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Validity of CAPM by Using Portfolios: Evidence from Indian Capital Market

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Abstract

This article tests the validity of Capital Asset pricing Model and compares the results of 16 periods including 14 sub periods which comprises 3 years each for the prediction of the expected returns in the Indian capital Market. The tests were conducted on portfolios having different security combinations. By using Black Jenson and Scholes methodology (1972) the study tested the validity of the model for the whole and different sub periods. The study used daily data of the BSE 100 index for the period from January 2001 to December 2010. Empirical results mostly in favor of the standard CAPM model. However, the result does not find conclusive evidence in support of CAPM.

Key words: Capital Asset pricing Model, Beta, Systematic risk, Security market line , Portfolios.

Introduction

Globalization and international investments to Indian capital market over the past decade made investment arena tougher and investment decisions complex. Today the market is highly volatile and the investor should be cautious and should identify an appropriate tool to evaluate the risk and return involved in his investment decisions. Normally rational investor will expect high return for bearing risk and the rate of return on the investment should commensurate with the riskiness of the assets. Capital Asset Pricing Model (CAPM) was developed by Sharpe (1964), Lintner (1965), and Mossin (1966) and it has been used widely for determining the risk return relationship in asset management. The core assumption of this model is that contribution of an asset to the variance of the market portfolio is the asset's systematic risk and beta can explain the asset's risk. In other words, rate of return and the risk premium, which will be proportional to assets market risk or beta quantifies the amount of

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risk that cannot be diversified away.

This study has four testable objectives. It checks the empirical validity of the CAPM in Indian stock market and ascertains the relationship between return of securities and market return. It also compared whether expected rate of return is linearly related with systematic risk and the difference in results while using different security combinations. This study is unique in the sense that it is difficult to find a study, which tested the validity of CAPM in Indian capital market by using different portfolio combination. The analysis was conducted for the whole study period and for different sub periods by using two different set of portfolios and failed to find irrefutable evidence in validating CAPM. The size of the sample and the number of companies used to construct the portfolio is one of the important limitations.

Review of literature

CAPM is the widely applauded model to explain the risk return relation. Large number of studies has been carried out to elucidate the relationship between return and factors which affect return and this has been tested with individual security return and portfolio return. Generally portfolio betas are more precise when compared to the individual security beta and researchers like Black and et.al (1972), Friend and Blume (1973) etc, followed portfolio approach to examine CAPM. In1973 Fama and Mac.Beth tested the linearity between expected return and pre ranked historic beta of assets and included squared beta as an additional variable to the basic Capital Asset Pricing Model and found a positive relation between return and risk.

Results of various empirical tests revealed that there is a mixed feeling on the applicability of CAPM in predicting risk return relationship. Studies conducted by (Fama and Mac Beth 1973), (Gibbons and Ferson, 1985) are generally in favor of CAPM. At the same time there is substantial criticism against the CAPM since the mid of 1975 and many empirical studies uncovered various anomalies that were clearly in conflict with the model's predictions. (Ross, 1976) introduced the concept of a multi factor model with the theoretical foundation and presented a number of state variables to explain the expected. (Roll, 1977) argued that one cannot empirically test the CAPM because the construction of the market portfolio as per the theory is impossible. (Basu, 1977) found that when stocks are sorted on earnings-price ratios (E/P), the expected returns on high E/P stocks are higher when compared to the return predicted by the Capital Asset Pricing Model. Similarly (Stattman, 1980) tested the effect of book value on stock return, (Banz, 1981) the size effect. (Bhandari, 1988) the effect of leverage and showed the inefficiency of beta to explain the market returns. In 1992 by using the cross-sectional regression Fama and French examined the validity of CAPM and found that size, book to market, debt equity and earning price should consider in the explanation of

expected stock return. Further, Chan et.al (1991) challenged the validity of CAPM. (Bark, 1991) tested the risk-return relationship for assets by using the CAPM with Fama and Macbeths' two-stage approach and found Sharpe-Linter-Mossin CAPM frame work is not adequate in the Korean stock market. (Yue, 1997) tested CAPM with multivariate testing based on Gibbon's methodology in Hong Kong market and their results rejected both the Sharpe- Lintner CAPM and Black CAPM at an extremely low level. (Harris et al., 2003), (Fan, 2004), (Malin and et. al, 2004) UK, France and German markets rejected CAPM. (Michailidis et.al, 2006) found that their study do not support the theory's basic hypothesis of CAPM in Greek securities market but explained the excess returns. Pettengill et. al (1995) found valid relationship between beta and returns by using a modified methodology of Fama and MacBeth (1973). (Rahman et al., 2006) in Bangladesh market, (Andor et al., 1999) Hungarian capital market also found positive relationship between beta and ex-post return, concluded that CAPM valid for these markets. Besides this (Majumdar et al., 2007) neither support nor reject (mixed result) the Capital Asset Pricing Model. In Indian context few studies were conducted for analyzing risk- return relationship and studies by (Madhusoodanan, 1997), (Srinivasan, 1988) have generally supported CAPM. Studies by (Rao and Bhole, 1990), (Vaidyanathan, 1995), (Sehgal, 1997), (Sehgal, 2003), (Mohanthy, 2002), (Manjunatha, et.al 2006) questioned the validity of CAPM in Indian context.

