KMC Journal
[A Peer-Reviewed, Open-Access Multidisciplinary Journal]
ISSN 2961-1709 (Print)
Published by the Research Management Cell
Kailali Multiple Campus, Dhangadhi
Far Western University, Nepal
DOI: https://doi.org/10.3126/kmcj.v8i1.90651

Trading Day Effect and Volatility Clustering in NEPSE Returns: An Empirical Analysis of Market Anomalies

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Abstract

This study examines the seasonality of stock returns across trading days in Nepal's stock market. The analysis is based on 4,504 trading days of the NEPSE composite index from 2005 to 2024. The study utilized descriptive statistics, OLS regression, and EGARCH (1,1) estimation incorporating weekday dummy variables. A nonparametric Kruskal–Wallis H Test is also employed to measure the robustness of the results. The study found negative average returns on Sundays and Mondays, and positive returns on Tuesdays, Wednesdays, and Thursdays. NEPSE operates five days a week, with Friday and Saturday being closed. During the study period, mean returns on Wednesday were higher than on any other day of the week. The ANOVA (one-way) results report a significant difference in mean returns on Wednesday and Sunday. The regression results reveal that the returns vary systematically across weekdays. The study found significantly higher returns on Wednesday and Thursday compared to Sunday, indicating seasonality in returns across operating days in a week. The results of the EGARCH (1,1) model, significant ARCH and GARCH coefficients indicate that shocks immediately increase volatility and that volatility persists over time, confirming both short-term clustering and long-term dependence in NEPSE returns. However, the insignificant volatility term (γ) suggests there is no asymmetric volatility response to negative shocks. The findings of this study are beneficial for stock market investors in Nepal, suggesting that they should buy stocks at the start of the week and sell them by the end.

***Keywords**:* ANOVA, EGARCH, mean difference, dummy variables, seasonality

Introduction

In an efficient market, stock returns are typically not expected to exhibit predictable patterns. However, numerous studies worldwide (Cross, 1973; French, 1980; Aggarwal & Rivoli, 1989) have documented a phenomenon known as the Weekdays effect, where returns vary systematically depending on the trading day. These patterns challenge the theory of market efficiency, suggesting the presence of behavioral or structural inefficiencies. Fama (1970) states that in an efficient market, stock returns are generally not expected to show predictable patterns.

Eugene Fama proposed the concept of market efficiency in 1970, which suggests that the stock prices accurately reflect all accessible information. Therefore, no investor can continuously surge returns without taking additional risk. However, empirical studies conducted in various stock markets worldwide have found persistent patterns in stock returns that contradict the EMH. The contradicting factors of EMH theory are known as market anomalies. The identified factors that challenged the market efficiency have been classified into calendar anomalies (like daily return anomaly, turn of the month, months of the year, holiday, festival effect, etc.), technical anomalies (like momentum, reversal), and fundamental anomalies (like size effect, profitability effect). Anomalies suggest that markets may not be perfectly efficient; therefore, the study of Fama (1970) classified market efficiency into three distinct forms: the weak form, the semi-strong form, and the strong form of efficiency. The calendar anomalies violate the weak efficiency condition in the market. Moreover, the market efficiency in its weakest form states that the current trading price of the stock market fully reflects all available information contained in the past price and returns (Fama, 1970). Moreover, in the weak form of efficiency, investors cannot earn additional returns by analyzing past price movements or return patterns. Samuelson (1965) and Malkiel (1973) argued that stock prices move randomly, meaning that price changes are unpredictable by supporting the idea that technical analysis and market timing don't work consistently. While, empirical studies found persistent return patterns or seasonality within the weekdays (Cross, 1973; French, 1980; Agrawal & Tandon, 1994; Hasan et al., 2021), months of the year (Rozeff & Kenney, 1976; Dangol, 2010; Agrawal & Jha,2023), turn of the month (Arial,1987), at the time of festivals, and holidays (Arial, 1990). The evidence of seasonal patterns found in the stock returns contradicts the random walk theory, which forms the theoretical foundation of the market efficiency hypothesis.

The weekly seasonality in returns is a calendar anomaly where average returns exhibit systematic differences across the weekdays. This effect is also called the weekend effect in the study of market anomalies. Two consecutive studies conducted in the 1970s and 1980s by Cross (1973) and Keim and Stambaugh (1984) found significant negative returns on Monday and positive returns on Friday in the US stock markets. A similar study of Kato (1990) investigated significantly lower returns on Tuesday and higher returns on Wednesday in the Tokyo Stock Exchange of Japan. The most recent studies have also reported daily return anomaly in developed countries' stock markets as well as developing countries like South Asia. A study by Aggarwal and Jha (2023) reported the weekday effect and return volatility clustering in the Indian stock markets.

