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# Sectoral Robustness of Asset Pricing Models: Evidence from the Indian Capital Market

***Mobin Anwar,***

Research Scholar,
Department of Management,
Central University of Rajasthan,
Ajmer, India

***Sanjay Kumar,***

Assistant Professor,
Department of Management,
Central University of Rajasthan,
Ajmer, India

**ABSTRACT**

*In asset pricing literature, discussions are going around every corner of the world that the CAPM is dead or alive. Pragmatic evidences are supporting the three factor model proposed by Fama and French that it better captures the return of an underlying asset than the conventional CAPM in developed economies. Some literature in asset pricing is in favour of CAPM stating that it has become a basis for the development of other models. The present study is an attempt to find the applicability of CAPM, other one factor models, two factor models and the three factor model for various sectors in Indian context. The study covers a period of 1st April 2009 to 31st March 2016. In the study it has been found that the Fama and French three factor model better explains the returns for every sector. In financial sectors the CAPM and the Fama and French three factor model hold strongly than non-financial sectors. The two factor model with market premium and value premium is very close to three factor model as per the question of predicting returns is concerned.*

***Keywords****: CAPM, Fama and French three factot model, size premium, value premium*.
***JEL Classification:*** *G10, G12, G17*

**Introduction:**

Every business enterprise needs to raise funds for procurement of physical resources. These physical resources are supportive to the smooth functioning of a firm. In an economy the savings of individual households are channelized to production units through intermediaries. Some intermediaries offer risk free returns to the investments. Some investors opt for bearing risk so as to witness capital gain by investing in stocks of the firms. In such scenario investors need a model so as to have an idea about the pattern of stock prices. Behavioural sciences are not like mathematical sciences where some predefined rule is there. So in such situation there is a need of a model that will capture the price fluctuations up to a greater extent. In 1950 Harry Markowitz propounded portfolio theory to reduce the risk associated with an investment. The first model in this regard was given by William Sharpe in 1964 and for this echelon he was also awarded Noble Prize. After that the literature of risk reduction witnessed a deluge of models. But all these models were based on CAPM (the model given by William Sharpe). It means CAPM became a basis for the development of other models. In (Fama & French, 1993) gave three factor model. It was also an extension of the benchmark CAPM. The additional two factors were size premium and value premium. The National Stock Exchange in India is one of the key players through which investments are made in stocks. NSE of India maintains indices for 11 sectors. The present study is an attempt to get a practical at hand of prediction of returns of these sectors on the basis of one factor models, two factor models and three factor model.

**Review of Literature:**

(Sharpe, 1964) found a significant relationship between return of the underlying asset and beta. Beta is the measure of co-movements between assets return and the market risk premium. It was also said that the relationship between return of the asset and market beta is positive.

(Fama & French, 1992) concluded that there is a significant relationship return of the asset and market

risk premium. In factor model size premium is very weakly related to the returns and value premium is better than the size premium. In all three combinations of single factor model there is a strong evidence of market risk premium. In two factor model market risk premium and value premium better explain the returns of the stocks. Three factor model better explain the return of stock to one factor model.

(Connor & Sehgal, 2001) confirmed the applicability of three factor model in Indian Stock Market.

(Pandey, 2001) analysed the effects of size, B/M ratio and other predictors on expected returns of assets for Malaysian firms. It was concluded that size and B/M ratio has a significant effect on expected return of the asset. Size has a converse relationship with the return of the asset. B/M ratio has a positive relationship with the asset return.

(Aksu & Onder, 2003) said that high value assets play a significant role in accessing the return of the asset. Also small size stocks have a significant contribution in predicting the returns. For individual asset return the models are witnessing the market risk premium and the size premium significant but the value premium didn't show any significant relationship with the return of the asset. But for portfolio asset return, in the models all predictors were found to be significant. Apart from CAPM the additional predictors namely size premium and value premium add to the explanatory power of the model.

(Gaunt, 2004) concluded that value premium sorted portfolios play a significant role in asset pricing other than market risk premium.

(Bartholdy & Peare, 2005) conducted a survey on NYSE and concluded that neither CAPM nor Fama and French three factor model is having quality necessary to explain the return of an underlying asset.

(Bahl, 2006) also concluded that Fama and French three factor better explains the cost of equity. It was also said that there was no abnormal profit in the model.

(Kapur, 2007) said that the market risk premium has a significant effect in predicting the returns of the assets. The other two factors are somewhere significant and somewhere not. The three factor model keeps a better explanation of returns of stocks to one factor model.

(Mehta & Chander, 2010) found that three factor model is definitely a better model is definitely a better model than one factor model than one factor model especially in case of small capitalisation portfolios. Market risk premium and value premium was best model in two factor models. In two factor models size premium and value premium were inable to explain the returns.

