

*Full Length Research Paper*

# **Determinants of corporate hedging policies: A case of foreign exchange and interest rate derivative usage**

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**Derivatives are mostly used by corporations to hedge their foreign exchange or interest rate risk, especially in Asian countries due to their highly volatile political and economic situation. Current study aimed to determine the factors affecting firms hedging policies of both foreign currency and interest rate derivative instruments of 105 non-financial firms listed on Karachi Stock Exchange for the period of 2004-2008. Logit model was used to test whether the firm's decision to use hedging instruments can increase firm value? For a detailed analysis, firm's endogenous policies were regressed separately to identify the effect of firm's investment and financing policies on firm's hedging policies. The estimated results supported the financial distress hypothesis, tax convexity, underinvestment hypothesis and managerial risk aversion hypothesis. Though, inconsistent with the theory, interest coverage ratio demonstrated positive effect on firms hedging policies that may be attributed to the lag period effect.**

**Key words:** Derivatives, hedging, foreign exchange derivatives, interest rate derivatives, Pakistan.

## **INTRODUCTION**

Economic liberalization, proliferation of information technology, removal of free trade barriers, loosening of restrictions on capital flows and economic activity have contributed towards the growth in international trade from the last two decades. The growing international trade and capital flows not only enable firms to increase their profits by capitalizing on unexplored market opportunities but also increase firm's risk exposure as well. Corporations therefore, are also focusing on risk management policies along with other financing and investment policies in order to minimize unpredictability of firms projected earnings due to the variations in interest rates and foreign exchange exposures.

Growing globalization trend has encouraged many investors to extend their businesses across geographical boundaries in order to exploit un-tapped market. Whereas, situations like Asian crises of 1998 and U.S financial crises of 2007 had increased exchange rate and interest rate exposure for corporations in general, and firms

engaged in international trade activities in particular. Unstable political and economic situation had made net cash flows more sensitive to interest rate and exchange rate volatility and therefore, increased the trading of derivative instruments in Asian countries. To deal with such a volatile financial environment, financial professionals have developed both off-balance sheet and on-balance sheet financial instruments in order to manage risk arising from various sources. Survey report of International Swaps and Derivative Associations reported that the usage of interest rate derivatives increased from USD 69.2 Trillion in 2001 to USD 464.7 Trillion in 2007, while, credit derivatives and equity derivatives showed an increase of approximately 69.33 and 11.9% respectively from 2001 to June 2008.

This increase usage of derivative instruments has motivated many researchers to explore the reason behind firm's decision to use derivative techniques for hedging risk exposure. Traditional paradigm by Modigliani and Miller (1958) asserted that firm's decision to hedge its risk exposure has no effect on firms' value. While, hedging theorists identified financial distress costs, agency costs of debt, underinvestment hypothesis, tax convexity,

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agency costs of equity and hedging substitutes as the main determinants of firms hedging policies for both foreign currency and interest rate derivative instruments. Researchers have tried to empirically examine the impact of above factors on firms hedging policies mostly in developed countries, whereas, very few studies have focused on developing and emerging economics. Despite of a volatile political and economic situation of Pakistan from the last five years no study has explored the determinants of firm's hedging policies of non-financial firms of Pakistan. Current study attempts to fill this gap by identifying the factors affecting the firm's hedging policies of using interest rate and foreign currency derivative instruments of 105 non-financial firms listed on Karachi stock Exchange for the period of 2004 to 2008.

## LITERATURE REVIEW

Formerly, corporations are employing diversification strategy of Markowitz (1952) in order to reduce firms' systematic risk (Sprcic, 2008). Financial managers characterize diversification approach as an operational hedging technique as firm invests in any unrelated or outside the geographical boundaries projects. This strategy though provides synergy to firm, but adoption of mixed floating exchange rate regime by mostly countries has made expected cash flows more exposed to exchange rates and interest rates volatility. Corporations are, therefore, engaging in aggressive financing policies, such as higher liquidity, lower leverage and investment expenditures in order to ensure investors that sufficient funds are available in hand for precautionary motives, yet on the other hand aggressive financing policies increase opportunity cost for firms. Therefore, as an alternative, financial professionals have developed derivative instruments in 1970s as a hedging instrument to hedge corporation's risk exposure.

