



INTERNATIONAL JOURNAL OF RESEARCH IN COMMERCE, ECONOMICS AND MANAGEMENT

CONTENTS

Sr. No.	TITLE & NAME OF THE AUTHOR (S)	Page No.
1.	INTERNATIONAL FINANCIAL REPORTING STANDARD ADOPTION, IMPLICATION ON MANAGEMENT ACCOUNTING AND TAXATION IN NIGERIAN ECONOMY <i>FOLAJIMI FESTUS ADEGBIE</i>	1
2.	MODERN PORTFOLIO THEORY (MPT) AND FINANCIAL ECONOMICS: A THEORY OF LESSER TURF? <i>DR. ANDREY I. ARTEMENKOV</i>	6
3.	THE IMPACT OF STOCK MARKET OPERATIONS ON THE NIGERIA ECONOMY: A TIME SERIES ANALYSIS (1981-2008) <i>DR. OFURUM CLIFFORD OBIYO & TORBIRA, LEZAASI LENE</i>	13
4.	PERFORMANCE APPRAISAL SYSTEM ON COMPANY PAY ROLL EMPLOY, SENIOR, MIDDLE & LOWER MANAGEMENT (A STUDY WITH REFERENCE TO INTERNATIONAL TOBACO COMPANY LTD., GHAZIABAD) <i>DR. RAGHVENDRA DWIVEDI & KUSH KUMAR</i>	18
5.	CREDIT POLICY AND ITS EFFECT ON LIQUIDITY: A STUDY OF SELECTED MANUFACTURING COMPANIES IN NIGERIA <i>STEPHEN A. OJEKA</i>	25
6.	CREDIT RISK MANAGEMENT IN STATE BANK OF INDIA - A STUDY ON PERCEPTION OF SBI MANAGER'S IN VISAKHAPATNAM ZONE <i>DR. P. VENI & P. SREE DEVI</i>	31
7.	THE ARCHAEOLOGY OF RECESSION: DILEMMA BETWEEN CIVILIZATION AND CULTURE – TWO DIFFERENT APPROACHES OF WEST AND EAST WHILE COMBATING GREAT DEPRESSION <i>DR. V. L. DHARURKAR & DR. MEENA CHANDAVARKAR</i>	38
8.	TRANSFORMING A RETAIL CENTRE INTO A BRAND THROUGH PROFESSIONAL MALL MANAGEMENT <i>DR. N. H. MULLICK & DR. M. ALTAF KHAN</i>	42
9.	IMPACT OF EXCHANGE RATE VOLATILITY ON REVENUES: A CASE STUDY OF SELECTED IT COMPANIES FROM 2005 -2009 <i>K. B. NALINA & DR. B. SHIVARAJ</i>	47
10.	DETERMINING WORKING CAPITAL SOLVENCY LEVEL AND ITS EFFECT ON PROFITABILITY IN SELECTED INDIAN MANUFACTURING FIRMS <i>KARAMJEET SINGH & FIREW CHEKOL ASRESS</i>	52
11.	FUTURE NUTRITION & FOOD OF INDIA – THE AQUA-CULTURE: AN ENVIRONMENTAL MANAGEMENT & CULINARY PARADIGM PERSPECTIVE STUDY FOR A SUSTAINABLE NATIONAL STRATEGY <i>DR. S. P. RATH, PROF. BISWAJIT DAS, PROF. SATISH JAYARAM & CHEF SUPRANA SAHA</i>	57
12.	A STUDY OF NON-FUND BASED ACTIVITES OF MPFC - WITH SPECIAL REFERENCE TO CAUSES OF FAILURE AND PROBLEMS <i>DR. UTTAM JAGTAP & MANOHAR KAPSE</i>	65
13.	CRM IN BANKING: PERSPECTIVES AND INSIGHTS FROM INDIAN RURAL CUSTOMERS <i>ARUN KUMAR, DEEPAI SINGH & P. ACHARYA</i>	69
14.	DETERMINANTS OF INCOME GENERATION OF WOMEN ENTREPRENEURS THROUGH SHGS <i>REVATHI PANDIAN</i>	78
15.	AGRICULTURAL CREDIT: IMPACT ASSESSMENT <i>DR. RAMESH. O. OLEKAR</i>	81
16.	MICRO FINANCE AND SELF- HELP GROUPS – AN EXPLORATORY STUDY OF SHIVAMOGA DISTRICT <i>MAHESHA. V & DR. S. B. AKASH</i>	87
17.	INFORMAL SMALL SCALE BRICK-KILN ENTERPRISES IN GULBARGA URBAN AREA – AN ECONOMIC ANALYSIS <i>SHARANAPPA SAIDAPUR</i>	91
18.	EXTENT OF UNEMPLOYMENT AMONG THE TRIBAL AND NON-TRIBAL HOUSEHOLDS IN THE RURAL AREAS OF HIMACHAL PRADESH: A MULTI-DIMENSIONAL APPROACH <i>DR. SARBJEET SINGH</i>	98
19.	WOMEN SELF HELP GROUPS IN THE UPLIFTMENT OF TSUNAMI VICTIMS IN KANYAKUMARI DISTRICT <i>DR. C. SIVA MURUGAN & S. SHAKESPEARE ISREAL</i>	106
20.	FOREIGN BANKS IN INDIA – EMERGING LEADER IN BANKING SECTOR <i>DR. C. PARAMASIVAN</i>	110
21.	AN EMPIRICAL EVALUATION OF FINANCIAL HEALTH OF FERTILIZER INDUSTRY IN INDIA <i>SARBAPRIYA RAY</i>	114
22.	A STUDY ON EMPLOYEE ABSENTEEISM IN INDIAN INDUSTRY: AN OVERVIEW <i>R. SURESH BABU & DR. D. VENKATRAMARAJU</i>	119
23.	LONG MEMORY MODELLING OF RUPEE-DOLLAR EXCHANGE RATE RETURNS: A ROBUST ANALYSIS <i>PUNEET KUMAR</i>	124
24.	THE US ECONOMY IN THE POST CRISIS SCENARIO – HOLDING LITTLE CAUSE FOR CHEER <i>C. BARATHI & S. PRAVEEN KUMAR</i>	131
25.	IMPLEMENTATION OF 5 S IN BANKS <i>YADUVEER YADAV, GAURAV YADAV & SWATI CHAUHAN</i>	135
	REQUEST FOR FEEDBACK	149

