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Testing Distribution of Risk and Return in Nepalese Stock Market

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Abstract: *The present study deals with the normal distribution of risk and return of the Nepalese stock market. Normal distribution of return is an essential assumption in the field of efficient market hypothesis which posits that the returns of a market must follow the random-walk behaviour. This study has used a set of parametric and non-parametric tests to examine the normality of risk and return of daily, weekly, monthly, quarterly and annual figures for twelve years from mid-July 2000 to mid-July 2012 with three non-overlapping sub-periods (2000/01-2003/04, 2004/05-2007/08 and 2008/09-2008/12). The returns are positively skewed for all the cases over the period except daily returns. The daily and weekly returns are not found normally distributed, which denies the random-walk behavior of stock prices. However, the monthly, quarterly and annual returns are found normally distributed, and therefore the random-walk behaviour of stock prices is accepted in Nepal. However, risks have been distributed non-normally in all the cases. Thus, risk and return relationship found inconsistent in the Nepalese stock market. So investors may have the chance to earn abnormal returns. Hence, the market is not efficient in the weak-form of market efficiency.*

I. INTRODUCTION

Efficient Market Hypothesis (EMH) explained that the stock prices fully reflect all available information (Fama, 1970, 1991). For this reason market participant having a piece of information cannot expect to predict the future price and earn abnormal returns on that information if the market is held to be efficient. So, the future price must be always random and unpredictable. Market participant in the stock market can only earn higher return by bearing higher risk. Basically, return is considered as a compensation for risk. Hence, the efficient market hypothesis can play an important role in investment strategy formulation.

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EMH assumed that the stock market return must follow a random-walk behaviour, which denotes the normal distribution of risk and return. The importance of normal distribution is undeniable since it is an underlying assumption of many statistical procedures such as *t*-test, linear regression analysis, discriminant analysis and Analysis of Variance (ANOVA). When the normality assumption is violated, interpretation and inferences may not be reliable or valid (Razali & Wah, 2011). The three common procedures in assessing whether a random sample of independent observations of size *n* come from a population with a normal distribution are: (i) graphical methods (histograms, box-plots, Q-Q plots), (ii) numerical methods (skewness and kurtosis) and (iii) formal normality tests.

So, basically this paper assesses whether and to what extent the risk and returns are normally distributed in the Nepalese stock market using numerical method and formal normality tests for the different sample time periods, as importance of risk and return in investment decision-making is the time horizon. In the matter of time period in the investment strategy formulation, Madhusoodanan (1997) emphasised that time needs to be taken as an important variable in the investment decision process and further argued that the long-term investments could reduce risk significantly and increase returns.

The remaining part of the paper has been organised as literature review, data and methodology, empirical findings and conclusion.

II. LITERATURE REVIEW

Testing normality and market efficiency of capital markets has been a prime area of interest for researchers for a long time. Stock market efficiency is a matter of interest for investors for formulating a short and long-term investment strategy. In this section, the paper reviews few previous studies, concentrating with the risk and return, and calendar anomalies of the stock markets.

Khan and Huq (2012) examined the normal distribution of risk and return of the capital market of Bangladesh to three different indices from 2002 to 2010 using a set of parametric and non-parametric tools. They found that a positive skewness and kurtosis in most of the cases and the returns were found to be suffering from some extremities. Daily, weekly and monthly returns were not normally distributed which showed the contra-evidence of random-walk behaviour of market return. The inconsistency between risk and return (daily and weekly) was reported, indicating that the investors could earn additional return without having exposure to additional risk.

Kumar and Dhankar (2011) applied a set of parametric and non-parametric tests on Indian stock market to find out whether the risk and return of that market were distributed normally. They examined three listed indices of Bombay Stock Exchange for the period 1996 to 2006 and found the evidence of non-normality in case of daily and weekly returns but normality in case of monthly and annual returns. Besides their study pointed out negative skewness in returns and emphasised on time horizon in the investment strategy.

