by dividing the current day's index value by the previous day's index and taking the natural logarithm.

Numerous researchers have applied statistical techniques to test weak-form efficiency, broadly categorized into event study analysis and predictability of returns. The former

examines market reactions to events in the stock market to discern profit-making strategies, while the latter investigates the predictability of current stock prices using past prices and information. In this study on the Mongolian stock exchange, we predominantly focus on the predictability of returns to ascertain the extent of efficiency. Laurence (1986) found that the Kuala Lumpur and Singapore stock markets exhibited close conformity with the random walk model, consistent with Dawson's (1981) findings. Similarly, Ojah & Karemera (1999) examined weak form efficiency in four emerging Latin American markets, concluding that equity prices in these markets, except for Chile, followed a random walk pattern, indicative of weak form efficiency. Chan et al. (1992) proposed that major Asian markets and the US market were weak-form efficient, with indices such as the Hong Kong, South Korea, Singapore, Taiwan indexes are unpredictable. Additionally, Dickinson & Muragu (1994) found that the Nairobi Stock Exchange price series adhered to the Efficient Market Hypothesis (EMH), precluding the development of profitable trading strategies based on past price information.

Various testing methods widely used include non-parametric tests such as serial correlation and run tests, as evidenced by studies such as Fama & French (1988), Barnes (1986), Claessens et al. (1995), Gandhi et al. (1980), and Laurence (1986). Mobarek et al. (2008) employed variance ratio tests, while Alsabban & Alarfaj (2019) and Urrutia (1995) utilized variance-ratio tests. Phan & Zhou (2014) applied traditional techniques including run tests and variance ratio tests. A fundamental assumption of the random walk model is that the index return time series is normally distributed. Under the random walk model, market returns behave randomly, either with or without drift. Our approach and techniques are structured in alignment with prior research by Mobarek et al. (2008) and Mollah (2007).

Runs test. Using parametric tests alone is insufficient for assessing the statistical independence of market return time series values, particularly in relation to serial correlation. Hence, we can also utilize non-parametric tests, such as the run test. This test is commonly used to examine the random walk model and does not rely on distributions.

H_0: MSE Top 20 index return series is independent.

H_1: MSE Top 20 index return series is dependent.

If we reject the null hypothesis, we infer that the return series of the MSE Top 20 index is not random.

Autocorrelation test. Apart from the non-parametric test to determine the randomness of the return series, confirmation is sought through a parametric test, typically involving parameter estimation. Autocorrelation testing serves as a means to ascertain the independence or dependence of random variables within a series. Autocorrelation quantifies the correlation between stock market index returns at time t and those at time t - k.

In technical terms, the autocorrelation test determines whether the correlation coefficients of a series are statistically significant and not equal to zero. The null hypothesis posits that the serial correlation coefficients are equal to zero, indicating no serial correlation within the return series.

H_0: There is no serial correlation in the MSE Top 20 index return.

H_1: There is a serial correlation in the MSE Top 20 index return.

If the null hypothesis of no serial correlation in the index series is rejected, it implies that there is dependence and predictability in the stock market index.

Variance ratio test. The variance ratio test, Campbell et al. (1998) proposed by serves to examine the presence of a random walk in stock market index returns. The test assesses the presence of random walks by determining the presence of serial correlation in the time series of index returns. Technically, time series values are divided into non-overlapping subgroups of equal length (eg, 2, 4, 6, 8, 16 days long). After that, the value of the test statistic is calculated by comparing the sum of the variances of each group divided by equal length with the overall variance. Under the null hypothesis that the index return series are independent and identically distributed, the ratio of variances should converge to 1 as the sample size increases. If there is a serial correlation in the return series, it will differ from 1.

H_0: VR(q) = 1 The return series follow a random walk

H_1: VR(q) ≠ 1 The return series does not follow a random walk VR(q) >1, imply positive serial correlations and VR(q)

Positive serial correlations are implied by VR(q) >1, whereas negative serial correlations are implied by VR(q) <1.

According to Worthington and Higgs (2004), research suggested that if the heteroscedastic random walk model rejects the null hypothesis, the return series shows evidence for autocorrelation. Furthermore, we examined Lo & Mackinlay's (1988) recommendations in this study to examine a statistical test for a random walk, where p_t represents the log price process.

