
# Working Capital Management and Firms' profitability: Evidence from Manufacturing S.C. in Addis Ababa, Ethiopia

A Thesis Submitted to the Department of Accounting and Finance to Undertake a Research in Partial Fulfillment of the Requirements for the Master of Science (MSc) Degree in Accounting and Finance

By: Henok Yohanes Nigatu

ADDIS ABABA UNIVERSITY

SCHOOL OF BUSINESS AND ECONOMIC SCIENCE

DEPARTMENT OF ACCOUNTING AND FINANCE

May 2015, ADDIS ABABA

ETHIOPIA

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MSC Thesis Approval Sheet

This is to certify that the thesis entitled, the impact of working capital management on firms' profitability: evidence from manufacturing S.C in Addis Ababa Ethiopia was carried out by Henok Yohanes Nigatu under the supervision of to Habtamu Berhanu (PhD), submitted in partial fulfillment of the requirements for the degree of Master of Science in Accounting and Finance complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

**Approved by:**

Internal examiner:_____ Signature _____Date _____

External examiner:_____Signature _____Date _____

Advisor: Habtamu B. Signature _____Date _____

## Declaration

I, the undersigned, declare that this thesis is my original work and it has never been presented in any university. All sources and materials used for this thesis have been duly acknowledged.

Name: Henok Yohanes Nigatu Signature_____

Place: Addis Ababa University

Date of Submission: May 29, 2015

This master thesis, has been submitted for examination with my approval as thesis

Advisor Name: Habtanu Berhanu (Phd)

Signature_____ Date_____

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Henok Yohannes

## Abstract

*The main purpose of this study is to test empirically the impact of working capital management on profitability .To investigate this relationship between these two, the author collected secondary data from 19 manufacturing share companies in Addis Ababa, Ethiopia for the period of 2010 to 2014.*

*Accounts receivable period, inventory holding period and accounts payable period are used as independent working capital investment policy variables. Moreover, cash conversion cycle and current assets to total assets ratio are used as comprehensive measures of working capital investment policy. On the other hand, current liabilities to total assets ratio is used as measure of working capital financing policy. The regression results show inverse relationship between accounts receivable and inventory holding periods with profitability. However there is statistically insignificant relationship between accounts payable period and profitability. The results also show that there exists significant negative relationship between cash Conversion cycle and profitability of the sampled firms. In addition to that there is significant positive relationship between current assets to total assets ratio and profitability measures has been observed. On the other hand, results show that a significant positive relationship between current liabilities to total assets ratio and profitability.*

*To be profitable, firms must try to keep these numbers of days account receivable and inventory turnover days to minimum level. This also helps to minimal the cash conversion cycle also. Since aggressiveness of working capital management investment policies is inversely related to profitability, and aggressive investment policy positively related with profitability, the financial managers of manufacturing sector should follow conservative investment policy and aggressive financing policy in their working capital management.*

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## Acronyms

**APP** = Accounts Payable Period

**ARP** = Accounts Receivable Period

**CA =** Current Assets

**CATAR**= Current asset total asset ratio

**CCC =** Cash Conversion Cycle

**CLTAR**= Current liability to total asset ratio

**ERCA**= Ethiopian revenues and Customs Authority

**GDP**= gross domestic product

**ICP** = Inventory Conversion Period

**INF**= inflation

**Ln Sales** = Firm Size

**OLS**= Ordinary List Square

**ROA** = Return on Assets

**WC =** Working Capital

**WCM** = Working Capital Management

# CHAPTER ONE: INTRODUCTION

## 1.1. Background of the Study

Working capital refers to the capital that companies use in their daily operations and it consists of companies' current assets and current liabilities, and management of Working capital is the ability to control the current assets and current liabilities in a manner that provides the firm with maximum return on its assets and minimizes payments for its liabilities. Working capital management efficiency is vital especially for manufacturing firms, where a major part of assets is composed of current assets that will directly affect the profitability and liquidity of firms (Raheman & Nasr 2007).

Wang (2002), shin and Soenen (1993), Lazaridis and Tryfonidis (2006), Falope and Ajilore (2009) have shown that working capital management has an effect on profitability of a firm and Proper estimation of working capital is a difficult task for the management because amount of working capital varies across firms over the periods depending upon the nature of business, scale of operation, production cycle, credit policy, availability of raw materials, etc. For this reason significant amount of funds is necessary to invest permanently in the form of various current assets. For instance, due to time lag between sale of goods and their actual realization in cash, adequate amount of working capital is always required to be made available for maintaining the desired level of sale (Blinder & L.J.Maccini, 1991).

The working capital management practices also examine the impact of aggressive/conservative working capital investment and financing policy. Wajahat & Syed (2010), Vishnani S & Shah B (2007) argue that working capital is just an idle resource with a high cost and low benefit associated with it so they advised companies to follow zero working capital policy but such a policy

is very risky because it reduces the liquidity and it might leads to a default. Other researchers support companies to have a working capital policy because they believe that proper management of components of working capital can balance cost and benefits of the company and it will reduce the risk of default by raising the level of liquidity. Companies can choose among three different types of working capital i.e. aggressive, conservative and moderate but their choice depends on their desire level of liquidity and risk.

Investments in current assets are inevitable to ensure delivery of goods or services to the ultimate customers, and a proper management should give the desired impact on profitability. If resources are blocked at different stage of supply chain, this will prolong cash operating cycle. Although this might increase profitability (due to increase sales), it may also adversely affect the profitability if the costs tied up in working capital exceed the benefits of holding more inventory and/or granting more trade credit to customers (Arshad, 2013). Modern Financial management aims at reducing the level of current assets without ignoring the risk of stock outs. Proper working capital management improves firms' profitability and liquidity position, and thus increasing the market value of the firm (Ali, 2011). Liquidity and profitability are two sides of the same coin because they work in opposite directions. Increasing liquidity of the firm will reduce profitability of the firm and vice versa. Therefore finance managers need to maintain a level of working capital that will ensure liquidity of the firm but not reduce its profitability.

## 1.2. Statement of the Problem

Every firm is required to maintain a balance between profitability and liquidity while conducting its day to day operations. As inadequate amount of working capital impairs a firm's liquidity, holding of excess working capital results in the reduction of the profitability.

Working capital management concerned with two decision areas: Determination of appropriate level of investment in current assets and decisions as to what method of financing to use and to obtain funds for this investment. They are part of investment and financing decisions respectively.

Pass and Pike (1987) emphasized that short term finance area particularly working capital management was given very less attention in contrast to long term investment even if it played a very vital and important role in the growth of firm and in enhancement of profitability. Deficiency in the planning and control of working capital management is one of the main causes of business failure and it is a neglected subject which has been too little investigated or written about. The two main objectives need to be satisfied by working capital management is liquidity and profitability but there should be a trade-off / balance between these two objectives.

In Ethiopia many private and public manufacturing sectors do not carrying out working capital management practices due to obsolete business process and structure of the company. As a result there is a huge deficiency problem in manufacturing sector Samuel & Tarekegn (2011. Therefore; firms related to this sector are the target respondents for measuring the perception and the application of these practices.

These industries are the main contributors towards economy, According to World Bank report (2009), In 2013/14 the share of the manufacturing sector to the GDP is 14% and share of manufacturing companies to the employment is 7% and also it contributes more than 3.8% for trade balance.