While examining the literature it is clear that most of the studies in India used monthly or yearly data and only few studies used daily and weekly data to test the validity of Capital Asset Pricing Model. There is dearth of studies in Indian context and is planned to examine the CAPM by using daily data of 70 companies listed in BSE100-index with two different combinations of portfolios.

Objectives of the study

The main objectives of the study is to revisit the empirical validity of CAPM frame work in Indian stock market by using different set of portfolios . The study will use Black et.al (1972) methodology and Fama and Mac Beth (1973) methodology to test the non linearity.

1. To examine the empirical validity of the 'CAPM' in Indian stock market.
2. To establish the relationship between return of securities and market return in Indian stock market.
3. To check whether expected rate of return is linearly related with systematic risk.
4. To compare the result of portfolios with different security combinations.

Source and Period of Data

The sample for the study covers nine years daily data of 70 companies of BSE 100 stock Index, a broad-based index, launched in 1989 for the period from 01-01-2001 to 31-12-2009 The data used in this study were sourced from of Prowess- a data base of CMIE and the websites Reserve Bank of India (RBI). The study considers 91 day Treasury bill rate as the proxy for the risk free assets, will better reflects the short term changes in the financial market.

Methodology for testing Capital Asset Pricing Model.

Black, Jensen and Scholes (1972) introduced a time series test of the CAPM and the relationship between risk and return has been analysed systematically. The present study also follows a similar approach will follow portfolio technique and use time series regression of excess portfolio return on excess market return and also cross sectional regression in risk premium form and is expressed by the equation below. In the first step, betas (systematic risk) of individual securities are measured and the beta coefficients of individual securities were calculated for the whole period and for the sub periods. A time series regression between the daily percentage return against the market return is used to get the beta coefficient of each security in the sample and the model is shown below.

$$Rit - Rft = a\,i + bi\,(Rmt - Rft) + eit \quad \text{----------} \quad (1)$$

Where: Rit is the rate of return on asset i (or portfolio) at time t, Rft is the risk-free rate at time t, Rmt is the rate of return on the market portfolio at time t, BSE 30 index is taken as the best proxy for the market portfolio. bi is the beta of stock i, eit is the error term of regression equation at time t.

In the second stage, for the formation of portfolios individual beta for each stock is arranged on ascending order and stocks were grouped in to portfolios having 10 and 5 stocks each according to their beta value .The first portfolio comprises the first 10/5 securities with lowest beta, the next portfolio with the next 10/5 securities and same method is followed for the formation of other portfolios and there by last portfolio is formed with securities having the highest beta. Then portfolio betas are calculated by using the following model.

$$rpt = ap + bp\ rmt + ept \quad \text{----------} \quad (2)$$

Where

rpt is the average excess portfolio return on time t, bp is the estimated portfolio beta, and, e pt is the error term in the regression equation at time t.

to estimate the ex post security market line for each testing period the portfolio return are regressed against portfolio betas. The model is

$$rp = \lambda 0 + \lambda 1\ bp + ep \quad \text{----------} \quad (3)$$

Where

rp = is the average excess return of the portfolio P, bp is the beta of the portfolio P, and ep is the error term in the regression equation

Further the study will also tested the non- linearity between the total portfolio return and betas by using the following equation.

$$rp = \lambda 0 + \lambda 1bp + \lambda 2b2p + ep \quad \text{----------} \quad (4)$$

CAPM in Different Periods.

To test the validity of CAPM , the study considered whole period data that is (2001-2009) and then the entire test period is divided in to seven different sub periods comprising three years each. The details are shown in Table1 below.

Table 1: Different Portfolio Formation Periods and Testing Periods

CAPM in the Whole Study Period (2001-2009) with Portfolios Having Ten Securities.

Period	1	2	3	4	5	6	7	8
Period Range	01-09	01-03	02-04	03-05	04-06	05-07	06-08	07-09
Portfolio Formation	2001	2001	2002	2003	2004	2005	2006	2007
Testing period	2009	2003	2004	2005	2006	2007	2008	2009

The study investigated the applicability of CAPM and the data used in this study consists 5259 days observations of 70 stocks listed in the BSE 100 Index. The results for the whole period by using the model (2) are shown in Table 2 below. Portfolio 1(P1) with lowest beta earned the minimum return of (0.1113) and the portfolio 5 with the beta (1.0538) gives the maximum return (0.1997). During the study period the average risk free return is (0.0163) and the average excess return on the market is (0.0669).The CAPM postulates that higher risk beta is associated with higher rate of return and the result of the study partially supports this argument since portfolio6 and portfolio7 with highest beta bags less return than portfolio.

