A STUDY ON CAPITAL ASSET PRICING MODEL AND ARBITRAGE PRICING THEORY IN THE INDIAN STOCK MARKET: AN EMPIRICAL STUDY

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Abstract
Stock market plays an important role in the global economy and Indian economy become progressively significant part of the world economy; we are interested in the Indian stock market. After we compared the methods on the stock market, we choose to use the CAPM and the APT model on Indian stock market. As a few papers study on the Bombay stock exchange market, we pay our attention on the BSE market. We put the samples from the BSE 30 Company and seven macro-economic factors into the regression models which are based on the CAPM and the APT model, and then we can use the regression models to forecast the long returns. We may find that the CAMP or the APT model can forecast better on the Indian stock market. The systematic risk is the only factor we put the regression model based on the CAPM. For the regression model based on the APT model, we use seven factors which are the systematic risk, daily exchange volume and the volatility. Our results show that the APT model can explain factors better than the CAPM for the samples from the Indian stock market.

Introduction

Investment is the employment of funds with an aim to achieve additional income or growth in value. In other words, an investment is a commitment of funds made in expectation of some positive rate of return. Investment can be defined as the purchase of an asset with a primary motive of conserving or increasing the wealth of an individual. The asset so purchased may be a financial assets or an asset like residential house or gold jewelry etc. if asset purchased is financial asset, like a share stock, debenture, government bonds or a unit of any mutual fund, the returns expected from these investments may be either a regular income or a capital appreciation or a combination of both.

The behaviour of share prices, and the relationship between risk and return in financial markets, has long been of interest to researchers. In 1905, a young scientist named Albert Einstein, seeking to demonstrate the existence of atoms, developed an elegant theory based on Brownian motion. Einstein explained Brownian motion the same year he proposed the theory of relativity. At that time his results were considered completely revolutionary
From the prior and existing studies on capital market it is observed that there are very few research studies were conducted in undertaking the factor influencing the risk and return relationships existing in Indian capital market today the modern financial theory upon systematic factors as sources of risk and contemplates that the long run return on individual asset must reflect the changes in such systematic factors.

Therefore, the present study was taken up to test and compare the models accepted to be equilibrium models explaining the factors influencing the returns on factors affecting the return generating process of securities such as capital asset pricing model(CAPM) and arbitrage pricing theory(APT) in the Indian stock market, and explore into the performance of asset prices our equity markets in India.

GaoxiangWang(2008) in which he studied that whether the macroeconomic variables defined through Arbitrage Pricing Theory (APT) can explain the returns on the stock indexes in Australia. This research was based on the returns of stocks listed on the Australian Stock Exchange (ASX) during the period from 31March 2000 to 31 December 2007. The research concluded that industry indices' returns can only be explained by three to five of the thirteen macroeconomic variables selected in the research. Empirical results suggest that macroeconomic variables, used in an APT framework, can explain consumer discretionary, energy, financial, IT, and materials,

price index returns, but cannot explain other index returns. Generally, APT is a desirable model in examining the ASX200, as it explains half of the industry indices' returns.

ErieFebrian, AldrinHerwany, (2010)in which the researchers wanted to investigate the ability of CAPM and APT in explaining the additional returns of portfolio of stocks traded in Jakarta Stock Exchange. They used data from three important economicer as i.e. pre-crisis period (1992-1997), crisis period (1997-2001), and post-crisis period (2001-2007). The results came out in the favour of APT as it proved that Beta is not the only factor that can explain the portfolio's additional returns. Studies on testing of market efficiency of Asian emerging stock markets are also surprisingly few.

Methodology

The test used for the CAPM and APT is a two-step test, which is extensively used in the literature. The first step involves the use of time series to estimate the betas for the shares for the CAPM and a set of factor loading through factor analysis for the APT: The second step the regresses the sample mean return on the beta (for the CAPM) and to the factor loadings (for the APT)The study covers the period from the January 2010 to June 2014.

Objectives

1. To estimate to parity between risk and return on lines of CAPM.
2. To establish the relationship estimated between return and priced factors on lines of APT
3. To find out the whether shares and portfolios are significantly influenced by Systematic factors.
4. To compare CAPM and APT with artificial factors, and to assess which model perform better in
5. Explaining the behaviour of share prices.
6. To find out the share prices are influenced by macro-economic factors or not.

Data Analysis and Interpretation

The present study also focuses on comparing the CAPM and APT with artificial factors using residual analysis to ascertain which model perform better in explaining the behaviour of share prices in Indian environment.

