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Impact of Cash Flow Volatility on Capital Structure and Debt of Different Maturities

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Abstract

The firm's capital structure is the most crucial decision to its operating and investment activities, and it has been studied at both the academic and corporate levels. The purpose of this study is to investigate how different Pakistani listed companies' cash flow volatility may have an impact on their capital structure and the maturity of their debt. The research covers the years 2013 through 2022 and includes data from a total of 80 non-financial companies. The fact that multiple measures of capital structure and cash flow volatility have been used makes this study stand out as being particularly novel. The findings of the research indicate that capital structure and cash flow volatility have a significant and negative relationship with one another. This indicates that a one standard deviation increase in cash flow volatility will lead to a decrease of 0.24 in leverage. Our model accurately predicted a significant and negative connection between debt maturity and the volatility of cash flow. That means a decrease in debt maturity of 0.82 percentage points for every standard deviation in cash flow volatility. The results of this model suggest that when dealing with high levels of cash flow volatility, businesses should utilize debt with a shorter maturity. For the purposes of analysis, the OLS and GLM Logit link functions on SPSS have been utilized over the data.

Keywords: Capital structure, Cash flow volatility, Debt maturity, Multiple measures, GLM logit

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1. Introduction

How organizations or the firms decide about their capital structure and what are the important determinants of capital structure, are the two most frequently and extensively researched areas in the field of corporate finance. Capital structure decision is the most critical decision for the firms. According to net income approach, if a firm is failed to make this decision effectively this may lead a firm to insolvency. Whereas according to Modigliani and miller (1958) capital structure is irrelevant to the value of the firm. A rich theoretical and empirical research literature is available on capital structure and the factors affecting its decision but there is no conclusive argument.

Pierluigi Santosuosso (2015) stated that various surveys have been conducted around the world in order to analyze the financial manager's view or opinions about the factors affecting their policies of capital structure in practice. Earning volatility or the cash flow volatility considered as the most important factors that influence decisions of financial mangers regarding capital structure. Similarly in decisions regarding issuing debt cash flow volatility is considered as third most important element (Graham & Harvey, 2001).

As cash flow volatility is used as proxy of business risk, which means probability of an organization to face financial distress. That's way (Keefe and Yaghoubi 2017) argued that the higher cash flow volatility leads to higher cost of debt which demotivates firm to leaver up their capital structure. Viet and Dang (2017), agreed with the arguments of (Keefe and Yaghoubi 2017) and further found that some time even firms having low cash flow volatility do not use higher levels of debt in capital structure because they are financially constrained. So reverse relationship is not always observed. Another study of Choe et al. (1993) also did not found reverse relationship they cited that even having low cash flow volatility firms do not levered up their capital because of macroeconomic conditions which may not be supportive for borrowing. A very prominent theory of capital structure "Trade-off theory" suggests that firm's leverage level fall when there is increase in volatility of cash flow (Frank and Goyal, 2009). Similarly Evan and James (2015) found that firms facing financial constraints use debt in their capital structure when their cash flow volatility is low but face high levels of problems when try to unlevered due to high cash flow volatility then. By the same token Dudley and James, (2014) found negative and significant relationship of both leverage and cash flow volatility furthermore it states that firms increase their leverage with decrease in cash flow volatility but volatility do not increase in response to firms decrease in its leverage or retirement of leverage, more over they also states that this irregular behavior of cash flow volatility is more prominent in financially constraint firms. Lastly (Friend and Lang 1988) identified positive relationship among volatility and leverage; however (Bradley, Jarrell, and Kim 1984) analyzed a negative relationship.

On the other hand Ayla and Titman (2004) found that among investment expenditures, history of stock price and cash flow volatility, cash flow volatility is least effecting debt ratio of firms. Likewise Frank and Goyal (2009) in their study of determinates of capital structure determined twenty five explanatory variables represented as determinates of capital structure in previous studies and found only

six of them significantly explain capital structure in empirical testing. Further it is identified that cash flow volatility is not robustly explain capital structure. Likewise many other studies such as Roberts (2005) and Antoniou, Guney, and Paudyal (2008) they also do not find any reliable explaining power of cash flow volatility for capital structure. A seminal study of international firms conducted by Rajan and Zingales (1995) do not have cash flow volatility as explanatory variable as well. Parallel studies were performed by (Leary and Roberts 2014) and (Kayhan and Titman 2007).

