The Relevance of Financial Ratio Analysis in Predicting Business Failures in Nigeria: A Study of Selected Companies

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Abstract: *In the world of uncertainties, risk is the ever present variable in investment decision making. Once management has a clear cut view of predicting failure and the variables that are important in financial decision making, then rules for undertaking investments can be developed. The purpose of this study is to empirically investigate the relevance of financial ratios in predicting business failures in Nigeria in the context of assessing its conformity with the literature in the area. Survey method was employed in carrying out the investigation. Neither questionnaire, nor interviews were conducted, only that Annual Financial Statements of Companies were analysed. Results were analysed with the old models. Based on the analysis, the uni-variate approach give only trends of performance of companies but not a real benchmark of a cut – off level of failure, of non – failure performance of companies. The multivariate technique performs better since it is a combination of the uni-variate ratios. The study recommends the application of multivariate discriminate analysis model, since it sheds more light on companies' wealth.*

Keywords: *Financial ratios, company failures, failure predictions, multiple discriminate analyses.*

1. Introduction

One of the most significant threats for many businesses today, despite their size and the nature of their operations, is insolvency. Extant evidence shows that in the past two decades business failures have occurred at higher rates than at any time since the early 1930's.The factors that lead businesses to failure vary. Many economists attribute this phenomenon to high interest rates, recession squeezed profits and heavy debt burdens. Furthermore, industry specific characteristics, such as government regulation and the nature of operations can contribute to a firm's financial distress. Studies of patterns of business failure in the UK, US, Canada and Australia (e.g. Star, 1990) found that small, private and newly-founded companies with ineffective control procedures and poor cash flow planning are more vulnerable to financial distress than large well established public firms.

The economic cost of business failures is relatively large. Evidence shows that the market value of the distressed firms declines substantially (Warner, 1977). Hence, the suppliers of capital; investors and creditors, as well as management and employees are severely affected by business failures. The auditors will also face the threat of a potential lawsuit if they fail to provide early warning signals about failing firms through the issuance of qualified audit opinions (Boritz, 1991; Jones, 1987; Zavgren, 1983). There are several approaches used in failure and bankruptcy prediction studies over the past forty years since Beaver's 1966 study changed the way analysis are conducted in the field of evaluating and forecasting potential company failures and bankruptcies. One of the approaches is to search for the best predictors that lead to minimum misclassifications errors while the other approach has been to select the statistical method that would lead to improved correct classification accuracy. The continuing interests in failure prediction models are understandable as company collapse does have unpleasant consequences for not only its shareholders but also their employees, creditors, government, the economy of the locality where that company operates and the overall country's economy at large.

Considering the fact that most research studies on company bankruptcy and failure predictions are done in developed countries such as those carried out by Beaver (1966), Altman (1968), Ohlson (1990) in the United States, Taffler (1983), Wood & Piesse (1987), Inman (1991) in the United Kingdom and Ganelasingam & Kumar, (2001) and Cybinski (2001) in Australia. These are countries that have longer commercial histories with more enforcement and more stringent legal and accounting rules and regulations. Generally, financial distress precedes business failure and demise. Therefore, assessing the financial trends and financial information of a business on a periodic basis, gives the analyst, valuable insights about the performance and status of the business and companies under review. An early warning

system model that can anticipate distress and can give indications of financial troubles ahead would doubtless be useful in minimizing or outright avoidance of exposure to possible substantial losses for their own companies and shareholders or their clients. Having a more reliable and accurate model suitable for the Nigerian setting will make the study differ from other studies and would benefit many interested parties. The problems highlighted above give rise to the following research questions: i) Can financial ratio techniques be the only tool for predicting company failure? ii) Do financial ratios of failed companies differ significantly from those of non-failed companies? iii) Can it be demonstrated that a multivariate model of business failure is better than a univariate approach? iv) Are all the models considered validly applicable for the prediction of company failure?

The objective of the study therefore, is to discover the best method that can be employed in detecting the failure of companies before it actually occurs - to ensure the best method of assessing the going concern concepts of Nigerian companies based on test carried out with annual reports of companies based in Nigeria instead of using results of studies carried out somewhere outside Nigeria. The study will help provide credit officers in their professional career by adopting the corporate evaluation models contained in the study and will also form foundation for further research in the area.