Normality Test

For the present study on comparative evaluation of CAPM and APT in Indian market, the monthly share prices of 30 companies are collected from BSE India website. The BSE30 market index is considered as benchmark to assess the security risk and used in CAPM model. The period of study is from January 2010 to June 2014. The share price return for each selected companies (R_{it}) is calculated by dividing the successive stock price (Pt+1) by the current price and subtracting one from the result. The formula is as follows:

$$R_{it} = \frac{P_{t+1}}{P_t} - 1$$

Table-1 shows the summary statistics such as mean, standard deviation along with skewness and kurtosis as well as with Shapiro Walk W test for normality for the share price returns of selected companies and BSE30 market index. The Shapiro Walk test used here to test normality of the times series share price data. In addition to skewness and kurtosis, this test is used to get the statistical significance of the normality of the data.

An examination of the table shows that the average return from selected 30 companies between January 2010 and June 2014, i.e., for the period of 54 months, ranging from -0.0161 to 0.0273. While 6 companies have yielded negative returns, the share price returns from all 24 remaining companies are positive.

Table-1: Summary Statistics

No.	Scrip Name	Mean	SD	Skewness	Kurtosis	Shapiro-Wilk W Test	Normality
1	AXIS	0.0076	0.1188	0.1801	-0.0748	0.9763^{ns}	0.5693
2	BAJAUT	0.0184	0.0682	-0.3476	0.3782	0.9801^{ns}	0.7175
3	BHEL	-0.0161	0.2289	0.8422	10.2448	0.7977**	0.0000
4	BHATE	0.0048	0.0920	0.3628	-0.2459	0.9773^{ns}	0.6087
5	CIPLA	0.0056	0.0624	-0.0403	-0.7246	0.9719^{ns}	0.4116
6	COALIN	0.0052	0.0795	0.8736	1.6296	0.9579^{ns}	0.1119
7	DRREDDY	0.0178	0.0608	0.1066	-0.1888	0.9822^{ns}	0.7923
8	GAIL	0.0000	0.0568	-0.2804	-0.3024	0.9723^{ns}	0.4240
9	HDFCBNK	0.0036	0.1330	-4.3700	26.7716	0.6344**	0.0000
10	HEROMOT	0.0109	0.0762	-0.0849	-0.0659	0.9832^{ns}	0.8279
11	HINDAL	0.0071	0.1092	0.8167	0.6850	0.9492*	0.0440
12	HUL	0.0196	0.0669	0.7695	2.0158	0.9699^{ns}	0.3512
13	HDFCCOR	-0.0021	0.1252	-4.8802	30.8124	0.5862**	0.0000
14	ICICI	0.0152	0.1044	0.4464	0.9269	0.9780^{ns}	0.6350
15	INFOSYS	0.0090	0.0835	-0.3103	0.6843	0.9780^{ns}	0.6339
16	ITC	0.0100	0.0860	-3.3792	18.4616	0.7439**	0.0000
17	LT	0.0076	0.1185	-0.3259	2.2186	0.9708^{ns}	0.3763
18	MAHMAH	0.0090	0.0974	-2.2738	9.1694	0.8439**	0.0000
19	MARUTI	0.0153	0.1092	0.6597	0.5428	0.9564^{ns}	0.0953
20	NTPC	-0.0017	0.0840	1.9054	6.5047	0.8611**	0.0000
21	ONGC	0.0001	0.1074	-2.1510	12.0106	0.8389**	0.0000
22	RELIND	0.0032	0.0745	0.3122	-0.5980	0.9673ns	0.2787
23	SESASTER	0.0135	0.1915	0.5755	2.7060	0.8733**	0.0000
24	SBI	0.0099	0.1016	0.6002	0.3354	0.9620ns	0.1696
25	SUNPHAR	-0.0008	0.1632	-4.3248	23.5509	0.5978**	0.0000
26	TCS	0.0217	0.0621	0.3950	0.2023	0.9809ns	0.7446
27	TATMOT	0.0273	0.1155	0.1586	0.8460	0.9847ns	0.8720
28	TATPOW	-0.0159	0.1565	-3.3601	19.9856	0.7290**	0.0000
29	TATSTL	0.0066	0.1273	0.5507	-0.0485	0.9601ns	0.1394
30	WIPRO	-0.0019	0.1030	-1.0568	4.9822	0.9351**	0.0090

The skewness is less than -1.00 and greater than 1.00 for 9 out of 30 stocks (as a rule of thumb, If the skewness is greater than 1.0 or less than -1.0, the skewness is substantial and the distribution is far from symmetrical) indicating that the distribution of only 9 stocks is far from symmetrical, i.e., far from normality. That is, 21 stocks are normality distributed as exhibited by skewness.

