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THE BEST PREDICTORS OF INDUSTRIAL SICKNESS – ACCRUAL RATIOS OR CASH FLOW RATIOS?

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Abstract
Indian industry has been witnessing tremendous progress in the recent decades thanks to the industrial reform initiatives of the central and state governments. Despite the rapid growth, certain firms have been suffering from sickness due to various factors. Indeed, corporate sickness has been observed as a global phenomenon. A warning system signaling the incipient sickness is the need of the hour as industrial sickness results in heavy cost to the society and the government. Earlier research studies have proved that certain financial ratios well predict corporate sickness. Some of the researchers have developed corporate bankruptcy prediction models with and without cash flow ratios to determine the predictive ability of cash flows over accrual ratios. These studies have shown contradicting results in different countries during different time periods. The present study attempts to find out if accrual or cash flow ratios best predicts industrial sickness in India.

INTRODUCTION

A company's health can easily be evaluated from all possible dimensions using financial ratios. Several researchers have found accrual ratios well predicting corporate sickness. Patrick (1932) was pioneer in forecasting corporate failure, showing that net worth to debt and net profits to net worth were the predictors of sickness among the ratios he used. Beaver (1966) found that cash flow to total debt ratio revealed statistically significant forewarnings prior to corporate failure. Gupta (1983) found that net worth to short and long term debt and outside liabilities to tangible assets ratios were able to predict corporate failure. Weibel (1973) established that inventory turnover and debt to asset ratios along with six other ratios including liquidity measures were capable of discriminating sick from non-sick group of companies.

STATEMENT OF THE PROBLEM

Since Beaver (1966), many researchers have used traditional financial ratios namely accrual ratios (Gupta, 1983; Sharma and Rao, 1976; Libby, 1975; Altman, 1968; Tamari, 1966) and certain studies found cash flow ratios (Beaver, 1966; Deakin, 1972; Blum, 1974; Norton and Smith,1979; Largay and Stickney, 1980; Aziz and Lawson, 1989; Gilbert, Menon and Schwartz, 1990; Taffler, 1984) useful to predict corporate failures whereas few studies (Gombala, Haskins, Ketz and Williams, 1987; Viscione, 1985) identified cash flow ratios as insignificant predictors of failure.

Some researchers have developed bankruptcy prediction models with and without cash flow ratios (Ahmad, Azhar and Wan-Abu-Bakar, 2010; Aziz, A., D. Emanuel and G. Lawson, 1988) to determine the predictive ability of cash flows over accrual ratios. These studies have shown contradicting results in determining superior prediction models.

The present studies are an attempt to determine the predictive abilities of accrual and cash flow ratios in Indian context.

LITERATURE REVIEW

Rujoub, Cook and Hay (1995) used a sample of 33 failed firms and 33 non-failed firms, matched on the basis of industry type and asset size and employed eighteen financial ratios based on cash flow data including financial policies ratio which is equal to cash from financing activities/Total assets. On employing a stepwise discriminant

procedure for selecting the financial ratios that are most useful in discriminating between bankrupt and non-bankrupt firms, it was found that cash flow data predict bankruptcy better than accrual accounting data. Aziz and Lawson (1989) compared cash models with Altman's Z and Zeta models, and a mixed model comprising cash and accrual variables. Using 49 bankrupt firms matched with 49 non-bankrupt firms up to five years prior to failure, it was found that the cash flow model was more accurate in predicting bankruptcies and operating cash flow and lender cash flow were found to be the two most significant cash variables.

