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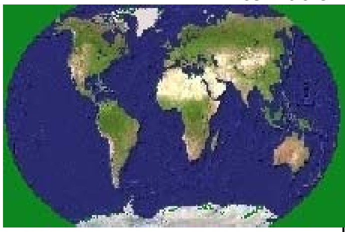

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Testing the validity of CAPM in Indian stock markets

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Abstract
The Capital Asset Pricing Model, or CAPM, describes the relationship between risk and expected return and is used in the pricing of risky securities. The paper tests the CAPM for the Indian stock market using Black Jensen Scholes methodology. The sample involves 87 stocks included in the Nifty and Nifty Junior indices from 1st Jan 2005 to Aug 2014. The test was based on the time series regressions of excess portfolio return on excess market return. The results shows CAPM partially holds in Indian markets.

Keywords: CAPM, Black Jensen Scholes, excess market return

1. Introduction
Asset pricing theory is a framework designed to identify and measure risk as well as assign rewards for risk bearing. This theory helps us understand why the expected return on a short-term government bond is a lot less than the expected return on a stock. Similarly, it helps us understand why two different stocks have different expected returns. The theory also helps us understand why expected returns change through time. The asset pricing framework usually begins with a number of premises such as: investors like higher rather than lower expected returns, investors dislike risk and investors hold well-diversified portfolios. These insights help us assess the “fair” rate of return for a particular asset. While there have been many advances in asset pricing over the past 40 years, to understand the issues that we face with asset pricing in emerging markets, it is useful to follow the framework of the first asset pricing theory, the Capital Asset Pricing Model (CAPM) of Sharpe and Lintner. Since William Sharpe (1964) and John Lintner (1965) found a linear relationship between expected returns of assets and their market betas and developed the famous Capital Asset Pricing Model (CAPM).

2. Review of literature
Sharpe (1964): shed light on the relationship between the price of an asset and various components of its overall risk with special reference to systematic risk. He showed that relationship between expected returns and risk for efficient combination of risky assets would have been linear.

Lintner (1965): explained how Capital Asset Pricing Model substantiated the idea that, in competitive equilibrium, assets earn premium over the risk-free rate that increase with their risk, by showing that the determining influence on risk premium was the covariance between the asset and the market portfolio, rather than the own risk of the asset.

Eugene F. Fama; James D. MacBeth (1973): ests the relationship between average return and risk for New York Stock Exchange common stocks. The theoretical basis of the tests is the "two-parameter" portfolio model and models of market equilibrium derived from the two-parameter portfolio model. The observed "fair game" properties of the coefficients and residuals of the risk-return regressions are consistent with an "efficient capital market1'-that is, a market where prices of securities fully reflect available information.

Fama and MacBeth (1973): found that size was negatively related to the average stock return in the sample period. In the second hand, he used Fama French three Factor Model and found that size and market risk premiums captured most of the cross-sectional variation in stock returns.

Richardson pettit, Randolf Westerfield (1974): examined the validity of two widely used methods for forming conditional predicted portfolio returns. Their principal findings are the predictions from ex-post CAPM and MM include a bias towards zero in providing estimates of actual asset returns for portfolios of common stocks over successive periods of one month. The relationship between predicted portfolios returns fluctuates from sample to sample period.

Jagadeesh, Narasimhan (1992): investigated whether the size effect could be explained by the betas, the traditional Capital Asset Pricing Model, which was estimated using test portfolios. The test portfolios were constructed so that the cross-sectional correlation between beta and size coefficients was small. It was found that for these portfolios, the betas didn't explain the cross-sectional differences in average returns.

Ray (1994): conducted a test of CAPM using 170 actively traded scripts on the Bombay Stock exchange. Monthly data over the period 1980-91 was used. He used three market indices, the RBI index, ET index and the BSE Sensitive index. He found that the Capital Asset Pricing Model did not seem to hold for the Indian Capital Market.

Najet Rhaiem, Salouna Ben, Anouar Ben Mabrouk. (2007): focused on the estimation of CAPM at different time scales for French stock market. The empirical results shows that the relationship between the return of the stock and its beta becomes stronger as the scale increase, but the test of the linearity between the two variables shows that there is an important ambiguity.