RESULTS

Summary of descriptive statistics for Mongolian stock market data for the full sample and 3 market cycles. (based on 3 market regimes). The estimation result shows that the 3rd cycle has the highest standard deviation and mean. The positive skewness and leptokurtic distribution of the MSE Top 20 index series on the Mongolian stock exchange. Indicate that the distribution is not normal. The results of the Jarque-Bera test show that the null hypothesis is rejected at the 1% level for all cycles. The return series of the MSE Top 20 index is not normally distributed, as confirmed by the parametric test (Table 1).

Table 1: Summary statistics (MSE Top 20 Index return series)

Statistics	Full Sample	1st cycle	2nd cycle	3rd cycle
Mean	.00020	-.00039	.00040	.00101
Median	-.00026	-.00056	-.00021	.00033
Maximum	.06525	.05068	.04537	.06525
Minimum	-.05752	-.05752	-.03925	-.05145
Standard deviation	.01056	.00990	.00945	.01268
Skewness	.528	0.200	.277	.834
Kurtosis	7.669	6.709	6.600	7.566
Jarque-Bera	2979.9**	825.1**	503.0**	775.9**
Observations	3121	1423	910	788

Note: ** and * indicate significance at 1% and 5% levels, respectively.

Source: author's work.

A non-parametric K-S test was utilized to assess whether the return series of the MSE Top 20 index followed a normal distribution. The test results indicate rejection of the null hypothesis at the 1% significance level across all cycles, suggesting that the return series of the MSE Top 20 index is not normally distributed. This finding aligns with the summary statistics and parametric tests conducted to examine normality. (Table 2). Such non-normal distributions in the MSE stock return series echo the observations made in other emerging market return series, as discussed by Harvey (1995), mainly attributed to the elevated volatility in stock returns. This aligns with the conclusions drawn regarding the market above.

Table 2. The Kolmogorov-Smirnov test results (MSE Top 20 Index return series)

	Absolute	Positive	Negative	Z_{stat}	p-value
Full sample	.291	. 291	–.182	.291	.000**
1st cycle	.083	-0.083	-.062	.083	.000**
2nd cycle	.087	.082	-.087	.087	.000**
3rd cycle	.083	.083	-.061	.083	.000**

Note: ** and * indicate significance at 1% and 5% levels, respectively.

Source: author's work.

A non-parametric run test was used to test for serial correlation in the MSE Top 20 index return

series. According to the results of the runs test, the null hypothesis is rejected at the 1% level for all cycles. Consequently, the null hypothesis positing adherence to the random walk model for the MSE return series can be rejected. Additionally, both the 3-sample and full sample run tests reveal that the number of runs exceeds 350 in all instances. This finding suggests a departure from the independent assumption of the random walk model in the return series. These outcomes resonate with the documented results of Poshakwale (1996) concerning the Southeast Asian stock market. Moreover, the non-random behavior observed in the price series may stem from the dearth of institutional investors in the MSE, contributing to market inefficiencies characterized by high concentration, illiquidity, low trading volume, and reporting delays (Table 3).

Table 3. The Run Test results (MSE Top 20 Index return series)

	Total number of runs (M)	Z_{stat}	p-value (2-tailed)
Full Sample	1404	-5.639*	.000**
1st cycle	634	-4.163*	.000**
2nd cycle	412	-2.919*	.000**
3rd cycle	358	-2.638*	.000**

Note: ** and * indicate significance at 1% and 5% levels, respectively.

Source: author's work.

A parametric test was also used to test for serial correlation in the return series of the MSE Top 20 index. In order to ascertain the weak form of the EMH for the MSE Top 20 index on the Mongolian stock exchange, we estimate the Ljung-Box Q-statistics for each sample with a lag of 10. The test outcome appears in Table 4. The findings demonstrate that the auto-correlation coefficient is statistically significant for every sample at each lag. As a result, the return series of the Top 20 index is dependent and does not follow the random walk model.