Table 2: Test Results for Whole Study Period (2001 – 2009) (N= 5259)

Port folio	Portfolio Return(rp)	Intercept	Beta	Standard Error	R^2	F value	P Value of Beta at 99%
P1	0.11130	0.07971***	0.47233	0.76289	0.54509	2688.93	0.0000
P2	0.11554	0.06680***	0.72892	0.97319	0.63685	3935.33	0.0000
P3	0.12702	0.06868***	0.87242	0.79571	0.78981	8432.46	0.0000
P4	0.13047	0.06646***	0.95720	0.90286	0.77844	7884.51	0.0000
P5	0.19971	0.12924***	1.05378	0.91577	0.80541	9288.38	0.0000
P6	0.16271	0.08401***	1.17683	1.09133	0.78425	8156.95	0.0000
P7	0.18238	0.09388***	1.32345	1.20891	0.78931	8406.92	0.0000
Avg Rf	0.01626	Average rm = (Rm-Rf)		0.06687	***significant at 99 % level.		

R-square explains the relative amount of the variance in return of a particular portfolio with the return on index. In the case of portfolio 1, the R2 value is (0.54509), which indicates less than adequate correlation with the market index. Were as in portfolio 5, R2 value is (0.80541), which indicates that above 80 per cent of the variation in the scrip has been explained by the relationship with the index. The positive constants suggest that the portfolios have earned higher returns than the CAPM has predicted. Thus from the analysis it is clear that in most of the cases **β is a predictor of return in Indian capital market during the study period** but there no conclusive evidence in favor of CAPM.

Test of Non-Linearity (2001-2009)

Test for the non-linearity helps one to check whether there exists **non-linearity between portfolio return with beta. As per theory, if CAPM holds true** λ0 and λ2 will be equal to zero and the λ1 will be equal to the average risk premium. In this work the non-linearity has been tested by using the regression model (4). The results of the estimated values are summarised in the Table 3; it shows that the value of the constant **λ0 is not significantly different from zero. Statistically the t - value is (0.8377), which is less than (2.7765) at 5% significant level and thereby it** is consistent with the argument of CAPM.

Table 3: Test of Non-Linearity for the Whole Period (2001 - 2009)

	Coefficients	Std error	t- value	p-value
λ_0	0.08368	0.09989	0.8377	0.4493
λ_1	0.02685	0.23162	0.1159	0.9133
λ_2	0.03990	0.12751	0.3130	0.7699

Critical value for 4-Degrees of freedom (2.7765)

In the case of λ1, the t- value is (0.1159) is smaller than (2.7765), and it is not significantly different from zero. As per the CAPM, the λ1 should be equal to the average risk **premium**; hence the result is inconsistent with the CAPM hypothesis. In the case of λ2, the value (0.3130) and the t-value is less than (2.7765) at 5% significance level and thereby it is consistent with the CAPM hypothesis. Thus, it is clear tha betas are linearly related with expected return. Hence CAPM cannot be clearly rejected during the study period.

CAPM in Different Sub Periods

Consolidated Test Results for Different Sub –Periods (Ten Securities)

CAPM is tested for different study period by using portfolios having 10 securities. The results for different study periods are summarized below in Tables 4 to 7. The findings are

mostly supportive in different test periods to the hypothesis of Capital Asset Pricing Model, which says that higher beta provides higher return to the investor. Study reveals that while using percentage return and portfolios with equal weight, in most of the case beta explain the variation in portfolio returns, in few periods lower beta earned more return than higher beta portfolios, which is clear from table. 4.

Table 4 : Consolidated Results for Different Sub Periods by Using 10 Securities

	Sub period 1 (20001-2003)					
Port folio	Portfolio return	Constant	Beta	R^2	F Value	P value Beta
P1	0.1358	0.1189***	0.34760	0.2715	279.90	0.0000
P2	0.1988	0.1709***	0.57192	0.3664	434.37	0.0000
P3	0.1438	0.1084***	0.72707	0.5547	935.38	0.0000
P4	0.1821	0.1415***	0.83370	0.5541	933.16	0.0000
P5	0.2164	0.1702***	0.94681	0.5903	1081.92	0.0000
P6	0.2196	0.1668***	1.08355	0.5961	1108.22	0.0000
P7	0.1284	0.0514	1.57857	0.7688	2496.59	0.0000
Avg Rf	0.01681	Average rm = (Rm-Rf)			0.04881	

