Forecast the Company Sales in Working Capital Management Using Time Series Technique in Machine Learning

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Abstract:

Working capital plays most important role in firm's growth, profitability which are internal linked with liquidity. The working capital management between the current Assets and Current Liabilities is considered to the vital one in all the business. An effective working capital management system helps businesses not only cover their financial obligations but also boost their earnings. The main problem of the study is to find the impact of liquidity ratios on profitability ratio and how liquidity ratio affects the Profitability of the business. This study also deals with forecasting the sales which help the company in the inventory management. The literature review was done with more references from internal and external sources which are helped to frame the objectives of this research. The data is collected from the annual reports of the company as secondary data which is consists of include income statement, profit and loss statement and cash flow statement. For analysis and finding the insights of data from company annual report researcher have used the MS Excel and R tool. The results are discussed brief in this paper with conclusion. The main objectives of the study is to review the efficiency, liquidity, financial soundness of the company and find the relationship between the liquidity and profitability of the company and to using the finding of the data to predict the company sales in feature.

Keywords: *Working Capital Management, Time Series Analysis, Machine Learning, ARIMA Model, Business Analytics*

1. Introduction

The business analytics is the key area of research in recent days. Various techniques are available in the branch of machine learning. The machine learning basically classified into three types such as supervised, unsupervised and reinforcement learning. Working capital plays most important role in firm's growth, profitability which are internal linked with liquidity. This liquidity-profitability relationship is associated with the maintenance of the proper level of working capital and which are connected with corporate business. The profit of the firm is making money but no liquidity in the firm it will get downfall soon. The liquidity management has one of the broad aspects of analysing the performance of a corporate entity. Computation and analysis of financial figures are two different sides of the same coin. While the computation gives us the financial figures in the form of balance sheet, profit and loss statement and cash flow statement. The analysis of these statement leads to proper decision making. The article deals with the effective management of working capital in terms of liquidity and profitability of the company. This study also reviews the efficiency, Liquidity and financial soundness of the company and the joint effect of the liquidity and profitability of the company. The study of the liquidity and profitability is based on the ratios of the company. In this study researcher applied time series analysis for forecasting the company performance in future.

2. Review of Literature

Padachi, K.(2006). The author written this article titled working capital management and its impact on firms performance analyzed the data from 1998-2003 of 58 Mauritius manufacturing firms. The study explained analysis of liquidity, profitability and operational efficiency. The article dealt what are changes among them and how the changes lead the company best practices for good performance. The study also reveals an increasing trend in the short-term component of working capital financing. An analysis of working capital efficiency in telecommunication equipment industry, Ganesan.V [2007], the relationship between working capital management and profitability examined using correlation and regression analyses. This study uses 443 financial statements, 349 telecommunication companies during the period 2001-2007. The study showed statistical evidence that there is negative relationship between the working capital management and the liquidity, profitability of the company. The statistical data indicate that the management of DSO does not have much impact on the return on assets and profit margin. Amirjit Gill et.al, (2010) in the paper named the relationship between working capital management and profitability: Evidence from the United States studied the relationship between the working capital management and profitability. This study revealed that there is a relationship between the cash conversion cycle and profitability and also discussed there is a negative relationship between the accounts receivables and profitability of the company. Jayaratne, T. A. N. R. [2014] in the article titled impact of working capital management on profitability: Evidence from listed companies in Sri Lanka used data taken from Colombo stock exchange for the year 2008-2012. The study analyzes the effect of working capital management on profitability. The study showed that there is negative relationship among the profitability and accounts receivables, inventory turnover and cash conversion cycle. The result showed that a liberal credit policy tends to decrease the profitability and suggested that the firm should optimize the cash conversion cycle. It showed that

