

Corporate Risk Management, Firms' Characteristics and Capital Structure: Evidence from Bombay Stock Exchange (BSE) Sensex Companies

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Abstract

The current article takes account of the existing status of risk management practices of the Indian publicly listed companies and establishes the relationship of their risk management programme with the firms' financial characteristics such as capital structure, assets' size, asset tangibility, profitability and valuation multiples. To establish the relationship, a risk management score is constructed using publicly disclosed information for Bombay Stock Exchange (BSE) Sensex 30 companies. Results suggest that companies with more comprehensive risk management programmes are likely to enjoy lower costs of debt and have a higher propensity to invest in intangible assets. These firms with more comprehensive risk management programmes also demonstrate more stable cash flows, sales and net operating profit. It is also evident that firms that are deeply indulged in risk management activities are likely to have higher financial leverage as higher leverage increases a firm's total risk, and their risk management activities act to balance that risk. Consequently, firms with extensive risk management activities can endure higher debt in their capital structure; hence, a risk management programme works as a substitute of equity capital.

Key Words

Corporate Risk Management, Hedging, Volatility, Value at Risk, Shareholder's Value Creation

Introduction

Firms have limited capacity to bear risk. When they approach their potential risk-bearing capacity, one risk comes at the cost of another risk. Some of these risks are productive while others are unproductive. These risks can be hedgeable or un-hedgeable. A firm can create value by undertaking productive risks that are not hedgeable and also by hedging unproductive risks. Research and development (R&D) projects are undoubtedly the productive risk that cannot be eliminated by hedging, while risks such as foreign exchange (FX) risk that make the firm vulnerable by increasing volatility of its cash flows are unproductive risks and must be hedged.

As the shareholders can diversify a firm-specific unsystematic risk using a portfolio of investments, the

firm's risk management programme should be designed to take a strategic view of the firm's resources rather than merely focusing on reduction or elimination of earnings and cash flow volatilities. Such comprehensive risk management programmes are intended to avoid potentially disabling consequences to the firm from such risks that are beyond management's control and thus to create shareholders' value in the long run. There are academic views both against and in favour of hedging. Modigliani and Merton (1958) argued that under the assumption of perfectly competitive capital markets with no transaction costs or taxes, both the firm and the individual investors are able to perform the same financial transactions at the same costs. Thus in the context of hedging, the value of the firm will remain constant despite any attempt to hedge

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risk exposure. Unfortunately, the assumptions of no transaction costs or taxes are highly unrealistic in the real world, which makes it a weak argument on not to hedge risk. Sharpe (1964) developed capital asset pricing model (CAPM), which argues that under perfect capital markets firms should only be concerned with the systematic risk that is common to all market participants. Firms should not be worried about the unsystematic or idiosyncratic risk that pertains specifically to the firm because such risks could be reduced through diversification in a large investment portfolio and in a costless manner. However, the perfect capital markets assumption is not realistic in practice, and diversification activities will result in transaction costs. Market participants believe that hedging is a zero-sum game that has no long-term increase on a firm's earnings or cash flows. This argument assumes perfect capitals and that derivative pricing fully reflects all of its risk factors. However, in practice, derivative pricing is extremely complex and not as accurate as equity and fixed income securities pricing. Therefore, derivative pricing is not always likely to reflect all of its risk factors, so hedging with derivatives may not always be a zero-sum game of transferring risk between periods or between parties.

A firm's highly volatile cash flows can lead to both direct and indirect costs associated with financial distress and bankruptcy. Hedging can reduce the probability and associated costs of financial distress by stabilizing a firm's earnings and cash flows. Empirical evidences suggest that firms with characteristics associated with higher likelihood of financial distress, such as higher leverage, lower debt-servicing capacity, shorter debt maturities and highly volatile earnings and cash flows, are more likely to use risk management programmes comprehensively than other companies. Firm management can use derivatives and other operational hedging tools that reduce cash flow volatility, to cut the probability of financial distress. A well-designed strategic risk management programme also helps firms with more intangible assets, by reducing the information asymmetry associated with the fair market value of these assets. Since the risk management programme has potential to reduce the likelihood of financial distress, these firms can invest more in R&D activities and intellectual assets. Implementing strategic risk management program is also worthwhile to the firms (such as start-ups and new technological ventures) with attractive investment opportunities but having scarcity of funds due informational asymmetry associated with their non-conventional and risky projects. Insufficient financing opportunities can force these firms either to defer such positive net present value investments opportunities or to incur the higher cost of capital. Risk management can control this underinvestment problem by reducing the firm's cost of capital and enhancing the firm's attractiveness in capital markets.

