Impact of probability to default on sugar sector using firm level variables

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Abstract

It is noticed that there are many running sugar mills in Pakistan which are facing problem of liquidity. They are not able to clear their legal liabilities. Banks are unwilling to give loans to the sugar mills because of unprecedented crisis. These crises create probability to default for firms and it is a vast concern to investors / creditors, borrowing firms, and governments. For smooth working of sugar sector, it is very important to know all factors which are creating unprecedented crisis for the sector because in recent times Punjab Government auctioned Chishtia-Sugar-Mills (Sargodha), Abdullah-Sugar-Mills (Okara), Abdullah-II Sugar-Mills (Sargodha), HaseebWaqas-Sugar-Mills (Nankana-Sahib) and Colony-Sugar-Mills (Khanewal) and stocks of these companies Shakar Ganj-I Sugar-Mills (Jhang), ShakarGanj-II Sugar-Mills (Jhang), Hussain-Sugar-Mills (Faisalabad) and Brother-Sugar-Mills (Kasur) were taken in custody because dues of sugarcane farmers were unpaid. Therefore, sugar mills owners are willing to know the importance of probability to default on sugar sector. Because of this, the importance of sugar sector and factors which are causing liquidity for sugar companies were discussed in this research.

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Introduction

Worldwide there are more than one hundred countries which produce sugar, and Pakistan belongs to the top ten largest sugar producers' countries in the world. After textile, sugar is second biggest agro-based sector in Pakistan. There are 75 operating mills with capacity of 7 mln tones. Sugar is a part of the world's ten largest agricultural future markets. In 2015, the exports of sugar by different countries were about US \$ 21.6 billion. According to continents contribution, Latin America and Caribbean countries contributed highest dollar value worth of sugar exports during 2015 with export to \$ 10.3 billion or 47.6 % of global exports. Asian countries contributed 24.4 %, European suppliers contributed 18 %, African exporters contributed 6.8 % and North American shipped 4.5 % in global export of sugar. Contribution of Pakistan into world's sugar export was US \$ 17.6 million in 2015. On the other hand; Pakistan sugar industry for last three year are facing unprecedented crisis. Production mills, raw material suppliers, employees and owners equally affected by these crisis. In this manner, growers says they are not getting much price according to Government policy and cost of production, there is a payment delay issue from sugar mills owners side, Owners of sugar mills are unable to pay loan installments of banks, employees are not getting proper benefits according to Government benchmark and shareholders dividend payout is converted in negative due to unstable growth. In the production of sugar, sugarcane is the biggest source of raw material but rates of raw material in Pakistan is much high as compare to its competitor countries like China, India etc. Total contribution of Pakistan in global export of sugar is only 0.1% because Pakistan international export prices are much higher than the others exporting countries of sugar. According to world atlas report Pakistan is at number 5 in the production of sugarcane; however sugar mills of Pakistan is unable to produce much sugar to fulfilling

demand of country. Pakistan have to import sugar for different countries to fulfil excessive demand of sugar in country, which is a reason for less contribution of Pakistan in international export. In Pakistan many running mills are facing problem of liquidity. They are not able to clear legal liabilities. Banks are unwilling to give loans to the sugar mills because of unprecedented crisis. These crises create probability to default for sugar sector and it is a vast concern to investors / creditors, borrowing firms, and governments. The researchers (Mirzaei, Ramakrishnan, & Bekri, 2016) have called for an uprising of active default warning systems to notice or stop default trouble in real time. This study is explained that firms follow leverage targets. To run a business with success and profitability, growth of the business plays a vital role to achieve goals. Investors look growth rate of the firm before investment and creditors give loans on the basis of same. Growth rate is a significant tool for measuring competitive position. Growth of the business can be enhanced by waiving unprecedented crisis. These unprecedented crises of growth are measured by change in market share in respect to change in profit. Businesses use financial leverage to increase the profit margin of shareholders compare to equity operations. Within the business financial leverage is also be used to enhance the return on investment of capital employed. Sugar sector in Pakistan uses leverage to reduce probability of default. Leverage of sugar sector is calculated by leverage ratio formula.