Yash Pal Taneja (2010): examined the Capital Asset Pricing Model and Fama French Model and thestudy showed that efficiency of Fama French Model, for being a good predictor, cannot be ignored in India but either of the two factors (size and value) might improve the model. It is so because a high degree of correlation is found between the size and value factor returns.

Gursoy and Rajepova (2007): studied the validity of CAPM using regression onthe weekly risk premium against the beta co-efficient of 20 portfolios each including 10 stocks during 1995-2004 of Turkey stock market. In the study it is found that a portfolio of high beta stocks perform better in up market condition, where as a low beta portfolio is a better investment in down market. It also revealed that beta co-efficient is indeed an important determinant of portfolio return in Turkey.

3. Data and Methodology

The required data for the present study is secondary in nature and the study was conducted using the data from Jan 2005 to Aug 2014. The selection of the stocks was made on the basis of the membership in Nifty and Nifty Junior indices as on 1st Jan 2005. From these 100 stocks, we excluded stocks where data is not available continuously and those that are merged and/or acquired afterwhich only 87 stocks remained. The study used monthly stock returns for the sampled companies and the prices from NSE were obtained from CMIE Prowess database. The risk-free rate was proxied by the implied yield on the month-end auction of 91-day Treasury Bills. The risk free rate was obtained from the RBI bulletin, a publication of RBI.

4. Empirical Methodology

In this study Black Jensen Scholes (BJS henceforth) method was deployed for testing CAPM in Indian markets. BJS introduced a time series test of the CAPM. The test was based on the time series regressions of excess portfolio return on excess market return, which can be express by the equation below:

$$R_{i,t} - R_{f,t} = \alpha + \beta_{i,t}(R_{m,t} - R_{f,t}) + \varepsilon_{i,t} \quad \text{------------ (1)}$$

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.
*βi*is the beta of stock *i.* [can be also express by Cov(*Ri* , *Rm*)/Var(*Rm*)]
*eit*is the is random disturbance term in the regression equation at time t.
The above equation can be also expressed by:

$$r_{i,t} = \alpha_i + \beta_{i,t} \cdot r_{m,t} + \varepsilon_{i,t} \quad \text{---------------------- (2)}$$

Where:
Rit - Rft = rit and *Rmt –Rft = rmt*
*rit*is the excess return of stock *i*;
*rmt*is the average risk premium.

The intercept α_i is the difference between the estimated expected return by time series average and the expected return predicted by CAPM. If CAPM describes expected returns and a correct market portfolio proxy is selected, the regression intercepts of all portfolios (or assets) are zero.
In order to compose portfolios we should use the true beta of stocks. But, all the stocks' betas are estimated betas. Ranking into portfolios by estimated betas would introduce a selection bias. Stocks with high- estimated beta would be more likely to have a positive measurement error in estimating beta. This would introduce a positive bias into beta for high-beta portfolios and would introduce a negative bias into the estimate of the intercept. Black, Jensen and Scholes used a grouping combination method to solve the measurement bias. They estimated betas for the last year and used these in the grouping of the next year portfolios, in order to mitigate statistical errors from the beta estimation. In the present study we followed Black, Jensen and Scholes and accordingly we used the stock beta obtained from CMIE Prowess for the sample stocks as at the end of December every year. Based on the estimated betas we divided the 87 stocks into 10 portfolios; with the first seven portfolios (Portfolio 1 to portfolio 7) each comprising 9 stocks and the remaining three portfolios (Portfolio 8 to portfolio 10) each

with eight stocks. The first portfolio—portfolio 1 has the 9 lowest betas and the last portfolio—portfolio 10 has the 8 highest beta stocks. Combining securities into portfolios will diversify away most of the firm-specific part of returns thereby enhancing the precision of the estimates of beta and the expected rate of return on the portfolios. The portfolios are rebalanced at the end of every year and new portfolios are formed using the betas observed at the end of December of the preceeding year.

The second step is to regress the portfolios' excess returns on the market's excess returns and the regression equation is given below:

$r_{pt} = \alpha_p + \beta_p r_{mt} + e_{pt}$-------------------------(3)

Where:

$r_{pt}$is the average excess portfolio return at time t,

$r_{mt}$is the average excess return on market portfolio at time t,

$e_{pt}$is random disturbance term in the regression equation at time t.

