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TOWARDS MODIFIED CAPITAL ASSET PRICING MODEL: WITH EVIDENCE FROM NEPAL STOCK EXCHANGE

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ABSTRACT

The paper has proposed a modified asset-pricing model which is provides a simple and applicable generalization to the conventional CAPM and is backed by evidence from Nepal Stock Exchange. The empirical finding shows that the proposed modification, abbreviated as MCAPM, provides nontrivial contribution to the limitation of conventional CAPM with simplicity to test and apply. This study also highlights the application of the proposed modification to Arbitrage Pricing Theory of asset pricing.

1. Introduction

1.1. General background

The linear risk return trade off Sharpe (1964) and Lintner (1965), with risk measured by the beta coefficient (which reflects covariance or non-diversifiable risk) is one of most resorted models in the finance literature with simple message that the only risk that is priced at equilibrium in the market is that undiversified risk. CAPM was developed in a relatively restricted theoretical environment. However, it has provided strong empirical implications that systematic risk and return are linearly related in the capital market. In the last two decades the field of asset pricing, in both the theoretical and empirical domains, has advanced significantly (Celik, 2012).

In the Nepalese context, the Nepalese Stock Market is an emerging market, having only existed for a decade and a half. This market has traditionally been dominated by banking and financial sectors, with a very low level of transactions from the other sectors such as Manufacturing and Processing, Trading, Hotels and others, until quite recent (Kiran, 2010). However, other sectors, including remarkable trading of hydro-sector, have been witnessed lately. Under these conditions, the CAPM theory of the relationship between risk and return has been certainly applicable in the Nepalese stock market, and studies have been endeavored by many authors (Poudel 2002; K.C., 2005; Kiran, 2010).

The study by Poudel (2002) on risk return assessment of commercial banks showed that the individual stock's beta coefficient helps determine the minimum rate of return required by the investor to compensate for systematic risk.

On the other hand, Kiran (2010) found that the CAPM does not provide a valid framework to predict common stock returns on the NEPSE for the total sample period of 1998 to 2008. In a monthly basis analysis, the researcher found that small number of months with a significant relationship between average return and risk, only about 32%. In a yearly basis analysis, there was a significant relationship between risk and return only in the years 2004 and 2008. Joshi (2005) postulated that to existence of calendar anomalies is becoming non existent which indicated that market is behaving weakly efficient in recent years. This would suggest that more sophisticated models to understand risk return tradeoff of Nepalese Capital market would be imperative. This indicates that the relevance of CAPM is a matter of academic debate and unsolved riddle in the case of Nepalese Capital Market as well.

1.2.Statement of the problem

CAPM has its limitation which is attributed to its static nature, and, thus, to its incomplete description of asset prices. Indeed, both theoretical and empirical works support the use of dynamic pricing models. For example, Hansen and Richard (1987) show that even if the static CAPM fails, a dynamic version of the CAPM could be perfectly valid. However, there are several problem associated with dynamic models on the ground that time-series econometric models are considerably distant from convergence of interpretation in literature and practice.

This provides strong imperative to seek for a better approach that take into account the limitation of considerably parsimonious static version of CAPM and their cousins, the dynamic versions, which are complex and difficult to adhere. Specifically, this study attempts to deal with the following problem: Whether there is any incentive to adopt the proposed version of CAPM i.e. MCAPM in assessing risk return behavior of financial assets.

1.3.Organization of the study

The study is organized into five sections with each section being devoted into specific aspects of the study. The general background of the study along with the main objectives are covered in section one. This section is followed by section two, where the conceptual framework is explained along with the review of existing literatures in the area. Methodology of the study is explained in section three which put forth the details on research design, nature and sources of data, methods used and limitations inherent in the study. The report then covers findings of the study and then is concluded in the last section.

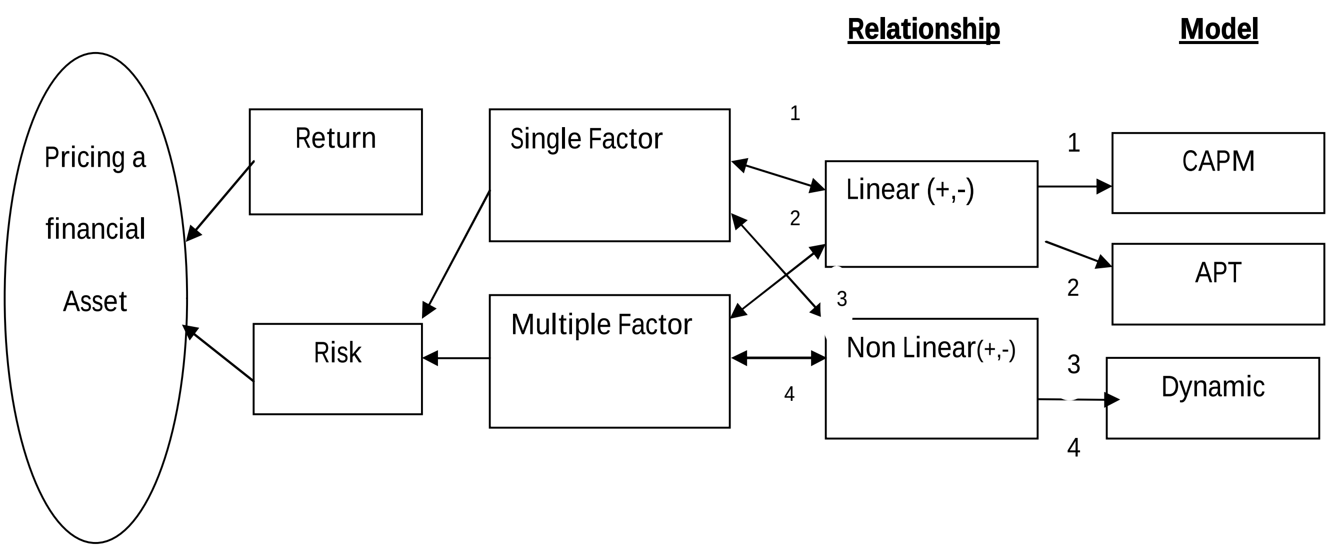
2. Theoretical or conceptual framework

Modeling risk-return have been attempted in the field of finance since the Markowitz Mean-Variance Theorem. The risk return tradeoff models, which are also referred as asset pricing models, since then have travelled a long way to reach the present stage with plethora of sub-areas including prominence in static and dynamic versions. The risk-return relationship for asset pricing is shown in figure 1.

Conventional CAPM and APT are static pricing models with difference that CAPM is a single factor risk assessment model whereas APT incorporates multifactor risk in pricing assets. However, major limitation of APT lies in the fact that there is no congruence among researchers regarding which are the factors that are to be considered in this multiple factor evaluation. The linear CAPM model assumes both positive and negative relation with market return depending on the nature of asset. Non-linear models incorporate influence of higher order moments in addition to mean and variance of market return. Non-linear models can be both: time-varying and time stationary and single as well as multiple factors.

