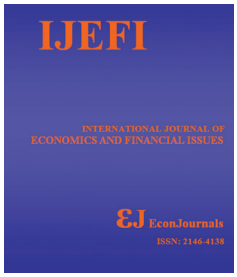

International Journal of Economics and Financial Issues

ISSN: 2146-4138

available at http: www.econjournals.com

International Journal of Economics and Financial Issues, 2016, 6(S3) 197-202.

Special Issue for "Asia International Conference (AIC 2015), 5-6 December 2015, Universiti Teknologi Malaysia, Kuala Lumpur, Malaysia"

Default Prediction in Pakistan using Financial Ratios and Sector Level Variables

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ABSTRACT

Default prediction provides a way to control and direct firms in achieving their goals. The common approach in this regard has been to study the relationship between set of explanatory variables and financial distress. The study served specific objectives by highlighting the sectors impact on financial behavior of Pakistani listed firms across sectors. The study looks into the sector specific attributes that affect the bankruptcy prediction determinants. Since sectors operate in business environments which are subject to different levels of growth, competiveness and market concentration. The study will investigate the relationship of several independent firm-level, sector level variables that have to be examined with dependent variable. Financial variables nature is not normal so logit used for the nature and also financial distress is binomial variable. In addition, the company may provide the possibility of financial distress and indicates an argument that this study used independent variables that are best predictors of financial distress.

Keywords: Financial Distress, Financial Ratio, Sector Level Variables
JEL Classifications: E24, G23

1. INTRODUCTION

Forecasting of monetary distress corporations have remained one of the utmost prevalent zone of exploration in finance. The capability to foresee monetary distress is vital to the corporations, to the latent and present stockholders and to the stock market controllers. A business in Pakistan is measured to be insolvent when corporation delisted by Karachi stock exchange (KSE) due to bankruptcy/winding up under court order i.e., defilement of listing regulation no. 32 (1) (d) and Winding up of business by securities and exchange commission of Pakistan. Though, earlier studies that were conducted in this extent of forecasting are based on financial distress and have used financial ratios (Alifiah, 2011; Nur Adiana et al., 2007; Low et al., 2001; Chin, 2005; Mohamad Isa et al., 2005; Mohamed et al., 2001; Mohmad Isa, 2004; Karbhari and Zulkarnain, 2004; Rohani and Adiana, 2005) and some have used country level variables only (Zulkarnain et al., 2001; Chin, 2005; Zulkarnain and Karbhari, 2004; Fauzias and Chin, 2001). The work illustrates that no interest have been showed in this area to forecast the monetary distress businesses in discrete subdivisions in Pakistan using sector level variables. This paper targets to progress monetary distress forecasting model in sectors of Pakistan using ratios and sector level variables using logit analysis. Recent work on bankruptcy prediction has highlighted the importance of sector/industry behavior that affects the bankruptcy prediction of firms. According to past literature, the measurement of industry/sector-level factors and data limitations was the problem faced by researchers in developing countries (Kayo and Kimura, 2011; Ramakrishnan, 2012). Few studies included sectors or industries dummies. However, these techniques do not provide clear picture of sectoral effect on bankruptcy prediction of firm. In the circumstances of developing markets, particularly in Pakistan, to the best of the researcher's knowledge, no study up to date has investigated the effect of sector/industry on the relationship of default prediction and determinants of bankruptcy prediction at firm, sector level. In order to capture the more realistic effect of sector or industry on bankruptcy prediction of firm, the current study employed four new variables at industry/sector level, such

as; munificence, dynamism, Herfindahl–Hirschman index (HHI) and uniqueness.

2. STYLIZED FACT

The inflow of ODA to Nigeria from 1970 to 2010 are shown in the Figure 1, all trends are plotted in logarithm forms of the data. Bilateral aids (BA) flows are of three categories - BA from top-five CDI ranked countries (BACDI), BA from Nordic countries (BANC), and BA from Nigerian's trading partners (BATP) (Figure 1). The influx of BATP supersedes any other category of BA. As at 1970, BATP stood at 81.68 compared to BACDI and BANC which were 1.68 and 3.99 respectively. However, BANC dropped sharply between the first half 1980s, but gradually increases over time. Other categories show a significant increase over the mid-periods of 2000s.