(Taneja, 2010) concluded that there is a need of comprehensive and thorough study of Fama and French three factor model in Indian Stock Market. The two factor model market and size factors explain the expected return of the asset better than to the conventional CAPM and three factor model.

(Al-Mwalla & Karasneh, 2011) found that the CAPM single factor model is incapable of predicting the returns of the underlying asset especially in case of portfolio returns. It is expected that higher beta coefficients implies higher returns but an antithesis situation was found. The risk associated with assets having big capitalisation was higher than small capitalisation assets. The Fama and French three factor model proved itself to be superior to the single factor model CAPM. The two factor model with explanatory variables market risk premium and value premium shows reconcilable relation to return of the underlying asset.

(Bhatnagar & Ramlogan, 2012) said that investment on the basis of value is better than based on size. The data evidences support the three factor model more than one factor model.

Hamid, Z. et al. (2012) concluded that one can't nullify the applicability of Fama and French three factor model in banking firms of Karachi Stock Exchange.

**Objectives of the study:**

- To determine the explanatory power of the asset pricing models for different sectors in Indian Capital Market.
- To analyse the effect of market risk premium on return of the asset as per the asset pricing models for different sectors in Indian Capital Market.
- To analyse the effect of size premium on return of the asset as per asset pricing models for different sectors in Indian Capital Market.
- To analyse the effect of value premium on return of the asset as per asset pricing models for different sectors in Indian Capital Market.

**Research Methodology:**

The CAPM given by William Sharpe in 1964 is given by the equation,

$$R_{it} - R_f = \alpha + \beta_1(R_m - R_f) + e_{it} \quad (1)$$

The Fama and French three factor model is given by the equation,

$$R_{it} - R_f = \alpha + \beta_1(R_m - R_f) + \beta_2 SMB + \beta_3 HML + e_{it} \quad (2)$$

$$R_{it} - R_f = \alpha + \beta_1 MKT + \beta_2 SMB + \beta_3 HML + e_{it} \quad (3)$$

Where,

$R_{it}$ is the daily arithmetic return of i$^{th}$ sector

$R_f$ is the proxy of the risk free rate

$(R_m - R_f)$ *or* $MKT$ is proxy of excess return to market

$SMB$ is the proxy of the size premium

$HML$ is the proxy of value premium

**Sectoral indices return:**

The sectoral indices available in the NSE website are NIFTY Auto, NIFTY Bank, NIFTY Financial Services, NIFTY FMCG, NIFTY IT, NIFTY Media, NIFTY Metal, NIFTY Pharma, NIFTY Private Bank, NIFTY PSU Bank and NIFTY Realty.

Among all these sectors NIFTY Metal Indices data were found to be inadequate. So the study comprises of the daily indices return of the rest as dependent variable.

**Calculation of $R_f$:**

Every Wednesday 91 day Treasury bill is auctioned by RBI, the yield has been taken down from the RBI website and that yield has been converted into daily return using the following formula,

$$daily\ rate = (1 + implied\ yield)^{(\frac{1}{364})} - 1 \quad (4)$$

This daily rate is used for Wednesday, Thursday, Friday, Monday & Tuesday

**Calculation of $MKT, SMB$ & $HML$:**

For "$MKT$" i.e. market risk proxy is daily arithmetic return of Nifty 50 has been used from 1st April 2009 to 31st March 2016. 71 companies found their existence in Nifty 50 for the sample period, for these companies the following data was collected from PROWESS data base (A central data base maintained by CMIE),

I. Daily adjusted closing price Nifty 50 companies for a period of 31st March to 31st March 2016.
II. Quarterly data of market capitalisation of Nifty 50 companies from March 2009 to December 2015.
III. Quarterly data of P/B ratio of Nifty 50 companies from December 2008 to September 2015.

On the basis of BE/ME ratio and market capitalisation Nifty 50 companies were divided into six portfolios (SH, SM, SL, BH, BM & BL). The portfolios were changed quarterly based on market capitalisation and BE/ME ratio. If there is an interim change in the list of Nifty 50 list within the quarter the portfolios were reconstructed with the effective date. On the basis of market capitalisation there were two division's namely big capitalisation and small capitalisations. The companies having market capitalisation less than the median were placed under small capitalisation firms and rest under big capitalisation firms. On the basis of value three categorisations were made namely large value firms, mid value firms and high value firms (0 to 30th percentile, 30th to 70th percentile and 70th & above percentile respectively). Daily SMB and HML data were calculated as follows,

$$SMB = \frac{(SH+SM+SL)}{3} - \frac{(BH+BM+BL)}{3} \quad (4)$$

$$\&HML = \frac{(SH+BH)}{2} - \frac{(SL+BL)}{2} \quad (5)$$

**Hypotheses to be tested:**

I. $H_{01}$: There is no abnormal profit ($\alpha$=0)
II. H02: There is no significant effect of market risk premium on the return of the asset ($\beta_1$=0).
III. H03: There is no significant effect of size premium on the return of the asset ($\beta_2$=0).
IV. H04: There is no significant effect of value premium on the return of the asset ($\beta_3$=0).

