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Security Returns and Idiosyncratic Volatility in the Indian Stock Market

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Abstract
The study explores the possibility of rewards for holding undiversified portfolios by investors and examines the impacts of idiosyncratic volatility on expected cross-sectional returns for the Indian stock market. For the analysis, the study utilized the constituent companies of the BSE S&P 500 index as a sample for the period starting from July 2014 to June 2019. The study employed Fama and MacBeth's (1973) two-step cross-sectional regression to assess the impact of the idiosyncratic volatility. The findings reveal a significant negative association between idiosyncratic volatility and returns of the security. Particularly, the size-based sample results show a negative relationship of idiosyncratic volatility on security returns for medium and large-sized securities. Hence, the findings confirm the existence of the idiosyncratic volatility anomaly in the stock market of India and adding stocks to the portfolios may not increase the expected returns for investors.

Keywords- Stock returns, Idiosyncratic volatility, Value premium, Size effect.

1. Introduction

The idiosyncratic or unsystematic risk is the risk specific to investing in a particular security and inherent in any individual company or investment. It arises because every company has unique strengths and weaknesses, competitive landscape, management style, and external threats. The modern portfolio theory (MPT) advocates that the idiosyncratic risk can be substantially mitigated or eliminated in a portfolio by including inversely correlated stocks in the portfolio (Markowitz, 1952). By extending the views of MPT, the CAPM (capital asset pricing model) was established. It states that in a perfect frictionless market, all the investors hold the market portfolio at the equilibrium. Under such a situation, the unsystematic risks are not priced, and the investor is rewarded for market fluctuations only. Hence, the investors are entitled to receive returns for bearing the systematic risks.

It also advocates that the risk-return trade-off should be the same in one period as investors seeking returns for taking risks in the concurrent period. However, market imperfections, unrealistic assumptions of the CAPM model, and diverse risk classes of assets restrain investors from holding diversified portfolios. Therefore, the unsystematic risks should be priced, and if idiosyncratic volatility is utilized as the substitute for idiosyncratic risk, there should be a positive association between security returns and volatility (Bali and Cakici, 2008; Fu, 2009; Tinic and West, 1986).

Empirically, in a major study based on 62,000 households during the period 1991 to 1996, Goetzmann and Kumar (2004) observed that more than 25 per cent of the investors held a single security in their portfolios. Likewise, more than half of the investors did not hold more than three securities, and less than 10 percent of investors did not hold more than 10 securities in their portfolio. Therefore, investors having imperfectly diversified portfolios sought a reward for taking the idiosyncratic volatility risk. The findings concluded that the unsystematic risk is directly correlated with expected returns (Barberis et al., 2001; Lintner, 1965; Levy, 1978; Lehmann, 1990; Merton, 1987). Contrarily, Ang et al. (2006) showed a negative association between security return and one-month lagged idiosyncratic volatility. However, Fu (2009) interrogated the previous volatility as a determinant of security's unsystematic returns and exposed that lagged idiosyncratic volatility is not an appropriate alternative for expected idiosyncratic risk.

The inclusiveness of the studies is observed globally, for instance, the study reported the robustness of the results in G7 countries. Few notable studies have also documented that idiosyncratic volatility has a positive association with security return and estimated idiosyncratic volatility by using the EGARCH method (Brockman et al., 2022; Chua et al., 2006; Fu, 2009). Lee and Mauck (2016) examined three aspects of the relationship between dividend initiation and idiosyncratic volatility and increased announcements and idiosyncratic volatility in the companies listed in the U.S. for the period 1963-2013. The findings advocated that firms with high idiosyncratic volatility are associated with increased dividends and higher abnormal returns.

Several research studies in India have also reported the presence of prominent market anomalies such as the size, value, profitability, investment, and momentum (Balakrishnan, 2014; Sehgal and Balakrishnan, 2013; Singh and Yadav, 2015; Pandey and Sehgal, 2016). However, only a handful of studies have revealed the association between security return and idiosyncratic volatility risk.