Researchers have tried to determine that under frictional world, usage of hedging instruments can enhance firm value.

Smith and Stulz (1985) states that firms having higher financial distress costs, leverage, growth opportunities and tax convexity are exposed to higher foreign exchange and interest rate exposure and thus, are more probable to use hedging instruments. Bessembinder (1991) stated that hedging provides an incentive for a firm to reduce opportunistic behavior of bond holders and therefore, enhances firm's value. Froot et al. (1983) empirically find that firms with higher growth opportunities and financial constraints are more likely to hedge corporation's risk exposure, which is later on empirically supported by the Gay and Nam (2002) by using the data of 486 U.S non-financial firms for the period of 1993 to 1995.

Obtaining a sample data of 711 U.S firms for year 1992, which discloses their usage of derivative

instruments, Mian (1996) reports mixed evidence regarding tax convexity and growth opportunities whereas growth options show significant negative effect on corporation's decision to use hedging instruments and this might be due to the high financial reporting cost in time of growth whereas size supports economies of scale hypothesis. By using 100 U.S oil and gas producer companies, Haushalter (2000) identifies the determinants of decision to use derivatives and the extent of such decision. By taking fraction of oil and gas revenue being hedged as dependent variable, independent variables are regressed via Tobit model. Study estimates a positive relation between decision to use derivative and leverage, debt constraint, investment expenditures and tax convexity. While dividend payout, managerial ownership and basis risk have demonstrated negative effect on firm's decision to hedge risk exposure.

Another study by Foo and Yu (2005) has explored the determinants of firms' hedging policies by using a sample data of 297 firms of fortune 500 for the period of 1997. Empirical results support underinvestment hypothesis and economies of scale. Leverage though positive but not consider as an important factor in driving firms hedging policies, whereas mixed findings are documented by tax convexity and managerial ownership. Via survey data, Kapitsinas (2008) studies the usage and practice of derivative instruments of 62 Greece non-financial firms for the year of 2005. Survey findings for motives behind firm's decision to use derivative instruments report that 61.9% corporations are using derivative instruments for reducing cash flow variability and 47.62% corporations employ derivative instruments to minimize variation in accounting earnings. Hedging the balance sheet account and firm value are the objective of only 9.52 and 4.76% derivative usage, respectively.

In order to examine the relationship between firms' riskier policy choices and compensation plan, Coles et al. (2006) test sample data of fortune 500 firms for the period of 1992 - 2002. Results support a positive relationship between Vega and riskier policy choices whereas delta depicts negative effect on firm's riskier policies. According to Fok et al. (1997), instead of using off-balance sheet hedging instruments corporations can reduce their risk exposure by altering on-balance sheet items or financing policies, therefore, researchers have used liquidity, dividend payout and hybrid securities as substitutes of hedging (Nance et al., 1993).

Considering different sample data set, researchers have explored determinants of firms hedging policies via Logit and Tobit model. Abolhassan Jalivand (1999), Berkman and Bradbury (1996), Singh and Upneja (2009) and Heaney and Winata (2005) finds a significantly positive relationship between leverage and firms decision to hedge risk exposure via derivative instruments. In addition to them Schiozer and Saito (2009) and Allayannis and Ofex (2001) observe that larger firms are more tend towards using derivative instruments. Positive influence

of hedging substitutes and tax convexity on firms decision to use derivative instruments have been observed by Abolhassan Jalivand (1999), Berkman and Bradbury (1996), Geczy et al. (1997), Schiozer and Saito (2009), and Heaney and Winata (2005). While Singh and Opneja (2009), Schiozer and Saito (2009), Geczy et al. (1997) demonstrate positive effect of growth options on firms derivative usage whereas mixed findings are estimated by researchers for managerial ownership.