Even the available literature regarding relationship of cash flow volatility and a firm's use of debt is extensive still there is no consensus on the nature of relationship between them. Further our understanding of capital structure is developed from those studies based on data of advanced countries or economies which have different infrastructure and institutional differences than developing countries. Markets of developing countries are comparatively young than markets of developed countries. Keeping this in view the purpose of this study is to analyze this puzzled relationship of cash flow volatility and capital structure of firms belong to developing countries like Pakistan, as we have found no literature in Pakistani setting. This relationship is further explored by analyzing the debt maturity structure of the firms with different levels of cash flow volatility.

We have used multiple measures of cash flow volatility and leverage because of lack of uniformity in the existing literature whereas conclusion is independent of which measure is used. In this study, we endeavor to analyze in what way cash flow volatility defines firm's leverage and debt maturity structure in the context of Pakistani listed manufacturing sector firms. This sector has been chosen on the basis of the fact that it alone contribute 13.45 percent in GDP in 2017.

The remaining part of the paper is organizes as, section 2 provides framework used to formulate hypotheses. Whereas section 3 contains information related to methodology followed for this research. Last section presents results and discussion of the analysis.

2. Hypothesis development

Those firms which have high cash flow volatility and bankruptcy cost are characterized as riskier firms. As stated earlier that trade off theory suggest that the firms at higher levels of risk include lower level of debt in their capital structure. There exist plenty of other arguments which support believe of trade off theory. For example model of Merton (1974) which considered equity of a firm as call option over the assets of the firm. This model states that the firm will be default firm if the value of the firm's asset is less than value of debt on its maturity date. This concept provides a simple indicator or index for the chances of firm's default, as a function of assets present value as compared to the value of debt and asset volatility of that firm.

Leland (1994) developed a model similar to that of Merton (1974), by the name of optimal capital structure model which states that optimal leverage counter balance tax benefit over debt with the expected bankruptcy cost. Most of the prior studies found negative relationship between cash flow volatility and leverage. Further Minton and Schrand (1999) found that the relationship between cash flow volatility and cost of debt is positive. Due to this reasons firms having higher cash flow volatility try to reduce their leverage level to reduce cost of debt. This leads us to hypothesize that the leverage and cash flow volatility has inverse relationship.

H1: There exist negative relationship between cash flow volatility and leverage.

Cai et al. (2008), states that optimal debt maturity structure or choices are very crucial for firms as it helps to avoid any possible bankruptcy and agency cost. Another study by Kane et al. (1985) found negative relationship between asset return volatility and debt maturity structure. As cash flow volatility is also used as risk measure (Sarkar, 1999) states that it (cash flow volatility) increases chances of bankruptcy thus having inverse relationship with debt maturity.

Cash flow volatility is identified as key variable that influences optimal debt maturity structure of a firm Miltersen and Torous (2008). Dangl and Zechner (2016) used comparative analysis method to claim that optimal debt maturity is reduced when there is higher cash flow volatility. Further they stated that growth in the cash flow rate results in extension of optimal maturity of the debt. Keefe and Yaghoubi (2016) used Black and Scholes model (1973) on capital structure to illustrate the marginal cost of debt increase if a firm issue debt of longer maturity when there is high cash flow volatility. Ultimately this results in issuance of shorter maturity debt when experiencing high cash flow volatility.

In another study Ju and Ou-Yang (2006) firms issue shorter maturity debt or issue debt more frequently when having higher cash flow vilitality.in this way firms gain benefits of tax shield over debt and bankruptcy cost is reduced and vis a vis. therefore it is hypothesizes that the higher cash flow volatility leads to shorter maturity debts.