In comparison to the globe working capital management practices in Ethiopia are still immature. If manufacturing sector in Ethiopia adopts comprehensive working capital management, this would be directly affecting profit and value maximization of the organization. (Ephrem, 2011)

To the best of researcher's knowledge, no research has been done in case of working capital management and profitability of manufacturing share companies in Addis Ababa. Thus the researcher will conduct this study with the aim of providing the following basic research objective:

## 1.3. Objectives of the Study

### 1.3.1. General Objective

The main objective of the study is to examine the relationship between working capital Management and profitability of manufacturing firms.

### 1.3.2. Specific Objectives

To achieve the general objective, the following specific objectives will be used:

- To analyze the effect of receivable management on firms performance
- To examine the impact of payable management on firms performance.
- To evaluate the effect of inventory management on firms performance
- To evaluate the effect of cash conversion cycle management on firms performance
- To examine the effect of working capital investment policy on firms' profitability.
- To determine the effect of working capital financing policy on firms' profitability.

## 1.4. Research Hypotheses

Hypotheses 1,2,3,4 and 5 are used to examine the effect of working capital investment policy on firms' profitability (hypothesis 4 and 5 used as a comprehensive measurement of working capital management), whereas hypothesis 6 is used to determine the effect of working capital financing policy on firms' profitability.

**H1:** There is significant and negative relationship between Average Collection Period (ACP) and Profitability of the firm.
**H2:** There is significant negative relationship between Inventory Conversion Period (ICP) and Profitability of the firm.
**H3:** There is significant positive relationship between Average Payment Period (APP) and Profitability of the firm.
**H4:** There is significant negative relationship between Cash Conversion Cycle (CCC) and Profitability of the firm.
**H5**: There is strong negative relationship between current assets to total assets ratio and profitability of firms.
**H6**: There is significant positive relationship between current liabilities to total assets ratio and profitability of firms.

## 1.5. Research methodology

To understand how working capital should be managed by manufacturing share companies the hypothesis from 1 to 6 needs to be tested. In this study Quantitative methods approach will used to meet the objective of the study and to test research hypotheses under it. This approach enabled to see the impact of working capital management on profitability of manufacturing firms. The panel data ordinary least square/OLS regression model has been used for the sample of nineteen manufacturing firms having at least five year experience. Structured document survey used to collect the necessary data from audited

financial statements of each manufacturing firms. And the data were analyzed by using E-views 6 software package.

## 1.6. Significance of the Study

The outcomes and results of the study will have potential value to manufacturing firm to understand the effect of working capital management on the profitability of the firm. In addition, the study will have vital use for policy makers to consider the identified factor and to take corrective measure that promote manufacturing sector.

The focus of this study is on an industry in a distinct nature of operation which process is the most important driver for work in progress inventory and finished goods. Additionally Manufacturing sector is one of the majors sectors in Ethiopia, It needs due consideration regarding the management of assets and liabilities.

Further, the research study will be used as a source of data for other researcher on similar topic and it will create picture to the general public. Besides, it will serve as a base for further research work on which other interested researcher could do a more in-depth analysis or create new research idea.

## 1.7. Scope and Limitations of the study

This study will mainly focus on the impact of working capital management on profitability of the selected manufacturing share companies found in Addis Ababa. In doing so, sample of 19 manufacturing share companies were selected from Addis Ababa and the analysis is done for five years. Therefore the study is limited to manufacturing companies found in Addis Ababa. The location is chosen because there are a lot of firms found in the city than the other part of the country. Because of the specific nature of their activities, firms in financial

sector, banking and finance, insurance, leasing, business services, renting and other services are excluded from the sample. The result of the paper, therefore, is limited to those selected manufacturing share companies in particular and could be generalized to all manufacturing share companies in Ethiopia. The topic needs much time and money to conduct and come up with important conclusions.

## 1.8. Organization of the Study

The tentative organization of the final report of the study will be organized in five chapters. The first chapter will deal with introduction, statement of the problems, objectives of the study, research questions, methods adopted, significance of the study, and scope and limitation of the study. In the second chapter, different literature that relates to the topics of the study will be review and present. In the third chapter, the research design including the population and sampling procedure, data and data collection instrument, data analysis, research method adopted, Choice of Variable and Research Hypothesis, techniques used in data collection and analysis will present. Then, the fourth chapter will discuss the results and analysis of the findings of the study. Finally, the fifth chapter will provide the conclusion and recommendation for the study according to the findings.

# CHAPTER TWO: LITERATURE REVIEW

### Introduction

This chapter deals with the literature regarding working capital management. Structurally, the chapter comprises in to ten sections. Section 2.1and section 2.2 explains An Overview of Overview of Financial management and overview of manufacturing company in Ethiopia respectively. Under section 2.3 and 2.4 Working capital, Working capital management and their roles on firm's profitability has been elaborated. section 2.5 explain the relation between Working capital and liquidity section 2.6 examine different working capital policies 2.7 point out the effect of different industries on working capital In section 2.8 different related literatures summarizes and their result about the effect of Working capital management on profitability presented. Section 2.9 presented the summery and knowledge gap from the reviewed literature presented section 2.10 the conceptual framework has been presented.

## 2.1. An overview of Financial Management

Financial Management is an integral part of the overall management. It is concerned with the duties of the financial managers in the business firm. Effective procurement and efficient uses of finance lead to proper utilization of the finance by the business concern. Finance is the lifeblood of business organization it needs to meet the requirements of the business concern. Each and every business concern maintain adequate amount of financial management for their smooth running of the business and also maintain the business carefully to achieve the goal of the business. (John, T. A., & John, K. 1991).

One of the importance's of financial management is proper use of current asset and current liability that are the most important element of Net Working

capital management. The primary cause of an enterprise's failure is the poor control management of working capital internally among components. Thus, the finance manager of an enterprise must be alert to the level of working capital changes (Brigham, E. F and Houston, J. F. 2003)

From the other point of view, financial management is concerned with raising funds needed to finance the company's asset and activities, allocating those scarce funds between competing uses, and ensuring that those funds are used effectively and efficiently in achieving the company's targets. financial management also include some other aspects such as accounting information system, financial reporting and analysis, fixed asset management, capital structure management (Horne, V.C.1998)

## 2.2. Overview of Manufacturing Companies

Manufacturing is the production of goods for use or sale using machines, tools and labor. It refers to a series of human activities, from handcraft to high tech, but mostly applied to industrial production, in which raw materials are transformed into new products/finished goods on a large scale (CSA, 2012, pp 2).

Manufacturing activity increased as the governments five year plans diversified the economy by encouraging agro industrial activity and by substituting domestically produced goods for imported items in 1957. In 1975, the Derg regime nationalized most of the industries in the country and it was another factor for the sector to remain at its infancy level by discouraging and under - utilization of private investors. In 1984/85 manufacturing and handicrafts is getting encourage and together accounted for 11.4 percent of GDP.

Even if, manufacturing sector in Ethiopia is still in its infancy, its recent growth record has been good. Growth rates in the sector have been around 10

percent per year in recent years. The share of manufacturing has remained essentially unchanged at just 5 percent of GDP over the past decade.

The five-year Growth and Transformation Plan that Ethiopia unveiled in 2010 presents a government-led effort to achieve the country's ambitious development goals by transforming agricultural based economy to industry, from which expansion of manufacturing is its major mission (Fantu Chekol 2001). According to World Bank report (2009), and CSA (2008) In 2013/14 the share of the manufacturing sector to the GDP is 14% and share of manufacturing companies to the employment is 53% and also it contribute more than 12.8% to the economy.