Considering the inconclusive studies in the literature, this piece of work examines whether investors who are under-diversified should be rewarded for taking idiosyncratic risks. Therefore, the current study explores the impact of idiosyncratic volatility on expected security returns and whether this idiosyncratic effect is persistent through all sized securities or limited to a specific group. Thus, India is a good choice for studying the above issue with new data and a strong methodology.

The remaining study is planned as: Section 2 discusses the related literature and research gap, and Section 3 discusses the research methodology, data and variables used to conduct the study. Section 4 embarks on the empirical analysis and in the last Section 5 concludes the study.

2. Literature Review

The MPT advocates that investors should be rewarded to bear the market risk only because the idiosyncratic may be diversified by including the securities in the portfolio having inverse correlation among them. In the literature theoretical and empirical finance have produced enormous studies to test the applicability of MPT, however, no consensus has been reached.

The differences of opinions were named as anomalies or puzzles in the asset pricing literature. For instance, small firms, are observed to carry more risk because of the vulnerability of revenue, technology, manpower, and financial costs, hence generating excess returns in the long run in comparison to large firms. This phenomenon explains the size anomalies. The size effect is heterogeneously distributed and found to be more pronounced in the first quartile of the portfolio i.e., amongst the micro firms (Fama and French, 2008).

The excess returns by the portfolios are also explained by the 'momentum' anomaly. It is reported that the past performances of the portfolios play a key role in explaining the current returns on the stock. For example, the stocks that outperformed in the past will regenerate excess returns in the future as well.

Likewise, the stocks that lost investment in the past would also lose investment in the future as well (Jegadeesh and Titman, 1993).

The stocks that have more intrinsic values than their market price also provide returns than the stocks that have higher market values than their intrinsic value. Empirically the proxies for the value anomaly are utilized as the book/market value and overreactions (Fama and French, 1993; Fama and French, 1996).

One more reason to hold a portfolio of stocks by the investors is the quality of stocks to convert into cash on demand without losing their value. Empirically, it was reported that stocks having low liquidity tend to offer higher returns as compared to more liquid stocks. It indicates that the low liquidity is also compensated by the market by way of providing excess return. This is termed a liquidity premium anomaly in the market (Amihud and Mendelson, 1986).

The stock prices are also observed to be affected by the availability of retained earnings in the firm. For instance, if a firm has high retained earnings on its balance sheet, then its stock prices tend to generate higher returns. Contrarily, if a firm has low retained earnings or accruals on their balance sheet then the stocks of these companies tend to underperform (Sloan, 1996).

Like other anomalies, the profitability anomalies are also pronounced in the security pricing. The asset prices of profitable firms are found to be higher than the stock prices of non-profitable firms. The researchers concluded that the earnings of any company are the proxy for growth opportunities. Therefore, when the profits are found to be higher, the investors perceive this as a signal of growth and vice versa (Fama and French, 2008).

The subsequent financing options of the firms are also priced by the market participants. The additional financing decisions may be categorised into deficit financing (issuing stocks) or excess financing (repurchasing of the stocks). The theoretical and empirical finance literature reported that when a firm repurchases its stocks from the market, its returns on the stocks are observed to be higher. Whereas, when a firm issues additional capital in the market its returns tend to fall. The further issues by the companies are treated by the investors as an adverse signal of the financial health of the company. Therefore, the investors penalise the stocks of the firms that issue further capital (Lougran and Ritter, 1995).

The size, value, momentum, profit, liquidity, and additional funding anomalies are studied extensively across the world and their applicability has been accepted worldwide for equity as well as debt markets. For instance, in the American, British, European, and Japanese markets, a comprehensive study conducted by Asness et al. (2013) reported that the value and momentum theories of behavioural finance are capable of accounting for the variation in stock returns in these countries. The study also acknowledges that the liquidity risk contributes significantly to the firms' overall risk. In the same line, Fama and French (2012) reported that in the North American, European, Japanese and Asian Pacific markets, the size, value and momentum anomalies are present significantly and have the power to explain the variation in the expected returns. The study further reported that the value premium persists in all the countries which is larger in the small stocks (Zhu et al., 2014).

