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Role of leverage and liquidity risk in asset pricing: evidence from Indian stock market

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Received 22 August 2020
Revised 2 November 2020
20 December 2020
13 February 2021
Accepted 27 March 2021

Abstract

Purpose – Asset pricing revolves around the core aspects of risk and expected return. The main objective of the study is to test different asset pricing models for the Indian securities market. This paper aims to analyse whether leverage and liquidity augmented five-factor model performs better than Capital Asset Pricing Model (CAPM), Fama and French three-factor model, leverage augmented four-factor model and liquidity augmented four-factor model.

Design/methodology/approach – The data for the current study comprises records on prices of securities that are part of the Nifty 500 index for a time frame of 14 years, that is, from October 2004 to September 2017 consisting of 183 companies using time series regression.

Findings – The results indicate that the five-factor model performs better than CAPM and the three-factor model. The model outperforms leverage augmented and liquidity augmented four-factor models. The empirical evidence shows that the five-factor model has the highest explanatory power among the entire asset pricing models considered.

Practical implications – The present study bears certain useful implications for various stakeholders including fund managers, investors and academicians.

Originality/value – This study presents a five-factor model containing two additional factors, that is, leverage and liquidity risk along with the Fama-French three-factor model. These factors are expected to give more value to the model in comparison to the Fama-French three-factor model.

Keywords Capital asset pricing model, Fama-French three-factor model, Leverage, Liquidity, Indian stock market

Paper type Research paper

1. Introduction

The capital markets around the world have witnessed key changes over the past few decades (Christensen *et al.*, 2016; Rethel, 2018). This has led to the evolvement of research about various dimensions of markets. One such central area of research pertains to asset pricing. The concept of asset pricing deals with the prices of assets and based on this, investment and valuation decisions are made. The Capital Asset Pricing Model (CAPM) was

Vilakshan - XIMB Journal of Management
Vol. 19 No. 2, 2022
pp. 128-141
Emerald Publishing Limited
0973-1954
DOI 10.1108/XJM-08-2020-0088

developed by William Sharpe (1964) and by John Lintner (1965) who originated and established the asset pricing theory. But this theory in itself is not self-reliant and has numerous flaws. The limitations of CAPM model lead to further development of multi-factor theories. Various studies based on the Fama-French three-factor model shows that in some cases the Fama-French model is not appropriate and thus an alternate model should be developed to explain the cross-section of expected returns on stocks. The topic of asset pricing has been continuously evolving, and many researchers are trying to find the key factors that impact asset pricing (Merton, 1973; Rubio, 1988; Pástor, 2000; Fama and French, 2015). To study risk–return relationship, many factors evolved over the time and still many variables are yet to be identified.

This study analyses various asset pricing models for the Indian companies and embrace leverage and liquidity risk as additional risk factors in asset pricing models and studies the expanded version of the Fama-French three-factor model as a leverage augmented four-factor model, liquidity augmented four-factor model and leverage and liquidity augmented five-factor model in providing excess returns in the Indian Capital Market.

The variables such as "leverage" and "liquidity risk" are supposed to be of utmost importance in the financial markets. Leverage ratio describes the funding of a firm's activity by creditor's fund versus owner's fund. Modigliani and Miller (1958) proposed that with an increase in financial leverage in the capital structure, the expected return on equity should increase. Despite its centrality in finance, the relationship between leverage and returns has not been extensively researched and empirical findings on this issue have been mixed and sometimes contradictive. This study embraces leverage as an additional risk factor in an asset pricing model and studies the expanded version of the Fama-French three-factor model to analyse the role of leverage in providing excess returns in the Indian Capital Market.

Liquidity represents the ability to trade large quantities at low cost with minimal price impact. As every investor is concerned about the liquidity of his investment, therefore it should be considered as one of the most critical factors in explaining the cross-section of stock returns. Studies such as Amihud and Mendelson (1986), Lu and Hwang (2007), Sehgal (2012, 2014) and Amanda and Husodo (2014) show that it is important to measure liquidity separately.

Thus, the above explanation shows that both leverage and liquidity have a critical role in explaining the expected stock returns.