H2: Firms with high cash flow volatility prefer to use debt of shorter maturities.

3. Methodology

3.1. Sample

Sample of the study consist on 80 non-financial listed firms. Sample is constructed on the basis of availability of data and time constraint. Panal data of 10 years from 2013 to 2022 for these 80 firms has been collected. Final data set reduced to 7 years because of 3 years lag is taken on cash flow volatility measure. Data has been collected from annual reports of firms and Karachi stock exchange website.

4. Variable construction

4.1. Capital structure

Previous studies on capital structure used different measures for leverage. There is no universal leverage measure. In most of the prior studies leverage or proxy of capital structure is defined as ratio of financial debt and total asset (FD/TA). We intended to not fellow this measure as it has been criticized by Welch (2011) which states that this measure ignore non-financial liabilities and treat them as equity which is not correct. During literature review we found three different definitions for leverage. 1) The most broad definition of debt include all liabilities, financial and non-financial (Rajan and Zingales 1995). 2) This approach consider only short term and long term financial liabilities as debt (Huang and Song 2006). 3) According to third definition the narrowest approach, only long term debt is considered as debt (Bradley et al 1984). Further these three measures of capital structure are defined at both book and market value to address criticism of Welch (2011) which results in six measures of capital structure in total. To construct capital structure variables at book value we used book value of equity (total asset) in denominator and for market value

calculation we used market value of equity (market capitalization) in denominator. Detailed construction of capital structure measures is given in the table 1.

5. Cash flow Volatility:

Like capital structure cash flow volatility is also measured in number of ways in prior studies. Dierker et al., 2013, scaled the annualized standard deviation of operating cash flows by total asset to construct cash flow volatility measure. Percentage change in annual earning's first difference subtract mean of the first differences is used to construct cash flow volatility measure by (Antoniou et al., 2009). In another study (Booth et al., 2001) standard deviation of ROS (return on sales) is used as proxy. Which means there is no standard cash flow volatility measure. Due to lack of consensus over one definition of cash flow volatility we used two different definition of cash flow volatility.

In order to construct final cash flow volatility measure we first need to develop a measure of cash flow. We used operating income before depreciation (OIBD) as our first, measure of cash flow and cash base operating profit as second measure (Ball et al. 2015). At second step we scaled our cash flow measures by net asset. Various prior studies scaled their cash flow measure by net asset like Bradley et al. (1984) and Dierker et al. (2013). Instead of total asset net assets has been used because according to Pinkowitz and Williamson (2007) cash holdings of a firm are function of its cash flow volatility. By using net assets this function has been removed. Furthermore the advantage of scaling measures is that it makes comparison between firms easy. After that on third step, to measure volatility in our cash flow measures we fallowed Friend and Lang (1988). By following Friend and Lang (1988) we calculated five-year rolling standard deviation of both measures of cash flow. At Last step we lag cash flow volatility measure to deal with any potential issue of indigeneity. Detailed calculation of cash flow measures is given in the table 1.

6. Control variable of the study:

Some control variables are also the part of study. These variables have been included to avoid any possible alternative explanations. Variables identified by Frank and Goyal (2009) have been used as control variables. There are total five control variables and their detail construction is presented in table 1.

Table 1: Detailed variable construction

NO.	VARIABLE	CONTRUCTION
	CAPITAL STRUCTURE	
1	Capital structure as total liability at market value (LEV 1)	• Total liability/(total asset-equity)+market capitalization • TL/(TA-Equ)+MC
2	Capital structure as total liability at book value (LEV 2)	• Total liability /total asset • TL/TA
3	Capital structure as total debt at market value (LEV 3)	• Total debt/total debt +market capitalization • TD/TD+MC
4	Capital structure as total debt at book value (LEV 4)	• Total debt/total asset • TD/TA
5	Capital structure as long term debt only at market value (LEV 5)	• Long term debt/long term debt market capitalization • LD/LD+MC
6	Capital structure as long term debt only at book value(LEV 6)	• Long term debt /total asset