For the Indian stock market, a strong size effect is observed with different proxies of the size of the firm. The studies also reported that the size of the firm in the Indian capital market is explained by the market, value, liquidity and business cycle premiums. The studies also reported that the Indian stock market has significant momentum, accruals, profitability and net stock issues anomalies. In the comparison studies by the researchers, it was reported that size is the most dominant factor and net stock issues are the least important factor in generating excess returns for Indian fund managers (Pandey and Sehgal, 2016). However, a study conducted by Sharma et al. (2021) reported that size and volume anomalies provide significant returns to Indian portfolio managers. On the other hand, a study conducted by Jana et al. (2018) applied the optimisation and concluded that a small number of stocks in the portfolio may mitigate the overall risk of the portfolio.

The study conducted by Ali et al. (2020) reported that unsystematic risk tends to positively affect the security returns, and small firms are observed to be more exposed to idiosyncratic volatility. Moreover, the momentum profit is also affected by idiosyncratic volatility. For instance, if the portion of unsystematic risk is more in the portfolio, then the returns are also observed to be higher. Whereas, the portfolios tend to carry lower unsystematic risks and are found to have lower earnings Barik and Balakrishnan (2022). The pattern of ownership also has a great influence on the security returns via idiosyncratic volatility. For example, high-concentrated ownership firms are observed to have lower unsystematic risk as compared to the firm's specific risk in low-concentred ownership firms. Therefore, the patterns of ownership safeguard the investment in India (Dhasmana, 2024).

The above-stated literature and the inconclusive studies presented above indicate that, to the best of our knowledge, no study in India has explored the possibility of idiosyncratic volatility anomaly for the Indian stock market. Hence, there is a need for an updated study, with a widely accepted methodology, especially for a fast-growing country like India. Thus, this piece of work examines whether investors who are under-diversified should be rewarded for taking idiosyncratic risks. In a nutshell, the study explores the impact of idiosyncratic volatility on expected security returns for the Indian stock market. The study further evaluates whether the idiosyncratic effect is persistent irrespective of the size of securities or prevalent in a specific group. In the next section, the study explains the data and methodology in detail.

3. Methodology

3.1 Data

The basic requirements for conducting the research in the portfolio selection process and security pricing literature are the proxy for the market portfolio, stock returns of individual firms, risk-free rate of returns, and the sample period of the study. Following the previous literature, the current paper has utilized the constituents of the S&P BSE 500 index of stock as a proxy of the market portfolio and individual security returns. The returns on the security were calculated using adjusted closing prices to mitigate the payment of dividends by the firms. The substitute for risk-free return is taken as the yield on 91-day treasury bills decided by India's Central Bank. The sample spans are chosen from July 2004 to June 2019. The current study has avoided the excess volatility period in the stock market i.e., the COVID-19 period. Therefore, the COVID-19 crisis period is deliberately removed from the study period. The data has been extracted from the Bloomberg Database and Reserve Bank of India databank.

3.2 Formulation of the Variables

In the current study, the key variables employed are idiosyncratic volatility (widely accepted proxy for unsystematic risk), excess returns (returns over and above the risk-free returns), market beta (widely accepted proxy for systematic risk), book/market value (proxy for value premium anomaly), and market-capitalization (standard proxy for the size anomaly). Furthermore, the idiosyncratic volatility is computed by employing the three-factor Fama-French model (Henceforth FF-3 Factor Model) based on daily returns. The FF-3 factor model is chosen for the computation of idiosyncratic volatility because it outperformed in comparison to the standard CAPM, Carhart's four-factor model and the five-factor model of the Fama-French model. Consistent with the previous literature recently, in a recent study conducted by Bali et al.

(2016), it is advocated that the decision to estimate idiosyncratic volatility by utilizing the standard CAPM, FF-3 factor model and four-factor model of Carhart is insignificant.