This study focused on the variation in stock returns across trading days in the Nepal Stock Exchange market (NEPSE). In the Nepalese context, few studies have been conducted to examine the calendar anomalies in NEPSE. A study conducted by KC and Joshi (2005) reported a significant negative return on Monday across weekdays. The NEPSE, an emerging market characterized by a limited number of related studies, offers a unique context for examining such anomalies. Despite an increase in investor interest, empirical research on market anomalies in NEPSE is scarce, particularly regarding the calendar-day anomaly. Therefore, the goal of the study is to investigate whether the NEPSE exhibits a notable trading day effect and what implications this might have for market efficiency and trading strategies in Nepal. This study employed very recent statistical tools, the EGARCH model with dummies, to observe the weekdays' returns patterns on NEPSE. This study aims to achieve the following objectives:

1. To examine the presence of the trading day effect in NEPSE stock returns
2. To analyze the volatility clustering behavior in NEPSE returns
3. To examine whether stock returns volatility in the NEPSE varies systematically across trading days of the week

Literature Review

Researchers in the stock market have shown a growing interest in calendar anomalies. Numerous studies have been conducted on various calendar anomalies, including the trading day effect across different stock markets worldwide. The first study on weekday anomaly was conducted in the S&P 500 stock market of the United States (US) in 1973 by Frank M. Cross. Cross (1973) investigated the significant difference in average returns among the weekdays. The author found the difference in mean returns between Monday and Friday during the study period of 1953-1970. Similarly, French (1980) re-examined seasonal effect in the S&P 500 stock market using an OLS regression model. The study reported a significantly lower mean return on Monday compared to other days of the week, and the phenomenon is known as the Monday effect. Moreover, Lokonishok and Smidt (1988) found that Monday returns were significantly negative and differed from those on other days. The study was conducted over a lengthy period, from 1897 to 1986, spanning approximately 90 years on the stock returns of the Dow Jones Industrial Average (DJIA). Afterward, Wang et al. (1992) examined weekday return variation in the stock markets of five countries: Hong Kong, Taiwan, Malaysia, Singapore, and Thailand, covering the period from 1975 to 1987. The study utilized a non-parametric test (Kruskal-Wallis) and found a statistically significant weekday return variation in four of the five countries, except for Taiwan.

In the 1980s and 1990s, the majority of the studies focused on the testing of seasonality, like the weekday return effect in developed and developing security markets. However, in the 2000s, some related studies claimed to have eliminated the effect in the stock markets. Kohers et al. (2004) found that the DOW effect faded away in the 1990s, whereas the effect was found in the 1980s. The study was conducted taking a sample of eleven developed countries' stock markets from 1980 to 2002. The study found that the seasonal effect in the stock market can be time-varying and inefficient market positions. The results indicated that market efficiency can cover the anomalies that appear in the financial markets. A similar study of Basher and Sadorsky (2006) examined the calendar-related trading pattern in 21 emerging stock markets from different countries from 1992 to 2003 and found a significant effect only in three countries. This finding indicates that the effect may not be present in all stock markets. The study of Doyle and Chen (2009) found an inconsistent pattern of returns among the weekdays, analyzing the daily returns of eleven countries' stock markets from 1993-2007. The study's results suggest that the weekly seasonal patterns can change over time, with the well-documented Monday effect also varying. Additionally, the study of Gao et al. (2015) found an insignificant relationship between the Monday effect and short-selling strategies in the Hong Kong Stock Exchange during the study period of 1980-2003. Whoever, in previous empirical studies such as Chen and Singal (2003), reported a significant relationship between the trading day effect and short-selling strategies in the stock markets.

Khan and Rabbani (2019) investigated the calendar effect in bull and bear market conditions of the Japanese Stock Markets from 1977 to 2017. The study employed the OLS regression and GARCG (1,1) model to examine the daily seasonal behavior and other calendar anomalies, and reported that the seasonality in the Japanese stock markets depends on the market condition. The study found inter-day returns fluctuation only in the bull market condition, not in the bear or down markets. A study by Pandey (2022) used the GARCH family models (i.e., SGARCH, TGARCH, and GARCH-M) to examine the calendar effect on Egyptian stock markets from 2012 to 2019. The study examined the weekday anomaly in terms of mean returns and volatility clustering, and reported the weekday effect, persistent volatility, and leverage effect in the Egyptian stock markets. The study observed that the negative market shocks tend to cause greater volatility than positive shocks, indicating asymmetry in market behavior. In this context, Aggarwal and Jha (2003) utilized several GARCH models to examine the trading day returns behavior and volatility dynamics in the Indian National Stock Exchange (NSE) market from 1990-2022, and found a significant positive pattern in returns within the weekdays and the leverage effect in returns during the study period of 28 years.