Using discounted cash flow (DCF) valuation formula, under the imperfect market conditions, hedging can create

shareholders' value by affecting one of the two variables: (a) the future expected cash flows and (b) capital providers' required rate of return at which those cash flows are discounted by the market. Expected cash flows can be increased in three ways: (a) by reducing taxes for the firms having convex tax functions, (b) reducing probability of financial distress and the expected costs associated with it and (c) reducing firms' inability to fund positive NPV projects and opportunities. Hedging can also reduce the investor's required rate of return in the following ways: (a) working as substitute for equity capital and thus enhancing the risk-bearing capacity of the firm and allowing a more flexible capital structure, (b) reducing cost of debt through renegotiating the negative covenants of debt and (c) reducing cost of equity by reducing the volatility of the firm's cash flows and in turn lowering its equity beta. However, it is difficult to measure the effectiveness of financial hedging, because hedging involves some readily identifiable explicit costs that reduce a company's reported earnings and cash flows, while aforesaid benefits of such hedging programmes are less obvious and difficult to quantify. Thus there is a need to design *an integrated corporate risk management system* which should be able to: (a) adapt to the value adding principle of risk management, (b) provide substitute for the equity capital, (c) define the optimal hedge ratio, (d) clearly define and communicate the objective of risk management programme whether it is to minimize the variance or to eliminate the lower tails outcomes and (e) identify the suitable derivative instruments for hedging.

The current research proposes to take account of the existing status of risk management programmes of Indian firms using a sample of publicly listed companies and establishes the relationship of their risk management programme with the firms' characteristics such as capital structure, assets' size, asset tangibility, expected probability of financial distress and cost associated with it, profitability and valuation multiples.

The article is further organized as follows. The second section describes statement of the problem and related assumptions; the third section provides a brief literature review; the fourth section provides the details of research methodology; the fifth section presents the results and discussion; and finally, the conclusion is given in the sixth section.

Statement of the Problem

To establish the relationship between risk management programmes of firms with the firms' characteristics, a *risk management score* is constructed, which includes the followings parameters: (a) a company's reliance on at-risk ratios (value at risk [VaR], cash flow at risk [CFaR]), (b) use of financial derivatives in hedging, (c) integration of risk management into existing strategic planning and reporting process, (d) recognition of all relevant risks

(e), measurement of all recognized risks and (f) level of operational hedging. Information regarding operational hedging is collected from various public sources including companies' websites, websites of companies' suppliers and customers, operational policy and labour policy of the firms. Operational hedging includes the following: (a) flexible pricing and marketing, (b) long-term contracts with customers, (c) flexibility in switching suppliers, (d) long-term contracts with suppliers and (e) flexible production process. Initially, the study is conducted taking data for BSE Sensex 30 companies and constructing the risk management score using publicly disclosed information by these firms in their annual risk management reports and other sources. The research objective of the article is to take account of the integrated risk management practices of BSE Sensex companies and outlining their financial characteristics; therefore, research questions of the article can be summarized as follows:

1. Does a comprehensive risk management programme result into lower cost of capital and enhance the firm's investment in value-creating intangible assets?
2. Does a comprehensive risk management programme work to stabilize a firm's cash flows, sales and operating profit?
3. Is risk management a more worthwhile activity for highly levered firms than the low leverage firms?

Literature Review

The job of risk management is to ensure that the top management knows and understands the probabilities associated with possible outcomes of the firm's strategy before they commit the firm's capital (Stulz, 2008). Researchers and practitioners appreciate the utility of risk management in enhancing a firm's debt-bearing capability and contribution in long-term value creation by investing more in productive intangible assets. However, they typically find it difficult to measure or report the accomplishments of such a risk management programme. Stulz (2009) in an article in *Harvard Business Review* described six factors responsible for the mismanagement of risk. These factors are (a) relying on historical data, (b) focusing on narrow measures, (c) overlooking knowable risks, (d) overlooking concealed risks, (e) failing to communicate and (f) not managing in time. Firms have limited capability to undertake risk. When firms approach their potential risk bearing capacity, one risk comes at the cost of another risk. For instance, if a company chooses to bear exchange rate risk that it could easily hedge using derivatives, holding that risk could come at the cost of taking on the risk of a new positive NPV green-field project or a new investment in a R&D project. Hedging can create value by enabling companies to shed non-productive risks and clear the way to take on productive risks (Stulz, 2013). Companies have, nonetheless, two well-known ways of

