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Determinants of Working Capital Requirement: Evidence from Manufacturing Companies in Ethiopia

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Abstract

The purpose of this study was to identify the determinants of the working capital requirement of manufacturing companies in Ethiopia. The study followed explanatory research design using four years' data, from 2010/11 to 2013/14, from a sample of 85 manufacturing companies in Ethiopia from 10 manufacturing industrial sub-sectors. Univariate analysis of descriptive statistics, correlation, and fixed effect model were employed as methods of data analysis, and then results were presented using tables, followed by a brief description interpreting them. The results of fixed effect model showed that while operating cycle and firm size are positive and significant determinants of working capital requirements, real gross domestic product and fixed assets ratio were found to be negative and significant determinants. Based on the results of the study, the researcher recommended that operating cycle, firm size, fixed assets ratio, and real gross domestic product shall be considered by financial managers while setting the working capital requirement of their companies.

Keywords: Working Capital Requirements, Firm Size, Fixed Assets Ratio, Real Gross Domestic Product, Operating Cycle

Introduction

Working capital management is one of the key financial management decisions in any organisation. According to Nazir and Afza (2008) and Salawu and Alao (2014), working capital management, which is the management of current assets and current liabilities, is an important component of the overall management of any company, as one of the three corporate finance decisions. Firms should design and implement a working capital management policy, which is sound in balancing the trade-offs that exist between liquidity and profitability. Determining the important factors affecting working capital management would help managers determine the optimal level of investment in current assets, as well as the appropriate sources of financing the investment (Salawu & Alao, 2014).

However, before adopting working capital policy, identifying the various determinants of working capital requirement is essential, to decide whether the firm has to keep much of the current assets and less of current liability, or vice versa. Ross, Westerfield and Jordan (2003), Fabozzi and Peterson (2003), Ehrhardt and Brigham (2011), and Brigham and Houston (2006) argued that such crucial determinants of working capital requirements can be grouped into two spectrums. The first group includes internal factors, which are determinants that are related to firm-specific characteristics; these may include factors like operating efficiency, operating cycle, production policy, credit policy, growth and expansion, profit level, and nature of the business. The second group includes external factors that are beyond the control of a firm, such as GDP, level of tax rates, technological changes, price level change, and availability of raw material. Once the question of what determines the working capital requirements are addressed, an appropriate working capital policy can be designed that is relevant to the firm, given the various internal and external operating conditions. Tesfay and Batra (2018) and Salawu and Alao (2014) also assured this in their empirical studies.

Tesfay and Batra (2018) stated that most manufacturing companies will fall between the two extreme requirements

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of trading firms and public utilities for their working capital requirements. They further argue that the operating working capital policies of manufacturing firms is totally different from service firms, since the former typically carry substantial inventory levels, while the latter invest almost nothing in inventory. Salawu and Alao (2014) observed the Nigerian experience and asserted that little attention was given to the determinants of working capital management, while financial managers in Nigeria spent most of their time on working capital management. There is scant empirical evidence on the factors determining working capital management in the manufacturing sector of the Nigerian economy. Tesfay and Batra (2018) claimed that a number of studies were conducted to examine the determinants of working capital management and provided mixed results. For example, according to Afza and Nazir (2007), operating cycle, leverage, ROA, and Tobin's Q are the internal factors that significantly influence working capital management. It is also found to differ among industries. However, no relationship was found between the level of economic activity, size of the firm, and sales growth, and working capital management.

However, Moussawi et al. (2006) indicated that firm size and growth opportunities influence working capital management, but not by industry. Uyar (2009) found a negative significant relationship between firm size and working capital management. Lyroudi and Lazardis (2000), however, found no significant relationship between Cash Conversion Cycle (CCC) and leverage and firm size. Tesfay and Batra (2018) further stated that although working capital management is an important aspect of the management of a firm, like the case of Nigeria mentioned by Salawu and Alao (2014), study in this area, in the context of Ethiopian companies, is scant. The few studies done on working capital management focussed on investigating the effects of working capital management on profitability. However, there are no studies that investigated the determinants of working capital management in Ethiopian firms. This research is therefore designed to fill these two major gaps in this area. These are conflicting outcomes in prior researches in developed economies, as well as lack of research in developing economies. Hence, this study will contribute to the finance knowledge base, contributing recorded evidence from the point of view of developing economies.

Review of Literature

The management of working capital affects profitability and liquidity of firms. A good working capital management practice requires the planning and controlling of the current assets used by a firm. Underlying sound working capital management lie two fundamental decision issues for the firm. The first is the decision on the optimal level and appropriate type of current assets that the firm has to carry. The second is the appropriate mix of short-term and long-term financing used to support this investment in the various types of currents assets required by a firm (Van Horne & Wachowicz, 2009; Brigham & Houston, 2006).

As discussed by Nazir and Afza (2009), when the working capital requirements are not properly determined and are allocated more than required, it results in inefficiency and reduces the benefits of short-term investments. On the other hand, if the working capital is too low, the firm may lose a lot of profitable investment opportunities or suffer short-term liquidity crisis, which leads to the degradation of company credit, as it cannot respond effectively to temporary capital requirements. There may be many internal and external factors that may induce the firms to strike a balance between meeting unforeseen capital requirements and avoiding inefficient management of capital. Therefore, the various external and internal factors that determine the working capital requirements of a firm should be identified and considered while designing and implementing working capital policy.

Nazir and Afza (2009) investigated the working capital requirements and the determining factors on a sample of 132 non-financial Pakistani firms from 14 industrial groups that were listed on the Karachi Stock Exchange between the period 2004 and 2007. They classify the factors into two categories: internal and external. The study considered operating cycle, ROA, operating cash flows, leverage, size, Tobin's q, and growth as internal firm specific factors, and industry dummy and level of economic activity as external macroeconomic factors. The study found that the internal factors operating cycle, leverage, ROA, and Tobin's q affect the working capital requirements significantly. The types of industry where the firms are operating are related to the working capital management practices, and different industries are following different working capital requirements.