Existing literature depicts that major part of empirical studies explore hedging patterns of U.S non-financial firms though only few have explored Asian non-financial firms like Faizullah et al. (2008) and Ameer (2009). Despite of highly volatile political and economic situation of Pakistan, the empirical investigations on the determinants of firm's hedging policies of Pakistani non-financial firms is yet to be undertaken. Therefore, to fill this gap, current study intends to examine the determinants of hedging policies by using the data of 105 listed non-financial firms of Pakistan for the period of 2004 - 2008. Moreover, present study also intends to facilitate decision makers in identifying hedging policies while considering the agency cost of debt and equity.

## METHODOLOGY

Following Berkman and Bradbury (1996), the study intends to identify the impact on firms hedging policies of financial distress costs, underinvestment costs, tax convexity, managerial incentives and other control variables on firms hedging policies for both interest rate and foreign exchange derivative instruments. Sample data is classified into two groups, users of derivative instruments and non-users, in order to test whether users are significantly different from non-users in their operating characteristics; non-parametric Mann-Whitney U test is used. Furthermore, it is assumed that firms use derivatives to hedge foreign exchange risk and interest rate risk, hence, in order to test whether firms use derivatives to hedge risk exposure or not, Logit model is used with binary value 'one' for derivative users and 'zero' for non-users.

In order to test empirically the factors affecting the firm's decision to use various hedging techniques, a sample data of 105 non-financial firms are taken for the period of 2004-2008. According to International Accounting Standards (IAS) 32 and 39, it is mandatory for firm's to disclose their usage of hedging instruments and their respective fair value in the notes of annual reports in a uniform manner.

Almost 60% of total sample data firms declared their usage of foreign currency derivatives and 70% firms of total sample data are identified as interest rate derivative users.

Financial sector has been excluded from the sample data since their business activities required derivatives to be used in trading or speculative motive.

Model 1 depicted that derivative usage is a function of size, financial distress costs, tax convexity, asset growth cash flow, profitability, managerial ownership and foreign sales.

$$DERIV_{it} = a + b_1a + b_1INCOV_{it} + b_2b_2SIZE_{it} + b_3b_3AGCF_{it} + b_4b_4MO_{it} + b_5b_5TAX_{it} + b_6b_6FS_{it} + ee_{it} \dots\dots\dots (1)$$

Where, SIZE = log of total assets; INCOV = ratio of earning before interest and taxes by interest expense; TAX = binary value 1 for unused tax losses and 0 otherwise; AGCF = ratio of change in

tangible assets plus depreciation by addition of net income and depreciation; MO = log of managerial holdings; FS= log of foreign sales and DERIV = dummy one if firm use foreign currency or interest rate risk derivative instruments and zero otherwise.

In order to identify the endogeneity effect, Mian (1996) studied the impact of leverage, dividend payout and liquidity on derivative usage. Firm's investment and financing policies can be effected from firm value; therefore model 2 is regressed by using Logit model to determine endogeneity effect of leverage, growth options, dividend payout and liquidity on firm's decision to use derivative instruments to hedge their foreign currency and interest rate risk exposure.

$$DERIV_{it} = a + b_1a + b_1LEV_{it} + b_2b_2MTB_{it} + b_3b_3LIQ_{it} + b_4b_4DP_{it} + ee_{it} \dots\dots\dots (2)$$

Where, LEV = ratio of total debt to total assets; MTB = ratio of market value of firm to book value of firm; LIQ = ratio of subtraction of current assets minus inventory to current liabilities and DP = ratio of dividend payout per share to earning per share.

## RESULTS

### Univariate analysis

For in-depth analysis, variations in firm's specific operating characteristics for both users and non-users were examined through Mann-Whitney U test.

Column 1 of Table 1 consists of the list of independent variables. Column 2 and 3 reported descriptive statistics of users and non-users, while last column demonstrated mean difference values for both the users and non-users. Findings characterized users as large size financial distressed leveraged firms having higher growth opportunities, tax convexity and foreign exchange exposure.

Though, users were identified as profitable firms with more ability to pay finance costs but still they were unable to finance their growth opportunities as they were depicted as financially constrained firms with lower liquidity level and higher dividend payout ratio. Furthermore, consistent with the agency costs of equity, firms with high managerial ownership had higher derivative usage.