Empirical studies conducted in the different stock markets of the world provided presence and absence of the weekday return anomaly in different periods. But, in the context of the Nepal Stock Exchange Market (NEPSE), there are limited studies conducted, particularly on the trading day effect. The first study on market seasonality on NEPSE was conducted by KC and Joshi (2005). The study examined the trading day effect in NEPAE returns during the study period of 1995-2004, using OLS regression with dummies and mean comparison between the weekdays, and reported different returns patterns in the weekdays and persistently negative returns on Thursday. The weak form of efficiency and the random walk hypothesis have been tested on NEPSE by various researchers in different periods (Pradhan & Upadhyay, 2006; Dangol, 2011; Maharjan, 2018) and found that NEPSE does not exhibit the weak form of market efficiency. If the market is inefficient in its weak form, seasonality in stock returns is evident (Kohers et al., 2004). This study examines seasonality in the Nepal Stock Exchange (NEPSE) by testing the weekday return anomaly using robust statistical tools, including the EGARCH, which incorporates seasonal dummy variables in the variance equation. There are limited studies on NEPSE that have examined the weekly seasonal pattern over an extended period, employing robust models. Therefore, this research represents a significant and original contribution to the literature on Nepalese stock markets.

Methods and Procedures

Data

This study utilized quantitative and secondary data sources, obtained from the NEPSE website. The sample period selected spans from April 2005 to July 2024, based on the operating days of the week established by the NEPSE. The study period was selected based on the consistent trading week structure of NEPSE (Sunday-Thursday) beginning from April 2005. To ensure uniformity in trading days throughout the week, the study period began on April 24, 2005, which was the first day the NEPSE operated on a Sunday. The daily closing index of the NEPSE has been taken to calculate the mean returns of a trading day. The results are based on R_t, representing the return rate for period t is calculated as the logarithmic first difference, $R_t = \ln (P_t/P_{t-1}) \times 100$, where P_t and P_{t-1} are the current day's and last trading day's closing value of the index.

Research Design

This study adopted a quantitative and explanatory research design, and a causal-comparative approach was employed to identify whether systemic differences exist in return and volatility across trading days. This study used a multi-stage methodological framework. At the initial stage, the OLS Regression with Dummy Variables (French, 1980) was applied to identify the preliminary presence of the seasonal effect on returns across the weekdays. The model is as follows:

$R_t = \alpha + \beta_1 D_1 + \beta_2 D_2 + \ldots + \beta_4 D_4 + \varepsilon_t$ ……………………………………………1

Where, R_t is the dependent variable, the stock return at time t (e.g., daily), and α is the intercept term, D_1, D_2, D_3, and D_4 are dummy variables for trading days, where the value 1 is assigned if the day is Sunday and 0 otherwise, similar to all weekdays. β_i is the coefficient associated with dummy variable j. The coefficient of α represents the mean return of Sunday, since Sunday is taken as the base day. A significantly positive or negative β_i suggests that the mean return on Tuesday is notably higher or lower than the mean return on Sunday (base day), similar to other trading weekdays.

The series of returns analyzed in this study does not follow a normal distribution, since there may be a problem related to autocorrelation and heteroskedasticity. However, the OLS assumptions are often violated in stock return time series. The significant p-value of the JB test indicates the return series used in this study is not normally distributed. Hence, the OLS results are taken as an initial benchmark.

To overcome the limitation of the OLS model and account for the problem of normality, an EGARCH (1,1) estimation has been used. Nelson (1991) claimed that the EGARCH model is relatively robust to outliers because it models the logarithm of conditional variance and allows asymmetric volatility responses of shocks. Thus, this model provides a more realistic representation of the return series used in this study and helps identify whether the trading day effect persists after controlling for volatility dynamics. Diagnostic tests, such as DW, ARCH-LM, and Ljung-Box Q statistics, were conducted to assess the validity of the estimated EGARCH (1,1) model. Similarly, the Unit-Root test has been conducted to verify stationarity in the data set. The EGARCH model provides results from two equations: the mean equation for return variability and the variance equation for volatility dynamics across the trading days in the week, which are mentioned in equations 2 and 3 as follows:

Mean Equation

$$R_t = \alpha + \beta_0 R_{t-1} + \sum_{i=1}^{k} \beta_i D_{ij} + \epsilon_t \text{ ……………………………………2}$$

Variance Equation

$$\ln(\sigma^2_t) = \omega + \delta \ln(\sigma^2_{t-1}) + \alpha \frac{|\varepsilon_{t-1}|}{\sqrt{\sigma^2_{t-1}}} + \gamma \frac{\varepsilon_{t-1}}{\sqrt{\sigma^2_{t-1}}} + \sum_{i=1}^{k} \beta_i D_{ij} \text{ ……………………….3}$$

