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INTERACTION OF ASSET TANGIBILITY ON THE RELATIONSHIP BETWEEN LEVERAGE STRUCTURE AND FINANCIAL DISTRESS IN AGRICULTURE-LINKED NON-FINANCIAL FIRMS

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Abstract

This study aims at investigating, from a perspective of agriculture linked firms, the impact of leverage structure on the probability of corporate financial distress with the moderating role of asset tangibility. A panel data logit regression model used to estimate the relationship between capital structure, debt maturity structure, and financial distress while controlling the effects of acclaimed variables like firm size, taxes, and profitability. The data set consists of 187 agriculture linked non-financial firms listed on the Pakistan Stock Exchange (PSX) over five years (2013-2017). The results reveal that asset tangibility negatively moderates the relationship between debt maturity structure and the probability of financial distress, but no such evidence found for the relationship between capital structure and financial fragility. Results suggest lessening the reliance on short term debt in the leverage structure. This research implies that policymakers at managerial levels should have less reliance on short term debt to abate rollover risk. Productive fixed assets can act as collateral without a considerable rise in associated fixed costs. The current study evaluated the moderating role of tangible assets on the relationship of debt maturity structure and the possibility of financial distress along with the previously addressed link of capital structure and the chances of financial distress. A sample of agriculture-linked corporate entities is also unexplored in previous literature.

Key words**:** *capital structure, debt maturity structure, financial distress, logit regression, agri-linked firms*

INTRODUCTION

Financial distress, if not addressed, may cease the application of going concern assumption. In this situation, firms find it challenging to honor the lender's claims. It is an alarm that alerts to initiate repair work. This situation often, leads to firm failure, prevalent phenomena nowadays, especially in the developing world. There are many factors studied in the past literature that contribute to such a disliked outcome. Researchers used several micro and firm-specific attributes that lead to financial distress [28, 30, 12]. Some studies link financial distress with macro and external factors [9, 19, 25]. Financial distress deals with the inability of organizations to meet their obligations both short term and long term and also continuous obligations like interest payments and other financial expenses. Choice of financial resources is crucial in this regard as it will have future implications on performance vulnerability. The literature on preference for financial resources is grounded in pecking order theory proposed by [31]. This theory explains the order of financial preference and ranks retained earnings, debt and equity as first, second and third choice respectively.

Inclusion of asset tangibility in this debate is a scarcely addressed link in prior literature in that abundance of fixed assets puts a firm in a position to negotiate its loans better. A higher volume of tangible assets serves as collateral in accessing mortgage loans and vice versa. Small firms have a lower number of assets in place and find it challenging to acquire new loans [13] which further hinders their growth

potential. A non-growing firm cannot pull itself towards the maturity, and instead, it diminishes its chances of existence. The firm life cycle theory divides the life of firms into various stages, and each step has a varied level of financing requirements. This study takes an ex-post approach to determine what impact financing choices have on the financial distress considering the existing tangible assets. We also focus on the interacting effects of tangible assets on the pecking order theory. We base our research on the proposition that there can be reversals to the pecking order theory depending upon the volume of tangible assets possessed. Prior studies also support this argument in that such firms are more in line with the trade-off theory rather than following any distinct pattern in funds acquisition. In this setting, an immature firm needs external resources to pursue its growth but might not avail them due to scarcity of existing tangible assets in place and forced to rely on equity. Similarly, a mature firm can have adequate fixed assets in place that can serve as collateral, but it may not require external resources due to fewer growth potentials. Older firms are more concerned about sustaining their market position rather than pursuing more growth as they already expanded to maximum potential. Past researches have established a positive link between financial leverage and risk. It is not always accurate as firms with negotiating power can use debt in their favor—this argument supported by information asymmetry theory. Debt maturity is another crucial decision that can lead to risk differentials. The short-term loan thought to be riskier as compared to the long-term loan. However, firms with better assets in place and more information can better negotiate their loans and circumvent the rollover risk associated with short-term financing. One way to avoid this risk is to acquire long term loan as it will postpone this risk for the time being. However, a maturity matching approach is desirable to tackle the risks associated with debt maturity.

Motivation: Why Agriculture-Linked Firms?

Pakistan is an agriculture-based economy as agriculture is one of the most important sectors contributing to the economic wellbeing of the country. According to the latest stats published in the economic survey of Pakistan by the ministry of finance, there is an 18.5% contribution of agriculture in the Gross Domestic Product (GDP) of the country and 38.5% of the labor force is engaged in this sector. Most of the listed firms in the corporate area are also dependent on agriculture. The performance of listed firms contributes to the direction of the stock index, which in turn, is an indicator of financial development in a country. This research focuses on this established relationship between financial leverage and financial distress and that too on the economic plight of listed firms that directly or indirectly link to the agriculture sector in Pakistan. Many of the developing nations base their economy on agriculture and their corporate sector is also tightly connected to either agricultural input or the agricultural output. For example, in the case of Pakistan, the most important industry of firms is textile that is dependent on agriculture.

Similarly, other industries like leather, poultry, pesticides, agricultural machinery, tobacco goods, fertilizers, sugar, etc., are also reliant on agriculture. So, the most significant chunk of the corporate sector is related to agriculture, and it serves as a source of motivation for this study. Another essential reason for analyzing agriculture linked firms is that their performance will have an impact on the agriculturist income as well. If there are frequent firm failures, suppose in the textile sector, the demand for cotton should decline with each failure which will affect a farmer's income who produces cotton. The following figure 1 explains the distribution of firms into agriculture linked and non-agriculture linked firms. It based on the data extracted from the financial statement analysis (FSA) published by the State Bank of Pakistan (SBP) for non-financial firms. Three consecutive publications by SBP on FSA of non-financial firms for six years in each case used i.e., 2008-2013, 2010-2015 and 2012-2017.