CNX 500 index is considered as the proxy for market portfolio. If the CAPM holds then we will observe that, α_p should be equal to zero and the slope coefficient of SML, βp, will be statistically significant.

To test for nonlinearity between total portfolio returns and betas we used the following equation:

$r_p = \gamma_0 + \gamma_1 \beta_p + \gamma_2 \beta^2_p + e_p$...........................(4)

If the CAPM hypothesis is true; i.e., portfolios' returns and its betas are linearly related with each other, γ_2 should be equal to zero. In order to statistically test the CAPM, *t*-tests will be used. We choose the level of significance of 95%, which means, that a significant result at the 95% probability level tells us that our data are good enough to support a conclusion with 95% confidence. Hence, there is also a 5% chance of being wrong. The 95% critical value from the t-distribution is 1.96. Thus we will use 1.96 in a later analysis in order to verify the precision of the estimation results.

Table 1: Showing Alpha, Std Error And T-Value For 1 -10 Stocks

	ALPHA	STANDARD ERROR	T
1	0.007484	0.008925	0.838499
2	0.005849	0.007388	0.791748
3	0.004377	0.00712	0.614773
4	-0.00786	0.010028	-0.78349
5	0.003216	0.009997	0.321666
6	0.019314	0.006426	3.005558
7	0.017501	0.011202	1.562326
8	0.012531	0.007688	1.630098
9	0.003721	0.008073	0.460905
10	0.003478	0.010005	0.34762

Table 2: Showing Alpha, Std Error And T-Value For 10 -20 Stocks

	ALPHA	STANDARD ERROR	T
11	0.001458	0.008556	0.170409
12	0.00318	0.008026	0.396257
13	0.001483	0.007407	0.200255
14	0.003866	0.009525	0.405847
15	0.003647	0.006901	0.528439
16	-0.00056	0.008573	-0.06544
17	0.010842	0.011929	0.908852
18	0.009901	0.00753	1.314976
19	-0.0022	0.008829	-0.24875
20	-0.01528	0.008553	-1.7862

Table 3: Showing Alpha, Std Error And T-Value For 21 -30 Stocks

	ALPHA	STANDARD ERROR	T
21	0.006424	0.006837	0.939591
22	0.01383	0.006665	2.075097
23	0.005567	0.006387	0.871712
24	-0.00837	0.007949	-1.05329
25	0.010086	0.007096	1.421374
26	0.017398	0.006408	2.714997
27	0.010229	0.00714	1.43254
28	0.000671	0.005892	0.113923
29	0.005373	0.007115	0.755226
30	0.000916	0.007719	0.118685

Table 4: Showing Alpha, Std Error And T-Value For 31 -40 Stocks

	ALPHA	STANDARD ERROR	T
31	0.000143	0.008909	0.01609
32	0.013364	0.0085	1.572152
33	0.008683	0.004733	1.834651
34	0.006477	0.006636	0.975988
35	-0.00474	0.008149	-0.58185
36	-0.00405	0.009781	-0.41382
37	0.009101	0.007027	1.295285
38	0.007898	0.005393	1.464626
39	0.002823	0.006553	0.430883
40	-0.01012	0.008849	-1.14397

Table 5: Showing Alpha, Std Error And T-Value For 41 -50 Stocks

	ALPHA	STANDARD ERROR	T
41	0.006167	0.014842	0.415511
42	0.011926	0.006129	1.945871
43	-0.00858	0.009144	-0.93816
44	0.005395	0.007559	0.713815
45	0.000742	0.010116	0.07333
46	0.015993	0.007145	2.238421
47	0.010094	0.009434	1.069972
48	0.009937	0.006729	1.476754
49	0.019408	0.007113	2.7285
50	-0.01869	0.011615	-1.60951

Table 6: Showing Alpha, Std Error And T-Value For 51 - 60 Stocks

	ALPHA	STANDARD ERROR	T
51	0.011743	0.006604	1.77814
52	0.008111	0.007794	1.040745
53	-0.02829	0.011832	-2.39121
54	0.004044	0.009159	0.441551
55	-0.00487	0.009278	-0.52508
56	0.001222	0.006025	0.202851
57	0.010615	0.010341	1.026481
58	-0.00773	0.010199	-0.75824
59	0.000976	0.008756	0.111425
60	0.001488	0.00796	0.186899