The rest of the paper is organised as follows. Section 2 presents the literature review; Section 3 describes the data and sample, the operationalization of variables, the construction of portfolios and the research methodology deployed. Section 4 reports the empirical results and their interpretations. Finally, Section 5 concludes the paper.

2. Review of literature

A plethora of evidence in the literature explains asset pricing models in India and abroad.

Connor and Korajczyk (1995) suggested that with the understanding of the relation between risk and return, more work is required in the area of asset pricing theory, econometrics and macroeconomics. Mackinlay (1995) suggested that the deviations from CAPM due to lack of appropriate risk factors will be quite challenging to identify empirically but the non-risk based sources are easy to identify. Driessen (2003) studied a broad spectrum of the models which are used in the pricing of assets and found that the model with two or three-factor signifies better results for sample prediction than the single-factor model. Manjunatha and Mallikarjunappa (2011) concluded that the combination of market and company factors together is important to understand asset pricing in the Indian stock market. Sehgal and Balakrishnan (2013) found that the three-factor model of

Fama-French described the returns on company characteristics sorted portfolios better than the single factor CAPM. Balakrishnan (2014) found that the three factors of Fama-French performed better in explaining average returns as compared to the single factor CAPM. Das (2015) showed that the size of the firm and the value factor played a major role in explaining the stock returns in India. Sreenu (2018) found that the Fama-French three-factor model provides a better explanation as compared to the CAPM for the risk-return variations in the Indian capital market.

Many previous studies (Basu, 1977; Banz, 1981; Stoll and Whaley, 1983 and Reinganum, 1981) came out with the view that increase in the debt of a company increases the risk of the equity shareholders. They found a significant positive relationship between the expected returns and the debt–equity ratio. Bhandari (1988) revealed that the cross-section of average stock returns provide better results when leverage was included as one of the factors. Gulnur Muradoglu and Sivaprasad's (2013) findings indicated that the variations in stock returns are better explained with the help of leverage mimicking portfolios as compared to the other asset pricing models. Koseoglu (2013) revealed that the leverage mimicking factor increased the descriptive ability of the model by providing a good description for cross-sectional variations of stock returns in Istanbul Stock Exchange as compared to the Fama-French three-factor model. Boubaker *et al.* (2018) found that leverage risk premium was positive for firms with high leverage. Maiti and Balakrishnan (2020) indicated that a substantial portion of stock returns are explained by debt to equity ratio which is a leverage-based risk factor. The results showed that the debt to equity ratio could explain more of the cross-section of stock returns than the size and value factors alone.

The relation between stock returns and liquidity has drawn the attention of academicians, researchers, regulatory bodies and investors. Pástor and Stambaugh (2003) concluded that there exists a significant positive relationship between stock returns and market liquidity. Acharya and Pedersen (2005) found that liquidity-adjusted CAPM performed better than standard CAPM. Liu (2006) showed that liquidity is a major source of priced risk and concluded that the two-factor model reports for the book-to-market effect, which the Fama-French three-factor model was unable to explain. Sehgal (2014) concluded that the four-factor liquidity augmented FFM proved to describe the asset pricing better as compared to the one factor CAPM and the three-factor model of Fama-French in India. Altay and Çalgıcı (2019) showed that asset return has a significant effect on the market liquidity.

Research Hypothesis

The following alternate hypotheses have been tested in the current study:

H1. *Ceteris paribus*, there exists a significant size premium in the Indian stock markets.

H2. *Ceteris paribus*, there exists a significant value premium in the Indian stock markets.

H3. *Ceteris paribus*, there exists a significant leverage premium in the Indian stock markets.

H4. *Ceteris paribus*, there exists a significant liquidity premium in the Indian stock markets.

3. Data and methodology

3.1 Sample selection and sources

The companies that were part of the Nifty 500 index as on 31 March 2017 have been considered in the sample. Data for 91-Days Treasury bills have been collected from the website of Reserve Bank of India. The data for the prices of the securities and the companies' financials has been collected from the PROWESS database. The data has been collected for a time frame of 14 years, that is, from October 2004 to September 2017. As already stated, the main objective of the study is to test several assets pricing models for the Indian securities markets. Specifically, the study aims to test the CAPM, the three-factor model, the liquidity and leverage augmented four-factor model and the five-factor model.

