

Firm Specific and Macroeconomic Determinants of Probability of Default: A Case of Pakistani Non-Financial Sector



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ABSTRACT

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This study extends the literature on the capital structure by examining the effect of firm specific and macroeconomic factors on probability of default using 2385 firm year observations of Non-financial firms listed on Pakistan Stock Exchange (PSX) for the period 1998 to 2021. This is the first study that used a large dataset to analyze the default risk of Pakistani listed non-financial companies. This study follows Bharat and Shumway (2008) methodology to calculate expected default probability, which is a simplified version of the Merton (1974) structural default model. Fixed effect model has been used for data analysis. The empirical results of firm specific variables show that growth, operating cash flow ratio, liquidity, and performance is negatively related with the probability of default while leverage and tangibility of assets are positively related with the probability of default. Size of the company has no relationship with the probability of default. Macroeconomic variables economic conditions measured by GDP growth rate and index return have negative while short term interest rate have positive impact on probability of default. This study may be beneficial to the managers of non-financial companies since it may help them become more aware of the consequences of default risk and may also help them build effective policies linked to managing default risk. The board of directors of non-financial companies can extract valuable information from this study which is required to conduct control measures related to default risk management. The study excluded financial firm because those have different capital structure as compared to non-financial firms. Further studies can also investigate the effect of firm-specific factors and macroeconomic factors in different sectors to check is there any difference in results on sector basis.

1. INTRODUCTION

According to purchasing power parity, Pakistan's economy is the 25th largest in the world in terms of gross domestic product (GDP). The economy of Pakistan has been steadily expanding at a low pace during the past two decades. Annual per capita growth has averaged only 2%, significantly lower than in South Asian countries. The year 2018 was a challenging one for most developing economies, including Pakistan, which contributed to the country's ongoing financial crisis. The already tenuous state of the nation's economy has been further harmed by the tightening of monetary policy on a global scale, the rise in the price of oil, and a decline in confidence among investors. However, the country's extensive structural issues as well as its poor macroeconomic policies have further exposed the economy to a variety of debt vulnerabilities [1]. As a result, Pakistan is experiencing a surge in bankruptcy right now. Due to the state's current precarious status, it is essential to have a better understanding of the risk of corporate default, which has implications for both financial stability and the overall macroeconomic environment. On the other hand, the factors that determine the default risk of Pakistani listed companies are still not well defined. This regrettable condition of events compels us to inquire about the subject matter at hand. Are the factors that determine the

likelihood of a company failing to make payments the same in Pakistan as they are in other countries? It is still uncertain whether the profitability of the company, leverage, liquidity, size, or other macroeconomic variables are the factors that determine the likelihood of default.

Due to COVID-19 the importance of default risk has increased as it can create a lot of socio economic issues for countries [2]. Other than COVID-19, credit derivatives and innovative corporate debt products are the reasons for the increased interest of scholars and practitioners to determine the factors which affect default risk. Default affects the performance of a company in a number of ways. It has a negative impact on productivity because it disrupts supply chains and causes staff turnover; it increases expenses for legal and administrative services; and it reduces the likelihood that customers will return. A company is said to be in default when its cash flows are unable to satisfy the costs of its debt servicing as well as its principal payments. The probability of default of a company increases when a company's average cash flow level drops, when its cash flow volatility rises, or when all of these factors occur simultaneously [3]. In the event of a default, suppliers may tighten credit terms, some present workers may become demotivated due to fear of job insecurity, other employees may look for employment elsewhere, and customers may become unwilling to purchase

items from the defaulting business. In addition to that, default events also bring stress and negatively affect the mental state of managers, entrepreneurs, and their families [4].

Default of a company is one of the primary indicators of financial distress and has been widely explored in the literature on banking and corporate finance. The literature has traditionally examined the relationship of default events with various financial variables (cash flows, liquidity, size of company, leverage, cost of debt, nature of debt etc.), frequently with the aim of developing a synthetic rating measure capable of accounting for the risk involved in financing a specific business activity. To determine default risk, many models are used. The first category of default risk model is one that uses information from financial statements and is known as an accounting model. Another major category of default risk models is based on market data developed by Merton in 1974.