Figure 2, depicts the trend of multilateral aids (MA) as increasing over the period of time. Precisely, early periods of 1990s show a sharp increase of MA flow, while the period after witnessed a gradual increase of this category of aid. Total BA and MA are tracked in Figure 3. During the earlier periods of 1970s, total BA exceed MA (Figure 3). This disparity cannot be far-fetched, BA which comes through the development donor countries are seen as free monies with less stringent conditions as against MA which are mostly tied to agencies conditionality. However, the periods of 1990s and 2000s witnessed an increase in the influx of multilateral, thus making it exceed the BA.

In Figure 4, total aid between the periods of 1970 to 2010 depicts a kind of oscillatory movement. It peaked in the 1990s and mid 2000s but the growth became unsustainable the periods thereafter.

In 1970 and 1971, the share of total aid in gross domestic product was as high as 165% and 119% respectively, but fell to 2% in 1981 and 1982. In 1989, it remarkably increases to about 14%, and continue to reduce thereafter. It peaked again to 4% and 5% in 2005 and 2006 (Figure 5).

3. LITERATURE REVIEW

1. Multiple discriminant analysis (MDA) and logit analysis had been used by the researchers on the calculation of insolvency and monetary distress. Overall, insolvency and monetary distress expectation simulations have been effective in categorizing businesses as financial distress/non-financial distress by applying statistical technique. Multivariate statistical techniques have been very prevalent between scholars with the obtainability of contemporary services and because of its capability to transact with numerous variables concurrently (Ganesalingam and Kuldeep, 2001).
2. A lot of research had been conducted using financial ratios in developed and emerging countries and the technique was MDA. Most researchers that have used MDA are (Nur Adiana et al., 2007; Karbhari and Zulkarnain, 2004; Chin, 2005; Mohamed et al., 2001). Besides using financial

Figure 1: Trend of developmental bilateral aid (BA) to Nigeria (1970-2012). As at 1970, BATP stood at 81.68 compared to BACDI and BANC which are 1.68 and 3.99 respectively. However, BANC dropped sharply between the first half 1980s, but gradually increases over time. Other categories show a significant increase over the mid-periods of 2000s. BACDI: BA from top-five CDI Ranked countries, BANC: BA from Nordic countries, BATP: BA from Nigerian's trading partners. The flow of BATP supersedes any other category of BA

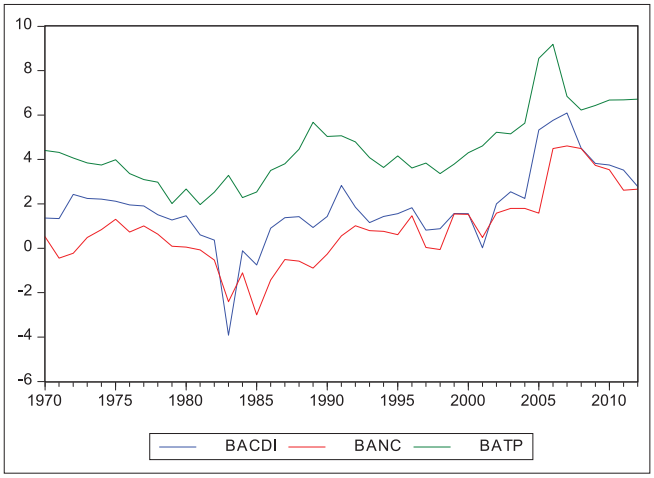


Figure 2: Trend of multilateral aid to Nigeria (1970-2012)