attempting to manage their market risks. One is to use derivatives such as futures and options to hedge their exposures, and the other one is, alongside such financial hedging, companies can also engage in operational hedging. There is also a third, less obvious way for companies to manage their exposures: they can leave them largely or completely unhedged, while seeking to ensure their access to external financing in the event of worst-case scenarios (Amberg & Friberg, 2016). Froot, Scharfstein, and Stein (1993) have argued that risk management can be worthwhile to the firms with positive net present value investment projects but has constraints on external funding due to information asymmetry associated with the complex and non-conventional projects. Insufficient financing opportunities can force these firms either to defer such positive net present value investments opportunities or to incur the higher cost of capital. Risk management can control this underinvestment problem by reducing the firm's cost of capital and enhancing the firm's attractiveness in capital markets.

Therefore, firms facing scarcity of capital market funding or productive investment opportunities would pursue risk management more intensely to avoid underinvestment problems. In this way, risk management programmes will improve the debt-bearing capacity of the firm and work as a substitute of equity capital.

Several studies have reported the effective implementation of derivative hedging in the context of asset exposures (Allayannis & Ofek, 2001; Geczy, Minton, & Schrand, 2012; Guay, 1999; Jin & Jorion, 2006). However, efficacy of operational hedging in managing firm exposures to the underlying risks is unconvincing, as there are complications in recognizing and quantifying operational hedging approaches of firms. Firms in a particular industry adopt a unique set of operational hedging approaches, which are not necessarily transferable to the firms belonging to other industries. These difficulties have led scholars to segregate their research work broadly into two areas of study with respect to operational hedging—analogue industry research and cross-sectional research on multinational firms with respect to currency risk management. The first area of research concentrates on the firm's ability to adjust production in response to dynamic market settings (Kallapur & Eldenburg 2005; Petersen & Thiagrajan, 2000; Tufano, 1998). The second area of research concentrates on cross-sectional examination of multinational firms regulating their cross-border operating subsidiaries' operations to hedge FX rate exposure (Allayannis, Ihrig, & Weston, 2001; Carter, Rogers, & Simkins, 2006; Kim, Mathur, & Nam, 2006; Pantzalis, Simkins, & Laux, 2001).

Dixit and Pindyck (1994) argues that a firm's ability to regulate output and control costs work as a real options with the firm, providing operational hedging. Tufano (1998) examines real options for a mining firm that is analogous to a call option and reports that increased volatility of gold results into curtailed exposure to gold prices. However, Petersen and Thiagrajan (2000) present

the opposite view, that the firm's ability to adjust operating costs in response to changes in gold prices is due to its ability to close mines with higher operating costs and vary the mix of ore extracted. These actions work as operational hedging for the firm. Therefore, firms with restricted ability to adjust production often resort to hedging activities using financial derivatives. Kallapur and Eldenburg (2005) find that changing the mix of variable and fixed costs is used as an operational hedging strategy by state hospitals in Washington, the USA. They postulate that firms will adopt risk-reducing methods, if the environmental uncertainties increase.

A multinational firm can effectively use its foreign operations as an operational hedging tool to hedge its exchange rate risk (Allayannis et al., 2001; Pantzalis et al., 2001; Williamson, 2001). Williamson (2001) examined exchange rate exposure of Japanese and the US automobile firms in the US market with respect to their offshore operations. They report a decline in FX rate exposures of Japanese automakers with the increase in production of Japanese cars in USA. Allayannis et al. (2001) find that operational hedges do not reduce a firm's risk exposure. They postulate that greater the number of geographic regions where a firm has operating subsidiaries, greater is the firm's operational hedge. However, authors could not find a negative and significant relationship between a firm's geographic spread of operations and its exposure to currency risk. However, findings of Pantzalis et al. (2001) are contrary to the results of Allayannis et al. (2001). They found that the geographical spread of a multinational's operations is a significant factor in controlling a firm's exchange rate risk. The findings of Carter et al. (2006) suggest that positive FX exposure of multinational firms with higher geographical spread of operating subsidiaries experiences significant exposure with a strong dollar and insignificant exposure with a weak dollar. However, for firms with negative FX exposure, the geographic dispersion is not a significant factor of their exposure with either states of the dollar.