		• LD/TA
	CASH FLOW VOLITALITY	
	Operating income before depreciation(vcf 1)	• OIBD= Net Sales- Operating Expenses • OIBD=NS-OE
1	Cash based operating Profit (vcf 2)	• CBOP= Operating profit –Receivables-inventory-prepaid expenses+ total deferred revenue+ account payable+ accrued expenses • CBOP=OP-R-INV-PE+DR+AP+AE
2	Operating Profit (OP)	• Operating profit =sales-cost of goods sold-(operating expenses- research and development expenses) • OP=S-CGS-(OE-R&D Exp)
	CONTROL VARIABLES	
1	Asset Tangibility (A.Tan)	• Fix asset/Total asset • FA/TA
2	Firm size (f size)	• Natural log of total asset • Ln (TA)
3	Profitability (profit)	• Operation income before depreciation/total asset • OIBD/TA
4	Market to book ratio (MTB)	• Market value of asset or market capitalization/total asset • MC/TA
5	Ln R&D	• R&D expenses /sales • Ln (1+R&D/S)

7. Debt Maturity:

The third variable which is need to test second hypothesis is Debt maturity and it is a categorical variable. Like our other two variables it also has been measured in different ways in previous studies resulting in no standard measure. For example Fan et al. (2012) estimated it by using the ratio of long-term debt to total debt. Another study conducted by Barclay and Smith (1995) ratio of debt with more than three years maturity to total debt is used as measure of debt maturity. Keefe and Yaghoubi (2016) have used a unique approach to measure debt maturity. They assigned different categories according to the usage of debt of firms of different maturities. On category 1 they place those firms which are using debentures of maturity life 10 years and firms using notes but not debentures are placed in second category. Further in category three those firms fall which are using long term debt with maturity less than notes. Whereas firms in category four are those which are using short term debts in their capital structure. And in last category firms which do not use short term or long term debt in their capital structure are placed. We used their approach to construct our debt maturity variable with little modifications. Detailed construction of debt maturity is given in the following table.

Table 2: Debt Maturity

Categories	Debentures (D)	Notes (N)	Long Term Debt (LTD)	Short Term Debt (STD)	Short & Long Term Debt (SLTD)
1	Yes	N.A	Yes	N.A	N.A
2	No	Yes	Yes	N.A	N.A

3	No	No	Yes	N.A	N.A
4	No	No	No	Yes	NO
5	No	No	No	No	NO

Table shows that there are total 5 categories of debt maturity variable. Reaming table explains the rules according to which variable is set. "Yes" means the firm is using that type of debt where as "No" means firm is not using that type of debt and N.A means fir may or may not use that type of debt.

8. Estimation models

In order to test our first hypothesis or impact of cash flow volatility over leverage we followed the methodology used by (Papke and Wooldridge 1996) and (Kieschnick and McCullough 2003). They used GLM with logit link function, this model is preferred because our dependent variable value lies between 0 and 1 being a fractional variable. According to Cook et al. (2008) conditional anticipations for fractional dependent variable is represented as nonlinear function of independent variables. In such case application of linear function will results in error. Following GLM model is used to test hypothesis 1 with control variables.

$$E(Lev_{i,t)}) = G(\beta_0 + \beta_1 VCF_{i,t-1} + \beta_2 prof_{i,t-1} + \beta_3 FSize_{i,t-1} + \beta_3 tang_{i,t-1} + \beta_4 RND_{i,t-1} + \beta_7 MTB_{i,t-1} + \mu)$$

In order to test the hypothesis 2 or the impact of cash flow volatility over debt maturity structure of the firms, we used OLS model by introducing categories into OLS. Because our dependent variable is a categorical variable, estimation model is given below.

$$(Dm > m \mid c, x_{t-1,}v_{j)}) = \Theta(\beta_1 VCF_{i,t-1} + \beta_2 prof_{i,t-1} + \beta_3 FSize_{i,t-1} + \beta_3 tang_{i,t-1} + \beta_4 RND_{i\ ,t-1} + \beta_5 FAge_{i,t-1} + \beta_6 Lev_{i,t-1} + \beta_7 MTB_{i,t-1} + VJ - cm)$$

In the above model, m symbolizes the category number, whereas c represents the set of cut points of debt maturity, as we have 5 categories of debt maturity m=5,so the cut point for above mentioned model is c=4. Ø represents here cumulative distribution function of standard normal distribution, and the standard normal distribution of the residual vj N (0, 1).