Where, $R_{t-1:}$ Representing lagged effect (past return), σ^2_t: Conditional variance of the error term at time t. $\ln(\sigma^2_{t-1})$: Natural logarithm of the conditional variance (used in

EGARCH to ensure positive variance), ω (omega): Constant term (intercept in the variance equation), δ(delta): Coefficient for the lagged log, variance term $\ln(\sigma^2_{t-1})$ representing volatility persistence, ε_{t-1}: Lagged residual or shock term from the mean equation, α(alpha): Coefficient capturing the magnitude effect (how large shocks affect volatility, regardless of sign), γ (gamma): Coefficient for the leverage effect (captures asymmetry — whether negative shocks affect volatility more than positive ones), D_{it}: Dummy variables representing days of the week (e.g., Monday to Thursday; one day is omitted as a base), and B_i (beta): Coefficients for the dummy variables $D_{it,}$ measuring the volatility dynamics across the weekdays. This model shows the ARCH, GARCG, returns patterns, and volatility clustering among the weekdays.

Based on the research question, "Are mean returns and volatility different across the weekdays?" The following hypotheses are formed and tested in this study. H_0: The daily mean returns and volatility across the weekdays are expected to be the same in the NEPSE index.

This study also incorporated an ANOVA test to identify whether the mean return of at least one weekday is significantly different from the other days. H_o (null) = $\mu_1 = \mu_2 = \mu_3 = ... = \mu_k$ (All days of the week mean are equal), and H_1 (alt) = At least one weekday mean is different. The post hoc Test is performed when the ANOVA results lead to rejection of the null hypothesis. A post-hoc test shows a significant difference between the mean returns on weekdays.

Finally, to validate the robustness of the weekday effect obtained from parametric models, non-parametric tests, Kruskal-Wallis, and Mann–Whitney U tests were applied. These test results provide evidence that the mean difference observed on trading days is not influenced by the assumptions of the parametric models. The Kruskal–Wallis test examined whether the distributions of returns differ across all weekdays under the null hypothesis that all median returns are equal. Upon detecting significant overall differences, pairwise comparisons were performed to determine whether the median returns of any two weekdays are identical. When the null hypothesis is rejected in either set of tests, it indicates that daily returns are not uniformly distributed, implying the presence of a weekday anomaly in the market.

Results

Descriptive Statistics

Table 1 provides a statistical overview of the distribution of 4504 observations of daily returns of the NEPSE composite index from 2005 to 2024. The average returns among the weekdays during the period are very diverse. The mean on Sunday and Monday has been negative, and the remaining days have been positive. Monday and Wednesday have the lowest returns. This evidence of mean returns indicates a persistent pattern in the mean returns of NEPSE. The highest standard deviation on Sunday (1.58%) shows high volatility in returns on this day, and the lowest standard deviation on Thursday (1.0749) indicates the lowest return volatility. However, all days except Sunday exhibit fat tails (Kurtosis > 3), which violates the assumption of normality. Similarly, a highly significant Jarque-Bera (JB) test value shows that the series does not conform to a normal distribution.

Table 1

Summary Statistics of NEPSE Daily Returns from April 2005 to July 2024

Days	Sunday	Monday	Tuesday	Wednesday	Thursday	Overall
Mean	-0.0402	-0.024	0.0674	0.1284	0.1192	0.0502
Median	-0.1446	-0.0396	-0.0081	0.0322	0.0127	-0.0208
Std. Dev	1.5824	1.3218	1.3296	1.2369	1.0749	1.3202
Minimum	-7.2281	-6.2262	-6.2056	-5.1592	-6.2052	-7.2281
Maximum	5.8659	5.831	5.8846	5.836	5.6972	5.8846
Skewness	0.346	0.132	0.08	0.568	0.613	0.288
Kurtosis	2.13	3.587	3.607	3.444	4.53	3.433
JB	46.032***	15.656***	14.760***	55.910***	144.469***	97.449***
N	894	907	899	902	902	4504

Note: ***, **, and * indicate significance of P-value at 1, 5, and 10 percent levels.