Till now very limited amount of work on default risk assessment has been done for the Pakistan Stock Exchange [5, 6] and the analysis has only been done for a small number of individual industries. So, this study has utilized the data of all the listed non-financial companies on the Pakistan Stock Exchange (PSX). Secondly, most studies done in the context of Pakistani companies have utilized Z-score to assess the default risk of companies, which is based on accounting data. Due to the financial statement's backward-looking orientation, from which accounting-based models are built, its validity has been questioned. This study will use a market-based approach to quantify default risk for all non-financial businesses listed on the Pakistani Stock Exchange. Because market data is forward-looking, using a market-based approach addresses the drawbacks of accounting-based models. To the best of our knowledge, this is the first study that uses a large dataset to analyze the default risk of Pakistani listed non-financial companies. This study follows methodology presented by Bharath and Shumway in 2008 to calculate expected default probability, which is a simplified version of the Merton [7] structural default model. Bharath and Shumway [8] model use the functional form suggested by Merton [7] structural model rather than solving for the implied probability of default. They found that their alternate model performed slightly better than the Merton model.

Numerous studies have been conducted on default risk and its effects, but the financial sector has received the majority of the attention. However, more than 70% of the Pakistan Stock Exchange is made up of non-financial companies. Non-financial firms should be studied for reasons other than their size because they are also vulnerable to default risk. From two perspectives, default risk is important to non-financial enterprises. From the standpoint of the lender, non-financial companies serve as the clients' lenders. From an investment point of view, non-financial companies choose to invest their money in other businesses or bonds [6].

The findings of the study might be beneficial for both investors and researchers. Investors will be able to make more informed investment decisions after becoming aware of the factors that influence default risk, and researchers will gain knowledge about the validity of the model that they can use in their subsequent work. This study may be beneficial to the managers of non-financial companies since it may help them become more aware of the consequences of default risk and may also help them build effective policies linked to managing default risk. The board of directors of non-financial companies can extract valuable information from this study which is

required to conduct control measures related to default risk management.

2. LITERATURE REVIEW

The presented literature review discuss the empirical evidences related to determinants of probability of default.

2.1 Firm specific determinants of probability of default

Altman et al. [9-11] first proposed firm specific accounting based measures to examine default risk. They have found that liquidity, profitability, cash flows and leverage of companies are good predictors of default probability. Firms with higher profits, good liquidity, high cash flows and lower level of leverage have lower probability of default. The studies from Duffie et al. [12-14] also found firm specific variables are good predictors of default risk.

The default probability of a business is also related firm size. Large businesses have a lower chance of default than small and medium-sized businesses. According to Duan et al. [20], a business's default risk is highly affected by firm-specific characteristics such leverage, liquidity, profitability, and firm size. Additionally, Campbell et al. [15] discovered that companies with strong prospects for future growth have a decreased likelihood of going bankrupt. However, there are situations when investors may undervalue a company, which causes a positive relationship between the growth potential and the likelihood of the company defaulting [16].

Defaults are warning signs that a company is dealing with costly and significant issues that need to be avoided because, if they are allowed to persist, they might eventually cause bankruptcy. According to Altman [9], the main factor contributing to default is a firm's bad financial situation, which might have been prevented in the short term. Accounting metrics including debt ratios, cash flow, and profitability ratios were studied as predictors of the likelihood of default [17]. One of the key variables that affect the likelihood of default is debt. In their seminal study of debt as a factor in default, Cathcart et al. [18] found that default happens when a firm's asset value is less than its debt values. In addition, Leland [19] demonstrates that default happens when businesses find it challenging to attract equity capital to pay down their debt commitments because debt is clearly related to a business's likelihood of default.