From kurtosis, it is apparent that it is above 3 for 10 monthly time series stock data and within 3 for the remaining 20 stocks. This also indicated that majority of the selected stock have behaved normally during the study period.

The above picture is also statistically significantly supported by Shapiro-Wilk W Test. The W value is significant for 12 stocks (BHEL, HDFC Bank, HDFC Corporation, HINDAL, ITC, MAHMAH, NTPC, ONGC, SESASTR, SUNPHAR, TATPOW and WIPRO), revealing non-normality. The remaining 18 stocks are found to be normally distributed during the study period.

The BSE 30 market index is found to be satisfied the normality test. In sum, it is found that most of the selected time series stock price data have behaved normally during the study period. **TESTING FOR CAPM**:The results of the analysis are portrayed in Table-2. The statistical significance of estimated parameters is tested using t-values, which are provided below the coefficient in brackets. It can be seen from the table that the estimated CAPM model for both sub-periods and also for overall period is statistically significant with degrees of freedom adjusted explained variance of 90.58 per cent, 83.80 per cent and 88.69 per cent for first sub-period, second sub-period and whole period respectively.

This shows that in both sub-periods as well as in whole study period the selected stocks have performed better relative to market risk. In unit terms, it can be said that average returns from 30 selected stocks have increased by 0.8580 units during first sub-period, 0.8649 units during second sub-period and 0.8658 units during whole study period against every one unit increase in market risk. The resulting equation for monthly returns of Indian stock market for whole study period from January 2010 to June 2014 is:

$$E[R_i] = -0.0014 + 0.8658_{\ i}$$

$$\overline{R}_i = a_0 + a_1 \hat{\ }_1 + I_1$$

Table-2: Cross Sectional Regression of Returns

Period	a_0	a_1	R^2	Adj R^2
Jan-2010 to Jun 2012	-0.0037 -(1.22)	0.8580** (16.44)	0.9091	0.9058
Jul 2012 to Jun 2014	0.0014 (0.41)	0.8649** (10.96)	0.8451	0.8380
Jan-2010 to Jun 2014	-0.0014 -(0.63)	0.8658** (20.22)	0.8891	0.8869

**Significant at 1% level*
Figures in parenthesis represents't' values

Test for the APT
The APT model is tested using factors extracted from principal component factor analysis of 30 stocks selected for the study as independent variables and monthly returns as dependent variable. The results of factor analysis such as factor component and factor loadings eliciting the number of possible valid factors underlying the actual data are reported in Table 3 and Table 4.

The table 3 shows the eigenvalue of factors underlying the selected stocks. The eigenvalue is the variance explained by each factor in the actual data. A factor is considered to be valid if the eigenvalue is one and above. In the table, it can be seen that the eigenvalue for first eight factors is more than one and all these eight factors

together possess 70.79 per cent of the characteristics of the original data. Therefore, the factors one to eight are the valid factors underlying the 30 stocks. The Scree plot clearly shows the above picture graphically.

Table-3: Eigenvalue of Factor Components

Factor	Initial Eigenvalues			After Varimax Rotation		
	Eigenval	% total Variance	Cumul. %	Eigenval	% total Variance	Cumul. %
1	8.8432	29.48	29.48	7.2483	24.16	24.16
2	2.6661	8.89	38.36	2.5587	8.53	32.69
3	2.1199	7.07	45.43	2.3649	7.88	40.57
4	1.9398	6.47	51.90	1.7619	5.87	46.45
5	1.7545	5.85	57.74	1.6368	5.46	51.90
6	1.4409	4.80	62.55	1.8037	6.01	57.91
7	1.3563	4.52	67.07	2.0944	6.98	64.90
8	1.1172	3.72	70.79	1.7692	5.90	70.79
9	0.9504	3.17	73.96			
10	0.8936	2.98	76.94			
11	0.7777	2.59	79.53			
….	….	….	….			
29	0.0495	0.16	99.84			
30	0.0477	0.16	100.00			