Figure 1

Graphical Presentation of Daily Returns on a Bar Chart from April 2005 to July 2024

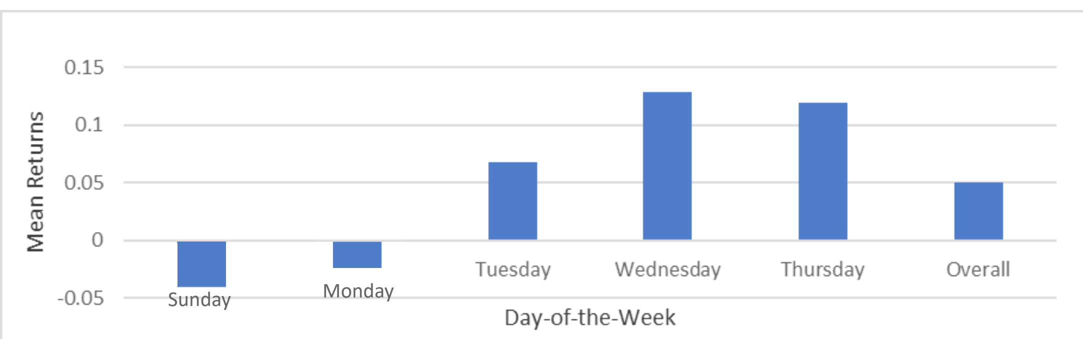

Figure 1 presents the bar chart to illustrate the mean daily returns of the NEPSE index across trading days. The pattern reveals clear variations in returns across the weekdays, indicating the existence of a trading-day effect. The negative returns on Sunday and Monday indicate a weak start to the trading week. The positive returns started from Tuesday and gained their highest on Wednesday, followed by moderately high returns on Thursday. The overall average return during the sample period is positive but smaller with compared to midweek returns. This pattern suggests that investors tend to experience lower or negative returns at the beginning of the weekly trading days and higher returns in midweek.

Figure 2

Trend of Daily Returns on a Line Chart

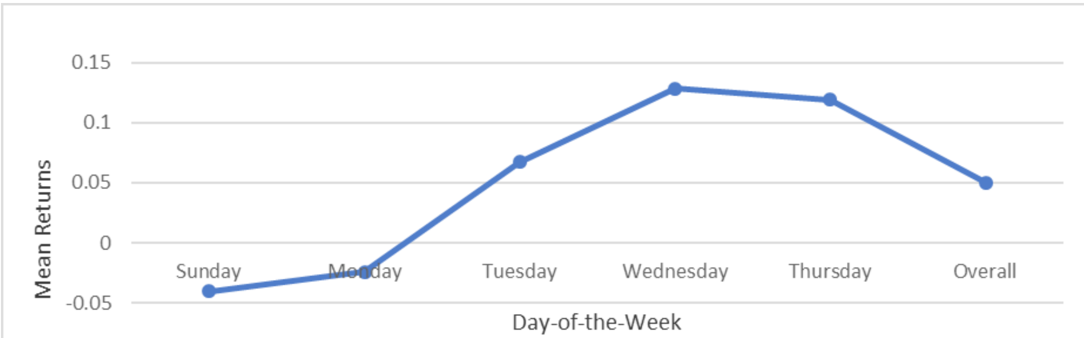

Figure 2 depicts the mean daily returns across the trading weekdays in the line chat. The trend line shows a low and negative return on Sunday and Monday, and a positive return on Tuesday to Thursday, providing the highest mean return on Wednesday. The overall mean return is positive.

The pattern of mean returns suggests the presence of a trading day effect, showing weak performance at the beginning and stronger returns during the middle of the week. The negative Sunday and positive midweek returns may reflect investor mood and trading behavior, consistent with the investor sentiment hypothesis (Thaler, 1987; Hirshleifer & Shumway, 2003). Since the Nepali trading week begins on Sunday, the weak start may be equivalent to the "Monday effect" observed in Western markets.

Stationarity Test

The Augmented Dickey–Fuller (ADF) test was performed to measure the stationarity of the stock market returns series. H_0: Returns have a unit root (non-stationary) and H_1: Returns are stationary.

Table 2

ADF Test Results for Non-stationarity

Test statistic	Value	1% level critical value	P-value	Conclusion
With trend and intercept	-45.5509	-3.9609	0.0001	Stationary
With intercept	-45.5511	-3.4316	0.0001	Stationary
Without intercept	-45.4572	-2.5654	0.0001	Stationary

Table 2 shows the results of the stationarity test, indicating returns are stationary.

The significant p-value shows the stationary nature of returns during the study period. So, further inferential tests can be performed.

Regression Analysis

The Ordinary Least Squares (OLS) regression with dummy variables has been applied to compare the mean returns across the trading days in a week. The model used is as follows:

$R_t = \beta_0 + \beta_1 D_{Monday} + \beta 2 D_{Tuesday} + \beta 3 D_{Wednesday} + \beta 4 D_{Thursday} + \epsilon$ ……………………4

Where β_0: Mean return on Sunday, D: Dummy variables indicating the day, and ϵ: Error term

Table 3

OLS Regression Results of the Dummy Variables

Day	Coefficient (B)	Std. Error	t-Statistic	p-Value
Constant	-0.0402	0.0441	-0.9105	0.3626
Monday	-0.0160	0.0622	0.2595	0.7953
Tuesday	0.1080	0.0623	1.7273	0.0842
Wednesday	0.1690	0.0622	2.7082	0.0068
Thursday	0.1590	0.0622	2.5610	0.0105
$R^2 = 0.003$				
F-Statistics = 3.217				
P Value (F) = 0.012				
Se. error = 1.318				

Note: The weekday dummies were created; if the particular day is Sunday, it holds the value I and 0 otherwise, and so on for other days in the week. Sunday is set as a base day, and n-1 dummies have been used in the model to control the dummy trap.

