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Random Walk Hypothesis Under Scrutiny: Nepal's Stock Market before the Pandemic Era

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Abstract

The efficient processing and dissemination of information are fundamental to the proper functioning of a stock market, as they directly affect capital allocation and economic growth. This study investigates the Random Walk Hypothesis (RWH) in the Nepalese stock market by analyzing daily NEPSE Index returns from March 2011 to March 2020. Utilizing both parametric and non-parametric tests—including the Kolmogorov-Smirnov test, run test, autocorrelation, autoregression, Augmented Dickey-Fuller test, ARIMA modeling, and variance ratio test—the study consistently finds evidence against the RWH. The results reveal that NEPSE returns are not independently and identically distributed, indicating weak-form inefficiency. This suggests that historical price movements can predict future returns, highlighting significant market inefficiencies and potential opportunities for abnormal gains. However, such inefficiencies also increase investor vulnerability to misinformation, manipulation, and risk. The findings align with similar outcomes in emerging markets and challenge the universal applicability of the Efficient Market Hypothesis (EMH). Furthermore, the study underscores the growing importance of behavioral finance in explaining stock price dynamics in underdeveloped markets. It offers crucial insights for policymakers, researchers, and investors focused on enhancing the Nepalese capital market's efficiency.

Keywords: *Stock market, RWH, EMH, Historical price.*

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Introduction

The RWH asserts that future price changes are independent of historical price movements because stock prices fluctuate randomly and unpredictably. This theory holds that it is impossible to regularly generate returns above average by employing historical price trends or patterns because all available information is already reflected in current market prices. Technical analysis is therefore ineffective for forecasting future price changes based on the RWH's assumptions. The RWH is closely linked to the EMH, particularly its weak form, which claims that technical analysis is irrelevant because current stock prices already reflect all historical trade data, including prices and volumes. Eugene Fama developed the EMH in the 1960s. It describes three types of market efficiency: weak-form (prices reflecting historical trading data), semi-strong (prices reflecting all public information), and strong-form (prices reflecting both public and private information). The RWH advocates in favor of weak-form efficiency by arguing that if prices follow a random walk, it is impossible to forecast them using past data since price changes are the consequence of new, and unexpected information. Not all efficient markets must have totally random pricing pathways, despite the conceptual alignment of RWH and EMH. This is particularly true in emerging or less developed markets where price behavior can be distorted by behavioral biases, information asymmetries, and market inefficiencies.

The Securities Exchange Center, which was first established in 1976 with an emphasis on trading government bonds, marked the beginning of Nepal's stock market's development. When the center changed its name to the Nepal Stock Exchange (NEPSE) in 1993. The Securities Board of Nepal (SEBON) was established as the regulating body in 1994, and it marked a significant turning point. Important advancements in the ensuing years were the 2007 introduction of semi-automated trading, the 2011 creation of CDS and Clearing Ltd. for settlement and dematerialization, and the 2013 deployment of fully computerized trading platforms. Real-time online trading through brokers was made possible by NEPSE's Online Trading System (NOTS), which was introduced in 2021. NEPSE's operational capacity has been expanded, governance has been strengthened, secondary market investment by non-resident Nepalese (NRNs) is permitted, and IPO listing requirements have been tightened. Furthermore, monetary and regulatory actions like loosening regulations on margin lending, encouraging digital disclosures, and preventing insider trading have aimed to improve market liquidity, transparency, and confidence in investors.

The aim of this paper is to test the random walk behavior in the Nepalese stock market. The structure of this analysis is organized as follows: Section 2 presents a review of relevant literature on the RWH, summarizing key empirical findings. Section 3 outlines the methodology employed to test the RWH in the context of Nepalese stock market. Section 4 reveals the results of the various statistical tests. Section 5 offers a comprehensive discussion on how the study's results align or contrast with existing literature and what they imply for financial theory and practice. Section 6 draws conclusions based on these findings, while Section 7 highlights the broader implications of the study.