Gill (2011) determined factors that influence working capital requirements using a sample of 166 Canadian firms listed on the Toronto Stock Exchange for a period of three years, from 2008-2010. The study found that operating cycle, leverage, return on assets, and Tobin's q are the internal factors that affect the working capital requirements significantly. Overall, the results of the study indicate that operating cycle (OC), return on assets (ROA), internationalisation of firm, firm's growth, and firm size influence the working capital requirements (WCR) in Canada. Particularly, the study found that OC, ROA, leverage, internationalisation of the firm, Tobin's q, and firm size affect the working capital requirements of firms in the Canadian manufacturing industry, whereas OC, ROA, sales growth, and firm size affect the WCR in the Canadian service industry. The researcher also states that since working capital requirements and the management of working capital differ from industry-to-industry and from country-to-country, careful analysis has to be performed before investing in debt and equity securities.

Suleiman and Rasha (2013) investigated the determinants of working capital requirements in Palestinian Industrial Corporations using a sample of 11 industrial firms over eight years, for the period 2004-2011, that are listed on the Palestine Securities Exchange to determine working capital requirements. Suleiman and Rasha used working capital as the dependent variable, and some macro-economic variables, such as cash conversion cycle, operating cash flow, leverage, firm size, return on assets, interest rate on loans and advances, and economic growth rate, as exogenous variables. The study found that the cash conversion cycle, return on assets, and operating cash flow are positive and significant determinants of working capital requirements, while leverage and firm size are significant but negatively related to the working capital requirements. On the other hand, economic variables such as the real GDP growth rate and interest rate have no significant impact on the working capital requirements. In addition, it was found that firms in Palestine maintain a sizable working capital, which may be due to a long cash conversion cycle (over six months) and conservative policies due to instable economic and political conditions.

Taleb, Zoued and Shubiri (2010) identified determinants of effective working capital management policy in the case of 82 industrial firms in Jordan for the period 2005 to 2007. The dependent variable was the working capital management measured by net working capital. The study considered two types of determinants as internal and external in the model. The internal determinants, operating cycle, operating cash flow, level of economic activity in the country, firm growth, return on assets, Tobin's *q,* leverage, and firm size, were independent variables in the study, whereas gross domestic product was included in the model as an external determinant. The panel multiple regression model of this study found that firm growth, return on assets, and leverage were found to be positive and significant determinants of working capital requirement.

Wasiuzzaman and Arumugam (2013) examined the determinants of working capital investment of 192 firms in Malaysia, spanning a period of eight years, from 2000-2007. Wasiuzzaman and Arumugam considered corporate governance, financial, and economic variables to identify the determinants of working capital requirements. These include leverage, growth opportunity, asymmetric information, size/access to capital market, assets tangibility, revenue volatility, age profitability, operating cash flow, board size, board independence, and economic condition.

By using ordinary least squares in estimating the model, they found that during economic expansion, younger and smaller firms that have less tangible assets, low leverage, high immediate sales growth, high operating cash flow, less volatile revenues, and low levels of asymmetric information, are likely to have the highest investments in operating working capital. Board characteristics, viz. size and independence of the board, were not found to have any significant effect on the working capital investment of firms.

Despite a sizeable amount of the time and money invested in the different components of the working capital, with a view to maximise firms' profitability, prospects, and prosperity with reasonable risk, such influence has not attracted the attention of researchers adequately, as attested by the limited literature in developing countries in general, and in Ethiopia, in particular. And those studies that have been undertaken in the area have focussed on small and micro scale aspects through use of secondary data, in view of establishing a relationship between working capital management and profitability.

However, to contribute a lot to the profit and wealth maximisation goal, the practice is so crucial. Ross et al. (2003) discussed that profitability is the result of different practices and policies. To the extent of the existing body of knowledge, only few studies, like those conducted by Derese and Abiy (n.d), surveyed the working capital management practices in the case of business enterprises of Jimma town in Ethiopia. Therefore, it is essential to ask what factors determine the working capital requirements of companies, to design sound working capital policy that is desirable for companies.

Determinants of Working Capital and Testable Hypotheses

Van Horne and Wachowicz (2009) argue that one of the underling objectives of working capital management is the determination of the optimal level of investment in current assets. To do so, it is necessary to identify the factors that determine the level of working capital requirements. Firms should keep an optimal level of working capital, which is neither inadequate nor excessive. On one hand, keeping an inadequate level of working capital exposes firms to liquidity risk, which is an early sign of bankruptcy and ultimate death. Inadequacy also leads to loss of sales, which consequently results in loss in profit that could come out of possible sales. On the other hand, if firms keep an excessive level of working capital, it might reduce the risk of liquidity, but such excessive level of inventory results in the incurrence of opportunity cost on the money tied up on working capital and loss in possible profit if the money had been invested in some other returnable investment. As such, the level of working capital directly affects liquidity and profitability of firms. Hence, an optimal level of working capital should be maintained by firms, which otherwise would turn firms insolvent and accelerate the probability of bankruptcy. Hence it would be important to identify and consider the major factors that affect the working capital requirements of manufacturing companies in Ethiopia. Thus, this objective aimed at identifying the major factors to be considered while working capital policy is designed, which encompasses the decision as to the level of working capital to be maintained.

The need for holding working capital is inevitable for different reasons, such as transaction, speculative, or precautionary motives. The level of working capital to be maintained by companies can be affected by many macro and micro factors, which may include, among others, price level change, operating efficiency, production cycle, production policy, business cycle, credit policy, growth and expansion, availability of raw material, profit level, level of tax rates, and nature of the business. Therefore, in light of the above research objective, the following statements of supposition can be made related to the determinants of firms' working capital requirements.