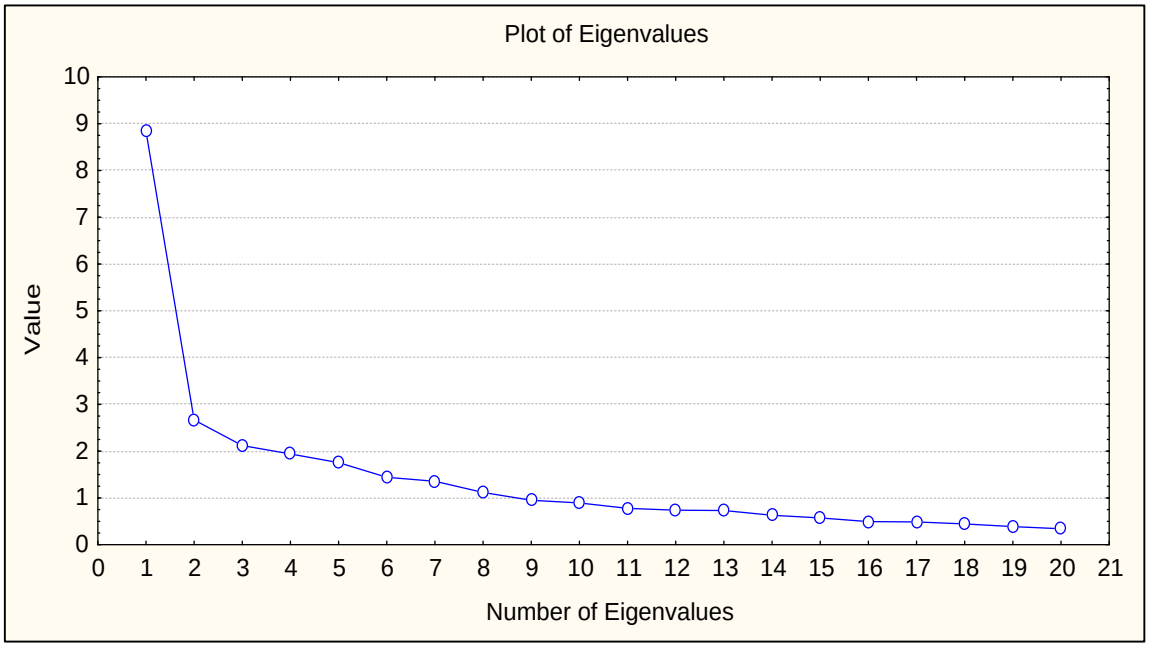

Table-4: Factor Loadings of Stocks

Stocks	Factor							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
ICICI	**0.866**	-0.024	0.097	0.138	-0.028	0.196	0.202	0.043
TATSTL	**0.858**	0.149	0.011	-0.074	0.049	-0.006	-0.064	0.009
HINDAL	**0.828**	0.019	-0.048	-0.070	0.207	0.030	-0.160	0.103
SBI	**0.819**	-0.149	-0.018	-0.045	-0.018	0.244	0.223	-0.025
LT	**0.772**	-0.253	0.164	0.082	-0.138	0.053	0.282	0.093
MARUTI	**0.724**	-0.274	0.089	0.243	0.039	0.084	0.267	0.178
RELIND	**0.683**	0.159	0.314	0.119	0.102	-0.054	0.034	0.185
TATMOT	**0.649**	0.265	-0.104	0.322	0.031	0.129	0.123	-0.019
AXIS	**0.616**	0.037	0.206	0.231	-0.347	0.302	0.258	-0.128
NTPC	**0.582**	0.025	0.154	-0.303	0.032	0.059	0.437	0.276
TATPOW	**0.566**	0.036	0.269	-0.072	0.062	0.165	-0.015	-0.136
COALIN	**0.522**	-0.278	0.384	-0.364	0.060	0.345	0.060	-0.115
HDFCBNK	**0.509**	0.197	0.128	-0.207	-0.071	-0.051	-0.006	0.406
INFOSYS	0.001	**0.858**	0.057	0.132	0.033	0.013	0.209	0.001
TCS	-0.092	**0.846**	0.029	-0.010	0.001	-0.065	-0.070	-0.059
WIPRO	0.030	**0.776**	0.014	-0.048	-0.004	0.164	-0.203	-0.038
ITC	0.041	0.009	**0.936**	0.059	0.076	0.090	0.071	0.083
HDFCCOR	0.122	0.063	**0.908**	0.039	-0.050	-0.024	0.023	0.073
DRREDDY	0.050	0.055	0.116	**0.884**	-0.013	-0.002	0.013	0.019
HEROMOT	0.365	-0.036	0.115	0.109	**0.645**	-0.084	0.064	0.285
BHEL	0.078	-0.023	-0.046	0.129	**-0.543**	0.058	0.230	-0.212
SUNPHAR	0.299	-0.185	0.141	0.167	**-0.539**	-0.262	0.033	0.201
BAJAUT	0.374	-0.001	0.207	0.294	**0.456**	0.197	0.289	0.138
BHATE	0.300	0.079	0.104	-0.003	0.189	**0.803**	0.030	-0.003
SESASTER	-0.146	-0.005	0.000	-0.052	0.274	**-0.711**	0.037	-0.209
MAHMAH	0.145	0.002	0.118	-0.027	-0.031	0.028	**0.810**	-0.017
ONGC	0.394	-0.009	-0.020	0.134	0.015	-0.116	**0.638**	0.072
GAIL	0.327	-0.011	-0.029	0.432	0.069	0.295	**0.444**	0.277
HUL	0.031	-0.161	0.083	-0.004	0.210	0.064	0.119	**0.846**
CIPLA	0.183	0.175	0.279	0.251	-0.211	0.130	-0.178	**0.589**

