Does the NEPSE Index Represent the Nepalese Stock Market ?

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ABSTRACT

I examined representative market indices, including the NEPSE Index (the value weighted index of the Nepal Stock Exchange, NEPSE) and the Equal-Weighted Index (EWI) in the NEPSE, finding that the NEPSE Index is more robustly representative of the Nepalese stock market than the EWI. Although NEPSE is fully dominated by the banking and finance sectors, the NEPSE Index remains vital.

Keywords : NEPSE Index, EWI, VWI, Stock Market

1. The Nepalese Stock Market

Gurung (2004) summarized the development of Nepalese stock market as follows :

> The history of the capital market in Nepal dates back to 1936, when, shares of Biratnagar Jute Mills, Ltd. were floated. In 1937, Tejarath was set up to facilitate loans to the government employees and was later converted into Nepal Bank Ltd. In 1974, the Nepalese government announced its Industrial Policy, under which the Securities Marketing Center (SMC) was established to deal in government securities-development bonds and national savings bonds, and in corporate securities for a few companies. The government has had a virtual monopoly power over the securities market. Then, Securities Exchange Center (SEC) was established in 1976 for the purpose of facilitating and promoting the growth of the capital market. It was the only capital market institution in Nepal. The SEC has operated under the Securities Exchange Act since it came into force in 1984. The interim government (1990-1991) initiated a financial reform program and two indirect investment vehicles, the Citizen`s Investment Fund and NIDC Capital Markets Ltd.. were established with the collective investment schemes in the corporate sector. Then, due to the worldwide privatization and economic liberalization, it was felt that the operation of the SEC needed to change so that it would be compatible with the changing economic system. Thus, in 1993, the government initiated changes in the structure of the SEC by dividing it at the policy level into two distinct entities : the Securities Board, Nepal (SEBO/N) and the Nepal Stock Exchange, Ltd. (NEPSE). Since that time they have been operating as the main constituents of the securities market in Nepal.

SEBO/N was established on June 7, 1993 with the mission to facilitate the orderly development of a dynamic and competitive capital market and maintain its credibility, fairness, efficiency, transparency and responsiveness under the Securities Exchange Act. It registers the securities and approves the public issues. Moreover, the SEBO frames the policies and programs required to monitor the securities market, provide licenses to operate stock exchange businesses and work as a stock broker and supervise and monitor the stock exchange operations and securities businesspersons. NEPSE, Ltd. is a non-profit organization that operates under the Securities Exchange Act of 1983. The basic objective of NEPSE is to impart free marketability and liquidity to the government and corporate securities by facilitating transactions on its trading floor through market intermediaries such as brokers and market makers, etc.

Nepal Stock Exchange Ltd. (NEPSE) opened its trading floor on January 13, 1994 through its newly appointed licensed members and has adopted an "open out-cry" system for transactions involving securities with trading hours from 12pm to 2pm. NEPSE currently has 144 listed companies in 8 sectors; there are 23 broker firms and 9 issues managers. The market capitalization is Rs. 301.86 billion at mid-January of 2008, and trading hours have been extended to 3pm. On August 24, 2007, NEPSE adopted an Automated Trading System through a Wide Area Network (WAN).

Despite these measures, the Nepalese stock market is not still taking its height. There is desperate need for the profound improvement of this market.

The main objective of this study was to examine the representative of market indices such as the value-weighted NEPSE Index (NEPSE Index) and the Equal-Weighted Index in NEPSE for the Capital Asset Pricing Model (CAPM) test.

The study is organized in five sections. After the first section, which is the introduction, the second section reviews the literature on market indices. The third section describes the data sources and methodology used in the study, and the fourth Section consists of the empirical analysis and findings. The final section is the conclusion.

2. Short Review of the Literature

The study on the CAPM by Fama and MacBeth (1973) tests the relationship between average return and risks for New York Stock Exchange (NYSE) common stocks using the EWI of market return. The theoretical basis of the tests is the "two-parameter" portfolio model and models of market equilibrium derived from it under the hypothesis that the pricing of common stocks reflects the attempts of risk-averse investors to hold portfolios that are "efficient" in terms of expected value and dispersion of return. The monthly average return is adjusted for changes in

capital such as dividends and capital gains, with appropriate adjustments for other changes in capital such as splits and stock dividends for all common stocks traded on the NYSE. Beta is estimated by using monthly stock returns and market returns. Market return is calculated by using an equally weighted average of the returns (EWI) on all stocks listed on the NYSE in month t. The results of the study by Fama and MacBeth (1973) indicate that average returns on NYSE common stocks reflect the attempts of risk-averse investors to hold efficient portfolios. In making portfolio decisions, an investor should assume that there is a linear relationship between the portfolio risk of a given security and its expected return.

