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Is The Nepalese Stock Market Weak Form Efficient? Evidence from the Banking Index

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Abstract: *This study investigates about the weak form of efficiency of the Nepalese Stock market based on the banking index. The origin of market efficiency can be discovered to the innoviative works of (Fama, 1970). He developed the efficient market hypothesis which consisted of three forms: the weak form, semi-strong form and strong form. Daily returns of the banking index of Nepalese commercial bank is examined for weak form of efficiency using auto-correlation test, runs tests, Augmented Dickey-Fuller (ADF) unit root tests and variance ratio test. The data used in this study consisted of banking index returns for the Nepalese stock market. The data are retrieved from official web site of NEPSEY. Daily data are collected from February 2015 to February 2020. The results of autocorrelation and variance ratio test indicate that the Nepalese stock market is weak form efficient. Contrary, the results of unit root test and runs test indicate that the Nepalese stock market is weak form inefficient. From the empirical analysis there is conflicting results between the test result of different statistics.*

Keywords: *Market Efficiency, Random Walk Hypothesis, Banking Index, Unit root, Runs test Variance Ratio, Autocorrelations.*

1. INTRODUCTION:

If a market is efficient in the weak form, stock price movements should follow a random walk and the price movements in the past should be not related to future price movements. But if the market is not efficient in the weak form and price movements are not random, some investors can exploit the inefficiency by gaining abnormal returns. Potential investor may be able to correctly predict the future price movements by examining the historical price movements. The banking index of Nepal stock is a weighted index of all stocks of commercial banks listed on the Nepalese Stock Exchange. The aim of this study is to determine whether the Stock market of Nepalese commercial banks is efficient in the weak form by examining the index's daily returns from February 2015 to February 2020. We use unit root test, autocorrelation test, runs test and Lo and Mac Kinlay variance ratio test to measure the market efficiency. The study explored the commercial bank of Nepalese stock market is not efficient in the weak form and investors can earn abnormal returns by analyzing the historical stock price movements. The results of this study have implications for investors and analyst as they seek predictability in stock returns. Investors can earn abnormal returns by analyzing the historical stock price movements. The results of our study have implications for investors and practitioners as they seek predictability in stock returns.

2. LITERATURE REVIEW :

The study of market efficiency can be developed to the innovative works of (Fama, 1970). He developed the efficient market hypothesis which consisted of three forms: the weak form, semi-strong form and strong form. After works of Fama many studies have been done to examine whether some markets are efficient in the weak form. (Chan, Gup, & Pan, 1992) tested the weak form hypothesis in Hong Kong, South Korea, Singapore, Taiwan, Japan, and the United States. Their detecting indicate that stock prices in these major Asian markets and the United States are efficient in the weak form. Studies conducted by (Baral & Shrestha, 2006) have tested the RWH in the context of Nepalese Capital Markets. They found the Nepalese stock market is inefficient.

(Gu, 2004) also deliberated study the weak form efficiency of the NASDAQ composite index by using of the variance ratio test from 1971 to 2001. Using daily returns, he found evidence that the daily returns of the NASDAQ were not weak form efficient. Contrary (Seiler & Rom, 1997) studied the random walk hypothesis by using the Box-Jenkins methodology from 1885 to 1962 and found that historical stock price movements are random.

Several researchers have examined market efficiency in emerging markets but got conflicting results. (Gupta & Basu, 2007) evaluated market efficiency in the Indian stock market from 1991 to 2006. They used the ADF, PP, and KPSS procedures to test for unit roots. Their results indicated that Indian Stock Markets do not follow a random walk. (Harper & Jin, 2012) also studied the Indian Stock Market and found similar results. (Chigozie & Okpara, 2010) examined the

Nigerian stock market from 1984 to 2006. Using a generalized autoregressive conditional hetrosecedasticity (GARCH 1, 1) he found that the Nigerian stock market is weak form efficient.

Along this line of inquiry (Magnus, 2008) investigated whether the Ghana stock exchange follows a random walk. Employing a similar GARCH (1, 1) model and daily data from 1999 to 2004, he found evidence that rejected the random walk hypothesis which indicated that the Ghana Stock Exchange is weak form inefficient. In an earlier study (Karamera, Ojah, & Cole, 1999) found that the RWH cannot be rejected in respect to Indonesia and that Indonesia stock returns follow a random walk. In contrast to the study of (Kim & Shamsuddin, 2008) test the martingale hypothesis in stock prices using a multiple variance ratio test based and find no evidence of market efficiency in Indonesia. They further indicate that despite financial liberation in Indonesia the markets have not become efficient in the weak form. Despite the findings of (Guidi & Gupta, 2013)also investigate market efficiency from January 2000 to April 2011 with the aid of variance ratio and co-integration tests, they find that the Indonesian stock market does not follow a random walk and is weak form inefficient.