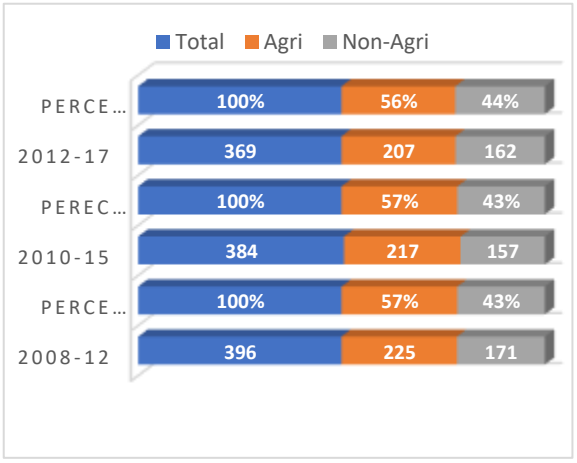

Fig. 1. Distribution of Firms as Agriculture and Non-Agriculture Linked
Source: Author's calculation based on the data from FSA published by State Bank of Pakistan.

Figure 1 clearly states that agriculture-linked firms are more in number than non-agriculture related firms. The FSA for 2008-13 includes 396 listed firms, out of which 225related to agriculture which constitutes 57% of the total firms. The State Bank of Pakistan performed FSA for 384 firms from 2010 to 2015, and 217 firms belong to the agriculture sector with a similar percentage of 57%. The latest FSA published by SBP for the years 2012 to 2017 includes 369 firms, and 56% of firms belong to agriculture, which consists of 207 firms. These stats indicate that the stock index is also highly dependent on agriculture in Pakistan. The criteria for assuming a firm as agriculture linked is that the particular firm is using the agricultural output as their raw material/input or the output of such a firm is used in agricultural operations e.g. agricultural machinery, fertilizers, pesticides, etc. This paper is structured as next section 2 cites the literature supporting the study, part 3 deals with data and methodological issues, section 4 portrays the results of this study, results discussed in part 5 and finally, papers concluded along with future implications and limitations of the research in part 6.

Review of literature and hypothesis development

Capital structure, debt maturity, and financial distress

Past literature suggests that firms with a higher proportion of debt in their capital structure are riskier and have more probability of being financially distressed [7, 21, 37]. A distressed firm is risky, the past literature also relates the financing choices to risk. There is a scarcity of researches that links leverage structure to financial distress. We will also discuss the association in risk perspective due to insufficient theoretical evidence on the link between leverage structure and financial distress. Recently, [8] found that an increase in leverage causes more risk-taking in financial firms. Dierker, *et al.* [15] proved that firms issue equity (debt) in case of an increase (decrease) in risk. el Alaoui, *et al.* [16] detected a change in the sample firm's returns and volatility as the capital structure changes. Mselmi, Lahiani and Hamza [30] revealed that financially distressed firms are small in size, possess more leverage in their capital structure, and have a lower tendency to repay loans. They also maintain more inferior liquidity, solvency and profitability ratios. Charalambakis and Garrett [12] analyzed 31,000 private Greek firms by using a multi-period logit model. They found multiple determinants of financial distress including assets, profitability, liquidity, leverage, dividend payout, exports and GDP growth.

There are two justifications in the literature that support the direction of linkage between debt maturity and financial distress based on the rollover risk hypothesis and asset substitution hypothesis as posited by [40]. He and Xiong [20] interpreted the role of rollover risk by putting the argument that shareholders are supposed to bear the negative consequences of rollover risk, whereas creditors are free of any such charge. Therefore, shareholders file for early bankruptcy, being the only victims in this conflicted situation [38]. Whereas, the proponents of the asset substitution hypothesis take the lead through monitoring hypothesis and state that short term leverage arrangements require acute monitoring due to continuous debt renewal and the asset substitution problem fades away, resultantly a decrease in default risk [39]. Recently, Adachi-Sato and Vithessonthi [1] elaborated that debt maturity has a negative association with operating performance volatility and no association with the value of firm volatility in

the future. Wang and Chiu [40] claimed that firms with higher rollover risk have more probability of default. Rollover risk is tied to short term debt. Conversely, Brancati and Macchiavelli [10] inferred that short term debt has an insignificant impact on default risk and has nothing to do with rollover risk. It only becomes severe if the firm has limited access to new loans. Javadi and Mollagholamali [23] reported that higher debt market illiquidity, specifically for short term debt causes more default risk. Keeping in view the above studies we propose the following hypothesis:

H1: Use of debt in capital structure makes agriculture-linked firms financially distressed.

H2: Use of debt with longer maturity makes agriculture-linked firms financially less distressed.