Hodoshima et al. (2000) investigates the relationship between return and beta using cross-sectional regression method. They use two proxies of the market return the value-weighted index (VWI) provided by the Japanese Securities Research Institute (JSRI), and an EWI of all the firms in the sample. Because the nonmanufacturing sector, and especially the financial sector is very large in Japan ; the VWI is heavily influenced by the financial sector and is therefore, not a good proxy for the market return in the Japanese stock market. Hodoshima et al. (2000) conclude that the difference between positive and negative market excess returns produces a significant conditional relationship between return and beta. They also find that the conditional relationship is in general a better fit in the down market than in the up market in terms of the goodness of fit measures.

Hawawini (1991) examines the relationship between the average return and the risk in a sample of common stocks traded on the Tokyo Stock Exchange (TSE) using both the market return index, the VWI and EWI finding that the CAPM does not provide a valid framework for predicting common stock returns on the TSE unless adjustment is made for firm size and prediction is limited to the common TSE stock returns.

3. Data and Methodology

3.1 Sources of data

The present study examines common stock within the 5-years time span from fiscal year (FY) 2002/2003 to FY 2006/2007. SEBO/N and NEPSE, Ltd. are the major sources of data. The required data was taken from the annual reports of SEBON and downloaded from the official website of NEPSE Ltd. Some of the information and data were collected from previous studies. The main characteristics of the available data reported by NEPSE Ltd. are as follows :

- Monthly stock prices are available from July 2002 to June 2007.
- The NEPSE, Ltd. price index is available from July 2002 ; and
- Monthly stock prices are not adjusted for capital changes such as dividends, bonus issues, or right issues.

Furthermore, the Nepalese stock market has always been dominated by the banking sector. The volume of other sectors is very low. This domination is reflected in major stock market

indicators, such as the amount of share traded, number of share traded quantity and market capitalization. In FY 2002/2003, the percentage of shares traded in the banking sector was 59.60%, the total traded amount was 60% and the total market capitalization was 62.76%. Similarly, in FY 2006/2007, the percentage of total shares in the banking sector was 45.28%, the total traded amount was 78.12% and the total market capitalization was 71.99%. These figures clearly show the domination of the banking sector over all other sectors in the Nepalese stock market. For more details, please see Appendix 1.

Thus, the NEPSE index represents the banking sector to a greater extent than others sectors. For this reason, the present study also used the new index EWI to measure the market return of the Nepalese stock market. Finally, both the NEPSE Index and the EWI were used to calculate the individual stock beta for all companies listed in NEPSE from 2002 to 2007.

3.2 Models

The primary purpose of the present study was to examine the relevance of the market indices which are used to calculate the beta to test the CAPM. Capital adjustment is traditionally carried out based on three main factors: dividends, bonus issues and rights issues. The following modified model (Kunimura, 2008) of the JSRI equation has been used to calculate the adjusted stock prices for capital change.

$$PP_{i,t}=P_{i,t}*Q_{i,t} \tag{1}$$

$$Q_{it}=\left(\frac{P_{i,t-1}}{P_{i,t-1}+\beta_{i-t}*A_{i,t}}\right)\left(1+\alpha_{i,t}+\beta_{i,t}+\gamma_{i,t}\right)\lambda_{i,t}+\frac{D_{i,t}}{P_{i,t}}\Bigg) \tag{2}$$

$$R_{i,t}=\frac{PP_{i,t}}{P_{i,t-1}}-1 \tag{3}$$

where

i individual stock i
t time (month)
p stock price
pp adjusted stock price
Q adjustment multiple
R monthly returns of stock
A offer price per share on rights issue
D cash dividends
α ratio of bonus issues stocks
β ratio of rights issues stocks
γ ratio of stocks to stock dividends
λ ratio of changing face values

For the sample period (2002 to 2007) most of the firm's monthly stock prices are unavailable. Since it is not possible to calculate the monthly stock returns without the missing monthly stock prices, the missing monthly stock prices have been replaced with the previous monthly stock prices. The monthly stock returns were then calculated using the above model.

To calculate beta, a market model was designed using the following model;

$$R_{it} = \alpha + \hat{\beta} Rmt + E \tag{4}$$

where

R_{it} = individual stock return at time t

α = constant term

R_{mt} = market return at time t

E = error term

The beta estimation period is every 12 months from July 2002 to June 2007. Reducing by one month period, this procedure is repeated up to June 2007. The individual stock beta was calculated using the Excel VBA program by Toan (2008).