The following are the manufacturing sector classification according to Central Statistical Authority (CSA 2012):

-Manufacture of food products and beverages

-Manufacture of tobacco products

-Manufacture of textiles

-Manufacture of wearing apparel

- Tanning and dressing of leather, manufacture of footwear, luggage and hand bags

-Manufacture of wood and off products of wood and cork except furniture

-Manufacture of paper, paper products and printing materials

-Manufacture of chemicals and chemical products

-Manufacture of rubber and plastic products

-Manufacture of other nonmetallic mineral products,

-Manufacture of basic Iron and steel;

-Manufacture of fabricated metal products except machinery and equipment'

-Manufacture of machinery and equipment not mentioned elsewhere

-Manufacture of motor vehicle, trailers and semi-trailers

-Manufacture of furniture.

## 2.3. Working Capital and Working Capital Management

### 2.3.1. Working Capital

#### *2.3.1.1. Definition of working capital*

According to Bahttacharya (2009) the concept of working capital was perhaps first evolved by Karl Marks1867, though in somewhat different form, and the term he used was "variable capital" meaning outlays for payrolls to advanced workers before the goods they worked on were complete. This 'variable capital' was the wage found remains blocked, in work- in- process along with other operating expenses until it is released through sale of finished goods. Although Marx didn't mention, workers also gave credit to the firm by accepting periodical payment of wages which founded a portion of work-in-process Guthman & Dougall (1948) defined the working capital as current asset minus current liabilities. Net working capital represents the excess of current asset over current liability and in an indicator of the firm's ability to meet its short term financial obligation.

#### *2.3.1.2. Importance of Working Capital*

Just as working capital has several meanings, firms use it in many ways. The first and most critical use of working capital is providing the ongoing investment in short term asset that the company needs to cover its daily expenditures such as payroll, vendor invoices, and inventory purchases. The business also needs working capital for prepaid business costs such as licenses, insurance policies or security deposits.

The second purpose of working capital is addressing seasonal or cyclical financial needs. Since most business doesn't receive prepayment for selling

their goods or services, they need to finance their purchase of row materials, production and sales of goods prior to receiving payments from their customers.

Thirdly, working capital is needed to sustain firm's growth. The firm is expanded not only by investing in new plants or machinery, working capital is also requires to facilitate sales growth. It is because as a business growth, it requires larger investment in inventories, accounts receivable, personnel and other items to increase their sales.

The other use of working capital is to undertake activities, to improve business operations and to remain competitive, such as activities for product development or exploring new markets. In the time of high computation, firms are in need of integrating those activities in to operations on a continuous basis. Consequently, those expenses are more likely to be incurred as small repeated costs rather than as large infrequent investments. Those ongoing investments, accordingly, must be addressed through working capital financing (Seidman 2004).

### 2.3.2. Working Capital Management

#### *2.3.2.1. Definition of Working Capital Management*

Working capital management refers to all the actions and decisions of the management which affects the size and effectiveness of working capital. Working capital management requires special attention in present days when cost of capital is rising and funds are scarce. It has been generally established that the performance / profitability of a firm largely depends upon the manner of its working capital management. If a firm is inefficient in managing working capital, it will not only reduce profitability but may also lead to financial crisis. Both inadequate and excessive working capital is detrimental for a business concern. The excessive working capital can result in idle funds which could be

used for earning profit while the inadequate working capital will interrupt the operations and will also impairs profitability (Chowdhary and Amin, 2007).
In their studies Chen, Wang,C., M., & jin, L. (2009) Defined working capital management as making decision that affect working capital. Also Explained working capital management as the administration of all aspect of current asset and current liabilities, it includes the firms' investment in short term securities, short term assets, inventories and account receivable.

The working capital meets the short-term financial requirements of a business enterprise. It is a trading capital, not retained in the business in a particular form for longer than a year. The money invested in it changes in form and substance during the normal course of business operations. Just as circulation of blood is very necessary in the human body to maintain life, the flow of funds is very necessary to maintain business (Arshad 2013).

#### *2.3.2.2. Importance of Working Capital Management*

Working capital management is very imperative because it affects the firm's risk, profitability and value (Smith 1980). Investment in working capital involves a balance/tradeoff between risk and profitability because investment decision which leads to increase in profitability will be inclined to increase risk and vice versa. Efficiency in working capital management is very important for the manufacturing firms where more than half of the assets are current assets. Efficiency in managing working capital also increases cash flow to the firms which in turn increase the growth opportunities for the firms and return to the shareholders (Blinder and Manccini 1991).

Proper estimation of working capital actually required, is a difficult task for the management because amount of working capital varies across firms over the periods depending upon the nature of business, scale of operation, production cycle, credit policy, availability of raw materials, etc. For this reason efficient amount of funds is necessary to invest permanently in the form of various

current assets. For instance, due to time lag between sale of goods and their actual realization in cash, adequate amount of working capital is always required to be made available for maintaining the desired level of sales. A firm can be very profitable if it can translate cash from operations within the same operating cycle, otherwise the firm would need to borrow to support its continued working capital needs (Cheatham 1989).

Siddiquee and Khan (2009) observed that, firms which are better at managing working capital are found to be able to make counter cyclical moves to build competitive advantage. They are also better at generating fund internally and also face lesser trouble while seeking external sources of financing.

Smith (1979 p.149) contends that the goal of working capital management management is to replenish stocking points in such a way as to minimize the total of all associated cost, and there by enhance profitability of the organization.

Maintaining high inventory levels can reduce the cost of possible interruption occurred during the production process or the cost of business loss due to the product scarcity. It can also reduce supply cost and protect against price fluctuation.

Granting trade credit to customers favors the firm's scales in various ways. Trade credit can incentivize customers to acquire merchandise at times of low demand. And helps firm to strengthen long term relationship with their customers (Smith,M.B & Begmann,E. 1998)

Trade credit received from suppliers is considered as an internal source of financing that compensates the money tied up in the companies' inventories and customer receivables. But there is another opportunity cost associated with early payment discount if available. In fact this cost may exceed 20 percent, depending on the discount percentage and discount period granted

(Blinder & L.J.Maccini 1991). From another aspect, the way Working capital management acts can have a significance impact on both liquidity and profitability of a company (Shin& soenen 1998) companies should make a good balance between these two targets.

## 2.4. Working Capital Policies

Working capital policy can be best described as a strategy which provides the guideline to manage the current assets and current liabilities in such a way that it reduces the risk of default (Brian, 2009). The role of working capital management policies on firm performance and the importance of a tradeoff between liquidity and profitability were investigated by Vishnani and Shah (2007) they provided two basic reasons behind the tradeoff between profitability and liquidity. On the one hand if a firm wanted to take higher risk for higher profits, than it reduced the level of its working capital. On other hand if firm wanted to improve liquidity, it increased the amount of working capital which puts a negative impact on the profitability of firm.

### The Level of Working Capital Policy

**Aggressive policy:** An aggressive policy with regard to the level of investment in working capital means that a company chooses to operate with lower levels of inventory, trade receivables and cash for a given level of activity or sales (Cheatham 1989). According to Gallagher & Joseph (2000) an aggressive policy will increase profitability since less cash will be tied up in current assets, but it will also increase risk because the difference between short term or liquid assets and short term liabilities turns very little. Furthermore few finance managers take even more risk by financing long term asset with short term debts and this approach push the working capital on the negative side. Managers try to enhance the profitability by paying lesser interest rate but this approach can be proved very risky if the short term interest rate fluctuates or the cash inflow is not enough to fulfill the current liabilities.