The moderating role of asset tangibility

The resource dependency theory claims that firms tend to acquire resources, both internal and external, to roll their operational wheels and make profits through this process. Acquisition of new finances especially borrowed ones are subject to the presence of tangible assets that can be used as collateral [5, 27]. Firms with more fixed assets can get loans quickly and at lucrative terms. This scenario brings a positive association between firm assets and financial leverage [3]. Mota and Moreira [29] investigated the determinants of the capital structure of Portuguese firms investing in Angola and found that firm age, asset tangibility and return on assets influence capital structure positively whereas, liquidity and non-debt tax shields affect the leverage ratio negatively in such firms. The static trade-off theory purports that an optimal structure is desired and firm profitability, asset tangibility and firm size have a positive impact on financial leverage. At the same time, past literature has developed a negative association between tangible assets and financial distress[6]. Similarly, Daskalakis and Psillaki [14] analyzed the capital structure of SMEs from France, Greece, Italy and Portugal. They inferred that the firms which invest more in tangible assets like property, plant and equipment as compared to the intangible assets face lower financial distress costs.

The impact of leverage on financial distress is positive in various studies which explain that a more levered firm will have more risk exposure as compared to the equity-based entities. This association is stronger for firms with more short-term debt if they find it difficult to refinance their operations regularly. Organizations issue more debt if they are facing lower levels of risk and rely on equity if facing higher levels of risk. Based on these relationships, we can infer that a firm with more tangible assets can get superior loans without putting firms in acute financial distress. Recently, Alfaro, *et al.* [2] determined the importance of total assets in defining the association between financial leverage and financial fragility in emerging markets. They further insisted that large firms are more fragile and equally crucial for economic growth. Lee *et al.* [26] studied the relationship between leverage and financial distress in the U.S. based restaurant industry. This study detected a positive moderating role of the capital intensity measured through fixed assets to total assets ratio on the relationship between financial leverage and distress. So, the positive association between leverage and financial trouble may be moderated by the volume of tangible assets possessed by firms keeping other things constant. Joshi [24] reported that firms with better risk management systems issue more debt and acquire more tangible assets. Increased debt causes more risk but neutralized through better risk management practices. Such firms also exhibit better cash flows with stability in sales and profits.

H3: Impact of capital structure and debt maturity on financial distress is moderated by asset tangibility in agriculture-linked firms.

MATERIALS AND METHODS

Data sample

The data extracted from Financial Statement Analysis (FSA) for non-financial firms listed on the Pakistan Stock Exchange (PSX) published by the State Bank of Pakistan (SBP) formed the primary sample. The data period of five years ranging from 2013 to 2017, is considered. A panel data set is generated for

this study period — only those firms selected in the final sample which fulfill the following criteria.

*(i)*Those firms included which linked to the agriculture sector.

*(ii)*The firms that were in operation continuously during the study period.

*(iii)*The firms with missing data are excluded from the sample.

Those firms included in the sample that had data for five years before the study period to calculate the standard deviation of assets. It is required to classify the data into subsamples of low-risk and high-risk firms.

According to the FSA, there are 369 firms listed on PSX, out of which 207 firms linked to the agriculture sector. The complete data set is available for 187 firms based on the criteria mentioned above. There are 124 firms from the textile sector, 27 firms from the sugar industry, 13 firms from the food sector and 23 firms from other industries that secured their position in the final sample. Among these last 23 firms, 05 belong to chemicals and pharmaceuticals, 07 from the manufacturing sector, 03 from motor vehicles, trailers & auto parts and 08 relate to paper, paper board & products according to the economic groups defined by SBP. Firms less than ten from any sector are cumulatively placed under a single head of other industries instead of being separately identified due to lesser representation. We have further divided the primary sample into two sub-samples based upon their risk levels named as high risk and low-risk firms. We have calculated the standard deviation of return on assets for each firm and divided the firms into these two categories after calculating the median value of the standard deviation of return on assets. Firms with lesser value than the median of the standard deviation of return on assets are regarded as low-risk firms and remaining as high-risk firms. To avoid confusion and make data easily divisible we have considered the last year's value for this classification as each firm may have different values for standard deviation each year during the study period.

Statistical analysis

Variables and their operational definition

Before we proceed to the statistical analysis, it is essential to identify the variables involved in this study, their relevant proxies, and the methods of their computation (Table 1).

Table 1. Operational definition of variables

Variable	Notation	Measurement
Dependent Variable: Financial Distress (Altman, 2005 EM Z-score)	EMZ-Score	$6.56X_1+3.26X_2+6.72X_3+1.05X_4+3.25$
Independent Variable: Capital Structure Debt Maturity Ratio	D/E DMR	Total debt scaled by total equity Long term debt scaled by total debt
Moderating Variable: Asset Tangibility	AT	Fixed assets scaled by total assets
Control Variable: Profitability Firm Size Tax Expenses	ROA SIZE TAX	EBIT scaled by total assets Natural log of total assets Natural log of tax expenses

Source: Proxies based on past literature.

This study focuses on the impact of capital structure and debt maturity structure on financial distress. So, financial distress is the dependent variable in the current study. We used the emerging market Z-score model proposed by [4]. It involves three accounting ratios X_1, X_2, $X_3$and X_4 as working capital/total assets, retained earnings/total assets, current operating income/total assets and the book value of equity/total liabilities, respectively. The decision criteria is a cutoff point, i.e., if EMZ Score >4.15 then the firm is safe and the EMZ Score <=4.15 indicates that the firm is either facing financial distress or is vulnerable to distress in the respective year as per the firms are assigned binary values of 0 and 1.

The debt-equity (D/E) ratio used as a proxy for the capital structure similar to the other studies like [32]. We employed a debt maturity ratio (DMR), which is a ratio of long term debt to total debt as a proxy for debt maturity following [17]. This study also captures the moderating effect of asset tangibility represented by notation AT and measured similarly as to [29]. We have used

three control variables in this study namely firm size (SIZE), taxes (TAX) and profitability (ROA) similar to the researches of [17, 33, 34], respectively.