9. Analysis and Discussion

9.1. Descriptive and covariance matrix:

Table 3 given below shows descriptive statistics of the variables used in the study. Tables indicates that mean of LEV 2 which is total debt at book value is highest (0.56742) among all leverage variables with max value 0.998646 and minimum value 0.000203. Cash flow volatility (VCF) have mean value 0.56742 and its maximum value 279.243 and minimum value 0. Mean value of third variable debt maturity is 2.983929 where as its maximum value is 5 and minimum value is 1.

Table 4 shows co variance analysis. Analysis of variance allows the comparison of variable in more than one group that causes the variation in other variables. The table shows the covariance analysis of the variables. The table shows the main results and interaction effects of categorical variables on the continuous variable. Market to

book ration, debt maturity, profitability and R& D are negatively co related with cash flow volatility. Whereas firm size, tangibility and leverage are positively co related.

9.2. Impact of cash flow volatility on capital structure:

The table 5 presents the results of impact of cash flow volatility and other control variables with the first proxy of capital structure that was total liability at market value. It is shown from the table that cash flow volatility showed a negative but insignificant impact on capital structure. It implies that cash flow variation didn't have any influence on the capital structure being measured by total liability at market value. It means that if a firm is measuring its leverage by considering its total liability then variation in cash flow will not effects its capital structure. All other control variables showed the insignificant impact on capital structure except research and development expenses.

Table 3: Descriptive Statistics

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Probability
LEV1	0.18081	0.00382	0.98765	0.000102	0.29803	1.354831	3.216885	172.4171	0
LEV2	0.56742	0.61371	0.99865	0.000203	0.242	-0.39145	2.124932	32.16896	0
LEV3	0.27668	0.00607	0.98765	0.0001	0.35358	0.675134	1.675169	83.49599	0
LEV4	0.40961	0.37421	0.98755	0.000123	0.2483	0.42116	2.164594	32.83944	0
LEV5	0.44471	0.654	0.9999	0.0001	0.38091	-0.1348	1.274094	71.2002	0
LEV6	0.25595	0.1488	0.98785	0.000259	0.27032	1.213655	3.367266	140.6234	0
VCF t-1	44.0378	2.25581	279.243	0	202.167	7.420419	65.75964	97043.88	0
MTB t-1	53.5181	1.01145	10043.8	8.30E-05	632.608	14.62494	225.6654	1176827	0
A.TAN t-1	0.63395	0.96259	1	-129.238	5.50387	-23.5248	555.5893	7176601	0
F.SIZE t-1	16.4764	16.459	24.7186	10.15423	1.77525	0.081137	5.485082	144.7125	0
PROFIT t-1	89.8588	0.96796	10043.8	-21.0716	761.606	10.68426	125.5836	361278.2	0
Ln R&D t-1	0.49419	0.03113	9	0	1.40486	4.096673	21.23347	9323.777	0
Debt Mat	2.98393	3	5	1	0.82325	-0.04728	1.847267	31.21374	0

TABLE 4: Covariance Analysis: Ordinary

	GENR_M	GENR_N	GENR_O	GENR_P	GENR_Q	GENR_R	GENR_S	GENR_LEV2
VCF (-1)	1							

MTBR (-1)	-0.0119	1						
	0.7792	-----						
TANG (-1)	0.00874	-0.0068	1					
	0.8365	0.8716	-----					
F.Size (-1)	0.08329	-0.0794	0.16439	1				
	0.0488	0.0605	0.0001	-----				
Profit (-1)	-0.0195	0.8265	-0.0033	-0.102165	1			