In present time because of unprecedented crises most portion of sugar sector of Pakistan is facing trouble of default, in last few year Punjab Government has auctioned Chishtia-Sugar-Mills (Sargodha), Abdullah-Sugar-Mills (Okara), Abdullah-Two Sugar Mills (Sargodha), and Colony-Sugar-Mills (Khanewal). In the next step stocks of these companies ShakarGanj-I Sugar Mills (Jhang), ShakarGanj-II Sugar Mills (Jhang), Hussain-Sugar-Mills (Faisalabad) and Brother-Sugar-Mills (Kasur) were taken in custody because dues

of farmers were unpaid by sugar mills owners. The mills are not capable to pay their legal liabilities. The banks are unwilling to give loan to the owners of sugar mills in these unprecedented crises. The result of these unprecedented crises can be predicted with Probability to default with the help of leverage, growth and liquidity ratio variables. The main purpose of this research is given below.

To find out the impact of leverage ratio on sugar sector to overcome the crisis of capital or long term debt.

By using growth ratio, sugar sector can measure sales position and control the stock position in the market.

To investigate the impact of liquidity ratio, sugar mills owners can realize short term loan payback position.

As we know that Sugar sector is second biggest agro based division of Pakistan after textile but because of these unprecedented crises, future of sugar sector is not sustainable for investors and mills owners. In this study with the help of firm level variables it is showed that how probability to default on sugar sector can be measured. Probability to default is used as a tool to measure the estimation of business probability of default on the basis of variables. Probability to default on sugar sector can be incorporates using three variables, which are leverage, growth and liquidity ratio. Significance of Leverage is based on following reasons leverage helps to access the financial risks. Financial risks of not being to pay the financial obligation by the firm to the debt holders. Fixed return sources of capital in sugar sector is influenced the return of variable sources of capital and such effect is control by leverage. The role of capital structure in sugar sector is very essential to raise business worth and the financial performance of the business. Main parts of capital structure are debt and equity. Leverage arises when any business use word debt. Liquidity and productivity of sugar sector are some of the mainly studied ideas of financial organization inside the area. For the purpose of improving the productivity of sugar sector, the importance of liquidity management arises. Liquidity in term of cash or near cash assets effects productivity of sugar. The better management of liquidity is very vital for each organization that purpose to give current responsibilities on business. In this manner the liquidity management in term of cash ratio, current ratio and liquid assets ratio that effect on productivity of sugar sector the liquidity ratios are used.

This research would create ways to measure, analyze and compile the position of sugar sector long term debt and short term debt payback position and position of sugar sector growth in future. In connection with overview related to the topic, main problem statement, what is the significance of this study i.e. what is the objective is presented in (introduction) i.e. chapter 1, chapter 2 consist of literature review of the research, the research framework, development of research hypothesis and research outcome questions; chapter 3 (research methodology) i.e. data collection, sampling technique.

Literature review

To get in order whether to continue as an ongoing concern about the client's capability to least one year after the reporting date serious doubts. A wrong decision on a client's financial probability grounds considerable values. The issuance of a profitable view to a consequently enduring client can hint to training the client; while the disaster to subject going concern judgment to a sequentially bankrupt firm can cause to enormous trial costs and status indemnities for accountants (Ramakrishnan, AhmadNabi, & Anuar, 2015). To establishing the industry's specific variables researchers, face problem of data limitations (Mirzaei, Ramakrishnan, & Bekri, 2016).