Most studies conclude that firms which use financial derivatives to reduce their risks are able to reduce the exposures significantly. Allayannis and Ofek (2001) find that the absolute value of a firm's exchange rate exposure decreases as the level of derivatives the firm uses increases. Thus as the use of financial derivatives rises, the exposure coefficient moves closer to zero. Numerous other studies report usefulness of interest rate and commodity derivatives in hedging the respective risks (Geczy, Minton, & Schrand, 2012; Jin & Jorion, 2006; Tufano, 1998). However, Guay and Kothari (2003) report that the role of derivatives hedging is relatively small in comparison to the overall exposure of the firm, because firms use financial derivatives to hedge the residual risk exposure after using operational hedging to its full potential. Risk management works as a substitute for equity capital by increasing the firm's debt-bearing capacity. Bock (2013) provides evidence

from German companies on the impact of risk management on a firm's capital structure, cash flow volatility and cost of capital. Amberg and Friberg (2016) provide evidence on whether operational and financial hedging are substitutes—that is mutually exclusive alternatives designed to accomplish the same objective—or complements that are used together to accomplish the goal.

The present study combines the approach of Bock (2013) and Amberg and Friberg (2016) and develops a risk management score to evaluate the risk management practices of Indian firms. A risk management score measures the operational hedging, use of financial derivative, as well as the integration of risk management programme into the overall strategic decision-making process of the firm. The article then relates the risk management score with the financial characteristics of the firm such as company's size, profitability, capital structure, liquidity, asset tangibility, dividend policy, income volatility and valuation. Present study is a worthwhile attempt, because no such study has been conducted in the context of Indian firms. Moreover, as per Companies Act 2013, there are specific requirements in terms of enterprise risk management that a company needs to comply with. In addition, the board and audit committee have been vested with specific responsibilities in assessing the robustness of risk management policy, process and systems. Therefore, it makes a strong case for taking stock of existing risk management practices of Indian firms and its relationships with firms' financial characteristics.

Research Methodology

The study is conducted taking data for BSE Sensex 30 companies and constructing the risk management score using publicly disclosed information by these firms in their risk management report and other sources. The risk management report discusses various dimensions of a firm's enterprise risk management practices relating to the identification, analysis, evaluation, treatment, mitigation and monitoring of the strategic, operational and legal and compliance risk to achieving the firm's business objectives. These risk management reports are available only for the past couple of years, as reporting of the risk management was made mandatory from the financial year, 2015–2016, onwards via the new Companies Act 2013. The sample firms are categorized according to their risk management scores, grouping firms with top 75 per cent of the maximum risk management score in group A and firms with lower score in group B.

Risk management score includes the followings parameters: (a) firm's dependence on at-risk ratios (VaR and CFaR), (b) use of financial derivatives in hedging, (c) integration of risk management into existing strategic planning and reporting process, (d) recognition of all relevant risks, (e) measurement of all recognized risks and (f) level of operational hedging. Information regarding operational hedging is collected from various public sources including companies' websites, websites of

companies' suppliers and customers and operational and labour policy of the firms. Operational hedging includes the following: (a) flexible pricing and marketing, (b) long-term contracts with customers, (c) flexibility in switching suppliers, (d) long-term contracts with suppliers and (e) flexible production process. All the aforementioned parameters are rated on a 5-point scale, from 1 (no or very low usage of related risk management tools) to 5 (high usage of related risk management tools). Later the total risk management score was divided by five to convert it on a 10-point scale. Table 1 provides the scale of risk management score.

Various financial ratios are calculated to capture a firm's financial characteristics. Table 2 presents the definition of companies' financial characteristics used in the study.

To examine the relationship between capital structure and the firm's financial characteristics, a multiple regression analysis is applied using the company's debt ratio as a dependent variable and a firm's risk management classification as an independent variable. On the basis of risk management scores, firms are classified into three categories, namely high-risk management firms, moderate-risk management firms and low-risk management firms. Three dummy variables are used for the respective categories of the risk classification, which take the value of 1, if the firm belongs to a particular category; otherwise, it takes value of 0. Various firm-related control variables are used in the regression analysis including firm size, cross-listing dummy, dividend payout, market-to-book value, net income volatility, operating profit margins, R&D expense ratio and asset tangibility.