The initial data has been subjected to various kinds of filters. The companies operating in the banking and financial services sector have been removed. The companies that had negative book-to-market ratios (BTMRs) have been deleted. Besides, the company that had missing observations for any of the four variables – size, book-to-market, liquidity and leverage have been deleted. The filtering process has yielded a final sample consisting of 183 companies that have been used for the analysis purpose (Table 1).

The table shows that the final sample consists of 183 companies. These companies operate in different industries and segments. The table also shows that (except for the banking and financial services) the composition of the sample is quite similar to that of the NIFTY-500 index. Thus, the sample selected is appropriate and represents the overall market.

Table 2 reports the descriptive statistics for the final sample consisting of 183 companies over the entire time frame. The table shows that the variables selected display huge variations in terms of mean, median, maximum, and minimum values. The mean market capitalization of all the selected companies is around INR 161.6bn. Similarly, the median value of the market capitalization is around INR 37.4bn. In terms of the BTMR, the average value is around 0.56 implying that the market values the stocks almost twice its book value. The average leverage is around 0.70 implying that debt is around 70% of total equity. In other words out of the total capital around 41% (70/170) comprises the debt portion and remaining 59% comprises the equity portion. The variable liquidity also shows great variations in terms of the mean and median values.

Value	Count	(%)	Cumulative count	Cumulative (%)
Automobile	13	7.07	13	7.07
Chemicals and Pharmaceuticals	37	20.11	50	27.17
Construction Materials	12	6.52	62	33.7
Construction Services	8	4.35	70	38.04
Diversified	6	3.26	76	41.3
Electrical and Electronics	9	4.89	85	46.2
Energy	11	5.98	96	52.17
FMCG	4	2.17	100	54.35
Food Processing	13	7.07	113	61.41
Healthcare	1	0.54	114	61.96
Hospitality and Tourism	3	1.63	117	63.59
IT and Software	14	8.15	131	71.74
Machinery Manufacturing	13	7.07	144	78.8
Media and Entertainment	1	0.54	145	79.35
Metal and Metal Products	9	4.89	154	84.24
Miscellaneous	9	4.89	163	89.13
Printing and Stationary	2	1.09	165	90.22
Textile	7	3.8	172	94.02
Trade	8	4.35	180	98.37
Transport and Logistics	3	1.63	183	100
Total	183	100	183	100

Table 1. Industrial composition of NIFTY-500

3.2 Variables and its operationalization

To tests these models, certain variables are required to be formed which are as follows:

- Firm Size (SIZE): Market capitalization is estimated as the product of market price per share and the number of shares outstanding as on 30 September of each year.

This measure of size has been widely deployed in the past studies (Gaunt, 2004; Singh and Yadav, 2015; Fama and French, 2017):

- Book-to-market ratio (BTMR): It has been operationalized as the ratio of book value per share to market value per share. The ratio is calculated as on 31 March of each year.

This measure of BTMR has been widely deployed in many past studies (Maroney and Protopapadakis, 2002; Gaunt, 2004; Sanusi and Ahmad, 2016):

- Leverage: The ratio of total debt to total equity of a firm has been utilized as the proxy for leverage which is calculated as on 31 March of every year.

This measure of size has been widely deployed in the past studies (Mendoza and Smith, 2006; Aragon, 2007; Bathia and Bredin, 2018):

- Liquidity: It is the average of the ratio of volume and the absolute measure of return "$|R_t|$" for a particular stock. The average is calculated for all the days in which the return is non-zero.

The measure has also been deployed in the literature by several researchers (Goyenko *et al.*, 2009; Marshall *et al.*, 2011).

The sorting is done in September of each year "t" and the portfolios are formed. These portfolios have a holding period of one year, that is, from the year "t" to year "t + 1". The monthly equally weighted returns are calculated for all the portfolios for all the 12 months in a particular year. This provides a monthly time-series consisting of 168 observations (14 years × 12 months) for each portfolio.