Such a policy is adopted by the company which is operating in a stable economy and is quite certain about future cash flows. A company with aggressive working capital policy offers short credit period to customers, holds minimal inventory and has a small amount of cash in hand. This policy increases the risk of default because a company might face a lack of resources to meet the short term liabilities but it also gives a high return as the high return is associated with high risk (Vishnani& Shah, 2007).

**Conservative policy:** conservative and more flexible working capital policy for a given level of turnover would be associated with maintaining a larger cash balance, perhaps even investing in short-term securities, offering more generous credit terms to customers and holding higher levels of inventory by using long term debt and equity. Such a policy will give rise to a lower risk of financial problems or inventory problems at the expense of reducing profitability because long term debt offers high interest rate which will increase the cost of financing (Cheatham 1989)

Mostly the companies that are operating in an uncertain environment prefer to adopt such a policy because they are not sure about the future prices, demand and short term interest rate. In such a situation it is better to have a high level of current assets. E.g. helps to keep the higher level of inventory in the stock to meet the sudden rise in demand and to avoid the risk of stoppage in the production. This policy provides the shield against the financial distress created by the lack of funds to meet the short term liability but as we discussed earlier long term debt have high interest rate which will increase the cost of financing. Similarly funds tie up in a business because of generous credit policy of the company also have its opportunity cost. Hence this policy might reduce the profitability and the cost of following this policy might exceed the benefits of the policy (Arnold, 2008).

**A moderate policy:** A moderate policy would trample a middle path between the aggressive and conservative approaches. So, In order to balance the risk

and return these firms are following the moderate approach. This approach is a mixture of defensive working capital policy and aggressive working capital policy. In these approach temporary current assets, assets which appear on the balance sheet for short period will be financed by the short term borrowings and long term debts are used to finance fixed assets and permanent current asset. Thus the follower of this approach finds the moderate level of working capital with moderate risk and return (Siddiquee and Khan 2008).

All three approaches are shows that the working capital policies of a company can be characterized as aggressive, moderate or conservative only by comparing them with the working capital policies of similar companies. There are no absolute benchmarks of what may be regarded as aggressive or otherwise, but these characterizations are useful for analyzing the ways in which individual companies approach the operational problem of working capital management.

## 2.5. Liquidity and Profitability

For number of years maintaining liquidity has been one of the prime goals of the firms and financial managers because, maintaining high or low liquidity affects the profitability of firm in an adverse manner. The profitability and liquidity, both are important goals for any firm, and to forego one goal at the cost of other can create serious problems for the firm. Profitability is a long term goal for any firm because it is required for the survival of the firm and firm will not continue to exist without profits. On the other hand liquidity is relatively shorter term goal which needs to be addressed to protect the firm from bankruptcy (Scharf 1984).

Different authors addressed this issue of maintaining a tradeoff between these two conflicting goals of profitability and liquidity but only gave a general approach to solve the problem. Walker (1964) stated that increased investment

in working capital is associated with decreased risk of inadequate liquidity, risk of lesser inventory for sales and risk of not granting credit for sales and production. Similarly if the firm decreased investment in working capital, it will increase the above mentioned risks. Increased risk also increases profitability of the firm as the decreased investment in working capital can be used for some productive use. Weston and Brigham (1975) also discussed this trade off issue and suggested that investment in working capital should be made till that time marginal return are more than cost of invested capital. And working capital financing should be used instead of long term financing as long as their use does not increase firm's cost of capital. The study conducted by Walker (1964) also encouraged the use of more working capital assets but emphasized on the risk involved as the major determinant of degree of working capital investment.

A research by Smith (1980), Raheman & Nasr, (2007), also states the main purpose of any firm is to maximize profit. But, maintaining liquidity of the firm also is an important objective. The problem is that increasing profits at the cost of liquidity can bring serious problems to the firm. Thus, strategy of firm must maintain a balance between these two objectives of the firms.

First as found by Lazaridis and Tryfonidis (2006) companies may enjoy better pricing when they hold enough cash to purchase from own suppliers and thus they may enhance their profit. So having enough liquidity also affects the profitability of the firm.

Secondly Deloof (2003) has also proved that by minimizing the amount of funds tied up in current assets; firms can reduce financing costs and/or increase the funds available for expansion.

Referring to theory of risk and return, investment with more risk will result to more return. Accordingly, firms with high liquidity of working capital may have low risk then low profitability. On the contrary, firm that has low liquidity of

working capital, facing high risk results to high profitability. The issue here is in managing working capital, firm must take into consideration all the items in both accounts and try to balance the risk and return.

Therefore the profitability liquidity tradeoff is important because if working capital management is not given due considerations then the firms are likely to fail and face bankruptcy (Kargar & Bluementhal 1994). Efficient working capital management involves planning and controlling current assets and current liabilities in a manner that eliminates the risk of inability to meet due short term obligations on the one hand and avoid excessive investment in these assets (Eljelly (2004).

Smith, (1979) emphasized that profitability and liquidity comprised the salient goals of working capital management. Therefore, in the next portion of this chapter, we present the studies specifically on the relationship between working capital management and the profitability of a firm.

## 2.6. Working Capital Management and Profitability

Profitability can be termed as the rate of return on investment, if there is an unjustifiable over investment in working capital then, this would negatively affect the rate of return on investment Vishnani & Shah, (2007). Therefore the basic purpose of managing working capital is controlling of current financial resources of a firm in such a way that a balance is created between profitability of the firm and risk associated with that profitability (Ricci & Vito 2000).

As stated by Siddiquee and Khan (2008) it has been observed that, firms which are better at managing working capital are more profitable. They are also better at generating fund internally and also face lesser trouble while seeking external sources of financing.

Short-term assets and liabilities are important components of total assets and need to be carefully analyzed. Management of these short-term assets and liabilities warrants a careful investigation since the working capital management plays an important role in a firm profitability and risk as well as its value (Smith, 1980).

Recent works of Deloof, (2003); Howorth and Westhead, (2003) and Afza and Nazir, (2008), state that firms try to keep an optimal level of working capital that maximizes their value.

As explained on Dupont model indicates by Brealey et.al (2006), there is a relationship between working capital and profitability of a firm.

Here ROA can be defined as: $\frac{\text{net income}}{\text{sales}} * \frac{\text{sales}}{\text{Total asset}}$

In this formula, net income per sales is usually called net operating profit margin. and sales per total asset the asset turnover. The total asset includes fixed asset and current asset. As defined previously, current asset consist of gross working capital, thus by reducing the amount of capital invested in the working capital, the company can effectively increase their asset turnover ratio, which intern increase ROA.

## 2.7. Industry Effects on Working Capital

According to Mohammad (2011) Proper estimation of working capital actually required is a difficult task for the management because amount of working capital varies across industries over the periods depending upon the nature of industry, scale of operation, production cycle, credit policy, availability of raw materials, etc. as the need and policies vary heavily from industry to industry. Weinraub & visschr (1998) study the different strategy employed by companies to manage their working capital (aggressive, moderate or conservative) across

different industries, their purpose was to find out industries that tend to have aggressive investment and financing strategy.

Moyer, Mcguigan and Kretlow (1995) found that working capital consists of a large portion of a firm's total investment in assets, 40 percent in manufacturing and 50% - 60% in retailing and wholesale industries respectively.

The study conducted by Hawawini,L et.al (1986) studies the investment needed in working capital per industry. They use the working capital requirement as a measure for the investment in working capital. They find significant industry difference in working capital needs. For example airline industry has a negative working capital requirement which means that they actually make money from their investment in working capital.