Leverage

Any incorrect decision related to capital structure can be cause for the firm to financial distress and eventually to bankruptcy. The impact of outside factors should be measured. The Role of debt financing is very essential in emerging market finance. Although emerging markets and developed markets both have practised an increase in leverage in excess of the past since last decade, even in emerging markets rate of increase is much high than developed markets (Mirzaei, Ramakrishnan, & Bekri, 2016). Sugar unprecedented crisis

can be affected by leverage. Cost of debt and corporate risk of insolvency can be enhanced because of high degree of leverage. (Santosuosso, 2014). Total equity over financial debt is tested to measured leverage. Loans from financial institution are defined as financial debt and amount of equity higher associated to the amount of debt, risk of default is lower; thus the sign or result of this coefficient or constant is expected to be negative (Jouault & Featherstone, 2011). Other debt over current assets is other leverage. Short term debt corresponds other debt to suppliers, social creditors and tax. Amount of short term debt higher, repayment capacity is lower, thus probability to default is higher in result (Jouault & Featherstone, 2011). The finding of (Fildes, Nikolopoulos, Crone, & Syntetos, 2008) concluded by quarreling that the exclusive contribution that operational research can carry on to probability of default is via developing such models that directly link the effectiveness of accurate probability of default models to the business aspect in which updated models will be applied. The researchers (Jouault & Featherstone, 2011) further describe leverage have close similarity to debt ratio and it is described as total assets over total liabilities. This explanation is different related to measure of leverage that only reflect debt to the financial organizations. The proportion of a company's assets is shown by debt ratio that are financed via loan or debt. We further more can describe, this explanation of leverage is subcomponents as showed above. Organization with highly leveraged if its debt ratio is high and have more likely to probability to default. The risk of leverage is remunerated in symmetry through the comparative pricing of safeties, because of this the tangency collection comprises an unequal amount of harmless assets (Asness, Frazzini, & Pedersen, 2012).

Growth

The researchers (Santosuosso, 2014) made a research to find out the effect of cost of debt on firm growth or profitability. Exactly the study of researcher was to examine the relationship among cost of debt, which is measured by financial debt ratio of interest expense. This study is included data of 3556 unlisted firm of Italy during the period of 2007 to 2011. All 3556 firms have their average profit and loss both. The authors examined that the impact of growth on cost of debt due to increase the probability of default. The first assumption of researcher (Santosuosso, 2014) depends on the cost of debt and firm growth to find out inverse relationship among variables. Result raised another major issue of corporate finance. Theory of pecking order, negative correlation is leaded by capital structure between growth and leverage. Thus, which firms has low growth have high degree of leverage and firms which has high growth have low degree of leverage. In this manner it is concluded that these kind of increase and decrease level of leverage can further increase or decrease the cost of debt and can creates trouble of probability of default for organizations. To investor it is very important to identify whether to invest in sugar sector or not, for this purpose growth rate of any sector play a significant role for investors. The researcher (Chhapra, Mashkoor, & Syed, 2010) found growth rate of Mehran sugar mill, Chashma sugar mill and Kohinoor sugar mill to identify the impact of growth on probability to default using binary logistic.

Liquidity

The researchers (Jouault & Featherstone, 2011) defined liquidity of probability to default is described as working capital of organization equal to current assets minus organization's current liabilities. The figure of this equation can be negative or positive according to scenario. Organization that having working capital in quantity may be higher successful rather than organization have less working capital. It is difficult to run with effectively for those organization which has low quantity of working capital. In the result of (Jouault & Featherstone, 2011) it is found that chi-square statistical analysis shows that all variables according to researchers significant at the percentage of 95 confidence level. There is positive coefficient for leverage and negative coefficients for profitability or growth and liquidity. Firms which has higher profitability tend to be more sufficient to repay its debt of finance. Here as expected, liquidity is

negatively link to the probability to default. It can be further describe in other words, without incurring higher cost the firm have ability to repay business obligations in case of greater chance of liquidity (Mirzaei, Ramakrishnan, & Bekri, 2016). Research examine the ratios of different variables which includes liquidity, solvency, profitability, and leverage ratio. Probability to default on sugar sector can be examined using these ratios (Nabi, Ramakrishnan, & Anuar, 2014).