The study has calculated the idiosyncratic volatility (unsystematic risk) of the current month based on the regression of the same month, i.e., the '*t*' (time) for regression and idiosyncratic volatility is the same, and no lead or lag is present. For instance, to compute the idiosyncratic volatility for the month of June 2005, this research analysis utilized the regression on the FF-3 factor model for daily returns data for the month of June 2005. To study the impacts of idiosyncratic variables individually and mitigate the possible impacts of liquidity anomaly and following the existing literature, the study excluded the stocks that were not traded for less than seventeen days in any month.

As a standard practice and following previous studies in this area, the current study has defined idiosyncratic volatility as the standard deviation of the error term derived, which is derived from the regression of the FF-3 factor model. The error terms are further multiplied by the square root of the trading days in a particular month. Precisely it may be written as Equation (1) formally.

$$\text{Idiosyncratic volatility} = \text{Residuals}'\text{Standard deviation} \times \sqrt{\text{Trading days in month}} \quad (1)$$

The study also included the three more prominent explanatory variables which have the power to explain the variation in the stock returns of the firms. For instance, the market beta or market premium, the size premium or the differences between small and big companies (SMB) and value premium or the differences between high and low (HML). These factors are adopted in the study as advocated by the FF-3 factor model. In the methodology, the market risk premium is calculated after accounting for the risk-free returns. Additionally, at the end of the trading day of the month of June, the study distributed the sample companies into two groups i.e., small and big.

The market capitalization of the firms is taken as the proxy of the size of the firm. The natural logarithm of market capitalization i.e., Ln (MC) has been employed as the proxy for the size of the firm. To minimize the probability of getting affected by the extreme values at both ends the study considered the median value as a breakpoint. For further classification, the study created sub-groups of portfolios constituted based on the value, namely low, neutral, and high book-to-market value portfolios by following the 30th and 70th percentile of book-to-market equity as breakpoints. This division resulted in a total of six portfolios. Furthermore, each year from July to June, the study calculated the monthly weighted average return of all six portfolios and market capitalization. The same was applied to the weights on the portfolio and the process was repeated every year.

Since the small minus big denotes the risk premium for size, which is the variation between the average returns on big portfolios in comparison to the average returns on small portfolios. The high minus low symbolizes the risk premium for value, which was calculated after deducting the average returns of high-value portfolios from the average returns on low-value portfolios. Additionally, the study estimated the beta with the help of the market model. To compute the market risk premium the study regressed daily excess security return on the daily market premium that may be written as follows.

$$R_i - Rf = \alpha_i + \beta_i\,(Rm - Rf) + \varepsilon_i \quad (2)$$

For the estimation of the Beta, which is a measure of market premium, this study relied on Equation 2. For instance, to estimate the beta for the month of June 2005, the regression on Equation (2) of the market model on daily data from July 2004 through June 2005 has been adopted. Similarly, to estimate the Beta of the month of July 2005, regression for the market model on the daily data from August 2004 to July 2005 was employed. The same process was applied for the remaining sample periods. Hence, the study considered one year as the window of daily data.

While calculating the beta and robustness of the results at least 200 observations were considered. Accordingly, the securities with less than 200 observations were excluded from the calculation of market beta.

The study performed univariate sorting on the basis of idiosyncratic volatility. For instance, at the end of every June, the study created the decile portfolios based on the idiosyncratic volatility and calculated their equal-weighted monthly returns and value-weighted returns. This process has been adopted repeatedly till the entire sample was exhausted. While creating weighted average returns on portfolios based on idiosyncratic volatility, the study excluded those stocks bearing zero returns throughout the year and whose market capitalization was missing. The portfolios having the lowest idiosyncratic volatility are denoted as 'Portfolio 1' and those with the highest idiosyncratic volatility are denoted as 'Portfolio 10'. In Section 3.3 the methodology is explained in detail.