when cash conversion is increased, the profitability gets reduced and it indicates profitable firms takes more days to pay their dues. This shows that companies withhold their payment to their creditors to take advantage of the cash available for their working capital needs. Kusuma, H and Bachtiar, A.D (2018) in the study named working capital management and corporate performance: Evidence from Indonesia studied the relationship between the working capital management and profitability of the company listed in Indonesia Stock Exchange. The author measured working capital management with five variables: cash conversion cycle, inventory turnover ratio, average payment period, current ratio, and working capital turnover ratio, while ROA is a measure of firm performance. After accounting for three independent variables, the result indicates that working capital management significantly improves firm's performance. Working capital management measured by inventory turnover is the best model in explaining firm performance. The current study examined the comparative measures of working capital management in relation to firms' performance. However, it did not evaluate the effects of the individual components comprising cash, accounts receivable, inventory, and accounts payable. Ahmed, S., Ahmed, F., & Kanwal, S. (2018) in the study named Corporate profitability working capital management tie: Empirical evidence from pharmaceutical sector of Pakistan used secondary data covering a period of six years from 2011 – 2016. This study should has advantage for the pharmaceutical sector in Pakistan as performance and survival of this sector is important for investor and for the health of the public.

3. Business Research

3.1 Formulation and Statement of the Problem

From the review of literature researcher has to understand the important of working capital management and the effect of working capital management on the liquidity and profitability of the company. Working capital management plays a vital role in accounting strategy to maintain sufficient balance between a company's current assets and liabilities. Therefor researchers have to analyses the effective of various variables interlinked with working capital and their connection with company performance in current and feature. The main purpose of the study is to find the sales forecast of the company in near feature which can help to manage company inventory management and raw materials. The study also finds the drivers that affect the Return on Equity (ROE) of the Company

3.2 Business Research Objectives of the Study

- To review the efficiency, liquidity and financial Soundness of the company
- To measure the relationship and effect between the liquidity and profitability of the company
- To analyze the Return on Equity (ROE) of the company

- To forecast the sales in feature

3.3 Business Research design of the Study

Descriptive research was employed to reach the research objectives for this quantitative research, a few variables have been selected for the study to study the liquidity and profitability of the company. The data is collected from the annual reports of Southern Petrochemical Industries Corporation Limited (SPIC) Ltd, Tuticorin, Tamil Nadu, and India from the last eight financial years 2010-11 to 2017-18. The secondary data is being taken from the annual reports which include income statement, profit and loss statement and cash flow statement. It is also a correlational research examining the differences and characteristics of the variables and also heterogeneity and homogeneity of the variable. Return of capital employed as dependent variable and current ratio, quick ratio, investors turnover ratio, debtors turnover ratio are independent variables in this research, these are variable considered for finding the insights from the data. The hypothesis are drawn and finding the association among the variable for reaching the research objectives. This entire research project deals with the secondary data. Secondary data are the data collected by a party not related to the research study but collected these data for some other purpose and at different time in the past. The external secondary data is collected from the outside resources which includes the company website and other resources extracted from various web sources for literature review and formulate the research objectives. The Du-Pont Analysis Calculations are done in Microsoft-excel. The tool used for the statistical computations are done in R which is a programming language for machine learning. The Time Series analysis, Pearson Correlation Analysis and Multiple Correlation Analysis are done in R.

4. Business Analysis and Data Insights

These are the quantitative analysis machine learning techniques used to test the hypothesis of the study correlation, Multiple Regression, DuPont Analysis and ARIMA Model but in this article researchers presented only two models.

4.1 Machine Learning - ARIMA Model

An autoregressive integrated moving average model is a form of regression analysis that gauges the strength of one dependent variable relative to other changing variables. The model's goal is to predict future securities or financial market moves by examining the differences between values in the series instead of through actual values.

