

# WORKING CAPITAL VARIATIONS BY INDUSTRY AND IMPLICATIONS FOR PROFITABLE FINANCIAL MANAGEMENT

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## ABSTRACT

*Data on annual working capital and profitability for 5 years, 2010-2015, in 7000 U.S. companies were grouped into three industrial sectors, retailing, production, and services. Mean current and inventory ratios and profitability were calculated for each industrial sector, and the correlation and regression tests were run for data analysis. No significant difference in profitability was found between industries. However, within industries, a correlation was found between current ratio, sales inventory ratios, and profit margin. A positive correlation was found between current and sales inventory ratios and profit margin in the production industry. In the retail industry, no correlation was found between current ration and profit margin, but a negative correlation was found between sales inventory ratio and profit margin. In the services industry, a correlation was found between current ratio and profit margin, and a negative correlation between sales inventory and profitability. High inventory volumes are profitable to manufacturing and production industries. Low inventory volumes are profitable in retail industries. None, if not very little inventory is profitable for the services industry. From the findings, a predictive model was developed for profitable working capital management. Further research that tests the model is suggested using data from other companies and countries.*

**JEL:** G31, G34

**KEYWORDS:** Working Capital, Current Ratio, Profitability, Industry

## INTRODUCTION

Poor working capital management (WCM) has led to the demise of many businesses. Some financial managers take for granted the need to constantly monitor variations in WC or lack the skills to do so (Adediran, Josiah, Bosun-Fakunle, & Imuzeze, 2012). WC is a sensitive determinant of liquidity and profitability, which are two factors that stagnate a business to failure or death when ignored (Buchmann & Jung, 2016; Javid, 2014). Poor WCM is still a critical business issue across the globe (Arunkumar & Ramanan, 2013); it led to 92% of business failures in the U. S., 96% in Canada and 76% in Australia, particularly in small firms (Shafique, et. al., 2007). In UK, inefficient WCM has cost UK businesses about £125bn (PWC, 2012). Poor WCM skills is attributed to lack of necessary skills and inattention to industry specific details, in small day-to-day operations (PWC, 2012; Shafique, et. al., 2007). Working capital is the difference between a company's current assets and its current liabilities. Current assets are cash, cash equivalents, accounts receivables, inventory, and other shorter-term prepaid expenses (Mehmood, 2013). Current liabilities are made up of accounts receivable, accounts payable, and inventories. The ratio of current assets over current liabilities can be used to figure out a firm's overall profitability or the ability of a firm to meet its short-term commitments. The ability to skillfully manage working capital and its components is important to the financial health of businesses in all industries

(Buchmann & Jung, 2016). One example of such skill in knowing when to reduce accounts receivable, or limit sales credits to increase cash inflow (Ganesan, 2007).

Care should be taken in implementing severe collection policies that decrease sales credits, because it could lead to lost sales and constrict profit. Just like minimizing inventory may lead to stock-out, lost sales and result in a decrease in profit. The goal of working capital management is to achieve an optimal mix of WC components that maximum profit and cash flow, which requires some skills and knowledge of the variability of working capital depending on situations and industry (Jayarathne, 2013). Huge losses are incurred when the optimal profit levels are not achieved (Ganesan, 2007; PWC, 2012; Shafique, et. al., 2007). Some managers in their day-to-day operations pay inadequate attention to working capital variations relative to optimizing profitability in their specific industries.

Such managers may lack the understanding that while WC variations are industry specific, these variations may not be fixed and may be constantly changing requiring constant attention and management. This study assessed actual working capital variability by industry as a basis for modeling an equation for WC adjustment for profitability in each industry. Many studies have shown that a significantly negative correlation exists between working capital and profitability (Arunkumar & Ramanan, 2013; Mathuva, 2010). While this might be true in some studies, it sounds like a sweeping assumption that may not hold true for all industries, because the worth of an extra dollar investment in working capital in a company is influenced greatly by its future sales potentials, debt load, and financial constraints, which vary from one industry to another (Kieschnick, Laplante, & Moussawi, 2012). There are divergent views about the impact of working capital on profitability. For example, high credit policy and huge stock or inventory enhances sales volume and invariably profitability in sugar and leather firms (Mehmood, 2013). On the contrary, “the incremental dollar invested in net operating working capital is worth less than the incremental dollar held in cash for the average firm,” which suggests that the lower the amount invested in working capital the greater the profitability (Kieschnick, Laplante, & Moussawi, 2012, p. 10). In addition, there is a risk and return paradox, in that the higher the net working capital, the less risk a company faces, and the lower the returns. Contrarily, the opposite is also true, because holding less net working capital or less liquidity amounts to a great risk as well.