## 2.8. Empirical Review

In addition to the above theoretical review, an attempt is made on other empirical studies to look into the working capital management and profitability of manufacturing companies in different countries by different researchers.

Empirical results show that ineffective management of working capital is one of the significant factors causing industrial sickness. Modern Financial management aims at reducing the level of current assets without ignoring the risk of stock outs. Efficient management of working capital is thus an important indicator of sound health of an organization which requires reduction of unnecessary blocking of capital in order to bring down the cost of financing (Arshad 2013).

Deloof (2003), Surveyed on Belgian Firms to find out whether the working capital management affects profitability, using correlation and regression tests he found a significant negative relationship between corporate profitability and number of days accounts receivable, inventories and accounts payable of

Belgian firms. On the basis of these he suggested that manager could increase corporate profitability by reducing the number of day's accounts receivable and inventories to a reasonable minimum. The negative relationship between accounts payable and profitability is consistent with the view that less profitable firms wait longer to pay their bills.

Arshad (2013) conducted a study to find out the relationship between working capital management and profitability of Pakistan cement sector. The research adopted quantitative method of research approach to test a research hypothesis. The survey use rations of 21 listed cement companies in Karachi stock exchange during the period of 2004 – 2010. In the study the researcher uses regression analysis to investigate the effect of current ratio, quick ratio, net current assets to total assets ratio, working capital turnover ratio and inventory turnover ratio on firm profitability. The result of study showed that there is significant relationship between working capital management and profitability of the firms, the study also indicate that accounts receivables and inventory periods and account payable period lengthen then the profitability increase. The other variables that have significant effects on firm profitability are quick ratio affecting it negatively. This means that any increases in stock increase profits. The other variables included in the regression model working capital turnover ratio and inventory turnover ratios have no statistically significant effects on firm profitability.

In their study Falope and Ajilore (2009) present empirical evidence about the effects of working capital management on firms' profitability by using secondary data sources from annual reports and financial statements of 50 non-financial firms listed in Nigerian Stock Exchange for the time period 1996-2005. The dependent variable, firms' profitability, was measured by return on assets. The independent variables, number of days of accounts receivable, number of days of inventory, number of days of accounts payable and cash conversion cycle were used to measure working capital management. Size

(defined as logarithm of assets), sales growth, debt and economic cycle (annual GDP growth rate) were also used as control variables. The study utilized panel data econometrics in a pooled regression with fixed effect models, where time-series and cross-sectional observations were combined and estimated. Significant negative relationship was found between profitability and average collection period, inventory turnover in days, average payment period and cash conversion cycle. According to the researchers, a negative relationship between number of days of accounts payable and profitability was consistent with the view that less profitable firms wait longer to pay their bills. In this case, profitability affects the account payables and vice versa. Furthermore, the study found no significant variations in the effects of working capital management between large and small firms. Finally, the researchers were suggested that managers can create value for their shareholders if they manage their working capital in more efficient ways by reducing the number of days of accounts receivable and inventories to a reasonable minimum.

In his study Tufail (2008) investigated the impact of working capital policies on profitability. Return on assets was used as a measure of profitability. Current assets to total assets ratio was used to compute the investment policy of working capital management, and to determine financing policy of working capital management current liabilities to total assets ratio is used. Other variables that are used in the study are quick ratio, debt to equity ratio and size of the firms. Secondary data of 117 textile firms listed on Karachi stock exchange was taken for a period of six years i.e. 2005-2010. Results of the regression analysis show that aggressiveness of working capital management policies is negatively associated with profitability. Moreover liquidity and size of the firm have positive relation profitability whereas debt to equity ratio is negatively correlated with profitability.

Weinraub and Visscher (1998) study the issue of aggressive and conservative working capital policies on 126 industrial firms from 10 diverse industrial

groups by using quarterly data from a period of 1984 to 1993. Their objective was to observe the differences in working capital policies as well as the long-term stability of working capital policies over time. Current assets to total assets ratio and current liabilities to total asset ratio were used as proxies of working capital investment and financing policies respectively. They conclude that significant and negative relationship between industry working capital investment and financing policies. It indicated that when relatively aggressive working capital investment policies were followed, they were balanced by relatively conservative working capital financing policies.

Most of the empirical studies regarding working capital management and profitability relationship support the traditional belief that reducing current assets proportion in total assets, would positively affect the profitability of firm (aggressive policy).

Bhunia (2012) was examines the relationship between the working capital management and profitability of Indian private sector small-medium steel companies. Working capital management and profitability indicators over the period from 2003 to 2010 was modeled as a linear regression system in multiple correlation and regression analysis. The study shows a small relationship between working capital management, including working capital cycle and profitability. Multiple regression tests confirm a lower degree of association between the working capital management and profitability. They conclude that liquidity position has no impact on profitability. The study concluded that there is no association between debt financing and profitability and working capital management and working capital cycle has no impact on profitability.

in his study Padachi (2006) try to analyze the impact of working capital management on firms' performance for a sample of 58 Mauritian Small Manufacturing Firms operating in five major industry groups (food and beverages, leather garments, paper products, prefabricated metal products and

wood furniture) by using panel data analysis for the period 1998 – 2003. The regressions were include the ratio of current liabilities to total assets to measure the degree of aggressive financing policy, with a high ratio being relatively more aggressive. Sales a proxy for size (the natural logarithm of sales), the gearing ratio (financial debt/total assets), the gross working capital turnover ratio (sales/current assets) and the ratio of current assets to total assets were included as control variables in the regressions. The regression results showed that high investment in inventories and receivables is associated with lower profitability.

Pass and Pike (1987) emphasize on short term finance area particularly working capital management which was given very less attention in contrast to long term investment. Working capital management played a very vital and important role in the growth of firm and in enhancement of profitability. In continuation of their work they have discussed that deficiency in the planning and control of working capital management is one of the main causes of business failure and it is a neglected subject which has been all too little investigated or written about.

Mathuva (2010) investigated the impact of working capital management components (average collection period, inventory conversion period, and average payment period) on corporate profitability measured by the net operating profit for a sample of 30 firms listed on Nairobi Stock Exchange (NSE) for the periods 1993 to 2008. Both the pooled OLS and the fixed effects regression models were used. The result of the study shows that (1) there exists a highly significant negative relationship between the time it takes for firms to collect cash from their customers (accounts collection period) and profitability. This means that more profitable firms take the shortest time to collect cash from their customers; (2) there exists a highly significant positive relationship between the period taken to convert inventories into sales (the inventory conversion period) and profitability. This means that firms which maintain

sufficiently high inventory levels reduce costs of possible interruptions in the production process and loss of business due to scarcity of products. This reduces the firm supply costs and protects them against price fluctuations: (3) there exists a highly significant positive relationship between the time it takes the firm to pay its creditors (average payment period) and profitability. This means that the longer a firm takes to pay its creditors, the more profitable it is. Based on the findings, the management of a firm can create value for their shareholders by increasing inventories to a reasonable level, taking long to pay creditors to the optimum level and reducing the cash conversion cycle to its minimum.

The study by Kaddumi (2012) reviled the effect of working capital management on performance. The study utilizing unbalanced data for a sample of 49 Jordanian Industrial corporations listed at Amman Stock Exchange - 2005 to 2009. He used two alternative measures of profitability as proxy for the performance and five proxies for the Working Capital Management. Twenty models panel data cross-sectional time series have been tested by employing two regression models; the Fixed-Effects Model and the Ordinary Least Squares Model. The findings of the study were significantly consistent with the view of the traditional working capital theory. The researcher suggests that working capital management and performance are positively correlated. The regression result also shows that Jordanian industrial firms follow a conservative investing policy and less aggressive financing policy.