2. Literature Review

Financial ratio analysis involves comparing the relationships between figures in the financial statements in relative terms. Key individual financial ratios appear frequently in company annual reports, auditors' reports and internal management reports. Green (1978) stated that financial ratios have long been regarded as barometers of corporate health, being used for reporting liquidity, leverage, activity and profitability and that an investor may use financial ratios to appraise a company's performance and its future prospect of success. Gibson (1982) states that financial ratios when used and interpreted properly can be effective in assessing the liquidity, profitability and debt position of a company. Chen & Shimerda (1981) found that financial ratios have played an important part in evaluating the financial conditions of an entity and that over the years empirical studies have repeatedly and consistently demonstrated the usefulness of financial ratios. Gardiner (1995) concluded that ratio analysis continues to represent one of the financial world's most powerful and versatile tools.

The earliest studies on company failures and company bankruptcies were univariate in nature. The most well-known univariate model is probably the 1966 study by Beaver, which from then on, had started many other company failure prediction analyses using other statistical techniques such as the multiple discriminant analysis by Altman (1968), Mutchler (1985) and Koh & Killough (1990), logistic regression method by Ohlson (1980) and Zavgren & Friedman (1998), artificially Intelligent Systems (such as artificial neural networks or ANNs) by Balcaen and Ooghe (2006), Hekanaho, Back, Sere & Laitinen (1998) and Pramodh & Ravi (2007). Some other models that have been studied and used in the past include Balance Sheet Decomposition Model developed by Lev (1973), gambler's ruin model by Wilcox (1971), cash management models, emphasizing the importance of cash, by Mills & Yamamura (1998) and Gentry, Newbold & Whitford (1990), a Survival Analysis model by Gepp & Kumar (2008) and the Case-based reasoning model by Li & Sun (2010).

Though all previous researches seem to give reasonable degree of predictive accuracy with regards to differentiation between failed and non-failed firms, most recent example is Zeytınoglu & Akarım (2013) that developed a model which differentiates financially successful and unsuccessful firms in ISE by employing discriminate analysis. They used Altman Z score to differentiate successful and unsuccessful firms. They concluded that capital adequacy and networking capital/ total assets ratios seemed to be significant in all three periods. They determined classification success as 88.7% 90.4% and 92.2% in 2009, 2010 and 2011 years respectively. These high accuracy ratios indicate that the developed models for three years are efficient to determine the financial failure of the firms traded in ISE.
All these had not come to the conclusions on which factors are the most important and none can claim to have developed the best model with the ideal variables that can predict a company's future health with certainty. While these models claim success they may not be universally so, it thus becomes pertinent to ask if there is really a ratio, or combination of ratios, that can be used effectively to predict corporate failure or bankruptcy successfully.

2.1 Univariate Estimation

The most well-known univariate model is probably the 1966 study by Beaver, which from then on, had opened the way for many other company failure prediction analyses using other statistical techniques. William H. Beaver's 'Financial Ratios as Predicators of Failure', which was published in 1966, is regarded as one of the classic studies in the field of business failure Measurement. Ratio analysis began – as early as 1923 – with the development of a single ratio, the current ratio, for a single purpose: the evolution of credit-worthiness. The current ratio (the quotient of current assets and current liabilities) indicates the ability of a company to fulfill its short-term (within-one-year) obligations. Beaver's article is a formal, empirical verification of the usefulness of ratios as a predicator of failure.