Operating Cash Flow (OCF) and Working Capital Requirement (WCR)

Positive operating cash flow enables firms to finance positive working capital requirements, permitting a more conservative working capital strategy, thereby facilitating future sales growth; however, firms with negative operating cash flows must finance positive working capital requirements through other sources (Suleiman & Rasha, 2013). On the one hand, Hill et al. (2010), Fazzari and Petersen (1993), and Baños-Caballero et al. (2014) argued that a greater capacity to generate cash results in a higher amount of cash and short-term investments that in turn allow a company to pursue conservative strategies by investing more on the working capital; however, firms with negative operating cash flow will need to finance their working capital requirement through other sources. On the other hand, higher cash flow results in leniency in terms of pay operation-related liabilities and accelerated collection of accounts receivables, thus resulting in lower working capital requirements. Gill (2011), Wasiuzzaman and Arumugam (2013), and Suleiman and Rasha (2013) found operating cash flow to be a positive and significant determinant of working capital requirement. While Nazir and Afza (2009) and Taleb et al. (2010) found the operating cash flow to be a positive, but insignificant determinant of working capital, Gill (2011), in his study, found operating cash flow to be a negative and insignificant determinant of working capital requirement. Thus, the first alternative hypothesis is stated as follows:

H1: Operating cash flow is a significant determinant of working capital requirement of manufacturing companies in Ethiopia.

Operating Cycle (OC) and Working Capital Requirement (WCR)

Fabozzi and Peterson (2003) point out that the firm's operating cycle, which is the time it takes the firm to turn its inventory into cash, affects how much the firm ties up in its current assets. The operating cycle comprises the time it takes to manufacture the goods, sell them, and collect on their sale. The longer the operating cycle of a firm, the larger the investment in current assets, and vice versa. Nazir and Afza (2009) and Gill (2011), in their studies, found that operating cycle was a positive and significant determinant of working capital requirement. Taleb et al. (2010) also found a positive relationship between operating cycle and working capital requirement, though it is not significant. Therefore, on the basis of the above theoretical and empirical review, the second alternative hypothesis is developed as follows:

H2: Operating cycle is a significant determinant of working capital requirement of manufacturing companies in Ethiopia.

Firm Size (FS) and Working Capital Requirement (WCR)

Fabozzi and Peterson (2003) discussed that the type of business and the nature of industry where firms are operating determine the amount of total capital invested in the firm. The total amount of investments are allocated to current assets and fixed assets. Hill et al. (2010), on one hand, argue that larger firms can afford to have relaxed receivables and inventories policies to motivate higher sales levels that would require larger investments in working capital.

On the other hand, since large firms have bargaining power with suppliers and customers, a negative relationship is also possible. Gill (2011), Suleiman and Rasha (2013), and Wasiuzzaman and Arumugam (2013), in their studies, found firm's size to be a negative and significant determinant of working capital requirement. While Nazir and Afza (2009) found a negative and insignificant relationship, Taleb et al. (2010) found a positive and insignificant relationship between firm size and working capital requirement. Given the theoretical and empirical review, the third alternative hypothesis is stated as follows:

H3: Firm size is a significant determinant of working capital requirement of manufacturing companies in Ethiopia.

Firm Growth (FG) and Working Capital Requirement (WCR)

Ross et al. (2003) discussed some factors that affect the level of working capital. Accordingly, one factor is firm's growth and expansion, where a growing firm with a long-term rising level of sales can be thought of as having a total asset need consisting of both the current assets and long-term assets required to run the business efficiently. Taleb et al. (2010) found firm growth to be a positive and significant determinant of working capital. Wasiuzzaman and Arumugam (2013) also reached the same conclusion, though there is a slight measurement difference in firms' growth. While Nazir and Afza (2009) found a positive and insignificant influence, Gill (2011) found growth of firms to be a negative and insignificant determinant of working capital requirement. Thus, the fourth alternative hypothesis is stated as follows:

H4: Growth of firm is a significant determinant of working capital requirement of manufacturing companies in Ethiopia.

Firm Leverage (FL) and Working Capital Requirement (WCR)

Firm leverage is a financial ratio that is used to indicate the relation between the external financing of the firm and its total assets. According to the Pecking Order Theory (Suleiman and Rasha, 2013), a company with short funds will tend to raise capital from inside before issuing new stocks or borrowing money from outside, due to the fact that capital raised via issuance of new securities will have issuing costs in addition to the increased control provided to outsiders.

Nazir and Afza (2009) argue that leverage of a firm is negatively related to the working capital management of a firm, indicating that with a rising debt to total assets ratio, firms are supposed to pay more attention to avoid most of the working capital being tied up in accounts receivables and inventories. So, companies with an increasing debt to total assets ratio (high leverage) show lower working capital requirements. While Nazir and Afza (2009), Wasiuzzaman and Arumugam (2013), and Suleiman and Rasha (2013) found a negative and significant influence of leverage on working capital requirement, Gill (2011) and Taleb et al. (2010) found a positive and significant influence. The results of the study conducted by Baños-Caballero, García-Teruel and Martínez-Solano (2010) showed that leverage has a negative and significant influence on the working capital requirement. The fifth alternative hypothesis is stated as follows:

H5: Firm leverage is a significant determinant of working capital requirement of manufacturing companies in Ethiopia.

Assets Tangibility (AT) and Working Capital Requirement (WCR)

Baños-Caballero et al. (2010) point out two different points of view as to how asset tangibility influences the working capital requirement. That is, on the one hand, a negative relationship is expected because the investment in fixed assets competes with the investment in working capital for the limited funds available. On the other hand, from the point of view of asymmetric information and agency problems, firms with more intangible assets will have higher asymmetric information and agency problems due to difficulty in valuation of intangible assets. Thus, such firms will have higher working capital investment. The result of the studies conducted by Baños-Caballero et al. (2010) and Wasiuzzaman and Arumugam (2013) showed that assets tangibility has a negative and significant influence on the working capital requirement. The sixth alternative hypothesis is stated as follows:

H6: Assets tangibility is a significant determinant of working capital requirement of manufacturing companies in Ethiopia.