**Findings and Discussions:**

Table 1: Regression Analysis in case of NIFTY Auto

In case of MKT as the dependent variable the F-statistic is found to be significant at 1% level of significance. The intercept term and the coefficient term are also significant at 1% level of significance. This is the case of conventional CAPM model and the model captures the return by 54.47%. The F-statistic is found to be significant in case of the model in which SMB acts as an independent variable. The intercept term and the coefficient term of SMB are also found to be significant at 1% level of significance. The explanatory power of the model is very weak. In case of HML the explanatory power is 12.33%. In this case F-statistic, intercept term and coefficient of HML are found to be significant. If SMB is added to the conventional CAPM the explanatory power increases a little bit. The F-statistics, the intercept term and the coefficients of MKT and SMB were found to be significant at 1% level of significance. The two factor model in which MKT and HML are independent variables is having explanatory power of 55%. F-statistic, intercept term and the coefficients all found to be significant. In case of SMB and HML the explanatory power is found to be very low. The Fama and French three factor model is having the highest explanatory power. The F-statistic, the intercept term and the coefficient terms all found to be significant at 1% level of significance.

**Table 2: Regression Analysis in case of NIFTY Bank**

In one factor model the CAPM is having an explanatory power of 65% and there is no possibility of abnormal profit as the intercept term is insignificant. In case of SMB the null hypothesis that there is a linear relationship between the dependent and the independent variable ceased to be accepted as the data evidences are supporting the alternative hypothesis. The intercept term in case of SMB is insignificant at 10% level of significance. HML as the independent variable is having an explanatory power of 27.24% and in case of SMB the model is worst fit. In case of HML there is no possibility of abnormal profit. In two factor model when SMB is added to MKT, the intercept term and coefficient of SMB are found to be insignificant although the F-statistic is found to be significant. This model is having an explanatory power very close to CAPM. When SMB is replaced by HML the explanatory power of the model increases and is very close to the Fama and French three factor model. SMB and HML as

independent variables are having very low explanatory power. The three factor model has proved itself to be a better model as compared to the CAPM.

**Table 3: Regression Analysis in case of NIFTY Financial Services**

In case of MKT as the independent variable in one factor model, the Adj. $R^2$ is 70.18% and the intercept term is insignificant. If SMB is the predictor, the data evidences are supporting the null hypothesis that there is no significant relationship between predictor and the response variable. Lastly if is the predictor the explanatory power of the model is very low. If MKT and SMB are the predictors, the two factor model is having an explanatory power of 70.20%. In this model the hypothesis that there is a significant effect of size premium is ceased to be accepted. If SMB is replaced by HML the Adj. $R^2$ increases and is very close to three factor model. Lastly, in case of SMB and HML the explanatory power found to be very low. In three factor model the Adj. $R^2$ is little bit more than the conventional CAPM.

**Table 4: Regression Analysis in case of NIFTY FMCG**

In CAPM the model is found to be significant with an explanatory power of 31.35%. In one factor model if SMB acts an independent variable the model is insignificant and worst fit. In case of HML the model is fit but having very low explanatory power. When SMB is added to the conventional CAPM, the model is fit with insignificant intercept term and coefficient of SMB. The explanatory power of the same was found to be 31.31%. The two factor model with MKT and HML as independent variables the explanatory power was found to be 34.08% with insignificant intercept term. In case of SMB and HML as predictors the explanatory power was found to be 0.23% only although the model is fit. The Fama and French three factor model was also found to be significant with an insignificant coefficient term of SMB and having an explanatory power of 34.05%.

**Table 5: Regression Analysis in case of NIFTY IT**

The CAPM model is having very low explanatory power. In case of SMB and HML both, the model finds itself incapable of explaining the return. When HML is added to MKT as predictor, the explanatory power was found to be 33.68%. When we consider MKT and HML as predictors the power with which the model explains the return is 37.33%. But in this case the coefficient of MKT and the intercept term are found to be insignificant. In case of SMB and HML the value of the Adj. $R^2$ was found to be very low and coefficient of HML is insignificant. In Fama and French three factor model the explanatory power is better than the conventional CAPM.