Given these paradoxical variations in approaches to WCM, managers need models to guide them in making profitable decisions. Few studies if not none have examined variations in working capital and financial performance by industry, with a focus on understanding industrial specific factors, such as number of firms per industry, and how their variations implicate profitable working capital management. Moreover, some managers may be using WCM ratios that are profitable, but do not optimize profit. Such managers continue to do so because lack of knowledge or models that determine relationships between variations in working capital and profitability by industry (Damodaran, 2016; Harsh & Satish, 2014). Thus, the purpose of this study was to identify the significance of variations by industry, of the influence of WC (current and sales inventory ratios) on profitability, and to model working capital variability by industry as the basis for developing an equation for WC adjustments for profitability in three main industrial sectors. Aligned with purpose, the following sections of this paper are organized as follows: An examination of related literature focused on the key variables. Followed by a description of data and methodology, and a discourse on the results of statistical tests. The last or final section is the concluding comments.

## LITERATURE REVIEW

Working capital (WC) is otherwise known as net working capital. It is a financial measure of a firms operating liquidity, calculated by a simple formula, current assets minus current liabilities (Buchmann & Jung, 2016). This simple definition does not embrace the importance of some industry specific characteristics that are becoming increasingly relevant for effective WCM and firm or industry

competitive advantage (Baghiyan, 2013), such as number of firms per industry and industrial variations. There seem to be no attention to, or a gradual shift away from industrial characteristics or variations that impact profitability, to few WC components like current assets and current liabilities. Concerns have mainly been to keep WC positive. When the result of WC calculation is positive, that means the firm can meet its day-to-day operational expenses and needs. Thus, when WC is less than 1.0 it suggests liquidity problems and profitability issues abound. A WC of 1.5 and above shows a strong short-term liquidity. Working capital management calls for ensuring that a lot of money is not tied up in accounts receivable and inventory. Avoiding having too little money on short-term liquidity or assets that can be easily converted to needed cash is a prevalent WCM strategy (Oladipupo, & Okafor (2013). How about other factors that can affect liquidity and profitability? Effective working capital management is the ability to creatively integrate industry specific variables into a balanced WC mix that frees up cash, while decreasing cost of outside funding which improves profit standing (Buchmann & Jung, 2016).

Examples of liquidity ratios are the current ratio, and inventory turnover. Current ratio is current assets divided by current liabilities. Current ratio indicates the ability to recompense current liabilities using current assets which provides a glance at profit standing (Shivakumar & Thimmaiah, 2016). Inventory turnover is cost of goods sold divided by average inventory, over a period. Inventory is the main part of working capital. Though not in all cases, a high inventory level increases sales growth, reduces cost of supply or goods thereby reducing cost of production and enhancing profitability (Mehmood, 2013). On the contrary, Arunkumar & Ramanan (2013) found that the key variables of working capital are negatively related to profitability, and profitability can be increased through a reduction of accounts receivable and inventory levels below the benchmarks per industry. While there is a consensus in many studies that shorter debt collection periods magnify profitability, and longer payment periods boost profitability standing, there seem to be a disagreement on the effect of inventory on a firm's financial performance or profitability in the few studies that focused on different industries (retailing, production, and services). The effects of financial ratios on profitability need to be studied individually in groups of industries, for a good understanding of the underpinnings of efficient working capital management (Moradi, Salehi, & Arianpoor, 2012). In that regard, Moradi, Salehi, & Arianpoor compared working capital management of two groups of companies, one in the medical industry, and another in the medicine industry. They found that "in the medicine industry compared to chemical industry, debt ratio makes more impact on reduction of net liquidity..... In chemical industry, debt ratio makes more impact on reduction of working capital requirements, compared to medicine industry" (page 62). Clarification of discrepancies regarding profitable inventory levels is critical for efficient working capital management, because accounting, growth, organizational performance, and survival of firms depend on it (Baghiyan, 2013; Nwamkwo & Osho, 2010).