Debt ratio = $\beta_0 + \beta_1$ (firm size) + β_2 (cross-listing dummy) + β_3 (dividend payout) + β_4 (market to book) + β_5 (net income volatility) + β_6 (operating profit margin) + β_7 (R&D expense ratio) + β_8 (high-risk management dummy) + β_9

(moderate-risk management dummy) + β_{10} (low-risk management dummy) + β_{11} (asset tangibility) (1)

A binary logistic regression is performed to study the antecedents of intense risk management activities of the sample firms. A dichotomous dependent variable is created for intensive risk management practices of the sample firm, which takes the value of 1, if the firm is having a risk management score of 6.0 or more out of 10, and 0 if the score is less than 6. Explanatory variables used for the binary regression include firm size, cross-listing dummy, debt ratio, dividend payout, market to book, net income volatility, operating profit margin, R&D expense to sales and asset tangibility.

Risk management firm = $\beta_0 + \beta_1$ (firm size) + β_2 (cross-listing dummy) + β_3 (debt ratio) + β_4 (dividend payout) + β_5 (market to book) + β_6 (net income volatility) + β_7 (operating profit margin) + β_8 (R&D expense ratio) + β_9 (asset tangibility) (2)

Findings and Analysis

Table 3 presents the summary statistics for companies' financial characteristics. Since the mean values are influenced by the extreme values for certain variables, it is more appropriate to consider median values. The sample consists of BSE 30 companies, which are the 30 largest companies in terms of market capitalization; the median value of company size that is natural logarithm of its total assets is quite large at 4.75 with a low standard deviation of 0.64. Median value of operating profit is also quite high at 24 per cent. Data shows that median value after tax cost of debt for BSE 30 companies are about 6 per cent. Another important financial characteristic is the asset tangibility, whose median value is 0.19. Unexpectedly, mean value of R&D expense ratio is extremely low at just 2 per cent of

Table 1. Scale and Parameters for Risk Management Score

Parameter for Risk Management Score	Maximum Value (If Company Follows the Risk Management Practice)	Minimum Value (If Company Does Not Follow the Risk Management Practice)
Company's reliance on at-risk ratios	5	0
Using of financial derivatives in hedging	5	0
Integration of risk management into existing strategic planning and reporting process	5	0
Recognition of all relevant risks	5	0
Measurement of all recognized risk	5	0
Flexible pricing and marketing	5	0
Long-term contracts with customers	5	0
Flexibility in switching suppliers	5	0
Long-term contracts with supplies	5	0
Flexible production/service process	5	0
Total	50	0

Source: The author.

Table 2. Definition of Companies' Financial Characteristics

Variable	Definition
Firm size	Log of total assets
Firm profitability	Operating profit/sales
Firm leverage	Total debt/total assets
Cost of debt	Interest payable/outstanding debt
Cash ratio	Cash and marketable securities/current liabilities
Firm liquidity	Current assets/current liabilities
Asset tangibility	Value of PPE/total assets
Firm valuation	Market price per share/book value per share
Propensity of research	R&D expense/total assets
Interest coverage ratio	Earnings before interest and taxes/interest payable
Dividend payout ratio	DPS/EPS
EBIT/net income/sales volatility	Five-year mean of coefficient of variation of the respective variable
Risk management	Risk management score

Source: The author.

Table 3. Summary Statistics for Companies' Financial Characteristics

Financial Characteristics	Mean	Standard Error	Median	Standard Deviation
Firm size	4.86	0.12	4.75	0.64
Firm profitability	0.38	0.06	0.24	0.31
Firm leverage	0.22	0.05	0.06	0.30
Cost of debt	0.19	0.07	0.06	0.38
Cash ratio	0.34	0.10	0.08	0.57
Firm liquidity	1.08	0.16	0.81	0.86
Asset tangibility	0.21	0.04	0.19	0.19
Firm valuation	6.09	1.68	3.75	9.22
Propensity of research	0.02	0.00	0.00	0.03
Interest coverage	2,538.72	1,290.26	14.84	7,067.04
Dividend payout	-0.37	0.76	0.31	4.14
EBIT volatility	0.13	0.17	0.22	0.95
Net income volatility	-0.04	0.19	0.20	1.02
Sales volatility	0.22	0.04	0.16	0.25

Source: The author.