In their work, Shin & Soenen (1998) suggested that efficient working capital management was very important for creating value for the shareholders. By using correlation and regression analysis they justified the relationship between the length of net trading cycle, corporate profitability and risk adjusted stock return. They found a strong negative relationship between lengths of the firm's net trading cycle and its profitability. In addition, they found that shorter net trade cycles associated with higher risk.

Lazaridis and Tryfonidis (2006) investigated the relationship between working capital management and corporate profitability using quarterly date of 131 firms listed at Athens Stock Exchange of Greece. Cash conversion cycle has been used as a measure of working capital management whereas gross profit has been taken as profitability measure. The size of the firms as measured by natural logarithm of sales, financial debt of firm and fixed financial assets to total assets ratio were used as control variables. Pearson correlation analysis showed a negative relationship of gross profit with cash conversion cycle, number of days of accounts receivables and inventory and there is a positive relationship between gross profit and number of accounts payable days. In order to validate the robustness of correlation results, four regressions were run the results provides that cash conversion cycle, number of days accounts receivables and inventory were negatively related with gross profit while the number of days accounts payables were positively related to gross profit. All results were statistically significant at 1 percent level of significance indicating that managers can create profits by keeping current assets and current liabilities to an optimal level.

Teruel and Solano (2008) took samples of small to medium-sized Spanish firms for the 1996-2002 periods and found that the firms can create value by reducing the days-in-inventory period and the debtor's collection period, thus leading to the reduction in the cash conversion cycle.

On the other hand, though, other researchers support that investing more in cash conversion cycle (conservative policy) may lead to increased profitability since maintaining high inventory levels is expected to increase sales, reduce supply costs, reduce cost of possible interruption in production and protect against price fluctuations (Blinder and Maccini, 1991). Another study by Ng *et al*, (1999) stated that longer debtors' collection period may also strengthen the relationship with customers and hence may lead to an increase in sales revenue.

Rafuse (1996) analyzed the different aspects of optimal working capital management and its components. His article argued that attempts to improve working capital management by delaying the payments to creditors is an inefficient and ultimately damaging practice, both to its practitioners and to economy as a whole. The study claimed that altering debtors and creditors levels would rarely produce any net benefit rather it will harm the sales or the financing options of the firm. The study proposed that stock reduction strategies based on some "Lean Production" techniques might be far more effective than any other single working capital management technique. Reducing stock would produce major financial advantages by improving cash flows, reducing operational level costs of inventory and reducing capital spending. Moreover, it is further argued that the "Lean" world-class companies are systematically better than their counterparts in every important aspects and characteristics that makes a company "Lean" is low stock levels.

Ganesan (2007) tried to examine the working capital management efficiency of firms from telecommunication equipment industry in India. The relationship between working capital management efficiency and profitability is examined using correlation and regression analyses. Working capital management efficiency was measured by day's sales outstanding, day's inventory outstanding and day's payable outstanding. Days of working capital was also use as a comprehensive measure. The firm's profitability was measured using the operating income plus depreciation related to total assets. This measure is indicator of the raw earning power of the firm's assets. Another profitability measure used for this analysis was the operating income plus depreciation related to the sales. ANOVA analysis was done to study the impact of working capital management on profitability. 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 was not significantly impacting the profitability of firms Intel communication equipment industry.

Samiloglu and Demirgunes (2008) investigated the effect of working capital management on firms' profitability for a sample of manufacturing firms listed in Istanbul Stock Exchange (ISE) for the period 1998-2007. The data was taken from the quarterly financial statements of the sampled firms from ISE database and 5,843 firm quarter data was used. The dependent variable, firm profitability, was measured by return on assets. Accounts receivable period, inventory period and cash conversion cycle were used as proxies for working capital management policies. Like other many working capital literatures, firm size, firm growth, leverage and fixed financial assets were used as control variables. The data has been analyzed under a multiple regression model. The empirical results of the study showed that accounts receivable period, inventory period and leverage significantly negatively affect profitability of the sample firms, while firm growth (in sales) significantly and positively. However, it was also concluded that cash conversion cycle, size and fixed financial assets have no statistically significant effects on profitability of the sampled firms.

Wang (2002) who analyzed a sample of Japanese and Taiwanese firms, both emphasized that the way the working capital is managed has a significant impact on the profitability of firms and increase their profitability by reducing number of days, accounts receivable and reducing inventories. A shorter Cash Conversion Cycle and Net Trade Cycle are related to better performance of firms.

On their research Blinder and Maccini (1991) stated that, divergent to traditional belief, more investment in working capital (conservative policy) might also increase profitability. When high inventory is maintained, it reduces the cost of interruptions in the production process, decrease in supply cost, protection against price fluctuation and loss of business due to scarcity of products

In their study shin and Soenen (1993) on large sample and with longer time period, examined the relationship between aggressive working capital

management and profitability of United States firms. Cash conversion cycle (CCC) has been taken as a measure of working capital management, where a shorter cash conversion cycle represents the aggressiveness of working capital management whereas pre-tax return on assets and equity has been used as profitability. The data has been collected for a period of twenty-four years from 1974 through 1993 for 2,718 firms. The relationship between the cash conversion cycle and profitability measures has been tested through cross-sectional regression analysis. The results indicated a significant negative relationship between the cash conversion cycle and profitability indicating that more aggressive working capital management is associated with higher profitability. The shorter the cash conversion cycle leads to greater the return on assets and return on equity.

The issue of aggressive and conservative working capital policies on empirical basis has been discussed by Weinraub and Visscher (1998) who analyzed working capital policies of 126 industrial firms from 10 diverse industrial groups using quarterly data for a period of 1984 to 1993. The primary objective was to observe the differences in working capital policies as well as the long-term stability of working capital policies over time. Current assets to total assets ratio and current liabilities to total asset ratio were used as proxies of working capital investment and financing policies respectively. Analysis of Variance (ANOVA) and Tukey's HSD (honestly significant difference) tests clearly indicate significant differences in working capital policies across various industries. Rank order correlation analysis confirmed the stability of these polices over ten year period of time. Furthermore, the negative relationship between industry working capital investment and financing policies indicated that when relatively aggressive working capital investment policies were followed, they were balanced by relatively conservative working capital financing policies.

Afza and Nazir (2007) investigated the relationship between the aggressive/conservative working capital policies for seventeen industrial groups and a large sample of 263 public limited companies listed at Karachi Stock Exchange for a period of 1998-2003. Using ANOVA and Least Significant Difference (LSD) test, the study found significant differences among their working capital investment and financing policies across different industries. Moreover, rank order correlation confirmed that these significant differences were remarkably stable over the period of study. The aggressive investment working capital policies were accompanied by aggressive working capital financing policies. Finally, ordinary least square regression analysis found a negative relationship between the profitability measures of firms and degree of aggressiveness of working capital investment and financing policies. These results were further confirmed by Afza and Nazir (2008) on a longer period of time (i.e. 1998-2005).

Sen and Oruc (2009) in their study aimed to determine the relationship between efficiency levels of working capital management and return on total assets of 49 production firms being traded in ISE (Istanbul Stock Exchange) by using 3 month-table data of 15 years (i.e. 1993-2007) for the total of 60 periods. They tried to explain the relationship between different indicators of efficiency in working capital management (cash conversion cycle, net working capital level, current ratio, accounts receivable period, inventory period) and return on total assets through two models. The results, in terms of both models, in all the firms involved in the study there is significant negative relationship between cash conversion cycle, net working capital level, current ratio, accounts receivable period, inventory period and return on total assets.