The NEPSE has two price indices that reveal market trends: the NEPSE Index and the Sensitive Price Index. The Sensitive Price Index represents only the companies with the best performance and was not taken into account in the present study. For the purposes of the present study, we used the NEPSE price index, a market capitalization weighted index in which the weight of every company is taken as the number of ordinary shares listed in the market. It covers all companies traded during the market day. We also use the Equal weighted price index return (EWI). The NEPSE price index is calculated using the following model:

$$\text{NEPSE Price Index} = \frac{\textit{Market Capitalization of All Listed Companies}}{\textit{Base Year Market Capitalization}} \tag{5}$$

Where

Market Capitalization = current number of listed shares of company * market Price

Base Year Market Capitalization = number of listed shares of company * market Price

The base year of market capitalization was 1994.

The EWI is calculated using the following model:

$$\text{Equal Weighted Price Index} = \frac{\textit{Total Maket Share Price of All Listed Companies}}{\textit{Total No. of Listed Companies}} \tag{6}$$

4. Results

4.1 Capital adjustment

In the present study, we first examined the individual stock price and return before and after capital adjustment from different sectors of NEPSE Ltd. The statistical results imply that over the test period, the stock return is always increases after capital adjustment. Let us consider two representative cases: Himalayan Bank, Ltd. in (Table 1) and Investment Bank, Ltd. (Table 2).

Table 1: Case Study for Adjusting Capital Change

Himalayan Bank, Ltd.

Date	Capital Adjustment	Price Before Adjustment	Price after Adjustment	Return Before Capital Adjustment	Return After Capital Adjustment
Nov 05	—	1140	1140	0.065	0.065
Dec 05	Cash Dividend: Rs 10 Stock Dividend: 20%	940	1138	−0.17544	−0.00175

Models: explanations (1), (2) and (3)
(Source: NEPSE Annual Reports)

Table 2: Case Study for Adjusting Capital Change

Investment Bank, Ltd.

Date	Capital Adjustment	Price Before Adjustment	Price after Adjustment	Return Before Capital Adjustment	Return After Capital Adjustment
Dec 02		890	890	0.065868	0.065868
Jan 03	Bonus Issue: 30%	750	1550.758	−0.1573	0.7424

Models: explanations (1), (2) and (3)
(Source: NEPSE Annual Reports)

For Himalayan Bank, Ltd., there is no effect on return in November, 2005 because there is no capital adjustment. The return is 0.065868. However in December 2005, the return has changed because there is a capital adjustment, i.e., a cash dividend of Rs 10 and a stock dividend of 10%. Before capital adjustment, the return was −0.17544: after adjustment, it increased to −0.00175.

Similarly, Investment Bank, Ltd., there is no change on return in December 2002 because there is no capital change. But when there is a capital change, specifically a bonus issue of 30% in January 2003, the return increases from −0.1573 to 0.7424. Thus, after the capital adjustment, the individual stock return is greater than before. For more details, please see in Appendix 2.

4.2 t-Value of the beta

Second, I examined the t-values of the beta using both the VWI and the EWI and calculated the

descriptive statistics using t-values. The descriptive statistics are presented in Table 3. I found that the mean t-value of NEPSE RM is greater than that of EWI RM, i.e., 0.378076 > 0.235465367, indicating that the NEPSE RM, which is also known as the VWI, is more reliable in representing the stock market of Nepal.

Table 3

Descriptive statistics of t-values

NEPSE RM		EWI RM	
Mean	0.378	Mean	0.235
Standard Error	0.022	Standard Error	0.018
Median	0.235	Median	0.206
Standard Deviation	1.392	Standard Deviation	1.133
Sample Variance	1.939	Sample Variance	1.285
Kurtosis	5.821	Kurtosis	0.660
Skewness	1.283	Skewness	0.078
Range	16.887	Range	9.483
Minimum	−4.647	Minimum	−4.645
Maximum	12.240	Maximum	4.837
Sum	1492.643	Sum	929.617
Count	3948	Count	3948

(Source: NEPSE Annual Reports)

Finally, for examining the goodness of fit, the coefficient of determination R^2 was computed in both the NEPSE RM and the EWI RM for each individual stock return. The coefficient of determination R^2 is a summary measure that indicates how well the sample regression line fits the data. I then summed all the individual stock R^2 and calculated the descriptive statistics result of R^2.