In the case of the Nepalese stock market, KC and Joshi (2005), Bhatta (2008) and Dangol (2010) studied the existence of calendar anomalies. KC and Joshi (2005)

evaluated calendar effect in the Nepalese stock market for daily data of Nepal Stock Exchange Index from February 1, 1995 to December 31, 2004 covering approximately ten years. Using the regression model with dummies, they found persistent evidence of day-of-the-week anomaly but disappearing holiday effect, turn-of-the-month effect and time-of the-month effect. They also documented no evidence of month-of-the-year anomaly and half-month effect. Bhatta (2008) examined the month-of-the-year and day-of-the-week effects in the Nepalese stock market and did not find the above said effects but the highest return reported in the month of October and day of the highest return on the day of weekend.

The both studies (KC & Joshi, 2005; and Bhatta, 2008) were analysed on the basis of Gregorian calendar. But it is to be noted that the important information releases relating to economic events need to be based on Bikram calendar rather than Gregorian calendar in Nepal. Thus, their analysis was biased to some extent with the following reasons: first, it is mandatory for the institutions in Nepal to publish their quarterly financial reports in national daily newspapers as per the Bikram calendar. Second, national budget is announced in the month of Ashad (June/July), which makes investors aggressive and enthusiastic towards market due to government announcements of upcoming economic programmes and tax rates. Third, the financial year in Nepal ends in Ashad (Mid-July). Considering them, Dangol (2010) investigated into the presence of month-of-the-year effect in the Nepalese stock market. A set of parametric and non-parametric tests were used to examine independent mean returns for monthly returns of ninety-six months in eight years' data from mid-August 2001 to mid-July 2009 as per the Bikram Calendar used in Nepalese administrative practices. Dangol (2010) found two distinct calendar effects in returns for the Nepalese stock market. First, average monthly returns for four months from Baishakh (April/May) to Shrawan (July/August) were significantly greater than the average monthly returns of remaining eight months of the year. Second, mean returns for Paush (December/January) to Falgun (February/March) were substantially less than those for the remaining nine months of the year. There were two distinct effects: the 'Baishakh to Shrawan effect' and the 'Paush to Falgun effect' that are statistically independent of each other.

The above studies show that the stock returns are not normally distributed so that the random-walk hypothesis of the stock prices is rejected. Moreover, the present paper has completely concentrated on test of normality of risk and return of the stock market of Nepal.

III. DATA AND METHODOLOGY

Returns calculated form the stock market indices are widely used as the proxies for the market return. The paper employed market returns of the All Share Price Index (ASPI)[1] of Nepal Stock Exchange (NEPSE) for the period of 12 years from July 14, 2000

1. The ASPI is based on market prices of all stocks listed with the Nepal Stock Exchange (NEPSE). At present, as on July 15, 2012, in total 219 companies are listed in NEPSE.

to July 15, 2012. Market returns (R_t) are calculated from the price indices as follows:

$$R_t = Ln\left(\frac{P_t}{P_{t-1}}\right) X\ 100$$

Where, R_t refers to market return in period *t*; PI_t, price index at period *t*; PI_{t-1}, the price index at period *t-1* and Ln refers to natural log. The paper consider only changes in stock price and calculate the market return on a daily, weekly, monthly, quarterly and annual basis. Besides the whole period 2000/01-2011/12[2], three non-overlapping sub-periods (2000/01-2003/04, 2004/05-2007/08 and 2008/09-2008/12) for four years, each period has been considered for analysis.

Several parametric and non-parametric tests were used to determine whether the risk and return calculated from samples are normally distributed. Basically, Kolmogorov Smirnov (K-S) test is used to find out whether the returns calculated from sample data fit normal distribution. The significance of the test statistic will reject the assumption of normality in respective sample data One way ANOVA (Analysis of Variance or F-test) and Kruskal-Wallis (K-W) tests are applied on returns calculated from the three sub-periods' sample data to find out whether these have emerged from the same population. If these are found not to be emerged from the same population, then it is concluded that risk is not normally distributed (Kumar & Dhankar, 2011 and Khan & Huq, 2012).