In comparison, non-users were small size less financial distressed firms. Corporation's inability to pay their finance costs decreased their ability to take more debt. In addition, non-users faced lower growth opportunities and therefore, despite of lower profitability level they were in a position to finance their growth opportunities. Users were observed as statistically significant from non-users in terms of financial distress costs, size, growth opportunities, managerial ownership and foreign exchange exposure.

Table 2 described correlation matrix of independent variables. Excluding factors defining firm's endogenous policies, Model 1 illustrated that firms with higher ability to pay finance costs have lower capability to convert its growth options into assets in place, tax losses, managerial ownership and foreign exposure. Whereas, positive correlation between firm's ability to pay its finance costs and size explained that larger size firms have enough

**Table 1.** Univariate analysis for all derivatives.

Variable	Mean non-user (96)	Mean user (248)	Mann-Whitney U test
LEV	0.5654 (0.2002)	0.5849 (0.2071)	-0.701 (0.484)
INC	4.7889 (3.5865)	4.9298 (3.2522)	-0.721 (0.471)
SIZE	6.2406 (0.6067)	6.4315 (0.5786)	-2.349 (0.019)**
MKBK	1.1556 (0.6790)	1.2484 (0.5978)	-2.323 (0.020)**
AGCF	2.1383 (2.3859)	2.4866 (2.4226)	-1.512 (0.131)
DP	0.1899 (0.3879)	0.2029 (0.3416)	-1.390 (0.165)
QR	3.0264 (1.5272)	2.8254 (1.6601)	-1.617 (0.106)
MNGRL	3.4457 (1.5224)	3.8594 (1.3306)	-1.886 (0.059)*
TAX	0.3958 (0.4916)	0.4274 (0.4957)	-0.532 0.595
LFS	1.8286 (2.5762)	3.0491 (2.7879)	-0.6727 (0.000)***

\*\*\*, \*\*, \* are 1, 5 and 10% respectively

**Table 2.** Correlation matrix.

Model 1	INC	SIZE	AGCF	TAX	ILMNGRL	LFS
INC	1					
SIZE	0.18	1				
AGCF	-0.182	-0.026	1			
TAX	-0.291	0.0562	0.0273	1		
LMNGRL	-0.0886	0.2868	0.0755	0.1986	1	
LFS	-0.1367	0.0583	0.1428	0.1353	0.1017	1
Model 2	LEV	MKBK	DP	QR		
LEV	1					
MKBK	-0.073	1				
DP	-0.0086	0.0365	1			
QR	-0.3852	0.0878	-0.0005	1		

cash in hand or having access to cash because of institutional stake, hence can easily pay their interest payments.

Moreover, financially distressed firms had higher unused tax losses and foreign exchange exposure. Model 2,

**Table 3.** Logit regression for all derivatives by using panel data analysis.

Binary	Model 1			Model 2		
	Coefficient	Z	P>z	Coefficient	Z	P>z
LEV				0.4484	0.1	0.424
INC	0.0467	1.75	0.032**			
SIZE	0.4620	1.84	0.065*			
MKBK				0.2856	1.47	0.14
AGCF	0.0036	0.1	0.921			
DP				0.0203	0.29	0.769
QR				-0.0395	-0.88	0.378
TAX	0.2603	0.9	0.368			
LMNGRL	0.2311	2.39	0.017**			
LFS	0.2202	4.09	0.000***			
_cons	-3.0722	-1.98	0.048***			
	Number of observation=340			Number of observation =323		
Logit	LR Chi square (9) =44.55			LR c chi square (4)=3.47		
regression	Prob > Chi square=0			Prob > chi square=0.4832		
	Pseudo R <sup>2</sup> =0.1101			Pseudo R <sup>2</sup> =0.009		

\*\*\*, \*\* and \* are significant at 1, 5 and 10% respectively

documented correlation coefficients of firms' endogenous policies, supported pecking order theory that firms possessing growth opportunities were more likely to finance these opportunities through internally generated funds. Moreover, negative relationship between leverage and quick ratio demonstrated that they both work as a substitute of each other.