Figure 1

Basic Theoretical Framework Of CAPM



It is clear from figure that CAPM ability to explain the pricing of model is limited in that it is linear as well as single factor version of asset pricing and does not takes into account influence of multiple factors, non-linearity and time varying dynamic effects. In context, the proposed MCAPM aims to provide an easy and robust approach that takes into account the non-linearity and time dependent influence. The limitation lies in proposed model to not taking the account of multiple factors. Thing to taken into consideration, however, is that the process prescribed by MCAPM is can be applicable robustly in the APT, which, however, is beyond the scope of the paper. The major empirical studies that have been conducted in corporate finance, especially in regard to stock prices and risks, static vis-à-vis dynamic versions of CAPM which would capture best the variation in financial assets returns. These literatures presented in table 1 provide a basic foundation to this study.

Table 1

Theoretical Development of CAPM.

	Model	Originators
STATIC	Markowitz mean Variance Theorem	Markowitz(1952,1959
	Sharpe-Linter CAPM	Sharpe(1964),Linter (1965),Mossin (1966)
	Black Zero beta CAPM	Black(1972)
	CAPM with non markatable Human Capital	Mayers (1972)
	CAPM with Multiple Consumption Goods	Breeden (1979)
	International CAPM	Solnik (1974a, Adler and Dumas(1983)
	Arbitage Pricing Theory	Ross(1976)
	Fama French Three Factor Model	Fama and French (1993)
	Partial Variance Approach Model	Hogan and Warren(1974), and Bawa and Linderberg (1977), Harlow and Roa (1989)
	Three moment CAPM	Rubinstein (1973), Kraus and Litzenberger(1976)
	Four Moment CAPM	Fang and Lai (1997) and Dittmar (1999)
DYNAMIC	The intertemporal CAPM	Merton (1973)
	The Consumption CAPM	Breeden (1979)
	The Production Based CAPM	Lucas (1978),Brock (1979)
	Investment Based CAPM	Cochrane (1991)
	Conditional CAPM	Jagannathan and Wang (1996)
	Liquidity Based CAPM	Acharya and Pedersen (2005)

Source: Celik, Saban (2012)

3. Research methodology

3.1.Nature and sources of data

This study is based on industry index of Nepal Stock exchange. The secondary sources of data have been employed to understand and analyze the relation between industry portfolio returns of nine different industries with market return. The data comprise of daily returns of nine industry portfolio and market return from July 7, 2003 to December 31, 2013. The data has been obtained from NEPSE corporate office database.

3.1.1. Basic Methodological Proposition

3.1.1.1. Security market line

The security market line (SML) expresses the return an individual investor can expect in terms of a risk-free rate and the relative risk of a security or portfolio. The SML with respect to security *i* can be written as:

$$E(R_p) = R_f + \sigma_p \left[\frac{E(R_m) - R_f}{\sigma_m} \right] \text{.....................i)}$$

Where

$$\beta_i = \frac{\sigma_i r_{im}}{\sigma_m} \left[\frac{Cov(R_i, R_m)}{\sigma_m{}^2} \right] \text{...............................ii)}$$

and r_{im}= the correlation between security return, and market portfolio return. The β can be interpreted as the amount of non-diversifiable risk inherent in the security relative to the risk of the market portfolio.

Assumptions of CAPM are the following:

(i) the investor’s utility functions are either quadratic or normal,

(ii) all diversifiable risks are eliminated and

(iii) the market portfolio and the risk-free asset dominates the opportunity set of risky assets.

The SML is applicable to portfolios as well. Therefore, SML can be used in portfolio analysis to test whether securities are fairly priced, or not.

3.1.1.2. CAPM

In order to test the validity of the CAPM researchers always test the SML given in (i). The CAPM is a single-period *ex ante* model. However, since the *ex ante* returns are unobservable, researchers rely on realised returns. The beta in such an investigation is usually obtained by estimating the security characteristic line (SCL) that relates the excess return on security *i* to the excess return on some efficient market index at time *t*. The *ex post* SCL can be written as:

$$R_{it} - R_{ft} = \eta_i + b_i(R_{mt} - R_{ft}) + \varepsilon_{it} \quad \text{....................a)}$$

where, □$_i$ is the constant return earned in each period and is an estimate of *ibi*β in the SML. The estimated *i*β is then used as the explanatory variable in the following cross-sectional equation:

$$R_{it} - R_{ft} = \eta_i + b_i(R_{mt} - R_{ft}) + \varepsilon_{it} \quad \text{....................b)}$$

1.5.1.3. Modified Capital Asset Pricing Model (MCAPM)

In the dichotomy of static and dynamic versions of CAPM, the proposed model i.e. MCAPM offers a new genre and hybrid form that lies in between the two and caters to the limitations and complexities of these extremes.

A. Proposition of MCAPM

Let y be a multivariate dependent function as represented as follow:

$$y = f(x, g)$$

Where x and y are explanatory variables.

Or, $y = f(x) + f(g) + f(x).f(g)$ ……………………………1)

The orthogonal impact of x and g would make the last expression of equation 1) $f(x).f(g)$ as zero negligible.

Hence equation i) can be written as :

$$y = f(x) + f(g) \quad \text{..2)}$$

$y = (\partial y / \partial x) \times x + (\partial y / \partial g) \times g$ and

$\bar{y} = (\partial y / \partial x) \times \bar{x} + (\partial y / \partial g) \times \bar{g}$

Where

$\partial y / \partial x = \partial f(x) / \partial (x)$ and

$\partial y / \partial g = \partial f(g) / \partial (g)$

Replacing "y" by asset's return and "x" by market return and "g" by co-movement variable as defined in the paper Modified Capital Asset Pricing Model (MCAPM) becomes

$R_j = \alpha + \beta_j R_m + \delta_j CM_j + \varepsilon$ ....3)

This can be expressed in excess return form and with restriction, α = 0.

$R_j - R_f = \beta_j (R_m - R_f) + \delta_j CM_j + \varepsilon$ ....4)

Special Case

1). When $\beta_j = 1$ and $\delta_j = 0$

$R_j = R_m$ which is by definition, equal to market return.

2). When $\delta_j = 0$, Equation 3) becomes $R_j = \alpha + \beta_j R_m + \varepsilon$ .....5)

And Equation 4) becomes $R_j - R_f = \beta_j (R_m - R_f) + \varepsilon$ ....6)

which are conventional representation of CAPM.

B. Process of Conducting MCAPM test

1. Identify the explanatory variable for the model. In our case it is market return.
2. Define co-movement variable (CM) which is the point-to point change in explained variable for unit change in explanatory variable.
3. Run regression incorporating this CM variable with the original explanatory variables.

   Our regular OLS and GLS would provide robust estimation of risk return trade off.

C. Interpretation of Result:

1. Significant beta of CM would indicate the marginal impact of non static and non linear impact of explanatory variable.
2. Insignificant beta of CM would suggest the existence of static and linear risk-return trade off as indicated by conventional CAPM.
3. Beta of CM=1, and beta of R_m=1 would suggest holding of conventional market portfolio.

3.1.2. The models

The study has employed paired regression comparisons of following regression models

$R_j = \alpha + \beta_j.R_m + \varepsilon_j$ …………(7a) and

$R_j = \alpha + \beta_j.R_m + \gamma_j CM_{j,m} + \varepsilon_j$ …………(7) where

$E(\varepsilon_j^2) = \sigma_j^2$ is heteroscedastic.

Based on the basic models depicted by equation (1) and (2) paired regression equations have been carried out for each of the industry portfolio of nine different industries as classified by NEPSE.