Beaver selected a group of 79 failed companies that were a heterogeneous group in terms of asset size and industry type. The selection of non-failed firms was paired with the failed firms. That is, same asset-size and industry type was selected. The paired-sample design was used to prevent differences in asset-size and industry to blur the outcome. The dichotomous classification test predicts the failure status of a firm based solely upon the financial ratios. The ratio of each company, failed and non-failed, is arrayed (put in ascending order) and an optimal cutting off point is established above or below which the miscalculations of failed or non-failed are the least. The test clearly illustrates the percentage miscalculations per ratio, per year prior to failure. A limitation of this test is that it treats the prediction dichotomous while a ratio that vary far away from the cut-off point may be given more confidence to the prediction than the one that is close. The additional information from the ratio is not revealed in this test. Also, as noted by Blum (1974), there is not necessarily a unique cut-off point. More than one (>1) may be optimal and most probably will be giving different results. Different cut-off points in different years prior to failure therefore produce inconsistent predictions. The probability study of failure indication by ratios is essentially a Bayesian approach. It assesses the probability of failure conditional upon the value of a ratio. Beavers' approach misclassified only 13% of the sample firms 1 year before bankruptcy and 22% of the sample firms 5 years before bankruptcy.

2.2 Multivariate Discriminant Analysis

Altman's 1968 article – in terms of purpose – is similar to that of Beaver (1966). Altman however, improves Beaver's univariate study by introducing the multivariate approach which allows for simultaneous consideration of several variables in the prediction of failure. Altman claims that univariate ratio analysis is susceptible to faulty interpretation. Altman was the first to apply a multiple discriminant statistical methodology known as linear discriminant analysis (LDA) to develop a business failure prediction model. The methodology attempts to derive a linear relation from ratios that best discriminates between 2 groups (failed and non-failed).

Altman selects 2 groups of 33 companies. Of these, 1 group has gone bankrupt and 1 group is still in business. In terms of asset-size and industry the groups are not homogenous. Altman also chose a paired sample as far as asset-size, industry type, and period of reporting are concerned. Initially a list of 22 potentially helpful ratios is compiled based on popularity and relevance. Finally, 5 are selected as doing the best job predicting corporate failure. The choice of ratios was based on evaluation of inter-correlation and best result of numerous computations: working capital to total assets, retained earnings to total assets, EBET to total assets, market value of equity to book value of total debt and sales to total assets. The complete discriminate function with these ratios incorporated leads to Altman's Z-score model which – with 2 more ratios added – is called the ZETA model. It appears the models have proven to be of value since both models today are still widely used by analysts throughout the world. Altman takes great care to make sure the methodology he uses is appropriate and that the model he has constructed contains the right ratios. To do so he tests relative contribution to the total discriminating power of the function of the variables he has chosen and the overall discriminating power of the model by means of an f-test. He tests the predictive accuracy of his model by testing the whole range of predictions up to 5 years prior to failure. The predictive ability of his function on the 66-firm sample 1 year before failure is 79%. Altman concluded with several suggestions where and how to apply his model and that he recognizes at least one limitation being that his study examines publicly held manufacturing companies only for which comprehensive data were available, including market price quotations.

2.3 Business Failure

Attempts have been made to look closely at the reasons why businesses failed apart from the quantitative reasons. Argenti (1977) cited in Bello (2004) classified failure scans into two categories; those that essentially contain a list of signs and symptoms that failing businesses or companies are said to exhibit and those that can be detected by using financial data calculations. He points out that failure do not just happen but follow a process. The sequence of failure could be explained as follows: in phase one, management defects include executive skills not being well spread and directors who do not participate actively; system defects include ineffective budgetary control, inaccurate costing systems and poor cash flow planning, while change defects include poor response to change and the company being significantly out of date. Phase two list three mistakes which can be very significant, namely overtrading the import projects and high gearing. Overtrading occurs when a company expands faster than capital base. As turnover increases working capital requirements increase due to poor financial management, the company's cash or equity does not increase at the same rate, eventually it falls to make the interest payments. The second fatal error is to allow bank borrowing to the maximum possible level which have no room for manoeuvres should a stroke of bad luck occur having the company unable to obtain any further loan. In phase three, the signs and the symptoms become obvious that the economy is in grave difficulty. The signs are indicated through ratios, which together with non financial signs may result in creative accounting. Phase four refers to the terminal signs such as remarks and resignations.

Argenti (1977, 1986) and Alugbuo (1981) cited in Bello (2004) assert that there are other factors that make business to succeed or fail. They are the kind of people in the employment of that business, the kind of attitudes the employers have towards their work. They listed some reasons for business failure as: Lack of funds or sufficient capital; Inadequate executive capacity; General economic conditions such as inflation, recession, adverse government monetary and fiscal policies; and; Dishonesty on the part of employees.