## 2.9. Summery and Knowledge Gap

Although lot of scholars provided much descriptive and empirical evidence on financial management practices, it appears that there are still some gaps in the literature which need to be addressed.

*First*; there is no agreement on the sign of relationship between the above mentioned variables and their impacts on profitability. If we take cash conversion cycle as an example, some of literature suggests that cash conversion cycle (a comprehensive measure of working capital management) is positively related to firm profitability: Blinder and Maccini (1991) shows that longer cash conversion cycles increase the firm's profitability. The other strands of literature, however, suggest that shorter cash conversion cycle increases the firms' profitability Wang (2002), shin and Soenen (1993), Lazaridis and Tryfonidis (2006), Falope and Ajilore (2009). On the other hand other researchers like (Bhunia, 2012), Samiloglu and Demirgunes (2008), Amarjit gill, (2010) concluded that there is no significant relationship between the two. We can see it from the above mentioned literatures there is no consensus on the nature of relationship between the variables. This study therefore, seeks to contribute to this research gap.

Secondly; As Demirguc-Kunt and Maksimovic (2002) indicated, firms operating in countries with more developed banking systems grant more trade credit to their customers, and at the same time they receive more finance from their own suppliers. With limited access to the long-term capital markets, Working capital management is importance to developing countries. This suggests that in developing countries manufacturing firms have fewer alternative sources of external finance available, which makes them more Dependent on short-term finance. But Studies that investigated the association between profitability and working capital management practices on manufacturing firms from the perspective of developing countries are rare.

Thirdly; in case of Ethiopia there are few literatures like Ephrem,W, (2011), Getachew.J and Natarajan ,V.( 2013.), Wobshet Mengesha, (2014) who try to identify the impact of working capital management on the performance of the firm. To identify this relationship those previous studies use dependant variable like Cash conversion cycle, Accounts receivable period, inventory conversion period and accounts payable period are used as independent working capital variables. Thus, here in this study include some additional dependent variables that was not included in those previous studies but which is believed to have some impact on the firm's profitability, The Variable CATAR has been included examine the effect of working capital investment policy on firms' profitability. And CLTAR is also included to determine the effect of working capital financing policy on firms' profitability.

Finally; to the knowledge of the researcher the empirical studies on the area working capital and profitability in case of manufacturing share company in Addis Ababa was not done. This study therefore, seeks to contribute to this research gap and identify which variables of working capital have a significant effect on the profitability of manufacturing share companies that is located in Addis Ababa.

## 2.10. Conceptual Framework

Figure 1 below presents schematic conceptual framework of the relationship between working capital management measures and profitability of firms.

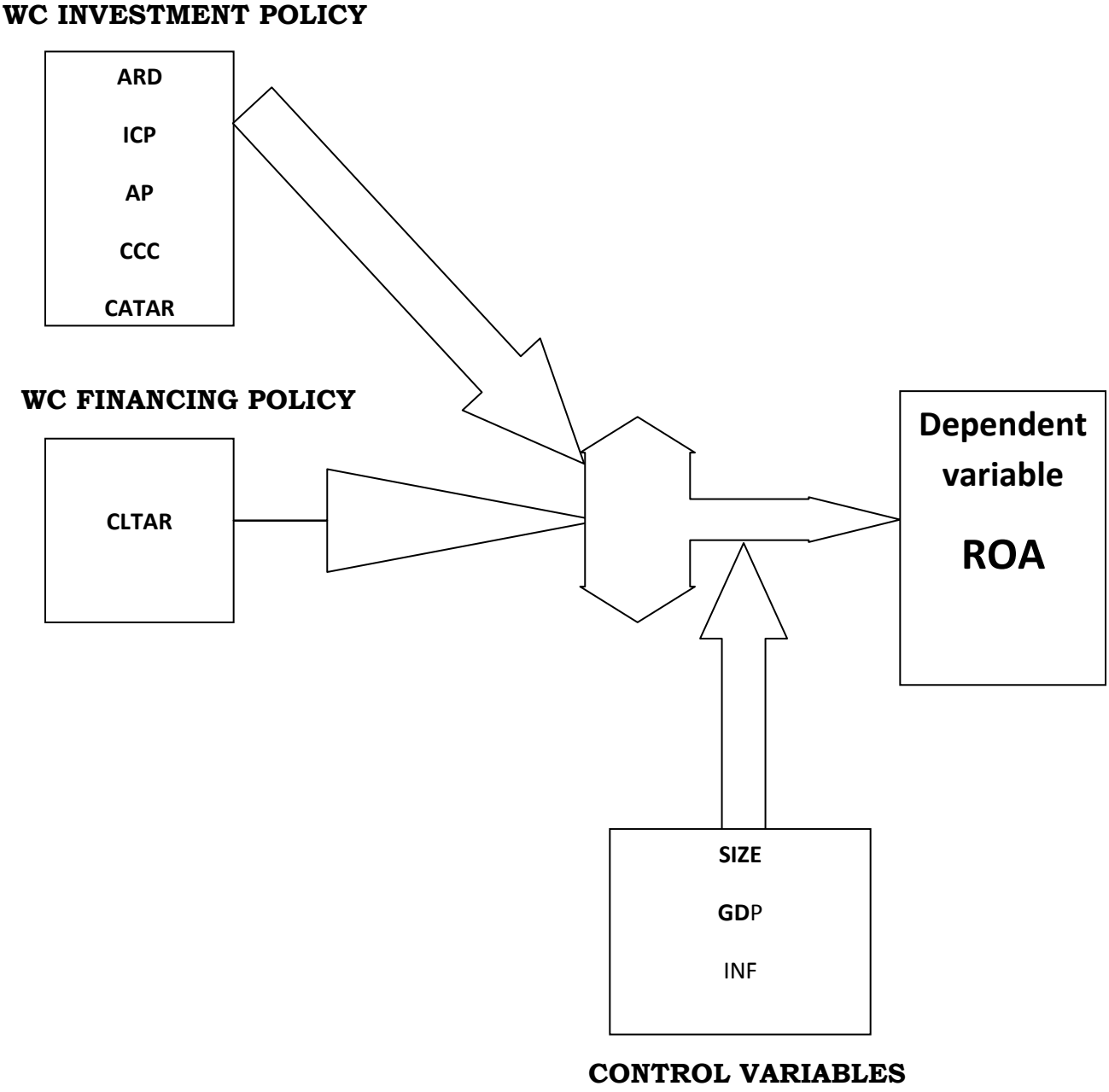



**Figure 1: Schematic Conceptual Framework**

Source: researcher's personal design

The above figure shows conceptual framework of how all the independent variables are related with the dependent variable.

The study used return on assets as, dependent profitability variables. Accounts receivable period, inventory holding period and accounts payable period were used as independent working capital investment policy variables. Moreover, cash conversion cycle and current assets to total assets ratio were used as comprehensive measures of working capital investment policy. On the other hand, current liabilities to total assets ratio is used as measure of working capital financing policy. In addition, the study used firm size as measured by logarithm of total asset, annual GDP growth rate and inflation rate as control variables.

- The first five variables of working capital investment policy which is Account receivable days, average inventory days and acct payable days are used to predict the effect of working capital investment policy on the profitably of the firm the other two variables the cash conversion cycle and current asset to total asset ratio are used as a comprehensive measurement for working capital investment policy.
- The graph also shows working capital financing policy effects on firms' profitability. In measuring the effect of working capital financing policy current liabilities to total assets ratio is used.
- In order to have a reliable analysis of the effect of working capital management policies on profitability Firm Size (lan of total asset) used as firm specific control variable. Since change in economic conditions affect operating efficiency of firms and tend to be reflected in firms' profitability inflation and GDP Growth Rate of the country was also used as a control variable.