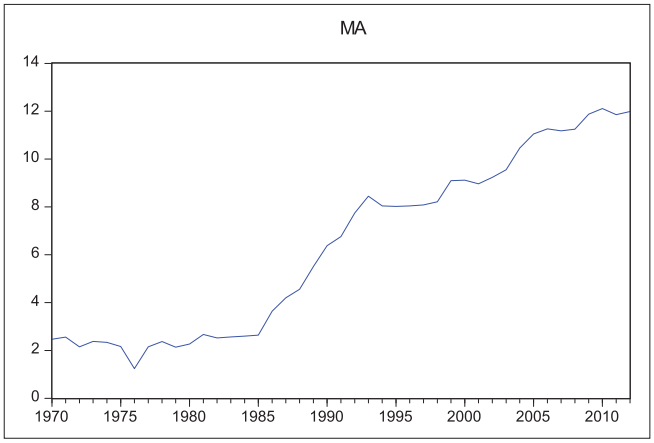


Figure 3: Trend of total bilateral and multilateral aid in Nigeria (1970-2012). BA: Bilateral aid, MA: Multilateral aid

Figure 4: Total developmental aid to Nigeria (1970-2012). TAID: Total developmental aid

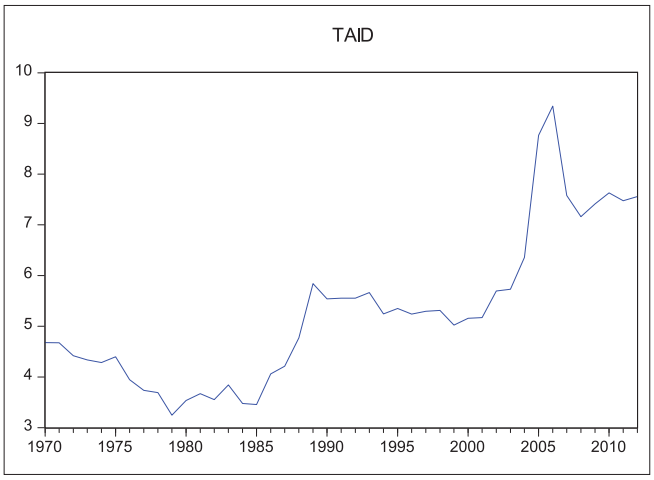
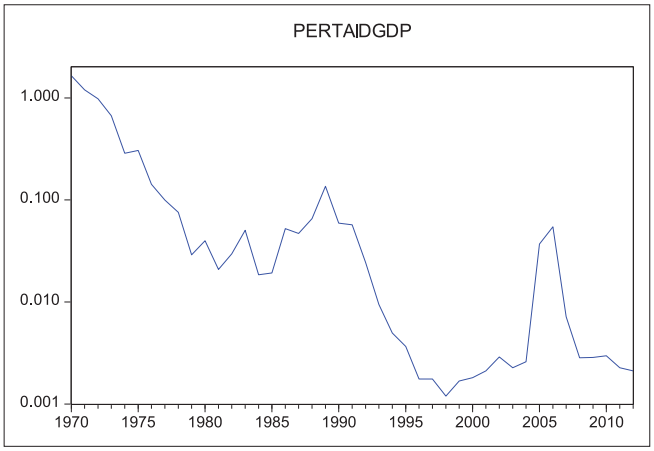


Figure 5: Total developmental aid as a percentage of gross domestic product (1970-2012)



ratios most of the researchers used financial and country level variables both (Chin, 2005; Zulkarnain and Karbhari, 2004; Zulkarnain, et al., 2001). Assumptions of MDA are that the cluster scattering (variance-covariance) matrices being equivalent for unsuccessful and successful corporations and the population ought to be dispersed in a multivariate manner. Though, it had remained that these expectations are frequently despoiled by the facts that this study used MDA method that would simply be ideal if the normality situations are encountered (Karels and Prakash, 1987). Researchers argued that MDA do not essentially deliver improved effects if the proportions that are used to proceed from the familiarity assumptions.