Table 4. Summary Statistics for Companies' Risk Management Score

Financial/Operation Hedging	Mean	Standard Deviation	Coefficient of Variance
Application of at-risk ratio	0.57	0.50	0.89
Use of financial derivatives	0.80	0.41	0.51
Integration of risk management	0.73	0.45	0.61
Identification of all relevant risk	0.53	0.51	0.95
Measurement of risks	0.33	0.48	1.44
Sum of financial hedging	2.97	1.87	0.63
Flexible pricing/marketing	0.40	0.50	1.25
Long-term contracts with customers	0.63	0.49	0.77
Flexibility in suppliers	0.50	0.51	1.02
Long-term contracts with suppliers	0.80	0.41	0.51
Flexible production	0.67	0.48	0.72
Sum of operational hedging	3.00	1.11	0.37
Total score	5.97	1.88	0.32
Correlation between financial and operation hedging		-0.281973738	

Source: The author.

total assets, while median value of the same is zero. It shows that even the largest 30 Indian firms (in terms of market capitalization) spend a meagre amount of money on R&D activities. Median value of interest coverage ratio is quite good at 14.84 times. Firms pay approximately 31 per cent of their earnings in dividends. Median value of EBIT volatility, net income volatility and sales volatility stand at 0.22, 0.20 and 0.16, respectively. It is surprising to note that sales volatility is lower than EBIT and net income volatility. It shows that companies are hedging only the transaction exposures using financial derivatives and are not fully integrating their risk management activities with the operations. Liquidity position of the sample firms seems average with mean and median values for current ratio standing at 1.08 and 0.81, respectively.

Table 4 presents the summary statistics for companies' risk management score. Risk management score comprises both financial and operational hedging parameters. There are five parameters on financial hedging, namely application of at-risk ratios, use of financial derivatives, integration of risk management, identification of all relevant risks and measurement of risks. Mean value of sum of financial hedging activities is 2.97 with a standard deviation of 1.87. Mean value of sum of operational hedging activities is marginally higher at 3.0, with a lower standard deviation of 1.11. It indicates that sample firms are more engaged in operational hedging activities than the financial hedging activities. One important component of financial hedging is the use of financial derivatives, which has got the highest mean value of 0.80 with a relatively low standard deviation

of 0.41. This shows that large Indian firms are generously using derivatives to hedge their transaction exposures. Mean value of risk management score is 5.97, with a standard deviation of 1.88. Another important finding of the study is that there exists a negative correlation between the scores of financial hedging activities and operational hedging activities. This indicates that firms which are seriously engaged in operational hedging of risks are less active in financial hedging activities. This result can also be interpreted as the firms which are not able to perform operational hedging resort to financial hedging.

Table 5 presents the differences in financial characteristics between extensive risk management user companies and less extensive risk management user companies. Only five companies, namely Reliance Industries, Infosys, Tata Motors, ONGC and Wipro, could qualify for group A. Thus there are 25 firms in group B. Mean risk management score for group A firms is 9.0, while mean score for group B companies is 5.40.

Companies with more extensive risk management tend to be larger in size, as mean value of group A companies (5.15) is larger than the mean value (4.82) for group B companies. More extensive risk management companies are less profitable than the less extensive risk management companies, as the mean operating profit margin for group A is 22 per cent in comparison to 41 per cent of group B companies. This indicates that firms which are less profitable resort to a more extensive risk management programme. This insight can be reconfirmed from the fact that the more extensive risk management group faces higher volatility for their

Table 5. Financial Characteristics of Comprehensive Risk Management Firms and Other Firms

Variable	Group A: More Extensive Risk Management Activities		Group B: Less Extensive Risk Management Activities	
	Mean	SD	Mean	SD
Firm size	5.15	0.41	4.82	0.67
Firm profitability	0.22	0.13	0.41	0.33
Firm leverage	0.09	0.10	0.24	0.32
Cost of debt	0.13	0.20	0.19	0.41
Cash ratio	0.61	0.76	0.28	0.52
Firm liquidity	1.21	1.09	1.02	0.82
Asset tangibility	0.15	0.08	0.22	0.21
Firm valuation	3.35	2.07	6.64	10.01
Propensity of research	0.05	0.04	0.01	0.02
Interest coverage ratio	2,280.00	2,488.23	2,680.83	7,693.48
Dividend payout ratio	0.33	0.15	-0.51	4.54
EBIT volatility	0.70	0.96	0.04	0.94
Net income volatility	-1.00	2.12	0.10	0.61
Sales volatility	0.47	0.55	0.19	0.12
Risk management	9.00	0.84	5.40	1.47

Source: The author.

