DOES MULTIFACTOR PRICING MODEL AN ALTERNATIVE APPROACH TO CAPITAL ASSET PRICING MODEL: EVIDENCE FROM INDIAN INFORMATION TECHNOLOGY SECTOR

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ABSTRACT

The purpose of this study is to examine the effect of significant variables among the alternative measures of risk other than beta and establishes a framework in search for an efficient alternative to the Capital Asset Pricing Model (CAPM). In this study the conditional relationship between the variables was testing by using Fama French Model by extending the previous developments on the improvement of CAPM through the combined univariate and multivariate regression techniques and broadens the scope by testing additional financial factors as proxies for measuring risk. The study used monthly dataset for the period from 1st March 2006 to 31st March 2011 for selected Information Technology Industry by considering market capitalization as the bench mark indicator. The methodology developed as part of the study explains return as a function of financial variables including the price to earnings per share ratio, price to book ratio, dividend yield, firm size and beta by retrieving the data from CMIE Prowess database and www.bseindia.com. Our results of the study indicate that Beta is not the only variable which helps in predicting the return, there are other variables also kept into consideration. Overall, the exogenous variable and sentimental behavior of the investors played a crucial role and dominating Indian Information Technology Industry into the panic side.
Keywords: *CAPM, Fama French, Returns, Dividend Yield, Earning per Share*

INTRODUCTION

One of the important problems of modern financial economics is the quantification of the trade off between risk and expected return will fluctuate over a period of time in both the developed and developing markets. The developing markets have been quite extensively studied due to the large interest of investors who view them as an attractive alternative to investing in more developed markets. The developing markets are characterized by relatively higher returns, but also higher volatility of stock returns as compared to the developed ones. However, there is no consensus in the literature stating that which model should be used to explain the returns in these markets and estimate the cost of equity capital. A large number of studies empirical explained the evidence against the prediction of the Sharpe (1964), Linter (1965) and Black (1972) on Capital Asset Pricing Model (CAPM). The CAPM theory affirms that in a world where investors have homogeneous expectations about expected returns and covariance of individual assets, in the absence of transaction costs, taxes and trading restrictions of any kind, the market portfolio, which represents the aggregations of all individual portfolios, is mean variance efficient and gives the maximum expected return for a given level of risk. In general, the CAPM shows that the cross-section of expected excess returns of financial assets must be linearly related to the market betas, with an intercept of zero. Campbell (2000) examined during 1980s and 1990s and suggested that researchers began to look at other characteristics of stocks apart from their betas. The change in research direction led to academia, researchers and policy makers to the identification of puzzles that are not captured by systematic risk. The identification of deviations from CAPM has been the catalyst for a reevaluation and reassessment of asset pricing technology by researchers leading to the development of multifactor asset pricing models.

Chan, Hamao and Lakonishok (1991) provided preliminary evidence that firm characteristics such as size, style, earnings multiples, cash flow and past sales growth ratios explain the cross-section of average stock returns with greater precision than the single-factor CAPM. Fama French (1992) examined all of these variables simultaneously for NYSE, AMEX and NASDAQ stocks, making two observations about the cross-section of average stock returns like weak positive relation between average returns and systematic risk and the size and style factors capture the cross-section variation in average returns. Fama French (1996) introduce a multifactor asset pricing model to capture anomalies that are not explained by the CAPM. The research undertakes several tests that suggest a firm's size and style are the proxies for the loading on priced risk factors. The Fama French (1996) document covariation in returns related to size and style beyond the covariation explained by the market return, suggesting the existence of a common risk factor. In addition, the loading on zero cost factor portfolios, formed on size and style ratios in concert with a value weighted market portfolio, appear to explain the excess returns of size and style sorted portfolios. The conclusions reached by Fama French (1996) were consistent with a multifactor version of Merton's (1973) intertemporal

capital asset pricing model (ICAPM) or the arbitrage pricing model (APT) of Ross (1976), in suggesting that the higher average returns on value stocks are compensation for risk missed by the CAPM.