Gombola et al (1987) computed 21 accrual ratios and three cash flow ratios namely cash flow from operations/sales, cash flow from operations/assets and cash flow from operations/debt for 77 failed and matched non-failed firms and found that none of these cash flow ratios were significant predictors of failure. Viscione (1985) carried out trend analysis of 24 bankrupt firms up to five years prior to failure and compared cash flow from operations with selected accrual ratios. He found out that cash flow from operations was not a strong indicator of financial distress. Casey and Bartczak (1985) used 60 bankrupt and 230 non-bankrupt firms belonging to the same industry during the period 1971-82 and revealed that operating cash flow data do not provide incremental predictive power over accrual based ratios. Gentry, Newbold, and Whitford (1985) showed that found that addition of cash-based funds flow components to the traditional financial ratios to discriminate between failed and non-failed companies resulted in significantly improved predictive performance. Largay and Stickney (1980) conducted comparison and trend analysis of cash flow from operations and other accrual variables including stock price for single case study of W.T.Grant Company. He found out that cash flow from operations more accurately indicate impending failure up to 10 years prior to WT Grant's demise.
Thus it is evident that earlier studies have shown contradicting results as to the superiority of accrual ratios over cash flow ratios in predicting corporate sickness.

OBJECTIVE OF THE STUDY

The main objective of the present study is to find out which category of financial ratios – accrual ratios or cash flow ratios – are the best predictors of industrial sickness.

RESEARCH METHODOLOGY

Secondary data set containing a sample of 30 sick companies from the website of BIFR *www.bifr.nic.in.* and a matching sample of 30 non-sick companies based on market capitalization belonging to the same industry type in the fiscal year of comparison have been established for the purpose of the study. The financial data pertaining to both sick and non-sick companies for 5 years period from 2007-2008 to 2011-2012 has been obtained from PROWESS data base maintained by Center for Monitoring Indian Economy (CMIE). In the present study, Multi Discriminant Analysis (MDA) has been employed to independent variables including 21 accrual ratios classified under four groups namely Leverage and Net worth, Profitability, Turnover and Liquidity and 12 cash flow ratios totaling 33 as shown in Table 1.

Table 1: Accrual and Cash flow Ratios

Sl. No.	Ratios	Abbreviation	Formula
(i) Net worth Ratios & Leverage Ratios			
1.	Proprietary Ratio	PR	Shareholder's Equity /Total Assets
2.	Debt-Equity ratio	DE	Total Liabilities / Shareholders' Equity
3.	Total Liabilities to Net Worth	TL/NW	Total Liabilities / Net Worth
4.	Current Liabilities to Net Worth	CL/NW	Current Liabilities/Net Worth
5.	Fixed Assets to Net Worth	FA/NW	Fixed Assets/Net Worth
(ii) Profitability Ratios			
6.	Return on Assets	ROA	Net Income / Total assets
7.	Return on Equity	ROE	Net Income / Equity

8.	Gross Profit Margin	GPM	Gross Profit / Total Revenue
9.	Net Profit Margin	NPM	Net Income / Sales
10.	EBIT to Current Liabilities	EBIT/CL	Earnings Before Interest and Tax / Current Liabilities
11.	Operating Profit Margin	OPM	EBIT / Total Revenue
(iii) Turnover Ratios			
12.	Working Capital Turnover	WCTRN	Sales/Average working Capital
13.	Inventory Turnover	INVTRN	Net Sales / Average Inventory
14.	Debtors Turnover	DBRTRN	Net Sales/ Average Debtors
15.	Average Collection Period	ACP	365/Debtor Turnover ratio
16.	Fixed Assets Turnover	FATRN	Net Sales/Fixed Assets
(iv) Liquidity Ratios			
17.	Current Ratio	CR	Current Assets/Current Liabilities
18.	Quick Ratio	QR	Quick Assets/ Current Liabilities
19.	Cash Ratio	CAR	Cash & Bank Balance/Current Liabilities
20.	Inventory to Net Working Capital	INV/NWC	Inventory/Net Working Capital
21.	Times Interest Earned Ratio	TIER	EBIT/Interest
Cash Flow Ratios			
22.	Operating Cash flow Ratio	OCR	Cash Flow from Operations / Current Liabilities
23.	Cash Total Debt Coverage ratio	CTDC	Cash flow from Operations/ Total Liabilities
24.	Cash Flow to Net Worth	CF/NW	Cash Flow / Net Worth
25.	Operating Cash flow to Total Debt	OCF/TD	Operating Cash Flow / Total Debt
26.	Cash flow from Investing activities/ (Cash flow from Operating activities + Cash flow from Financing activities)	CFI / (CFO+CFF)	Cash flow from Investing activities/ (Cash flow from Operating activities + Cash flow from Financing activities)
27.	Cash Flow Margin	CFM	Cash Flow from Operations / Net Sales
28.	Cash Flow Yield	CFY	Operating Cash Flow/Net Profits
29.	Financing Policies Ratio	FPR	Cash from financing activities/ Total Assets
30.	Debt Coverage	DC	Total Debt / Cash Flow from Operations
31.	Net Income / Cash Flows	NI/CF	Net Income /Cash Flows
32.	Cash Flow to Interest	CF / I	Cash Flow / Interest
33.	Cash Flow to Net Working Capital	CF / NWC	Cash Flow / Net Working Capital