	0.645	0	0.9377	0.0156	-----			
LN R&D (-1)	-0.043	-0.0288	-0.1468	-0.230259	-0.04	1		
	0.31	0.4971	0.0005	0	0.3444	-----		
Debt Mat. (-1)	-0.0747	-0.0222	0.05043	0.078413	-0.0454	-0.0022	1	
	0.0774	0.5997	0.2334	0.0637	0.284	0.9583	-----	
Leverage	0.11471	0.07788	0.00714	0.06356	0.02474	0.06449	-0.012	1
	0.0066	0.0655	0.8661	0.133	0.5591	0.1274	0.777	-----

Table 5: Generalized Linear Model (Dependent Variable: GENR_LEV1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-2.20483	0.79903	-2.759394	0.0058
VCF t-1	-0.00053	0.00078	-0.681669	0.4954
MTBR t-1	-0.00026	0.00037	-0.712055	0.4764
A.TAN t-1	-0.00214	0.01034	-0.207329	0.8358
F.SIZE t-1	0.036457	0.04753	0.767067	0.443
PROFIT t-1	0.000126	0.00015	0.867625	0.3856
Ln R&D t-1	0.177766	0.04178	4.254368	0
Mean dependent var	0.18081	**S.D. dependent var**		0.298029
Sum squared resid	48.31552	**Log likelihood**		-108.576
Akaike info criterion	0.412772	**Schwarz criterion**		0.466871
Hannan-Quinn criter.	0.433896	**Deviance**		48.31552
Deviance statistic	0.08737	**Restr. deviance**		49.65123
LR statistic	15.28792	**Prob(LR statistic)**		0.018132
Pearson SSR	48.31552	**Pearson statistic**		0.08737
Dispersion	0.08737			

Table 6: Generalized Linear Model (Dependent Variable: GENR_LEV2)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.63006	0.43317	-1.454554	0.1458
VCF t-1	0.000656	0.0003	2.171275	0.0299
MTBR t-1	0.000558	0.00042	1.323536	0.1857
A.TAN t-1	0.001004	0.00752	0.133452	0.8938
F.SIZE t-1	0.050806	0.02596	1.95706	0.0503
PROFIT t-1	-0.00014	0.00011	-1.309135	0.1905
Ln R&D t-1	0.065961	0.03198	2.062902	0.0391
Mean dependent var	0.56742	**S.D. dependent var**		0.241997
Sum squared resid	31.53227	**Log likelihood**		10.91148
Akaike info criterion	-0.01397	**Schwarz criterion**		0.04013
Hannan-Quinn criter.	0.007155	**Deviance**		31.53227
Deviance statistic	0.05702	**Restr. deviance**		32.73657
LR statistic	21.12053	**Prob(LR statistic)**		0.001745
Pearson SSR	31.53227	**Pearson statistic**		0.05702

Dispersion	0.05702

Table 6 results presented here show the impact of cash flow volatility and other control variables on capital structure being measured by total liability at book value. Cash flow volatility influenced capital structure positively and significantly. It means with an increase in cash volatility book value of the total liabilities will be increased to meet up the cash needs. The model was fit for predictions as well because pvalue was lower than 0.05. Furthermore, size was also positively and significantly related to capital structure. The large sized firms need more finance to meet their capital needs. Research and development expenses also showed positive and significant influence on capital structure. Other control variables showed insignificant relation with capital structure. Hypothesis 1 is accepted.