In the bullish market condition equations (7a) and (7b) become

$R_j^+ = \alpha^+ + \beta_j^+.R_m^+ + \varepsilon_j^+$ …………(8a) and

$R_j^+ = \alpha^+ + \beta_j^+.R_m^+ + \gamma_j^+ CM_{j,m}^+ + \varepsilon_j^+$ …………(8b) where

$E(\varepsilon^{+2}_j) = \sigma^{+2}_j$ is heteroscedastic.

In the bearish market condition equations (7a) and (7b) become

$R_j^- = \alpha^- + \beta_j^-.R_m^- + \varepsilon_j^-$ …………(9a) and

$$R_j^- = \alpha^- + \beta_j^- . R_m^- + \gamma_j^- CM_{j,m}^- + \varepsilon_j^- \qquad \text{…………(9b) where}$$

$E(\varepsilon_j^{-2}) = \sigma_j^{-2}$ is heteroscedastic.

Here R represents $\frac{Ending\ Price - Begining\ Price}{Begining\ Price}$ x 100 of j^{th} portfolio asset. σ_j^2 represents variance of returns of jth portfolio. Sub-script *c, d, f, Mf, h, Ot, Hy, in,* and *T* represents industry portfolio of commercial banks, development banks, manufacturing firms, hotels, sector classified as others in NEPSE, hydropower companies, insurance companies and trading companies respectively.

3.1.3. Definition of Variables and technical terminologies:

Portfolio return (R_j): Return of a stock comprises of Capital gain yield and dividend yield. In our study, since daily data have been used, dividend yield would not be a part return calculation. Therefore, return of a stock , here, would be synonymous to capital gain yield. Portfolio return has been defined as the ending price –beginning price divided by the beginning price of jth portfolio. This is shown mathematically as under:

$$R_j = \frac{Ending\ Price(J) - Begining\ Price(J)}{Begining\ Price(J)} \text{ x } 100$$

Market Return (Rm): Market return has been defined as the ending price –beginning price divided by the beginning price of market portfolio. This is shown mathematically as under:

$$R_M = \frac{Ending\ Price(M) - Begining\ Price(M)}{Begining\ Price(M)} \text{ x } 100$$

Bullish Market conditions: Bullish market condition is defined as the condition in which market return is positive. Therefore, the analysis contains sub samples with positive return of jth industry portfolio return. The data-points with zero returns would be ignored for the analysis.

Bearish Market Conditions: Bearish Market condition is defined as the condition in which market return is negative. Therefore, the analysis contains sub samples with negative return of jth industry portfolio return. The data-points with zero returns would be ignored for the analysis.

4. Presentation and analysis of data

4.1.1 Summary statistics

Table 4 presents descriptive statistics of selected variables. Descriptive statistics include mean and median as measure of central tendencies, minimum and maximum that measure range, standard deviation, skewness and Kurtosis. Table 4 is divided into three panels. Panel A provide descriptive statistics of price levels of industry portfolios and market. Even though they are not the direct variables used in analysis, the returns in Panel B are derived from these price levels and hence descriptive analysis would be insightful. Panel C provide Descriptives of uniquely defined variables, i.e. co-movement variables as defined in methodology section.

Panel A shows that the mean daily price levels over the period of 10 years. For example Price, level (Index) of commercial bank portfolio has 470.86 in average and the median value of the same is 422.81. Simiilarly, it has ranged from minimum of 181.75 to the maximum of 1204.79 over the period with standard deviation of 220.42 . The sknewness and kurtosis value are 0.976 and 0.29 respectively.

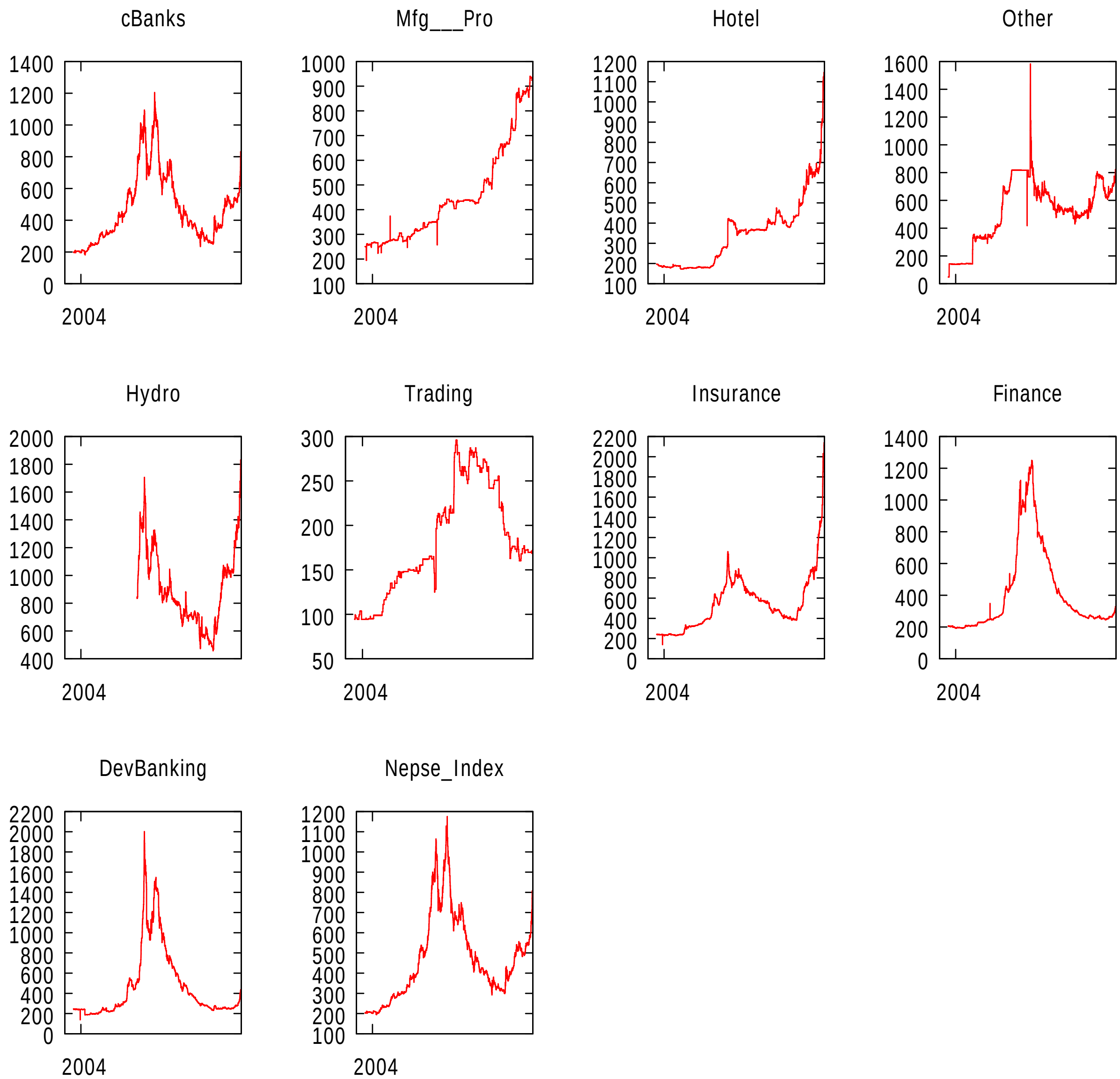
Table-4

Descriptive Statistics of Variables.