Review of Literature

The RWH posits that stock prices evolve in a stochastic manner, implying that historical price movements do not influence future price paths. This notion, first mathematically hinted by Bachelier (1900), was empirically reinforced by Working (1934) and formalized in economics by Samuelson (1965), who introduced the concept of a martingale process. Fama (1965, 1970) further refined the theoretical foundations by aligning market efficiency with randomness in price movements, classifying it into weak, semi-strong, and strong forms. In developed markets like G7, studies by Kendall (1953), Granger and Morgenstern (1963), Fama (1965), Solnik (1973), and Narayan & Smyth (2007) generally support the RWH. Fama's (1965) comprehensive examination of the NYSE's daily returns strongly advocated for weak-form efficiency and randomness.

Contrarily, emerging markets exhibit mixed evidence. Omar et al. (2013) found that the Karachi Stock Exchange (KSE) does not follow a random walk, suggesting inefficiencies exploitable by technical traders. Similarly, Raquib and Alom (2015) rejected the RWH in the Dhaka Stock Exchange (DSE) using autocorrelation and partial autocorrelation analyses, concluding that the market is inefficient in the weak form. In the Nepalese context, Dangol (2016) revealed that observed stock returns in the Nepal Stock Exchange (NEPSE) violated the RWH. However, after adjusting for infrequent trading, the corrected data appeared to support the hypothesis, indicating data irregularities may mask underlying patterns. A broader regional study by Hamid et al. (2017) covering 14 Asia-Pacific markets concluded that none of the examined markets exhibited random walk behavior during the 2004–2009 period. Their results suggested persistent opportunities for arbitrage, driven by inefficiencies. Similarly, Sadat and Hasan (2019) employed parametric tests to analyze DSE indices and found them inconsistent with the RWH, rejecting weak-form efficiency.

Empirical results from developed markets generally favor the RWH. In contrast, developing and emerging markets like Pakistan, Bangladesh, Srilanka, and others consistently display violations of weak-form efficiency, often attributed to structural market deficiencies such as low liquidity, higher information asymmetry, and underdeveloped regulatory frameworks. As such, findings across emerging economies remain inconclusive and market-specific, reinforcing the need for localized analysis and deeper structural reforms.

Table 1: Summary of empirical studies on the RWH

Author(s)	Market Studied	Methodology	Key Findings
Bachelier (1900)	Commodity Prices in US	Conceptual – Mathematical theory of random movement	Prices fluctuate randomly; idea ignored for decades
Working (1934)	US Stock Market	Empirical price analysis	Confirmed price fluctuations are random
Samuelson (1965)	General Economics, US	Martingale model (stochastic process)	Prices follow a random walk
Fama (1965, 1970)	NYSE, US Capital Market	Autocorrelation, variance ratios, information classification	Supported RWH and weak-form efficiency
Kendall (1953); Granger and Morgenstern (1963); Solnik (1973)	US and Developed Markets	Time series analysis of returns	Largely consistent with RWH
Narayan and Smyth (2007)	The G7 countries	Unit root tests	G7 markets supported the RWH
Omar et al. (2013)	Karachi Stock Exchange (KSE), Pakistan	Descriptive statistics, VAR, KS test, run test, ADF, PP (1998–2012)	RWH rejected; market not efficient
Raquib and Alom (2015)	Dhaka Stock Exchange (DSE), Bangladesh	Autocorrelation, Partial Autocorrelation (2001–2013)	Weak-form efficiency and RWH both rejected
Dangol (2016)	Nepal Stock Exchange (NEPSE), Nepal	Analysis of observed and adjusted return series	Observed data violated RWH; corrected data supported RWH
Hamid et al. (2017)	14 Asia-Pacific Markets	Autocorrelation, unit root, Ljung-Box Q, runs test, VR (2004–2009)	All markets violated RWH
Sadat and Hasan (2019)	DSE, Bangladesh	JB test, ADF, Autocorrelation Function, VR test (daily data)	RWH rejected; weak-form inefficiency evident

The main criticism of the RWH is that it oversimplifies the complexity of financial markets by ignoring the behavioral aspects of market participants. In today's context, one of the biggest challenges to the theory arises from the behavioral concerns and actions of investors, which significantly influence stock prices and market outcomes. It is observed from the above discussion that the validity of the random walk model is contradictory in various markets. So, it is interesting to test the RWH on relatively small and developing markets like Nepal. This paper is an attempt in this direction to examine random walk behaviour before the pandemic era.