Using a dataset of Chinese companies, Zhang, Zhao, and Yao [20] discovered that large companies have a lower probability of default. Compared to small companies, large companies have a more diversified business and access to more sources of funding [21]. Furthermore et al. [22] discovered that small businesses experience considerable financial constraints while large businesses are not subject to such restrictions. They discovered that, in accordance with the "too big to fail" notion, state-owned businesses have a lower default rate. Additionally, their findings demonstrated that the likelihood of default is highly influenced by the interest rate, cash on hand, ROA, and business size. This means that businesses might be less likely to go bankrupt if they keep more cash on hand, make more money, and use less financial leverage.

According to Kwak et al. [23], insolvency is primarily concerned with liquidity of a company. When a company's liquidity declines, it might ultimately result in the company's

collapse. They also discovered that profitability and business size had a negative relationship with the likelihood of a corporate default. Company's liquidity and default risk have a negative association. A company's liquidity may be at risk if the current liability growth rate considerably surpasses the current asset growth rate.

According to the findings of Switzer et al. [24], higher default probabilities are connected with businesses that have higher stock return volatility, high levels of illiquidity, high levels of debt, and low levels of profitability. On the other hand, the probability of default is higher for larger companies with more tangible assets and greater growth opportunities. The possible explanation for these results is that large companies that own large tangible assets may be in a position to undertake high-risk investments because they have the reputation, resources, and capabilities necessary to do so.

Dewaelheyns and Hulle [25] have shown that due to a shortage of equity financing, the leverage level of firms can increase, signaling a high level of financial risk for the firm and increasing the likelihood of default. There is a positive relationship between financial leverage and the probability of default of companies [26]. Cathcart et al. [18] found that default risk is positively related with different components of leverage like short term liabilities, long term liabilities and trade finance.

Altman [9] proposed that the return on a company's assets is vital for the company's going concern. Dewaelheyns and Hulle [25] argued the likelihood of a default decreases when the return on assets improves. Companies that are profitable often have a lower likelihood of defaulting on their debt commitments because profitable companies create larger cash flows, which may be utilized to pay down their debt obligations [27]. Hamid and Siddiqui [28] using data of Pakistani Non-financial firms found that firms with high level of profitability, Cash Flows, liquidity and growth rate are less risky as compared to firms with lower levels of profitability, liquidity and growth rate. The results also suggest that larger firms are less risky as compared to smaller firms. The study also found that firms with higher level of financial risk are more vulnerable to default because of the greater fixed interest cost.

Lozinskaia et al. [29] used data from 192 listed shipping businesses to evaluate default risk. According to their results, profitability, size, liquidity, leverage, and age of a company inversely affect a company's default risk. Badayi et al. [30] using a sample of 496 firms from 17 developing countries for the period 2010-2017 found a positive relationship between default risk and leverage, meaning the probability of default increases with an increase in debt ratio. In addition, firm size, asset tangibility, and profitability are negatively related to the probability of default. Their study results related to the European countries showed that leverage is positively related to default risk, while profitability and business size are negatively related to the probability of default.

Using a large cross-country firm-level dataset, Gopalakrishnan and Mohapatra [31] demonstrated that companies with higher cash flows and higher growth often have higher Z-scores, indicating a lesser propensity to default. Asset tangibility is linked to default risk because businesses with more tangible assets have lower Z-scores. This could be because these businesses rely more on debt financing secured by their physical assets. According to results firm size is positively related with default risk which is contrary to previous findings. Sales growth has shown no relationship

with default risk according to results of study.

One of the variables that affects a firm's likelihood of default is its size [27]. According to the trade-off argument, large companies typically have higher debt ratios because they have less information asymmetry. Due to their stable cash flows, these businesses have stronger access to financing markets [32]. According to Johnsen and Melicher [33], as a company's size grows, the chance of default decreases. According to the literature on default probabilities, a company's chances of default are correlated with its future cash flows [34]. Therefore, when a company's future cash flow declines due to a drop in sales, the chances that the company will default increase [35].