**Table 6: Regression Analysis in case of NIFTY Media**

In case of one factor model the CAPM is having an explanatory power of 33.88%, but the intercept term was found to be other than zero. As soon as the MKT is replaced by SMB in one factor model, the model loses its power to a greater degree and with a possibility of abnormal profit. Again when we replace SMB with HML the Adj. $R^2$ was found to be 10.86%. In two factor model when the independent variable is MKT and SMB the intercept term is insignificant and Adj. $R^2$ is 35.29%. In case of SMB and HML the value of the explanatory power is very low. The three factor model is having insignificant intercept term with an explanatory power of 37.85%.

**Table 7: Regression Analysis in case of NIFTY Pharma**

The conventional CAPM model was found to be significant at 1% level of significance and with an explanatory power of 30.73%. In case of SMB, the model is also significant with an Adj. $R^2$ of 2.27%. In case of HML the one factor model, the data evidences are not supporting the alternative hypothesis that there is a significant effect of HML on the return of the asset. In two factor model when MKT and SMB act as predictors, the model is found to be significant at 1% level of significance with an explanatory power of 33.22%. When MKT and HML act as predictors of the return of the asset, the model is found to be significant at 1% level of significance with an Adj. $R^2$ of 35.53%. In case of SMB and HML the explanatory power is very low. In case of three factor model the intercept term is insignificant at 5% level of significance with an explanatory power of 38.80%.

**Table 8: Regression Analysis in case of NIFTY Private Bank**

The one factor CAPM model has an explanatory power of 64.80%. The case when SMB is the independent variable the model is worst fit with an explanatory power of -0.02%. Also, the model as well as the coefficient of SMB was not found to be significant. The one factor model of HML has a power of 21.99%. In two factor model where MKT and SMB are the predictors the model is found to be significant with Adj. $R^2$ of 64.79%, but in this case the coefficient of SMB is found to be insignificant. In case of MKT and HML as predictors the model is significant with an explanatory power of 68.02%. SMB and HML as independent variables have an explanatory power of 22.29%. The Fama and French three factors model is significant and have an explanatory power of 68.08%.

**Table 9: Regression Analysis in case of NIFTY PSU Bank**

The CAPM model has an explanatory power of 45.10% and the model was found to be significant. The CAPM model has an insignificant intercept term. In case of SMB, the model is significant and the intercept term was found to be insignificant. The model with HML as the independent variable was found to be significant with an explanatory power of 36.54%. The two factor model with MKT and SMB as predictors has an explanatory power of 46.45% with an insignificant constant term. When SMB is replaced by HML, the two factor model has an explanatory power of 59.54% with a possibility of intercept term.

In case of SMB and HML the Adj. $R^2$ was found to be 36.83%. The Fama and French three factors model is having an insignificant constant term with an explanatory power of 60.15%.

**Table 10: Regression Analysis in case of NIFTY Realty**

In case of one factor CAPM model, the model is found to be significant with an insignificant constant term and an explanatory power of 46.09%. The one factor model where SMB is the predictor the model is found to be very weak. The two factor model where MKT and SMB act as predictors, the model, and the model is fit with an insignificant constant term and the power of the model was found to be 50.55%. The model in which MKT and HML are the independent variables, the model is significant with an explanatory power of 54.89% and insignificant constant term. The SMB and HML have an explanatory power of 30.55% with an insignificant constant term. The three factor model is having a power of 58.22%.

**Conclusion:**

In NIFTY Auto the Fama and French three factor model is healthier than the conventional CAPM and the two factor models. The two factor model in NIFTY Auto with market risk premium and size premium as explanatory variables has a very close capturing power with the three factor model. In NIFTY Bank, the CAPM model is robust but not healthier to the three factor model. The two factor models in this sector are also strong and are very close to the three factor model except for size premium and value premium as predictors. In NIFTY Financial Services also the models are witnessing same result as that of the NIFTY Bank. In NIFTY FMCG the CAPM as well as the Fama and French three factor model are very weak. For this sector the two factor model with market risk premium and value premium as independent variable is salubrious than the three factor model. For NIFTY IT also the explanatory powers are very low for different sort of portfolios, but the three factor model is wholesome than the conventional CAPM. The CAPM for NIFTY Media is also weak, but the three factor model is stronger. In NIFTY Pharma the returns of the assets are unable to be captured by the CAPM as well as Fama and French three factor model, but the three factor model is found healthier than CAPM. In NIFTY Private Bank the CAPM and Fama and French model are wholesome and three factor model is robust than CAPM. In NIFTY PSU Bank the one factor models, two factor models and the three factor model are not very strong but the three factor model is stronger than the CAPM. For NIFTY Realty weak models are evident but the three factor model proved to be a good model than CAPM.

The CAPM and Fama and French three factor models are evidencing to be weak for non-financial sectors than to financial sectors. Fama and French three factor model proved to be a good model than the conventional CAPM. The two factor model with market risk premium and value premium as predicting variables gives a result very close to the three factor model. Sometimes the size premium doesn't show any relation with the return of the asset. So it can be concluded that in India also CAPM is alive and has proven itself for the development of other models. But the two factor model with market risk premium and value premium as independent variables and the Fama and French three factor model are superior to the conventional CAPM.