Table 7: Showing Alpha, Std Error And T-Value For 61 -70 Stocks

	ALPHA	STANDARD ERROR	T
61	-0.00206	0.01123	-0.18366
62	-0.00047	0.007665	-0.06101
63	-0.00279	0.011804	-0.23623
64	-0.00416	0.010094	-0.41201
65	0.002651	0.005963	0.44463
66	0.000749	0.006256	0.119768
67	-0.01311	0.008488	-1.54463
68	0.008172	0.008454	0.966659
69	0.003253	0.00706	0.460722
70	-0.0053	0.008446	-0.62724

Table 8: Showing Alpha, Std Error And T-Value For 71 -80 Stocks

	ALPHA	STANDARD ERROR	T
71	0.017655	0.006295	2.804813
72	-0.0002	0.009628	-0.02043
73	0.00885	0.011649	0.759717
74	-0.00189	0.006061	-0.31183
75	0.000902	0.011788	0.0765
76	0.011118	0.007135	1.558314
77	0.00358	0.007376	0.485368
78	0.007276	0.008588	0.847209
79	-0.00121	0.006436	-0.1874
80	-0.00346	0.008686	-0.39868

Table 9: Showing Alpha, Std Error And T-Value For 81 -87 Stocks

	ALPHA	STANDARD ERROR	T
81	-0.01305	0.010249	-1.27286
82	-0.00034	0.009554	-0.03563
83	-0.01197	0.008681	-1.37915
84	0.001198	0.007608	0.157478
85	0.006739	0.014226	0.473711
86	0.003672	0.008358	0.439332
87	0.00712	0.0109	0.653194

Table 10: Showing Capm for Portfolios – Alpha

	Alpha	SE	T
PF1	0.000535	0.003001	0.178233
PF2	-0.00238	0.003101	-0.76786
PF3	-0.00453	0.003436	-1.31735
PF4	-0.00273	0.003366	-0.81175
PF5	0.003066	0.003013	1.017592
PF6	-0.00424	0.003752	-1.13035
PF7	-0.00458	0.003401	-1.34697
PF8	-0.00619	0.003889	-1.5907
PF9	-0.00463	0.003399	-1.36308
PF10	-0.00893	0.004112	**-2.1721**

Table 11: Capm for Portfolios – Beta

PORTFOLIOS	Beta	SE	T
PF1	0.805452	0.038481	**20.93143**
PF2	0.902913	0.039765	**22.70604**
PF3	0.881604	0.044059	**20.00971**
PF4	0.933297	0.043167	**21.62047**
PF5	0.95877	0.038638	**24.81415**
PF6	0.966548	0.048111	**20.09017**
PF7	1.130616	0.043612	**25.92424**
PF8	1.249489	0.049867	**25.0564**
PF9	1.05858	0.043587	**24.28673**
PF10	1.093738	0.05273	**20.74232**

Table 12: Showing Excess Returns of Portfolios

PF 1	0.007563
PF2	0.005498
PF3	0.003167
PF4	0.005412
PF5	0.011433
PF6	0.004194
PF7	0.005285
PF8	0.004718
PF9	0.004604
PF10	0.000613

5. Discussions

We now present the empirical findings from testing CAPM first for the individual securities and then for the ten portfolios formed and described in the Methodology section.

1. We expect to find that the intercept be not significantly different from zero and the regression slope coefficient ought to be significant for CAPM to be valid in India. A perusal of the Tables above show that only for 6 stocks out of the 87 stocks that are subjected to empirical testing showed intercept terms with t-values greater than 1.97 indicating statistical significance. For the remaining stocks the intercept term is not significant. This shows that security returns are adequately described by the market risk premium as premised by CAPM.
2. Next, we repeat the same analysis for the ten portfolios and the results shown in Tables above indicate that the intercept term is significant for only Portfolio 10 while in other cases the intercept term is not significant. The regression slope coefficient for the market risk premium is significant for all the ten portfolios thereby indicating that the market risk premium is a significant variable in explaining portfolio returns in India.
3. When we examine the relationship between excess returns and portfolio risk (results presented in Table 11) we don't find evidence favoring CAPM - which postulates that portfolios with higher betas (risk) are entitled to higher returns and the securities market line to have a positive slope and that higher beta portfolios provide higher return.
4. The CAPM prediction for the intercept is that it should be equal to zero. The findings of the test confirm the hypothesis formulated.
5. The CAPM premises that the slope of SML should be statistically significant and the findings of the test

confirm the same. In fact it is noted that betas are found to be highly significant.