Table 4. Auto-correlation test result (MSE Top 20 Index return series)

Lag	Full sample		1st cycle		2nd cycle		3rd cycle	
	AC	Q_{stat}	AC	Q_{stat}	AC	Q_{stat}	AC	Q_{stat}
1	.185	106.47**	.106	16.06**	.180	29.65**	.268	56.95**
2	.107	142.33**	.082	25.74**	.044	31.41**	.178	82.11**
3	.056	152.08**	.011	25.91**	.025	31.97**	.115	92.598**
4	.053	160.92**	.022	26.62**	-.001	31.97**	.116	103.33**
5	.070	176.21**	.029	27.83**	.077	37.34**	.101	111.46**
6	.029	178.78**	-.015	28.14**	.038	38.69**	.064	114.74**
7	.031	181.69**	.008	28.23**	.034	39.78**	.048	116.58**
8	.018	182.71**	.059	33.14**	-.028	40.50**	-.001	116.58**
9	.021	184.02**	.006	33.19**	-.007	40.54**	.049	118.53**
10	.041	189.38**	.033	34.72**	.062	44.12**	.035	119.51**

Note: ** and * indicate significance at 1% and 5% levels, respectively.

Source: author's work.

The variance ratio test is the final assessment for the Top 20 index return series, is statistically independent, and follows the random walk model. In the framework of the VR analysis, the length of the subsamples was chosen to be 2, 4, 8, and 16 days.In addition, the variance ratio test is applied to the logarithm of return for all samples. According to the results of the VR test, the null hypothesis is rejected at the 1% level for all cycles for all values of q. Also, the variance ratio was

calculated to be less than 1 in all cases. This is evidence of negative autocorrelation in the series. Therefore, the MSE Top 20 index return does not follow a random walk (Table 5).

Table 5. Variance ratio test result (MSE Top 20 Index daily return)

Statistics	Number of observations for subsamples			
	2	4	8	16
Full Sample				
Var. Ratio	.547	.291	.151	.076
Z_{stat}	-15.86**	-14.61**	-12.25**	-9.70**
Obs.	3119	3117	3113	3105
1st cycle				
Var. Ratio	.513	.274	.132	.072
Z_{stat}	-10.58**	-9.57**	-8.33**	-6.67
Obs.	1421	1419	1415	1407
2nd cycle				
Var. Ratio	.592	.306	.158	.077
Z_{stat}	-8.17**	-7.74**	-6.41**	-5.14**
Obs.	910	910	910	910
3rd cycle				
Var. Ratio	.563	.303	.172	.083
Z_{stat}	-8.96**	-8.23**	-6.58**	-5.09**
Obs.	788	788	788	788

Note: ** and * indicate significance at 1% and 5% levels, respectively.

Source: author's work.

DISCUSSION

The topic of market efficiency has garnered substantial scholarly attention, giving rise to a plethora of empirical investigations spanning diverse countries and employing varied methodological approaches to examine weak-form market efficiency. We tested Fama & French (1988) assumptions for weak-form market efficiency using various statistical tests. The presence of serial correlation in the MSE return series suggests that prices are not purely random and that past prices can help predict future prices. Consequently, our findings indicate that the market does not follow a random walk model. This suggests that the market does not fully adhere to weak-form efficiency, as investors do not utilize all available information efficiently, and not all investors behave rationally. This study endeavors to contribute empirical evidence regarding market efficiency in the Mongolian Stock Exchange (MSE), specifically scrutinizing whether the return series of Mongolian equities exhibit independence and conform to the premises of the random walk model. The empirical findings contradict the null hypothesis, which postulated a random walk model for the daily return series of the MSE over the period from 2012 to 2023. Instead, our analysis unveiled the presence of serial autocorrelation within the return series, indicating predictability and volatility in security prices within the Mongolian stock market. Both non-parametric assessments, encompassing the Kolmogorov-Smirnov normality test and the run test, as well as parametric tests, including the autocorrelation test, collectively rejected the hypothesis of a random walk model, thereby violating the tenets of weak-form market efficiency. These outcomes are consistent with prior empirical analyses conducted by Butler & Malaikah (1992), Claessens et al. (1995), Gandhi et al. (1980), Mobarek et al. (2008), and Poshakwale (1996), which uncovered evidence of non-random stock price and return behavior in financial markets such as Kuwait, Saudi Arabia, India, and Bangladesh. Our findings contrast with those of Barnes (1986) and Ojah & Karemera (1999) , who found that emerging markets in Latin America and the Kuala Lumpur Stock Exchange, respectively, did not reject the random walk