2.2 Macroeconomic factors affecting probability of default

Studies by Tang et al. [36-38] provide empirical evidence that firm-specific variables alone do not accurately predict the probability of default of companies. Macroeconomic variables are another group of variables that have a significant effect on a firm's risk of default [39]. Duan et al. [16] also found that default risk of firm is significantly related to interest rate and stock index return. They explained that firm financing cost increase in short run due to increase in short term interest rate which in result increase the default probability of firm. A lot of other researcher found probability of default is related with macroeconomic conditions, e.g., Jonsson and Fridson [40]; McDonald and Gucht, [41]; Keenan et al. [42]; Carling et al. [43].

The average default frequency and individual default probability show co-movement across time with macroeconomic and financial factors, which may indicate that aggregate shocks are a significant default driver. The seminal work of Bemanke et al. [44] offers a theoretical framework in which macro shocks and firm-specific variables both influence the default risk of individual companies. In this framework aggregate shocks are also found an important driver of individual firm default risk. It suggested that default risk model should include variables which depicts overall macroeconomic conditions as well as firm specific variables. Hackbarth et al. [45] also provides a mechanism by which firm default risk is affected by macroeconomic conditions. According to their argument, companies' ideal default thresholds will be impacted by aggregate shocks when cash flows are dependent on economic conditions. When a firm cash flow is dependent upon the state of economy (GDP growth) so it is not reasonable to exclude effect of economic conditions on default risk. Fama et al. [46, 47] found that economic conditions significantly affect the probability of default. Gopalakrishnan and Mohapatra [31] found that that firms in countries with higher GDP growth tend to have a lower likelihood of default. Schuermann et al. [48] showed that the interrelationship between the condition of the economy and firms is the main driver of defaults.

3. METHODOLOGY

This section provides information about variables of study, econometric model and operationalization of variables.

3.1 Econometric model

To investigate the relationship between firm specific and macroeconomic and probability of default, we first calculate

the probability of default by using Bharath and Shumway [8] methodology. Bharath and Shumway [8] methodology to calculate expected default probability is a simplified version of the Merton [7] structural default model. Bharath and Shumway [8] model use the functional form suggested by Merton [40] structural model rather than solving for the implied probability of default. According to research studies structural model of default performs better as compared to models based on historical accounting information..Expected default probability computed by Bharath and Shumway [8] is presented as followed:

$$DD_{i,t} = \frac{\log\left(\frac{Equity_{i,t} + Debt_{i,t}}{Debt_{i,t}}\right) + \left(r_{i,t-1} - \frac{\sigma^2 V_{i,t}}{2}\right) * T_{i,t}}{\sigma v_{i,t} * \sqrt{T_{i,t}}}$$

$$\sigma v_{i,t} = \frac{Equity_{i,t}}{Equity_{i,t} + Debt_{i,t}} + \sigma_{Ei,t} + \frac{Debt_{i,t}}{Equity_{i,t} + Debt_{i,t}} * (0.05 + 0.25 * \sigma_{Ei,t})$$

And

$$EDF_{i,t} = N(-DD_{i,t})$$

where, $Equity_{i,t}$ is equity market value computed as product of stock price at the end of the year and shares outstanding. $Debt_{i,t}$ represent face value of debt calculated as sum of one-half of long-term debt and debt in current liabilities at the end of year. Past year annual return of firm i's are shown by $r_{i,t-1}$. Stock return volatility estimated by using the return data from last year is shown by $\sigma_{Ei,t}$. $\sigma v_{i,t}$ is approximation of company assets volatility computed from $\sigma_{Ei,t}$ and $T_{i,t}$ is set to one year. The $DD_{i,t}$ has been developed on last day of year for all firms. $N(.)$ is the cumulative standard normal distribution function and $\sigma v_{i,t}$ calculated here is time consistent variance. Model of study is as follows:

$$PD_{i,t} = \alpha_0 + B_1 Size_{i,t} + B_2 Lev_{i,t} + B_3 Ocr_{i,t} + B_4 Liq_{i,t} + B_5 Tan_{i,t} + B_6 Growth_{i,t} + B_7 Perf_{i,t} + B_8 Str_{i,t} + B_9 EC_{i,t} + B_{10} Ind_{i,t} + u_{i,t}$$

where

- PD = Probability of Default
- Size= Size of Company
- LEV = Leverage
- OCR = Operating Cash flow Ratio
- LIQ = Liquidity of Company
- TAN = Tangibility
- Growth = Growth of Company
- PERF= Performance of Company
- STR = Short Term Interest rate
- EC = Economic Conditions
- IND = Index Return
- μ = Error term