3.3 Research Methods

The current study utilized the widely accepted asset pricing methodology in the literature, i.e., Fama and MacBeth's (1973) two-stage regression model for computing the pricing of a risk factor idiosyncratic volatility. In the first stage of the Fama and MacBeth (1973) methodology, time series regression was applied for each stock 'i'. The first stage of regression yields estimated lambdas ($\lambda_0, \lambda_1, \lambda_2, \lambda_3$ and λ_4) for each stock considered in the study after the data validation process. The formulation for the same is provided in Equation (3).

$$R_{it} - R_{ft} = \lambda_{0t} + \lambda_1 IV_{it} + \lambda_2 Beta_{it} + \lambda_3 (ln MC) + \lambda_4 BM_{it} + \varepsilon_{it} \quad (3)$$

In Equation (3) R_{it} represents the security's cross-sectional return 'i' for time 't', R_{ft} stands for risk-free return, IV is an acronym for idiosyncratic volatility, Beta is utilized as the market risk premium, ln MC is the natural logarithmic value of market capitalization of the firm, BM is used as the book to the market value of the firm.

In stage two, the paper applied a cross-sectional regression for each month. The results of regressions yield estimated betas of risk and intercept for every month. Hence, this process provides a time series of estimated risk premiums. The study also constructed estimates of unconditional betas and intercepts by averaging them over time. After this, the study applied the *t*-test to examine whether the risk premiums were significant or not. The results advocated that *t*-statistics computed under the Newey-West (1987) approach were consistent and significant.

Furtherance, the study applied cross-sectional regression for computing excess return of individual security on idiosyncratic volatility and other control variables such as Beta, lnMC and BM for each month. Accordingly, if λ_1 is positively significant then it is consistent with Merton (1987) which means that investors are under-diversified. In the next Section 4, the study presents the results in detail.

4. Analysis and Findings

4.1 Average Return and the FF-3 Factor Model Intercepts Based on Idiosyncratic Risk

This section of the study is devoted to the presentation and discussion of the results derived from the empirical analysis based on the objectives of the study. For instance, the average return of equal and value-weighted decile portfolios based on idiosyncratic volatility as well as a hedge portfolio (difference of high and low volatility portfolio) are provided in **Table 1**. **Table 1** also displays the intercept of the FF-3 factor model for the value-weighted idiosyncratic volatility portfolios. As a standard rule, if any significant factor is missing from the regression model, then the true value of the dependent variables may not be predicted. Accordingly, if idiosyncratic volatility is one of the missing factors in the asset pricing models, for instance, CAPM or Fama-French three model, then these models would misprice the underlying security.

The findings of the paper observed that the average returns on the equal-weighted portfolios are increasing from low to high portfolios, however, the upsurge is insignificant. Alternatively, when the weights are assigned based on the values, the study noticed that average returns are positive and insignificant. When the study observed the low-value to high-value portfolios, it was seen that the return became negative and insignificant. It is also noticeable from **Table 1** that the signs of intercepts of all portfolios are negative, however, for the five portfolios intercepts are significant. It is also found that the signs of the portfolios based on the value premium, i.e., high minus low, are insignificant. For testing the joint hypothesis, if all intercepts are jointly insignificant, the GRS test is conducted for value-weighted portfolios.

The t-statistics and p-value i.e., 2.802 (p-value = 0.003), respectively, provided by the GRS test are observed to be significant. Therefore, the test strongly rejects the null hypothesis that all the intercepts of regressions are jointly equal to zero. This indicates that none of the risk factors included in the FF-3 factor model of security pricing explains the return of portfolios formed by sorting on idiosyncratic volatility.

Table 1. Average return and Fama-French three-factor model intercepts of idiosyncratic volatility-based portfolios.