DATA ANALYSIS

Using MDA, prediction models using different categories of financial ratios namely accrual ratios based model ($MDA_{Accrual}$), cash flow ratios based model ($MDA_{Cashflow}$) and a combination of these two called mixed model (MDA_{Mixed}) have been developed and evaluated.

(i) Accrual ratios based model ($MDA_{Accrual}$)

The accrual based model involves construction of discriminant functions for sick and non-sick group by applying MDA to accrual ratios of sick and non-sick companies using isolated data set as shown below:

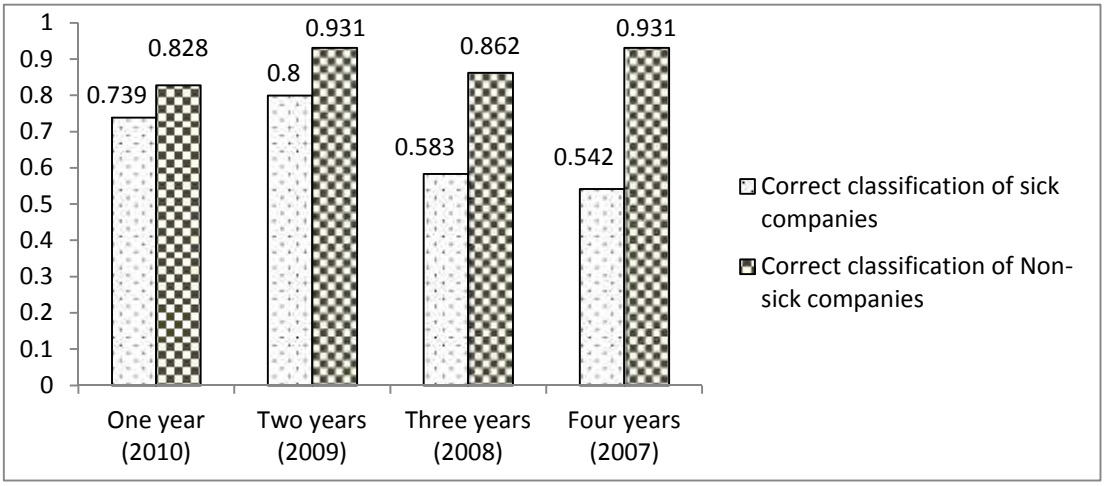
Table 2: $MDA_{Accrual}$ Model

Year	Sick Group
2010	-1.789-0.258ROA-0.150GPM-0.075NPM-0.382EBIT/CL+ 22.764OPM+1.922CAR-0.063TIER
2009	-1.5062-0.8342ROA-0.0480GPM-0.0080NPM+0.7015EBIT/CL-2.1365OPM+1.8911CAR-0.0153 TIER
2008	-1.1296-0.0202ROA-0.0281GPM-0.0123NPM+1.3347EBIT/CL-1.4047OPM+0.8339CAR-0.0266TIER
2007	-1.1726+0.0751ROA-0.0742GPM-0.0063NPM-0.8183EBIT/CL+ 9.1273OPM+1.2366CAR-0.0151TIER

Table 2 shows that OPM ratio has a high positive impact on correct classification of the companies into sick and non-sick group in the years 2010 and 2007 whereas CAR has a positive effect in all the years. TIER has a trivial negative effect in all the years in predicting sickness of the firm.

Using these prediction models pertaining to years 2010 to 2007, prediction accuracy in respective years has been determined.