Empirical findings regarding firms' decision to use derivatives to hedge foreign exchange risk and interest rate risk were reported in Table 3. Model 1 showed that, supporting economies of scale, large size firms were more likely to use derivative instruments to hedge risk exposure. Aligned with underinvestment hypothesis, corporations with higher market to book ratio and inability to convert these growth options into assets in place were observed as larger interest rate and foreign exchange derivative user. Significant positive relationship between managerial ownership and usage of derivative instruments proved existence of agency of cost of equity in Pakistan.

Corporations with higher foreign exchange exposure were found to be the significant user of foreign exchange derivative instruments. Tax convexity showed insignificant positive impact on corporation's usage of derivative instruments, depicted that marginal gain obtained from hedging unused tax losses was approximately equal to the cost of the employing interest rate and foreign exchange derivative instruments. Except for interest coverage ratio, all other variables depicted signs consistent with the hedging theory. It was expected that corporations having less ability to pay their finance costs were more likely to use foreign currency or interest rate

hedging instruments. But positive relationship between firms' ability to pay its finance costs and usage of hedging instruments explained that in order to avoid any adverse circumstances firms that were still in a position to pay their finance costs were using interest rate and foreign currency derivative instruments.

Model 2 exhibited effect of firm's endogenous policies on its decision to use interest rate and foreign exchange derivative instruments. Consistent with financial distress hypothesis, financially leveraged firms were assumed to be the derivative user in order to reduce variability in net income. Highly growth oriented firms demonstrated positive relationship with derivative usage, coherent with underinvestment hypothesis. Corporations having higher dividend payout ratio and liquidity constraints were more probable to use interest rate and foreign exchange derivative instruments in order to hedge variability in net income. All the coefficients of Model 2, that were leverage, growth options, dividend payout and liquidity, support hedging theory, though results were insignificant.

## Conclusion

It is generally argued that the overall change of a country's economic and political situation expose firms to changes in interest rates and foreign exchange rate risk, thus increasing firm risk level. Derivatives are therefore, widely used by many firms to hedge firms' interest rate risk and foreign exchange rate risk. Current study attempts to identify the factors influencing the firms' decision to hedge their risk by using the data of 105 listed

non-financial Pakistani firms for the period of 2004 - 2008. Overall, findings support Smith and Stulz (1985) that firm can achieve its primary goal of shareholders' wealth maximization through optimal utilization of the hedging technique.

Empirical estimation supports financial distress hypothesis that corporations having lower tangible assets and higher leverage ratio are more likely to use hedging instruments in order to reduce the variability in net income.

Confirming existence of agency cost of debt and equity in non-financial firms of Pakistan, findings describe that corporations having higher growth opportunities and managerial ownership can enhance firm's value by optimally employing hedging instruments. Moreover, corporations with higher foreign exchange exposure are more likely to employ hedging instruments, while contradictory with the financial distress theory, positive relationship between firms' interest coverage ratio and hedging usage might be due to the lag period effect of firm's derivative usage in previous year.

The interest rate hedging instruments facilitate corporations to take debt at a lower interest rate, which enables firms to pay their finance costs in upcoming years.

Current Study attempts to identify the determinants of firms hedging policies for both interest rate and exchange rate exposure and helps academics in identifying the factors affecting the firm's decision to hedge its risk exposure in emerging countries like Pakistan.

However, the results of this study may be biased since a large number of sample firms are using interest rate derivative instrument as compared to foreign exchange derivative instruments, so future research could be focused on determining the factors affecting interest rate and foreign currency derivative instruments independently.

For practitioners, study facilitates in understanding how corporations can enhance firm's value by reducing financial distress costs, underinvestment costs and agency cost and foreign exchange by defining firm's hedging policies along with other corporate financial decision. For policy makers, this study explains that despite of illiquid and amateur Pakistani derivative market;

Pakistani non-financial firms decide to use hedging techniques in order to minimize financial distress costs, financial constraints and foreign exchange exposure. Therefore, policy makers should develop a well-organized exchange traded derivative market so that large sized financially constrained firms with highly variable cash flows, leverage, growth options and foreign sales can get benefit by optimally utilizing hedging techniques. As a result, it will not only facilitate the firms to achieve their primary goal of shareholders' wealth maximization – but may also enhances economic growth.