Gross Domestic Product (GDP) and Working Capital Requirement (WCR)

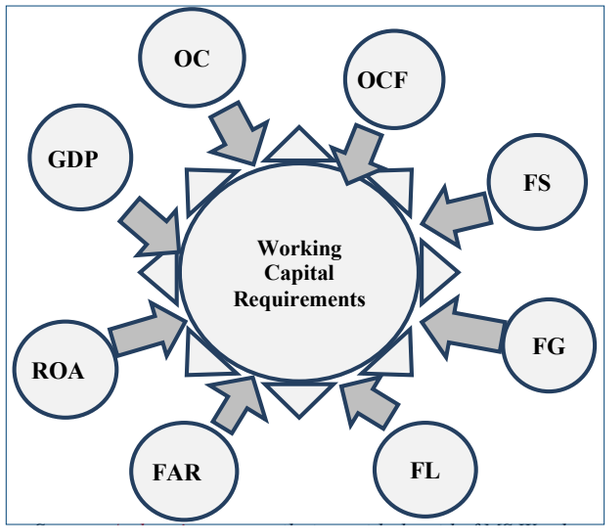
Ross et al. (2003) discussed that seasonal fluctuation or the business cycle, where the sales of a business fluctuates across time on a day-to-day, month-to-month, or otherwise unpredictable basis, in turn affects the working capital requirements. For example, during the boom the business cycle peaks; production will increase and high investment is required in current assets, especially in inventories. During a period of recession, the business cycle dips (valleys) since demand for the product decreases; production will decline, and therefore, the investment working capital becomes low.

Suleiman and Rasha (2013) argue that the changes in economic conditions may have an effect on managing the working capital of the firm more efficiently. The working capital requirement and policy is not static over time; it varies with the changes in the state of the economy. On one hand, Wasiuzzaman and Arumugam (2013) argued that during the periods of recession, it is expected that since the expansion of a company may not run as smoothly as possible and problems may occur in collecting receivables and selling off inventory, it may result in a higher net volume of working capital requirements. On the other hand, Baños-Caballero et al. (2010) argued that during recession, when there are attempts to squeeze out cash from wherever possible, firms try to reduce their working capital cycle. While Wasiuzzaman and Arumugam (2013) found a positive and significant influence of economic condition measured by GDP on the working capital requirement, Suleiman and Rasha (2013) and Taleb et al. (2010) found a positive and insignificant relationship. Manoori and Muhammad (2012), on the other hand, found a negative and significant influence of economic condition measured by GDP on the working capital requirement. Therefore, the direction of influence of economic condition is difficult to hypothesise, as argued by Kwenda and Holden (2014). Given the theoretical and empirical review, the seventh alternative hypothesis is stated as follows:

H7: Economic condition is a determinant factor of working capital requirement of manufacturing companies in Ethiopia.

Conceptual Framework

In order to better see the factors that determine the working capital requirements, it is necessary to make a conceptual framework, which is presented in Fig. 1.



Source: Researchers' own compilation, with the aid of MS Word

Fig. 1: Conceptual Framework of Determinants of Working Capital Requirements

Variables and Measurement

To achieve this objective, the panel multiple regression model was employed using measurable dependent and independent variables, used mainly by Nazir and Afza (2009), Gill (2011), Deoolf (2003), Suleiman and Rasha (2013), and Mongrut, Fuenzalida, Cubillas and Cubillas (2014). In order to determine factors that affect the working capital requirements of manufacturing companies in Ethiopia, dependent and independent variables were identified as follows.

Dependent Variable

The dependent variable of this working capital requirement (WCR) is measured by working capital deflated by total asset, as used by Nazir and Afza (2009), Gill (2011), and Suleiman and Rasha (2013).

$$WCR = \frac{\text{Working Capital}}{\text{Total Assets}} = \frac{\text{Current Assets} - \text{Current Liability}}{\text{Total Assets}}$$

Independent Variables

The independent variables of the study that determine working capital requirement include:

- Operating Cash Flow (OCF): It is the cash that the firm will obtain from its normal course of operations. It is calculated as net cash flow obtained from income statement deflated by total assets.

  Thus, OCF is calculated as:

$$OCF = \frac{\text{Earnings before Interest and Tax} + \text{Depreciation} + \text{Amortisation} - \text{Taxes}}{\text{Total Assets}}$$

- Operating Cycle (OC): It is the time period between the acquisition of inventory and the collection of cash from receivables. This cycle is comprised of two periods: the Average Inventory Period is the time it takes to acquire and sell inventory; the Accounts Receivable Period is the time between sale of inventory and collection of the receivable. Operating Cycle is thus the sum of Accounts Receivable Period and Average Inventory Period, as used by Nazir and Afza (2014), Gill (2011), and Suleiman and Rasha (2013). Thus, OC is measured as:

  OC = Average Inventory Period + Accounts Receivable Period = (Inventory/Cost of Goods Sold)*365 + (Accounts Receivables/Sales)*365

- Firm Size (FS): It measures how big a firm is. Though there are many other measures, this study used the natural logarithm of total sales of the firm to measure firm size, as used by Deloof (2003), Raheman and Nasr (2007), and Mongrut et al. (2014). Therefore, FS is measured as:

  FS = Natural Logarithm of Total Sales = Log (TS)

- Firm Growth (FG): It is firm's sales variability measured by changes in annual sales. Thus, FG is measured as:

$$FG = \frac{\text{Current Year's Sales} - \text{Previous Year's Sales}}{\text{Previous Year's Sales}} = \frac{S_t - S_{t-1}}{S_{t-1}}$$

- Firm Leverage (FL): It is a measure of capital structure. Nazir and Afza (2014) and Gill (2011) used the leverage ratio, which is the ratio of total debt to total assets, as an independent variable in their study, to determine the factors that affect working capital management in Pakistan. Thus, FL can be measured through the following equation:

$$FL = \frac{\text{Total Debt}}{\text{Total Assets}}$$

- Assets Tangibility (AT): It is a financial ratio that is used to measure asset tangibility of firms by Fixed Asset to Total Asset Ratio. Thus, FAR can be used as a proxy for assets tangibility, which is measured through the following equation:

$$\bar{FAR} = \frac{\bar{\text{Fixed Asset}}}{\text{Total Assets}}$$

- Profitability (P): It is one of the most important objectives of firms that can be measured by several indicators such ROE and ROA. Most studies prefer to use ROA to find the efficiency of management in generating profits from the firm's assets (Nazir and Afza, 2009; Gill, 2011; and Suleiman and Rasha, 2013). Thus, ROA as the proxy for profitability is calculated as:

$$ROA = \frac{\text{Net Income}}{\text{Total Assets}}$$

- Real Gross Domestic Product Growth Rate (RGDP): It is one of the reliable estimates of a country's economic growth. RGDP is used as an indicator of economic growth and five years' RGDP of the country is taken from the Annual Report of National Bank of Ethiopia (2014/15).