EBIT, net income and sales. It means the firms which face volatile sales and earnings with low operating profit margins deploy risk management activities more extensively. Counter-arguments can be given here that the companies having more extensive risk management activities are less profitable. However, the former argument seems to be more intuitive and appropriate as the measure of profitability is operating profit margins and not the net income margin or return on capital employed. Mean and standard deviation figures for interest coverage ratio are unrealistically high for both group A and group B companies. It is primarily because of the presence of outliers that is very high interest coverage ratios for some companies having zero debt or extremely low debt and high profitability. Median and coefficient of variance of interest coverage ratio would be appropriate statistics to represent the difference between interest coverage ratios of group A and group B companies. Coefficient of variance of interest coverage ratio for group A companies is 1.09 in comparison to that of 2.87 for group B companies. Median value of interest coverage ratio is a more realistic number for group A companies; it is 20.86. And for group B companies, it is 5.96. It clearly shows that the more extensive risk management companies under group A have better interest cover in comparison to the less extensive risk management companies under group B.

Another important finding is that the firms with less asset tangibility tended to be more extensive risk management users. Literature suggests that the risk management programme can be considered as replacement of the equity capital. Therefore, companies which are highly engaged in risk management activities should have higher debt ratios. Contrary to this theory, the study suggests that more extensive risk management user firms have much lower debt in their capital structure than the less extensive risk management user group. However, average cost of debt for the more extensive risk management user group is significantly lower than the other group, which signifies that extensive risk management activities are capable of bringing down the cost of debt and cost of capital for a firm. This is in confirmation with the theory. Another fact worth highlighting here is that price-to-book ratio for the more extensive risk management user group is lower than the less extensive risk management user group.

To examine the relationship between capital structure and a firm's financial characteristics, a multiple regression analysis is applied using a company's debt ratio as the dependent variable and firm's risk management classification as the independent variable. Other firm-related control variables considered as independent variables in regression analysis are firm size, cross-listing dummy, dividend payout, market to book, net income volatility, operating profit margin, R&D expense to sales and asset tangibility. On the basis of risk management scores, firms are classified into three categories, namely high-risk management firms, moderate-risk management firms and low-risk management firms. Three dummy variables are used for the respective categories of the risk classification, which takes value of 1,

if the firm belongs to a particular category, and otherwise the value of 0. Results of regression analysis corrected for heteroskedasticity are presented in Table 6.

Firm size, net income volatility, operating profit margin, R&D expense to sales, high-risk management firm dummy, moderate-risk management firm dummy and asset tangibility are statistically significant. Coefficients of firm size, operating profit margin and asset tangibility are positive, while coefficients of net income volatility, R&D expense to sales, high-risk management firm and moderate-risk management firm are negative. Therefore, results confirm that larger and more profitable firms having a high proportion of tangible assets tend to have higher debt ratios.

Table 6. Heteroskedasticity Consistent Regression Results for Debt Ratio on Firms' Risk Management Class and Other Variables

Dependent Variable: Debt Ratio	Coefficient/t-statistics/ p-value
Adjusted R ²	0.7048
F-statistic	7.2958
Prob. (Wald F-statistics)	0.0001
C	-1.3118
	-3.1908
	0.0051
Firm size	0.3005
	3.7868
	0.0014***
Cross-listing dummy	0.0804
	1.1165
	0.2789
Dividend payout	0.0017
	0.2164
	0.8310
Firm valuation	0.00195
	0.9939
	0.3334
Net income volatility	-0.0788
	-2.1195
	0.0482**
Firm profitability	0.3950
	2.2986
	0.0337**
R&D expense to sales	-2.1870
	-1.3940
	0.1803
High-risk mgt. firm	-0.3505
	-3.9859
	0.0009***
Moderate-risk mgt. firm	-0.1579
	-1.9482
	0.0671**
Low-risk mgt. firm	-0.1062
	-0.9105
	0.3746
Asset tangibility	0.3014
	2.5712
	0.0165**

Source: The author.