Table 7: Generalized Linear Model (Dependent Variable: GENR_LEV3)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.94768	0.74857	-1.265979	0.2055
VCF t-1	-0.00089	0.00083	-1.072466	0.2835
MTBR t-1	0.000103	0.0003	0.34526	0.7299
A.TAN t-1	0.015129	0.02575	0.587533	0.5568
F.SIZE t-1	-0.00294	0.04493	-0.065374	0.9479
PROFIT t-1	-7.73E-05	0.00028	-0.27576	0.7827
Ln R&D t-1	0.104479	0.04601	2.27072	0.0232
Mean dependent var	0.276678	**S.D. dependent var**		0.353576
Sum squared resid	68.85094	**Log likelihood**		-207.75
Akaike info criterion	0.766963	**Schwarz criterion**		0.821062
Hannan-Quinn criter.	0.788087	**Deviance**		68.85094
Deviance statistic	0.124504	**Restr. Deviance**		69.884
LR statistic	8.297341	**Prob(LR statistic)**		0.217119
Pearson SSR	68.85094	**Pearson statistic**		0.124504
Dispersion	0.124504			

The above table 7 shows the impact of cash flow volatility and other control variables on capital structure measured by total debt at market value. The variables had shown insignificant impact on capital structure except research and development expenses. Increase in research and development expenses will increase the total debt at market value. A company might take external loans to finance its growing needs of research and development. This model was not fitted for prediction as p value was greater than 0.05

Table 8: Generalized Linear Model (Dependent Variable: GENR_LEV4)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-1.36236	0.42599	-3.198152	0.0014
VCF t-1	0.000842	0.00028	3.048462	0.0023
MTBR t-1	0.000106	0.00013	0.804353	0.4212

A.TAN t-1	-0.02001	0.01604	-1.247787	0.2121
F.SIZE t-1	0.058818	0.02549	2.307832	0.021
PROFIT t-1	-7.10E-05	0.00012	-0.618456	0.5363
Ln R&D t-1	0.011458	0.03177	0.360614	0.7184
Mean dependent var	0.409608	S.D. dependent var		0.248298
Sum squared resid	32.9707	Log likelihood		-1.57877
Akaike info criterion	0.030638	Schwarz criterion		0.084738
Hannan-Quinn criter.	0.051763	Deviance		32.9707
Deviance statistic	0.059622	Restr. Deviance		34.46328
LR statistic	25.03426	Prob(LR statistic)		0.000337
Pearson SSR	32.9707	Pearson statistic		0.059622
Dispersion	0.059622			

The table 8 shows the influence of cash flow volatility and other control variables on capital structure being measured as total debt at book value. Cash flow volatility showed a positive and significant influence on capital structure. Cash flow variations here will cause total book value of debt to increase. Size was also positively and significantly related to capital structure. All other variables were insignificantly related to capital structure. Model was fit for predictions as p value was lower than 0.05.

Table 9: Generalized Linear Model (Dependent Variable: GENR_LEV5)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.524934	0.66121	0.793899	0.4273
VCF t-1	-0.00018	0.000353	-0.511951	0.6087
MTBR t-1	-0.000146	0.000326	-0.448496	0.6538
A.TAN t-1	-0.223827	0.300118	-0.745797	0.4558
F.SIZE t-1	-0.033044	0.040832	-0.809272	0.4184
PROFIT t-1	-2.29E-05	0.000152	-0.149993	0.8808
Ln R&D t-1	0.008467	0.048515	0.174522	0.8615
Mean dependent var	0.444713	**S.D. dependent var**		0.380907
Sum squared resid	80.45253	**Log likelihood**		-251.352
Akaike info criterion	0.922686	**Schwarz criterion**		0.976786
Hannan-Quinn criter.	0.943811	**Deviance**		80.45253
Deviance statistic	0.145484	**Restr. Deviance**		81.10521
LR statistic	4.486271	**Prob(LR statistic)**		0.611171
Pearson SSR	80.45253	**Pearson statistic**		0.145484
Dispersion	0.145484			

Results of influence of cash flow volatility and other control variables are presented in the table 9. Here capital structure was taken as long term only at market value. Not even a single variable showed significant impact on long term debts i.e.

capital structure. The model was not fitted for predictions as p value was greater than 0.05.