Research Methodology

Quantitative research of correlational design was appropriate and thus used in order to identify the determinants of working capital requirements of manufacturing companies in Ethiopia.

Sources of Data and Method of Data Collection

In order to address the objectives of the study properly, accurate and reliable secondary data are crucial. Secondary data was collected by obtaining financial statements of manufacturing companies in Ethiopia, from the Ethiopian Revenue and Custom Authority Large Taxpayers Office (LTO), where the sample companies report their financial statement for tax purposes. This was done because it was difficult to secure secondary financial statements, namely income statements and balance sheet, directly from the companies. For one thing, the absence of a stock market makes it tough to obtain financial statements. For another, companies believed that financial statements were confidential, though they were informed that the data would be used only for the sole purpose of research.

Sampling Method and Procedures

Income statement and balance sheet of a sample of 85 manufacturing companies from 10 manufacturing industrial sub-sectors that operate in Addis Ababa, Ethiopia, for the period 2010/11 to 2013/14 (2003 to 2006 Ethiopian fiscal year) were used for several reasons. First, Addis Ababa is the largest and oldest centre of trade and industry, and thus could share the characteristics of other companies located outside Addis Ababa. Second, having a sample from different manufacturing industrial sub-sectors enables one to investigate the study under consideration with a wider spectrum. These industrial sub-sectors include Agro Processing Industry, Chemical and Pharmaceutical Industry, Leather and Leather Product Industry, Metal and Engineering Industry, Non-Metallic Mineral Product Industry, Paper and Paper Product Industry, Rubber and Plastic Industry Textile, Apparel Industry, Wood and Wood Product Industry, and Tobacco Product Manufacturing Industry. Tobacco Product Manufacturing Industry consists of only one company and was excluded from the analysis. Third, from the target manufacturing companies, some companies were excluded either because they were new establishments or were close to bankruptcy, while others had no complete records for the period under study, and did not qualify to provide a minimum of four years' financial statement. Finally, the data after the year 2014/15 were not considered in this study, as significant events occurred in the country, including the declaration of a new financial reporting proclamation to adopt the newly converged international accounting standards in the year 2014, under proclamation number No. 847/2014, and the change in income tax proclamation in the year 2016, under proclamation number No. 979/2016.

The occurrence of such events has significantly changed the way financial statements are prepared and presented, which may have a distortion effect in the data analysis, and thus have been excluded. Therefore, the sample size of 85 companies for the period 2010/11 to 2013/14 was considered, to obtain a sample that would yield a balanced panel data with a total of 340-firm-year wider observation, and to reduce the panel attrition that would have existed had recent years' data been included in the sample.

Method of Data Analysis and Model Specification

Sekaran and Bougie (2010) suggest that before starting the data analysis, some preliminary matters of data cleaning needs to be done, to ensure that the data are accurate, complete, and suitable for further analysis. Based on this, outliers which result in extreme kurtosis and skewness were identified, by looking at the box-whisker in the boxplot plots and observed value in the normal probability plots. Then, the outlier values, detected following the outlier labelling rule of Hoaglin and Iglewicz (1987), were normalised by means of winsorization up to a maximum of 5% and 95% level, as recommended by Hellerstein (2008). In addition, the panel unit root test was done to check whether the variables are stationary or not using the Harris-Tsavalis test. After data collection and cleaning have been finalised, univariate analysis of descriptive statistics, such as measure of central tendency of mean, measure of dispersion within and between variation, minimum value, maximum value, and standard deviation, were used. In addition, a bivariate analysis of correlation was used to see the association between the variables under study, and multivariate analysis of fixed effect panel data econometrics model was employed, as specified below, to identify the determinants of working capital requirement of manufacturing companies in Ethiopia, with the aid of Stata Version 12. Finally, the results were presented using tables, followed by adequate explanation.

$$WCR_{it} = \alpha_i + \beta_1(OCF_{it}) + \beta_2(OC_{it}) + \beta_3(FS_{it}) + \beta_4(FG_{it}) + \beta_5(FL_{it}) + \beta_6(FAR_{it}) + \beta_7(RGDP) + \varepsilon_{it}$$

Where, WCR_{it} = Working Capital Requirement of Firm i for time period t

OC_{it} = Operating Cycle of Firm i for time period t

OCF_{it} = Operating Cash Flow of Firm i for time period t

FS_{it} = Natural Log of Firm's Sales for Firm i for time period t

FG_{it} = Natural Log of Firm's Total Assets for Firm i for time period t

FL_{it} = Financial Leverage Ratio for Firm i for time period t

FAR_{it} = Fixed Asset Ratio for time period t

$RGDP_{it}$ = Natural Log of Firm's Sales for Firm i for time period t

α_i = intercept (individual specific effect)

β_i = coefficients of independent variables

ε_{it} = idiosyncratic error term of the model

i = 1…n

t = 2011...2014

Results and Discussions

The result and discussion part is divided into three sections, presented as follows.

Descriptive Statistics

Table 1 shows the descriptive statistics, such as within and between variations, mean, standard deviation, and minimum and maximum values of the dependent and explanatory variables. As it can be seen from the table, the between variation of all variables are greater than within variation, except for FG and RGDP. Panel A of Table 1 shows the dependent variable; Panel B contains the seven explanatory variables.