IV. EMPIRICAL FINDINGS

Risk and Return Distribution of Daily Return

Table 1 depicts the summary of summary statistics of daily return for the period of 2000/01 to 2011/12 of the All Share Price Index. The daily market return exhibits negative skewness and kurtosis is greater than zero. From the perspective of skewness and kurtosis, the daily return series violated normality distribution. The test statistic for K-S is statistically significant at 1 per cent level, which means that the daily return distribution is not normal within the sample period. This finding is also consistent with the findings where the day of the week effect (for example, KC & Joshi, 2005) on the Nepalese stock market is evident.

Table 1: Summary Statistics of Daily Return from Mid-July 2000 to Mid-July 2012

Period	Observations	Average returns	Standard deviation	Skewness	Kurtosis	K-S
2000-07-14 to 2012-07-15	2798	0.003	1.611	-0.028	222.948	8.688* (.000)

Note: Figure shown in parenthesis is p-value, *significant at 1 per cent leve

2. Fiscal year for the study has been based on the Bikram Calendar, which is begins and ends at mid-July.

Table 2 provides the summary statistical summary of daily return for three sub non-overlapping periods, i.e., 2000/01-2003/04, 2004/05-2007/08 and 2008/09-2008/12. The negative skewness of the daily return distribution has been exhibited for the period of 2000/01-2003/04 and 2004/05-2007/08, whereas, positive skewness is reported for the period of 2008/09-2008/12. Kurtosis is higher than three for all the sub-periods, which indicates the non-normality of the distribution patterns of daily return in the Nepalese stock market.

According to Khan and Hug (2012), if there is higher Kurtosis than normal, then more of the variability can be explained by the fewer observations' extreme differences from the mean. The paper observed kurtosis for the period of 2000/01-2003/04 is abnormally high. The same is not observed in the remaining periods 2004/05-2007/08 and 2008/09-2008/12. It indicates that the volatility of the daily return is relatively low in the recent periods. Similarly, the K-S test statistics are significant at 1 per cent level for all sub-periods. So these results show non-normality in daily return of each sub-period. However, the higher return is reported in the period of 2004/05-2007/08.

The F-value and K-W value are statistically significant at 1 per cent level. It indicates that the three sample periods have not emerged from the same population. Hence, the risk for the three sub-periods is significantly different from each other.

Table 2: Summary Statistics of Daily Return for Three Different Sub-periods from Mid-July 2000 to Mid-July 2012

Period	Observations	Average returns	Standard deviation	Skewness	Kurtosis	K-S	F	K-W
2000/01 to 2003/04	953	-0.051	2.102	-0.065	225.352	7.532* (.000)	6.701* (.001)	69.241* (.000)
2004/05 to 2007/08	923	0.159	1.088	-0.267	5.933	3.346* (.000)		
2008/09 to 2011/12	922	-0.098	1.449	0.469	3.607	3.770* (.000)		

Note: Figures shown in parenthesis are p-value, *significant at 1 per cent level, ** significant at 5 per cent level

Risk and Return Distribution of Weekly Return

This part deals with the risk and return distribution of weekly return of the Nepal Stock Exchange. Table 3 reports summary statistics of weekly return for All Share Price Index during the period between mid-July 2000 and mid-July 2012. The weekly return series is positively skewed and higher kurtosis value, this denote to non-normality. Kurtosis in weekly return has been reduced that observed in daily return (222.948). The K-S value of the weekly return is statistically significant at 1 per cent level of significance, which indicates that the return series is not normally distributed.

Table 3: Summary Statistics of Weekly Return from Mid-July 2000 to Mid-July 2012

Period	Observations	Average returns	Standard deviation	Skewness	Kurtosis	K-S
2000-07-14 to 2012-07-15	615	0.0126	3.116	0.865	4.625	2.281* (.000)

Note: Figure shown in parenthesis is p-value, *significant at 1 per cent level

Table 4 shows the summary statistics of weekly return for three different non-overlapping sub-periods. The K-S value is statistically significant at 5 per cent for the period of 2000/01-2003/04 and 2008/09-2011/12 indication return series is not normally distributed. But, the K-S value is not statistically significant at 5 per cent level for the sub-period of 2004/05 to 2007/08, which indicates that the series is normally distributed during the respective sub-period. The F-value and K-W value are also statistically significant at 1 per cent level. It suggests that the risk is not distributed normally during the sample period, i.e., the level of risk for the three sub-periods is significantly different from each other.