Figure 1 Time Series graph on the differenced log Transform of sales

Figure 2 Plot of Auto-Correlation and Partial Auto-Correlation of differenced sales

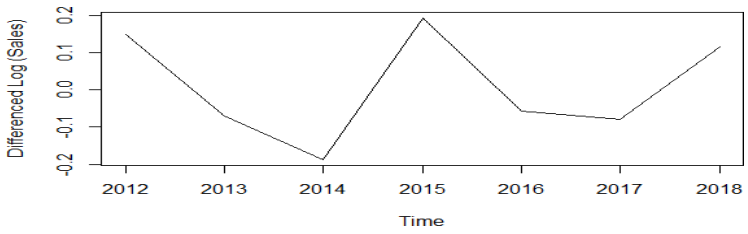


Table 1 Identification of Best ARIMA Model

Time Series: log10(Sales)		
Best Fit Model: ARIMA (0,0,0) with non-zero mean		
		Ar1
Coefficients		1878.00
Standard error		113.77
Log likelihood = -43.92		
AIC=119.09	AICc=121.49	BIC=119.25

Source: Primary: Computed and Complied from the R Tool

Figure 3 Time series graph of the forecasted sales using best fit ARIMA Model

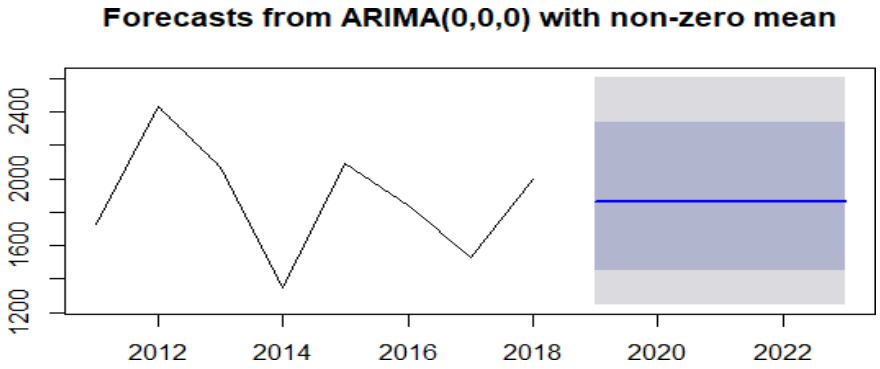
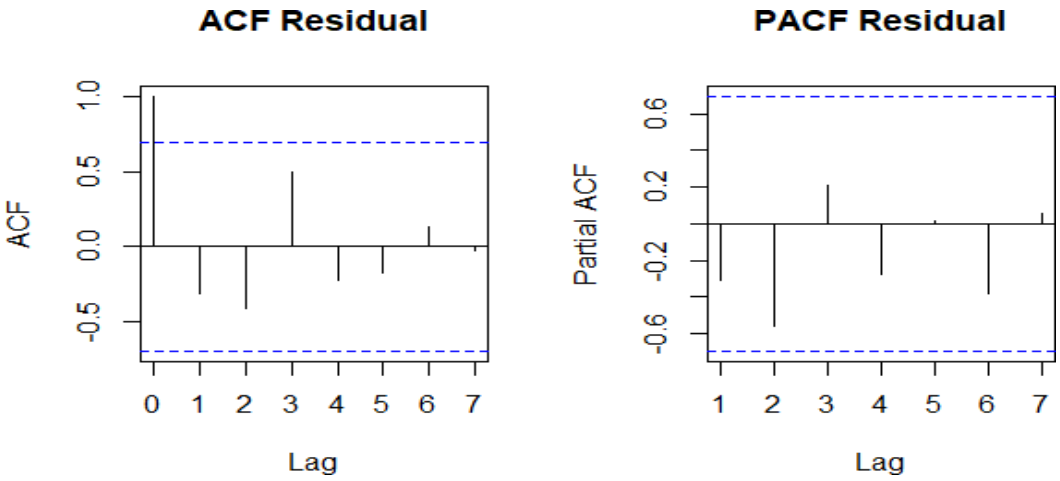