3.2 Data

To examine the relationship between firm specific and macroeconomic and probability of default, we utilize data from Thomson Reuters DataStream. The study include the data of all non-financial companies listed on Pakistan Stock Exchange included for the period 1998 to 2021. The study has not include financial firms because they have different capital

structure than non-financial firms. They study has utilized 2385 firm year observations. To eliminate the effect of outliers all firm-specific variables are winsorized at the 1st and 99th percentile.

3.3 Variables

The following Table 1 provides the measurements of variables.

Table 1. Measurement of variables

Variables	Abbreviation	Measurement
PD	Probability of Default	Bharat and Shumway (2008) Method
SIZE	Size of company	Log of Total Assets
LEV	Leverage	Total Debt/ Total Assets
OCR	Operating Cash Flow ratio	Operating Cash Flows / Current Liabilities
LIQ	Liquidity	Current Assets / Current Liabilities
GROWTH	Growth of Company	Annual change in Book Value of Total Assets
PERF	Performance of Company	Net Income / Total Assets
STR	Short Term Interest rate	Short Term Interest rate
EC	Economic Conditions	Annual GDP Growth
IND	Index Return	KSE-100 Index Annual Return

The dependent variable for the study is probability of default. As independent variables we have utilized firm specific and macroeconomic variables as suggested by literature. Independent variables are size of company, leverage, operating cash flow ratio, liquidity, tangibility, growth and performance of company while macroeconomic variables include short term interest rate, index return and economic conditions of country.

4. RESULTS

4.1 Descriptive analysis

Table 2 presents the results related to descriptive statistics.

The average probability of default is 31 % while lowest is 2 % and highest is around 64 %. The average growth of companies is 9.4 % while maximum is 53% and minimum is negative 2.3 %. Negative growth shows that assets of firm decreased as compared to last year. The liquidity of firm measured by current ratio shows mean value of 1.15, minimum is 0.4 while maximum value is 6.73.

4.2 Corelation analysis

Table 3 contains the correlation results.

The values in parentheses shows the significance of correlation between variables. The correlations values shows there is weak to moderate correlations between variables which means there is no issue of multicollinearity between independent variables. There is a negative correlation between size of company and liquidity which means large companies hold less cash. There is negative correlation between performance of company and probability of default means firms with high profitability have less chances of default. Index return also shows negative correlation with probability of default means when overall stock market is performing well

there is less default risk for companies. Economic condition also shows negative relationship with probability of default

which means there are less chances of default in good economic conditions.

Table 2. Descriptive statistics

	Mean	Std. Dev.	min	max	skewness	kurtosis
LEV	.622	.673	0.020	34.65	33.761	1608
Growth	.094	.151	-0.239	.532	.575	3.10
OCR	1.724	6.019	-1.472	62.849	6.363	49.80
SIZE	15.58	1.622	5.916	20.572	.039	3.458
LIQ	1.511	1.008	0.400	6.73	2.287	9.162
PERF	7.665	9.33	-20.480	59.35	.553	5.281
TAN	.508	.172	0.110	.807	-.299	2.181
PD	.315	.12	0.024	.646	-.173	2.736
IND	.134	.254	-0.440	.57	-.62	2.698
STR	.114	.025	0.067	.146	-.497	2.002
EC	4.025	1.919	-1.330	7.547	-.597	3.576