Table 4: Summary Statistics of Weekly Return for Three Different Sub-periods from Mid-July 2000 to Mid-July 2012

Period	Observations	Average returns	Standard deviation	Skewness	Kurtosis	K-S	F	K-W
2000/01 to 2003/04	203	-0.229	2.945	0.516	3.020	1.606** (.012)		
2004/05 to 2007/08	203	0.706	2.808	-0.135	2.415	1.322 (.061)	7.892* (.000)	37.173* (.000)
2008/09 to 2011/12	209	-0.426	3.442	1.801	7.678	1.758* (.004)		

Note: Figures shown in parenthesis are p-value, *significant at 1 per cent level, ** significant at 5 per cent level

Risk and Return Distribution of Monthly Return

Table 5 outline the statistical summary of monthly return for the period between 2000/01 to 2011/12 for All Share Price Index. The K-S statistic is not statistically significant at 5 per cent level. It is provided the evidence about the monthly return series of the sample index for the period is normally distributed. This finding is not consistent with Dangol (2010) who exhibited the month-of-the-year effect in the Nepalese stock market.

Table 5: Summary Statistics of Monthly Return from Mid-July 2000 to Mid-July 2012

Period	Observations	Average returns	Standard deviation	Skewness	Kurtosis	K-S
2000-07-14 to 2012-07-15	144	0.054	7.436	0.124	0.578	0.933 (.349)

Note: Figure shown in parenthesis is p-value

Summary statistics of the monthly return series for the three sub-periods is presented in Table 6. The K-S statistics for the three different non-overlapping sub-periods are not statistically significant at 5 per cent level, which provides evidence of monthly returns is distributed normally. From the F-statistic and K-W statistic, the returns series for the three different periods have not emerged from the same population, since the both test statistics are statistically significant at 1 per cent level. It indicates that the risk levels of the three sub-periods are significantly different and risk is not normally distributed during the sample period.

Table 6: Summary Statistics of Monthly Return for Three Different Sub-periods from Mid-July 2000 to Mid-July 2012

Period	Observations	Average returns	Standard deviation	Skewness	Kurtosis	K-S	F	K-W
2000/01 to 2003/04	48	-1.011	7.201	-0.120	1.462	0.627 (.826)		
2004/05 to 2007/08	48	3.057	6.781	-0.296	0.815	0.590 (.877)	6.505* (.002)	16.924* (.000)
2008/09 to 2011/12	48	-1.885	7.496	0.852	1.589	0.770 (.594)		

Note: Figures shown in parenthesis are p-value, *significant at 1 per cent level

Risk and Return Distribution of Quarterly Return

Table 7 reports the statistical summary of quarterly return for the period between 2000/01 to 2011/12 for All Share Price Index. The K-S statistic is not statistically significant at 5 per cent level, i.e., return is normally distributed. Table 8 presents summary statistics of the quarterly return series for the three sub-periods. The K-S statistics for the three different non-overlapping sub-periods are not statistically significant at 5 per cent level, which provides evidence of monthly returns is distributed normally. The F-value and K-W statistic are statistically significant at 1 per cent level. It indicates that the risk levels of the three sub-periods are significantly different and risk is not normally distributed during the sample period.

Table 7: Summary Statistics of Quarterly Return from Mid-July 2000 to Mid-July 2012

Period	Observations	Average returns	Standard deviation	Skewness	Kurtosis	K-S
2000-07-14 to 2012-07-15	48	0.161	14.474	0.065	0.067	0.460 (.984)

Note: Figure shown in parenthesis is p-value.