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- Schemenner, R.W., Huber, J.C. and Cook, R.L. (1987), "Geographic Differences and the Location of New Manufacturing Facilities," Journal of Urban Economics, Vol. 21, No. 1, pp. 83-104.

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DETERMINING WORKING CAPITAL SOLVENCY LEVEL AND ITS EFFECT ON PROFITABILITY IN SELECTED INDIAN MANUFACTURING FIRMS

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ABSTRACT

A well-designed and effective working capital management has a significant contribution on profitability and liquidity position of firms. The purpose of the study is to assess working capital adequacy (relative solvency level) and its impact on profitability of firms. The study is conducted using samples of 449 Indian manufacturing firms after taking into account outliers of the subject. One-way ANOVA with mean summary and multiple means comparison test (Bonferroni, Scheffe and Sidak) and Independent t-test are used for analysis. There is a significant difference in relative solvency ratio level of firms with in manufacturing companies in relation with their operational size during the study period. Moreover, the independent t-test result reveals that firms with adequate working capital have performed better than firms with inadequate working capital in manufacturing companies during the study period. Thus, we can conclude that there is a significant difference in relative solvency level of firms and firms with adequate working capital have better performance in manufacturing companies during the study period.

KEYWORDS

Adequate working capital, required working capital, profitability, relative solvency ratio.