According to Baghiyan (2013), "proper selection and management of working capital management policies can create competitive advantage" and brings about improved management of companies. However, these ratios have to be constantly reevaluated for each industry and situation given uncertainties in the business environment caused by political instability, weakening law and order, wars, technological developments, monetary shortage, food and energy crises and high business operational costs (Baghiyan, 2013; Harsh & Satish, 2014). Furthermore, Harsh & Satish (2014) noted the lack of current theories, models, and survey based studies in the area of WCM. This suggests that having a significant predictive model or standards for determining profitable working capital ratios for each industry as a guide for financial managers and accountants has become highly crucial. The call for further studies by Moradi, Salehi, & Arianpoor (2012, p. 75) in the statement "we suggest that working capital management be examined in other industries that have an important role in our country's economy" could not have come at a better time. Many industries, such as telecommunication industry, have poor or inefficient working capital management (Ganesan, 2007). "Using a sample of 443 annual financial statements of 349 telecommunication equipment companies covering the period 2001-2007, this study found evidence that even though "days working capital" is negatively related to the profitability, it is not significantly

impacting the profitability of firms in telecommunication equipment industry” (p.3). In a current study Damodaran (2016) showed a significant variation by sector in WC ratios. Damodaran believes that enough data exist that can be mined and converted into measures of risk or WC ratios and percentages, unlike a decade ago. In his database exists measures of risk, profitability, leverage and value, and most importantly, working capital ratios by sector, region (US). The relationship between working capital management and corporate performance is nonlinear (Khan and Ghazi, 2013). It compels developing WCM strategies that are based on industrial characteristics and challenges to enable the attainment of optimal level of investment in working capital that balances costs and benefits and maximizes a firm's value (Chuan-guo, et. al. 2014). Examining WCM strategies by industry in assessing its impact on firm profitability is inevitable in determining optimal profitability (Chuan-guo, et. al. 2014; Nwamkwo & Osho, 2010). These studies emphasize the need for current working capital management theories and models. They attest the significance of this study that these variables should not be taken for granted as was the case in the past, but their variations by industries and sectors need to be constantly evaluated in making financial management and investment decisions.

## DATA AND METHODOLOGY

The purpose of this study was to identify variations by industry, of the influence of WC components (current and sales inventory ratios) on profitability, and to model working capital variability by industry as the basis for developing an equation for WC adjustments for profitability in three main industrial sectors. Yearly data on key business ratios, covering a period of 10 years, 2005-2015, were obtained from multiple sources, such as Dun & Bradstreet (D&B), Damodaran (2016), CreditGuru for working capital and profitability ratios respectively. These are companies that store in their databases, data on key business ratios developed and derived from companies' financial statements. Financial statements were used to obtain data on firm's current ratios and data for computing inventory turnover as in Gakure, et. al., (2012). Current ratio is the dependent variable and is taken as the proxy for profitability. Current ratio is computed as current assets divided by current liabilities. Current ratio is an indicator of the financial performance, profitability or working capital health standing of a firm. A current ratio above 1 indicates that current assets surpass current liabilities. A ratio higher than one indicates a better profitability standing. Inventory turnover is the independent variable and is also taken as the proxy for inventory levels. Inventory turnover is calculated as cost of goods sold divided by average inventory. Firms were randomly selected and grouped by industry, retailing, production, and services. Then, the mean current ratio, and the mean inventory turnover were calculated and correlated for each industry group, as in some studies (e.g., Akoto, Awunyo-Vitor, & Angmor, 2016) and many similar studies. Finally, results were compared and used to test the null hypotheses. The null hypothesis states, “A firm's working capital, measured by inventory turnover does not correlate negatively with profitability in all industries.