Methodology

This section describes the research methodology employed to test the RWH in the Nepalese stock market over the nine-year period from March 24, 2011 to March 22, 2020, covering the post-automation trading period up to the pre-COVID era. It includes details on the data sources, selected models, statistical tests, and relevant hypotheses. This study primarily relies on secondary data to examine the RWH in the context of Nepalese stock market. The daily closing prices of the NEPSE All-Share Index having observations of 2087—sourced from the official NEPSE website—serve as the main dataset. The NEPSE index, a value-weighted index of all listed companies, is calculated daily based on closing prices. Daily market returns are computed as shown in Equation 1. A variety of statistical and econometric methods are applied to examine the randomness of return series during the study period. This study employs parametric and non-parametric tests to avoid the bias resulting from the non-normal distribution of the data.

The model specification

The RWH is a narrower form of the weak-form EMH. It assumes that stock returns are independent and identically distributed over time, making them inherently unpredictable. However, the fair game model (Fama and Macbeth, 1973), which underpins this hypothesis, does not require returns to be time-independent. It acknowledges that factors such as a company's increasing debt or risk may lead to higher expected returns over time, creating correlations between current and past returns. Despite this, under weak-form efficiency, such historical information cannot be used to earn excess returns. To examine this, stock returns are first calculated using the following model:

$R_t = L_n P_t - L_n P_{t-1}$ ………………………........... (1)

Where, R_t= Return on share prices

P_t= Stock prices

L_n = Natural logarithm

However, there is a concern with the EMH in that some portions of the returns are predictable (Sharpe, 1983). The asset's return contains two components: (a) the expected component, and (b) the unexpected component. The return on share price is calculated by using the following model, which incorporates these two components of return.

$R_t = E_{t-1} (R_t^e) + U_{t-1}$ ………………………… (2)

Where, R_t^e = Expected return

E_{t-1} = the conditional expectations operator with the conditions sets consisting of information up and including period t-1.

U_{t-1} = the unexpected return or stochastic term or predication on stock prices in period t-1.

However, the available information is introduced in Model 2 becomes,

$E_{t-1} (R_t^e) = E (\frac{R_t^e}{V_{t-1}})$ …………………………… (3)

Where, V_{t-1} = the available information in t-1 period.

However, the component of unexpected returns depends on the set of information i.e. $E(\frac{U_t}{V_{t-1}})$. Thus Model 3 is restated as in Model 4.

$R_t = E_{t-1} (R_t^e) + E (\frac{U_t}{V_{t-1}})$ ……………………... (4)

If the market is informationally efficient, then

$E (\frac{U_t}{V_{t-1}}) = 0$ ……………………………………. (5)

If V_{t-1} contains only past returns then Model 5 becomes as

$E (\frac{U_t}{V_{t-1}}) = (\frac{U_t}{R_{t-1}, R_{t-2} \ldots R_{t-n}})$ ………………………….. (6)

Model 6 exhibits that the market is weak form efficient. In a fair game model, the stock market performs in such a way that the actual and predicted stock returns are same. The following is a mathematically fair game model:

$R_{i,t+1} = E (\frac{R_{i,t+i}}{V_t}) + U_{i,t+1}$ …………………………(7)

Where, $R_{i,t+1}$ = Actual returns on stocks i in period t+1

$\frac{R_{i,t+i}}{V_t}$ = Expected returns on stock i in period t+1 (if the set of information is available)
$U_{i,t+1}$ = Stochastic term error on stocks i in period t+1.

The statistical properties of a stochastic term error are: consistency, independence, and efficiency.
If the expected return given the available set of information is an unbiased estimator of actual returns, the prediction error is consistent.

$E\left(\frac{U_{i,t+1}}{V_{i,t+1}}\right) = 0$ ……………………………………,,,(8)

If the prediction error is unrelated to the expected return, it will be independent.

$E\left(\frac{U_{i,t+1}}{V_{i,t+1}}\right) = 0$ ………...(9)

If the prediction error is serially uncorrelated, it will be efficient.