Sub period 2 (2002-2004)					
Portfolio return	Constant	Beta	F Value	R^2	P value Beta
0.18812	0.1456***	0.40544	390.38	0.3402	0.0000
0.13299	0.0651***	0.64687	1315.22	0.6347	0.0000
0.27030	0.1820***	0.84115	1378.53	0.6455	0.0000
0.20948	0.1071***	0.97486	1317.89	0.6352	0.0000
0.23339	0.1177***	1.10212	2776.67	0.7858	0.0000
0.27087	0.1415***	1.23187	2449.39	0.7639	0.0000
0.27020	0.1172***	1.45715	2179.65	0.7422	0.0000
Avg Rf	0.0142	Average rm = (Rm-Rf)		0.10498	

Table 5
Consolidated Results for Different Sub Periods by Using 10 Securities

Port folio	Sub period 3(2003-2005)					
	Portfolio return	Constant	Beta	R^2	F Value	P value Beta
P1	0.19576	0.1312***	0.46072	0.39166	487.370	0.0000
P2	0.23213	0.1359***	0.69667	0.64385	1368.55	0.0000
P3	0.19582	0.0762***	0.84995	0.73712	2122.70	0.0000
P4	0.24712	0.1152***	0.94406	0.70782	1833.88	0.0000
P5	0.24341	0.0943***	1.06785	0.84625	4166.87	0.0000
P6	0.23194	0.0589**	1.24122	0.74919	2261.24	0.0000
P7	0.27509	0.0690**	1.47422	0.79990	3026.13	0.0000
Avg Rf	0.01366	Average rm = (Rm-Rf)			0.13860	

Sub period 4 (2004-2006)					
Portfolio return	Constant	Beta	R^2	F Value	P value Beta
0.19367	0.13865***	0.56299	0.53150	854.283	0.0000
0.13098	0.04788**	0.81057	0.77784	2636.53	0.0000
0.18110	0.09071***	0.89768	0.78512	2751.36	0.0000
0.16977	0.07077***	0.97381	0.81428	3301.59	0.0000
0.13713	0.02389	1.1060	0.81169	3245.86	0.0000
0.17221	0.04885*	1.20218	0.84072	3974.74	0.0000
0.17639	0.02408	1.48129	0.84064	3972.28	0.0000
Avg Rf	0.0142	Average rm = (Rm-Rf)		0.10505	

*** Significant at99%,** Significant at 95%,* Significant at90%

Table 6
Consolidated Results for Different Sub Periods by Using 10 Securities

Port folio	Sub period 5 (2005-2007)					
	Portfolio return	Constant	Beta	R^2	F Value	P value Beta
P1	0.27919	0.0613	1.4924	0.8002	2997.27	0.0000
P2	0.28746	0.0672	1.5099	0.7860	2748.69	0.0000
P3	0.30661	0.0858 **	1.5166	0.7784	2628.29	0.0000
P4	0.31259	0.0911**	1.5203	0.7617	2391.5	0.0000
P5	0.30497	0.0842 *	1.5222	0.7771	2608.02	0.0000
P6	0.30914	0.0865 **	1.52323	0.7822	2686.45	0.0000
P7	0.31722	0.0972**	1.52382	0.7717	2529.03	0.0000
Avg Rf	0.01724	Average rm = (Rm-Rf)			0.14487	

Sub period 6 (2006-2008)					
Portfolio return	Constant	Beta	R^2	F Value	P value Beta
0.05494	0.05317*	0.4755	0.59363	1085.4	0.0000
0.00965	0.00700	0.7117	0.77526	2563.1	0.0000
0.03012	0.02690	0.8655	0.81634	3302.5	0.0000
-0.01330	0.01678	0.9389	0.86496	4759.4	0.0000
0.05991	0.05603**	1.0439	0.90513	7088.8	0.0000
0.06231	0.05787	1.1944	0.86683	4836.6	0.0000
0.12303	0.11767***	1.4412	0.87329	5120.82	0.0000
Avg Rf	0.01939	Average rm = (Rm-Rf)		0.00372	

*** Significant at99%, ** Significant at95%, Note: The Values of Constant, F, P and R2 are adjusted to 4 digits.

Table 7
Consolidated Results for Different Sub Periods by Using 10 Securities

Port folio	Sub period 7 (2007-2009)					
	Portfolio return	Constant	Beta	R^2	F Value	P value Beta
P1	0.08502	0.06672 **	0.393851	0.53903	860.651	0.0000
P2	0.04054	0.00929	0.67844	0.73441	2035.23	0.0000
P3	0.08185	0.04320	0.82771	0.79910	2927.60	0.0000
P4	0.08081	0.03690	0.93784	0.83494	3723.10	0.0000
P5	0.11927	0.06948 **	1.04698	0.84949	5719.99	0.0000
P6	0.16448	0.10719***	1.23770	0.87192	5010.55	0.0000
P7	0.12786	0.05648	1.47794	0.88429	5624.87	0.0000
Avg Rf	0.04611	Average rm = (Rm-Rf)			0.04611	

Test of Non –Linearity

The test for the non- linearity (Table 8-10) reveals that, for whole and adjusted period result support CAPM hypothesis. In addition high value of estimated correlation coefficient between the intercept and the slope indicates that the model explains excess returns