Chart 1: Results of $MDA_{Accrual}$ Model - Prediction Accuracy



It is evident from Chart 1 that the sick companies have been correctly classified to a maximum of 80% in 2nd year, followed by 73.9% in 1st year prior to the year of sickness. The classification accuracy of non-sick companies is high at 93.1% in 2nd and 4th year prior to sickness.

(ii) Cash flow ratios based model ($MDA_{Cashflow}$)

By applying MDA to the set of cash flow ratios indicated in Table 1 pertaining to sick and non-sick companies for all the years under study prior to the year of sickness, four sets of discriminant functions have been generated as below:

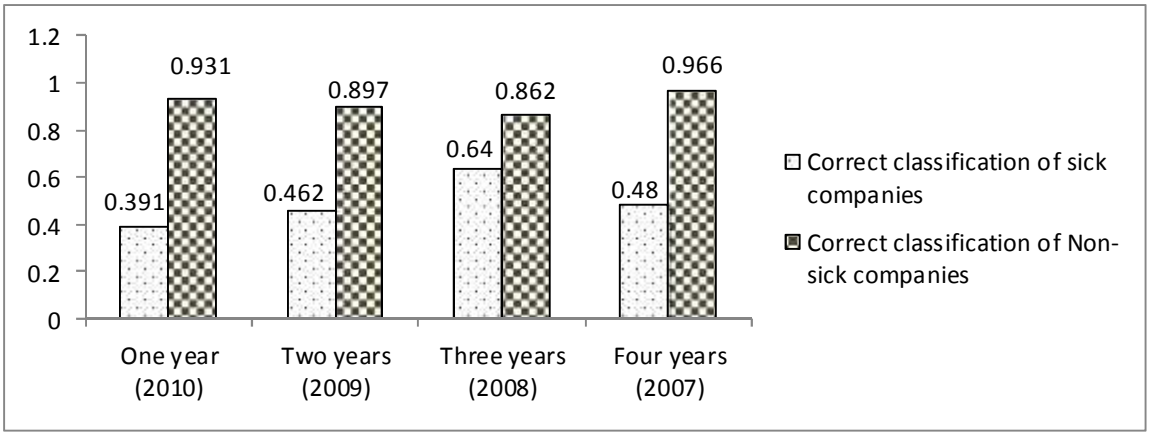
Table 3: $MDA_{Cashflow}$ Model

Year	Sick Group
2010	-0.17337+0.25628CTDC+ 0.07178 CF/NW+0.02989OCF/TD-0.83356 CFM+0.00051DC-0.00899CF/I-0.05760CF/NWC
2009	-0.3352+1.8958CTDC-0.3966CF/NW-0.4374 OCF/TD-1.9961CFM-0.0027 DC+0.0473CF/I +0.1866CF /NWC
2008	-0.21580-0.07867CTDC-0.17880 CF/NW+ 0.20152OCF/TD +0.33428 CFM+0.00210DC-0.10192CF/I+ 0.20062CF/NWC
2007	-0.23221+0.31095CTDC+0.49594 CF/NW-0.03252OCF/TD-0.45079CFM+ 0.00048DC+0.01572CF/I-0.21103 CF/NWC

Table 3 shows that cash flow from operations to total liabilities (CTDC) has the highest positive impact in correctly classifying the sick companies in the years 2010, 2009 and 2007, whereas cash flow from operations to net sales (CFM) has a considerable negative influence in the 1st,2nd and 4th years prior to sickness. CFM in 2008 and cash flow to net worth (CF/NW) in 2007 have positively influenced the correct classification of sick companies while cash flow to interest (CF/I) in 2008 and CFM in 2007 have a great negative impact on it.

The prediction accuracy in the previous years to the year of sickness has been presented in Chart 2.

Chart 2: Results of $MDA_{Cashflow}$ Model - Prediction Accuracy



It is evident from Chart 2 that sick companies have been correctly classified high at 64% in 3rd year and low at 39.1% in 1st year prior to sickness. The correct classification of non-sick companies is high at 96.6% in 4th year followed by 93.1% in 1st year.