Table 4

Descriptive Statistics Result of R^2

NEPSE RM		EWI RM	
Mean	0.161	Mean	0.142
Standard Error	0.003	Standard Error	0.003
Median	0.061	Median	0.057
Standard Deviation	0.244	Standard Deviation	0.227
Sample Variance	0.059	Sample Variance	0.051
Kurtosis	4.571	Kurtosis	7.282
Skewness	2.254	Skewness	2.729

Minimum	1.67E-09	Minimum	2.03E-08
Sum	666.115	Sum	584.103
Count	4112	Count	4112

(Source: NEPSE Annual Reports)

The NEPSE RM of 0.161 is better than the EWI RM of 0.142 for measuring the market return in NEPSE. Additionally, it indicates that fitness is higher in NEPSE RM than in the EWI RM. Because the mean value of R^2 of the NEPSE RM is greater than that of EWI RM, it is clear that for testing the validity of the CAPM, the NEPSE Index is more robust stood than the EWI.

4.3 Testing our hypothesis

We formulated the following hypotheses:

Null hypothesis (H^0): There is no significant difference between the average value of R^2 in the NEPSE Index and that in the EWI. In other words, the average value of R^2 in the NEPSE Index is equal to that in the EWI.

Alternative hypothesis (H^1): There is a significant difference between the average value of R^2 in the NEPSE Index and that in the EWI. In other words, the average value of R^2 in the NEPSE Index is equal to that in the EWI.

These hypotheses are based on the test of significance for differences of mean (t-test).

Table 5

Results of Testing the Hypotheses

t-Test: Two Samples Paired for Means		
	Nepse Index (Value-Weighted Index)	Equal Weighted Index
Mean	0.161	0.142
Variance	0.059	0.051
Observations	4112	4112
Pearson Correlation	0.179	
Hypothesized Mean Difference	0	
Df	4110	
t Stat	4.187	
t Critical two-tail	2.577	

(Source: NEPSE Annual Report)

Table 5 shows that T*cal* > T*tab* at the 1% level of significance for a two-tail test at 4110 degrees of freedom. The average value of R^2 in the NEPSE Index is not equal to that in the EWI

and the null hypothesis is therefore rejected. The results also indicate that the NEPSE Index robustly represents the NEPSE.

5. Conclusion

In the present work, I examined representative market returns based on two indices : the NEPSE Index and the EWI in the NEPSE. I found that the NEPSE RM (a value-weighted index) is better than the EWI to test the validity of CAPM in the Nepalese stock market.

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Appendix 1 : The Nepalese Stock Market

Transactions in 2002/2003 by Sector

Sectors	Listed companies	Traded Share Quantity (in`000)	Traded Amount Rs. (in millions)	No. of Transactions	Market Capitalization Rs. (in millions)
Commercial Banks	11	204.98	332.18	2238	21436.72
Finance Groups	35	95.23	128.81	3496	2561.16
Insurance Groups	13	28.35	64.59	1139	2388.54
Manufacturing & Processing	29	0.23	3.82	7	4731.3
Hotel	4	2.58	6.52	27	2550.61
Trading	8	0.56	13.41	31	488.02
Development Banking	4	11.96	25.83	307	1016.77
Other	4	1.65	0.64	31	67.26

Transactions in 2003/2004 by Sector

Sectors	Listed companies	Traded Share Quantity (in`000)	Traded Amount Rs. (in millions)	No. of Transactions	Market Capitalization Rs. (in millions)
Commercial Banks	13	2737.61	863.41	26000	27958.88
Finance Groups	41	1202.2	165.09	47920	2942.273
Insurance Groups	13	256.33	36.86	8689	2549.3
Manufacturing & Processing	29	1978.22	1031.62	163	4472.75
Hotel	4	61.04	2.84	549	1065.86
Trading	8	8.64	11.83	51	603.53
Development Banking	4	212.76	32.33	2073	796.85
Other	4	11.72	0.29	88	65.35

Transactions in 2004/2005 by Sector

Sectors	Listed companies	Traded Share Quantity (in`000)	Traded Amount Rs. (in millions)	No. of Transactions	Market Capitalization Rs. (in millions)
Commercial Banks	14	6416.4	4021.85	64966	38547.1
Finance Groups	44	14443.36	216.37	27576	3471.5
Insurance Groups	14	328.13	67.62	7340	3659.86
Manufacturing & Processing	29	7603.14	114.9	252	4585.66
Hotel	4	98.17	4.48	671	1016.45
Trading	8	10.41	7.99	49	802.04
Development Banking	7	135.62	22.01	4836	1049.07
Other	5	2398.11	52.48	556	4187.73