$E[U_{i,t+1}, U_{j,t}] / V_t = 0$ …………………………,,(10)

The return on stocks today will now be the best estimate of the return on stocks tomorrow. So, the EMH is true then
$R_{i,t+1} = R_{i,t} + U_{i,t+1}$ ……………….........................(11)

The above Model 11 represent the random walk model.
The random walk model with linearities and non-linearities to test the RWH is explained in Model 12 and Model 13 respectively.
The random walk model with linearities for returns for NEPSE index on daily basis is,
$R_t = \alpha_0 + \alpha_1 R_{t-1} + \varepsilon_t$ …………………………..(12)

The random walk model with non-linearities for returns for NEPSE index on daily basis is,
$R_t = \alpha_0 + \alpha_1 R_{t-1} + \alpha_2 R_{t-1}{}^2 + \alpha_3 R_{t-1}{}^3 + \varepsilon_t$ …... (13)

Where, R_t = Return on share prices for t period
$R_{(t-1)}$ = Return on share prices for t-1 period
ε_t = Error term for t period

Statistical tests for random walk hypothesis
This paper has used statistical methods, namely K-S test, run test, autocorrelation test, AR test, ADF test, and variance ratio test to examine the RWH of the Nepalese stock market.

Kolmogorov Smirnov goodness of fit test
The Kolmogorov-Smirnov (K-S) test is a non-parametric test used to check if a sample comes from a specified continuous distribution, typically to assess data normality.
The K-S test statistic is,
K-S = $\max_{1\leq i\leq N}[F(R_i) - \frac{i-1}{N}, \frac{i}{N} - F(R_i)]$ …………… (14)
Where, F = the theoretical cumulative distribution function of a continuous distribution.

Run test
The run test is a non-parametric test for serial dependence of time series, also known as the Geary test. The

total expected number of runs is distributed as normal with the following mean under the null hypothesis that successive outcomes are unbiased:

$$\mu = \frac{N(N+1) - \sigma_{i=1}^{3} n_i^{2}}{N} \quad \ldots (15)$$

Where, μ = Mean of stock return
N = The total number of return observations and
n_i = the number of runs of type i.

By comparing the actual number of runs in the price series to the expected number μ, the standard normal Z-statistic is carried out to test serial dependence.

$$Z = (R-\mu)/\sigma_{\mu}) \quad \ldots (16)$$

Where, R = The actual number of runs in the price series

Autocorrelation test
The autocorrelation test is a parametric test that assesses whether or not time series data successive returns have serial correlation. The autocorrelation coefficient ρ_k indicates the degree of relationship between the present stock return R_t and the return separated by K lags$R_{(t-k)}$.
The autocorrelation coefficient ρ_k measures the degree of correlation between the current stock return R_t and the return separated by K lags $R_{(t-k)}$ is measured as:

$$\rho_k = \frac{COV(R_t, R_{t-k})}{\sigma(R_t)(R_{t-k})} = \frac{E[(R_t - \mu)(R_{t-k} - \mu)]}{E[(R_t - \mu)^2]} \quad \ldots (17)$$

Where, μ = The population mean of stock return,
The autocorrelation coefficient at lag k ($\hat{\rho}_k$) is expressed as:

$$\hat{\rho}_k = \frac{\sum_{t=1}^{n-k}[(R_t - \bar{R})(R_{t-k} - \bar{R})]}{\sum_{t=1}^{n}[(R_t - \bar{R})^2]} \quad \ldots (18)$$

Where, $\hat{R}$ = The sample mean of stock returns, and
n = Number of observation in the return series.

The Ljung-Box Q test can be calculated as follows:

$$Q_k = n(n+2)\sum_{j=1}^{k}\frac{\hat{\rho}_j^{2}}{n-j} \quad \ldots (19)$$

Where, $\hat{\rho}_j$ = The sample autocorrelation coefficient at lag j.

Autoregression test
The autoregressive (AR) model with one lag to investigate if the current return series and the first lag of the return series have a non-zero significant relationship. The AR model of order one
can be defined as follows:

$$R_t = c + \beta_0 R_{(t-1)} \quad \ldots (20)$$

Where, R_t = The current return series,
$R_{(t-1)}$ = The first lag of return series, and
β_0 = The coefficient of the first lag.