Probability to default

Cost of debt possibly be enhanced and value of business may be reduce because of probability to default (Santosuosso, 2014). After examine different industries probability of default, it is discovered that Industries' structure riskiness level may be vary because industries are internally instable to each other. Big players of industries are more likely to invest financing. Therefore, discovering how the detailed situation of each industry could inversely affect the probability of default of firms is an essential issue (Mirzaei, Ramakrishnan, & Bekri, 2016). The researchers (Bharath & Shumway, 2008) discussed usual cumulative density function of probability of default is Z-score which depends on the firms values which were driven from financial statement of the business. The researchers used Z-score measure, Auditors view measure, Zmijewski Probability Measure and Stock Return Measure to get result of probability of default using firm level variables. Authors included 105 liquidations and 2058 non bankruptcies. They created that using limit of probability by 3.8% for sector wise as insolvent weakened type. On this situation point of cutoff, the perfect suitably classified 87.6% of broke firm trial and 82.6% of the non-bankrupt firms (Ramakrishnan, AhmadNabi, & Anuar, 2015). The dependent variable this study is ratios which are related to probability to default. Binary logistic variables used, if value is 1 for default and 0 for non-default. Here default is described as a debt that not been repaid for one fiscal year (Jouault & Featherstone, 2011). Based on researcher (Kealhofer, 2003) finding that in terms of economic variables, the most important reflector is interest rate related to leverage, which has high effect on probability to default of firms. Information of Pakistan debt rating is accessible on net. This information of credit rating provides significant image of defaults. Therefore, market investors and the shareholders of related firms have no worry to find out the probability to default of concern firm (Nabi, Ramakrishnan, & Anuar, 2014). The researchers acknowledged that affected firms present meaningfully diverse financial ratio amount than non-loosed firms. Afterward researches were used financial guides stranded on bookkeeping. In general cash flow upon total liabilities are most suitable for forecasting of probability of default. For explaining probability of default the Altman's Z-score is model which interpret probability of default using leverage, growth and also liquidity variables ratios to explain company future. Different expressive variables used in Altman's model which include net earning upon total assets, value of market equity upon value of total liability of book and sales upon assets' total (Ramakrishnan, AhmadNabi, & Anuar, 2015).

Fig. 1. Conceptual framework

This research model shows the relation of leverage, growth and liquidity with probability to default.

In this literature review is derived through different research papers that probability to default is clearly be explain or identified through three independent variables with name of leverage, growth and liquidity as he researchers (Jouault & Featherstone, 2011) abstract that indicators of probability to default are leverage, profitability and liquidity are statistically significant. As a result, probability of default increases, liquidity decreases, profitability or growth decreases and leverage increases. The companies and investors are worried in future because of increase rate of probability to default. Therefore, to improve the performance quick and significant decisions require for future better performance. Growth, activity ration and liquidity are variables to examine the probability to default for companies.

Methodology

To get proper result of the research Quantitative data approach is used on sugar mills financials. The approach of quantitative data allow a researcher to measure the performance, leverage payout ratio and default probability of the organization by using financial data (Wyse, 2011). Quantitative data can easily be used in different analyses software to get appropriate results. Furthermore secondary data of is used to find the impact of independent variables on dependent variable. In secondary data analysis approach main data is collected by someone else from different resources to get primary result. The second time data is used to investigate that data for getting appropriate result by researcher (P. Johnston, 2014). Six different sugar mills financial reports data is used to investigate the probability to default. Secondary data of 6 sugar mills financials is collected from sugar mills websites and Pakistan stock exchange website for last 5 year. The binary logit technique of regression is used to find out the appropriate results of prepared model. For non-default is expressed with 0 and default is expressed with 1. The financial data is examined with the help of ratios.

How leverage, growth and liquidity ratios can predict default probability of sugar sector by using binary logit regression is investigated in this research. Probability to default can be predict by using binary logit regression (Tartu, 2017). In this regression analysis depended variable is binary. Where data is coded 1 and 0, here the property of default is denoted by 1 and non-default is denoted by 0.