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**Table 1: Regression Analysis in case of NIFTY Auto**

| **Sector: NIFTY Auto** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Predictor(s)** | **α** | **$\beta_1$** | **$\beta_2$** | **$\beta_3$** | **F** | **Adj. $R^2$** | **SE** |
| **MKT [Sig.]** | 0.0006*** [0.0006] | 0.7584*** [6.4e-299] | - | - | 2077.47*** [6.4e-299] | 0.5447 | 0.009 |
| **SMB [Sig.]** | 0.0009*** [0.0052] | - | 0.2704*** [4e-07] | - | 28.89*** [4e-07] | 0.0141 | 0.014 |
| **HML [Sig.]** | 0.0011*** [0.0002] | - | - | 0.4520*** [8.66e-52] | 245.17*** [8.66e-52] | 0.1233 | 0.013 |
| **MKT & SMB [Sig.]** | 0.0006*** [0.0072] | 0.7599*** [2.9e-307] | 0.2883*** [ 7.83e-16] | - | 1110.81*** [0] | 0.5611 | 0.009 |
| **MKT & HML [Sig.]** | 0.0007*** [0.0023] | 0.7250*** [2.5e-17] | - | 0.1113*** [ 6.54e-07] | 1065.53*** [1.6e-302] | 0.5508 | 0.009 |
| **SMB & HML [Sig.]** | 0.0011*** [0.0003] | - | 0.2025*** [5.5e-05] | 0.4417*** [1.04e-49] | 131.84*** [4.99e-54] | 0.1310 | 0.012 |
| **MKT, SMB & HML [Sig.]** | 0.0006*** [0.0031] | 0.7315 [0.6970] | 0.2732*** [2.18e-14] | 0.0943*** [1.97e-05] | 754.06*** [0] | 0.5654 | 0.009 |

*** indicates significant at1%, ** indicates significant at 5% and *indicates significant at 10%

**Table 2: Regression Analysis in case of NIFTY Bank**

| **Sector: NIFTY Bank** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Predictor(s)** | **α** | **$\beta_1$** | **$\beta_2$** | **$\beta_3$** | **F** | **Adj. $R^2$** | **SE** |
| **MKT [Sig.]** | 0.0003 [0.2269] | 1.0306*** [0] | - | - | 3257.99*** [0] | 0.6523 | 0.010 |
| **SMB [Sig.]** | 0.0007* [0.0718] | - | -0.0182 [0.7842] | - | 0.0749 [0.7842] | -0.0005 | 0.02 |
| **HML [Sig.]** | 0.0011*** [0.0013] | - | - | 0.8332*** [ 3.6e-122] | 650.82*** [3.6e-122] | 0.2724 | 0.014 |
| **MKT & SMB [Sig.]** | 0.0002 [0.2278] | 1.0306*** [0] | 0.0062 [ 0.8740] | - | 1628.09*** [0] | 0.6521 | 0.01 |
| **MKT & HML [Sig.]** | 0.0005** [0.0159] | 0.9085*** [0] | - | 0.4063*** [8.09e963] | 2104.26*** [0] | 0.7079 | 0.009 |
| **SMB & HML [Sig.]** | 0.0011*** [0.0011] | - | -0.1474*** [0.0010] | 0.8407*** [1.5e-123] | 329.85*** [4e-122] | 0.2748 | 0.014 |
| **MKT, SMB & HML [Sig.]** | 0.0005** [0.0159] | 0.9070*** [0] | -0.0597* [0.0981] | 0.4099*** [2.27e-68] | 1405.16*** [0] | 0.7081 | 0.009 |