3. Because of the errors of MDA, a lot of researchers had used logit analysis (Tew and Enylina, 2005; Low et al., 2001; Mohmad Isa, 2004; Mohamad Isa, et al., 2005; Nur Adiana et al., 2007). Logit might be better in insolvency and monetary distress forecast studies because it not only shows grouping but also assortment which is vital for the likelihood of existence of distress (Barnes, 1987). Logit analysis provides a perspective that the impact of the consequences of using the coefficient dichotomous independent variables (or multi manifold) dependent variables that are defined. (Zavgren, 1985). Variables are organized in logit and they ought to be standard and have the skill to regulate the implication of distinct variables. Moreover, MDA have tough assumptions though logit does not have tough assumptions (Keasey and Watson, 1991). Plentiful research had been directed to classify the factors of insolvency and monetary distress. Financial ratios are calculated through the annual reports that came in fiscal year of the company and it is through balance sheet and income statement. The financial ratios that are used in this study are taken from previous studies (Mohmad Isa, 2004). A current assessment on earlier research on the forecasting of financial distress corporations displayed that lack of research on forecasting models for corporations in separate subdivisions due to the inaccessibility of figures (Aziz and Dar, 2006). Propositions have been completed to analyze the aptitude of likelihood models to forecast monetary distressed corporations in separate subdivisions in Pakistan (Chin, 2005; Zulkarnain and Karbhari, 2004).

4. METHODOLOGY AND DATA

The methodology part has been segregated into 3 subdivisions. In Section 3.1 all the independent variables of financial ratios and sector level variables that this paper is using to be used in the proceeding. Section 3.2 deals with population and data collection of this paper.

4.1. Independent Variables

Scholars have used financial ratios in the bankruptcy prediction as predictors based on the projecting capability (Ohlson, 1980; Altman, 1968; Beaver, 1966). Easiness and relevancy to the local atmosphere will be other factors to select financial ratios (Mohamed et al., 2001; Chen and Shimerda, 1981; Low et al., 2001). In this paper ratios are used because they have been useful in earlier studies to forecast financial distress. Sector level variables were used to show the relevance towards bankruptcy prediction and get desired outcomes and how sector level variables affect the sectors.

4.1.1. Profitability

It signifies a portion of profit on a business's venture and it displays the strength of a corporation. High productivity displays that corporations are lucrative and *vice versa*. Consequently, this research shows that there is a negative association among profitability as signified by financial distress.

4.1.2. Size

Large companies have a greater ability to borrow due to debt and stable cash flows to reduce the risk of bankruptcy compared to small businesses. Cost of bankruptcy is really important to determine the best prediction because these costs represent a smaller proportion of the total value of large companies and a large proportion of small businesses. Bharath and Shumway (2008) showed that in bankruptcy prediction the importance of information conditionally depends on the size of the firm.

4.1.3. Liquidity

Liquidity proportions signify the capability of a business to pay its obligation when it becomes due. High liquidity display that a business is capable to pay off its obligations when it's due. Henceforth, this research shows a negative association among liquidity and financial distress.

4.1.4. Leverage ratio

Leverage proportions signify the amount of investment of a business that is elevated by secure interest borrowings. High level of borrowings by a business is measured to be exceedingly geared while a business that is largely supported by equity is said to be lowly geared. Big companies have to create more revenue in command to recompense its responsibilities and arrears. So, this research shows a positive association among leverage ratios and financial distress.

4.1.5. Munificence

According to Beard and Dess (1984), the ability of an atmosphere to preserve a constant expansion is called munificence. These sectors/industries therefore, benefits from bigger profitability due to less competitive environment. Hereby, consistent with these advices, the impact of sector/industry is visible, as firms creates greater profits; those function in sectors/industries with high level of munificence.

4.1.6. Dynamism

Generally, the environmental dynamism describes the rate and instability of changes in a firm's external environment (Beard and Dess, 1984; Simerly and Li, 2000). It can be documented that high dynamism creates more uncertainty; therefore, it reduces the level of leverage. Consequently, the firms operating under dynamic environment may tend to use equity financing to lessen the transaction cost occurring from increased level of risk. On the other hand, firms operating under the environment with lower dynamism tend to use more debt financing. In a study across emerging markets, Kayo and Kimura (2011) found a positive but insignificant relationship between leverage and environmental dynamics.