H1: Leverage has an impact on probability to default on sugar sector

H2: Growth has an impact on probability to default on sugar sector

H3: Liquidity has an impact on probability to default on sugar sector

In this study binary logistic model is used to examine the impact of probability of default on sugar sector. The reason to choose this technique is that because it is widely used in statistical analysis of research studies. Understanding of binary logistic is easy for non-professionals. It is pre-installed program in different kind of statistical based software. Result of binary logistic can be fairly healthy and reliable tool for predicting. Different equations is used to test hypothesis.

$$\text{Probability of default } (x_1 \dots x_i) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 + \dots + \beta_i x_i)}}$$

Independent variables are denoted by $x_1 \dots x_i$ and firm specific variables are denoted by β_1, β_i

It is further can be examine by using ratios of independent variables.

$$\text{Leverage} = \frac{\text{Total Debt}}{\text{Total Assets} - \text{Current Assets}}$$

$$\text{Liquidity} = \frac{\text{Current Assets}}{\text{Current Liabilities}}$$

After applying binary logistic, there is no issue what are the values. The outcome shows between 0 and 1. This model is fair match to examine the probability to default on sugar sector using firm level variables.

Different techniques were discussed to determine the effect of probability to default on sugar sector using firm level variables. Six sugar mills of Pakistan which are facing the issue of default and data sources of secondary data like Pakistan stock exchange and financial

statement data of related sugar mills are selected to identify the impact of variables.

Results and findings

The analysis of research model with the help of finding and results has been discussed in this chapter. Appropriate results has been evaluated by using binary logit regression technique in SPSS. In this manner, 6 different sugar mills shakarganj-Limited, Imperial-Sugar-Mills-Limited, Habib-Sugar-Mills-Limited, Haseeb-Waqas-Sugar-Mills-Limited, Khaipur-Sugar-Mills-Limited and Mirpurkhas-Sugar-Mills-Limited was taken to get the impact of Leverage, Growth and Liquidity ratio on Probability to default. Sugar mills are selected according to outstanding share percentage in Pakistan stock exchange. Top three and less holding percentage of market sugar mills was selected. Authenticity of the sugar mills is checked from security exchange commission of Pakistan website. Secondary customized financial data is gathered from sugar mills official websites. Data was in the shape of financial reports. Appropriate financial data is transform in excel file and Leverage, Growth and Liquidity ratios are calculated with the help of formulas of ratios. Finding of the data is achieved by importing excel file in SPSS.

At the time of observing the model it has been noted that only leverage ratio is significant which have significant value less than 0.05. On the other hand growth and liquidity have significant value more than 0.05 but the data have the ability to predict the percentage of probability to default.

Table 4.1: Omnibus tests of model coefficients

		Chi-square	df	Sig.
Step 1	Step	6.738	3	.081
	Block	6.738	3	.081
	Model	6.738	3	.081

It has been found that the difference between observed and actual model is 6.737 percent change and all variables are significant to tell the probability to default percentage. Further significant is check by knowing the value of -2 log.

Table 4.2: Model summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	34.316 ^a	.201	.270

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

The table 4.2 presenting that this model is fitness of good model because Cox&Snell-R-square and Nagelkerke-R-square value is between 0 to1. Value of -2 log-likelihood showing there is a reduction between observed and actual model summary.

Table 4.3: Classification table^a

Observed	PD	Predicted PD		Percentage Correct
		0	1	
Step 1	PD	0	12	5
		1	4	9
Overall Percentage				70.0

a. The cut value is .500

Probability to default hit ratio is 70 percent and 30 percent data is not predicting the model. Five observation should be in the not default but its lying in default model and 4 observation should be in default model and its showing these observation data lying in not default.

Table 4.4: Variables in the equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1 ^a	Leverage	.648	2.133	.092	1	.761	1.912
	Liquidity	-1.031	.832	1.536	1	.215	.357
	Growth	-.223	.254	.769	1	.380	.800
	Constant	.094	1.995	.002	1	.962	1.099

a. Variable(s) entered on step 1: Leverage, Liquidity, Growth

Leverage, growth and liquidity, all three variables sig value is more than 0.05 which showing that according to data no company is going to default and it is can be predict that there is a significant percentage which is showing the position of sugar mills default.