6. But the risk return trade off implied by CAPM is not observed i.e., high risk portfolios giving higher returns is not observed.
7. Even in the case of individual securities also the study revealed that the intercept term is not significant showing evidence of CAPM.
8. CAPM holds only partially in the sense that Market Risk premium is a significant explanatory variable.
9. The CAPM predicts that the asset's expected rate of return has a linear relationship with its systematic risk. The findings of the test are in contrast with the above hypothesis and indicate inconsistency with the CAPM.
10. Jenson's alpha, is the intercept of the regression and measures the abnormal return of the portfolio given the correlation of the return on asset *j* with the return on the market portfolio. If CAPM holds in general, correlation of asset return with the market return (_*j*) alone could provide sufficient explanation to the risk premium, such that *alpha* should be zero. For this reason, a hypothesis testing is performed with null hypothesis *alpha*= 0.
11. A t-stat of greater than 1.96 with a significance less than 0.05 indicates that the independent variable is a significant predictor of the dependent variable within and beyond the sample. The results from the above table indicates that alpha is not statistically significant.
12. According to CAPM the stock expected rate of return is only affected by its systematic risk, i.e., has no relation with non-systematic risk at all. The findings of the test do not fully confirm this hypothesis.

6. Conclusion

The major findings of the study are CAPM holds only partially in the sense that Market Risk premium is a significant explanatory variable. There is a positive relationship between excess portfolio returns and betas but there is no evidence indicating that higher risk means higher returns. Further we find that a non-linear relationship between portfolio returns and betas. One of the new improved pricing model is the arbitrage pricing model and it was believed at the time of its introduction that it will solve the theoretical and empirical problems associated with CAPM. However in the case of India the regression analysis show that ex-post macro-economic factors have limited impact on stock returns and here also it is the market risk premium that explains the most of the portfolio returns.Only one of the FF factorsdo not have significant impact on stock returns and that factor is the size factor.On the basis of adjusted R^2 it may be concluded that FF model outperforms CAPM especially for the high beta portfolios.

7. References

1. Abhilash SN, Abhijit S. Ramanathan A, Subramanyam A. Anomalies in CAPM: A Panel Data Analysis under Indian Conditions. International Research Journal of Finance and Economics 2009; 33.
2. Abu-Hassan MdI, Chin-Hong P, Ying-Kiu Y. Risk and Return Nexus in Malaysian Stock Market: Empirical Evidence from CAPM - JEL Classification.
3. Al-Qaisi M. Estimation of an International Capital Asset Pricing Model with Dividends and Government Bonds. European Journal of Economics, Finance and Administrative Sciences 2012, 50.
4. Andrew WL, Jiang W. Trading Volume: Implications of an intertemporal capital asset pricing model. The Journal of finance 2006, 6.
5. Attiya YJ, Eatzaz A. Testing Multifactor Capital Asset Pricing Model in Case of Pakistani Market, International Research Journal of Finance and Economics 2009; 25:1450-2887.
6. Anyssa T, Hedi K. Multiscale Carhart Four-Factor Pricing Model: Application to the French Market, The Icfai University Journal of Financial Risk Management, 2009, 4(2).
7. Attiya YJ. Alternative Capital Asset Pricing Models: A Review of Theory and Evidence
8. Eugene FF, Kenneth RF. The Capital Asset Pricing Model: Theory and Evidence, Journal of Economic Perspectives 2004; 18(3):25–46.
9. Henk B. The Capital Asset Pricing Model (CAPM): The History of a Failed Revolutionary Idea in Finance? ABACUS, A Journal of Finance and Accounting Studies, Supplement, 2013, 49.