## RESULTS

This study investigated working capital variations by industry and its implications for profitable financial management by industry. Table 1 below shows ANOVA results on current and sales to inventory ratios by industries. The analysis in the table returned a p-value of 0.545618, making a strong case for not rejecting the null hypothesis, that there is no significance difference in profitability given working capital variations, particularly current and sales inventory ratios in all industries.

Figure 1 below indicated significant variations within industry and between industry in sales to inventory ratios (production=4.38; retail=8.15; services=1.01) relative to other variables. There seem to be no significant variations in other variables (current and sales inventory ratios) and profit margin or profitability within industries. However, closer analysis between, or by industry reveals differences in working capital levels that serves as a guide to determining working capital levels that are healthy and profitable for each industry. That gives an insight to developing a predictive model for profitability for

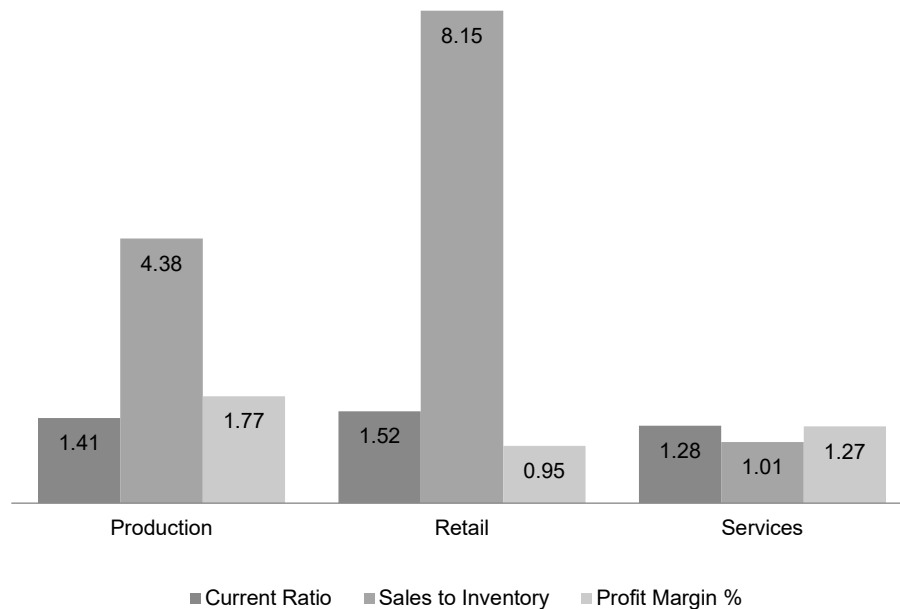
each industry, using data in Figure 1 as measuring coefficients for adequate profit margin at sales inventory ratio of 4.38 for production industry, 8.15 for retail industry, and 1.01 for services industry). In the same manner, at current ratio of 1.41 for production industry, 1.52 for retail, and 1.28 for services industry. Correspondingly, a profit margin of 1.77 for the production industry, 0.95 for the retail industry and 1.27 for the services industry (Figure 1).

Table 1: ANOVA on Current Ratio & Sales to Inventory Ratio by Industry

Source of Variation	SS	Df	MS	F	P-Value	F Crit
Between Groups	8.3563	2	4.1782	0.6713	0.5456**	5.1433
Within Groups	37.3417	6	6.2236			
Total	45.698	8				

This table reports the result of the analysis of variance on Current Ratio & Sales to Inventory Ratio by Industry. Column 6 indicates a p-value of 0.545618 used in making the decision to accept or reject the null hypothesis. The level of significance was set at  $p = 0.05$ . The null hypothesis was not rejected because  $p = 0.545618 > 0.05$

Figure 1: Working Capital Ratios by Industry



This reports a comparative picture within and between industries, and provides a guide to determining working capital levels that are healthy and profitable for each industry.

Table 2 shows a correlation between current ratio, sales inventory ratios, and profit margin, indicated a positive correlation between current (0.66079395) and sales inventory (0.68047619) ratios, and profit margin in the production industry. In the retail industry, no correlation (0.076088748) was found between current ratio and profit margin, but a negative correlation (-0.442035345) was found between sales inventory ratio and profit margin. In the services industry, a correlation (0.352894241) was found between current ratio and profit margin, and a negative correlation (-0.883147826) between sales inventory and profitability.