Table 8: Summary Statistics of Quarterly Return for Three Different Sub-periods from Mid-July 2000 to Mid-July 2012

Period	Observations	Average returns	Standard deviation	Skewness	Kurtosis	K-S	F	K-W
2000/01 to 2003/04	16	-3.032	11.322	-0.149	-0.198	0.395 (.998)		
2004/05 to 2007/08	16	9.172	14.946	-0.406	0.443	0.581 (.889)	5.749* (.006)	9.875* (.007)
2008/09 to 2011/12	16	-5.656	13.088	-0.200	0.864	0.557 (.916)		

Note: Figures shown in parenthesis are p-value. *significant at 1 per cent level

Risk and Return Distribution of Annual Return

Table 9 shows the annual return of the sample index for the overall period from mid-July 2000 to mid-July 2012. During the period, the minimum rate of yearly returns with higher value of standard deviation. It indicates that the investing in the stock market

is risky. The positive skewness of the series signifies the positive skewedness of annual return. The K-S value is not statistically significant. It provides the evidence that the annual return of the sample index of the Nepalese stock market is normally distributed. However, the power of the test is still low as the number of observations is too small (Razali & Wah, 2012). It also applies to the current study.

Table 9: Summary Statistics of Annual Return from Mid-July 2000 to Mid-July 2012

Period	Observations	Average returns	Standard deviation	Skewness	Kurtosis	K-S
2000/01 to 2011/12	12	0.645	32.240	0.134	-0.911	0.421 (.994)

Note: Figure shown in parenthesis is p-value.

V. CONCLUSION

This study has been conducted to examine the risk and return distribution of the stock market of Nepal. It brings out the importance of the time interval in investment decisions. This paper has highlighted a few notable points. The positive returns have been found in all the cases of daily, weekly, monthly, quarterly and yearly return series in the sample period from 2000/01 to 2011/12. During the above mentioned overall period, in most of the cases, the returns— except daily returns— are found to be positively skewed; it denotes that most of the returns are concentrated on the left side of the mean with some extreme values to the right. The kurtosis for the daily returns has been found too high indicating that more of the variability resulted from the extreme deviations of fewer observations.

The daily and weekly returns are not normally distributed, which denies the random-walk behavior of stock prices. However, the monthly, quarterly and yearly returns are normally distributed and accepted the philosophy of the random-walk behaviour of stock prices in Nepal.

It is further observed that risks have been distributed non-normally in all the cases. Thus, risk and return relationship is inconsistent in the Nepalese stock market. So, investors may have the chance to earn abnormal returns from their investments in the stocks. Hence, the market is not efficient in the weak-form of market efficiency.

REFERENCES

Bhatta, G. P. (2008). *Stock market efficiency in Nepal*. (Doctoral dissertation, Tribhuvan University, 2008)

Dangol, J. (2010). Calendar effects in the Nepalese stock market. *Nepalese Economic Review*, *2*(3), 104-109.

Fama, E. F. (1970). Efficient capital markets: A review of theory and empirical work. *The Journal of Finance*, *25*(2), 383-417.

Fama, E. F. (1991). Efficient capital markets: II. *The Journal of Finance*, *46*(5), 1575-1617.

KC, F. B. & Joshi, N. K. (2005). The Nepalese stock market: Efficient and calendar anomalies. *Economic Review*, 17, 43-88.

Khan, M. M. H. & Huq, U. R. (2012). Distribution of risk and return: A statistical test of normality on Dhaka Stock Exchange. *Research Journal of Finance and Accounting*, *3*(3), 28-38.

Kumar, R. & Dhankar, R. S. (2011). Distribution of Risk and Return: A test of normality in Indian stock market. *South Asian Journal of Management*, *18*(1), 109-118.

Madhusoodanan, T. P. (1997). Time diversification: The Indian evidence. *Journal of Financial Management and Analysis*, *10*(2), 11-22.

Razali, N. M. & Wah, Y. B. (2011). Power comparisons of Shapiro-Wilk, Kolmogorov-Smirnov, Lilliefors and Anderson-Darling tests. *Journal of Statistical Modeling and Analytics*, *2*(1), 21-33.