The fiscal year ends in March of each year. However, the portfolios are formed six months later, that is, September of each year. Thus, there is a time-lag of six months between the fiscal year-end and the formation of the portfolios. This is a commonly adopted procedure in the asset pricing literature (Miffre and Rallis, 2007; Singh and Yadav, 2015; Maheshwari and Dhankar, 2017). This is generally done because the companies usually take around six months to publish their audited annual statements. Thus, it is assumed that the audited financial figures become public only by September of each year.

Table 2.
Descriptive statistics for the final sample

	MCAP	BTMR	LEVER	LIQUID
Mean	161630.40	0.56	0.70	158,000,000
Median	37388.49	0.37	0.36	34,816,566
Maximum	4945089.00	6.59	58.75	4,960,000,000
Minimum	294.49	0.02	0.00	160,429
Std. Dev.	389569.20	0.58	1.79	343,000,000
Observations	2,562	2,562	2,562	2,562

Note: The figures for market capitalization (MCAP) are in INR million

3.3 Regression models

CAPM:

$$R_{pt} - RFREE_t = \alpha + \beta_p(MREt_t - RFREE_t) + e_t$$

Fama-French three-factor model:

$$R_{pt} - RFREE_t = \alpha + \beta_p(MREt_t - RFREE_t) + \beta_s SMB_t + \beta_v HML_t + e_t$$

Liquidity augmented four-factor model:

$$R_{pt} - RFREE_t = \alpha + \beta_p(MREt_t - RFREE_t) + \beta_s SMB_t + \beta_v HML_t + \beta_Q GMF_t + e_t$$

Leverage augmented four-factor model:

$$R_{pt} - RFREE_t = \alpha + \beta_p(MREt_t - RFREE_t) + \beta_s SMB_t + \beta_v HML_t + \beta_L DME_t + e_t$$

Leverage and liquidity augmented five-factor model:

$$R_{pt} - RFREE_t = \alpha + \beta_p(MREt_t - RFREE_t) + \beta_s SMB_t + \beta_v HML_t + \beta_Q GMF_t + \beta_L DME_t + e_t$$

3.4 Variables and definition

Below given Table 3 describes the various factors used in the study.

3.5 Construction of portfolios

First, all the firms have been sorted according to the variables SIZE, BTM, LEVER and LIQUID. After sorting the companies according to these variables, the companies have been classified into five portfolios. The smallest 20% of the companies are categorized as those belonging to the first portfolio (P1); similarly, the next 20% of the companies are categorized as those belonging to the second portfolio (P2) and so on for all the companies. Thus, 5 portfolios (P1 to P5) have been obtained based on the variable SIZE. A similar process has

Factor	Operationalization
$E(R_t)$	Expected Return on Portfolio or Security at time t
$REFREE$	Risk free rate of return
$MRET_t$	Return on Market Portfolio
SMB_t	Small Minus Big
HML_t	High Minus Low
GMF_t	Gentle Minus Fast
DME_t	Debt Minus Equity
α	Regression Coefficient – Intercept Term
$\beta_p, \beta_s, \beta_v, \beta_Q, \beta_L$	Regression Coefficients – Partial Slope Terms
e_t	Residual Error Term

Table 3. Description of the variables

been deployed for the other variables. Thus, 5 portfolios are obtained for each of the variables SIZE, BTM, LEVER and LIQUID.

The double sorting procedure comprises sorting the portfolio first based on two variables. All the companies are then segregated into two groups, that is, small-sized companies and large-sized companies. This classification is done based on the median value of the size. Further, the companies that have been classified as small-sized companies have again been sorted based on BTMR from smallest to largest. These companies are then categorized into three portfolios based on the 30–40-30 principle. This process is again repeated for the companies that have been classified into the big category. Thus this process yields a total of six portfolios SL, SN, SH, BL, BN and BH. Similarly, the size-liquidity sorting yields six more portfolios SG (Small-Gentle), SN (Small-Neutral), SF (Small-Fast), BG (Big-Gentle), BN (Big-Neutral) and BF (Big-Fast). Finally, the size-leverage sorting also yields six portfolios following the same process.

3.6 Factor and their operationalization

Table 4 describes the various calculations undertaken for the variables used in this study.

4. Results

4.1 Mean excess return on different portfolios

Table 5 reports the mean of excess returns generated by various portfolios constructed based on single sorting principle.