Table 2: Correlation between Current Ratio, Sales Inventory Ratio, and Profit Margin

Production Industry		Profit Margin
Current ratio		0.66**
Sales inventory ratio		0.68
Retail Industry		Profit Margin
Current ratio		0.076
Sales inventory ratio		-0.442
Services Industry		Profit Margin
Current ratio		0.352*
Sales inventory ratio		-0.883

This table shows the relationships between current and sales to inventory ratios. The correlation coefficient under the profit margins, measure the direction of the relationships, between profit margin and other variables (current and sales inventory).

Results in Table 3 confirm that high inventory volumes are more profitable in manufacturing or production industries than in retail industries. At lower sales to inventory volume of 4.38, the profit margin in production industries was 1.77%, which is higher than the profit margin of 0.95% in the retail industry with higher sales to inventory volume of 8.15 in Table 3. Contrarily, the services industry with the lowest sales to inventory ratio of 1.01, has a higher profit margin than the profit margin in the retail industries of 0.95% (Table 3). Relatively, this means that high inventory volumes are not profitable to the services industries. Also, none or very little inventory is profitable for the services industry.

Table 3: 10 -Year Mean Working Capital (Current & Sales to Inventory Ratios) by Industry

Mean Ratios	Production	Retail	Services
Current	1.41	1.52	1.28
Sales to Inventory	4.38	8.15	1.01
Profit Margin %	1.77	0.95	1.27

This table shows results from the analysis of data on WC and profit margin, used for a comparative analysis of profitability given mean current and sales to inventory ratios in each industrial sector.

Using a regression model equation, the predictive impact of three variable, current, sales inventory ratio and industry, on profitability was further assessed.

$$Profitability = a + b(sales\ to\ inventory\ ratio) + c(current\ ratio) + d(industry) \quad (1)$$

Where, a= 0 or the intercept; b, c, and d, are regression coefficients in each industry. For each variable, the magnitude of the coefficients determines the effect size or impact on profitability, which is either positive or negative, and shows the direction of the effect. Industry stands for industry specific characteristics, such as a ratio of the number of firms in the industry. The coefficient indicates how much the dependent variable is expected to increase when the independent variable increases by one, holding all the other independent variables constant. Table 5 is a regression analysis Table. It shows the regression coefficients for each industry, production, retail, and services at 0.05 level of significance. The coefficients were used to create a predictive model for profitability in each industry.

Table 4: Regression Statistics Table

Production		Retail		Services	
Multiple R	0.9371	Multiple R	0.6861	Multiple R	1
R Square	0.8781	R Square	0.4708	R Square	1
Adjusted R Square	0.7867	Adjusted R Square	0.1533	Adjusted R Square	0.6554
Standard Error	0.3765	Standard Error	0.3869	Standard Error	0

This table shows the R-statistics. R indicates the relationship between the independent variables and the dependent variable Y. R-squared ranges between 0 and 1 or 100%. 0% indicates that the model does not explain the changeability of data around its mean. 1 or 100% indicates that the model explains all the changeability of data around its mean. R squared is a number that indicates the percentage of variance in the dependent variable that is caused by an independent variable.

Table 5: Regression Analysis Table

Industry	Coefficients	Standard Error	T Stat	P-Value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
<b>Production</b>								
Intercept	-1.95	4.4921	-0.43	0.6864	-14.4233	10.5207	-14.42	10.52
Current Ratio	1.88	3.7449	0.50	0.6420	-8.5174	12.2774	-8.52	12.28
Sales to Inventory	0.20	0.1912	1.05	0.3518	-0.3296	0.7322	-0.33	0.73
Firm Ratio	3.72	1.0089	3.68	0.0211	0.9160	6.5181	0.92	6.52
<b>Retail</b>								
Intercept	2.257	1.0223	2.21	0.0783	-0.3705	4.8853	-0.37	4.89
Current Ratio	-0.68	0.5629	-1.21	0.2789	-2.1303	0.7635	-2.13	0.76
Sales to Inventory	-0.04	0.0219	-1.70	0.1497	-0.0934	0.0190	-0.09	0.02
Industry	1.44	1.6752	0.86	0.4288	-2.8646	5.7476	-2.86	5.75
<b>Services</b>								
Intercept	0.00	0.0000	65,535	0.0613	2.9143	2.9143	2.91	2.91
Current Ratio	1.29	0.0000	65,535	0.0031	1.2868	1.2868	1.29	1.29
Sales to Inventory	-0.29	0.0000	65,535	0.7022	-0.2927	-0.2927	-0.29	-0.29
Firms Industry Ratio	-0.69	0.0000	65,535	0.3712	-0.6942	-0.6942	-0.69	-0.69