Notes: *p < 0.10, **p < 0.05 and ***p < 0.01.

Whereas, research-intensive firms with highly volatile incomes have a tendency to have low debt ratios. As the coefficients of all the three categories of risk management firms are negative, it indicates the balancing act of the firm's risk management practices to regulate capital structure. Another interesting finding worth mentioning here is that the coefficient of high-risk management firm is the most negative and most statistically significant (at 1%), followed by a moderate-risk management firm (at 5%), and is the least negative and statistically insignificant for low-risk management firm. Therefore, firms that are deeply indulged in risk management activities are likely to have higher debt ratios as higher leverage increases firms' total risk, and a risk management programme acts to balance that risk. This result is also consistent with postulations of Froot et al. (1993) that risk management can reduce both the cost of and a company's dependency on external financing. Consequently, firms with more intensive risk management undertakings can accept higher debt in their capital structure, and risk management programme works as a substitute of equity capital.

A binary logistic regression is performed to study the antecedents of intense risk management activities of the sample firms. A dichotomous dependent variable is created for intensive risk management practices of the sample firms, which takes value of 1, if the firm is having risk management score of 6.0 or more out of 10, and 0 if the score is less than 6. Explanatory variables used for the binary regression include firm size, cross-listing dummy, debt ratio, dividend payout, market to book, net income volatility, operating profit margin, R&D expense to sales and asset tangibility. Table 7 presents the result of binary logistic regression corrected for heteroskedasticity.

Only two of the explanatory variables that is firm size and debt ratio are statistically significant. Firm size has a positive coefficient, while coefficient of debt ratio is negative. Results confirm that probability of extensive risk management activities in a firm is determined by firm size and capital structure. Larger firms have higher probability of more intense risk management programmes. Also, firms with higher leverage would have higher probability of implementing an extensive risk management to regulate the firm's total risk. Surprisingly, net income volatility which was a significant factor in explaining the firm's debt ratio has insignificant coefficient in binary logistic regression for the firm's risk management activities.

Conclusions

The findings suggest that the largest 30 Indian companies of BSE use risk management to increase firms' leverage-bearing capacity, and a comprehensive risk management programme works as a substitute for equity capital to some extent. Results confirm that larger and more profitable firms having high proportion of tangible assets tend to have higher debt ratios. Whereas, research-intensive firms with highly volatile incomes have a tendency to have low debt ratios.

Table 7. Heteroskedasticity Consistent Results of Binary Logit Regression for Risk Management Firms on Debt Ratio and Other Variables

Dependent Variable: Risk Management Firms	Coefficient/z-statistics/ p-value
Mc Fadden adjusted R ²	0.3592
LR statistics	14.5063
C	0.1054
	-15.0855
	-1.3969
	0.1624
Firm size	3.3306
	1.6339
	0.1023*
Cross-listing dummy	0.6230
	0.4970
	0.6192
Debt ratio	-5.4788
	-1.6902
	0.0910*
Dividend payout	-2.0424
	-0.7719
	0.4402
Market to book	-0.0403
	-0.3765
	0.7065
Net income volatility	-0.4347
	-0.5863
	0.5577
Operating profit margin	2.5314
	1.0698
	0.2847
R&D expense to sales	8.3267
	0.3226
	0.7470
Asset tangibility	0.5656
	0.1390
	0.8894

Source: The author.

Notes: *p < 0.10, **p < 0.05 and ***p < 0.01.

Companies engaged in more extensive risk management activities have a relatively lower cost of debt. Less profitable companies and those with higher volatility in terms of sales, EBIT and net income are engaged in more extensive risk management activities. Firms that are deeply indulged in risk management activities are likely to have higher debt ratios as higher leverage increases a firm's total risk, and a risk management programme acts to balance that risk. Consequently, firms with extensive risk management activities can accept higher debt in their capital structure; hence, a risk management programme works as a substitute of equity capital. It also suggests that firms that are capable of using operational hedging to reduce various exposures are less involved in financial hedging, or in other words, firms that are not able to manage their exposure with operational hedging are more inclined to use financial measures such as derivative and at-risk ratios.

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