Logistic Regression

Logistic regression is appropriate where the dependent variable is in binary numbers [11]. We will assign number '1' to the firms in financial distress, and '0' otherwise based on the emerging market Z-score discussed in the above section.

So,

$$Y = \{^{1,\ distressed}_{0,\ undistressed} \quad \text{.....} (1)$$

We will use binary logit models for panel data analysis, including and excluding moderators. Logistic distribution of the error terms assumed under logit analysis or logistic regression models. The logit analysis is a preferred approach over discriminant analysis. Based on the target estimation of financial distress the logit analysis model is reported as

$$P_{(FD)}=\frac{\exp(\beta o+ \beta 1X1+ \ldots.+\beta mXm)}{1+\exp(\beta o+ \beta 1X1+ \ldots.+\beta mXm)} \quad \text{.....}(2)$$

Where '$P_{(FD)}$' denotes the probability of financial distress in agri-linked firms

'*Xi*' represent the predictor variables, *i* equals 1 to m variables

'βo' is the intercept of the regression equation

'βi' capture coefficients of the predictor variables

The resultant odds equation defines the probability of being distressed as *P* and scaled by the chance of not being financially distressed as (*1 – P*) and can be re-written as

$$Ln(Odds) = \frac{P}{1-P} = \beta o + \beta 1X1 + \cdots + \beta mXm$$
.....(3)

The general logit regression models for the study given in the following equations:

$$EMZ - Score = \alpha + \beta 1\left(\frac{D}{E}\right) + \beta 2(DMR) + \beta 3(AT) + \beta 4(SIZE) + \beta 5(TAX) + \beta 6(ROA) + \epsilon$$
.....(4)

The equation (4) specifies the impact of capital structure, leverage structure, asset tangibility, and controls on financial distress without considering the interacting effect of asset tangibility. Control variables include firm size measured as the natural log of total assets and taxes measured as the natural log of annual tax expenses and return on assets as the ratio of earnings before interest and tax to total assets.

$$EMZ - Score = \alpha + \beta 1\left(\frac{D}{E}\right) + \beta 2(DMR) + \beta 3(AT) + \beta 4\left(\frac{D}{E}\right) \times (AT) + \beta 5(DMR) \times (AT) + \beta 6(SIZE) + \beta 7(TAX) + \beta 8(ROA) + \epsilon t$$
.....(5)

The equation (5) incorporates the interacting impact of asset tangibility and all other things being the same as in the equation (4). Where the dependent variable EMZ-score is a proxy for financial distress. Capital structure is proxied by D/E ratio, the debt maturity structure has a proxy denoted by DMR that represents long term debt ratio computed as the ratio of long term debt to total debt. Asset tangibility is represented by (AT). The interacting effects of assets tangibility are captured by notations (D/E)×(AT) and (DMR)×(AT). The control variables firm size, taxes and return on assets are denoted by SIZE, TAX and ROA, respectively.

RESULTS AND DISCUSSIONS

Table 2 presents the descriptive statistics of the study variables. The proxy for financial vulnerability presented by EMZ-score has a mean value of 0.43 with a standard variation of 0.49. We coded it as a binary number; therefore, minimum and maximum values are within a range of 0 and 1. The current study used the debt-equity ratio (D/E) as a measurement of capital structure, averaging 2.08, and having a standard deviation of 39.35.

Its minimum and maximum values lie at -941.27 and 337.8 respectively. The second independent variable of interest is the debt maturity ratio (DMR), with a mean value of 0.29 and 0.22 degrees of variation.

It involves firms with almost no long-term debt as minimum value accounts for 0 and also the firms with long term debt proportion as high as 99% of total debt.

Table 2. Descriptive Statistics

Panel A-Overall Firms					
Variable	Obs	Mean	SD	Min	Max
Z-Score	935	0.431	0.495	0	1
D/E	935	2.081	39.359	-941.272	337.808
DMR	935	0.292	0.216	0	0.999
AT	935	0.596	0.215	0	0.999
lnTAX	935	13.743	0.507	1.386	16.391
lnSIZE	935	14.619	1.842	7.045	18.763
ROA	935	0.456	18.654	-241.64	139.37
Panel B- High-Risk Firms					
Z-Score	390	.4897436	.5005369	0	1
D/E	390	2.357184	20.6805	-88.43332	337.8081
DMR	390	.2756544	.2284976	0	.9985459
AT	390	.5697841	.2416452	.0000558	.9997464
lnTAX	390	13.76632	.3568962	13.32332	16.39085
lnSIZE	390	14.15512	1.853395	7.044905	18.76264
ROA	390	-1.478256	27.34055	-241.64	139.37
Panel C- Low-Risk Firms					
Z-Score	545	.3889908	.4879691	0	1
D/E	545	1.882644	48.51533	-941.2717	309.6904
DMR	545	.3042311	.206655	0	.9477246
AT	545	.6145041	.191562	.0008426	.9996196
lnTAX	545	13.72552	.5907616	1.386294	15.78902
lnSIZE	545	14.95262	1.761909	8.197264	18.71674
ROA	545	1.840165	7.634875	-22.64	32.31

Note: EMZ-Score represents emerging market Z-score, D/E describes the debt to equity ratio, a proxy used for capital structure, DMR is a notation for debt maturity ratio measured as a percentage of long term debt to total debt used as a proxy for debt maturity. AT means asset tangibility, a ratio of fixed assets to total assets. Size means natural log of total assets. The TAX represents the natural log of yearly tax expenses, and ROA is a proxy for profitability measured as a ratio of earnings before interest and tax to total assets.
Source: Author's calculations.