3. Methodology

A sample of fifteen (15) companies was taken altogether for this study. Ten (10) companies are quoted by NSE and five (5) are not quoted, as stated earlier the research covers a period from 2000 to 2009; at that time (2000) there were a total of one hundred and twenty six companies quoted in the NSE excluding the banks and insurance companies. The sample represents about eight percent (8%) of the population which seems quite reasonable judging from the time coverage of ten (10) years. The other five (5) companies were taken from the unquoted and were used to test the applicability of the models in such companies for that reason only a period of five (5) years are used for unquoted companies. More samples would have been taken knowing that we have more unquoted companies than the quoted companies only that the information about them are difficult to come by. The choice of sample taken is based on random selection of companies listed and non – listed on the Nigeria stock exchange (NSE). Thus any conclusion will have wide ranging implication. This implies that the combination of the selection gives room for proper evaluation and obtaining of information relating to the companies. Recognising that these companies are not completely homogeneous due to industry, size differences careful selection of companies was attempted. It is almost impossible to carry out a detailed study of all the companies quoted and unquoted in the stock exchange.

Thus, a sample of companies annual report was taken to reduce sampling error before making decisions about data, stratified non – random sampling technique was applied to the study and combining with non-listed companies, and selecting from such growing according to performance. The purpose of this is to ensure that each sub – group or classification of company is adequately represented with the exception of the banking and insurance industry which are excluded intentionally due to the fact that their financial statements differ significantly from those of other business concern not only in pattern but also in contents. Although it remains true that the larger the sample, the smaller the sample error, efforts were made to take true representatives of the population. This had ensured that the following were present:

i. The period covered is long enough to give a valid conclusion i.e. ten and five years. This is done in order to minimise the separate effect of the different period of economy of the country.
ii. The stratified sample method was adopted to enable the sample cut across different strata in the population.

3.1. Methods and Sources of Data Collection

Financial data used in the studies was taken from each company's annual financial report, NSE and Non NSE, for a consecutive period of ten and five years from 2000 to 2009 for quoted companies and 2005 to 2009 for unquoted companies. Five years in the case of unquoted companies were taken because of unavailability of data from the companies. No attempt was made to merge non – failing companies with failing companies by sector, asset size or other criteria. Industry matching has been used in other studies (e.g. Glum 1974) but was rejected for this study on the grounds that industry factors could compound results.

3.2. Methods of Data Analysis

In order to ascertain the accuracy of the model in distinguishing failing from non – failing companies, the discriminant analysis was used in the testing and computing of an index and cut off point on the index. This index is derived from the financial model for computing the values of each of the variables for each company studied. When variables for one company are taking and added together, their sum is the company's index score. A company with index score above the benchmark as established by the model is predicted to success and a company with a score below is predicted to have failed. Thus, in considering the results of the ability to predict failure models, the method of classification used in this research is somewhat different; it presents the result of applying the model to all firms on a given data file in specific year, rather than just to companies found to have failed or to have received qualified opinions on failure. The two models used to classify all companies are based on the models classification. The models used in this research are: - The Altman's and Taffler's Z – score models as illustrated in the literature review. The prediction model for this research is based on the original Altman's and Taffler's models as stated earlier in the chapter. Therefore, the classification range used in Altman (1965) and Taffler and Tisshaw (1977) were the benchmark.

4. Results and Discussion

4.1 Major Findings

The results obtained from Table 4.1 using Altman's Model shows flour mills, Beecham were very viable during the study period. This is reflected by the high Z – score results of these companies. All the companies in the service (construction groups) have z – scores of 1.8 or less at one time or the other during the period of study. One (1) company has z – score of negative value. It means that this company shows signs that it should have collapsed by the late nineties. Table 4.2 shows two (2) of the five (5) unquoted companies having z – scores of 1.8 and below at one time or the other during the period of the study, one company has failed already. The z – scores shows that the viable companies have stronger z – value than the less viable or failing companies. The performance of the Altman's model in both quoted and unquoted companies have similar effects. They both have negative criteria and diminishing values of Z's. The values of the z – score are the clear indication of the companies' performance.