Table 10: Generalized Linear Model (Dependent Variable: GENR_LEV6)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.984621	0.604992	-1.627494	0.1036
VCF t-1	-0.000727	0.000506	-1.437197	0.1507
MTBR t-1	0.002985	0.003524	0.84713	0.3969
A.TAN t-1	-0.02108	0.019242	-1.095507	0.2733
F.SIZE t-1	-0.003092	0.036248	-0.085303	0.932
PROFIT t-1	-0.002875	0.003524	-0.815967	0.4145
Ln R&D t-1	0.032059	0.039255	0.816684	0.4141
Mean dependent var	0.25595	S.D. dependent var		0.270319
Sum squared resid	39.76602	Log likelihood		-54.0489
Akaike info criterion	0.218032	Schwarz criterion		0.272131
Hannan-Quinn criter.	0.239156	Deviance		39.76602
Deviance statistic	0.07191	Restr. Deviance		40.8473
LR statistic	15.03667	Prob(LR statistic)		0.019973
Pearson SSR	39.76602	Pearson statistic		0.07191
Dispersion	0.07191			

Table 10 shows the impact of cash volatility on capital structure by taking long term debt at book value. Control variables were also the part of the model. Cash flow volatility showed a negative and insignificant impact on capital structure. All other control variables showed insignificant impact on capital structure. Model showed fitness for predictions as p value was lower than 0.05.

9.3. Cash flow volatility and Debt Maturity:

Table 11: Generalized Linear Model (Dependent Variable: GENR_LEV7)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.396814	0.341567	7.017119	0
VCF t-1	-0.000333	0.000172	-1.931959	0.0539
MTBR t-1	6.29E-05	9.75E-05	0.644913	0.5193
A.TAN t-1	0.006102	0.006436	0.948032	0.3435
F.SIZE t-1	0.036255	0.020473	1.770838	0.0771
PROFIT t-1	-8.44E-05	8.12E-05	-1.039193	0.2992
Ln R&D t-1	0.009685	0.025621	0.378006	0.7056
R-squared	0.016727	Mean dependent var		2.983929
Adjusted R-squared	0.006059	S.D. dependent var		0.823248
S.E. of regression	0.820751	Akaike info criterion		2.455226
Sum squared resid	372.5183	Schwarz criterion		2.509326
Log likelihood	-680.4634	Hannan-Quinn criter.		2.476351
F-statistic	1.567893	Durbin-Watson stat		2.473287
Prob(F-statistic)	0.154225			

The impact of cash flow volatility was inspected on debt maturity and it was done with the help of ordinary least square regression. The table 11 showed that cash flow volatility was negatively and significantly related to debt maturity. It implies that increase in cash flow volatility will affect debt maturity in negative way. Firm size showed a positive and significant impact on debt maturity. Market to book ratio, tangibility, profitability and research and development expenses showed insignificant impact on debt maturity. Durbin Watson stat was 2.47 and was in range of 1.5 and 2.5 so there was no problem of autocorrelation. R squared shows that independent variables explained 1.6% variations in debt maturity. Model was not that much fit for predictions as p value was greater than 0.05. Our second hypothesis is accepted.

10. Conclusion:

This study is designed to check that how cash flow volatility can affect capital structure and debt maturity of different Pakistani listed firms. Among all different measures of leverage the second measure in which we considered total liability as measure of leverage results are significant .which means that higher cash flow volatility. Which means 1 standard deviation in cash flow volatility leads 0.24 decrease in leverage.

We have used a relatively new measure of debt maturity to check the impact of cash flow volatility on debt maturity. Debt maturity was a categorical variable. Our model significantly and negatively predicted this relationship .which means one standard deviation in cash flow volatility decrease debt maturity by 0.82.our finding of this model suggest that firms should use debt of shorter maturity when having high cash flow volatility.

This research study present some findings which can be useful in the following ways. First those firms which are encountering high cash flow volatility can decrease their bankruptcy costs by decreasing their leverage levels in their capital structure or also by using debt of shorter maturity Second, we suggest that government ownership is a vital element which must be considered during decision making by the financial managers as it effects the firm's optimal capital structure. Finally, our findings will also be useful for the investors as they can analyze the risk level associated with different firm by looking at variability of cash flows before and leverage levels of firms before taking any investment decisions.

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