Table 4. Calculation of the factors

Factor	Operationalization
SMB_{BTM}	$\frac{(SH+SN+SL)}{3}-\frac{(BH+BN+BL)}{3}$
SMB_{LIQUID}	$\frac{(SG+SN+SF)}{3}-\frac{(BG+BN+BF)}{3}$
SMB_{LEVER}	$\frac{(SD+SN+SE)}{3}-\frac{(BD+BN+BE)}{3}$
SMB_t	$\frac{(SMB_{BTM}+SMB_{LIQUID}+SMB_{LEVER})}{3}$
HML_t	$\frac{(SH+BH)}{2}-\frac{(SL+BL)}{2}$
GMF_t	$\frac{(SG+BG)}{2}-\frac{(SF+BF)}{2}$
DME_t	$\frac{(SD+BD)}{2}-\frac{(SE+BE)}{2}$

Table 5. Mean excess return on different portfolios

	Size	BTM	LEVER	LIQUID
P1	0.0079	−0.0027	0.0008	0.0049
P2	0.0003	−0.0029	−0.0015	0.0014
P3	−0.0015	−0.0042	−0.0023	−0.0021
P4	−0.0031	0.0000	−0.0010	−0.0028
P5	−0.0078	0.0057	−0.0001	−0.0055

The results show certain patterns in the returns being generated. It is observed that the average excess returns decrease monotonously as the size of the companies increases. This is in line with the established theory that the returns of small-sized companies' stocks are higher than those of large-sized companies' stocks. The results further show that the returns increase monotonously as the BTM ratio increases. This again is in line with the established understanding the returns of low-value stocks (that is companies with lower BTMRs) are generally lower than the returns of the high-value stocks (that is companies with higher BTMRs). Similarly, for the leverage-based portfolios, it is observed that the companies with low debt to equity ratios are generating higher excess returns. Finally, the returns of low liquidity stocks are higher than the returns of the high liquidity stocks.

4.2 Results of hierarchical linear regression

Table 6 reports the results of the hierarchical linear regression model. It compares four different models, namely, the CAPM, the three-factor model, the leverage augmented four-factor model (four-factor model with DME) and the five-factor model.

The table presents certain interesting findings. The first among them pertains to the variable size. The results show that there is a significant increase in adjusted R-square as we move from CAPM to the three-factor model. This indicates that the three-factor model is better able to explain the return behaviour of the size-based portfolios. These results strongly support the findings of some of the major past studies (Bahl, 2006; Tripathi, 2008).

Model	SIZE	Sig. F Change	BTM	Sig. F Change	LEVER	Sig. F Change	LIQUID	Sig. F Change
Portfolio-P1								
CAPM	0.699	0.000	0.802	0.000	0.797	0.000	0.709	0.000
Three Factor	0.905	0.000	0.849	0.000	0.827	0.000	0.826	0.000
Four Factor –DME	0.906	0.274	0.850	0.233	0.858	0.000	0.826	0.263
Five Factor	0.910	0.004	0.865	0.000	0.860	0.062	0.906	0.000
Portfolio-P2								
CAPM	0.758	0.000	0.834	0.000	0.790	0.000	0.738	0.000
Three Factor	0.898	0.000	0.850	0.000	0.824	0.000	0.844	0.000
Four Factor –DME	0.898	0.316	0.849	0.861	0.827	0.063	0.846	0.061
Five Factor	0.901	0.034	0.851	0.076	0.845	0.000	0.872	0.000
Portfolio-P3								
CAPM	0.824	0.000	0.743	0.000	0.841	0.000	0.790	0.000
Three Factor	0.848	0.000	0.806	0.000	0.875	0.000	0.831	0.000
Four Factor –DME	0.850	0.064	0.805	0.745	0.874	0.561	0.833	0.122
Five Factor	0.861	0.000	0.817	0.001	0.876	0.082	0.837	0.030
Portfolio-P4								
CAPM	0.828	0.000	0.820	0.000	0.813	0.000	0.880	0.000
Three Factor	0.829	0.271	0.893	0.000	0.867	0.000	0.903	0.000
Four Factor – DME	0.833	0.031	0.897	0.010	0.881	0.000	0.905	0.046
Five Factor	0.853	0.000	0.899	0.032	0.884	0.017	0.905	0.594
Portfolio-P5								
CAPM	0.885	0.000	0.768	0.000	0.812	0.000	0.901	0.000
Three Factor	0.888	0.034	0.940	0.000	0.893	0.000	0.908	0.001
Four Factor –DME	0.888	0.266	0.941	0.116	0.918	0.000	0.908	0.213
Five Factor	0.888	0.406	0.941	0.122	0.921	0.004	0.922	0.000