4.1.7. HHI

The HHI is used to measure the firm size in relation to sector or industry. The level of industry concentration measures the level of leverage employed by firms. Generally, in terms of their characteristics, both types of industries greatly vary (Almazan and Molina, 2005). In simple words, low concentration industries (competitive industries) are exposed to high risk and high volatility in profitability; therefore, they use lesser amount of leverage.

4.1.8. Uniqueness

Shahjahanpour et al. (2010) enlighten uniqueness in their research that research and development and selling expenses are at the first and at the end of the production value chain. It is claimed by Titman and Wessels (1988) that firms that generate specialized or unique products experience comparatively higher costs in the incident that they liquidate. Since their suppliers and workers almost certainly have job-specific expertise and capital, it is not easy for them to change to other operations or to cash out (Hsu and Hsu, 2011).

4.2. Population and Data Collection

The paper contains non-financial firms of Pakistan which are listed on KSE. The study relies on secondary data, which will be extracted from various reliable sources (e.g., State Bank of Pakistan, KSE and Federal Bureau of Statistics). This study will focus on the non-financial firms listed on KSE. In order to bring into focus how industry/sector affects the financial behavior of Pakistani listed firms across sectors under different political periods, the study utilizes 10 years panel data from 2004 to 2013.

5. EMPIRICAL RESULTS

Logit a parametric technique is tested in this paper. MDA which have been extensively used in monetary distress forecast to get over with MDA's confines (multivariate familiarity and equivalence in dispersal matrices between groups). The results of the logit model offer the prospect of constant argument by a dichotomous dependent variable. Logit analysis model has the system of the accumulative logistic possibility purpose. Logit's results can be inferred as the provisional prospect of failure. If this value, P(Z), as an alternative of the logistic increasing purpose, is sited into the ordinary increasing prospect purpose, the model is named as probit model. Because of the non-linearity of the model, constants are frequently assessed by the extreme possibility as an alternative of the slightest squares technique (Laitinen and Kankaanpaa, 1999). Under Logit analysis, the dichotomous dependent variable is just the logarithm of the odds in a specific experience so it will just show failed and non-failed. That is, here demonstrating of the 'log odds' of belonging to a cluster is trailed, relatively to the exhibiting the cluster association itself. Though it ought to be probable to model the odds, it is easier to model the log (natural log, ln) of the odds [ln (odd) = ln(P/1-P)]. The change in the normal connection, allowing the dependent variable to be negative infinity and positive infinity becomes meaningless. In this technique, if the dependent variable is continuous then it rather becomes discrete.

In direction to present the knowledge, let us start by considering the following model:

$$\text{Logit}(\pi) = \beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3\ldots+\beta_kX_k \quad (3.1)$$

$$\ln(P/1-P) = \alpha+\beta_1X_1+\beta_2X_2+\mu \quad (3.2)$$

$$P=\frac{1}{1+e^{-(\alpha+\beta_1X_1+\beta_2X_2+\beta_nX_n)}} \quad (3.3)$$

Where:

Logit of π is the probability of firm failure.

X_1 through X_k represent any of the independent variables used to predict firm failure (financial ratios ratios and sector level variables).

Equation 3 is assessed by means of extreme possibility technique. Supposing that 1 designates monetary distress, the better the subsequent decimal is above 0.5 (which suggests an identical outcome of a business being monetarily distressed or non-financially distressed), the greater occurrence there is of the business being monetarily distressed. It ought to be indicated that the negative coefficients of proportions in the advanced logit designated that these proportions are negatively associated with the prospect of monetary distress (the diminution becomes the threat of monetary distress). Though the proportions with positive coefficients have an optimistic consequence on the prospect of financial distress (they raised the threat of financial distress).