This table shows results from a regression analysis on four variables in three industrial sectors, production, retail, and services. The second Column reports the results of the coefficients used to determine the magnitude of the effect size or impact of the variable on profitability, in the predictive model.

### Model Equations

#### Production

$$Profit = -1.95 + 0.20(\text{sales to inventory}) + 1.87(\text{current ratio}) + 3.71 (\text{industry})$$

#### Retail

$$Profit = 2.25 + -0.03(\text{sales to inventory}) + 0.68(\text{current ratio}) + 1.44(\text{industry})$$

#### Services

$$Profit = 2.91 + -0.29 (\text{sales to inventory}) + 1.28(\text{current ratio}) + -0.69(\text{industry})$$

### **CONCLUDING COMMENTS**

The purpose of this study was to identify variations by industry, of the influence of WC components (current and sales inventory ratios) on profitability, and to model working capital variability by industry as the basis for developing an equation for WC adjustments for profitability in three main industrial sectors. Results in this study validate some findings in previous studies that some WC variables are negatively related to profitability, and profitability can be increased through a reduction of inventory levels below the benchmarks per industry (e.g., Arunkumar & Ramanan, 2013). Arbitrarily increasing, or decreasing working capital levels above the industry average or maintaining the industry average might not lead to a profitable working capital management. However, that is not guaranteed and may yield a less than expected result without the use of a predictive model derived for the industry from data on sales to inventory ratio, current ratio, and industry specific factor/s, as in this study. Skills and considerations must be applied in taking such decisions (Mathuva, 2010) through the use of a model and industry specific factors. Multiple factors and their variations by industry require consideration for effective WCM. They compel the use of models that very well integrate the impact of all key factors, especially in small and medium size industries (Javid, 2014). For example, no significance difference in profitability given working capital variations, particularly current and sales inventory ratios was found.

However, within industries or by industries, a correlation was found between current ratio, sales inventory ratios, and profit margin. Some industry specific factors, such as inventory volumes, and number of firms in an industry, have significant effects on profitability, but are ignored in WCM decisions. Effective working capital management involves constantly monitoring working capital variations, its ratios and most importantly the industry average, before making investment and financing decisions (Ali & Ali Atif, 2012). In line with the views of Adediran, Josiah, Bosun-Fakunle, and Imuzeze (2012), care must be taken in calculating sales inventory ratio for a company, noting that it could be below or above the industry average and the levels at which profit is maximized. Furthermore, it should be noted that when inventory level is very high compared to other assets, it could create a misconception on the availability of liquidity or cash for paying off short-term debts, especially when a company's inventory is not moving or turned over due to poor sales because the products have become outdated and difficult to sell. Short term debts need to be paid otherwise late charges which may apply affect profitability as well the credit wordiness which in turn might lead to high cost of credit. A constant assessment of the inventory to working capital ratio assists in calculating the percentage of working capital that is tied up in its inventory, and reveals a firm's liquidity position. It tells whether to reduce inventory level or increase it based on the industrial standard, and company characteristics. Working capital variations have to be constantly analyzed and watched from the standpoint of current and sales inventory ratios, as well as sales to working capital ratios and industrial averages or standards, to maintain a profitable liquidity position in a company. This study recommends the use of models. Also recommended are further research testing the models is suggested using data from other companies and countries.

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## ACKNOWLEDGEMENTS

I would like to thank the Editor in Chief, Dr. Terrance Jalbert, and two anonymous reviewers for their invaluable and helpful comments. The usual disclaimer applies.

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