INTRODUCTION

Working capital management is an important component of management of corporate finance since it directly influences profitability and liquidity positions of firms in everyday activities. In any business organization, it is obvious that there must be sufficient working capital to run daily operation. To operate daily activities smoothly, working capital of firms must be adequate. Then, the concern of working capital management is to set sufficient (optimal level) of working capital and managing short-term assets and liabilities of firms within a specified period, usually one year. It is obvious that, the importance of efficient working capital management is unquestionable to all business activities because business capability relies on its ability to use effectively receivables, inventories and payables, Filbeck and Kruger (2005).

Management of short-term assets and liabilities implies the management of current assets and current liabilities. Current assets and current liabilities are the two major components of working capital of firms. The overall current assets are considered as gross working capital of firms. Gross working capital or liquid assets of firms are measured by the existing current assets, which are available for current operation and settlement of short-term obligations. In some cases, these assets sometimes may account half of the total assets. Actually, too high or too short current assets will affect the long-run return on assets (investments) as theoretical concept explains in different financial management textbooks. If current assets of firms are too low, it will affect the ability to settle short term obligation. On the other hand, if it is too high current assets, it will affect the profitability of the business. This too high or too low working capital may exist due to inefficient management of working capital of firms. Inefficient working capital management not only reduces the profitability of business but also ultimately lead to financial crises, Chowdhury and Amin (2007). Thus, efficient working capital management is an important factor for survival of firms in the long run. Sometimes, even a profitable business may fail, if it does not have adequate cash flow (shorter cash conversion cycle) to meet its current obligations when request come from suppliers and this will lead firms to shutdown.

A positive working capital indicates that a business organization ability to pay off its short term obligations at most when request come from suppliers. On the other hand, a negative working capital indicates the inability of business organization to pay short-term obligation when mature.

Therefore, working capital should neither too high nor too low. Excessive working capital indicates an accumulation of idle current assets (resources) which do not contribute in generating income (profit) for firm during the operating period. On the other side, inadequate working capital harms the credit worthiness and the day to day activities of firms. This may also finally lead firms to insolvency (bankruptcy).

LITERATURE REVIEW

Profit maximization is the ultimate objective of firms as well as protecting liquidity is an important objective too. The difficulty of working capital management is to achieve the two objectives optimally within an operating period. If profit is increased at the cost of liquidity, this may create serious problem to firms. Therefore, to solve such problem, there must be some compromise between these two objectives of firms. One objective will not achieve at the cost of other as both objectives have their own importance to firms. If firms do not care about profitability, they may not survive for a longer period. On the other hand, if firms do not care about liquidity, they may face problem of insolvency or bankruptcy.

Amit, Mallik, Debashish and Debdas (2005) in their study regarding the relationship between working capital and profitability of Indian pharmaceutical industry have found no clear relationship between liquidity and profitability. Vishanani and Shah (2007) have studied the impact of working capital management policies on corporate performance of Indian consumer electronic industry by implementing simple correlation and regression models. They have found that there is no established relationship between liquidity and profitability for the industry as a whole; but various companies of the industry depict different types of relationship between liquidity and profitability. However, majority of the companies revealed positive association between liquidity and profitability. Reheman and Naser (2007) have found in their study negative relationship between profitability and liquidity of firms, Ganesan (2007) have studied working capital management efficiency in Telecommunication equipment industry, and their study revealed significant statistical evidence and negative relationship between profitability and liquidity.

Lyroudi and Lazardis (2000) investigate the cash conversion cycle and liquidity position of the food industry in Greece. They have used cash conversion cycle as a liquidity level indicator of the food industry in Greece and tried to determine its relationship with the traditional liquidity measurement and profitability measurement of return on investment, return on equity and net profit margin. They have found significant positive relationship between cash conversion cycle

and current ratio, quick ratio, receivables conversion period and inventory conversion period and negative relationship between cash conversion cycle and payable deferred period. The relationship between liquidity measurement variable and profitability measurement variables are not statistically significant and there is no relationship between cash conversion cycle and leverage ratio.