The table uses the observations daily data set of the selected variables for a period of 2003/07/17 - 2013/12/31

	Variable	Mean	Median	Minimum	Maximum	Std. Dev.	Skewness	Kurtosis
	ComBanks	470.862	422.810	181.750	1204.79	220.419	0.976223	0.299222
	Mfg	452.340	423.660	194.760	940.174	191.336	1.05326	0.0694172
P	Hotel	349.638	364.690	172.250	1146.15	171.156	1.32626	2.64718
A	Other	526.758	540.472	48.5600	1582.37	221.681	-0.23738	-0.297443
N	Hydro	909.572	848.000	458.058	1831.09	278.910	0.672932	-0.059387
E	Trading	181.423	169.679	94.2900	295.830	59.8107	0.235873	-1.10272
L	Insurance	546.794	489.765	139.520	2138.27	282.254	1.85718	6.01534
A	Finance	413.983	274.411	192.030	1249.66	269.070	1.53212	1.23229
	DevBanking	464.872	290.059	138.830	2001.39	345.360	1.78573	2.57769
	MarketIndex	469.901	418.898	195.140	1175.38	209.131	0.890473	0.207866
	Rc	0.0446082	0.000000	-10.2530	8.39995	1.34433	0.542680	10.9540
	Rm	0.0440570	0.000000	-27.9893	38.8682	1.40588	7.38500	422.905
P	Rh	0.0481171	0.000000	-6.71047	34.3596	0.858699	17.9369	681.890
A	Ro	0.120086	0.000000	-48.9315	183.811	3.86963	32.4143	1443.73
N	Rhy	0.0396056	0.000000	-8.02606	9.08379	1.35602	0.772565	9.32884
E	Rt	0.0203339	0.000000	-8.94254	50.4427	1.05260	28.5490	1384.18
L	Rin	0.0668308	0.000000	-41.5770	71.6743	1.52042	22.0884	1433.86
B	Rf	0.0179052	0.000000	-28.4992	40.5758	1.14884	6.95085	589.912
	Rd	0.0291105	0.000000	-41.9000	72.2826	1.75378	13.9075	856.357
	Rma	0.0393668	0.000000	-6.97306	5.98208	0.964275	0.529415	9.80516
	CC	1.21745	0.0173990	-6.66346	71.4951	4.38100	6.88359	60.1656
	CM	-0.0035621	-0.000000	-111.387	49.2071	2.18143	-31.6412	1864.21
P	CH	-0.0014843	-0.000000	-33.8125	15.4248	1.04410	-15.5658	570.700
A	CO	0.759100	0.000000	-11.4963	60.0704	3.93694	8.53788	87.9506
N	CHy	0.692126	0.000000	-31.7190	51.8181	3.34178	6.60282	67.0857
E	CT	0.00433762	-0.000000	-40.2240	17.1122	0.994245	-16.7825	774.265
L	CIn	0.175968	0.000000	-38.1320	28.8002	1.37292	0.946470	255.429
C	CF	0.138353	0.000000	-27.7371	28.9933	1.23343	1.61404	268.869
	CD	0.397326	0.000000	-50.2881	35.7612	2.04012	1.42732	157.847

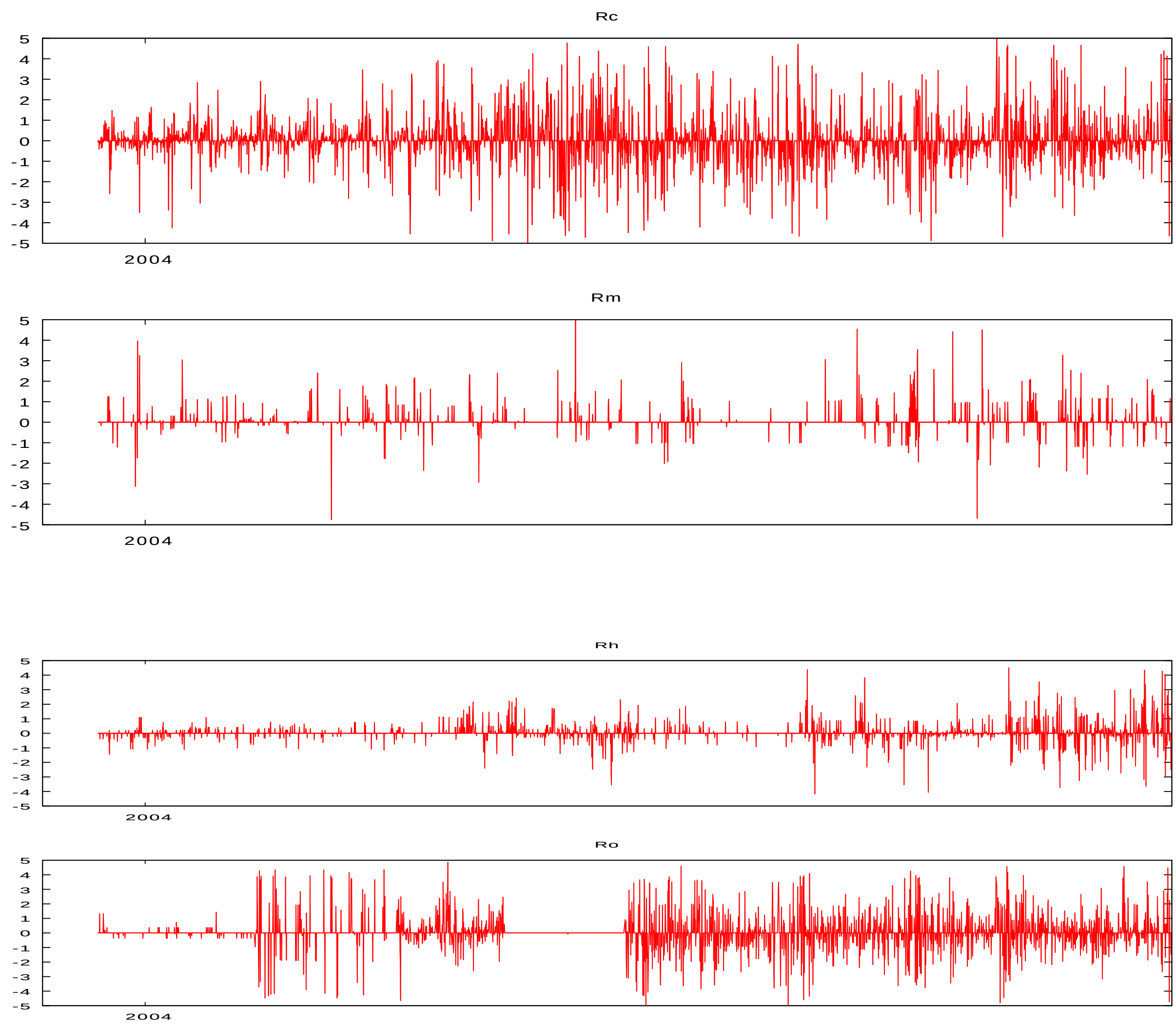
Figure 2: Time Series Plots of Price Movement of price levels of industry portfolio and market for a period of 2003/07/17 - 2013/12/31.