Table 1: Descriptive Statistics of Model

Panels	*Variable*	*Variation*	*Mean*	*Std. Dev.*	*Min*	*Max*	*Obs*
A	WCR	Overall	0.393	0.245	−0.430	0.840	N = 340
		Between		0.211	−0.290	0.728	n = 85
		Within		0.125	−0.049	0.773	T = 4
B	ROA	Overall	0.104	0.112	−0.2	0.48	N = 340
		Between		0.093	−0.086	0.385	n = 85
		Within		0.064	−0.099	0.569	T = 4
	OCF	Overall	0.127	0.110	−0.170	0.500	N = 340
		Between		0.090	−0.035	0.405	n = 85
		Within		0.063	−0.068	0.582	T = 4
	OC	Overall	206.226	131.910	0.000	615.000	N = 340
		Between		108.593	7.085	615.000	n = 85
		Within		75.580	−47.452	520.848	T = 4
	FS	Overall	7.975	0.414	6.470	9.230	N =340
		Between		0.371	7.195	9.230	n = 85
		Within		0.187	7.100	8.860	T = 4
	FG	Overall	0.394	0.549	−0.940	1.750	N = 340
		Between		0.262	−0.008	1.248	n = 85
		Within		0.483	−1.186	1.804	T = 4
	FL	Overall	0.470	0.247	0.040	0.970	N = 340
		Between		0.217	0.063	0.905	n = 85
		Within		0.120	−0.055	0.908	T = 4

Panels	Variable	Variation	Mean	Std. Dev.	Min	Max	Obs
	FAR	Overall	0.279	0.177	0.000	0.830	N = 340
		Between		0.147	0.030	0.723	n = 85
		Within		0.099	−0.051	0.749	T = 4
	RGDP	Overall	10.075	0.967	8.700	11.400	N = 340
		Between		0.000	10.075	10.075	n = 85
		Within		0.967	8.700	11.400	T = 4

Variables are defined as follows: Working Capital Requirement (WCR), Return on Assets (ROA), Operating Cash Flow (OCF), Operating Cycle (OC), Firm Size (FS), Firm Growth (FG), Firm's Leverage (FL), Fixed Assets to Total Assets Ratio (FAR), and Real Gross Domestic Product Growth Rate (RGDP).
Source: Researchers' Own Compilation, with the aid of Stata V.12.

Dependent Variable

Panel A of Table 1 presents the descriptive statistics for the dependent variables, which is the working capital requirement of the sample manufacturing companies. The working capital requirements variable has a mean value of 0.393, with a standard deviation of .245. The positive mean value indicates that 0.393 cents are tied in the net working capital of manufacturing companies, which also means that companies employed a relatively conservative policy in managing their working capital.

Independent Variables

Panel B of Table 1 shows the descriptive statistics of eight determinants of working capital requirement, which are the explanatory variables. The return on assets (ROA) has a mean value of 0.104, which indicates that manufacturing companies are earning about 10.4% rate or return on invested assets, with a standard deviation of 0.112. The operating cash flow (OCF) has a mean value of 0.127, which indicates that the cash flow of the manufacturing companies is 12.7% of the total assets, with a standard deviation of 0.110. The minimum value of operating cash flow is −0.170, which indicates that manufacturing companies are losing 0.170.

The operating cycle (OC) has a mean value of 206.226, which indicates that the average number of operating cycle is about 206 days, with a standard deviation and range of 131.91 and 615, respectively. The firm size (FS) has a mean value of 7.975, with a standard deviation of 0.414 and a range of 2.76. The mean value of firm's growth (FG) is 0.394, which shows that the growth rate in sales is 39.4%, with a standard deviation of 0.549. The mean value of firms' leverage (FL) is 0.457, which indicates that 47% of the firms' financing is funded with debt, with a standard deviation of 0.247. The average value of fixed assets to total assets ratio (FAR) is 0.279, which indicates that 27.9% of total assets of manufacturing companies is occupied with tangible assets, with a standard deviation of 0.177. The average real gross domestic product growth rate (RGDP) is 10.075%, with a standard deviation of 0.967.

Correlation Analysis

This section presents the correlation analysis, which is important to address two purposes. The first is to see the association between the dependent variable, WCR, and the independent variables of the seven determinants, using Pearson's correlation coefficient. The second is to detect the multicollinearity between the explanatory variables. Table 2 presents the Pearson correlation coefficient among the dependent variable and explanatory variables, with their significance levels at 0.10 or less. The result of Pearson's correlation shows that working capital requirement (WCR) correlates positively and significantly with ROA, OCF, and OC, whereas it has a negative and significant correlation with FL and FAR.

Table 2: Pearson's Correlation Matrix of Model

	WCR	*ROA*	*OCF*	*OC*	*FS*	*FG*	*FL*	*FAR*	*RGDP*
WCR	1								
ROA	0.162***	1							
OCF	0.165***	0.979***	1						
OC	0.141***	−0.226***	−0.247***	1					
FS	0.044	0.138**	0.171***	−0.279***	1				
FG	−0.029	0.037	0.058	−0.229***	0.038	1			
FL	−0.293***	−0.136**	−0.068	0.120**	0.008	−0.015	1		
FAR	−0.457***	−0.355***	−0.344***	−0.148***	0.053	0.067	−0.068	1	
RGDP	−0.077	−0.055	−0.051	0.067	−0.119***	0.030	−0.008	0.004	1

Legend: *, **, and *** denote significant levels at 10%, 5%, and 1%, respectively.
Source: Researchers' Own Compilation, with the aid of Stata V.12.

Fixed Effect Model and Post Estimation

This section presents the results of the model and the related post estimation.

Panel Unit Root Test Result

Harris-Tsavalis test and Fisher-type panel unit root test were employed for the variables considered in the study, to avoid spurious regression results. The Harris-Tsavalis test is appropriate in cases where the panel exceeds the time series, and the result of both tests was significant at 1% level of significance, rejecting the null hypothesis that states 'panels contain unit roots'. Consequently, the study concluded that all variables under consideration did not have unit root and were therefore used in levels instead of their first difference or other remedies.

Multicollinearity Test of Model

In order to see whether there is multicollinearity problem in the explanatory variable, two procedures were followed. The first is the correlation matrix in Table 2, which shows that the correlation coefficient between the explanatory variables ranges between a value of −0.355 and 0.171, which indicates the absence of multicollinearity. The correlations among the independent variables suggest that multicollinearity should not be a problem in the panel data regression analysis, since the coefficient values are well below the limit prescribed by Field (2005). However, the 0.979 strong positive and significant correlations between ROA and OCF is an indication of multicollinearity and the ROA was excluded in the final model.

Variance inflation factor (VIF) was also used to detect collinearity between the explanatory variables, and if ROA is included in the model, the VIF value for ROA and OCF become 28.54 and 28.96, respectively. Since both the correlation and VIF detect high degree of collinearity between ROA and OCF, a decision was made to exclude ROA from the model. After the exclusion of the collinear variable, the model results in individual variance inflation factors of less than 1.5, which indicates that there is no multicollinearity (see Table 3). The overall mean value of VIF is 1.14.