Table 8
Consolidated Results for Different Study Periods by Using 10 Securities

Coefficient	Whole Period (2001-2009)			Sub Period 1(2001-2003)			Sub Period 2(2002-2004)		
	Constant	t -value	P value	Constant	t- value	P value	Constant	t- value	P value
λ0	0.0837	0.8377	0.4493	0.03810	0.5678	0.6005	0.12757	1.0150	0.3674
λ1	0.0269	0.1159	0.9133	0.33520	2.252	0.0874	0.0991	0.3444	0.7479
λ2	0.0399	0.3130	0.7699	_	−2.326	0.0806	0.0030	0.0201	0.9849

Table 9

Consolidated Results for Different Study Periods by Using 10 Securities

Coefficient	Sub Period 3(2003-2005)			Sub Period 4(2004-2006)			Sub Period 5 (2005-2007)		
	Constant	t- value	P value	Constant	t- value	P value	Constant	t- value	P value
λ0	0.1839	2.6050	0.0597	0.2984	2.766	0.0505	60.2641	1.055	0.3509
λ1	0.0298	0.1946	0.8552	−0.2699	−1.244	0.2815	−80.6609	−1.065	0.3469
λ2	0.0186	0.2389	0.8229	0.12792	1.224	0.2881	27.1154	1.080	0.3410

*** Significant at 99 %level, ** Significant at 95% level

Table 10

Consolidated Results for Different Study Periods by Using 10 Securities

Coefficient	Sub Period 6 (2006-2008)			Sub Period 7(2007-2009)		
	Constant	t- value	P value	Constant	t- value	P value
λ0	0.2037	2.393	0.0750	0.0647	0.7213	0.5106
λ1	−0.4595	−2.485	0.0678	−0.0185	−0.0924	0.9308
λ2	0.2826	2.975**	0.0410	0.0529	0.5030	0.6414

*** Significant at 99 %level, ** Significant at 95% level

CAPM Frame Work in Indian Capital Market (Portfolios with Five Securities)

In this section an attempt is made to test the empirical validity of the CAPM by using portfolios having five securities. The theory says that through diversification one can strategically reduce the risk by allocating available funds in many securities by forming balanced portfolios. Further, this test will also help us to compare the results with our studies with same set of data and also to check whether number of securities in a portfolio has any influence on measuring the efficiency and validity of CAPM.

While analyzing table 11, it is clear that out of the14 portfolios, with the increase in beta we cannot see any increasing trend in the average portfolio excess return; rather it comes up and down. Results also supplement that, all portfolios including portfolio with lowest beta earned more than the average excess market return and the risk free return. Further the positive constants suggest that, the portfolios earned higher returns than the CAPM has predicted. Further from the Table11, it can be noted that the all constants has positive values. Thus the result indicates that, the alpha coefficients are significantly different from zero and hence we reject the null hypothesis. Further all estimated betas are found to be statistically significant at 99% level; thereby we reject the null hypothesis that the portfolio beta is not a significant determinant of portfolio return. Thus **β is a predictor of return during the whole study period (2001-2009).**

Table 11
Results of the Whole Study Period (2001 – 2009)

Port folio	Portfolio Return(rp)	Constant	Beta	Standard Error	R^2	F value	P Value 99%
P1	0.08861	0.06414	0.36583	0.92121	0.33020	1106.26	0.0000
P2	0.13393	0.09521	0.57899	1.09383	0.46691	1965.43	0.0000
P3	0.12553	0.07899	0.69593	1.38381	0.44153	1774.18	0.0000
P4	0.10556	0.05461	0.76191	1.05857	0.61823	3633.93	0.0000
P5	0.13207	0.07543	0.84704	1.06828	0.66276	4410.18	0.0000
P6	0.12198	0.06193	0.89781	1.09352	0.67816	4728.54	0.0000
P7	0.13557	0.07309	0.93429	1.14146	0.67682	4699.57	0.0000
P8	0.12536	0.05982	0.98011	1.22015	0.66855	4526.25	0.0000
P9	0.18670	0.11754	1.03411	1.11044	0.73053	6083.59	0.0000
P10	0.21272	0.14094	1.07345	1.30458	0.67912	4749.29	0.0000
P11	0.18653	0.10890	1.16086	1.68331	0.59786	3336.14	0.0000
P12	0.13889	0.05912	1.19280	1.29372	0.72657	5962.97	0.0000
P13	0.18345	0.10019	1.24502	1.51927	0.67734	4710.72	0.0000
P14	0.18131	0.08756	1.40188	1.44521	0.74628	6600.44	0.0000
Avg Rf	0.01626	Average rm =(Rm-Rf)		0.06687	significant at 99% level		

Consolidated result for the sub periods (Five securities)

In the second Phase test is repeated with five securities by using same methodology and procedure by constructing 14 portfolios for different sub periods and results for different study periods are summarized below in Table 12 to 15.