*** indicates significant at1%, ** indicates significant at 5% and *indicates significant at 10%

**Table 3: Regression Analysis in case of NIFTY Financial Services**

| Sector: NIFTY Financial Services | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Predictor(s)** | **α** | **$\beta_1$** | **$\beta_2$** | **$\beta_3$** | **F** | **Adj. $R^2$** | **SE** |
| **MKT [Sig.]** | 0.0003 [0.1779] | 1.0215*** [0] | - | - | 4086.79 [0] | 0.7018 | 0.009 |
| **SMB [Sig.]** | 0.0007* [0.0607] | - | -0.0747 [0.2391] | - | 1.3865 [0.2391] | 0.0002 | 0.016 |
| **HML [Sig.]** | 0.0011*** [0.0016] | - | - | 0.7435*** [1.9e-104] | 541.36*** [1.9e-104] | 0.2374 | 0.014 |
| **MKT & SMB [Sig.]** | 0.0003 [0.1720] | 1.0213*** [0] | -0.0506 [0.1448] | - | 2045.79*** [0] | 0.7020 | 0.008 |
| **MKT & HML [Sig.]** | 0.0004** [0.0192] | 0.9294*** [0] | - | 0.3067*** [1.13e-48] | 2426.33*** [0] | 0.7364 | 0.008 |
| **SMB & HML [Sig.]** | 0.0011*** [0.0013] | - | -0.1905*** [0.0006] | 0.7532*** [1.2e-106] | 278.25*** [1.6e-105] | 0.2420 | 0.014 |
| **MKT, SMB & HML [Sig.]** | 0.0005** [0.0162] | 0.9270*** [0] | -0.1009*** [0.0020] | 0.3130*** [2.95e-50] | 1628.68*** [0] | 0.7377 | 0.008 |

*** indicates significant at1%, ** indicates significant at 5% and *indicates significant at 10%

**Table 4: Regression Analysis in case of NIFTY FMCG**

| Sector: NIFTY FMCG | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Predictor(s)** | **α** | **$\beta_1$** | **$\beta_2$** | **$\beta_3$** | **F** | **Adj. $R^2$** | **SE** |
| **MKT [Sig.]** | 0.0004* [0.0533] | 0.4819*** [4.2e-144] | - | - | 793.63*** [4.2e-144] | 0.3135 | 0.009 |
| **SMB [Sig.]** | 0.0006** [0.0183] | - | -0.0265 [0.5544] | - | 0.3495 [ 0.5544] | -0.0003 | 0.011 |
| **HML [Sig.]** | 0.0007** [0.0140] | - | - | 0.0606** [0.0189] | 5.52** [0.0189] | 0.0026 | 0.011 |
| **MKT & SMB [Sig.]** | 0.0044* [0.0528] | 0.4818*** [5.6e-144] | -0.0151 [0.6847] | - | 396.71*** [1.4e-144] | 0.3131 | 0.010 |
| **MKT & HML [Sig.]** | 0.0003 [0.1454] | 0.5399*** [2.3e-158] | - | -0.1939*** [2.85e-17] | 449.75*** [4.5e-158] | 0.3408 | 0.009 |
| **SMB & HML [Sig.]** | 0.0007** [0.0135] | - | -0.0361 [0.4220] | 0.0624** [0.0160] | 3.0821** [0.0461] | 0.0023 | 0.011 |
| **MKT, SMB & HML [Sig.]** | 0.0003*** [9.8e-157] | 0.5403*** [3.6e-158] | 0.0162 [0.6589] | -0.1941*** [2.87e-17] | 299.76*** [9.8e-157] | 0.3405 | 0.009 |

*** indicates significant at1%, ** indicates significant at 5% and *indicates significant at 10%

**Table 5: Regression Analysis in case of NIFTY IT**

| Sector: NIFTY IT | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Predictor(s)** | **α** | **$\beta_1$** | **$\beta_2$** | **$\beta_3$** | **F** | **Adj. $R^2$** | **SE** |
| **MKT [Sig.]** | 0.0006* [0.0528] | 0.6171*** [7e-147] | - | - | 812.31*** [7e-147] | 0.3185 | 0.012 |
| **SMB [Sig.]** | 0.0009** [0.0141] | - | -0.3390*** [2.17e-09] | - | 36.19*** [2.17e-09] | 0.019 | 0.014 |
| **HML [Sig.]** | 0.0008** [0.0190] | - | - | -0.0075 [0.8191] | 0.0523 [0.8191] | -0.0005 | 0.014 |
| **MKT & SMB [Sig.]** | 0.0006** [0.0403] | 0.6155*** [1.6e-149] | -0.3245*** [3.7e-12] | - | 441.88*** [8.1e-156] | 0.3368 | 0.012 |
| **MKT & HML [Sig.]** | 0.0004 [0.2038] | 0.7213 [0.6773] | - | -0.3465*** [9.9e-34] | 518.19*** [3.7e-177] | 0.3733 | 0.012 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **SMB & HML [Sig.]** | 0.0009** [ 0.0137] | - | -0.3405*** [2.15e-09] | 0.0099 [0.7622] | 18.1343*** [1.61e-08] | 0.0193 | 0.014 |
| **MKT, SMB & HML [Sig.]** | 0.004 [0.1626] | 0.7148*** [1.2e-178] | -0.2746*** [1.71e-09] | -0.3296*** [4.36e-31] | 364.79*** [1.3e-183] | 0.3860 | 0.011 |