Table 3: Variance Inflation Factor for Model

	OCF	*OC*	*FAR*	*FSS*	*FG*	*RGDP*	*FL*	*Mean VIF*
VIF	1.29	1.27	1.23	1.12	1.06	1.02	1.02	1.14
Tolerance	0.774	0.788	0.813	0.895	0.943	0.976	0.980	

Source: Researchers' Own Compilation, with the aid of Stata V.12.

Hausman Specification Test of Model

In order to select from the two individual effect panel regression model multiples, the Hausman specification test was used; the fixed effect (FE) model was found to be the preferred model in the determination of working capital requirements of manufacturing companies in Ethiopia, since the result of the Hausman test has chi2

value of 23.53 and p-value of 0.0014, which is significant at 1% level (see Table 4).

Table 4: Hausman Test for Model

b = consistent under Ho and Ha; obtained from xtreg B = inconsistent under Ha, efficient under Ho; obtained from xtreg Test: Ho: difference in coefficients not systematic	
chi2 (7)	23.53
Prob > chi2	0.0014

Source: Researchers' Own Compilation, with the aid of Stata V.12.

Following the adoption of fixed effect model, except return on equity that is collinear with OCF, all explanatory variables were incorporated in the model, where all are individual invariant variables (Table 1) that can be used in the fixed effect model (Baum, 2006).

Heteroscedasticity Test Results of Model

In order to check the assumption of homoscedasticity, a modified Wald test was used. The results of the modified Wald test has chi2 value of 2.1e+05 and p-value of 0.0000, which is significant at l%; this result indicates that the residuals of the fixed effect model were not constant (see Table 5).

Table 5: Modified Wald Test for Heteroscedasticity

Modified Wald test for group-wise heteroscedasticity in fixed effect regression H0: sigma(i)^2 = sigma^2 for all i	
chi2 (85)	2.2e+05
Prob > chi2	0.0000

Source: Researchers' Own Compilation, with the aid of Stata V.12.

Serial Correlation Test Results of Model

In order to test serial correlation, heteroscedasticity-robust test statistic for serial correlation for fixed effect was employed Born and Breitung (2016), and the result from the test showed HR-stat of 0.80 and corresponding p-value of 0.425, which was insignificant, indicating that there was no first order autocorrelation in the panel data (see Table 6).

Table 6: HR-Test for Serial Correlation

Heteroscedasticity-robust Born and Breitung (2016) HR-test as post estimation			
Variable	HR-stat p-value	N maxT	balance?
Post Estimation	0.80 0.425	85 4	balanced

Source: Researchers' Own Compilation, with the aid of Stata V.12.

Cross-Sectional Dependence Test Result of Model

In order to test the cross-sectional dependence in panel data, it was necessary to employ pesaran cross-sectional dependence test. The result of the pesaran test of cross-sectional independence was insignificant, which entails that there is no cross-sectional dependence in the cross-sections in the panel data (see Table 7).

Table 7: Results for Pesaran Cross-Sectional Dependence Test of Model 1

Details	*Value*	
Pesaran's test of cross-sectional independence	−1.392	Pr = 0.1635
Average absolute value of the off-diagonal elements	0.515	

Source: Researchers' Own Compilation, with the aid of Stata V.12.

As such, after running the relevant diagnostic tests in the fixed effect, the assumption of no multicollinearity, no serial correlation, and cross-sectional independence were satisfied; however, the assumption of constant variance (homoscedasticity) was not fulfilled. As a result, robust standard error was employed in fixed effect, as recommended by Hoechle (2007), Wooldridge (2002), and Gujarati (2004). Heteroscedasticity can be corrected either by using White's heteroscedastic consistent covariance matrix estimation or using robust standard error (Wooldridge, 2002; Gujarati, 2004).

Because of the presence of heteroscedasticity, the decision to employ robust standard error was necessary, so that heteroscedasticity in the panel data can be controlled in the model. Therefore, fixed effect model was estimated with robust standard error, to account for heteroscedasticity.

Panel Model Multiple Regression of Model

The result presented in Table 9 is a robust fixed effect regression, which was finally employed, as specified by the Hausman test and other relevant diagnostic tests. The result on determinants of working capital showed that while operating cycle (OC) and firm size (FS) show a positive and significant influence on working capital requirement, fixed assets ratio (FAR) and real gross domestic product (RGDP) have a negative and statistically significant influence on working capital requirement.

However, the study is unable to find any statistically significant influence by the other variables, such as operating cash flow (OCF), financial leverage (FL), and firm growth (FG), on working capital requirement. The empirical result is presented in Table 8.

Table 8: Empirical Results for Model

Fixed Effect Model (Robust)				
WCR	*Coefficient*	*Robust Std. Err.*	*t*	*P > t*
OCF	0.0143		0.080	0.935
OC	0.0005		2.760	0.007***
FS	0.1582		2.780	0.007***
FG	0.0168		0.790	0.431
FL	0.0041		0.050	0.959
FAR	−0.4478		−4.590	0.000***
RGDP	−0.0128		−2.030	0.046**
Constant	−0.7176		−1.420	0.160
sigma_u	0.1938			
sigma_e	0.1285			
rho	0.6946			
F-Test (7, 84)	= 8.22	Prob > F = 0.0000w		
R-sqr Within	0.2256			
R-sqr Between	0.1623			
R-sqr Overall	0.1781			
N	340			

Legend: *, **, and *** denote significant levels at 10%, 5%, and 1%, respectively.
Source: Researchers' Own Compilation, with the aid of Stata V.12.

Empirical Results and Discussion of Model

As indicated in Table 8, the F-statistics (7, 84) is 8.22, which shows the fitness of the model at 1% level of significance. The R-sqr shows that the fixed effect estimator explained 22.56% within variation, which indicates that 22.56% variation in WCR is explained by the model. The rho in the model is 69.5%, which indicates that the proportion is explained by the individual company's specific terms, and the rest is due to idiosyncratic error.