	Equal-weighted	**Value-weighted**	
	Average return	**Average return**	**Intercept**
Low idiosyncratic volatility	0.006	0.003	-0.001
	(1.273)	(0.456)	(-0.504)
2	0.004	0.004	0.001
	(0.799)	(0.767)	(0.352)
3	0.005	0.001	-0.002
	(0.832)	(0.248)	(-1.076)
4	0.004	0.007	0.004
	(0.693)	(1.233)	(1.727)
5	0.004	-0.001	**-0.005**
	(0.632)	(-0.2190)	(-2.173)
6	0.005	0	-0.005
	(0.73)	(0)	(-1.572)
7	0.005	-0.002	**-0.007**
	(0.817)	(-0.336)	(-3.162)
8	0.006	-0.001	**-0.006**
	(0.908)	(-0.093)	(-2.431)
9	0.007	-0.004	**-0.009**
	(0.982)	(-0.567)	(-2.616)
High idiosyncratic volatility	0.008	-0.002	**-0.009**
	(1.051)	(-0.194)	(-2.185)
High-low idiosyncratic volatility	-0.005	-0.004	-0.008
	(-1.323)	(-0.845)	(-1.743)
GRS test			2.802
P-value			(0.003)

Note: *The **Table** 1 present the average return of equal and value-weighted portfolio sorted based on the idiosyncratic volatility. **Table** 1 shows the constant of the FF-*3 *factor model for value-weighted portfolio. T-statistics are in parenthesis. Bold figures are significant at* 5 *per cent level.*

4.2 Characteristics of the Idiosyncratic Volatility Portfolios

The attributes of the securities and their responses to the explanatory variables in every category of portfolio based on idiosyncratic volatility are presented in **Table 2.** These characteristics are idiosyncratic volatility, size, book/market and price. Portfolio 1 has the lowest idiosyncratic volatility while Portfolio 10 has the highest idiosyncratic volatility. The results indicate that the highest volatile portfolio is small in size and has a lower price. The book/market ratio of the low idiosyncratic volatility portfolio is 0.61 while it is high i.e., 0.74 for the highest volatile portfolio.

Table 2. Characteristics of the portfolio sorted based on idiosyncratic volatility.

Portfolios	Idiosyncratic volatility	Market capitalization	Book to market value	Price
1	0.04	302284.68	0.61	903.05
2	0.05	298206.44	0.54	677.10
3	0.06	231801.83	0.57	630.35
4	0.07	186096.03	0.59	601.94
5	0.08	154766.68	0.60	641.63
6	0.08	133914.16	0.61	392.14
7	0.09	90557.10	0.56	354.23
8	0.10	71316.85	0.65	326.26
9	0.12	72963.10	0.61	276.91
10	0.16	43838.19	0.74	257.50

Note: *The Table displays the different features of the portfolios created by sorting on idiosyncratic volatility from June* 2006 *to June* 2018. *The numbers represent the average value of these attributes.*

The findings of this study have certain very important implications for stakeholders. For instance, the largest firms show moderate unsystematic risk, whereas the smallest firms in the sample tend to have the lowest idiosyncratic risk. The medium size firms in the sample are exposed to the highest unsystematic risk. The unsystematic risk is observed to be inversely related to the firm's market price. For instance, the lower-risk firms tend to have high market prices in comparison to the highly volatile firms.

4.3 Correlation Analysis

To assess the possibility of any serious multicollinearity and check whether the variables considered in the study are correlated. The study computed the coefficient of correlation between the explanatory variables considered in the study and the same are reported in **Table 3**. It is found that there are negative and statistically significant correlations between the book-to-market and size of the firms (-0.10) and unsystematic risk and size of the firms (-0.3). The positive and significant correlations between systematic risk and size of the firms, systematic risk and book-to-market, unsystematic risk and book-to-market, and unsystematic and systematic risk are reported as 0.12, 0.11, 0.02 and 0.08, respectively. It is also worth noting that the highest positive and negative coefficients of correlations are -0.29 and +0.12, respectively.

Table 3. Correlation analysis.