Table-5: APT Model
Cross Sectional Regression of Returns

$$\overline{R}_i = a_0 + a_1\hat{b}_1 + a_2\hat{b}_2 + a_3\hat{b}_3 + a_4\hat{b}_4 + a_5\hat{b}_5 + a_6\hat{b}_6 + a_7\hat{b}_7 + a_8\hat{b}_8 + \varepsilon_i$$

Period	a_0	a_1	a_2	a_3	a_4	a_5	a_6	a_7	a_8	R^2	Adj R^2	F Value
Jan-2010 to Jun 2012	**0.0060** (4.05)**	**0.0440** (25.21)**	**0.0033 (1.60)**	**0.0151** (12.55)**	**0.0022 (1.36)**	**0.0017 (0.94)**	**0.0047* (2.39)**	**0.0138** (9.70)**	**0.0083** (5.17)**	**0.9846**	**0.9784**	**159.50****
Jul 2012 to Jun 2014	**0.0076** (4.00)**	**0.0397** (14.39)**	**0.0056* (2.48)**	**0.0172** (4.30)**	**0.0103** (5.04)**	**-0.0020 -(0.96)**	**0.0032* (1.96)**	**0.0146** (5.08)**	**0.0049* (2.05)**	**0.9685**	**0.9516**	**57.56****
Jan-2010 to Jun 2014	**0.0070** (5.78)**	**0.0406** (33.11)**	**0.0062** (5.03)**	**0.0152** (12.43)**	**0.0068** (5.58)**	**-0.0022 -(1.83)**	**0.0038** (3.12)**	**0.0144** (11.71)**	**0.0063** (5.11)**	**0.9712**	**0.9660**	**185.45****

**Significant at 5% level; **Significant at 1% level*
Figures in parenthesis are 't' values.

In order to know which one of eight factors is contributed by which stock, factor loadings obtained from the analysis are depicted in Table 4. Any stock with factor loadings of 0.50 and above with any one factor is considered to be belonging to that factor. Based on the above criterion, it can be observed that the first factor is highly loaded by ICICI, TATSTL, HINDAL, SBI followed by LT, MARUTI, RELIND, TATMOT, AXIS, NTPC, TATPOW, COALIN and HDFCBNK. The loading of INFOSYS and TCS is high followed by WIPRO with second factor. While third factor is highly characterized by ITC and HDFCCOR, the fourth is singularly loaded by DRREDDY. The fifth factor is found to be representing the stocks of HEROMOT, BHEL, SUNPHAR and BAJAUT, sixth factor representing BHATE and SESASTR, seventh factor with MAHMAH, ONGC and GAIL while loading of HUL is high and that of CIPLA is substantial with eighth factor. The specification of APT model is shown below. The results of the model are provided in Table 5.

The table-5, the APT model is fitted significantly for first sub-period, second sub-period and also for whole period with high explanatory power than CAPM model. The factors in the independent set together could determine 97.84 per cent of the variance in the stock price return after adjusting for degrees of freedom. Similarly, degrees of freedom adjusted explained variance is 95.16 per cent and 96.60 per cent for second sub-period and whole study period respectively. From explained variance, it becomes apparent that APT has outperformed CAPM in every sub period as well as in whole study period. The resulting APT equation for the Indian stock market for entire period under study is:

$$E[R_i] = 0.0070 + 0.0406b_{i1} + 0.0062b_{i2} + 0.0152b_{i3} + 0.0068b_{i4} - 0.0022b_{i5} + 0.0038b_{i6} + 0.0144b_{i7} + 0.0063b_{i8} + \varepsilon_i$$

Comparison between CAPM and APT: Residual Analysis
The results of the above models are provided in Table 6 and 7.From the observation of the table 7, it is evident that the regression model for residuals of the CAPM on the Factor loadings is not fitted significantly for two sub-periods but fitted significantly at one per cent level of entire study period of 54 months from January 2010 to June

2014. The model for whole period shows that APT could explain 24.84 per cent of the variance unexplained by CAPM. However, from the observation of regression results shown in table 6, it is understood that CAPM fails to explain the variance of APT residual in all three periods. This is because overall fit the regression model for two sub-periods and also for whole period is found with negative adjusted R^2 values in turn indicating unfit of the models.