Transactions in 2005/2006 by Sector

Sectors	Listed companies	Traded Share Quantity (in`000)	Traded Amount Rs. (in millions)	No. of Transactions	Market Capitalization Rs. (in millions)
Commercial Banks	15	5534.9	2696.28	45886	68841.24
Finance Groups	50	1957.68	305.85	28875	4930.634
Insurance Groups	14	575	129.9	6187	4852.19
Manufacturing & Processing	29	59.8	17.19	233	4619.2
Hotel	4	392.18	19.77	510	2393.61
Trading	8	15.22	15.8	66	737.39
Development Banking	8	386.39	82.76	4740	1227.49
Other	6	3301.54	183.88	513	8012.2

Transactions in 2006/2007 by Sector

Sectors	Listed companies	Traded Share Quantity (in`000)	Traded Amount Rs. (in millions)	No. of Transactions	Market Capitalization Rs. (in millions)
Commercial Banks	15	5534.9	2696.28	45886	68841.24
Finance Groups	50	1957.68	305.85	28875	4930.634
Insurance Groups	14	575	129.9	6187	4852.19
Manufacturing & Processing	29	59.8	17.19	233	4619.2
Hotel	4	392.18	19.77	510	2393.61
Trading	8	15.22	15.8	66	737.39
Development Banking	8	386.39	82.76	4740	1227.49
Other	6	3301.54	183.88	513	8012.2

(Source : NEPSE Annual Report)

Appendix 2: Case Studies for Adjusting Capital Changes

Bank of Kathmandu, Ltd.

Date	Capital Adjustment	Price Before Adjustment	Price After Adjustment	Return Before Capital Adjustment	Return After Capital Adjustment
Oct 06		1120	1120	0.33811	0.33811
Nov 06	Cash dividend : Rs18 Stock Dividend : 30%	1113	1464.9	−0.00625	0.30794

Everest Bank, Ltd.

Date	Capital Adjustment	Price Before Adjustment	Price after Adjustment	Return Before Capital Adjustment	Return After Capital Adjustment
Jan 03		405	405	−0.03341	−0.03341
Feb 03	Bonus Issue : 30%	455	546	0.1234	0.3481

Kumari Bank, Ltd.

Date	Capital Adjustment	Price Before Adjustment	Price After Adjustment	Return Before Capital Adjustment	Return After Capital Adjustment
Apr 06		468	468	0.4054	0.4054
May 06	Right Issue : 20%	438	504.059	−0.0641	0.07704

Nabil Bank, Ltd.

Date	Capital Adjustment	Price Before Adjustment	Price After Adjustment	Return Before Capital Adjustment	Return After Capital Adjustment
Dec 03		760	760	−0.01935	0.01935
Jan 04	Cash Dividend Rs50	785	835	0.030895	0.09864

Standard Chartered Bank, Ltd.

Date	Capital Adjustment	Price Before Adjustment	Price After Adjustment	Return Before Capital Adjustment	Return After Capital Adjustment
Oct 06		4355	4355	0.008875	0.008875
Nov 06	Cash dividend Rs 130 Stock dividend 10%	4650	5245	0.067738	0.204363

Development Credit Bank, Ltd.

Date	Capital Adjustment	Price Before Adjustment	Price After Adjustment	Return Before Capital Adjustment	Return After Capital Adjustment
July 05		260	260	0.065868	0.065868
Aug 05	Right Issue : 50%	260	327.0968	0	0.2550

Ace Finance, Ltd.

Date	Capital Adjustment	Price Before Adjustment	Price After Adjustment	Return Before Capital Adjustment	Return After Capital Adjustment
Oct 03		181	181	−0.04736	−0.04736
Nov 03	Cash Dividend Rs 15	184	199	0.09944	0.016575

Alliance Insurance Co., Ltd.

Date	Capital Adjustment	Price Before Adjustment	Price After Adjustment	Return Before Capital Adjustment	Return After Capital Adjustment
Dec 02		128	128	0.16667	0.16667
Jan 03	Cash Dividend Rs7	140	147	0.09375	0.148438

Bottlers Nepal, Ltd.

Date	Capital Adjustment	Price Before Adjustment	Price After Adjustment	Return Before Capital Adjustment	Return After Capital Adjustment
Dec 02		700	700	0	0
Jan 03	Cash Dividend Rs10	700	710	0	0.014286

Models: explanation (1), (2) and (3)
(Source: NEPSE Annual Reports)