*** indicates significant at1%, ** indicates significant at 5% and *indicates significant at 10%

**Table 6: - Regression Analysis in case of NIFTY Media**

| **Sector: NIFTY Media** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Predictor(s)** | **α** | **$\beta_1$** | **$\beta_2$** | **$\beta_3$** | **F** | **Adj. $R^2$** | **SE** |
| **MKT [Sig.]** | 0.0003 [0.3356] | 0.6642*** [ 2.6e-158] | - | - | 890.71*** [2.6e-158] | 0.3388 | 0.012 |
| **SMB [Sig.]** | 0.0005 [0.1332] | - | 0.4101*** [3.65e-12] | - | 48.99*** [3.65e-12] | 0.0269 | 0.015 |
| **HML [Sig.]** | 0.0008** [0.0217] | - | - | 0.4711*** [ 1.65e-45] | 212.57*** [1.65e-45] | 0.1086 | 0.014 |
| **MKT & SMB [Sig.]** | 0.0003 [0.3834] | 0.6663*** [5.2e-165] | 0.4259*** [ 4.85e-19] | - | 506.66*** [5.2e-174] | 0.3681 | 0.012 |
| **MKT & HML [Sig.]** | 0.0004 [0.1779] | 0.6085*** [5.4e-123] | - | 0.1850*** [5.8e-10] | 474.47*** [ 4.5e-165] | 0.3529 | 0.012 |
| **SMB & HML [Sig.]** | 0.0008** [0.0264] | - | 0.3404*** [1.23-09] | 0.4537*** [5.27e-43] | 127.17*** [2.9e-52] | 0.1269 | 0.014 |
| **MKT, SMB & HML [Sig.]** | 0.0004 [0.2240] | 0.6180*** [2.7e-130] | 0.4001*** [3.95e-17] | 0.1602** [5e-08] | 353.42*** [4.8e-179] | 0.3785 | 0.012 |

*** indicates significant at1%, ** indicates significant at 5% and *indicates significant at 10%

**Table 7: Regression Analysis in case of NIFTY Pharma**

| **Sector: NIFTY Pharma** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Predictor(s)** | **α** | **$\beta_1$** | **$\beta_2$** | **$\beta_3$** | **F** | **Adj. $R^2$** | **SE** |
| **MKT [Sig.]** | 0.0006*** [ 0.0080] | 0.46641*** [9.2e-141] | - | - | 771.33*** [9.2e-141] | 0.3073 | 0.009 |
| **SMB [Sig.]** | 0.0008*** [0.0036] | - | 0.2785*** [ 1.62e-10] | - | 41.3784*** [1.62e-10] | 0.0227 | 0.011 |
| **HML [Sig.]** | 0.0008*** [0.0031] | - | - | 0.0049 [0.8445] | 0.0384 [ 0.8445] | -0.0005 | 0.011 |
| **MKT & SMB [Sig.]** | 0.0006*** [ 0.0096] | 0.4679*** [9.1e-146] | 0.2895*** [1.1e-15] | - | 432.72*** [ 3.6e-153] | 0.3322 | 0.009 |
| **MKT & HML [Sig.]** | 0.0004** [0.0396] | 0.5414*** [ 5.6e-168] | - | -0.2495*** [3.85e-29] | 479.52*** [1.7e-166] | 0.3553 | 0.009 |
| **SMB & HML [Sig.]** | 0.0008*** [0.0038] | - | 0.2799*** [1.5e-10] | -0.0093*** [0.7096] | 20.7483*** [1.25e-09] | 0.0222 | 0.011 |
| **MKT, SMB & HML [Sig.]** | 0.0004* [0.0534] | 0.5493*** [8.8e-179] | 0.3330*** [1.39e-21] | -0.2702*** [5.31e-35] | 367.92*** [7.3e-185] | 0.3880 | 0.009 |

*** indicates significant at1%, ** indicates significant at 5% and *indicates significant at 10%

**Table 8: - Regression Analysis in case of NIFTY Private Bank**

| **Sector: NIFTY Private Bank** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Predictor(s)** | **α** | **$\beta_1$** | **$\beta_2$** | **$\beta_3$** | **F** | **Adj. $R^2$** | **SE** |
| **MKT [Sig.]** | 0.0006** [0.0218] | 1.0375*** [0] | - | - | 3196.71*** [ 0] | 0.6480 | 0.01 |
| **SMB [Sig.]** | 0.0001** [0.0143] | - | -0.0486 [0.4691] | - | 0.5244 [0.4691] | -0.0002 | 0.017 |