Table 4.1: Z – Score Performance of Selected Quoted Companies Using Altman's Model

S/no	Coy/yr	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10
Manufacturing											
1	Seven-Up	1.1	1.5	1.8	2.5	3.2	3.2	3.9	3.4	2.7	3.5
2	Pfizer	2.6	2.3	2.0	2.3	2.5	1.8	1.7	1.9	2.0	2.2
3	L/Stock	3.5	3.3	2.6	2.7	3.0	3.0	2.8	2.5	1.9	0.1
4	Dunlop	1.7	1.0	2.0	4.6	6.2	9.9	2.4	3.2	2.1	1.7
5	Flourmills	7.7	6.9	6.5	6.2	6.4	4.0	3.6	4.1	9.4	9.8
6	Beecham	3.7	2.9	2.7	2.3	2.2	2.1	2.7	2.6	2.1	2.3
Service/Construction											
7	J/Berger	0.8	0.9	0.7	0.6	1.0	0.8	1.1	1.1	1.0	1.3
8	Road Nig.	1.5	1.4	1.6	1.3	1.0	1.0	1.3	1.7	1.4	1.8
Commercial Conglomerates											
9	R. T. Briscoe	3.0	2.6	2.0	0.1	1.3	2.7	2.4	3.4	3.0	2.9
10	J/Holts	3.4	3.8	5.1	8.0	13.4	4.3	9.7	6.3	3.2	2.9

Source: *Researcher's Computations*

Table 4.2: Z – Score of Unquoted Companies using Altman's Model

Coy	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
1	2.77	2.20	2.24	2.20	2.25
2	0.16	0.35	0.12	0.10	0.42
3	1.80	1.66	1.89	1.83	1.86
4	1.17	0.89	1.33	1.35	1.32
5	4.96	4.47	3.61	2.41	1.52

Source: *Researcher's Computations*

Table 4.3: Z – Score Performance of Selected Quoted Companies using Tafler's Model

S/no	Coy/yr	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10
Manufacturing											
1	Seven – Up	0.3	0.6	0.4	0.3	0.3	1.0	1.0	1.2	1.2	1.2
2	Pfizer	1.2	1.2	1.2	1.3	1.7	1.8	1.8	1.5	1.3	1.4
3	L/S/Feeds	1.3	1.4	1.3	1.4	1.4	1.6	1.8	1.9	1.6	1.4
4	Dunlop	0.2	0.3	0.3	0.6	0.3	0.4	1.2	1.0	0.8	0.7
5	F/Mills	0.6	0.7	1.1	1.0	1.0	1.0	0.9	0.2	0.4	9.0
6	Beecham	1.2	1.5	1.3	1.2	1.5	1.5	1.1	1.3	1.2	1.1
Service/Construction											
7	J/Berger	0.4	0.5	0.3	0.2	0.4	0.2	0.5	0.3	0.4	0.5
8	Road Nig.	0.3	0.3	0.2	0.2	0.2	0.3	0.2	0.2	0.3	0.3
Commercial Conglomerates											
9	R. T. Briscoe	0.6	0.7	0.4	0.3	0.3	0.5	0.5	0.5	0.9	1.0
10	J/Holt	0.7	0.8	0.6	1.0	1.1	1.3	1.5	1.6	1.7	1.8

Source: *Researcher's Computations*

The result of the Z – score obtained using Taffler's Model from Table 4.3 shows that the scores have a very low range i.e. from 0.0 to 1.9. The result shows that the companies that have Z – scores of less than 0.2 were really in danger. Taking a close look at the companies quoted with the NSE no company was having a Z score less than the 0.2 all scores were above 0.2 this shows that the companies were viable during the period under review. The result of the five (5) unquoted companies' from table 4.4 below shows that the companies have Z – scores of 0.2 and above. There is no negative score. The scores depicted easily the performance of these companies. The second company in the list has been liquidated already and the Z score shows that there was enough warning. The score in 1995 was 0.2 in 1996 it dropped to 0.16 and it continued to decline and was finally liquidated in 1999. From the discussion so far it can be deduced that the Taffler's approach performs in failure eradication than univariate (single) ratio approach as has been clearly demonstrated.