Table 3. Correlation results

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Growth	1.00										
(2) SIZE	0.05 (0.00)	1.00									
(3) OCR	0.05 (0.00)	0.03 (0.07)	1.00								
(4) LEV	-0.18 (0.00)	-0.14 (0.00)	-0.15 (0.00)	1.00							
(5) LIQ	0.11 (0.00)	-0.03 (0.02)	0.31 (0.00)	-0.54 (0.00)	1.00						
(6) PERF	0.22 (0.00)	0.10 (0.00)	0.21 (0.00)	-0.42 (0.000)	0.34 (0.00)	1.00					
(7) TAN	-0.08 (0.00)	0.11 (0.00)	-0.09 (0.00)	0.14 (0.00)	-0.26 (0.00)	-0.22 (0.00)	1.00				
(8) PD	-0.21 (0.00)	-0.08 (0.00)	-0.38 (0.00)	0.34 (0.00)	-0.47 (0.00)	-0.41 (0.00)	0.18 (0.00)	1.00			
(9) EC	0.12 (0.00)	-0.05 (0.00)	0.02 (0.11)	-0.03 (0.05)	0.02 (0.16)	0.08 (0.00)	0.01 (0.40)	-0.12 (0.00)	1.00		
(10) STR	0.01 (0.35)	-0.19 (0.00)	0.01 (0.26)	-0.00 (0.66)	-0.04 (0.00)	0.12 (0.00)	-0.01 (0.43)	0.01 (0.51)	0.31 (0.00)	1.00	
(11) IND	0.11 (0.00)	-0.03 (0.01)	0.01 (0.34)	0.00 (0.96)	0.02 (0.08)	0.07 (0.000)	0.00 (0.74)	-0.13 (0.00)	0.43 (0.00)	0.27 (0.00)	1.00

4.3 Hausman results

Table 4 provides the results of Hausman test.

Table 4. Hausman results

	Coef.
Chi-square test value	144.377
P-value	0.000

The Hausman test has been applied to decide whether fixed effect model or random effect model is appropriate for this study. P-value is significant which means fixed effect model is appropriate for the study.

4.4 Fixed effect results

Table 5 provides the results of regression analysis. The empirical results of firm specific variables show that

growth, operating cash flow ratio, liquidity, and performance is negatively related with the probability of default while leverage and tangibility of assets are positively related with the probability of default. Size of the company has no relationship with the probability of default. In macroeconomic variables economic conditions measured by GDP growth rate and index return are negatively while short term interest rate is positively related with probability of default.

Firm growth is negatively related to the probability of default which is consistent with the previous studies results, i.e. Gopalakrishnan and Mohapatra [31]; Hamid and Siddiqui [28]; Campbell et al. [15]. Firms with good growth rate tend to have less risk of default because growth can signal financial strength and stability. When a firm is growing, it is typically generating increasing revenue, which can be used to pay off debts and meet other financial obligations. This in turn can help improve the firm's creditworthiness and reduce the risk of default. Additionally, growing firms often have access to a larger pool of potential investors, which can help them secure additional financing if needed.

Table 5. Fixed effect model results

PD	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
GROWTH	-.027	.009	-3.12	.002	-.044	-.01	***
LEV	.159	.012	12.77	0.00	.135	.184	***
SIZE	0.00	.003	-0.13	.895	-.005	.005	
OCR	-.003	0.00	-9.64	0.00	-.004	-.003	***
LIQ	-.029	.003	-9.37	0.00	-.036	-.023	***
PERF	-.002	0.00	-8.10	0.00	-.002	-.001	***
TAN	.031	.015	2.09	.037	.002	.059	**
EC	-.013	.001	-14.29	0.00	-.015	-.011	***
STR	.689	.094	7.34	0.00	.505	.873	***
IND	-.053	.007	-8.12	0.00	-.066	-.04	***
Constant	.246	.049	5.01	0.00	.149	.342	***
R-squared		0.439		Number of obs		2385	
F-test		165.401		Prob > F		0.000	