Table 6. Comparison of models

However, as we move from three-factor to four-factor model the adjusted R-square does not increase significantly for a majority of the portfolios. This shows that the fourth factor, which is leverage (DME) in the current case, is not adding significant value to the size-based portfolios. Finally, as we progress from the four-factor model to the five-factor model the change in adjusted R-square is significant for a majority of the portfolios. This shows that the five-factor model, among all the models tested currently, is best able to capture the asset pricing of the size-based portfolio. The results for the BTM-based portfolios are qualitatively similar to those obtained for the SIZE-sorted portfolios. This further reinforces the point that the five-factor model is superior to other models in explaining the behaviour of the return of Indian stocks.

The next set of results pertains to the portfolios sorted based on the variables leverage (LEVER) and liquidity (LIQUID). The results for the variable leverage (LEVER) show that there is a consistent and significant increase in the adjusted R-square as we move from the CAPM to the higher factor models. This shows that the additional factors are improving the prediction power of the returns obtained on different portfolios. These results support the findings of some of the major studies which contend that adding leverage as a variable increases the prediction ability of the asset pricing models (Chou *et al.*, 2010; Boubaker *et al.*, 2018).

Below given Table 7 reports the results of the hierarchical linear regression model. The table has similar analysis as has been performed earlier. The difference here is that the four-factor model has the variable liquidity (GMF) in place of leverage (DME).

Model	SIZE	Sig. F Change	BTM	Sig. F Change	LEVER	Sig. F Change	LIQUID	Sig. F Change
Portfolio-P1								
CAPM	0.699	0.000	0.802	0.000	0.797	0.000	0.709	0.000
Three Factor	0.905	0.000	0.849	0.000	0.827	0.000	0.826	0.000
Four Factor – GMF	0.909	0.008	0.863	0.000	0.833	0.010	0.906	0.000
Five Factor	0.910	0.117	0.865	0.052	0.860	0.000	0.906	0.698
Portfolio-P2								
CAPM	0.758	0.000	0.834	0.000	0.790	0.000	0.738	0.000
Three Factor	0.898	0.000	0.850	0.000	0.824	0.000	0.844	0.000
Four Factor – GMF	0.900	0.054	0.851	0.084	0.845	0.000	0.866	0.000
Five Factor	0.901	0.180	0.851	0.645	0.845	0.223	0.872	0.003
Portfolio-P3								
CAPM	0.824	0.000	0.743	0.000	0.841	0.000	0.790	0.000
Three Factor	0.848	0.000	0.806	0.000	0.875	0.000	0.831	0.000
Four Factor – GMF	0.856	0.001	0.817	0.001	0.876	0.104	0.834	0.061
Five Factor	0.861	0.014	0.817	0.382	0.876	0.391	0.837	0.059
Portfolio-P4								
CAPM	0.828	0.000	0.820	0.000	0.813	0.000	0.880	0.000
Three Factor	0.829	0.271	0.893	0.000	0.867	0.000	0.903	0.000
Four Factor – GMF	0.846	0.000	0.894	0.097	0.868	0.131	0.903	0.400
Five Factor	0.853	0.002	0.899	0.004	0.884	0.000	0.905	0.060
Portfolio-P5								
CAPM	0.885	0.000	0.768	0.000	0.812	0.000	0.901	0.000
Three Factor	0.888	0.034	0.940	0.000	0.893	0.000	0.908	0.001
Four Factor – GMF	0.888	0.522	0.940	0.207	0.894	0.138	0.922	0.000
Five Factor	0.888	0.218	0.941	0.071	0.921	0.000	0.922	0.642

Table 7.
Comparison of models

There are certain noteworthy findings. To begin with, for the variable SIZE, it is clear that the change in adjusted R-square is significant only up to the four-factor model. However, the change in adjusted R-square, by adding the fifth factor, is not significant for the majority of the portfolios. This indicates that the variable liquidity (GMF) is better able to explain the assets pricing behaviour as compared to the variable leverage (DME). These results support the findings of some of the major studies which argue that liquidity is a major factor that determines the asset pricing of various stocks (Chan and Faff, 2005; Liu, 2006; Altay and Çalgıcı, 2019).