Different techniques may apply as measurement of liquidity to determine the solvency level according to existing obligation of firms. Current ratio, quick ratio and cash ratio are among the most traditional liquidity measurement techniques and the, cash conversion cycle is applied as dynamic technique for measurement of liquidity level of firms. The relationship of these traditional and modern liquidity measurement techniques are studied by Lyroudi and McCarty (1993) for small US companies for the period of 1984-1988 and they have found that cash conversion cycle is negatively related with current ratio but positively related with quick ratio. In addition, the study reveals differences between the concept of cash conversion cycle in manufacturing, retail, wholesale and service industries. The advantage of modern liquidity measurement technique helps to evaluate working capital change. In addition, it facilitates the monitoring and controlling of its components, receivables, inventories and payables.

The shorter the cash conversion cycle the quicker to recover cash from sales of finished products and the more cash will have. Hence, this will lead to have less liquid assets of firms. If cash conversion cycle is high, it will take longer time to recover cash. Thus, high cash conversion cycle implies an existence of problem in liquidity, Lyroudis and Lazardis (2000). Mukhopadhyay (2004) has stated that firms are badly constrained to smoothly run the day to day operations if there is negative working capital and also difficult to settle short term obligations. Singh (2004) states that the liquidity position of any firm mainly depends upon accounts receivable collection and payables deferred policy as well as inventories conversion period of firms.

Kim, Mauer and Sherman (1998) have examined the determinants of corporate liquidity of 915 US industrial firms for the period of 1975 to 1994 by using panel data and different model. They have found that firms with large market to book ratio have significantly larger position in liquid assets. In addition, firm size tends to be negatively related to liquidity. Their finding revealed that positive relationship between liquidity and cost of external financing to the extent that market to book ratio and firm size are reasonable proxies for the cost of external financing. They also found that firms with more volatile earnings and lower return on physical assets relative to those on liquid assets lead to have significantly larger position in liquid assets.

Mehar (2001) has studied the impact of equity financing on liquidity of 225 firms listed in Karachi stock exchange for the period 1980 to 1994 by using a pooled data. The finding of the study depicted that equity financing plays an important role in determining the liquidity position of firms. From this finding, it can be concluded that equity and fixed assets have positive relationship with working capital, in the long term, however, the liquidity position will be deteriorated with the increase in paid up capital. Hsiao and Tahmiscioglu (1997) in their study revealed that liquidity might affect by substantial differences across firms in their investment behavior and firms characteristics.

Enyi (2005) has studied the relative solvency level of 25 sample firms. The finding of the study reveals that the relative solvency level model fulfills the gap created by the inability of traditional liquidity measurement of solvency level, like current ratio, quick ratio and other solvency ratio effectively to determine the proper size or volume of working capital. In addition, the study reveals that firms with adequate working capital in relation with their operational size have performed better than inadequate working capital (less working capital) in relation with their operational size. Bhunia (2007) has studied liquidity management of public sector Iron and Steel enterprise in India. He has found that the actual values of working capital lower than the estimated value of working capital for both companies under study and poor liquidity position in case of both companies.

In general, different research studies have tried to investigate the liquidity position of firms by using different ratios like current ratio, quick ratio and cash conversion cycle. Current ratio and quick ratio are static balance sheet ratio, which can explain the short term solvency level of firms on specific data whereas cash conversion cycle is modern measure of liquidity which combines balance sheet and income statement data. It shows the length of conversion period of non-cash current assets in to cash during the operating period. Otherwise, it cannot indicate the short term solvency level of firm or the adequate working capital in relation with firms operational size. Therefore, current ratio, quick ratio and cash conversion cycle have problem to determine relative solvency level of firms with operational size during an operating period. Therefore, the present study tries to investigate adequate working capital (relative solvency level) of firms in relation with their operational size during the operating period.

OBJECTIVES OF THE STUDY

It is obvious that inefficient management of working capital will lead firms to achieve under performance. A firm performs under its capacity not only decreases the current profitability but also its future survival is under question. Firms need adequate working capital to run daily activities, which is enough for current operation. Working capital should not be too high or too low. It should be adequate for current operation.