This study has a particular focus on the moderating effects of asset tangibility (AT), with an average value of 0.60 and a variation of 0.22. The minimum value for this variable is 0 and the maximum accounts for 0.99. We have used three control variables termed as lnTAX, lnSIZE, and ROA; each has average values of 13.74, 14.61 and 0.45, respectively.
The subsamples based on the median value of the standard deviation of return on assets, regarded as high-risk and low-risk firms also reported to understand the nature of data. The high-risk firms are more vulnerable as expected to have a mean value of 0.49 as compared to low-risk firms with a mean value of 0.38 for Z-score. Variation in means of two samples is 0.50 and 0.48, respectively. High-risk firms on average, used more debt as specified by the debt-equity ratio of 2.35 in comparison to 1.88 for low-risk firms. However, low-risk firms are volatile in debt consumption as their standard deviation approaches 48.51, much higher as compared to the high-risk firms represented by 20.68 variations in their debt usage. Average debt maturity of the two sub-samples is somewhat similar, represented by 0.27 and 0.30 with 0.23 and 0.20 standard deviation of debt maturity levels for high risk and low-risk firms. The mean of the proportion of tangible assets is 0.57 and 0.61 for high risk and low-risk firms, deviating up to 0.24 and 0.19, respectively.

Table 3. Correlations

	Z-Score	**D/E**	**DMR**	**AT**	**TAX**	**SIZE**	**ROA**
Z-Score	1						
D/E	0.02	1					
DMR	0.01	0.01	1				
AT	0.32*	0.00	0.23*	1			
TAX	-0.18*	-0.00	-0.04	-0.10*	1		
SIZE	-0.31*	-0.02	-0.05	0.00	0.21*	1	
ROA	-0.40*	-0.01	0.06	-0.16*	0.14*	0.37*	1

Note: EMZ-Score represents emerging market Z-score, D/E describes the debt to equity ratio, a proxy used for capital structure, DMR is a notation for debt maturity ratio measured as a percentage of long term debt to total debt used as a proxy for debt maturity. AT means asset tangibility, a ratio of fixed assets to total assets. Size means natural log of total assets. The TAX represents the natural log of yearly tax expenses, and ROA is a proxy for profitability measured as a ratio of earnings before interest and tax to total assets.
Source: Author's calculations.

Table 4. Variance Inflation Factor (VIF)

Sr#	**Variable**	**VIF**	**1/VIF**
1	D/E	1.00	0.999
2	DMR	1.08	0.925
3	AT	1.11	0.897
4	lnTAX	1.06	0.940
5	lnSIZE	1.22	0.820
6	ROA	1.23	0.816
7	Mean VIF	1.12	

Note: D/E represents the debt to equity ratio, a proxy used for capital structure, DMR is a notation for debt maturity ratio measured as a percentage of long term debt to total debt used as a proxy for debt maturity. AT means asset tangibility, a ratio of fixed assets to total assets. Size means natural log of total assets. The TAX represents the natural log of yearly tax expenses, and ROA is a proxy for profitability measured as a ratio of earnings before interest and tax to total assets.
Source: Author's calculations.

Table 3 represents correlations among the study variables. The debt-equity ratio and debt maturity ratios have an insignificant positive relationship with z-score. Asset tangibility has a significant positive correlation to EMZ-Score and DMR whereas it has an

insignificant positive correlation with the debt-equity ratio. Moreover, the DMR is a proportion of long-term debt to total debt, and it signifies that the rate of short term debt to total debt should have a negative association with z-score and asset tangibility. None of the selected variables has a correlation value of more than 0.5 which rejects the possibility of a multicollinearity problem among these variables. We are using logit regression in our analysis which relaxes many post estimation assumptions but is highly sensitive to multicollinearity. However, to further investigate this issue, we calculated the Variance Inflation Factor (VIF) which affirms our inferences regarding multicollinearity as all the study variables have values much less than the cutoff value of 10 as described by [36] (Table 4).

Main findings

The following Table 5 is designed to report the logit regression results based on the overall sample of firms containing 935 observations for each variable. The moderating role of asset tangibility is studied in two separate regression models termed as model 2 and model 3. Model 1 represents the results without assuming the moderating role of asset tangibility. Whereas model 2 assumes this role for the relationship of leverage and the probability of financial distress and model 3 for the relationship of debt maturity and the likelihood of financial distress.

This study employed logit regression models with and without the interaction of asset tangibility. Table-5 reports the results for non-financial agriculture linked firms using logit regression. The regression results without taking into account the moderator as shown under model-1 specify that debt-equity ratio (D/E) has a negative but insignificant impact on the probability of being financially distressed as its coefficient value is negative and p-value equals 0.84 which is much high than the critical level of 0.05 at 95% level of significance. Similar results reported for the debt maturity ratio (DMR) in this case. The beta coefficient for debt maturity stands at -0.49 depicting a negative association with the probability of financial distress but its p-value is also higher than the critical value i.e. p-value = 0.22 > 0.05.