Table-6: CAPM ModelRegression of Residuals of the APT Residuals on Beta

$$\pounds_i = a_0 + a_1 \hat{} _1 + \text{¦}_1$$

Period	a_0	a_1	R^2	Adj R^2
Jan-2010 to Jun 2012	0.0003	-0.0005	0.0232	-0.0129
	(0.24)	-(0.80)		
Jul 2012 to Jun 2014	-0.0003	0.0005	0.0115	-0.0335
	-(0.20)	(0.51)		
Jan-2010 to Jun 2014	-0.0001	0.0001	0.0011	-0.0185
	-(0.08)	(0.24)		

**Significant at 1% level: Figures in parenthesis represents't' values*.

Table-7: Regression of Residuals of the CAPM on the Factor Loadings

$$\text{¦}_i = a_0 + a_1\hat{b}_1 + a_2\hat{b}_2 + a_3\hat{b}_3 + a_4\hat{b}_4 + a_5\hat{b}_5 + a_6\hat{b}_6 + a_7\hat{b}_7 + a_8\hat{b}_8 + \pounds_i$$

Period	a_0	a_1	a_2	a_3	a_4	a_5	a_6	a_7	a_8	R^2	Adj R^2	F Value
Jan-2010 to Jun 2012	**0.0009 (0.36)**	**0.0050 (1.64)**	**-0.0023 -(0.62)**	**0.0055** (2.61)**	**-0.0056 -(1.94)**	**0.0010 (0.31)**	**-0.0069* -(2.00)**	**0.0010 (0.40)**	**-0.0031 -(1.08)**	**0.4761**	**0.2665**	**2.27^{ns}**
Jul 2012 to Jun 2014	**-0.0011 -(0.37)**	**0.0058 (1.34)**	**-0.0028 -(0.78)**	**-0.0037 -(0.58)**	**0.0015 (0.48)**	**-0.0062 -(1.93)**	**-0.0039 -(1.48)**	**0.0007 (0.16)**	**-0.0016 -(0.42)**	**0.4963**	**0.2277**	**1.85^{ns}**
Jan-2010 to Jun 2014	**0.0000 (0.00)**	**0.0039* (2.02)**	**-0.0028 -(1.46)**	**0.0047* (2.47)**	**-0.0011 -(0.59)**	**-0.0035 -(1.85)**	**-0.0050** -(2.59)**	**0.0015 (0.76)**	**-0.0026 -(1.36)**	**0.3640**	**0.2484**	**3.15****

**Significant at 5% level; **Significant at 1% level*

Figures in parenthesis are 't' values.

Factor Structure of Indian Economy

In order to ascertain the structure of Indian economy, seven macro-economic variables, viz., IPI, GIP, TRDDEF, FIIS, MONSUP, WSPI and CPIFORIW are subjected principle component method of factor analysis. The results of the analysis are shown in Table 8 and 9.

From the perusal of the table 8, it is understood that the eigenvalue for first two factors are more than one with explained variance of 75.99 per cent in original data together by these two factors. This picture shows that macro-economic status of Indian economy comprises of two major components. This is also graphically shown in Scree plot. To know which component represents which macro-economic conditions, the factor loadings of each variables with valid two factors obtained from the analysis are depicted in Table 9.

An examination of the table shows that the all macro- economic variables except TRDDEF are loaded with first factors. Among the loaded factors, the loading of MONSUP and CPIFORIW is very high followed by high loading of WSPI and IPI and substantial loading of GIP.

Table-8: Total Variance Explained by Factor Components of Macro Economic Variables

Factor	Initial Eigenvalues			After Varimax Rotation		
	Eigenval	% total Variance	Cumul. %	Eigenval	% total Variance	Cumul. %
1	4.0810	58.30	58.30	4.0810	58.30	58.30
2	1.2383	17.69	75.99	1.2383	17.69	75.99
3	0.9945	14.21	90.20			
…….	……	…….	…..			
7	0.0334	0.48	100.00			

Table-9: Factor Loadings of Macro Economic Variables

VARIABLES	FACTOR 1	FACTOR 2
IPI	**0.8526**	0.3751
GIP	**-0.7872**	0.3567
TRDDEF	-0.0066	**0.9710**
FIIS	-0.2105	-0.1522
MONSUP	**0.9765**	-0.0053
WSPI	**-0.8855**	0.0640
CPIFORIW	**0.9759**	-0.0105

The second factor wholly represents TRDDEF as only this variable is very highly loaded with second factor. The scores of these factors obtained from the analysis are used in the subsequent regression model.