The Cox and Snell R^2 and the Nagelkerke R^2 values for this model are 0.334 and 0.488 correspondingly. It elaborates that 33% and 48.8% of the inconsistency is clarified by ratios and sector level variables. The model appropriately classified 83% of complete cases or also identified as the proportion correctness. The classification table is shown in Table 1.

Table 2 exhibits, five variables made a statistically significant impact to the model. The five variables are size, liquidity, leverage ratio, dynamism and HHI. Wald test indicates the impact or significance of each of the forecaster or independent variables. Variables that contribute meaningfully to the models would have implication value of <0.05 (Pallant, 2007). Based on Table 2, size, liquidity, dynamism and HHI have negative B coefficient values. This means that businesses in the sectors in Pakistan with large size, more liquidity are less probable to be in monetary distress.

The independent variables that are shown significant in the sectors of Pakistan are size, liquidity, leverage ratio, dynamism and HHI. In this study, size, liquidity, dynamism and HHI have negative β. Grounded on the previous researches, no research was conducted on predicting financial distressed companies by using sector level variables. So, the results of this research cannot be associated with any other preceding research. The negative β coefficient values are also dependable with the supposition of this research which specified that there is a negative association among size, liquidity, dynamism, HHI with monetary distress. Though, the negative β coefficient for the size and liquidity is consistent with the supposition of this paper which indicated that there is a negative association among liquidity and financial distress. The results display that ratios and sector level variables can be used to forecast monetarily distressed businesses in different sectors of Pakistan (Table 3).

6. CONCLUDING REMARKS

This paper initiates that the independent variables that can be used to forecast distressed companies in the different sectors in Pakistan were size, liquidity, dynamism, HHI. Whereas the sector level variables are also important as they have shown that variables affect sector level so sector level variables can be used to forecast financially distressed companies in the different sectors in Pakistan. It displays that the forecasting models affects the sectors differently. Therefore, propositions by earlier researches to study the capability of forecasting models to forecast monetary distressed companies in different subdivisions in Pakistan are justified (Karbhari and Zulkarnain, 2004; Chin, 2005; Zulkarnain and Karbhari, 2004). Though, the results of this research cannot be linked with other earlier research as none of the preceding researchers used sector level variables with financial ratios to conduct analysis in different sectors. This paper would like to advise that forthcoming research ought to be directed on the forecast of monetary distress companies with different countries using sector level variables. Additionally, this paper advised that cash-flow ratios and macroeconomic variables must be measured as the independent variables in forecasting distressed companies in Pakistan.

Table 1: Model summary

Step	−2 Log likelihood	Cox and Snell R^2	Nagelkerke R^2
1	1220.632[a]	0.344	0.488

[a]Estimation terminated at iteration number 9 because parameter estimates changed by less than 0.001

Table 2: Classification table

Observed	Predicted		
	Default		Percentage correct
	0.000	1.000	
Step 1			
Default			
0.000	967[a]	100	90.6
1.000	160	298	65.1
Overall percentage			83.0

[a]The cut value is 0.500

Table 3: Variables in the equation

Variables	B	S.E.	Wald	df	Significant	Exp(β)
Step 1[a]						
PROF	0.354	0.573	0.383	1	0.536	1.425
SIZE	−0.224	0.041	29.794	1	0.000	0.799
LIQ	−2.294	0.220	108.808	1	0.000	0.101
Leverage ratio	46.340	5.039	84.560	1	0.000	
Munificence	0.024	0.052	0.215	1	0.643	1.024
Dynamism	−0.805	0.293	7.524	1	0.006	0.447
HHI	−0.001	0.000	41.186	1	0.000	0.999
UNIQ	2.754	2.330	1.397	1	0.237	15.703
Constant	4.058	0.826	24.144	1	0.000	57.875

[a]Variable (s) entered on step 1: PROF, SIZE, LIQ, Leverageratio, Munificence, Dynamism, HHI, UNIQ, S.E.: Standard error

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