Table 3 presents the results of the OLS regression of dummy variables, Sunday as the reference day, which represents the constant term in the model. The coefficient for the base day (Sunday) is compared with other days to determine whether their returns significantly differ from that of Sunday. The results exhibit that Wednesday and Thursday returns are significantly higher compared to Sunday. Tuesday shows a marginally significant positive effect, indicating slightly higher returns, though at a weaker significance level (10%). The Monday returns do not differ significantly from those of Sunday. The overall F-test (F-statistic = 3.217, P = 0.012) confirms a calendar day anomaly. Despite being statistically meaningful, the low R^2 (0.03%) value suggests that most of the variability in returns is driven by factors other than day of the week, which is typical for financial return data.

Exponential Autoregressive Conditional Heteroskedasticity (EGARCH) Model

Model Justification

This study employed the EGARCH (1,1) model to analyze the difference in mean returns and volatility on the days of the week. This model can capture volatility clustering and time-varying variance features, which are commonly found in the stock market returns series. Previous studies have found that although financial return series are stationary, they often exhibit volatility clustering and ARCH effects, making GARCH-family models more suitable than OLS. For example, Engle (1982) and Bollerslev (1986) demonstrated the limitations of constant-variance models. The OLS regression models are inadequate when volatility is not stable over time (Engle, 1982). In the Nepalese study, Pradhan and KC (2010) and Bhattarai (2016) have found time-varying volatility in NEPSE, justifying the use of GARCH-type models. Before selecting the EGARCH model, different GARCH-family models (i.e., SHARCH, EGARCH, TGARCH, GJR-GARCH, and GARCH-M) were tested based on the Akaike Criterion (AIC) and the Log likelihood. The EGARCH model has been best fitted to the return series used in this study.

Table 4

Results of the Mean and Variance Equation of the EGARCH (1,1) Model

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Mean Equation				
Constant	-0.0656	0.0294	-2.2293	0.0258
Returns (-1)	0.2259	0.0139	16.2672	0.0000
Monday	0.0415	0.0359	1.1559	0.2477
Tuesday	0.1067	0.0384	2.7784	0.0055
Wednesday	0.1220	0.0370	3.2966	0.0010
Thursday	0.1491	0.0391	3.8140	0.0001
Variance Equation				
Intercept (ω)	0.0240	0.0309	0.7773	0.4370
ARCH (α)	0.5360	0.0196	27.3660	0.0000
Volatility (γ)	-0.0082	0.0120	-0.6837	0.4942
GARCH (-1) (δ)	0.8546	0.0086	99.7731	0.0000
Monday	-0.6128	0.0517	-11.8587	0.0000
Tuesday	-0.4856	0.0449	-10.8194	0.0000
Wednesday	-0.5365	0.0486	-11.0350	0.0000

Thursday	-0.3152	0.0437	-7.2141	0.0000
R-squared	0.0438			
Adjusted R-squared	0.0428			
S.E. of regression	1.2907			
ARCH-LM test (1): F test	0.0060			0.9381
Ljung-Box Q^2 (36)	28.9380			0.7920
Durbin-Watson stat	2.0087			

Table 4 shows the EGARCH (1,1) estimated results that reveal the significant weekly seasonal patterns in both returns and volatility, using Sunday as the reference day. In the mean equation, the constant term is negative and significant, indicating lower average returns on Sundays. The Sunday returns are significantly lower than those of Tuesday, Wednesday, and Thursday, with Thursday exhibiting the highest positive coefficient. Monday returns, however, are not statistically different from Sunday, suggesting the absence of the traditional Monday effect. In the variance equation, past returns significantly influence current volatility, as shown by the highly significant ARCH (α) and GARCH (δ) coefficients, while the Volatility (γ) term is insignificant, indicating no asymmetric volatility response to negative shocks. The trading day dummy variables in the variance equation are all negative and highly significant, indicating that volatility is highest on Sundays and systematically declines throughout the week, reaching its lowest levels on weekdays, especially Mondays and Thursdays. Diagnostic tests, including the ARCH-LM and Ljung-Box Q^2, confirm the absence of residual autocorrelation and heteroskedasticity, suggesting that the model is well specified. Overall, the results demonstrate a clear mid-week return premium and a pronounced weekend volatility effect.