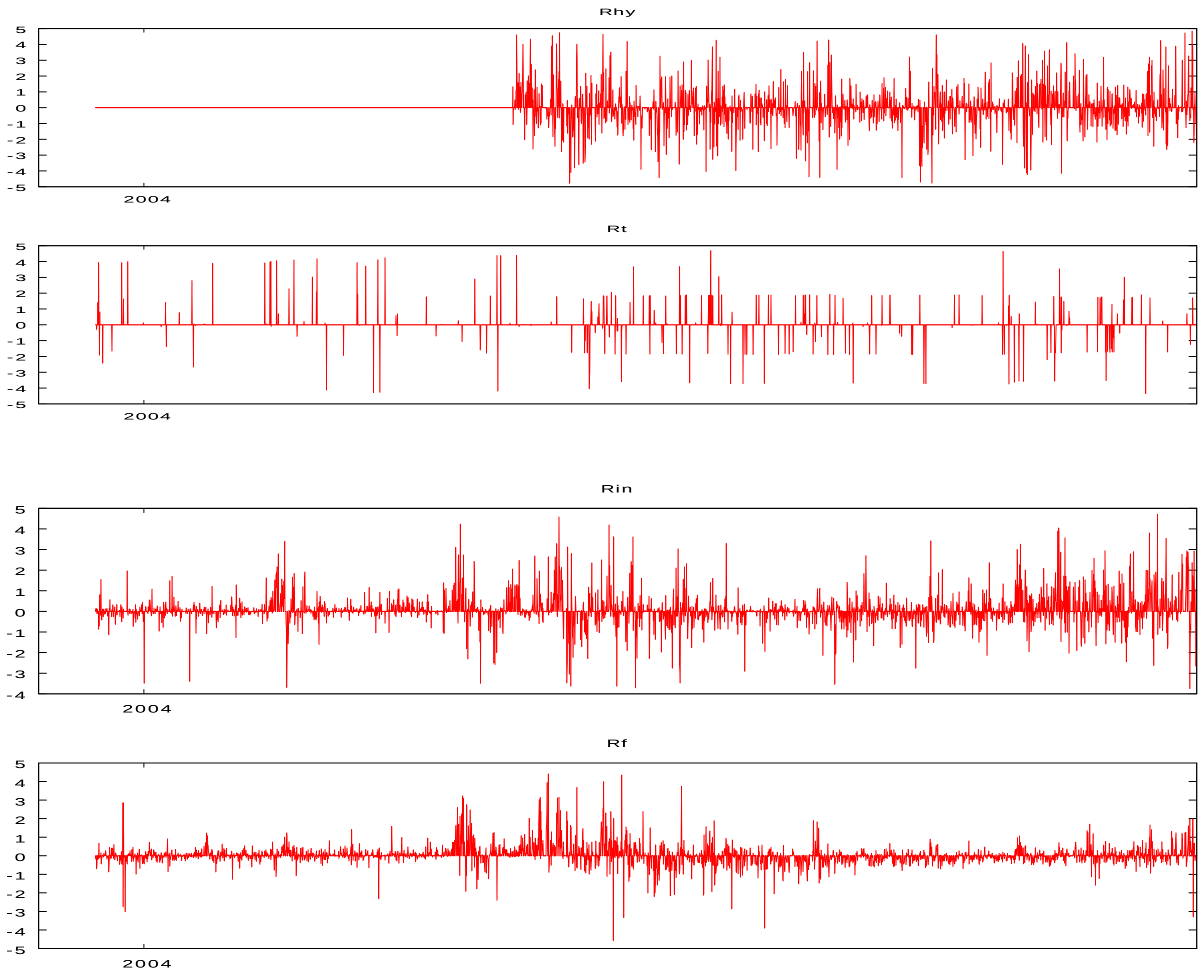


Time Series Plot of price levels of industry portfolio and market have been shown in figure 1. This plot shows that there is higher convergence of price movement of commercial banks, development banks and finance companies with the market price (index). This, however, seems logical as the trading activities in frequency and volume both, of Nepal Stock market have been dominated by these three industry over the period. At particular, price movements of commercial banks and market index are very resembling.

Figure 3

Time Series Plots of Movement of returns of industry portfolio and market for a period of 2003/07/17 - 2013/12/31.

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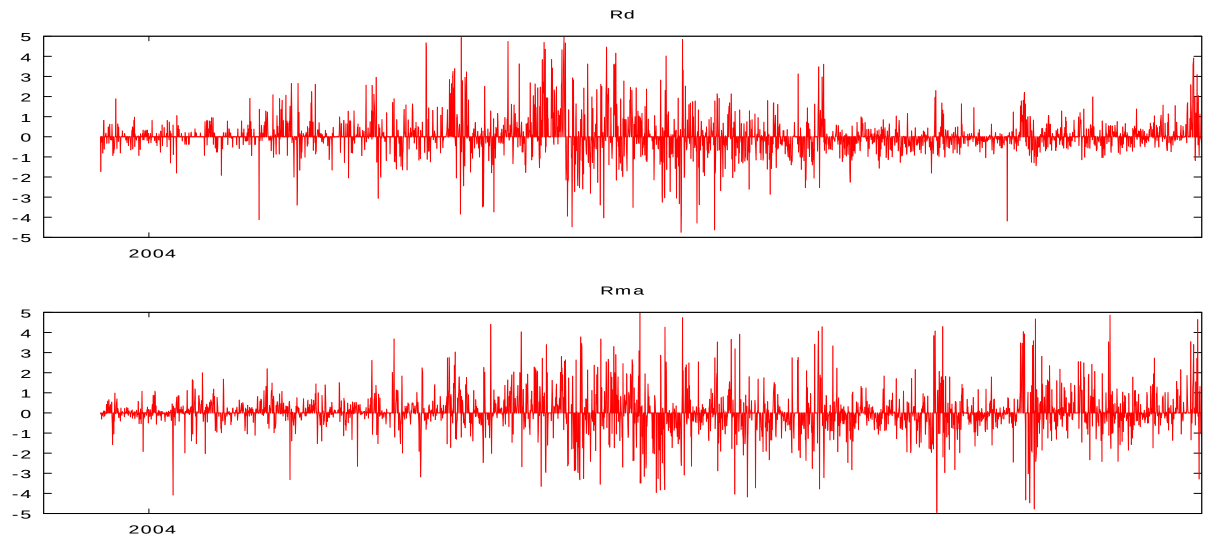

Figure 2 shows time series plots of nine industry portfolio returns and market returns over the period of 2003/07/17 - 2013/12/31. Even though time series plot of price level as in figure 1 shows non stationary movement of price level, the time series plots of return, which may be equivalent to first difference of price level deflated by initial price level, shows stationarity and convergence to mean value.

4.1.2. Correlational Analysis

Table 5
Pearson's Correlational Coefficient of different variables of study.