Thus, this empirical study designs

- To measure the relative solvency level (adequate working capital) of firms in relation with their operational size.
- To investigate the effect of working capital solvency level on profitability of firms.

HYPOTHESIS OF THE STUDY

This research is focused on working capital solvency level of firms and its effect on profitability. Hence, the empirical study is addressed the following hypotheses.

Hypothesis 1. There is no significance difference in solvency level of companies within manufacturing industry.

Hypothesis 2. Firms' that maintain adequate level of working capital in relation with their operational size do not perform better than inadequate (less than adequate) working capital level.

RESEARCH METHODOLOGY

The purpose of this research is to identify some important factors, which will enhance the performance of firms, and to contribute some aspects to working capital management process with reference to India. The study is emphasized on the determining of working capital solvency level and its impact on profitability of manufacturing firms.

DATA COLLECTION

Since the study is based on secondary data, the main source of data is Indian database of PROWESS. The total population of the study is all manufacturing companies listed in the databases. Firms that have full data for the whole study period of 1999-2008 are included in the population. Samples of 600 firms from the population are selected on a random sampling method based on their proportion from manufacturing companies. The numbers of firms are reduced to 449 after the removal of some outliers.

In testing of association, differences and/or impact of working capital on firms' performance, there are two major kinds of variables. These major variables are dependent and independent/explanatory/ variables. A dependent variable is the presumed effect, whereas, an independent variables are the supposed to be cause, Pedharzur and Schmelkin (1991). So, the following dependent and explanatory variables are employed in the study.

This study examines working capital solvency level of firms in relation with their operational size and its effect on profitability of firms. Profitability is the dependent variable for the study. Different scholars are used different measurement for profitability variable. In this study for profitability measurement GOP (Gross operating profit) is used as dependent variables and RSR (relative solvency ratio) is used as independent variable.

RSR= relative solvency ratio is the ratio of available working capital divided by required working capital

To calculate the required working capital the following formula is used as Enyi (2005) applied in prior study.

$$WCR = \frac{TOC}{N} \times OBEP$$

Where: -

TOC = Total Operating Cost (TS – PBT)

N = cycles may be in days, weeks or months

OBEP = Operational breakeven point

DESCRIPTIVE STATISTICAL ANALYSIS

Descriptive statistical analysis shows variable mean, standard deviation, minimum and maximum value of different variables. This helps to know the mean, standard deviation, minimum and maximum values of different variables of the study.

The average relative solvency level ratio (rsr) of firms is 0.492 and the standard deviation from the mean is 0.538 in both sides. The minimum and maximum values of rsr are -0.9 and 1.87 of rupees respectively. The mean value of gross operating profit is 0.06 and it is deviated from the mean in both sides by 0.1. The minimum and maximum values of gross operating profit during the study period are -1.12 and 1.32 respectively.

The minimum relative solvency ratio as indicated in table 1 is -0.9(-90%) and the maximum is 1.87(187%). However, the mean value of relative solvency ratio is less than one (0.492). This means that the mean value of relative solvency ratio (rsr) is less than the required working capital in relation with operational size of firms. Therefore, according the descriptive statistics in table 1, the minimum rsr (relative solvency ratio) is negative, while the maximum current assets are more than the required level of working capital. Too high or low working capital in relation to current operation has an impact on firms' performance unless otherwise this should manage properly and efficiently.

TABLE 1: DESCRIPTIVE STATISTICAL ANALYSIS FOR VARIABLES INCLUDED IN THIS STUDY

Variable	Obs	Mean	Std. Dev.	Min	Max
rsr	449	0.492	0.538	-0.900	1.870
Gop	449	0.06	0.10	-1.12	1.32

ONE-WAY ANALYSIS OF VARIANCE (ONE-WAY ANOVA)

One-way ANOVA with a mean summary and multiple mean comparisons test (Bonferroni, Scheffe and Sidak) are applied in order to investigate whether there is significant difference among companies within the same industry in terms of relative solvency ratio level. ANOVA helps to examine overall significance differences among companies. However, the ANOVA result does not tell where differences exist among pair mean values of companies, if the group are more than two. Thus, mean summary and multiple comparisons tests (Bonferroni, Scheffe and Sidak) are applied to examine differences between each pair of companies mean.