Augmented Dickey Fuller test

The Augmented Dickey-Fuller (ADF) test is applied for a unit root in the data. The unit root of the data can be computed using the OLS model:

$\Delta P_t = \alpha_0 + \alpha_1 t + \delta P_{(t-1)} + \delta_1 \Delta P_{(t-1)} + \dots + \delta_q \Delta P_{(t-q)} + \varepsilon_t$ …. (21)

Where, P_t = The stock price at time t,
$\Delta P_t = P_t - P_{(t-1)}$ = Change in stock price,
δ_i = Coefficients to be estimated,
q = The number of lagged terms,
t = The trend term,
α_1 = The estimated coefficient for the trend,
α_0 = The constant, and
ε_t = White noise.

Variance ratio test

Variance ratio (VR) test is employed to examine the random walk properties of asset prices. The VR (q) is defined as:

$$VR(q) = \frac{\sigma^2(q)}{\sigma^2(1)} \text{ ……………………………………… } (22)$$

Where, σ^2 (q) = The variance of the q-differences, and
σ^2 (1)) = The variance of the first differences.

Hypothesis

The hypothesis are tested as:
H_0: The Nepalese stock return series follows a random walk.
H_1: The Nepalese stock return series does not follow a random walk.

Results

Table 2 presents the descriptive statistics of daily NEPSE index data. The index shows positive average daily returns. However, the return series deviates from normality. The Kurtosis value of 7.544 indicates a leptokurtic distribution, while Skewness suggests asymmetry. The Jarque-Bera (JB) test confirms non-normality. Overall, Skewness, Kurtosis, and JB test results indicate that NEPSE returns do not follow a normal distribution, violating a key assumption of the random walk model.

Table 2: Descriptive statistics of market return

The table shows mean, standard deviation, minimum value, maximum value, Skewness, Kurtosis, Jarque-Bera, probability and coefficient of variation of NEPSE all share index returns.

Index	Mean (%)	S.D. (%)	Min (%)	Max (%)	Skew	Kurt	JB	Prob	CV
NEPSE	0.066	1.272	-6.04	5.94	0.423	7.544	1857.937	0.000	19.395

Kolmogorov Smirnov (K-S) Goodness of Fit

The Kolmogorov-Smirnov (K-S) test assesses the normality of return series. A K-S value above 0.05 indicates a good fit, while values below 0.05 suggest a significant lack of fit. Table 3 shows that the K-S statistic for NEPSE daily returns is above 0.05, yet the p-value is below 0.05, indicating the series does not follow a normal distribution. Thus, the null hypothesis of normality is rejected. This violates the assumption of identically distributed returns required by the random walk model, suggesting no evidence of RWH in the Nepalese stock market.

Table 3 Kolmogorov Smirnov goodness of fit

The table shows the Kolmogorov-Smirnov (K-S) test to check normal distribution for daily return series variable for NEPSE all share index. The probability value < 0.05 indicates that the returns series reject the null of normality at 5% significance level.

		Normal Parameters		Most Extreme Differences				
Index	N	Mean	S.D.	Absolute	Positive	Negative	Test Statistic	Prob.
NEPSE	2087	0.066	1.272	0.092	0.092	-0.087	0.092	0.000

Run Test

The run test evaluates randomness in daily NEPSE returns by comparing observed and expected runs. Table 4 shows that at the 95% confidence level, the return series does not follow a random walk. The results indicate serial correlation, suggesting autocorrelation in NEPSE returns. Thus, the null hypothesis of randomness is rejected.

Table 4 Run test

The table shows the run test to measure whether return series (daily) for NEPSE index follows random walk. The probability value < 0.05 indicates that the returns series reject the null of random walk at 5% significance level.

Index	Test Value	Cases < Test Value	Cases >= Test Value	Total Cases	No. of Runs	Z	Asymp. Sig. (2-tailed)
NEPSE	0.066	1162	925	2087	807	-9.939	0.000

Autocorrelation Test

The autocorrelation test checks serial correlation in returns across lags 1 to 10. Table 5 shows significant autocorrelation in NEPSE returns at the 5% significance level. This indicates serial dependence, rejecting the RWH in the Nepalese stock market.