Rc	RMf	Rh	Ro	Rhy	Rt	Rin	Rf	Rd	Rm	
1.0000	0.0066	0.0168	0.2218	0.4954	0.0041	0.2535	0.1771	0.3410	0.9531	Rc
	1.0000	0.0326	0.0025	0.0177	0.0029	0.0367	0.0251	0.0245	0.0076	RMf
		1.0000	0.0137	0.0121	0.0082	0.0740	0.0086	0.0438	0.0083	Rh
			1.0000	0.1454	0.0016	0.1408	0.0973	0.0855	0.3446	Ro
				1.0000	0.0230	0.2462	0.1542	0.2457	0.5516	Rhy
					1.0000	0.0078	0.0068	0.0466	0.0005	Rt
						1.0000	0.1448	0.1981	0.3020	Rin
							1.0000	0.1842	0.2323	Rf
								1.0000	0.4086	Rd
									1.0000	Rm

Table 5 shows bivariate Correlational coefficients of nine different industry portfolio returns and market returns with each other. All the coefficients are significant at alpha level of 5%. There is stong positive correlation between Rc and Rm is (i.e. +0.9531). This is not surprising as overall market capitalization is dominated by commercial banks. Similarly, there is moderately strong and positive correlation between Rhy and Rm, Rd and Rm. Rest of the variables are weakly correlated with Rm. This may indicate weak application of conventional CAPM. However, details of applicability of CAPM has been presented in the following section.

4.1.3. Regressional analysis

Regressional Analyses are reported in Table 6, 7 and 8. Table 6 represents nine paired full sample regression equations for the period of study. On the other hand regression equations presented in table 4 and 5 are sub sample equations. In table 7, regression reports dataset for those time-point in which return of the jth portfolio is positive to capture bullish market conditions. Similarly table 8 reports regression of sub samples in which returns of jth industry portfolio are negative.

The time-points when return is zero have been eliminated for the analyses because of its indecisive nature to categorize in either continuum of bullish or bearish market conditions.

4.1.4. Analysis of Full Sample regression

The conventional CAPM seems to hold in almost all industry portfolio. All the coefficients of Rm are significant in type a) in the paired equations from 1 to 9. The conventional CAPM seems powerful with respect to equation 1.a. which depicts relation between commercial bank portfolio and market return with coefficient of determination (adjusted R^2) equal to 0.93. Similarly, conventional CAPM also seems to have sufficient explanatory powerful for industry portfolios of hydropower, hotels, development banks and finance companies with adjusted R^2 of around 50%. The relation of other industry portfolio with market return seems comparatively weak even-though significant. With the incorporation of co-movement variables, however, the explanatory power of each of the dependent variables as depicted by part b) of equations 1 to 9 in table 6, has improved significantly. The incorporated variable coefficient is consistently significant for all the regression equations. In some case, incorporating co-movement variable has made the coefficient of market return insignificant.

Table 6. Results of the regression models(full sample)

Table 6 reports the results of paired regression-models using explanatory variables as stated in the columns. Paired regression comprises part a), which is conventional CAPM and part b), which is MCAPM. Explanatory variables are given in 4th and 5th columns. Coefficients presented are in absolute values. The p-values are presented in parentheses and the coefficients are reported under each variable for every model. The variables and the respective regression equations have been defined in detail in methodology. The sample includes variables for a period of 2003/07/17 - 2013/12/31.

	Dep.	Constant	R-Ma	CM	Adj R^2	p-value of F-	N
1.a.	Rc	0.0043189	1.08069		0.936312		3819
		(0.61564)	(0.00001)			(1.74e-69)	
1.b.	Rc	0.0103514	1.3054	0.00305492	0.951024		3819
		(0.14395)	(0.00001)	(0.00001)		(0.000000)	
2.a.	RMf	0.00812752	0.736542		0.418766		3819
		(0.71678)	(0.00015)			(0.000155)	
2.b.	RMf	0.0448625	0.0194796	0.0102529	0.576049		3819
		(0.00197)	(0.60620)	(0.00001)		(0.000000)	
3.a	Rh	0.0129282	0.73717		0.574666		3819
		(0.59426)	(0.00015)			(0.000150)	
3.b.	Rh	0.0489858	0.00438393	0.0100577	0.782069		3819
		(0.00348)	0.84068	(0.00001)		(0.000000)	
4.a.	Ro	0.0814765	0.951221		0.182266		3819
		(0.17207)	(0.00001)			(2.1e-117)	
4.b.	Ro	0.088783	0.827383	0.00168172	0.183168		3819
		(0.13262)	(0.00001)	0.04184		(0.000000)	
5.a.	RHy	0.0197297	0.921773		0.770592		3819
		(0.44477)	(0.00001)			(9.16e-49)	
5.b.	RHy	0.0299565	0.669316	0.00329687	0.788386		2372
		(0.25006)	(0.00001)	(0.00001)		(0.000000)	
6.a.	Rt	0.01548	0.738869		0.519845		2372
		(0.53201)	(0.00013)			(0.000131)	
6.b.	Rt	0.0205937	0.00224583	0.0100453	0.705452		3819
		(0.2853)	(0.91690)	(0.00001)		(0.000000)	
7.a	Rin	0.0302116	0.787055		0.445582		3819
		(0.1642)	(0.00001)			(5.79e-07)	
7.b	Rin	0.0611087	0.181892	0.00821354	0.539949		3819
		(0.00146)	(0.00001)	(0.00001)		(0.000000)	
8.a.	Rf	0.01874	0.776624		0.543498		3819
		(0.29398)	(0.00001)			(2.79e-06)	
8.b	Rf	0.0126995	0.154405	0.0084399	0.667953		3819
		(0.3617)	(0.00001)	<0.00001		(0.000000)	
9.a.	Rd	-0.00874	0.849551		0.449765		3819
		(0.70596)	(0.00001)			(7.50e-14)	
9.b.	Rd	0.0138829	0.430751	0.0056853	0.488902		3819

		(0.55309)	(0.00001)	(0.00001)		(0.000000)	

Table 7: Results of the regression models in Bullish Market Conditions

Table 7 reports the results of paired regression-models using explanatory variables as stated in the columns. Paired regression comprises part a), which is conventional CAPM and part b), which is MCAPM in bullish market conditions i.e. when jth portfolio return is positive. Explanatory variables are given in the 4th and 5th columns. Coefficients presented are in absolute values. The p-values are presented in parenthesis and the coefficients are reported under each variable for every model. The variables and the respective regression equations have been defined in detail in methodology. The sample includes variables for a period of 2003/07/17 - 2013/12/31.

	Dep.	Constant	R-Ma	CM	Adj R^2	p-value of F-	N
1.a.	Rc	0.108562	1.248		0.642936		
		(0.00001)	(0.00001)			(2.1e-272)	
1.b.	Rc	0.180675	0.914548	0.0916671	0.789875		120
		(0.00001)	(0.00001)	(0.00001)		(0.00000)	
2.a.	RMf	0.896394	0.0129415		-0.002966		327
		(0.00001)	(0.84954)			(0.849541)	
2.b.	RMf	0.973229	0.669928	0.736832	0.633512		327
		(0.00001)	(0.00001)	(0.00001)		(8.80e-72)	
3.a	Rh	0.824334	0.0509063		-0.000941		540
		(0.00001)	(0.48286)			(0.482857)	
3.b.	Rh	0.640726	0.338599	0.590546	0.445756		540
		(0.00001)	(0.00001)	(0.00001)		(5.63e-70)	
4.a.	Ro	0.899586	0.750241		0.128197		708
		(0.00001)	(0.00001)			(4.66e-23)	
4.b.	Ro	1.04794	0.313883	0.270635	0.506650		708
		(0.00001)	(0.00001)	(0.00001)		(2.5e-109)	
5.a.	RHy	0.739694	0.668846		0.153347		677
		(0.00001)	(0.00001)			(1.87e-26)	
5.b.	RHy	0.878956	0.287078	0.30484	0.527471		667
		(0.00001)	(0.00001)	(0.00001)		(7.1e-111)	
6.a.	Rt	2.15589	-0.290862		0.001446		161
		(0.00001)	(0.26875)			(0.268746)	
6.b.	Rt	2.15981	1.35651	0.689497	0.045780		161
		(0.00001)	(0.00501)	(0.00306)		(0.009134)	
7.a	Rin	0.514383	0.179772		0.023717		116
		(0.00001)	(0.00001)			(7.33e-08)	
7.b	Rin	0.401425	0.128131	0.373778	0.399526		116
		(0.00001)	(0.00001)	(0.00001)		(3.5e-130)	
8.a.	Rf	0.361767	0.150972		0.004451		122
		(0.00001)	(0.01108)			(0.011076)	