Through Portfolios having five securities each.

Table 12
Consolidated Results for Different Sub Periods by Using 5 Securities

Port folio	Sub period 1 (20001-2003)					
	Portfolio return	Constant	Beta	R^2	F Value	P value Beta
P1	0.19742	0.18649***	0.224016	0.05953	47.543	0.0000
P2	0.07307	0.05011***	0.47042	0.32234	357.22	0.0000
P3	0.11733	0.09139***	0.53131	0.35932	421.19	0.0000
P4	0.28033	0.25043***	0.61253	0.19548	182.48	0.0000
P5	0.14339	0.11568***	0.56765	0.67610	1567.61	0.0000
P6	0.17951	0.14242***	0.75989	0.43036	567.39	0.0000
P7	0.17044	0.13072***	0.81355	0.43529	578.89	0.0000
P8	0.19392	0.15224***	0.85385	0.48513	707.62	0.0000
P9	0.20621	0.16085***	0.92927	0.49174	726.60	0.0000
P10	0.22664	0.17956***	0.96435	0.45395	624.35	0.0000
P11	0.23548	0.18411***	1.05245	0.44146	593.58	0.0000
P12	0.20380	0.14939***	1.11465	0.54388	895.50	0.0000
P13	0.20038	0.13433	1.35309	0.57866	1031.42	0.0000
P14	0.05651	−0.0315	1.80405	0.60889	1169.21	0.0000
Avg Rf	0.01681	Average rm = (Rm-Rf)			0.04881	

Sub period 2 (2002-2004)					
Portfolio return	Constant	Beta	F Value	R^2	P value Beta
0.17171	0.13756***	0.32533	0.15175	135.43	0.000
0.20452	0.15354***	0.48554	0.28184	297.09	0.000
0.09170	0.02911	0.59613	0.46562	659.59	0.000
0.17428	0.10105***	0.69761	0.52564	838.85	0.000
0.23518	0.15026***	0.80884	0.54483	906.11	0.000
0.30542	0.21372***	0.87345	0.48309	707.48	0.000
0.29151	0.19444***	0.92460	0.42010	548.40	0.000
0.12744	0.01982	1.02513	0.54577	909.55	0.000
0.21617	0.10394***	1.06901	0.67917	1602.54	0.000
0.25062	0.13144***	1.13524	0.64087	1350.90	0.000
0.29870	0.17431***	1.18485	0.59285	1102.28	0.000
0.24304	0.10877**	1.27889	0.69318	1710.29	0.000
0.24396	0.10043***	1.36722	0.66184	1481.60	0.000
0.29643	0.13401**	1.54707	0.63798	1334.06	0.000
Avg Rf	0.0142	Average rm = (Rm-Rf)		0.10498	

*** Significant at 99%, ** Significant at 95% .

Table 13
Consolidated Results for Different Sub Periods by Using 5 Securities

Port folio	Sub period 3 (20003-2005)					
	Portfolio return	Constant	Beta	R^2	F Value	P value Beta
P1	0.24929	0.20095***	0.34627	0.05431	43.47	0.0000
P2	0.20172	0.12413***	0.55581	0.33865	387.63	0.0000
P3	0.20792	0.11751***	0.64766	0.52264	828.82	0.0000
P4	0.25831	0.15440***	0.74439	0.45755	638.53	0.0000
P5	0.23397	0.12034***	0.81396	0.57012	1003.95	0.0000
P6	0.15640	0.03245	0.88791	0.60786	1173.46	0.0000
P7	0.18686	0.05801	0.92303	0.61339	1201.05	0.0000
P8	0.30750	0.17265***	0.96590	0.54568	909.245	0.0000
P9	0.21573	0.07267**	1.02480	0.67206	1551.36	0.0000
P10	0.27128	0.11611***	1.11157	0.70056	1771.07	0.0000
P11	0.23793	0.06852*	1.21355	0.72147	1960.87	0.0000
P12	0.22874	0.05149	1.26967	0.60091	1139.83	0.0000
P13	0.30853	0.11609***	1.37849	0.64444	1372.07	0.0000
P14	0.24079	0.02146***	1.57112	0.72060	1952.39	0.0000
Avg Rf	0.01366	Average rm = (Rm-Rf)			0.13960	