HYPOTHESES

The study hypothesis is restated below and the result of the appropriate statistical analysis for testing the hypothesis is disclosed under here.

H₀ = There is no significant difference in solvency level of companies within manufacturing industry.

TABLE 2: ANALYSIS OF VARIANCE FOR WORKING CAPITAL RELATIVE SOLVENCY LEVEL OF COMPANIES WITHIN MANUFACTURING INDUSTRY

Analysis of Variance					
Source	SS	df	MS	F	Prob > F
Between groups	52.62	7.00	7.52	27.01	0.000
Within groups	1249.22	4489.00	0.28		
Total	1301.83	4496.00	0.29		

Bartlett's test for equal variances: chi2(7) = 19.053 Prob>chi2 = 0.043

Table 2 indicates the relative solvency ratio (rsr) differences among companies within manufacturing industry. The ANOVA result of F-value and its associated p-value are 27.01 and 0.00 respectively. This result reveals statistically highly significant working capital relative solvency ratio differences among companies within manufacturing industry during the study period. Nevertheless, this result does not explain differences in between pair of companies during the study period as the groups are more than two. It shows only an existence of overall differences among companies within manufacturing industry under study.

This means that, this one way ANOVA significant value indicates at least one of the company relative solvency ratio is differ from other companies' relative solvency ratio in manufacturing industry during the study period. In addition to ANOVA's F-value significant test, Bartlett's test of equal variance shows a significance variation among companies in working capital relative solvency ratio. The assumption of Bartlett's equal variance of all firms relative solvency ratio is rejected and the alternative hypothesis that firms have no equal variance is accepted. Therefore, this Bartlett test of equal variance confirms the ANOVA's result of an existence of relative solvency ratio mean differences among companies during the study period in manufacturing industry.

The existence of mean differences between pair of companies can easily identify from the mean summary table of all companies as indicated in table 3. This table is also could not explain whether difference between pair of companies mean is significant or not.

TABLE 3: MEAN SUMMARY OF INDUSTRIES ON RELATIVE SOLVENCY RATIO IN MANUFACTURING COMPANIES

companies	Mean	Std. Dev.
Chemical	0.545	0.505
Food & Beverage	0.347	0.541
Machinery	0.667	0.542
Metal & Metallic product	0.411	0.517
Miscellaneous	0.516	0.532
Non-Metallic & Mineral Prod.	0.643	0.565
Textile	0.380	0.544
Transport Equipment	0.490	0.495
Total	0.492	0.538

Table 3 indicates differences among pair of companies mean. For example to get differences between mean of Chemical company and other companies, the mean value of Chemical company should be deducted from the mean value of each one of the remaining companies mean value. These mean differences between Chemical Company and the remaining companies are 0.198, -0.122, 0.133, 0.029, -0.099, -0.165 and 0.054 respectively. Therefore, this result implies that there are differences between Chemical Company mean and other companies mean during the study period in manufacturing industry. Moreover, the same procedure can be applied to get mean differences among the remaining pairs of companies.

These differences show that all companies mean values are not the same during the study period. It supports the ANOVA result of significant differences among means of companies and Bartlett's test of equal variance. Still pair of companies mean differences significance are not explained either of the previous techniques. They have shown only an existence of mean differences among companies. To identify such significant mean differences between pair of companies Bonferroni, Scheffe and Sidak multiple comparisons test should apply. The result of all multiple mean comparison test are presented below.