8.b	Rf	0.341426	0.272005	0.777126	0.093272		122
		(0.00001)	(0.00001)	(0.00001)		(3.84e-27)	
9.a.	Rd	0.705808	0.325908		0.006983		101
		(0.00001)	0.00439			(0.004389)	
9.b.	Rd	0.670959	0.29443	0.426686	0.161339		101
		(0.00001)	(0.00001)	(0.00001)		(6.11e-40)	

Table 8: Results of the regression models in Bearish Market Conditions

Table 8 reports the results of paired regression models using explanatory variables as stated in the columns. Paired regression comprises part a), which is conventional CAPM and part b), which is MCAPM in bearish market conditions i.e. when jth portfolio return is negative. Explanatory variables are given in the 4th and 5th column . Coefficients presented are in absolute values. The p-values are presented in parenthesis and the coefficients are reported under each variable for every model. The variables and the respective regression equationshave been defined in detail in methodology. The sample includes variables for a period of 2003/07/17 - 2013/12/31.

	Dep. Var	Constant	R-Ma	CM	Adj R^2	p-value of F-	N
1.a.	Rc	0.183832	1.13765		0.498526		1206
		(0.00001)	(0.00001)			(7.0e-183)	
1.b.	Rc	0.247798	0.796963	0.151735	0.690145		1206
		(0.00001)	(0.00001)	(0.00001)		(3.1e-307)	
2.a.	RMf	0.712693	0.0599178		0.011650		187
		(0.00001)	(0.07562)			(0.075619)	
2.b.	RMf	0.66639	0.483065	0.748374	0.386969		187
		(0.00001)	(0.00001)	(0.00001)		(1.04e-20)	
3.a	Rh	0.71416	0.0582236		0.001165		444
		(0.00001)	(0.21880)			(0.218801)	
3.b.	Rh	0.622853	0.531357	1.02807	0.406495		444
		(0.00001)	(0.00001)	(0.00001)		(4.04e-51)	
4.a.	Ro	0.852495	0.854388		0.030917		682
		(0.00001)	(0.00001)			(2.29e-06)	
4.b.	Ro	0.94424	0.41908	0.46133	0.587692		682
		(0.00001)	(0.00001)	(0.00001)		(8.6e-132)	
5.a.	RHy	0.715943	0.479004		0.071556		731
		(0.00001)	(0.00001)			(1.15e-13)	
5.b.	RHy	0.671749	0.173994	0.27526	0.717168		731
		0.00001	0.00001	0.00001		(8.4e-201)	
6.a.	Rt	1.95324	0.0432235		-0.007743		129
		0.00001	0.89781			(0.897813)	
6.b.	Rt	1.76866	1.17762	0.677374	0.609025		129
		0.00001	0.00001	0.00001		(7.49e-27)	
7.a	Rin	0.413479	0.200052		0.024786		984
		0.00001	0.00001			(4.13e-07)	
7.b	Rin	0.353866	0.177232	0.55357	0.508857		984

		0.00001	0.00001	0.00001		(1.3e-152)	
8.a.	Rf	0.310935	0.101958		0.009397		1155
		0.00001	(0.00001)			(0.000567)	
8.b	Rf	0.261102	0.158901	0.675223	0.306805		1155
		(0.00001)	(0.00001)	(0.00001)		(7.92e-93)	
9.a.	Rd	0.49435	0.349199		0.053723		1093
		(0.00001)	(0.00001)			(5.11e-15)	
9.b.	Rd	0.472519	0.235708	0.522956	0.533678		1093
		(0.00001)	(0.00001)	(0.00001)		(1.0e-181)	

For instance, in equation 2.b) the coefficient of Rm has become non significant with the incorporation of co-movement variable. However, improved explanatory power from around 42% to around 57% indicates that relationship between Rmf and Rm to be spurious and caused by non-incorporation of relevant variable, here co-movement variable.

4.1.4. Regressional Analysis (Sub Samples, bullish and bearish market conditions)

Tables 7 and 8 present the sub sample regressions to assess the risk return relationship on bullish and bearish market conditions. The conventional CAPM does not hold for most of the regression equations except few cases like Rc, Rf and Rd for bullish market condition. The superiority of MCAPM over conventional CAPM is well demonstrated as presented by table 7. For instance for portfolio Rmf, incorporating co-movement variable, the risk return relationship changes from triviality equation 2.a to non trivial relation 2.b. The adjusted R^2 in model has improved from negative 0.002 to highly significant 0.63. Similar results have been observed in case of bearish market conditions. See table 8 for more details of results on each portfolio. The standard errors reported are heteroscedasticity robust.

5. Conclusion

This study mainly has attempted to analyze the relationship between portfolio return and market return under new specification of model and termed as MCAPM. This study has attempted to answer research questions including the applicability of CAPM in Nepalese Stock Market, applicability of CAPM hold in bullish and bearish market conditions, whether any incentive lies to adopt the proposed version of CAPM i.e. MCAPM in evaluating risk return behavior of financial assets and whether MCAPM shows its superiority in bullish and bearish market conditions. The findings show that Conventional CAPM also seems to have sufficient explanatory powerful for few industry portfolios of hydropower, hotels, development banks and finance companies. With the incorporation of co-movement variables, however, the explanatory power of each of the dependent variables has improved significantly implying superiority of MCAPM over CAPM. The conventional CAPM does not hold for most of the industry portfolio except few cases like Rc, Rf and Rd for bullish market condition. Incorporating of co-movement variable as prescribed by MCAPM the risk return relationship changes have changed trivial to non trivial relation. The adjusted R^2 in the equations have improved significantly.

This concludes that MCAPM is of nontrivial model. Even though incorporation of co-movement variable (as described in the MCAPM process) is possible and plausible for APT model, this has beyond the scope of this paper and shall constitute future endeavor.

REFERENCES

Acharya, V., Pedersen, L.H. (2005), Asset Pricing with Liquidity Risk. *Journal of Financial Economics*, 77 (2), 375–410.

Adler, M., Dumas, B. (1983), International Portfolio Choices and Corporation Finance: A Synthesis. *The Journal of Finance*, 38(3), 925-984.

Amsler, C. E., Schmidt, P. (1985), A Monte Carlo Investigation of the Accuracy of Multivariate CAPM Tests. *Journal of Financial Economics,* 14(3), 359-375.

Ang, J. S., Peterson, D.R. (1985), Return, Risk, and Yield Evidence from Ex Ante Data. *The Journal of Finance,* 40(2), 537-548.