Figure 4 Plot of ACF and PACF for residuals of ARIMA mode



The Auto Regressive Integrated Moving Average Model (ARIMA) is applied for forecasting of the sales for the next five years. Figure 1 shows the time series graph for the sale from the financial year 2010-11 to 2017-18. Figure 2 shows the differenced log (sales) and the time series graph has been drawn and the autocorrelation of the difference sales. The autocorrelation at lag 0 is included by default which always takes the value 1 as it represents the correlation between the data and themselves. The auto correlation shows that is a minimum linear relationship between the linear separations separated by larger lags and the partial autocorrelation factor of the difference sales. This shows that there is no relationship between the linear separation and larger lags. From the figure 4 shows the ARIMA fit

residuals. Since there are no spikes outside the insignificant zone for both ACF and PACF plots researcher can conclude that residuals are random with no information or juice in them. The best fit model is selected based on Akaike Information Criterion (AIC), and Bayesian Information Criterion (BIC) values. The idea is to choose a model with minimum AIC and BIC values. The best fit model shown in the interpretation is the ARIMA (0,0,0) with non-zero mean. An ARIMA (0,0,0) model with zero mean is white noise, so it means that the errors are uncorrelated across time. From the graph confirms that the correlation lie under the significance level. Figure 3 shows the forecasted sales for the next five years from 2019-2023. The sales are expected in the area of 1500-2000 crores. The range of expected error (i.e. 2 times standard deviation) is displayed with shadowed part on the either sides of the forecasted sales. The graph shows the output with forecasted values of sales in the blue dark line in the year 2020 -2023. Also, the range of expected error (i.e. 2 times standard deviation) is displayed with shadowed part on the either sides of the forecasted sales. It is also made sure that the forecast errors are not correlated, normally distributed with non-mean zero and constant variance. The researchers can use the diagnostic measure to find out the appropriate model with best possible forecast values.

4.2 Du Pont Analysis

DuPont analysis is a fundamental performance measurement framework popularized by the DuPont Corporation and is also referred to as the "DuPont identity." DuPont analysis is a useful technique used to decompose the different drivers of the return on equity (ROE).

Table 2 Five Stage DuPont Analysis on the Return on Equity (ROE)

Years	Return on Equity (ROE)
2010-11	17.61%
2011-12	-11.47%
2012-13	512.25%
2013-14	30.47%
2014-15	7.93%
2015-16	10.03%
2016-17	10.01%
2017-18	12.18%

Source: Primary

Table 2.0 shows the results of the Du-Pont five stage analysis on the return on equity. ROE is, therefore, arguably the most important of the key ratios, since it indicates the rate at which owner wealth is increasing. While the DuPont analysis is not an adequate replacement for detailed financial analysis, it provides an excellent snapshot and starting point. From the table 2.0, it is seen that the company is seeing a good return on equity for the past three financial years. ROE shows the

management effectiveness of the company. The return for the past three years shows the effective management of the company. The Dupont Analysis is done to analyze the return of equity for the past eight financial years. The company is showing a increasing trend in the ROE for the past three years. The company is having an average financial leverage of 4.00 which interprets the company is careful in using its debt to the operations. This analysis shows that company is having a good strength of the operating cash flow and tax treatments. The company is using effectively using the money from investors to the operation to produce value to the shareholders.

5. Conclusion

The study found that the cash turnover ratio and working capital ratio have a negative impact on the profitability of the company. Inventory turnover ratio and debtor's turnover ratio have a greater impact on the profitability of the company. The company should concentrate on improving the working capital turnover ratio. The company should make sure that it has strong collection teams to chase delinquent customers. Reward staff members who are able to collect dues effectively. The working capital position of the company can always be improved by earning higher profits, issuing company stock, taking on more debt, and selling assets for cash. However, these strategies should consider in improving the strategy. The company can reduce its debt-to-capital ratio is that of increasing sales revenues and hopefully profits. This can be achieved by raising prices, increasing sales or reducing costs. Inventory can take up a very sizable amount of a company's working capital. Maintaining unnecessarily high levels of inventory beyond what is required to fill customer orders in a timely fashion is a waste of cash flow. Restructuring debt provides another way to reduce the debt-to-capital ratio. This will help to build new model to predict the future revenue and business plan. The purpose of sales forecasting is to provide information that the company can use to make intelligent business decisions.

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