hypothesis. Moreover, the Mongolian stock exchange seems to be similar to other emerging markets. Our findings align with the latest studies on other emerging markets, such as those in Latin America (Sánchez-Granero et al., 2020). Another recent study found evidence of non-random stock price behavior in the Pakistan stock market, observing that none of the tests conducted confirmed the existence of weak form efficiency in the Pakistani stock market (Ali et al., 2021). In both studies, statistical tests, including the runs test, autocorrelation test, and the Box-Ljung statistic, were employed. The results of these tests did not confirm the existence of weak-form efficiency in the markets.

This study has the following limitations. First, our application of a time-serials approach to testing Mongolia's market efficiency did not include alternative cross-check methods. In addition, our data sample is relatively small due to the short history of the stock market in Mongolia. In spite of these limitations, this study has value as the first and original study in the market efficiency of Mongolia, which will open windows for new studies that build off this work and address these limitations. Future research could incorporate more advanced econometric models, technical analysis, and event study analysis to provide deeper insights. Future studies should consider longer timeframes to capture more comprehensive market dynamics. Furthermore, future research directions could include conducting comparative studies with other emerging and developed markets to understand the unique factors affecting the MSE.

CONCLUSION AND RECOMMENDATION

The study holds significant implications for both theoretical frameworks and practical applications. Firstly, it contributes substantially to the fields of international finance and emerging market theory by illuminating the relatively unexplored Mongolian stock market. By examining market efficiency within this unique context, the paper enriches the existing understanding of the Efficient Market Hypothesis (EMH). Additionally, it provides valuable insights into the application of this hypothesis within rapidly evolving emerging markets like Mongolia.

Secondly, the findings of the study necessitate a reevaluation of traditional perceptions of market efficiency, particularly within emerging market contexts. This has the potential to stimulate scholarly discourse and encourage further exploration of similar contexts. From a practical standpoint, the research holds relevance for various stakeholders, including market participants, investors, and regulators within the Mongolian market. It offers insights into investment strategies and the regulatory framework necessary to foster a more efficient market environment. Furthermore, it may inform improvements in regulatory disclosure standards, benefiting investors and financial analysts involved directly in the stock market. The potential importance of this study for capital market participants may be categorized as follows: the dependence found in the return series may be due to the lack of information disclosure requirements and private information in the market. The lack of effectiveness of the regulatory bodies and the lower standards of law enforcement are major causes.

Therefore, we suggest the two following key policy recommendations: First, the FRC could consider adopting a web-based electronic registration system to record the financial information of listed companies (similar to EDINET of Japan, DART of South Korea, and EDGAR of the US). Many countries have such an electronic financial reporting depository to ensure the timely submission of financial reports, the ability of stakeholders to access the financial information, and the sufficiency of the financial information. Second, the MSE currently has no link to major international markets. Having the Mongolian Central Securities Depository (CSD) linked to a major international network such as Euroclear would improve Mongolia's visibility and presence to foreign investors. The CSD should consider reaching out to major international settlement centers to link Mongolian CSD to a major international network. In fact, the market anomalies found in the MSE are due to the developing market in which it operates. The regulatory system and trading mechanisms *under which it operates are not as developed as those of* mature and developed markets.

Enhancing disclosure requirements and investor protection measures to foster greater market transparency and efficiency on the MSE, thereby attracting more foreign investment and improving overall market liquidity. Thus, Market participants will be better equipped to make

more accurate predictions about future stock returns.

Overall, the study's findings are likely to provoke scholarly interest in the analysis of stock markets within developing countries such as Mongolia. The practical implications of the research extend to regulators and market participants, particularly concerning the regulatory framework and trading procedures of the Mongolian Stock Exchange (MSE). Given the less developed nature of the MSE compared to established markets, the study underscores the importance of addressing issues such as information disclosure requirements and protection of foreign investors' rights. Improved regulatory disclosure guidelines are essential for MSE participants, particularly listed joint stock companies, and addressing long-standing dependencies within the market is crucial for restoring market confidence. Therefore, the research underscores the necessity of structural regulatory changes within the MSE to achieve desired outcomes.

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