Analysis of Variance (ANOVA) Test

In addition to the OLS and EGARCH (1,1) model, an ANOVA test is conducted to assess whether the mean returns differ across the trading days. Although the results from the OLS and EGARCH (1,1) model provide evidence of trading day return variability in the NEPSE index daily returns. To enhance the robustness and credibility of the findings, the ANOVA test has been performed. The ANOVA test provided an independent and robust assessment of whether the mean returns across the trading weekdays differ noticeably. The test hypothesizes that the mean return across the trading days is equal. Table 5 reports the results.

Table 5

One-Way ANOVA of Returns by Weekdays

Source	Sum of Squares	d.f.	Mean Square	F-stat	p-value
Between groups	22.382	4	5.596	3.217	0.012
Within groups	7825.968	4499	1.739		
Total	7848.351	4503			

Table 5 presents the outcome of the ANOVA test. Since the significance (P-value = 0.012< 0.05) test value indicates that at least one day's mean return is different from the others, suggesting the presence of a trading day effect on the NEPSE return. To identify the significant variation in mean returns across trading days, a post hoc test of Tukey's has been performed, and only significant results have been shown in Table 6.

Table 6

The Post Hoc Test Results for the Statistically Meaningful Variables

Comparison	Mean Difference (%)	Std. Error	p-value	95% CI
Wednesday vs. Sunday	0.169	0.062	0.043	[-0.001, 0.338]
Thursday vs. Sunday	0.159	0.062	0.078	[-0.010, 0.329]

Note: There were 10 pairwise comparisons of 5 trading days of the week in the post Hoc test, but only significant results are presented in the table.

Table 6 shows the Post Hoc test, which reveals that Wednesday returns are significantly higher than Sunday returns (P value = 0.043). However, the returns on Sunday and Thursday are significant at the 10 percent level, suggesting a mid-week effect with Wednesday showing notably stronger performance relative to Sunday.

Kruskal–Wallis Test (non-parametric test)

For robustness and validation of the results found from the parametric tests, non-parametric tests have been employed to compare mean returns across the trading weekdays. The hypotheses set for the test are: H_0: The median outcome is the same for all days (Monday = Tuesday = … = Sunday), and H_1: The median outcome for at least one day is different from the others.

Table 7

Test Outcome of Kruskal-Wallis for Weekdays Grouping Variable

Statistic	**Value**
Chi-Square	23.608
Degree of Freedom (DF)	4
P-value	0.000

Table 7 presents the significance (P-value < 0.01) test results of the Kruskal–

Wallis test**,** indicating that at least one day's median return is different from other days. Hence, the test result shows weekly seasonal pattern exists in the NEPSE returns during the study period.

Mann–Whitney U tests

The Kruskal-Wallis test result (Table 7) shows at least one day's return that is different from the others, but it does not indicate which day's return is different, so a further test, the Mann-Whitney test, has been applied to assess whether the median returns of two trading days are meaningfully different. The hypothesis tested is: H_0: The median returns of two trading days are the same (no difference), and H_1: One day's median return is different than the other. The study utilized the Bonferroni adjustment, as described by Dunn (1959), for multiple assessments to reduce the risk of false positives when conducting several statistical tests simultaneously.

Table 8

Pairwise Mann–Whitney U tests between Weekdays and Bonferroni Correction

weekday pair	Z- value	P-value	Significant after Bonferroni (<0.005)
Sunday vs Monday	-1.643	0.100	No
Sunday Vs Tuesday	-3.183	0.001	Yes
Sunday Vs Wednesday	-3.767	0.000	Yes
Sunday Vs Thursday	-4.095	0.000	Yes
Monday Vs Tuesday	-1.761	0.078	No
Monday Vs Wednesday	-2.293	0.022	No
Monday Vs Thursday	-2.531	0.011	No
Tuesday Vs Wednesday	-0.441	0.659	No
Tuesday Vs Thursday	-0.598	0.550	No
Wednesday Vs Thursday	-0.167	0.868	No

Note: The Bonferroni significance level is calculated by dividing the original alpha (0.05) by the number of independent hypotheses (m) (i.e., α adjusted = α /m = 0.05/10 = 0.005). The null hypothesis is rejected only when the P-value falls below 0.005.

Table 8 presents a series of pairwise comparisons conducted to measure mean differences between weekdays. The Z-values and p-values were calculated for each comparison. To eliminate the multiple pairwise comparisons error, a Bonferroni adjustment (Dunn, 1959) was applied. The weekdays pair having $p < 0.005$ is considered significant for the ten pairwise comparisons conducted.

The results of the Bonferroni correction, significant differences in mean returns found on Sunday compared to Tuesday, Wednesday, and Thursday ($p < 0.005$). These results indicate that Sunday's mean returns differ significantly from Tuesday, Wednesday, and Thursday. while other weekday comparisons do not show statistically significant differences after controlling for the multiple comparisons effect. The result provides evidence of a calendar day anomaly in NEPSE.