| Sector: NIFTY Private Bank | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Predictor(s)** | **α** | **$\beta_1$** | **$\beta_2$** | **$\beta_3$** | **F** | **Adj. $R^2$** | **SE** |
| **HML [Sig.]** | 0.0014*** [0.0002] | - | - | 0.7564*** [6.89e-96] | 490.327*** [6.89e-96] | 0.2199 | 0.015 |
| **MKT & SMB [Sig.]** | 0.0006** [0.0215] | 1.0374*** [0] | -0.0240 [ 0.5463] | - | 1597.95*** [0] | 0.6479 | 0.010 |
| **MKT & HML [Sig.]** | 0.0007*** [0.0014] | 0.9435*** [0] | - | 0.3130*** [2.6e-38] | 1847.44*** [0] | 0.6802 | 0.009 |
| **SMB & HML [Sig.]** | 0.0014*** [ 0.0002] | - | - 0.1662*** [ 0.0052] | 0.7648*** [2.03e-97] | 250.04*** [3.87e-96] | 0.2229 | 0.015 |
| **MKT, SMB & HML [Sig.]** | 0.0008*** [0.0012] | 0.9417*** [0] | - 0.07512** [0.04892] | 0.3177*** [4.6e-39] | 1234.97*** [0] | 0.6808 | 0.001 |

*** indicates significant at1%, ** indicates significant at 5% and *indicates significant at 10%

**Table 9: - Regression Analysis in case of NIFTY PSU Bank**

| Sector: NIFTY PSU Bank | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Predictor(s)** | **α** | **$\beta_1$** | **$\beta_2$** | **$\beta_3$** | **F** | **Adj. $R^2$** | **SE** |
| **MKT [Sig.]** | -0.0002 [0.6348] | 1.0209*** [2.1e-228] | - | - | 1427.14*** [2.1e-228] | 0.4510 | 0.015 |
| **SMB [Sig.]** | 0.0002 [ 0.6189] | - | 0.3624*** [4.4e-06] | - | 21.21*** [4.41e-06] | 0.0115 | 0.020 |
| **HML [Sig.]** | 0.0008** [0.0378] | - | - | 1.1492*** [8.7e-174] | 1000.66*** [8.7e-174] | 0.3654 | 0.016 |
| **MKT & SMB [Sig.]** | -0.0002 [0.5724] | 1.023*** [2.9e-233] | 0.3867*** [3.3e-11] | - | 753.77*** [2.7e-236] | 0.4645 | 0.015 |
| **MKT & HML [Sig.]** | 0.0003 [0.3423] | 0.7866*** [6.7e-172] | - | 0.7796*** [2.8e-117] | 1278.29*** [0] | 0.5954 | 0.013 |
| **SMB & HML [Sig.]** | 0.0008** [ 0.0420] | - | 0.1873*** [ 0.0031] | 1.140*** [ 5.2e-171] | 506.98*** [4.3e-174] | 0.3683 | 0.016 |
| **MKT, SMB & HML [Sig.]** | 0.0003 [0.3905] | 0.7928*** [7.5e-176] | 0.2640*** [1.65e-07] | 0.7632*** [1.3e-113] | 874.49*** [0] | 0.6015 | 0.013 |

*** indicates significant at1%, ** indicates significant at 5% and *indicates significant at 10%

**Table 10: - Regression Analysis in case of NIFTY Realty**

| Sector: NIFTY Realty | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Predictor(s)** | **α** | **$\beta_1$** | **$\beta_2$** | **$\beta_3$** | **F** | **Adj. $R^2$** | **SE** |
| **MKT [Sig.]** | -0.0006 [0.2029] | 1.29*** [2.4e-235] | - | - | 1485.77*** [2.4e-235] | 0.4609 | 0.02 |
| **SMB [Sig.]** | -7.7e-5*** [0.8971] | - | 0.8441*** [8.02e-18] | - | 75.57*** [8.02e-18] | 0.0411 | 0.02 |
| **HML [Sig.]** | 0.0006 [0.2643] | - | - | 1.2628*** [1.2e-126] | 679.38*** [1.2e-126] | 0.2809 | 0.02 |
| **MKT & SMB [Sig.]** | -0.0006 [0.1372] | 1.2974*** [7.1e-252] | 0.8748*** [1.27e-34] | - | 888.56*** [2.3e-266] | 0.5055 | 0.01 |
| **MKT & HML [Sig.]** | -0.0001 [0.7808] | 1.0637*** [4.7e-178] | - | 0.7628*** [2.3e-69] | 1057.49*** [5.7e-301] | 0.5489 | 0.02 |
| **SMB & HML [Sig.]** | 0.0005 [0.3133] | - | 0.6552*** [5.01e-15] | 1.23*** [7.8e-124] | 382.89*** [1.9e-138] | 0.3055 | 0.02 |
| **MKT, SMB & HML [Sig.]** | -0.0002 [0.6108] | 1.082*** [1e-193] | 0.7597*** [6.17e-31] | 0.7156*** [1.13e-65] | 807.51*** [0] | 0.5822 | 0.16 |

*** indicates significant at1%, ** indicates significant at 5% and *indicates significant at 10%

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