Table 5. Logit Regression Results for Overall Sample

Variable	Without Interaction	With Interaction	
	Model 1	**Model 2**	**Model 3**
D/E	-0.00(0.84)	-0.02(0.12)	-0.00(0.88)
DMR	-0.49(0.22)	-0.55(0.18)	2.28**(0.03)
AT	2.59***(0.00)	2.63*** (0.00)	3.93***(0.00)
D/E×AT		0.03(0.12)	
DMR×AT			-4.37***(0.00)
lnSIZE	-0.20***(0.00)	-0.20***(0.00)	-0.19***(0.00)
lnTAX	-1.37*(0.08)	-1.49*(0.06)	-1.36*(0.09)
ROA	-0.16***(0.00)	-0.16***(0.00)	-0.16***(0.00)
Log Likelihood	-415.35	-413.99	-410.80
LR Statistics	447.62***(0.00)	450.34***(0.00)	456.74***(0.00)
Pseudo R^2	0.35	0.35	0.36

Note: D/E represents the debt to equity ratio, a proxy used for capital structure, DMR is a notation for debt maturity ratio measured as a percentage of long-term debt to total debt used as a proxy for debt maturity. AT means asset tangibility, a ratio of fixed assets to total assets. SIZE means natural log of total assets. The TAX represents the natural log of yearly tax expenses, and ROA is a proxy for profitability measured as a ratio of earnings before interest and tax to total assets. Coefficients followed by ***, **, and * are significant at the 1%, 5%, and 10% level of significance respectively

Source: Author's calculations.

Debt maturity ratio measured as a ratio of long term debt to total debt which specifies a negative association with the possible occurrence of default and the results will become opposite if we use the ratio of short term debt to total debt in this analysis. This association is insignificant but yet it can be inferred that long-term loans are less deteriorating as compared to the short term loans in case of financial vulnerability. However, asset tangibility proved to be a strong predictor of the financial vulnerability with a coefficient value of 2.59 and a p-value of much less than 0.05 i.e. p-value = 0.00 in this case. All the control variables had a negative influence on a possible default, but it was insignificant for the log value of tax expense at a 5% level of significance but significant at a level of 10%. The coefficient values for SIZE, TAX and ROA are -0.20, -1.37 and -0.16 respectively and p-values are less than 0.05 except taxes.

The second stage of analysis involves the interaction of asset tangibility as a moderator in this study. The results showing the moderating role of asset tangibility are reported in columns under model 2 & 3 in this table. Model-2 captures the moderating role of

asset tangibility on the relationship between the debt-equity ratio and the probability of financial distress. The negative and insignificant impact of debt-equity and debt maturity ratio persists in this model as previously (beta = -0.02 & p-value = 0.12 i.e. p-value > 0.05 for D/E and beta = -0.55 & p-value = 0.18 i.e. p-value > 0.05 for DMR). Asset tangibility still reveals a positive and significant role with a beta value of 2.63 and a p-value of 0.00. Unlike Lee, Koh and Kang [26], there is a positive impact of tangible assets on financial distress. The positive relationship between the proportion of tangible assets to total assets and the probability of financial distress can also be narrated as the existence of unproductive fixed assets which are unnecessarily accumulated and are also not utilized properly as collateral for leveraged acquisition and as a result causing an increase in distress. The primary variable of interest is the moderating role of asset tangibility in this study in that the interaction term D/E×AT showed positive but insignificant moderating effect as coefficient value is 0.03 at 0.12 level of significance. The controlling power of the control variables remains unaffected even after the introduction of the interacting role of asset tangibility in model-2. All of them have a negative and significant impact on possible corporate distress. However, taxes are significant at 10% where, p-value = 0.06 i.e. 0.05 < p-value < 0.10.

The second interaction term denoted by DMR×AT captured in model-3 given in Table 5. The results for D/E ratio are similar to the previous two models but the DMR reveals a positive and significant role in predicting probable financial distress in this case showing a regression coefficient value of 2.28 and a p-value less than 0.05 i.e. 0.03. The standalone impact of asset tangibility is further strengthened in this model showing a beta value of 3.93 and a p-value of 0.00. Asset tangibility negatively moderates the relationship between debt maturity ratio and the probability of financial distress, as evidenced by the significant negative coefficient value of -4.37. It can be inferred that firms with more tangible assets and debt with longer maturities cause a reduction in possible financial distress and confirm our third hypothesis using logit regression only in case of long term debt usage which means if we take into account the debt with short maturities this interacting effect will reverse which can be a possible reason for a positive moderating role of asset tangibility on total leverage usage as specified by the interacting function of asset tangibility and debt-equity ratio. Agriculture linked firm need to worry less about long term leverage decisions if it possesses a higher concentration of assets as tangibles, but short-term financing decisions are a matter of concern . However, no such advantage captured for total leverage including a combination of short term and long-term debt in this study. The three control variables once again were significantly and negatively associated with possible financial distress, but the only taxes were insignificant at 5% level of significance.

Further checks for high-risk and low-risk firms

As discussed earlier, we have divided the primary sample of firms into two subsamples of high risk and low-risk firms based on the median value of the standard deviation of return on assets to put more rigor in our analysis. The following Tables 6 & 7 report the logit regression results of the two subsamples.

The result for model-1 without adding moderators report a positive impact on the outcome variable, but this impact is again insignificant for debt-equity and debt maturity ratio as reported in Table 6. Asset tangibility predicts a 3.03 per unit change in outcome variable and is again significant with a p-value of 0.00. Results for control variables reaffirm a negative change as firm size, taxes and return on assets have a negative influence, but it is significant for size and returns on assets as the p-values lie within the 5% range. However, in model-2, after adding moderators, the capital structure causes an insignificant negative change in probability of default, whereas debt maturity results in an insignificant but positive change in the dependent variable, as evidenced in model-1. The first moderating term D/E×AT is

insignificant and positive as shown under heading model-2 (beta = 0.18 and p = 0.16 i.e. p > 0.05)and the model-3 exhibit that second moderating term DMR×AT causes a negative and insignificant change in high risk firms (beta = -1.48 and p = 0.48 i.e. p > 0.05).