*** p<.01, ** p<.05, * p<.1

Leverage is found to be positively related with probability of default which is consistent according to trade off theory that increases in firm debt ratio increases firm probability of default. High leverage firms have high default risk because they have a greater proportion of debt in their capital structure. When a firm has a high level of debt, it is more susceptible to changes in market conditions or unexpected events that could negatively impact its ability to service its debt. When interest rates rise or economic conditions deteriorate, high leverage firms may struggle to generate enough cash flow to make interest and principal payments on their debt. This increases the risk of default, as the firm may not be able to meet its financial obligations. Results related to leverage is also consistent with previous studies, i.e, Badayi et al. [30]; Lozinskaia et al. [29]; Cathcart et al. [18].

Operating cash flow ratio is also negatively related with the probability of default which means firms having high operating cash flow levels have less chances of default. Firms with good operating cash flows have a steady and consistent source of funds to meet their financial obligations, such as paying off debts and interest, making payments to suppliers and employees, and investing in growth opportunities. When a firm has positive cash flow, it can also increase its financial stability and reduce its dependence on external sources of funding, such as loans and bonds. Sun et al. [34, 35] also found the same results related to cash flows of the company relationship with default risk.

Liquidity and performance also has negative relationship with probability of default. This means that firms with high profitability and high level of liquidity has less chances of default. A firm with good liquidity is less likely to default because it can easily pay off its short-term obligations, such as current debts, accounts payable and short-term loans, without relying on long-term financing. A good performing firm has a strong financial position, which increases its credibility with lenders and investors. They are more likely to invest in the firm because they believe that the firm is less likely to default. Results related to profitability are consistent with previous studies of Hamid et al. [16, 24, 28] while results related to liquidity are in line with studies of Switzer et al. [23, 24].

Asset tangibility is positively related with probability of default which means that companies with higher level of fixed assets are more prone to default. A firm with more tangible assets is considered to be more financially stable and less likely to default on its obligations. This is because tangible

assets, such as buildings, machinery, and inventory, can be sold or used as collateral to raise funds and pay off debts in the event of a financial crisis. Gopalakrishnan and Mohapatra [31] have reported the same results and this could be because these businesses rely more on debt financing secured by their physical assets.

Short term interest rate is positively related to probability of default. This means that when short term interest rate increases it increases default risk of companies. Duan et al. [16] also found that default risk of firm is significantly related to interest rate. They explained that firm financing cost increase in short run due to increase in short term interest rate which in short increases the default probability of firm. Default risk is negatively related to the stock market index return and economic conditions measured by GDP growth. This means increase in country GDP and overall market performance lower the chances of default of individual companies. These results are also consistent with previous studies.

5. CONCLUSION

The literature related corporate default risk related to Pakistani firms is very limited and failed to identify the firm specific and macroeconomic determinants of probability of default. This study tries to fill the gap by using a large dataset to analyze the default risk of Pakistani listed non-financial companies. We explore the factors that affect the probability of default in Pakistan and find some are from those identified by previous studies. This study follows Bharat and Shumway [8] methodology to calculate expected default probability, which is a simplified version of the Merton [7] structural default model referred as market model. The empirical results of firm specific variables show that growth, operating cash flow ratio, liquidity, and performance is negatively related with the probability of default while leverage and tangibility of assets are positively related with the probability of default. Size of the company has no relationship with the probability of default which is against the concept of "Too big to fail". In macroeconomic variables economic conditions measured by GDP growth rate and index return are negatively while short term interest rate is positively related with probability of default. Companies with high level of debt are more likely to default. Reducing debt and avoiding taking on too much debt can help companies' decreases default risk. Companies should

also diversify their revenue sources and better manage cash flows to decrease the chances of default.

This study focuses on firm-specific and macroeconomic factors affecting default risk without considering corporate governance factors. Further studies may investigate the effect of corporate governance on the probability of default. Another avenue is to explore how corporate governance factors influence the relationship between firm-specific factors and default risk. Further studies can also investigate the effect of firm-specific factors and a macroeconomic factor in different sectors to check if there is any difference in results.

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