	Market capitalization	Book to market value	Beta	Idiosyncratic volatility
Market capitalization	1			
Book to market value	**-0.1012****	1		
	(0.00)			
Beta	**0.1205****	**0.1107****	1	
	(0.00)	(0.00)		
Idiosyncratic volatility	**-0.2977****	**0.0215****	**0.0822****	1
	(0.00)	(0.00)	(0.00)	

Note: *This table is showing the association between the independent variables. T-statistics are in parenthesis. ** are utilized as the significant at* 5 *per cent level.*

The correlations among the pairs of variables are statistically significant. It is noticed that a negative correlation is observed between the pair of market capitalization and book-to-market value. It indicates that large firms tend to have low book/market value and high market prices, whereas small firms experience lower prices. The large firms are also experiencing lower unsystematic risk as compared to the small firms. The systematic risk directly affects the firms irrespective of their size. The systematic and unsystematic risks are directly correlated which signifies the importance of the impacts of macro variables on the companies' overall risk assessment.

4.4 Findings of Fama-Macbeth Cross-Sectional Regression

In Section 4.3, the study reported that the variables are not highly correlated, so there are rare possibilities of spurious regression. Accordingly, in this section, the current study assesses the pricing idiosyncratic volatility risk using Fama-MacBeth's two-step regression which is reported in **Table 4**. It depicts the results of five different models that the study has mentioned in the methodology section. For instance, model 1 is the model where only one explanatory variable i.e., idiosyncratic volatility, is considered to explain the variation in the security returns. Whereas models 2, 3, and 4 control for variables such as beta, size, and book-to-market ratio, respectively, separately. Lastly, model 5 controls for variables such as beta, size, and book-to-market ratio.

The notable findings of the study may be observed in all models that the idiosyncratic risk is inversely related to the security returns in all models. As per the objective of this paper, the most significant variable in Model 3 is idiosyncratic volatility, which is significant and negatively associated with security returns, and its coefficient is -0.066 (t = -2.29). The size variable proxied by market capitalization is also significant and negatively associated with security return, whose coefficient is -0.004 (t = -4.64). It is also reported that the adjusted R^2 is 3.6 per cent. The low adjusted R-square also indicates that the security returns are also explained by other factors which are not considered in this study, which is one of the major limitations of the study and should be taken into consideration by other researchers.

Table 4. Results of Fama and Macbeth's cross-sectional regression.

	Intercept	Idiosyncratic volatility	Beta	ln (market capitalization)	Book to market ratio	Adjusted R^2
Model 1	0.007	-0.017				0.016
	(1.470)	(-0.530)				
Model 2	**0.015**	-0.013	**-0.009**			0.059
	(3.950)	(-0.440)	(-2.170)			
Model 3	**0.052**	**-0.066**		**-0.004**		0.036
	(4.340)	(-2.290)		(-4.640)		
Model 4	0.007	-0.019			-0.001	0.039
	(1.570)	(-0.610)			(-0.300)	
Model 5	**0.053**	**-0.061**	-0.006	**-0.003**	-0.002	0.091
	(4.280)	(-2.430)	(-1.420)	(-3.610)	(-1.070)	

Note: *Table is showing the average slopes of cross-sectional regression by using Fama Mac-Beth* (1973) *procedure for different model. Explained variable is the excess return of individual securities. The seventh column shows the R^2 (Average-adjusted) of the cross-sectional regression. T-statistics are Newey- West* (1987) *consistent. Bold figures are significant at 5 per cent level.*

The average coefficient of expected idiosyncratic volatility is -0.061 in the 5th model, which is negative and significantly (t = -2.43) related to the security returns. When the study controls for beta, size, and book/market, the adjusted R^2 is increased to 9.1 per cent. However, the coefficients of beta and book-to-market turned out to be insignificant. The results show a negative and significant coefficient of size which means the study controls for idiosyncratic volatility. The results also indicate that small corporations have more average returns than large corporations which is in line with the well-known anomaly 'size effect'.

Hence, our evidence is supportive of a negative idiosyncratic volatility risk premium. This indicates that high idiosyncratic volatility securities are inclined to experience less returns in the next month. The results of the study are different from the existing literature (Barberis et al., 2001; Levy, 1978; Merton, 1987). One of the possible explanations for these attributes may be that the current study has considered firm-level idiosyncratic risks whereas, these studies have considered gross idiosyncratic volatility.