Arbel, A., Kolodny, R., Lakonishok, J. (1977), The Relationship Between Risk of Default and Return. *The Journal of Financial and Quantitative Analysis*, 12(4), 615-625

Bachrach B., Galai D. (1979), The Risk-Return Relationship and Stock Prices. *Journal of Financial and Quantitative Analysis,* 14 (2), 421-441.

Baesel, J.B., Stein, G.R. (1979), The Value of Information: Inferences from the Profitability of Insider Trading. *The Journal of Financial and Quantitative Analysis*, 14(3), 553 -571.

Banz, R.W. (1981), The Relationship between Return and Market Value of Common Stocks. *Journal of Financial Economics*, 9 (1), 3-18.

Basu, S. (1983), The Relationship Between Earnings' Yield, Market Value and Return for NYSE Common Stocks: Further Evidence. *Journal of Financial Economics*, 12(1), 129-156.

Bawa, V., Lindenberg, E. (1977), Capital Market Equilibrium in a mean, Lower Partial Moment Framework. *Journal of Financial Economics,* 5(2), 189-200.

Benartzi, S., Thaler, R.H. (2001), Naive Diversification Strategies in Defined Contribution Savings Plan. *American Economic Review*, 91(1), 79-98.

Best, M. J., Grauer, R.R. (1985), Capital Asset Pricing Compatible with Observed Market Value Weights. *The Journal of Finance*, 40(1), 85-103.

Bodie, Z., Kane, A., Markus, A.J. (2008), Investment, 7th edn., McGraw-Hill/Irwin, 1221 Aveneu of the Americas, New York, US.

Bodurtha, J. N.Jr., Mark, N.C., (1991), Testing the CAPM with Time-Varying Risks and Returns. *The Journal of Finance,* 46(4), 1485-1505.

Bollerslev, T., Engle, R.F., Wooldridge, J.M. (1988), A Capital Asset Pricing Model with Time-Varying Covariances. The Journal of Political Economy, 96(1), 116-131.

Bower, D. H., Bower, R.S., Logue, D. E. (1984), Arbitrage Pricing Theory and Utility Stock Returns. *The Journal of Finance,* 39(4), 1041-1054.

Brenner, M., Smidt S. (1977), A Simple Model of Non-Stationarity of Systematic Risk. *Journal of Finance,* 32(4), 1081-1092.

Brown, D. P., Gibbons, M. R. (1985), A Simple Econometric Approach for Utility-Based Asset Pricing Models. *The Journal of Finance*, 40(2), 359-381.

Brown, S. J., Weinstein, M. I. (1983), A New Approach to Testing Asset Pricing Models The Bilinear Paradigm. *The Journal of Finance,* 38(3), 711-743.

Burmeister, E., McElroy, M.B. (1988), Joint Estimation of Factor Sensitivities and Risk Premia for the Arbitrage Pricing Theory. The Journal of Finance, 43(3), 721-733.

Celik, S. (2012). Theoretical and Empirical Review of Asset Pricing Models: A Structural Synthesis. *International Journal of Economics and Financial Issues*, *2*(2), 141-178.

Chen, S.N. (1981), Beta Nonstationarity, Portfolio Residual Risk and Diversification. *Journal of Financial and Quantitative Analysis,* 16 (1), 95-111

Chen, S.J., Jordan, B.D. (1993), Some empirical tests in the Arbitrage Pricing Theory: Macrovariables vs. derived factors. *Journal of Banking and Finance*, 17(1), 65-89.

Clare, A.D., Smith P.N., Thomas S.H. (1997), UK stock returns and robust tests of mean variance efficiency. *Journal of Banking & Finance*, 21(5), 641-660.

Cochrane, J. H. (1991), Production-Based Asset Pricing and the Link Between Stock Returns and Economic Fluctuations. *The Journal of Finance*, 46(1), 209-37.

Cochrane, J. H. (1996), A Cross-Sectional Test of an Investment-Based Asset Pricing Model. *Journal of Political Economy*, 104(3), 572-621.

Cochrane, J. H. (2005), Asset Pricing, (revised edition) Published by Princeton University Press, William Street, Princeton, New Jersey 08540, US.

Constantinides, G.M., Harris, M., Stulz, R.M.(editors) (2003), Handbook of The Economics of Finance Volume 1b. Elsevier B.V. Sara Burgerhartstraat 25, P.O. Box 211, 1000 AE Amsterdam, The Netherlands

Daniel, K., Titman, S. (1999), Market Efficiency in an Irrational World. *Financial Anlaysts Journal*, 55(6), 28-40.

Dittmar, R.F. (2002), Nonlinear Pricing Kernels, Kurtosis Preference, and Evidence from the Cross Section of Equity Returns. *The Journal of Finance*, 57(1), 369-403

Fama, E. F., French, K. R. (1993), Common Risk Factors in the Returns on Stocks and Bonds. *Journal of Financial Economics*, 33(1), 3-56.

Fama, F., French, K.R. (1996), Multifactor Explanations of Asset Pricing Anomalies. *The Journal of Finance*, 51(1), 55-84.

Fama, E. F. and K R. French. 1996. "Multifactor Explanations of Asset Pricing Anomalies." *Journal of Finance*. 51:1, pp. 55-84.

Fang, H., Lai, T. (1997), Co-Kurtosis and Capital Asset Pricing. *The Financial Review*, 32(2), 293-307.

Hong, H., Kubik, J.D., Stein, J. C. (2004), Social Interaction and Stock-Market Participation.Working Paper, *Standford Bussiness School*.

Jagannathan, R., Wang, Z. (1996), The Conditional CAPM and the Cross-Section of Expected Returns. *Journal of Finance*, 51(1), 3-53.

Lintner, J. (1965), 'Security Prices, Risk and Maximal Gains from Diversification', *Journal of Finance*, **20**(4), pp. 587-615.

Lettau, M., Ludvigson, S. (2001), Resurrecting the (C)CAPM: A Cross-Sectional Test When Risk Premia Are Time-Varying. *The Journal of Political Economy*, 109(6), 1238-1287.

MacKinlay, A.C. (1987), On Multivariate Tests of the CAPM. *Journal of Financial Economics*, 18(2), 341-371.

Markowitz, H. M. (1952), Portfolio Selection. *Journal of Finance*, 7(1), 77-91.

Mankiw, N.G., Shapiro, M.D. (1986), Risk and Return: Consumption Beta Versus Market Beta. *The Review of Economics and Statistics*, 68(3), 452-459.

Ng, L. (1991), Tests of the CAPM with Time-Varying Covariances: A Multivariate GARCH Approach. *The Journal of Finance*, 46(4), 1507-1521.

Pettengill, G.N., Sundaram, S., Mathur, I. (1995), The Conditional Relation between Beta and Returns. *The Journal of Financial and Quantitative Analysis*, 30(1), 101-116.

Roll, R. and S. A. Ross (1980), 'An Empirical Investigation of the Arbitrage Pricing Theory', *Journal of Finance*, **35**(5), pp. 1073-1103.

Rouwenhorst, K.G. (1999), Local Return Factors and Turnover in Emerging Stock Markets. *The Journal of Finance*, 54(4), 1439-1464.

Wang, K.Q. (2003), Asset Pricing with Conditioning Information: A New Test. The Journal of Finance, 58(1), 161-196.