(ii) Mixed Model (MDA_{Mixed})

The mixed model consists of a pair of discriminant functions for each of the prior years to sickness when MDA is applied to both accrual and cash flow ratios together to determine the combined effect of these ratios on sickness prediction accuracy.

Table 4: MDA_{Mixed} Model

Year	Sick Group
2010	-3.409-0.102CL/NW+ 0.058FA/NW-1.520ROA-1.839ROE-0.026NPM- 0.387EBIT/CL +0.271 FATRN+ 0.007NI/CF+0.031CR +0.937CTDC-1.152CFM-0.156CF/I+0.110CF/NWC +20.675OPM +0.032ACP
2009	-3.0651-0.3174CL/NW+0.2063 FA/NW-0.9176ROA-0.5170ROE-0.0553NPM+ 0.9576EBIT/CL +0.3119FATRN-0.1138NI/CF + 1.8590CR-1.3654CTDC+ 5.2637 CFM-0.1204CF/I+ 0.1077CF/ NWC-3.3803OPM +0.0104TIER

2008	-4.1106+0.1843CL/NW-0.1853 FA/NW-4.0552ROA-0.9309ROE-0.0154NPM+ 3.1407EBIT/CL +0.4554 FATRN+0.0491NI/CF+ 0.1983CR+3.5560CTDC+0.2936CFM-0.0521CF/I+0.2634 CF/NWC-8.4860OPM +0.0472 ACP
2007	-2.820+0.277CL/NW-0.286FA/NW-3.963ROA-1.372ROE+ 0.010NPM+4.062EBIT/CL +0.390FATRN +0.014NI/CF+ 0.131CR +9.648CTDC+14.412CFM-0.102CF/I-0.321CF/NWC-6.812OPM +0.021ACP

It is inferred from Table 4 that the predictor variables OPM in 2010, CFM in 2009 and CTDC in 2008 and 2007 have a positive effect in determining the state of the firms namely sick or non-sick. ROE in 2010, OPM in 2009, 2008 and 2007 have shown a great negative influence in predicting the correct classification of sick firms.

Chart 3: Results of MDA_{Mixed} Model - Prediction accuracy

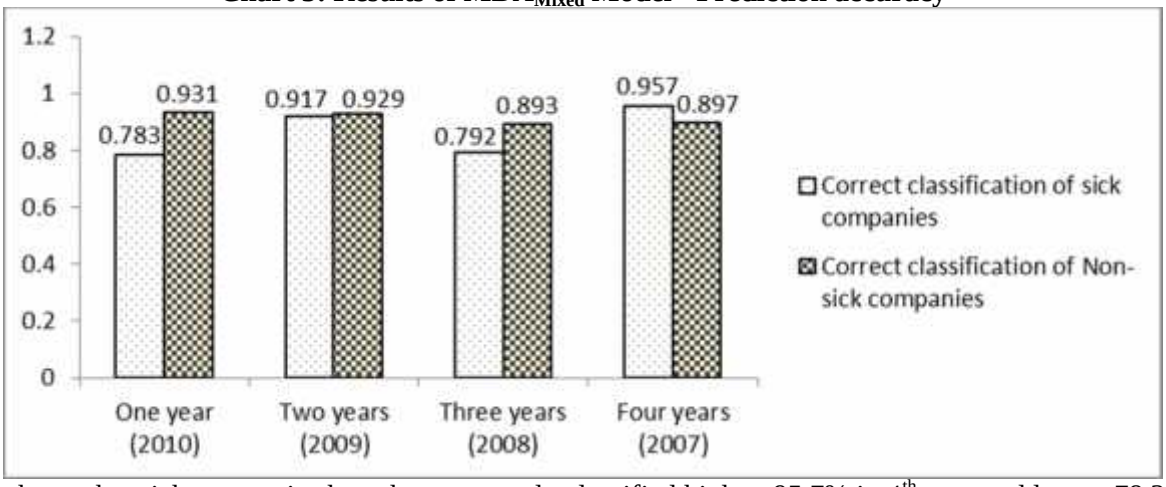
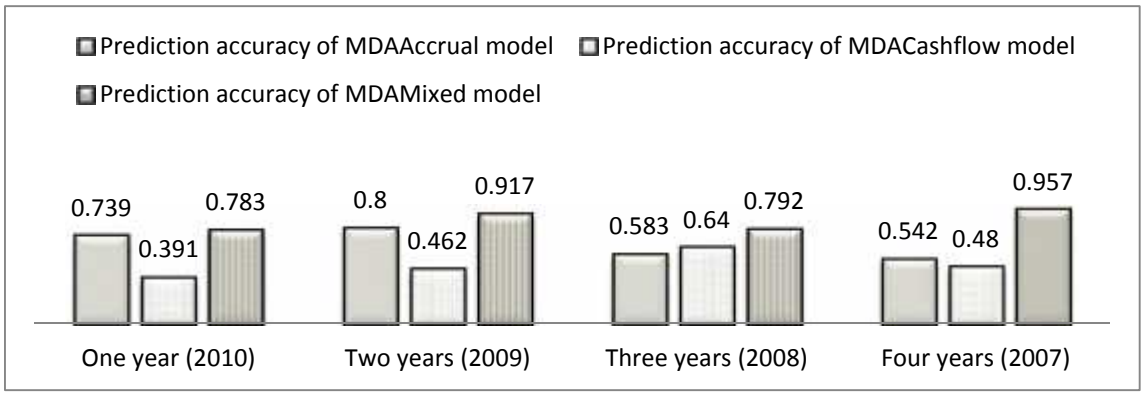