The results for the BTM-sorted portfolios are also similar with the only difference being that the change in adjusted R-square, due to the five-factor model, is significant in three out of five cases. This indicates that for the BTM-sorted portfolios the five-factor model is performing better than the rest of the models.

The next set of results pertains to the portfolios sorted based on the variables leverage (LEVER). These results show that the change in adjusted R-square, due to the four-factor model, is significant only for two portfolios. Similarly, the change in adjusted *R*-square brought by the fifth factor is significant for three out of five portfolios. This shows that the explanatory power of four and five-factor model for the variable leverage (LEVER) is quite limited. The table finally shows the results for the variable liquidity (LIQUID). In this case, it is quite clear that the change in adjusted R-square, due to the addition of the fourth and fifth factors, is significant for the majority of the portfolios. This shows that four- and five-factor models perform better than the rest of the models for the liquidity-sorted portfolios.

5. Conclusion

The study analyzes various asset pricing models for the Indian companies, that is, the objective is to analyze whether the leverage and liquidity augmented the five-factor model is superior to the CAPM, the three-factor model, the leverage augmented four-factor model and the liquidity augmented four-factor model.

Data of Nifty 500 companies for a period of 14 years, that is, from October 2004 to September 2017 has been used in the study. The simple OLS regression and the hierarchical linear regression methodologies were utilized for empirical estimations. The analysis has been performed on monthly portfolios created based on various parameters. Specifically, four variables including firms' size (SIZE), value (BTM), leverage (LEVER) and liquidity (LIQUID) have been utilized to construct the portfolios.

The results indicate that the three-factor model performs better than CAPM for all the portfolios. The results depict that the leverage augmented four-factor model performs better than CAPM for all the portfolios. However, the model outperforms the three-factor model for 7 out of 20 portfolios which shows that the four-factor model has some explanatory power. However, it is not the best model. The results show that the liquidity augmented four-factor model performs better than CAPM for all the portfolios. However, the model outperforms the three-factor model for 13 out of 20 portfolios. This indicates that the liquidity augmented four-factor model has very good explanatory power. Hence, liquidity augmented four-factor model should be preferred over CAPM and the three-factor model to explain the asset pricing behaviour of Indian companies. Finally, the results indicate that the five-factor model performs better than CAPM and the three-factor model for the majority of the portfolios. The model outperforms the leverage augmented four-factor model for 17 out of 20 portfolios. The model also outperforms the liquidity augmented four-factor model for 11 out of 20 portfolios. This clearly shows that the five-factor model has the maximum descriptive power among all the asset pricing models considered. The results indicated that the factors, including size, value, leverage and liquidity can explain the variations in the return behaviour of Indian stocks.

The present study has made an in-depth attempt to analyse different asset pricing model for the Indian stock markets. However, the key limitation of the current study is that the analysis has been performed only for the Indian markets. Much more useful insights can be obtained from analysing the asset pricing behaviour in other countries. Another limitation of the study is in terms of variables selected for construction of the portfolios. Other factors can be considered for the creation of portfolios and analysis of asset pricing behaviour.

The prime rationale for setting such an objective is that asset pricing is an important phenomenon that is of interest to different stakeholders. The practical implications of the analysis show that the individual investors are interested in finding out the key factors that guide the price movement of individual stocks and portfolios. Similarly, fund managers are interested in the formation of the optimal portfolios that will maximize the wealth of the investors in the long-run. Moreover, market regulators are interested in ensuring market efficiency to increase the overall trust of the participants. Finally, the results should act as the starting point for academicians and researchers to pursue further research in this topic.

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