Table 6. Logit regression results for high-risk sample

Variable	Without Interaction	With Interaction	
	Model 1	Model 2	Model 3
D/E	0.00(0.36)	-0.08 (0.20)	0.01(0.36)
DMR	0.49(0.43)	0.41(0.52)	1.30(0.32)
AT	3.03***(0.00)	3.02***(0.00)	3.39***(0.00)
D/E×AT		0.18(0.16)	
DMR×AT			-1.48(0.48)
lnSIZE	-0.42***(0.00)	-0.41***(0.00)	-0.42***(0.00)
lnTAX	-0.82(0.56)	-0.83(0.56)	-0.78(0.58)
ROA	-0.09***(0.00)	-0.10***(0.00)	-0.10***(0.00)
Log Likelihood	-170.70	-169.61	-170.45
LR Statistics	199.09***(0.00)	201.27***(0.00)	199.60***(0.00)
Pseudo R^2	0.37	0.37	0.37

Note: D/E represents the debt to equity ratio, a proxy used for capital structure, DMR is a notation for debt maturity ratio measured as a percentage of long term debt to total debt used as a proxy for debt maturity. AT means asset tangibility, a ratio of fixed assets to total assets. SIZE means natural log of total assets. The TAX represents the natural log of yearly tax expenses, and ROA is a proxy for profitability measured as a ratio of earnings before interest and tax to total assets. Coefficients followed by ***, **, and * are significant at the 1%, 5%, and 10% level of significance, respectively

Source: Author's calculations.

The impact of the proportion of tangible assets remains positive and significant in all the three models with slight variation in beta coefficients. These results prove that high-risk firms are unable to utilize the available tangible assets in attracting favorable financial leverage and their leverage acquisition is further adding to the possibility of default. However, the results for this sample once again confirms that the three control variable including firm size, taxes and profitability brace the financial soundness of the agriculture linked non-financial firms but taxes found to be having an insignificant role in doing so as portrayed by their insignificant p-values in the three models.

Table 7 is designed to report the logit regression results for low-risk firms with and without moderators. As shown in model-1 debt-equity ratio (D/E) has a negative but insignificant role in predicting financial distress without adding moderator. The debt maturity ratio (DMR) has a negative and significant role in defining possible distress in low-risk firms. Asset tangibility, in this case, has once again the positive and significant role (beta = 3.06 and p-value = 0.00).

Table 7. Logit regression results for low-risk sample

Variable	Without Interaction	With Interaction	
	Model 1	Model 2	Model 3
D/E	-0.00 (0.47)	-0.02*(0.08)	-0.000.52
DMR	-1.73***(0.00)	-1.82***(0.00)	1.86(0.31)
AT	3.06***(0.00)	3.18***(0.00)	4.85***(0.00)
D/E×AT		0.03(0.10)	
DMR×AT			-5.12**(
lnSIZE	0.02(0.74)	0.04 (0.64)	0.06(0.48)
lnTAX	-1.49(0.20)	-1.73(0.14)	-1.610.16
ROA	-0.32***(0.00)	-0.32***(0.00)	-0.32***(0.00)
Log Likelihood	-209.10	-207.74	-206.80
LR Statistics	310.23***(0.00)	312.96***(0.00)	314.85***(0.00)
Pseudo R^2	0.43	0.43	0.43

Note: D/E represents the debt to equity ratio, a proxy used for capital structure, DMR is a notation for debt maturity ratio measured as a percentage of long-term debt to total debt used as a proxy for debt maturity. AT means asset tangibility, a ratio of fixed assets to total assets. SIZE means natural log of total assets. The TAX represents the natural log of yearly tax expenses, and ROA is a proxy for profitability measured as a ratio of earnings before interest and tax to total assets. Coefficients followed by ***, **, and * are significant at the 1%, 5%, and 10% level of significance respectively

Source: Author's calculations.

In the case of control variables, only return on assets has substantial power to explain possible distress with significance values of 0.00 as reported in model-1.

After introducing the proportion of tangible assets to total assets as moderator, the debt equity ratio (D/E) shows a negative but significant change in outcome variable at 10% level of significance, the debt maturity ratio (DMR) also contributes positively to the financial stability of the agriculture linked firms (beta = -0.02 & p-value = 0.08 for D/E and beta = -1.82 & p-value = 0.00 for DMR as reported for model-2). Asset tangibility constantly reports significant positive results for all the three regression models (beta = 3.01 & p-value = 0.00 for model-1, beta = 3.18 & p-value = 0.00 for model-2 and beta = 4.85 & p-value = 0.00 for model-3). The first moderating term D/E×AT has insignificant but positive role in describing the chances of financial fragility (beta = 0.03 and p = 0.10).

The moel-3 reaffirms the negative role of debt-equity ratio (D/E) but the positive role of debt maturity ratio (DMR) but insignificant in both cases. The second moderating term

DMR×AT reduce the chances of financial vulnerability as a negative and significant value is reported (beta = -5.12 and p = 0.04, i.e., $p < 0.05$). These results confirm the significant moderating role of asset tangibility on the relationship between debt maturity ratio and financial distress. More importantly, these results are consistent with the overall sample of firms unlike the high-risk firms. So, the high-risk firms need to see their leverage decisions more keenly as compared to low-risk firms.