Table 5 Autocorrelation test

The table shows the autocorrelation test to examine whether return series (daily) for NEPSE index serially correlated at lag 1 to lag 10. The probability value < 0.05 indicates that the returns series reject the null of serial correlation at 5% significance level.

Index		Lag 1	Lag 2	Lag 3	Lag 4	Lag 5	Lag 6	Lag 7	Lag 8	Lag 9	Lag 10
NEPSE	Coef	0.22	-0.03	-0.01	0.04	0.01	0.02	0.08	0.08	0.01	-0.05
	p-val	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Autoregression Test

The autoregression (AR) test checks if current returns are influenced by past returns. Using an AR(1) model, Table 6 shows a significant AR(1) coefficient at the 5% level. This rejects the null hypothesis of independence, indicating that NEPSE returns are predictable and do not support the RWH.

Table 6 Autoregression test

The table shows the autoregression test to detect for the overall significance of first order lag on the current return series (daily) for NEPSE index. An autoregressive model of order one is: $R_t = c + \beta_0 R_{t-1}$ *. Where* R_t *is the return series,* R_{t-1} *is the first lag of return series and* β_0 *is the coefficient of the first lag. The probability value < 0.05 indicates that the returns series reject the null of return series are independent at 5% significance level.*

Index		Constant	AR(1)
NEPSE	Coef	0.052	0.219
	t-test	1.900	10.254
	p-value	0.058	0.000

Augmented Dickey Fuller Test

The Augmented Dickey-Fuller (ADF) test checks for stationarity in the NEPSE return series. Table 7 shows that the p-value is below 0.05, indicating no unit root. Thus, the null hypothesis of non-stationarity is rejected. Since stationarity contradicts the random walk requirement of a unit root, the results do not support the RWH.

Table 7 Augmented Dickey Fuller test

The table shows the ADF test to examine the stationarity for daily return series variable for NEPSE index at the level and 1st difference. The ADF statistic is a negative number. The test statistic is more negative the stronger the rejection of the hypothesis that the return series data has a unit root (i.e. non-stationary). The probability value < 0.05 indicates that the returns series reject the null of non-stationarity at 5% significance level.

	Level		1st diff	
Index	t-Stat	Prob	t-Stat	Prob
NEPSE	-30.810	0.000	-18.477	0.000

Variance Ratio Test

The Variance Ratio (VR) test is used to examine the random walk behavior of NEPSE return series, accounting for short-term fluctuations. It is applied under both homoscedastic and heteroscedastic assumptions. Table 8 presents VR test results at lags 2 to 34, showing that the variance ratio coefficients differ from one, indicating mean reversion. The homoscedastic Z(k) values for NEPSE shows p-values below 0.05, rejecting the null hypothesis of no serial correlation. The results suggest positive autocorrelation, implying stock prices react slowly to new information and that past prices can help predict future movements.

Table 8 Variance ratio test

The table shows the VR test to detect dependency (non-randomness) of stock return series (daily) for NEPSE index at different lags. The probability value < 0.05 indicates that the returns series reject the null of the RWH with the rise in lags value at 5% significance level.

Index		Lag2	Lag6	Lag10	Lag14	Lag18	Lag22	Lag26	Lag 30	Lag 34
NEPSE	Coef	0.66	0.21	0.13	0.09	0.07	0.06	0.05	0.04	0.04
	Z(k)	-7.62	-7.73	-6.56	-5.89	-5.40	-5.03	-4.76	-4.53	-4.34
	p-val	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Random Walk Model with Linearity

This study tests the linear relationship between consecutive NEPSE returns, as shown in Table 9. The results reveal a statistically significant model with a significant coefficient (α), indicating market inefficiency and a rejection of the RWH. No evidence of heteroskedasticity is found. However, the Ramsey RESET test shows significant non-linearity in the NEPSE return series.