TABLE 4: MULTIPLE COMPARISONS TEST OF COMPANIES MEAN DIFFERENCES (RELATIVE SOLVENCY LEVEL)

A. COMPARISON OF RELATIVE SOLVENCY LEVEL BY COMPANIES (BONFERRONI)

Row mean Col mean	Chemical	Food & Beverage	Machinery	Metal & Metallic	Miscellan.	Non-metallic	Textile
Food & Beverage	-0.198*						
Machinery	0.122*	0.320*					
Metal & Metallic	-0.133*	0.064	-0.255*				
Miscellaneous	-0.029	0.169*	-0.151*	0.105			
Non-metallic	0.099	0.296*	-0.023	0.232*	0.127		
Textile	-0.165*	0.033	-0.287*	-0.032	-0.136*	-0.264*	
Transport equip.	-0.054	0.143*	-0.176*	0.079	-0.025	-0.153*	0.111*

*Significant at 5%(p<0.05)

B. COMPARISON OF RELATIVE SOLVENCY LEVEL BY COMPANIES (SCHEFFE)

Row mean Col mean	Chemical	Food & Beverage	Machinery	Metal & Metallic	Miscellan.	Non-metallic	Textile
Food & Beverage	-0.198*						
Machinery	0.122*	0.320*					
Metal & Metallic	-0.133*	0.064	-0.255*				
Miscellaneous	-0.029	0.169*	-0.151*	0.105			
Non-metallic	0.099	0.296*	-0.023	0.232*	0.127		
Textile	-0.165*	0.033	-0.287*	-0.032	-0.136*	-0.264*	
Transport equip.	-0.054	0.143*	-0.176*	0.079	-0.025	-0.153*	0.111

*Significant at 5%(p<0.05)

C. COMPARISON OF RELATIVE SOLVENCY LEVEL BY COMPANIES (SIDAK)

Row mean Col mean	Chemical	Food & Beverage	Machinery	Metal & Metallic	Miscell.	Non-metallic	Textile
Food & Beverage	-0.198*						
Machinery	0.122*	0.320*					
Metal & Metallic	-0.133*	0.064	-0.255*				
Miscellaneous	-0.029	0.169*	-0.151*	0.105			
Non-metallic	0.099	0.296*	-0.023	0.232*	0.127		
Textile	-0.165*	0.033	-0.287*	-0.032	-0.136*	-0.264*	
Transport equip.	-0.054	0.143*	-0.176*	0.079	-0.025	-0.153*	0.111*

*Significant at 5% (p<0.05)

Table 4(A-C) indicates paired mean differences of companies in three different mean comparison tests. The statuses of Chemical Company mean differences in all three-comparison tests are as follow. Mean difference of Chemical company with Food & Beverage company, Machinery company, Metal & Metallic company and Textile company are significant at 5% level of significance whereas mean differences between Chemical company with Miscellaneous company, Non-Metallic & Mineral company, and Transport Equipment company are not significant at 5% level of significance. Even if, there is mean differences between Chemical Company and all other companies as indicated in the mean summary table 3, the mean differences with four companies (Food & Beverage, Machinery, Metal & Metallic and Transport Equipment companies) are only significant. However, the mean differences with the remaining three companies are not significant at 5% level of significance.

All most all three comparisons test of mean differences provide the same result to all pairs of companies mean except the pair result of Textile Company and Transport Equipment company mean difference. It is not significant in the mean comparison test of Scheffe. However, this pair means difference is significant in both two mean comparison test (Bonferroni and Sidak).

Thus, the study reveals significant mean differences in working capital relative solvency ratio level during the study period among manufacturing companies. Around 60% (17 pairs out of 28 pairs are significant) of manufacturing companies have significant relative solvency ratio differences during the study period.

The overall result (ANOVA, mean summary and multiple means comparison test) implies that there is significant difference in working capital relative solvency ratio in relation with operational size of firms within manufacturing industry. So, the null hypothesis that there is no significant difference in solvency level of firms within manufacturing companies is rejected and the alternative hypothesis is accepted.