With respect to the result of variables as to their direction, magnitude, and significance in the model, the coefficient of operating cycle (OC), which was used to measure the working capital management efficiency of firms, is positive (0.0005) and statistically significant at 1% level of significance to influence the working capital requirement. This indicates that the higher the days in operating cycle, the higher the working capital requirement, and vice versa. More specifically, a one day increase in the operating cycle above the average of a manufacturing company leads to an increase of 0.0005 cents in the working capital necessity. The implication of this result is that the operating cycle of the manufacturing companies has to be optimised if they have to reduce investment in working capital and capitalise in some profitable projects.

This finding is consistent with the results of Nazir and Afza (2009), Gill (2011), and Akinlo (2012).

The coefficient of firm size (FS), which was used to measure the size of companies, is positive (0.1582) and statistically significant at 1% level of significance to influence the working capital requirement. This indicates that the larger the companies, the higher their working capital requirement. This is because large companies have a larger volume of sales motivated by liberal credit policy, and hold more inventories (Hill et al., 2010; Moussawi et al., 2006). Niskanen and Niskanen (2006) also depict that firms with a larger size have better access to the financial markets, which gives them the ability to extend more trade credits, which in turn enables them to possess more investment in working capital. The findings of this study are consistent with Moussawi et al. (2006), Hill et al. (2010), and Marobhe (2015); however, it contradicts the results of Gill (2011) and Wasiuzzaman and Arumugam (2013).

The coefficient of fixed assets ratio (FAR), which was used to measure the assets tangibility of companies, is negative (−0.449) and statistically significant at 1% level of significance to influence the working capital requirement. This indicates that the higher the fixed assets ratio (FAR), the lesser the working capital requirement, and vice versa. More specifically, a one percent increase in fixed assets ratio (FAR) above the average of a manufacturing company leads to a 0.4478 cents reduction in the working capital. This may be because of the fact that investment in fixed assets competes with the investment in working capital for the limited funds available or capital rationing constraint. The findings of this study are consistent with the results of studies by Baños-Caballero et al. (2010) and Wasiuzzaman and Arumugam (2013), who found that assets tangibility has a negative and significant influence on the working capital requirement.

The coefficient of real gross domestic product (RGDP), which was used to measure the general economic activity of the country within which the sample manufacturing companies were operating, is negative (−0.0128) and statistically significant at 5% level of significance to influence the working capital requirement. This indicates that the higher the real gross domestic product (RGDP), the lesser the working capital requirement, and vice versa. The implication of the result is that during the periods of recession, the expansion of manufacturing companies may not run as smoothly as possible, and problems may occur in collecting receivables and selling off inventory, which in turn results in a higher net volume of working capital requirements (Wasiuzzaman & Arumugam, 2013). The findings of this study are consistent with those of Manoori and Muhammad (2012), who found a negative and significant influence of economic condition measured by GDP on the working capital requirement.

Hypotheses Testing of Model

Regarding the hypotheses, the researcher concluded the following points on the basis of the findings of this study presented in the result and discussion section of model one, which is the determinants of working capital. The first hypothesis (H1), which states that operating cash flow (OCF) influences the working capital requirement, is rejected, as there was no statistical evidence to support it.

The second hypothesis (H2), which states that operating cycle (OC) determines the working capital requirement, is supported, since the coefficient was positive and statistically significant at 1%. The third hypothesis (H3), which states that firm size (FS) determines the working capital requirement, is supported, since the coefficient was positive and statistically significant at 1%. The fourth hypothesis (H4), which states that firm growth (FG) determines the working capital requirement, is rejected, as there was no statistical evidence to support it. The fifth hypothesis (H5), which states that firm leverage (FL) determines the working capital requirement, is rejected, as there was no statistical evidence to support it. The sixth hypothesis (H6), which states that fixed asset ratio (FAR) determines the working capital requirement, is supported, since the coefficient was negative and statistically significant at 1%, and even at 0.1%. The final hypothesis in the determinant of working capital requirement, the seventh hypothesis (H7), which states that real gross domestic product (RGDP) determines the working capital requirement, is supported, since the coefficient was negative and statistically significant at 5%.

Conclusions and Managerial Implications

The paper employed quantitative analysis of correlational research design in identifying the determinants of working capital requirement of manufacturing companies in Ethiopia. The study found a positive and significant relationship between operating cycle (OC) and working

capital requirement (WCR), which implies that finance managers can increase the level of investment in working capital if the firm's operating cycle is longer.

The positive and significant relationship between firms' size (FS) and working capital requirement (WCR) entails finance managers that larger firms require larger investments in working capital. This is due to the fact that companies with large volume of sales are motivated by liberal credit policy, and holding more inventories would result in large size of working capital. The negative and significant relationship between fixed asset ratio (FAR) and working capital requirement (WCR) indicates that finance managers should keep minimum amount of working capital if the firm has or has to make huge investments in fixed assets, which could be due to capital rationing problem. The negative and significant relationship between real gross domestic product (RGDP) and working capital requirement (WCR) indicates that companies are keeping large size of working capital during the periods of recession, since the expansion of manufacturing companies may not run as smoothly as possible and problems may occur in collecting receivables and selling inventory, which in turn results in a higher net volume of working capital requirements. Therefore, it can be concluded that while operating cycle and firm size have a positive and significant influence on working capital requirement, fixed asset ratio and real gross domestic product have a negative and significant influence on working capital requirement of manufacturing companies in Ethiopia.

Manufacturing companies should keep an optimal level of working capital, which is neither inadequate nor excessive, for efficient utilisation, which would contribute to the operating success and creation of wealth for shareholders, by considering internal and external factors that determine the working capital requirement in general. Specifically, finance managers of manufacturing companies in Ethiopia should consider operating cycle, firm size, fixed asset ratio, and real gross domestic product while setting the working capital requirement that would define the working capital policy, as they are a statistically significant influence on working capital requirement.

Limitation and Future Research Direction

This study has limitations just like any other studies. Since the study focussed on the manufacturing companies, inferences are made only on the companies of manufacturing industrial sub-sectors. Thus, interested researchers can study further in the area by incorporating merchandise and service firms, and investigate how some company-specific issues like board members' characteristics, and other external factors like inflation, affect the working capital requirement.

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