Table 9 Random walk model with linearity of returns series for NEPSE index

The table shows the random walk model with linearities to examine the linear relationship between two successive returns for NEPSE Index on daily basis. The model is: $R_t = \alpha_0 + \alpha_1 R_{t-1} + \varepsilon_t$ *. Where,* R_t *is the return series;* R_{t-1} *is the first lag of return series;* α_0 *is constant,* α_1 *is the coefficient of the first lag; and* ε_t *is error terms. The probability value < 0.05 indicates that the regression coefficients reject the null of statistical significance at 5% significance level.*

Index		Constant	AR(1)	F test		Heteros test		Ramsey Reset test	
		α_0	α_1	F-stat	p-val	χ^{2a}	p-val	χ^{2b}	p-val
NEPSE	Coef	0.052	0.219	105.141	0.000	0.003	0.957	4.945	0.000
	p-val	0.058	0.000						

Random Walk Model with Non-linearity

The study examines the relationship between successive NEPSE returns using a non-linear random walk model that accounts for investor biases and neutral risk behavior. Table 10 shows the model is statistically significant (p-value < 0.05), with all coefficients (α1, α2, α3) significant. This indicates market inefficiency and rejects the RWH. Evidence of heteroscedasticity is present (p-value < 0.05), while the Ramsey RESET test finds no significant non-linearity (p-value > 0.05).

Table 10 Random walk model with non-linearity of return series for NEPSE index

The table shows the random walk model with non-linearities to examine the non-linear relationship between two successive returns for NEPSE index on daily basis. The model is: $R_t = \alpha_0 + \alpha_1 R_{t-1} + \alpha_2 R_{t-1}^2 + \alpha_3 R_{t-1}^3 + \varepsilon_t$. Where R_t is the return series, R_{t-1} is the first lag of return series, α_0 is constant, and α_1 is the coefficient of the first order function, α_2 is the coefficient of the second order function, α_3 is the coefficient of the third order function and ε_t is error terms. The probability value < 0.05 indicates that the regression coefficients reject the null of statistical significance at 5% significance level.

Index		α_0	α_1	α_2	α_3		F test	Het. Test	Ram. test
NEPSE	Coef	-0.008	0.401	0.042	-0.017	test stat	70.871	424.923	0.173
	p-val	0.789	0.000	0.000	0.000	p-val	0.000	0.000	0.863

Discussion

According to Fama (1965), the randomness and independence of price changes are fundamental to market efficiency. The weak form of the EMH asserts that stock prices reflect all past information, making price changes random and unpredictable—consistent with the random walk theory. This theory gained popularity after the 1970s, positing that stock prices follow a random walk, and that consistently outperforming the market is impossible. The RWH implies that stock price movements are independent, identically distributed, and follow no predictable pattern, thus making future price prediction based on past data futile.

This study investigates the operation of the RWH in the Nepalese stock market by applying various statistical tests, including Jarque-Bera, Skewness, Kurtosis, Kolmogorov-Smirnov, Run, Autocorrelation, Autoregression, Augmented Dickey-Fuller, Variance Ratio, and both linear and non-linear random walk models. The consistent outcome across these tests is that the return series are not independently and identically distributed, leading to the conclusion that stock returns in Nepal do not follow a random walk. This findings align with similar results observed in several emerging markets, including studies by Omar et al. (2013) in Pakistan, and Sadat & Hasan (2019) in Bangladesh. However, they contrast with findings from developed markets, such as Kendall (1953) in the UK, Solnik (1973) in the US, and Narayan & Smyth (2007) in G7 countries, where the RWH tends to hold. Literature on different markets often shows mixed results, which is expected due to institutional differences. Developed markets generally exhibit weak-form efficiency, benefiting from high liquidity, active trading, strong institutions, and low information asymmetry. In contrast, small markets like Nepal suffer from weak infrastructure, greater information asymmetry, and thin trading, leading to inefficiencies. However, investors should exercise caution, as Nepal's market is relatively illiquid and inefficient, increasing the risk of substantial losses. For regulatory authorities should need to improve informational efficiency and boost investor confidence.

The fundamental premise of EMH—that stock returns are random—is challenged by the Nepalese market's empirical evidence. The non-randomness suggests that the Nepalese stock market is weak-form inefficient, where past information can be used to predict future returns. This means current stock returns are the best predictors of future returns, implying that abnormal profits can potentially be earned by exploiting historical price patterns. This study contributes valuable insights into the time series behavior of the Nepalese stock market and serves as a foundation for future research aimed at improving market efficiency.