Table 4.5: Predicted probability table

Company	Predicted probability Mean
Habib Sugar Mills Limited	.09421
Haseeb Waqas Sugar Mills Limited	.61406
Imperial Sugar Limited	.47700
Khairpur Sugar Mills Limited	.50805
Mirpurkhas Sugar Mills Limited	.28946
Shakarganj Limited	.61721

According to above final table it can be predict that shakarganj-sugar-mill have highest probability to default which is 0.617 percent and habib-sugar-mill have lowest probability to default which is 0.094 percentage.

Hypotheses assessment summary

Table 4.6: Hypotheses assessment summary

Hypotheses	Sig. value	Empirical conclusion
H1: Leverage has an impact on probability to default on sugar sector	0.761	Rejected
H2: Growth has an impact on probability to default on sugar sector	0.215	Rejected
H3: Liquidity has an impact on probability to default on sugar sector	0.380	Rejected

Significant value of leverage, growth and liquidity ratio is more than 0.05 which means hypothesis are not capable to describe the accurate result of the model. All hypothesis has been found rejected in research investigation.

Conclusion, discussion, implications, limitations and recommendations

It has been concluded that Pakistan have number 5 position in production of sugar which is 63,800 TMT. On the other hand, only 1 percent of world export is contributed by Pakistan sugar mills. Production capacity of sugar mills are reducing because sugar mills are facing problem of financials, dispute with sugarcane growers and mills owners. These situations became huge when mills started auctioned by Punjab Govt. Sugar mills long term debt was analysis shows that due to unavailability of fund sugar mills owners are unable to payback bank loans installments and unwilling to give more loan to sugar sector because of current situation. Sugar mills owners are unable to pay dues of sugarcane producers and facing problem of liquidity ratio. Pakistan sugar price as compare to competitors are higher because of Government policies. Therefore, sugar mills owners unable to export sugar, which creates problem of low sales and less profit. It has been investigated that leverage, growth and liquidity ratio have impact on probability to default on sugar sector.

To tell situation of default or non-default of 6 sugar mills is main concern of this research. In this manner different authors articles are being read. By using the firm's debt rating as a proxy for the default risk and correcting for the endogeneity of leverage, I am able to measure the true impact of leverage on the probability of default. It has been found that probability of default is impacted by leverage of the sugar mills. Liquidity play a major role to tell the condition to pay dues of sugarcane owners. Sugar mills financial ratios data was inserted in SPSS and the result shows that financial ratios have impact on probability to default. In the result it is also noticed that all mills which were investigated are safe form the situation of default. After rejection of all hypothesis it can be observed that in 2008, the financial crises effected the global economy and each sector so this is

the external source which can be a reason of firm's probability of default.

In future this study can be used in different sectors because after investigated the result of the study it is clearly observed that financial ratios tell the situation of probability to default of sugar sector in percentage. If the others external factors remains same then organization which have debt ratio issue can estimate the position of default. Unprofitable firms leverage ratio testing by using binary logit model can tells the situation of default in future. Agro based sector borrowed from bank and due to low growth and environmental situation unable to payback installments. By using this model agro based sector special rice, mango, wheat etc. can predict percentage of probability to default with financial ratios. Furthermore, banks can estimates the power or situation of payback of loan of its clients by using this model.

In this section of the research the limitations of the research are deliberated. One of the main limitation was that the sugar mills which was investigated during the research are registered sugar mills of Pakistan and these sugar mills have part in Pakistan stock exchange sugar sector. Previously defaulted firms data was not available on available grounds. The model is unable to predict the fully desired result. Only 30 observations were taken which was 5 year data of sugar mills. SPSS has no equation to find out which is the bench mark to predict default and non-default years. It was calculated manual and then entered in SPSS by using excel. There is no data available on national level which can tells the current situation of sugar sector. Therefore, it was very difficult for researcher to create bench mark for default probability.

Recommendations

To predict the future default situation for unprofitable firms is permanent issue. By using this research on period basis organizations can overcome future default situation and manage debt payout ratio.

To get more accurate result of default probability research can study and proceed it to the final point. Because current study was conducted on limited basis and resources.

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