INDEPENDENT T-TEST

Independent t-test is applied to investigate the effect of relative solvency ratio level on profitability of firms. Independent t-test helps to know whether there is a significant difference between firms, which have less than one relative solvency ratio level(inadequate working capital) and one or greater one relative solvency ratio level(adequate working capital) on profitability of firms during the study period.

The hypothesis is restated below.

Hypothesis = Firms' that maintain adequate level of working capital in relation with their operational size do not perform better than inadequate (less than adequate) working capital level.

TABLE 5: SUMMARY STATISTICS FOR TWO GROUPS MEAN (LESS THAN ONE RELATIVE SOLVENCY AND ONE OR GREATER THAN ONE RELATIVE SOLVENCY LEVEL)

Group Statistics					
	FIRM	N	Mean	Std. Dev.	Std. Err. Mean
RSR	< 1	368	0.302702	0.377882	0.006227
	>=1	81	1.346855	0.246085	0.008625

Table 5 provides summary statistics for the two groups. In this table, there are two groups and the first group contains all firms, which have less than one relative solvency ratio level, and the second group contains firms, which have one or greater than one relative solvency ratio level. There are 368 firms in group one and 81 firms in group two. The mean value of group one and two are 0.303 and 1.347 respectively. The standard deviation from the mean for group one and two are 0.378 and 0.246 respectively.

Table 6 contains the main test statistics of independent t-test. This table has two rows containing test statistics that are necessary for analysis. First row labeled as equal variance assumed and the second row is labeled as equal variance not assumed. The result shows that Levene's test for equality of variances is less than 0.05 ($p = 0.000$). This implies that there is no equal variance. Therefore, it is possible to read the test statistics from table row labeled equal variance not assumed as the assumption of homogeneity of variance violated.

TABLE 6. INDEPENDENT t –TEST OF RELATIVE SOLVENCY RATIO

Independent Samples Test		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig.
RSR	Equal variances assumed	105.41	0.000	-75.38	449	0.000
	Equal variances not assumed			-98.15	1774.77	0.000

Significant at 5% ($P < 0.05$)

The independent t-test, t-value is significant ($p = 0.000$) at 5% level of significance. This shows that there is a significant performance difference between firms, which have less than one relative solvency ratio level and one or greater than one relative solvency ratio level in relation with their operational size of firms. It means that firms with adequate working capital (one or greater than one relative solvency ratio level) in relation with their operational size have performed better than those firms which have less than required working capital (less than one relative solvency ratio level) in relation with their operational sizes. Therefore, the null hypothesis that firms' maintain adequate level of working capital in relation with their operational size do not perform better than inadequate working capital level is rejected and alternative hypothesis is accepted.

This study also clarifies that majority of firms' available working capital is less than required working capital in relation with their operational size during the study period. As indicated in table 6 there are 368 firms which have less than required working capital in relation with their operational size during the study period whereas only 81 firms which have an adequate working capital in relation with their operational size during the study period. This finding is in conformity with the finding of (Bhunia, 2007) actual working capital lower than the estimated working capital of Iron and steel enterprise in India.

CONCLUSIONS

Generally, the ANOVA result reveals that there is a statistically highly significant difference among manufacturing companies in working capital relative solvency ratio level. The finding of Bartlett's test of equal variance, mean summary and multiple means comparison test (Bonferroni, Scheffe and Sidak) are supported the finding of ANOVA mean differences among manufacturing companies. Thus, relative solvency ratio level of firms differs according to their operational size during the study period for manufacturing companies in India.

Independent t-test result reveals that firms with adequate working capital in relation with their operational size have performed better than inadequate working capital in relation with their operational sizes. It implies that adequate working capital have significant effect on firms' performance because they can run their business activities without interruption during an operating period. Therefore, the null hypothesis that firms maintain adequate level of working capital in relation with their operational size does not perform better than inadequate working capital level is rejected and alternative hypothesis is accepted. This finding is in conformity with the finding of (Enyi, 2005) that companies with adequate working capital relative to their operational size have performed better than inadequate (less than required) working capital level.

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