## REFERENCES

- Allayannis G, Ofex E (2001). Exchange rate exposure, hedging, and the use of foreign currency derivatives. *J. Int. Money Financ.*, 20: 273-296.
- Ameer R (2009). Value-Relevance of foreign-exchange and interest-rate derivatives disclosure. The case of Malaysian firms. *J. Risk Financ.*, 10(1): 78-90.
- Berkman H, Bradbury ME (1996). Empirical Evidence on the Corporate Use of Derivatives. *Financ. Manage.*, 25(2): 5-13.
- Bessembinder H (1991). Forward Contracts and Firm Value: Investment Incentive and Contracting Effects. *J. Financ. Quant. Anal.*, 26(4): 519-532.
- Coles JL, Daniel ND, Naveen L (2006). Managerial incentives and Risk-taking. *J. Financ. Econ.*, 79: 431-468.
- Faizullah M, Azizan NA, Hui TS (2008). The Relationship between Hedging Through Forwards, Futures & Swaps and Corporate Capital Structure in Malaysia. Presented at Second Singapore International Conference on Finance (SSIF). Organized by Saw Center for Financial Studies and Department of Finance NUS on 17-18 July, Singapore.
- Fok RC-W, Carroll C, Chiou MC (1997). Determinants of Corporate Hedging and Derivatives: A Revisit. *J. Econ. Bus.*, 49: 569-585.
- Foo M, Wayne Y (2001). The Determinants of Corporate hedging decision: An Empirical Analysis. Presented at the Northern Finance Association (NFA) 2001 Annual Meeting. September 28-30 in Halifax. Nova Scotia.
- Froot KA, Scharfstein DS, Stein JC (1993). Risk Management: Coordinating Corporate Investment and Financing Policies. *J. Financ.*, 48(5): 1629-1658.
- Gay GD, Nam J (1998). The Underinvestment Problem and Corporate Derivatives Use. *Financ. Manage.*, 27(4): 53-69.
- Geczy C, Minton BA, Schrand C (1997). Why Firms Use Currency Derivatives. *J. Financ.*, 52(4): 1323-1354.
- Haushalter GD (2000). Financing Policy, Basis Risk, and Corporate Hedging: Evidence from Oil and Gas Producers. *J. Financ.* 55(1): 107-152.
- Heaney R, Winata H (2005). Use of Derivatives by Australian Companies. *Pacific-Basin Financ. J.*, 13: 411-430.
- ISDA (2008). ISDA® Research Notes. [www.isda.org/researchnotes/pdf/researchnotes-Autumn2008.pdf](http://www.isda.org/researchnotes/pdf/researchnotes-Autumn2008.pdf). 12/12/2010
- Kapitsinas S (2008). Derivatives Usage in Risk Management by Non-Financial Firms: Evidence from Greece. Submitted to MPRA paper No. 10945 on 7<sup>th</sup> October.
- Markowitz HM (1952). Portfolio Selection. *J. Financ.*, 7(1): 77-91.
- Mian SL (1996). Evidence on Corporate hedging policy. *J. Financ. Quant. Anal.*, 31(3): 419-439.
- Modigliani F, Miller MH (1958). The Cost of Capital, Corporation Finance and The Theory of Investment. *American Econ. Rev.*, XLVIII(3): 261-297.
- Nance DR, Smith CW, Smithson CW (1993) On the Determinants of Corporate Hedging. *J. Financ.*, XLVIII(1): 267-284.
- Schiozer RF, Saito R (2009). The Determinants of Currency Risk Management in Latin American Non-financial Firms. *Emerg. Mark. Financ. Trade.*, 45(1): 49-71.
- Singh A, Upneja A (2008). The determinants of the decision to use Financial Derivatives in the Lodging industry. *J. Hosp. Tourism Res.* 32(4): 423-447.
- Smith CW, Stulz RM (1985). The Determinants of Firms' Hedging Policies. *J. Financ. Quant. Anal.*, 20(4): 391-405.
- Spric DM, Tekavcic M, Sevic Z (2008). Corporate risk management practices in Croatian companies. *Ekon. Perogl.*, 59(7-8): 344-369.