Economic Determinants of Stock Returns

The objective is here to find the relationship between the artificial factors and macroeconomic variables. The economic variables are chosen using the categorization of the Indian economy provided by the factor analysis. Care has to be taken to choose the variables related to different artificial factors in order to form a base of macroeconomic variables that allows minimum overlapping and maximum amount of independent information in each single variable.

Following this procedures, the null hypothesis is accepted for following APT model with two factors underlying macroeconomic variables as independent.

$$FS_{jt} = a_0 + a_1 b_{i1} + a_2 b_{i2} + £_i$$

Table-10: Regression Results Showing Significance of Economic Variables

Factor	a_0	a_1	a_2	R^2	Adj R^2	F Value
FS1	-0.0024	0.1598	0.1029	0.0365	-0.0020	0.95^{ns}
	-(0.02)	(1.14)	(0.74)			
FS2	-0.0005	0.0861	0.1043	0.0186	-0.0206	0.47^{ns}
	(0.00)	(0.61)	(0.75)			
FS3	-0.0031	0.0498	-0.1146	0.0154	-0.0240	0.39^{ns}
	-(0.02)	(0.35)	-(0.82)			
FS4	0.0038	-0.0985	0.0788	0.0154	-0.0239	0.39^{ns}
	(0.03)	-(0.70)	(0.56)			
FS5	0.0043	-0.1001	0.1046	0.0204	-0.0188	-0.52^{ns}
	(0.03)	-(0.71)	(0.75)			
FS6	0.0055	-0.1421	0.1152	0.0324	-0.0063	0.84^{ns}
	(0.04)	-(1.01)	(0.83)			
FS7	-0.0008	0.1089	0.1211	0.0270	-0.0119	0.69^{ns}
	-(0.01)	(0.77)	(0.87)			
FS8	-0.0011	-0.0079	-0.0803	0.0066	-0.0332	0.17^{ns}
	-(0.01)	-(0.06)	-(0.57)			

**Significant at 5% level; Figures in parenthesis are't' values.*

The results of the regression are exhibited in Table 10. It is surprising to see the results reported in the table that none of the models is explained significantly by macro-economic factors. This indicates that the shares are not priced for status of Indian economic during the period under study.

Conclusion

From the inferences of the results regression analysis based on APT model, it is found that the independent factors was capable of explaining 97.84 per cent of the variance in the stock price return after adjusting for degrees of freedom during first sub-period. Similarly, degrees of freedom adjusted explained variance is 95.16 per cent and 96.60 per cent for second sub-period and whole study period respectively. With this table, it is found that the APT has outperformed the CAPM in Indian stock market. The better performance of APT compared to the CAPM in Indian stock market is due to consideration of risk borne on additional systematic variables other than risk associated with market portfolio.

From the comparison of CAPM and APT models using residual analysis method, which is main objective of the present study, to assess which one of the two competing models is best described by the data, it is found that residuals of the CAPM on the Factor loadings is fitted significantly at one per cent level of entire study period of 54 months from January 2010 to June 2014. Further, the APT is likely to explain 24.84 per cent of the variance in share price return unexplained by CAPM. On the other hand, it is found that CAPM fail to explain the variance in

share price return unexplained by APT. Hence APT is found to more powerful than CAPM in explaining share prices return in Indian stock market.

From the regression of artificial factors with macro- economic variables that are chosen using the categorization of the Indian economy provided by the factor analysis, it is found that macro- economic factors do not have the power of explaining the share price returns in Indian stock market. At the same time, it is found from the factor analysis of macro-economic variables that except Trade deficit all the remaining macro- economic variables tend to behave similarly in Indian economy.

Overall, it is concluded that the behaviour of share portfolio returns in the Indian stock market is complex and cannot be fully explained by market risk alone. The portfolio returns are significantly influenced by number of other systematic forces. But the macro factors in Indian economy have no power of determining behaviour of share price return series in Indian stock market. The findings of the present study are useful for the future researches in this area as well as for stock market investors.

The present study had delt with CAPM and APT with 30 shares. But a better generalization can be obtain if the number of shares is increased to make it a large sample , also more number of economic variables can be tried to have a better result. Cluster analysis can also be adapted to clusterise different type of companies and their specific reach into the macroeconomic factor.