Discussion

The results of the descriptive statistics, the mean returns across trading days, show an unequal distribution of returns. The results show negative returns on the beginning operating days of the week, and positive returns on the remaining weekdays. The finding is consistent with the study of (KC & Joshi, 2005). The one-way ANOVA test results indicate a rejection of the null hypothesis regarding equal mean returns across various trading days. The analysis shows a substantial difference in mean returns between Wednesday and Sunday, indicating that at least one day's average return deviates from the others. The results provide evidence of the existence of calendar-based variation in stock performance.

The results of the OLS regression also show significantly higher returns on Wednesday and Thursday as compared to Sunday (base day on weekdays dummy variables).

The significant value of the JB test (Table 1) suggests that the NEPSE daily returns deviate from being normally distributed, indicating the presence of fat tails.

For more validity and robustness of the results, the EGARCH (1,1) model has been employed to examine the seasonality on daily returns and volatility dynamics on the NEPSE daily returns. The empirical results of the EGSRCH (1,1) show that the mean returns of Sunday is significantly lower than Tuesday, Wednesday, and Thursday returns, suggesting weak performance of the NEPSE on the beginning operating day of the week. The finding supports the commonly known weekend effect (Monday effect) found in developed stock markets around the world. Similarly, the empirical finding of highly significant ARCH (α) and GARCH (δ) coefficients indicates that the past returns significantly influence current volatility (volatility clustering) in the daily returns of the NEPSE. The insignificant coefficient of the Volatility (γ) term indicates no asymmetric volatility response to negative shocks in the returns. More specifically, bad news has no greater impact than good news on the markets.

This study includes weekday dummy variables in the EGARCH (1,1) variance equation to estimate how volatility varies across weekdays. The empirical results show that the coefficients of weekday dummies are negative and highly significant, indicating that volatility is higher in Sunday returns than on other trading days. The higher volatility on Sunday returns than on other operating days of the week provides evidence of seasonality in volatility in the NEPSE. The result may help predict the price movement based on the specific trading days.

The Jarque-Bera (JB) test results indicate that the returns series in the study deviates from being normally distributed. Given this non-normality, non-parametric approaches give more valid results. The Kruskal-Wallis test outcomes suggested that at least one day's median of returns differs significantly from the others, providing evidence of heterogeneous performance across trading days. The results of the Mann-Whitney U test suggest the presence of a notable difference in median returns among specific weekdays. The result is similar to the findings in the global stock markets.

The Sunday effect found on NEPSE is similar to the "Monday effect" noted in Western markets (Cross, 1973; French, 1980; Lakonishok & Smidt, 1988). The negative returns found on Sundays in NEPSE can be understood through three basic assumptions of behavioral, informational, and liquidity theories. Based on a behavioral finance view (Thaler, 1987; Hirshleifer & Shumway, 2003), the investor mood hypothesis suggests negative mood of investors at the beginning of the workweek leads to lower returns.

Similarly, the information flow on weekend days leads to price adjustments and negative returns on the beginning trading days of the week (Damodaran, 1989; Berument & Kiymaz, 2001). The lower return on Sunday and Monday may be due to the accumulation of unprocessed information during Nepal's non-trading weekend (Friday–Saturday). This is consistent with findings in other emerging markets (Balaban, 1995; Chia et al., 2008). Rogalski (1984) argued that the lower returns at the beginning of the trading week are the cause of thin trading and increased volatility. Whereas an increase in liquidity in the midweek tends to increase returns. Similar kinds of return patterns are found in both developed (Jaffe & Westerfield, 1985) and emerging markets (Chia et al., 2008; Alam & Uddin, 2009; Raj & Kaur, 2018). In the Nepalese stock market, empirical evidence from KC and Joshi (2005) confirms findings showing significantly negative Sunday returns and stronger mid-week performance.

The findings of this study disclose that the weekday returns seasonality found in the NEPSE index returns is consistent with the trading days effect anomalies in the financial markets.

Conclusion

The study reveals a significant trading-day effect in NEPSE stock returns. The negative mean return of Sundays is significantly lower than Wednesdays, providing empirical evidence of the seasonality in weekday returns. This consistent return pattern suggests predictability in market behavior. The findings challenge the weak-form efficiency of NEPSE, as it contradicts the random walk hypothesis. The returns can be forecasted based on weekly trading days. The findings of this study are beneficial for Investors, providing insights into optimal trading days and risk mitigation strategies. For policymakers: Sheds light on market inefficiencies, potentially guiding regulatory improvements. For Academics: Enriches the behavioral finance literature in emerging markets.

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