Chart 3 shows that sick companies have been correctly classified high at 95.7% in 4th year and low at 78.3% in 1st year. The correct classification of non-sick companies is high at 93.1% in 1st year.

DISCUSSION OF RESULTS

The prediction accuracy of the three models developed using Multi Discriminant Analysis namely $MDA_{Accrual}$, $MDA_{Cashflow}$ and MDA_{Mixed} have been compared to arrive at the best predicting model.

Chart 4: Comparison of $MDA_{Accrual}$, $MDA_{Cashflow}$ and MDA_{Mixed} -prediction accuracy of Sick companies



It is apparent from Chart 4 that MDA_{Mixed} model has resulted in higher prediction accuracy of impending sickness than $MDA_{Accrual}$ and $MDA_{Cashflow}$ models in all the years prior to sickness and has the highest prediction accuracy of 95.7% in 2007. Among accrual and cashflow ratios, $MDA_{Accrual}$ model has shown higher prediction accuracy

than $MDA_{Cashflow}$ model in all previous years except 3rd year prior to sickness and accrual model has high prediction accuracy of 80% in 2nd year and cash flow model has high accuracy at 64% in 3rd year.

CONCLUSION

It is clear from the above analysis that MDA_{Mixed} model better predicts the incipient sickness well in advance than the other models namely $MDA_{Accrual}$ and $MDA_{Cashflow.}$ This finding is in line with Casey and Bartczak (1985) who suggested that operating cash flow data did not provide incremental predictive power over accrual based ratios and concluded that cash flow based measures were poor indicators of corporate bankruptcy as compared to accrual based financial ratios. Also Gentry, Newbold, and Whitford (1985) found that cash-based fund flow components and traditional financial ratios together discriminating between failed and non-failed companies resulted in significantly improved predictive performance. The present study contradicts the finding of Ahmad, Azhar and Wan-Abu-Bakar (2010) indicated that their model consisting of five categories of ratios – activity, liquidity, leverage, profitability and cash-flow was found to be superior to another model which was similar to the first one with an exception that it did not contain operating cash-flow ratio, in determining corporate failures.

The present study has shown that $MDA_{Cashflow}$ model resulted in low classification accuracy which disagrees with the finding of Panigrahy and Mishra (1993) that cash flow ratios are good indicators of corporate health under multivariate analysis. The present study refutes the findings of Rujoub, Cook and Hay (1995) that cash flow data predicts bankruptcy better than accrual accounting data, but agrees with another finding that the use of cash flow data in conjunction with accrual accounting data improves the overall predictive power of the model.

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