Table 4.4: Z – Score of Unquoted Companies using Tafler's Model

Coy	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
1	0.76	0.64	0.26	0.21	0.30
2	0.20	0.16	0.13	0.02	0.02
3	2.43	1.43	0.90	0.51	0.37
4	1.05	0.40	0.24	0.28	0.34
5	0.50	0.56	0.04	0.30	0.99

Source: *Researcher's Computations*

4.2 Discussion

In this research, Altman identified the ratios which indicate future success or potential failure but also by a number of statistical tests, computed weightings to give a straight forward formula which according to him any user can readily identify potential winner or more to the point in current climate, the potential fatalities. Since Altman in his work claimed a high level of predicting success within one year, two years at the absolute most, the success ranges between 72 percent and 95 percent. This is a very high probability which follows the fact that when applied to the data of selected companies the result will be a clear classification of failed or non – failed companies. The result from the sample of fifteen (15) companies

brings to question whether any one model is better than the other, if the Altman's model classified the company's success as indicated in the original study model then it is valid for Nigerian companies. The benchmark for success is between 1.8 and 2.99 as explained earlier.

There is no room for negative values because any company with a Z –score of 1.8 is deemed to have failed then the question is what happens to the companies with negative Z –score and are still viable. This implies that the original Altman's model parameters are not sensitive to Nigerian companies. It is important to note that the high rate of success reported of the model is not applicable to companies here in Nigeria. Recognizing the limitations of the Altman's Z – score particularly in its translation this research tried the model developed by Taffler. From the analysis above the model interprets a score in excess of 0.2 and certainly 0.3 as characteristic of a company with good long survival prospect, while below 0.2 and certainly below 0.0 the company exhibits characteristics of companies which have failed. The analysis above shows companies which have not experienced failure and are viable. Since there is a minimal misclassification it can be said that the Z- scores of Taffler is more reliable for classifying results of Nigerian companies. The Taffler model, from the results of the above analysis, shows a better predicting ability than the Z – scores of Altman considering this rate of misclassification; one can justly reject the Altman's model of failure prediction using Nigerian companies. From the performance of Taffler's model it could be seen that there is a better performance.

5. Conclusion and Recommendation

5.1 Conclusion

The Taffler model serves as a useful tool for predicting failure in a resource strapped developing economy, not only is it robust enough to accommodate different sized and sector firms it is also simple to apply. The finding of the study is consistent with the results of Zeytınoglu & Akarım (2013) that the model is efficient in determining the financial failure of the firms traded in Istanbul Stock Exchange. What is needed is to identify characteristic that clearly discriminate failure and success, and develop it further. Findings of the study should be taken with caution, considering the sampling approach used by the study, where only companies from the stratified areas with availability of annual reports were chosen. Since this study made use of mostly annual reports of companies, it is in fact one of the shortcomings of the study. This is because of the problem of using past accounting statements in deriving relevant ratios particularly in relation to the manipulations associated with accounting reporting methods. Also most financial statements are polished to satisfy specific purposes. From the forgoing limitations the results obtained suggest further research to be carried out in the following areas. Replication of the study using financial statement of banks and other financial institutions that were earlier isolated. There should be adjustments on the cut – off marks to enable the researcher construct a model that will have very short range of cut – off marks or benchmarks which will easily be interpreted. Whether the answers lay in the multiple discriminate analysis such as the Z – score or a pattern of one or more different ratios based on agreed definition remains to be seen.

5.2 Recommendation

Based on the above findings therefore, it is recommended that application of multivariate discriminate analysis (MDA) model of failure prediction developed by Taffler within the set range be used in the Nigerian context. This model has the following advantages: First, as regards the risk indicators, ambiguity as to the relative performance of relative firms is removed. The range of classification being certain a firm is either classified as failed or non – failed; Secondly, the model indicates superiority over other models tested; thirdly, it considers the entire profile of characteristics common to the events of firms.

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