4.5 Fama and Macbeth Regression Analysis for Large, Medium and Small Securities

This part of the study is devoted to analyze whether the idiosyncratic effect is present across all sizes of securities or is concentrated on a definite group of securities by using the Fama-MacBeth methodology. The methodology is further advocated by Fama and French (1993) who suggested running a separate regression for small-sized, medium-sized and big-size securities. Therefore, the study regressed the separate cross-sectional regression for small, medium and large stocks. The paper divided all the companies based on market capitalization and utilized the 30th and 70th percentile as breakpoints. This process resulted in three groups of size, i.e., small, medium and large. **Table 5** demonstrates the outcomes of the Fama-MacBeth cross-section regression.

Table 5. Results of Fama and MacBeth regression for large, medium and small stocks.

	Intercept	Idiosyncratic volatility	Beta	Size	Book to market	Adjusted *R* square
SMALL	**0.170**	-0.045	-0.003	**-0.016**	0.003	0.098
	4.770	-1.310	-0.740	-4.780	1.350	
MEDIUM	**0.154**	**-0.077**	-0.002	**-0.013**	-0.004	0.108
	6.370	-2.390	-0.400	-6.200	-1.820	
LARGE	**0.076**	**-0.084**	-0.003	**-0.005**	-0.007	0.123
	5.360	-2.940	-0.530	-4.510	-1.880	

Note: *Table is showing the average slopes of cross-sectional regression by using Fama Mac-Beth* (1973) *procedure for large, medium and small stocks. The t-statistics (dividing the average slope by the standard error of estimates) are provided in parenthesis. The seventh column shows the* R^2 *(Average-adjusted) of the cross-sectional regression. T-statistics are Newey- West* (1987) *consistent. Bold figures are significant at* 5 *per cent level.*

The results show an inverse and significant coefficient of idiosyncratic volatility for medium and large groups. The idiosyncratic volatility coefficient for medium groups of securities is -0.077 (t = -2.39), the coefficient of size is -0.013 (t = -6.2), the coefficient of Beta is insignificant i.e., -0.002 (t = -0.4) and coefficient of BM is -0.004 (t = -1.82) which is also insignificant. For large groups, the idiosyncratic volatility coefficient is -0.084 (t = -2.94), the coefficient of size is -0.005 (t = -4.51) and the coefficient of Beta is insignificant i.e., -0.003 (t = -0.53) and coefficient of BM is -0.007 (t = -1.88) which is also insignificant. However, for small stocks, the idiosyncratic volatility coefficient is negative and insignificant.

5. Conclusion

The total risk of a security is the summation of systematic and idiosyncratic risks. Unsystematic risk may be eliminated by investing in a fully diversified portfolio. In reality, no one has a fully diversified portfolio. Therefore, investors should receive the price for bearing the unsystematic risk. With the help of the cross-sectional two-step regression of Fama and MacBeth for the period of July 2004 to June 2019. However, the study intentionally excluded the COVID-19 period which may be one of the important limitations and should be addressed in the future. The study documents that security returns are negatively connected with idiosyncratic volatility, which means that the securities that have larger idiosyncratic volatility earn lower average returns. The possible justification for the idiosyncratic volatility puzzle is that the association between security returns and idiosyncratic volatility is sensitive to the frequency of data, the weighting scheme of portfolios, and breakpoints used to construct portfolios. Our findings are consistent and in line with existing research (Ang et al., 2006; Ang et al., 2009; Angelidis, 2010; Bali et al., 2016; Guo and Savickas, 2010). The study confirms that idiosyncratic volatility is inversely associated with returns only for medium and large groups of securities. However, a detailed and sectoral study is needed to address the question of the negative association between idiosyncratic volatility and security returns. For this purpose, the recent machine learning methodology should be adopted. Hence, the study concludes that the idiosyncratic volatility or unsystematic risk puzzle exists in the Indian stock market.

Conflicts of Interest
The authors of this article declare that there are no competing or financial interests associated with this article.

AI Disclosure
During the preparation of this work the author(s) used generative AI in order to improve the language of the article. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

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