Agriculture linked firms are greater in number than non-agriculture related firms in Pakistan being an agriculture-based economy. These firms use agricultural produce as raw materials or produce goods used in agricultural operations. Farmers do not grow less rewarding crops subject to their demand. Thus, the inferior contribution of agriculture linked corporations will force them to other crops that are more rewarding or are in demand. This statement refers to the dependence of corporations on agriculture and vice versa. The current study examines the moderating role of asset tangibility on the relationship of capital structure and debt maturity structure with the possible financial vulnerability of the agriculture linked firms. Results portray an insignificant impact of debt usage on the probability of financial distress in these firms. The proportion of fixed assets in total assets is positively linked to financial distress. There is a scarcity of research that establishes this link. However, there is an abundance of research that relates asset tangibility to firm risk [22]. Literature also builds an active link between firm risk and financial suffering. So, we can relate the asset tangibility to financial distress in this sense. The current study establishes a significant positive role of asset tangibility on the chances of being financially distressed. A firm's fixed assets typically serve as a source of operating leverage and thus tend to increase the firm risk. It can be inferred that a firm with a higher value of fixed assets in its asset structure is exposed to higher fixed costs that are not proportionate to its revenue generation [35].

Asset tangibility does not moderate the relationship of debt usage measured through debt-equity ratio with financial distress being statistically insignificant. The analysis of the relationship between debt maturity ratio measured as a ratio of long term debt to short term is negatively moderated by asset tangibility. It means that a firm using long term debt with a high level of fixed assets will have fewer chances of being financially distressed. This result supports the information asymmetry theory for firms with increased tangible assets in the structure of their assets. It is also proved that these results will be the opposite if we use the ratio of short-term debt to total debt as a proxy for debt maturity structure. Thus, we validate the argument that short term leverage is riskier in comparison to long term debt as also posited by [40] in the Pakistani context for agriculture linked non-financial firms. It is also evident that the average proportion of long term debt in agriculture-related non-financial is less than 30% and therefore, it is 70% for short term debt in Pakistani context confirming the inferences of [18] claim that nations with weaker laws and more corruption use more short term debt. Robustness checks were made to study these relationships in high-risk and low-risk firms. The empirical findings show that asset tangibility has no significant moderating role in the case of high-risk firms. However, in the case of low-risk firms, there is a significant moderating role of asset tangibility on the relationship of debt maturity and the probability of financial distress only confirming the results obtained for the overall sample. This evidence suggests that high-risk firms need to increase the proportion of long-term debt in their debt maturity structure to reduce the impact of rollover risk and also reduce the financial distress consequently.

CONCLUSIONS

Conclusions

The stock markets are mostly dependent on the agriculture sector in many emerging economies like Pakistan. A large number of firms are dependent on agriculture which makes it a fascinating area of study. In this

paper, we studied the impact of leverage and debt maturity structure on the probability of being financially distressed. Further, we analyzed the moderating role of asset tangibility on the relationship between capital structure and financial distress and the relationship between debt maturity and financial distress. The debt maturity structure has a negative impact on the probability of distress. The debt maturity is measured as a percentage of long term debt to total debt and it can be inferred that long term debt causes a reduction in financial distress which supports the notion that short term debt is risky that causes more chances of distress. The availability of tangible assets serves as collateral while acquiring loans and allows us to get credits on better terms. The empirical findings suggest a positive impact of fixed assets on the probability of financial distress which is a contradiction to the common knowledge. Asset tangibility also moderates the relationship positively between leverage and likelihood of financial distress and negatively between leverage maturity and the probability of financial distress. Past studies like [26] have also studied similar phenomena in U.S. based restaurant industry and regarded that firms that have more fixed assets should be less concerned about leverage but this study states such results for debt maturity ratio rather than overall debt position.

Policy Implications

This research has multiple implications for financial managers and policymakers at the organizational and governmental levels. First, it is observed that the leverage mix contains a much higher proportion of short-term debt in comparison to long term debt which adds to more risk and the higher probability of financial distress in agriculture-linked non-financial firms. Debt with longer maturities postpones the firm risks whereas short term loans enhance the current obligations, so, the firms facing huge risk should avoid short term loans and should try to finance itself through long term debt. Second, high-risk firms have a low proportion of fixed assets in their asset structure or are unable to use them productively. So, they must utilize their fixed assets properly in business operations to take advantage of them as collaterals. It is also observed that possible financial distress is insensitive to the overall debt levels and also insignificant for debt maturity. However, the interaction with the proportion of intangible assets in the asset structure makes long term debt risk inhibitor. Third, on a comparative basis, low-risk firms are highly sensitive to debt maturity, which predicts a reduction in distress, but the results are not confirmed for high-risk firms. On this basis, managers are advised to borrow on a long-term basis following less risky firms to avoid financial distress while devising their borrowing strategies. Fourth, governments are advised to make policies targeting subsidized lending rates to these firms and easy access to external financing. In Pakistan, usually very high markup rates are charged by lenders which makes borrowing unattractive adding more risk. The government acquires funding to handle the budget deficit from international agencies and sets the domestic lending rate much above the rate charged by these creditors. We recommend considering such a macro factor in future research and regard it as a limitation of this study. Moreover, the asset base of each sector of firms is different but this study considers them as equal. Therefore, it accounts for a limitation and further research may deal with various sectors separately for analyzing the role of tangible assets.

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