The recent empirical evidence questions the usefulness of these models. Most of the criticism has focussed on the distress premia identified by Fama and French (1993). Howton and Peterson's (1998) investigated the cross-section of realized stock returns and envisaged the betas are significantly positively related to returns and, except for some models in January, because the betas are significantly negatively related to returns. Drew Naughton and Veeraraghavan (2002) applied the Fama and French Three Factor Model for Chinese stock market and observed that the β coefficient and company were relevant for stock return; the risk could not well explain this phenomenon, whereas investors' irrational behaviours. Bloomfield (2004) performed two experiments to assess whether security characteristics are associated with returns because investors believe they reflect mispricing. Lewellen (2004) suggested strong evidence that dividend yield predicts both equal and value weighted NYSE returns. Ang and Chen (2006) explored a conditional CAPM with time-varying betas, predictable market risk premia, and stochastic systematic volatility; there is little evidence that the conditional alpha for a book-to-market trading strategy is different from zero.

Freeman and Guermat (2006) explore the idea that the ex-ante risk premium is always positive and the ex-post excess return to the market is not. Likewise, they evaluated a series of tests that analyzed the conditional relationship between betas and market returns from the CAPM perspective. The purpose of this study is to examine the effect of significant variables among the alternative measures of risk other than beta and establishes a framework in search of an efficient alternative to the CAPM. The reason for the study on the additional variables as proxies for risk in stock return as beta alone does not act as a significant measure of risk. The CAPM tests the conditional relationship between beta and stock return. But a large number of policy makers have studied the appropriate and significant proxies for risk in pricing the stock return. By simultaneously testing the FF (Fama-French) model on recent return data this study extends previous developments on the improvement of CAPM through the combined univariate and multivariate regression techniques and broadens the scope by testing additional financial factors as proxies for risk.

The need of this research is to provide theoretical significance by identifying the list of significant variables among the alternative measures of risk other than beta; and to develop a model for return on stocks. This study performs a statistical analysis to develop a multifactor pricing model that is an alternative to CAPM. The only risk that is priced in the return of a stock is systematic risk and CAPM assumes that stockholders have a well-diversified portfolio. It is essential for the investors to have a clear understanding of the major factors that constitute stock return as majority of the investors are risk averters and wealth maximizers. The research will attempt to analyse the significance and interpret the performance of the model compared to previous empirical research and present a multifactor pricing model that includes beta and other financial ratios, as a potential alternative to CAPM. The rest of the paper is organized as follows: Section 2 explains the overview of Indian Information technology industry. Section 3 indicates the data and methodology parts adopted for the study. The results and discussion for the significant variables among the alternative measures of risk other than beta for efficient alternative to the CAPM was presented in Section 4. Section 5 concludes the paper.

INDIAN INFORMATION TECHNOLOGY INDUSTRY

The Indian Information Technology (IT) industry played a key role in putting India on the global map. The Indian domestic IT market grew by 29% in the financial year 2007-08 to report revenues of Rs.288, 810 crore. The revenue of the information technology sector has grown from 1.2 per cent of the Gross Domestic Product in 1998 to an estimated 5.5 per cent in 2008. The net value added by this sector, to the economy, is estimated to be 3.3 to 3.9 per cent for 2008. The Indian IT services market is estimated to remain the fastest growing in the Asia-Pacific region with a CAGR of 18.6 per cent. The Indian IT-BPO sector is estimated to reach a target of US$ 60 billion in exports and US$ 73-75 billion in overall software and services revenues by 2010. India's information and communication technology market is estimated to grow 20.3 per cent annually to reach US$ 24.3 billion by 2011. The Indian IT and ITES market is estimated to grow at the rate of over 16 per cent to become a US$ 132 billion industry, significantly, the domestic market alone is expected to become over US$ 50 billion, with a CAGR of about 18.4 per cent. Simultaneously, the IT and ITES exports are estimated to more than double to US$ 78.62 billion by 2012. The success of IT industry has made India a power to reckon with. As per the Annual Report submitted by Department of Information Technology (DIT) in 2009-10, the IT-BPO industry is expected to garner a revenue aggregate of US$ 73.1 billion in 2009-10 as compared to US$ 69.4 billion in 2008-09, growing at a rate of over 5 per cent. The report predicts that the Indian IT-BPO revenues may reach US$ 225 billion in 2020.

The rapid growth of IT sector is a consequence of access to trained English speaking professionals, cost competitiveness and quality telecommunications infrastructure. In order to promote domestic investment, foreign direct investment, transfer of technology, know-how, technical collaboration, joint venture etc in India and export IT software products and services from India to the global market, both Government of India and State Governments in India have been offering a series of policy packages including tax breaks, import duty concessions etc. 100% FDI is permitted in the Electronic hardware sector and the Software development sector under the automatic approval route. The industrial licensing has been virtually abolished in the Electronics and Information Technology sector except for manufacturing electronic aerospace and defense equipment.