Sub period4 (2004-2006)					
Portfolio return	Constant	Beta	F Value	R^2	P value Beta
0.28197	0.23574***	0.44003	0.24059	238.56	0.0000
0.10538	0.03384	0.68098	0.54276	893.85	0.0000
0.14888	0.06619	0.78709	0.59590	1110.41	0.0000
0.11308	0.02567	0.83205	0.68855	1664.72	0.0000
0.17716	0.08494**	0.87792	0.65463	1427.33	0.0000
0.18503	0.08919**	0.91237	0.67145	1538.93	0.0000
0.20167	0.10168***	0.95182	0.63368	1302.60	0.0000
0.13786	0.03367	0.99184	0.74699	2223.26	0.0000
0.12929	0.01800	1.05944	0.81215	3255.66	0.0000
0.14496	0.02424	1.14913	0.63506	1310.39	0.0000
0.09773	−0.0250	1.16838	0.79510	2922.04	0.0000
0.24669	0.11720***	1.23260	0.70469	1796.91	0.0000
0.12800	−0.01909	1.40033	0.77133	2539.94	0.0000
0.22479	0.06110	1.55817	0.76394	2436.99	0.0000
Avg Rf	0.01496	Average rm = (Rm-Rf)		0.10505	

*** Significant at 99%, ** Significant at 95% * significant at 90

Table 14
Consolidated Results for Different Sub Periods by Using 5 Securities

Port folio	Sub Period 5 (2005-2007)					
	Portfolio return	Constant	Beta	R^2	F Value	P value Beta
P1	0.18841	0.12317***	0.45032	0.27014	276.86	0.0000
P2	0.05039	−0.0449	0.65794	0.45728	630.24	0.0000
P3	0.09877	−0.0093	0.74606	0.55341	926.918	0.0000
P4	0.16718	0.05084	0.80304	0.61659	1202.75	0.0000
P5	0.27100	0.14695***	0.85632	0.63024	1274.93	0.0000
P6	0.30328	0.17368***	0.89459	0.51774	803.03	0.0000
P7	0.17761	0.04330	0.92708	0.71130	1842.96	0.0000
P8	0.19412	0.05283	0.97526	0.68251	1608.00	0.0000
P9	0.16470	0.01685	1.02056	0.85017	4244.59	0.0000
P10	0.19538	0.03938	1.07679	0.73240	2047.21	0.0000
P11	0.21096	0.04895	1.11830	0.76155	2389.04	0.0000
P12	0.22037	0.04218	1.23002	0.69938	1740.26	0.0000
P13	0.23825	0.02799	1.45135	0.69469	1701.98	0.0000
P14	0.32012	0.09764**	1.53569	0.75221	2270.75	0.0000
Avg Rf	0.01724	Average rm = (Rm-Rf)			0.144872	

Sub period 6 (2006-2008)					
Portfolio return	Constant	Beta	F Value	R^2	P value Beta
0.04525	0.04382	0.382707	0.37697	449.574	0.0000
0.06464	0.06252	0.568486	0.52345	816.136	0.0000
-0.00058	−0.0030	0.674543	0.62702	1249.06	0.0000
0.01988	0.01709	0.749013	0.68243	1596.64	0.0000
-0.0127	−0.0158	0.841287	0.68243	1596.65	0.0000
0.07296	0.06965*	0.889805	0.72932	2001.94	0.0000
-0.05857	−0.0619	0.918755	0.74232	2140.44	0.0000
0.03197	0.02840	0.959227	0.78576	2725.07	0.0000
0.02223	0.01848	1.00811	0.80510	3069.29	0.0000
0.09760	0.09358**	1.07988	0.83894	3870.42	0.0000
0.07970	0.07545*	1.14211	0.80342	3036.71	0.0000
0.04492	0.04028	1.24674	0.78747	2753.06	0.0000
0.15627	0.15127***	1.34516	0.79343	2853.99	0.0000
0.08980	0.08408	1.53739	0.80657	3098.32	0.0000
Avg Rf	0.01939	Average rm = (Rm-Rf)		0.00372	

*** Significant at 99%, ** Significant at 95% * significant at 90

Table 15: Table Showing Consolidated Results for Different Sub Periods by Using 5 Securities

Port folio	Sub Period 7 (2007-2009)					
	Portfolio return	Constant	Beta	R^2	F Value	P value Beta
P1	0.08810**	0.07446**	0.29498	0.30900	329.13	0.0000
P2	0.08176	0.05897	0.49271	0.49339	718.79	0.0000
P3	0.06897	0.04041	0.61765	0.54659	887.28	0.0000
P4	0.01236	−0.02181	0.73922	0.60759	1139.59	0.0000
P5	0.10275	0.06578	0.79951	0.61307	1168.77	0.0000
P6	0.06021	0.02063	0.85599	0.74569	2158.11	0.0000
P7	0.08465	0.04232	0.91536	0.70034	1720.14	0.0000
P8	0.07589	0.03148	0.96031	0.80335	3006.82	0.0000
P9	0.15860	0.11175**	1.01291	0.78123	2628.33	0.0000
P10	0.07721	0.02722	1.08105	0.81452	3232.01	0.0000
P11	0.11063	0.05557	1.19049	0.86458	4698.93	0.0000
P12	0.21823	0.15881***	1.28490	0.76514	2397.79	0.0000
P13	0.11196	0.04916	1.35803	0.85806	4449.48	0.0000
P14	0.13770	0.06381	1.59784	0.79477	2850.37	0.0000
Avg Rf	0.01702	Average rm = (Rm-Rf)			0.046245	