Bibliography

1. Amanulla , S. And B. Kamiah, Asset Price Behaviour In Indian Stock Market: How In Adequate Is Arbitrage Pricing Theory?', International Journal Of Development Banking, July 1997,PP.39-61.
2. Ariff, M., Johnson, L.W., "Security Market And Stock Pricing', Longman,1990.
3. Arnold C.S Cheng, L.W., "The UK Stock Markets And Economic Factors: A New Approach, "Journal Of Business Finance &Accounting, Jan. 1995, PP.129-192
4. Black, F., "Beta And Return", Journal Of Portfolio Management, Fall 1993.
5. Chen, N.F., "Some Empirical Tests Of Arbitrage Pricing", Journal Of Finance Vol. 38, 1983.
6. Chen, N.F., Roll, R., Ross, S.A., Economic Forces and the Stock Market", Journal of Business, Vol.59, 1986.
7. Chen N (1983),"Some Empirical Test of the Theory of Arbitrage Pricing", Journal of Finance, PP. 1393-1414.
8. Chen N., Roll R and Ross S, 'Economic Forces and Stock Market', Journal of Business, July 1986, Pp. 383-403.
9. Cheng, A.C.S.,"The UK Stock Market And Economic Factors: A New Approach", Journal Of Business Finance And Accounting, Vol.22,1995.
10. Clare, A.D., Thomas, S.H. ,"Macroeconomic Factors: Then APT And The UK Stock Market", Journal Of Business Finance And Accounting, Vol21,1994.
11. Davidson,R .Mackinnon,J., "Several Tests For Model Specification In The Presence Of Alternative Hypotheses", Economic, Vol. 49, 1981.
12. Dhrymes, P.J., Friend Evidence On The Arbitrage Pricing Theory", Journal Of Business, Vol.36, 1984.
13. Fama,E.F. "Mandelbrod And The Stable ParteianHypothrses', Journal Of Business, Vol.38, 1963.
14. Fama,E.F., "The Behaviour Of Stock Market Prices", Journal Of Business, Vol.38,1965.
15. Fama E.F., "Multifactor Portfolio Efficiency and Multifactor Asset Pricing", Journal Of Financial Quantitative Analysis, Vol. 31, 1996.
16. Fama E.F., French K.R., "The Cross-Section of Expected Stock Returns", Journal Of Finance, Vol. 47, No.2, 1992.
17. Fama E.F., French, K.R., "The CAPM Is Wanted, Dear Or Alive", Journal Of Finance,Vol.51,1996.
18. Fama. E.F., Macbeth, J.D., "Risk, Return, And Equilibrium: Empirical Tests', The Journal Of Political Economic,Vol.81,1973.

19. FamaEugene F, 'Stock Returns, Expected Returns And Real Activity', Journal Of Finance, No.45,1990,PP.1089-1108.
20. Gupta O.P And Sanjay Segal, Án Empirical Testing of Capital Asset Pricing Model In India, Finance India. Voll VII No.4.Doc.1993.PP-863-874
21. Groenewold And Faster 'Share Price And Economic Factors' , Journal Of Business Finance & Accounting. PP.1367-1383.
22. Groenewold .N., Faster,P., "Share Price And Macro Economic Factors", Journal Of Business Finance And Accounting , Dec.1997.
23. Grundy, K., Malkiel , B.G., "Reports Of Beta's Death Have Been Greatly Exaggerated', Journal Of Portfolio Management, Vol.22,1996.
24. Gultekin,M.N., And Gultekin,N.B., "Stock Returns Anomalies And The Test Of The Apt', Journal Of Finance,Vol.42,1987.
25. Kothari, S.P., Shanken, J., Sloan,R.G., Another Look At The Cross-Section Of Expected Stock Return", Journal Of Finance, Vol.50,1995.
26. Llehmann,B., Modest,D., "The Empirical Foundations Of The Arbitrage Pricing Theory",Journal Of Financial Economics, Vol.21,1988.
27. Mandelbrot,B., "The Variation Of Certain Speculative Prices", Journal Of Business, Vol.36,1963.
28. Murthy, Y.Scree Rama, 'Share Prices And Economic Activity In India. Á Multiple Regression Approach', Decision, January-June1994,PP .86-87.
29. Murthy, Y.Scree Rama, 'Share Prices And Economic Activity In India. Á Multiple Regression Approach', Decision, January-June1994,PP .86-87.
30. Markowitz, H.M., "Portfolio Selection', Journal Of Finance, Volume7,1952.
31. NarayanaRaoAndBhole, Inflation In Equity Returns', Economic And Political Weekly, May 26, 1990, PP.m91-m96.
32. Osborne, M.F.M., "Brownian Motion In The Stock Market', Operation Research, Vol.7,1959.
33. Paul,M Thomas And Business Kamaiah, 'Stock And Demand For Money: The Indian Case', Darain Vol21,No.3, 1992,PP.309-323.