DATA & METHODOLOGY

This paper examines the effect of significant variables among the alternative measures of risk other than beta and establishes a framework in search of an efficient alternative to the Capital Asset Pricing Model (CAPM) for the selected Information Technology Industry by considering market capitalization as the bench mark indicator for the period from 1st March 2006 to 31st

March 2011 by using monthly database. The dataset retrieved from Centre for Monitoring Indian Economy (CMIE) Prowess database for listed companies in BSE Sensex were considered for the purpose of analysis by using univariate and multivariate regression techniques. By testing the Fama-French model on recent return data this study extends previous developments on the improvement of CAPM and broadens the scope by testing additional financial factors as proxies for risk. The statistical model developed as part of the study explains return as a function of financial variables including the Price to Dividend Yield, Price Earnings Ratio, Price to Book Ratio, Firm Size and Beta. The model explains the function of financial ratios. Return = f (Beta, PE, PB, DY, Fin leverage, size).

$$R_t = \alpha + \beta_0 Beta + \beta_1 PE + \beta_2 PB + \beta_3 DY + \beta_4 Leverage + \beta_5 Size + \varepsilon_t$$

Where, R_t denotes the realized return of the stock at time't'. The α and β are the parameter coefficient to be estimated and which is denoted as Price to Dividend Yield, Price Earnings Ratio, Price to Book Ratio, Firm Size and Beta. The ε_t is an error term representing unexplained price changes.

RESULTS & DISCUSSION

The size of the coefficient for each independent variable gives the size of the effect that variable is having on your dependent variable (R_t), and the sign on the coefficient (positive or negative) gives the direction of the effect. In regression with a single independent variable, the coefficient tells how much the dependent variable is expected to increase (if the coefficient is positive) or decrease (if the coefficient is negative) when that independent variable increases by one. In regression with multiple independent variables, the coefficient tells much the dependent variable is expected to increase when that independent variable increases by one, holding all the other independent variables constant.

The CAPM assumes that stockholders have a well-diversified portfolio and the only risk that is priced in the return of a stock is systematic risk and since the measure of systematic risk is beta, the results of this model are based on the assumptions that the dependent variable is R_t and the independent variable is Beta. The results for CMC Limited and Infosys Limited were statistically significant at 1 per cent, respectively. The Beta coefficient for CMC and Infosys Limited were significant at 1 per cent and 5 per cent. But, on the other end, the estimated parameters for the selected units were statistically insignificant in nature. Apart from this, the Log Likelihood value for the units was positive.

Table: 1 Univariate Model for Selected Information Technology Units

Company	C	Beta	Log Likelihood
3i Infotech	-0.0138(-0.338)	0.0116(0.2871)	53.53875
CMC	-0.6588[a](-3.724)	0.7862[a](3.8666)	43.72921
Financial Tech	-0.0981(-0.824)	0.0616(0.7488)	31.98850
Goldyne	-0.0911(-0.949)	0.0712(0.7925)	32.98663
Hexaware Tech	-0.0383(-0.556)	0.0229(0.3418)	32.40377
Infosys	0.0557[a](2.0219)	-0.0813[b](-2.12)	69.75381
Kpit	0.0812(0.5165)	-0.083(-0.613)	10.42747
Mphasis	0.0369(0.5332)	-0.031(-0.364)	46.46059
Wipro	-0.013(-0.338)	0.0116(0.2871)	53.53875

Note: Figures in the parenthesis indicate z-Statistics. a, b & c indicate significance level at 0.01, 0.05 and 0.10 per cent, respectively.

The results of multivariate model are based on the assumption that the dependent variable is R_t and the independent variables are Beta, Firm Size, PE, PB and DY are presented in Table: 2. The results for this model indicate that for three companies i.e., Hexaware Technologies Limited, 3i Infotech Limited and KPIT Limited none of the variables are observed with statistically significant role in predicting the return series. So, the investors who are investing in these units they are not considering the various factors for investment. For CMC Ltd the results of this model indicate that the P values of independent variables such as Beta, is the only variable which is significant in predicting the return and its t value is more than 1.96. The P values for beta, DY and PE for Financial Technologies Limited are less than 0.05 and their t stat values are also more than 1.96 which says that they play a significant role in predicting the return. Beta, DY and PE can cause 35.76 variations in return. In the case of Goldyne Ltd Size plays a significant role in predicting return of the company as its P value is less than 0.05 and its t value is more than 1.96 and it can cause 12.43% variation in return. PE & PB for Infosys Ltd play a significant role in predicting return as their P value is less than 0.05 & t stat is more than 1.96. For Mphasis Ltd Beta, DY and PB play a significant role in predicting return as their P value is more than 0.05 and t stat is more than 1.96. DY for Wipro Ltd plays a significant role in predicting the return as its P value is less than 0.05 and t stat is more than 1.96 and it can cause 16.67% variation in return.