*** Significant at 99%, ** Significant at 95% * significant at 90

Findings reveals that beta can explain the variation in portfolio return while using equally weighted portfolios and it is found that in most of the cases the return on portfolio increases with increase in beta, but we cannot see this trend in all the portfolios as similar to the previous results

Test of Non –Linearity

The test for non-linearity shows that in each case the beta square coefficient was insignificantly different from zero, which tells that there exists a linear relationship between expected return and beta. Thus the findings are according to the CAPM hypothesis. But in most of the cases, it is found that the tests in the sub periods were also consistent with the above hypothesis and indicate evidence in supporting the CAPM but did not provide conclusive evidence in favor of CAPM

Table 16: Consolidated Results for Different Study Periods by Using 5 Securities

Coefficient	Whole Period (2001-2009)			Sub Period 1(2001-2003)			Sub Period 2(2002-2004)		
	Constant	t -value	P value	Constant	t- value	P value	Constant	t- value	P value
λ0	0.0823	0.7274	0.4822	0.0614	0.8831	0.3961	0.11708	1.08700	0.3005
λ1	0.1659	0.6458	0.5316	0.3015	2.0410	0.066	0.12597	0.51670	0.6156
λ2	−0.0332	−0.2383	0.816	−0.1613	−2.266**	0.0446	−0.01167	−0.0906	0.9294

** Significant at 95 %level,

Table 17: Consolidated Results for Different Study Periods by Using 5 Securities

Coefficient	Sub Period 3(2003-2005)			Sub Period 4(2004-2006)			Sub Period 5 (2005-2007)		
	Constant	t- value	P value	Constant	t- value	P value	Constant	t- value	P value
λ0	0.24430	2.8490**	0.0158	0.450307	3.383***	0.0061	0.1325	0.76954	0.4578
λ1	−0.06528	−0.3534	0.7305	−0.588368	−2.200	0.0501	−0.0087	−0.0253	0.9803
λ2	0.05308	0.5643	0.5839	0.281998	2.175	0.0524	0.0730	0.43605	0.6713

** Significant at 95 %level
*** Significant at 99 %level,

Table 18: Consolidated Results for Different Study Periods by Using 5 Securities

coefficient	Sub Period 6 (2006-2008)			Sub Period 7 (2007-2009)		
	Constant	t- value	P value	Constant	t- value	P value
λ0	0.1067	1.0370	0.3222	0.0777	1.073	0.3064
λ1	−0.2344	−1.0620	0.3110	−0.0457	−0.2867	0.7797
λ2	0.1637	1.4520	0.1743	0.06414	0.7770	0.4536

** Significant at 95 %level
(Note: Some of the coefficients in tables are significant at 90% level

The test for non-linearity for the whole period shows that in each case the beta square coefficient was significantly different from zero, which tells that there exists a linear relationship between expected return and beta. Thus the findings are according to the CAPM hypothesis. Further it is found that the tests in the sub periods were also consistent with the above hypothesis and indicate evidence in supporting the CAPM but did not provide

conclusive evidence, or not fully in favor of the CAPM in all the tests. This leads to the conclusion that some of the results is inconsistent with the theory and hence against the CAPM. The test for portfolios based on percentage return with equally weighted portfolios having 5 securities does not give conclusive evidence in support of CAPM. In some periods, the test clearly rejects the CAPM hypothesis and in few periods it partially supports the CAPM hypothesis. Further in some of the sub periods the constants are insignificant and rejects the CAPM hypothesis. The study also found that, during the study period most of the portfolios, including the portfolio with lowest beta earned more than the average excess market return and the positive constants suggest that the portfolios earned higher return than the CAPM has predicted. The fluctuation in the market seems to influence the return of the portfolios. During the period of recession, some of the portfolios found to report a negative return (during the sub period 2006-2008)

Conclusion

Investment decision is one of the key areas in finance and the risk return relationship is one of the most discussing facts in investment decisions. This study tested the empirical validity of CAPM, and non-linearity between risk return. The result of the study is mostly in support and favor of the CAPM and is in support Ansari (2000) who suggests that the evidence is not sufficient to drop the use of the model. While comparing the test with ten securities and five securities it is found that the CAPM rejected in more tests when portfolios are formed with 10 securities and it shows almost similar result but there is difference in rejection period. This leads to the conclusion that portfolio combination may have importance in pricing and it should be established with more empirical tests. In short the result reveals that the CAPM not conclusively validated during the study period and this do not means that the data fully reject CAPM. present study reveals that beta can explain the variation in portfolio return while using equally weighted portfolios and it is found that, in most of the cases the return on portfolio increases with increase in beta, but we cannot see this trend in all the portfolios.

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