(Gilani, 2014) the study explored the weak-form efficiency of the Islamabad Stock Exchange (ISE) from January 2013 to December 2013. In testing for the weak-form efficiency of the Islamabad Stock exchange, different statistical techniques were used in analyzing the data of the weekly ISE-10 share index. This includes the famous tests of statistics such as run tests and the ADF test to check the Weak form of ISE. The study also focused on the random walk behavior of the stock market of Islamabad. Auto-correlation test and Run test showed market inefficiency at specific periods but ADF test showed weak form of market efficiency.

(Ojo & Azeez, 2012) Investigated the existence of the strong-form efficient market hypothesis in the Nigerian capital market for the period 1986 to 2010. The empirical analysis was conducted employing the Autoregressive Conditional Heteroscedasticity (ARCH) and Generalized Autoregressive Conditional Heteroscedasticity (GARCH) models. The empirical results revealed that the Nigerian capital market was weak-form efficient.

(Potocki & Swist, 2012) the study examined the strong form of market informational efficiency, based on the assumption that the institutions issuing recommendations have access to information inaccessible to the community of investors. The sample of the study consists of 3,270 recommendations produced between 1 January 2005 and 31 March 2010 by 63 financial entities regarding companies making up the WIG 20 index. The results disclosed the evidence for the efficient market hypothesis that the strong form efficiency is characteristic of the WIG 20 index shares listed on the Warsaw Stock Exchange. (Verma & Rao, 2007) examined the weak form of efficiency of the companies included in the BSE 100 index as on 31st March, 2001. The results showed that in 1998-99 and 1999-2000 there were no evidence of market efficiency. However, in the year 2000-01 market was found efficient.

Study conducted by (Sah & Omkarnath, 2007)reported mixed results in case of daily nifty returns when weak form of efficiency is concerned. (Sharma & Chander, 2011) found that there was possibility to develop predictable pattern of stock return from its past values during the study period from July 1997 to December 2007.Most of the previous research studies in this context primarily focused on detecting linear structure in the financial data. Applying autocorrelation test or runs test studies looked into the linear predictability of future share price changes. If the share returns turned out to be uncorrelated, then the EMH was accepted and the stock market in question were taken to be informational efficient, and vice versa. The traditional tests of serial correlation, which checks for linear predictability, cannot explicitly test for the i.i.d. assumption implied by Random Walk Hypothesis. (Dhankar & Chakraborty, 2007) Investigated whether the non-linear dependence in major daily indices of the three South Asian countries provided by the respective stock exchanges is caused by predictable conditional volatility. The BDS test was applied for investigating the same has strongly rejected the null hypothesis of independent and identical distribution of the return series.

3. MATERIALS:

The data used in this study consisted of banking index returns for the Nepalese stock market. The data are retrieved from official website of NEPSE. Daily data are collected from February 2015 to February 2020. The data is then transformed to natural logs of the index with a one period lag. The index used in this study is the Nepalese banking Index. The stock returns are defined as follows.

$Rt = Logpt / Logpt{-}1$

Where, Rt is the return at time t on the Banking Index, $Logpt$ is the logarithmic price at time t and $Logpt{-}1$ is the logarithmic at time $t{-}1$. The reason for transforming time series is to ensure that the data is stationary.

4. METHODS:

In testing the market efficiency of the banking index of Nepalese stock market, an autocorrelations test, runs test, unit root test and variance ratio tests are employed. All the tests examine the stock market efficiency and random walk model. The study uses daily returns of banking index from February 2015 to February 2020 which is a much smaller time frame. For the analysis the EViews and SPSS data analysis tools are used. The researcher seeks to test the

hypothesis that the series of returns are independently and identically distributed random variables. If significant autocorrelations are found in times series data, stock returns may not follow a random walk and the market can be classified as inefficient. However, if stocks returns do follow a random walk, then investor may not be able to successfully predict future returns and the market may be characterized as weak form efficient.

4.1 HYPOTHESIS

The objective of this research paper is to examine the random walk hypothesis (RWH) by testing the weak-form efficiency in the banking index returns. Therefore, the hypothesis to be tested is:
H0: The Nepalese Stock Market follows a random walk model.
H1: The Nepalese Stock Market do not follow random walk model.
H0: The Nepalese Stock Market is efficient in weak from.
H1: The Nepalese Stock Market is not efficient in weak from.

4.2 EMPERICAL RESULTS

AUTOCORRELATION TEST

Table 1 explores the results of the autocorrelations test. The 16 lag periods are associated with the autocorrelation test. The first lag depicts an autocorrelation of 0.004, a standard error of 0.029 and a Box-Lung value of 0.023 and is not significant at the 95% confidence level. This indicates that the Nepalese stock market follow a random walk and stock market is weak form of efficient. Lags 2, 3, 4, 6, 10,14 and 15 all exhibit negative autocorrelations with a "p" value of 1 .000 and are not significant again at the 95% confidence level which indicates that stock returns on the Nepalese commercial banking Stock Market are efficient. The implication is that investors may not be able to predict the future returns by analyzing the past price movements because the market is efficient in the weak form.