Table: 2 Multivariate Models for Selected Information Technology Units

Company	C	Beta	DY	PB	PE	Size
3i Infotech	-1.1972	0.1099	-0.013	0.0045	-0.008	0.0940
	(-1.335)	(1.077)	(-0.36)	(0.121)	(-0.63)	(1.40)
CMC	-0.7449	1.0189	0.0413	0.0380	-0.002	-0.029
	(-1.595)	(3.234)[a]	(1.026)	(1.416)	(-0.671)	(-0.50)
Financial	0.85981	-0.574	-0.079	-0.003	0.0035	-0.007
	(1.046)	(-3.75)[a]	(-2.46)[a]	(-1.00)	(2.394)[a]	(-.108)
Goldyne	-2.0503[b]	0.1428	0.0575	-0.039	0.008	.19941
	(-2.138)	(0.643)	(1.228)	(-0.77)	(0.773)	(2.12)[a]
Hexaware	0.1881	-0.091	-0.068	-0.001	0.0010	-0.000
	(0.346)	(-0.67)	(-1.78)[c]	(-0.03)	(1.579)	(0.06)
Infosys	-2.6174	-0.192	0.0041	0.060	-0.020	0.2001
	(-1.78)[c]	(-1.27)	(0.254)	(2.934)[a]	(-2.54)[a]	(1.84)[c]
Kpit	-0.9162	0.0394	0.0066	-0.007	-0.006	0.1085
	(-0.773)	(0.136)	(0.090)	(-0.02)	(-0.891)	(0.923)
Mphasis	1.0823	-0.688	0.0609	0.0667	0.0029	-0.093
	(1.112)	(-2.18)[b]	(2.100)[a]	(3.456)[a]	(0.766)	(-1.25)
Wipro	1.8338	-0.111	-0.084	-0.045	0.0259	-0.144
	(1.791)[c]	(-1.03)	(-2.45)[a]	(-1.24)	(1.916)[c]	(-1.83)[c]

Note: Figures in the parenthesis indicate z-Statistics. a, b & c indicate significance level at 0.01, 0.05 and 0.10 per cent, respectively.

SUMMARY AND CONCLUSION

The empirical work in economics in general and in finance in particular is ex post in nature, making it sometimes difficult to discriminate among various explanations for observed phenomena. A partial solution to this difficulty is to examine the alternatives and make judgments from an ex ante point of view. The current explanations of the empirical results on asset pricing are particularly well-suited to ex ante analysis. This paper presents a framework based on the economics of mean-variance analysis to address and reinterpret prior empirical results. The main objective of the study is to investigate the effect of significant variables among the alternative measures of risk other than beta and establishes a framework in search for an efficient alternative to the Capital Asset Pricing Model (CAPM). In this study the conditional relationship between the variables was testing by using Fama French Model by extending the previous developments on the improvement of CAPM through the combined univariate and multivariate regression techniques and broadens the scope by testing additional financial factors as proxies for measuring risk.

Several models developed by previous scholars challenges CAPM and suggest a multifactor pricing model that explains the risk and return relationship in a more practical way. The model developed in this research explains the relevance and significance of beta, PE, PB, DY and Size as independent variables determining return on stocks, which neither supports nor disagrees with CAPM, FF or other research supporting significance of financial ratios. From the analysis done in this study we can say that only in case of some companies the above mentioned variables were significant in predicting return. In case of CMC Limited and Infosys Limited companies none of the variables were useful in predicting return and only in case of two companies multifactor's played significant role in predicting return. This keeps the scope open for more intensive study and debate on developing the appropriate model to explain risk and reflected in stock return. Therefore, the results of Multifactor asset pricing models have been proposed as an alternative to the Sharpe-Lintner CAPM. However, the results in this paper suggest that looking at other alternatives will be fruitful. The evidence against the CAPM can also be interpreted as evidence that multifactor models on their own cannot explain the deviations from the CAPM. Generally, the results suggest that more can be learned by considering the likelihood of various existing empirical results under differing specific economic models.

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