Conclusion

The findings of this study lead to the conclusion that the Nepalese stock market does not follow the RWH. Results from parametric and non-parametric tests, as well as ARIMA and linear/non-linear models, reveal significant serial correlation in NEPSE returns. This supports the conclusion that stock prices are predictable to some extent, indicating a lack of weak-form efficiency. The findings are consistent with those of other emerging markets such as Pakistan, Bangladesh, and Srilanka, but contrast with results from developed markets like the UK, US, and other G7 nations. This results further concludes that the Nepalese stock market is informationally inefficient, challenging the core assumptions of the EMH. Future studies should examine semi-strong and strong-form efficiencies using sector-specific data to better capture the complexities of Nepal's stock market behavior.

Implications

The findings of this study hold important implications for policymakers, researchers, and investors.

Implications for Policy Makers:

- The study reveals that the Nepalese stock market suffers from informational inefficiency, largely due to inadequate dissemination of reliable financial data. Policymakers should prioritize enhancing transparency by improving public access to trustworthy information. This is critical since market returns are predictable, driven by thin trading, low financial literacy, and limited investor expertise. Therefore, regulatory reforms combined with investor education programs are urgently needed.
- Market inefficiencies have allowed dominant investors to manipulate stock prices, which undermines investor confidence and hampers capital market development. To address this, policymakers must establish and enforce stringent disclosure requirements supported by an effective system of rewards and penalties to ensure timely and accurate reporting.
- The adoption of electronic disclosure platforms should be accelerated, with strict monitoring of corporate disclosures and synchronization of reporting timelines to promote consistency and comparability of information across the market.
- Strong legal frameworks are essential to deter herding behavior and unfair trading practices. Policymakers should facilitate the creation and empowerment of independent financial research institutions and credit rating agencies to foster transparency and market discipline.
- Protecting investors must remain a top priority. This includes implementing robust regulations to prevent insider trading and speculative manipulations, thereby safeguarding both retail and institutional investors and enhancing overall market integrity.

Implications for Researchers:

- This study provides strong evidence of informational inefficiency in the Nepalese stock market, challenging the EMH's validity in emerging markets. The persistent non-random behavior of stock prices in NEPSE indicates market anomalies, highlighting the need to re-evaluate EMH's universal applicability in contexts with structural and behavioral constraints.
- The findings reinforce the growing relevance of behavioral finance in explaining market dynamics in less developed markets. Investor psychology, biases, and herd behavior significantly shape outcomes, suggesting the importance of alternative models that incorporate cognitive and behavioral dimensions.
- Future research should adopt mixed-method approaches, blending quantitative analysis with qualitative insights into investor behavior, regulatory performance, and market sentiment. Exploring factors like financial literacy, investor protection laws, and technological advancements in disclosure can offer deeper insights into improving efficiency.
- Overall, the study reveals the limitations of classical theories in emerging economies and calls for broader frameworks rooted in behavioral finance and institutional economics to better reflect the realities of markets like NEPSE.

Implications for Investors:

- The study's rejection of both the EMH and RWH has important implications for investors in the Nepalese stock market. It suggests that stock prices do not fully reflect all available information, and that returns may be predictable based on historical data. This creates both opportunities and risks for investors.

- For investors with analytical skills and access to reliable data, market inefficiencies offer the potential to outperform average returns. Strategies such as technical analysis, trend-following, and other data-driven approaches may prove effective in capitalizing on predictable patterns.
- However, these inefficiencies also pose heightened risks for investors. The market is vulnerable to manipulation by dominant players, and price movements are often influenced by rumors, misinformation, and herd behavior. Therefore, investors—especially individuals—should exercise caution and avoid making decisions based solely on market sentiment.
- The widespread lack of expertise underscores the need for financial education for investors. New and existing investors alike should participate in literacy programs to strengthen decision-making and avoid common pitfalls like panic selling, overtrading, or chasing speculative gains.
- A deeper understanding of market behavior and investor psychology can offer a competitive edge for investors navigating the uncertain and evolving environment of Nepal's financial market.

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