TABLE 1

AUTO-CORRELATION TEST

Lag	Autocorrelation	Std. Error[a]	Box-Ljung Statistic		
			Value	df	Sig.[b]
1	.004	.029	.023	1	.880
2	-.002	.029	.028	2	.986
3	-.010	.029	.138	3	.987
4	-.001	.029	.141	4	.998
5	.000	.029	.141	5	1.000
6	-.001	.029	.143	6	1.000
7	.000	.029	.143	7	1.000
8	-.003	.029	.153	8	1.000
9	.000	.029	.153	9	1.000
10	-.001	.029	.155	10	1.000
11	.000	.029	.156	11	1.000
12	.007	.029	.211	12	1.000
13	.000	.029	.212	13	1.000
14	-.003	.029	.222	14	1.000
15	-.194	.029	45.384	15	.000
16	.000	.029	45.384	16	.000

a. The underlying process assumed is independence (white noise).

b. Based on the asymptotic chi-square approximation.

UNIT ROOT TEST

Table 2 explores the result of the unit root test of the index return of Nepalese commercial bank at the maximum lag length of 32.The test is significant because the probability value of Augmented Dickey-Fuller test statistics is 0.0000 which is less than 5% level of significance. So the index return of the Nepalese commercial banks has no unit root or stationary. The implication is that the investors may be able to predict the future returns by analyzing the past price movements due to the market is not efficient in the weak form.

TABLE 2

Null Hypothesis: R_B__ has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, max lag=32)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-33.28425	0.0000
Test critical values:	1% level	-3.435654	
	5% level	-2.863770	
	10% level	-2.568008	

*MacKinnon (1996) one-sided p-values.

Runs Test

Table 3 illustrates the results of the runs test. This study finds the Z value to be -7.585 and lie outside of the range of 95% confidence level that tock return follows a random walk. Also, the P value is 0.000 and is significant at the 95% significance level.($P \leq 0.05$).The result from the runs test indicate that the stock market of Nepalese commercial bank does not follow a random walk and the stock market can be classified as weak form inefficient.

TABLE 3

RUNS TEST

	Bank
Test Value[a]	-.00073
Cases < Test Value	592
Cases >= Test Value	593
Total Cases	1185
Number of Runs	463
Z	-7.585
Asymp. Sig. (2-tailed)	.000

a. Median

TABLE 4

RUNS TEST 2

	Bank
Test Value[a]	.0031241
Cases < Test Value	810
Cases >= Test Value	375
Total Cases	1185
Number of Runs	385
Z	-8.644
Asymp. Sig. (2-tailed)	.000

a. Mean

LO AND MACKINLAY VARIANCE RATIO TEST RESULT

Table 5 clearly shows that the null hypothesis is not rejected for the stock return of Nepalese commercial bank, based on the return of banking index based on the joint index. The results are quite similar for individual as well as joint hypothesis. The period and joint test, variance ratio static P value is higher than alpha (5% level of significance) as well as Z statistics also less than the degree of freedom at 5% level of significance. So, Stock prices on the banking index follow the random walk model and the investors unable to earn abnormal profit from the stock market.

Table 5
Null Hypothesis: R_B__ is a Martingale
Date: 06/21/20 Time: 09:57
Sample: 1 1186
Included observations: 1185 (after adjustments)
Heteroskedasticity robust standard error estimates
User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max |z| (at period 8)*	1.073932	1185	0.7355

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.504444	0.464204	-1.067541	0.2857
4	0.252635	0.696318	-1.073309	0.2831
8	0.127532	0.812405	-1.073932	0.2829
16	0.064728	0.870943	-1.073861	0.2829

*Probability approximation using studentized maximum modulus with parameter value 4 and infinite degree of freedom

5. CONCLUSION:

Based on the result of autocorrelation and Lo and Mac- Kinlay variance ratio test, the test is not significant which explores the Nepalese stock market is weak form of efficient and investors unable to predict the future price and future return. This implies that the investors unable to earn excessive return from the stock of Nepalese commercial banks. But the result of unit root test and runs test indicate that the test is significant. This implies that the investors able to earn excessive return from Nepalese stock market of commercial banks. From the empirical analysis there is conflicting results between the test result of different statistics.

6. IMPLICATION:

The implication of acceptance of weak form efficiency for investors is that they cannot predict the stock price movements, in the stock of commercial banks. But the implication of rejection of weak form efficiency for investors is that they can better predict the stock price movements, by holding a well-diversified portfolio while investing in the Nepalese stock markets. Further research can be constructed to investigate whether the Nepalese stock market is weak-form efficient using weekly or monthly data. Alternatively, using different indices and sub-indices to measure the stock market efficiency.

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