# CHAPTER THREE: RESEARCH DESIGN

### Introduction

The preceding chapter indicated the literature on working capital management and firm profitability. Both theoretical and empirical reviews were made, and indicated the absence of empirical studies in Ethiopia regarding to working capital management and profitability of manufacturing share companies. The purpose of this chapter is to present how the researcher designed the research hypotheses and the research approach adopted by the study.

## 3.1. Population and Sampling Procedure

The population of study will comprised 25 manufacturing share companies in Addis Ababa. In selecting firms included in this study, convenience and purposive sampling designs have been used. Addis Ababa region is found to be convenient to obtain the required data with the limited time and fund. And selecting only manufacturing share companies also helps to avoid bias.

The purposive sampling method used is due to the following requirements. The study first selects companies that are engaged only in manufacturing sector from the business classification, i.e. agriculture, industry and service. This helps to avoid bias that may result from industrial classification since firms operating in different industries have different decision criteria in selecting sources of funds needed for executing investment opportunities and have different working capital requirements. To mitigate this problem the researcher limited the study population only to those companies engaged in manufacturing industry. The other criterion used in selecting sample units to be included in the study was holding a complete 5 years financial statement data which is from 2010 to 2014. The reason for selecting to this period is due to the latest data for the investigation available for these periods.

Therefore, According to CSA (2014) there are 25 manufacturing share companies in Addis Ababa. And the data set consist of 19 manufacturing share companies in Addis Ababa which is 76 percent of the population. Since some companies whose data not available for the entire study period or whose financial years were not uniform and some of the companies have started their operation after the year 2010 G.C. further increment of sample size become impossible. All the data were collected on annual base and the figures for the variables were on June 30 of each year under study.

According to Brooks (2008) while there is no definitive answer for an appropriate sample size for model specification, it should be noted that most testing procedures in econometrics rely on asymptotic theory. This theory says that as the sample size approaches to the population, the results from the sample estimates are more appropriate for generalizing to the general population. Thus in this case the sample size was large enough to make appropriate generalization to the overall population. *The details of the companies under this study have shown in the appendices 1.*

## 3.2. Research Methods Adopted

As noted by McKerchar, 2008 (cited in Yesegat, 2009), the choice among the three research approaches is guided by mainly the research problem apart from the underlying philosophy of each research methods.

In this study Quantitative methods approach will be applied to meet the overall objective of the study and to answer research hypothesis under it. In quantitative analysis, here, First: The researcher used correlation to measure the degree of association between different variables under consideration. Second: Regression analysis has been conducted to estimate the causal relationships between the chosen dependent and independent variables. According to Kothari (2004) regression analysis is concerned with the study of how one or more variables affect changes in another variable.

## 3.3. Data and Data Collection

To gather the necessary data copies of audited financial statements in the form of income statement and statement of financial position over the period of five years has been used. Most of the required data obtained from the financial statements submitted to the Ethiopian Revenues and Customs Authority (ERCA). However, due to incompleteness of data obtained from ERCA some of the data used obtained directly from the respective companies Research conducted by using appropriate data collection instruments will increase the credibility and value of research findings (Koul 2006).

## 3.4. Analysis Technique

To test the proposed hypotheses, statistical analyses carried out using the following methods and the *E - views software* has been used to analyze financial data.

First, descriptive statistics will be calculated over the sample period. This is in line with Malhotra (2007), which states using descriptive statistics methods helps the researcher in picturing the existing situation and allows relevant information. At this stage, mean, standard deviation, maximum and minimum values of the required variables have been computed. Then, correlation analyses between dependent and independent variables were made. Finally, Researcher used panel Least Squares methods for analysis. Panel data, where time-series and cross-sectional observations were combined to estimate the regression output. The stepwise least square regression method also conducted in order to test the assumptions of classical linear regression model.

## 3.5. Variable Choice and Research Hypothesis

After reviewing several literatures, the following best fitted variables were selected to measure the impact of working capital management on profitability. The choices of operational definitions as well as the expected signs of the study variables were based on previous studies.

### 3.5.1. Dependent Variable

**Return on Assets (ROA):**

Amongst various measures of profitability ROA is a better one since it relates the profitability of the business to the asset base, and also it is a simplest one to measure the profitability. It explains the performance and progress of the business in utilizing its resources to generate the income. The major difference between ROA and ROE is that the ROA remain unaffected by the company choice of structure-the choice of using debt versus equity to fund operation. The higher the return on assets indicates that the firms effective enough in generating profit from its available and the reverse is true for decrease in return on assets. Gitman, (2002) If the return on asset showing positive value it indicates that the firms are efficient enough in generating profit with its available assets. It is used by influential researchers as a dependent variable for the measurement of profitability such as Afza and Nazir (2008), Mohamad and Saad (2010), Danuletiu (2010), Padachi (2006) and Deloof (2003).

ROA is calculated by the following formula: $\mathbf{ROA} = \frac{\text{EBIT}}{\text{TA}}$

Where;

ROA: Return on Asset;

EBIT: Earnings before Interest and Taxes;

TA: Total Assets

### 3.5.2. Independent Variables and Their Respective Hypothesis

In this research the independent variables, Accounts Receivable days (ARD), Inventory Holding Period (ICP) and Accounts Payable days (APD) were used to measure working capital investment policy. The variable Cash Conversion Cycle (CCC) and Current Assets to Total Assets Ratio (CATAR) used as compressive measures of working capital investment policy. Current Liabilities to Total Assets Ratio (CLTAR) used to measure of working capital financing policy.

#### *3.5.2.1. Accounts Receivable Days (ARD)*

Account receivable days has been used as a proxy for cash collection policy and represent the average time it takes to collect payments from customers. From literatures shows higher the investment in account receivable, the lower will be the profitability and vice versa. If a firm collects its accounts receivable quickly the fund will be available for productive usage. This intern leads to more sales which ultimately results in an increase in profitability.

Deloof(2003); Padachi (2006); Samiloglu and Demirgunes (2008); Lazaridis and Tryfonidis (2006); Sen and Oruc (2009); Falope and Ajilore (2009) all point out negative relation between account receivables and firms profitability. In other words, having an account receivables policy which leads to low as possible account receivables will lead to the highest profitability. Thus, based on the above explanation and various empirical studies, the following hypothesis is expected:

**H1**: There is significant and negative relationship between Average Collection Period (ACP) and Profitability.

The formula to calculate ARD is:

$$\text{ARD} = \frac{\text{Account receivable}}{\text{sales}} * 365\text{days}$$

### *3.5.2.2. Inventory Conversion Period (ICP)*

Inventory Conversion Period is the average time it takes to acquire and sell inventory. The longer the inventory storage period, the higher will be the investment tied up in inventory. Therefore, the higher the investment invested in inventory, the lower will be the profitability of firms. The reason for this could be tied up of more funds and/or deterioration and obsolescence of inventory due to longer inventory period leads to lower profitability.

(Deloof, 2003), Padachi (2006) ,Teruel and Solano (2007) Samiloglu and Demirgunes (2008), Lazaridis and Tryfonidis (2006), Sen and Oruc (2009), Falope and Ajilore (2009) found a significant negative relation between performance of firms and number of day's inventories. This explains that an increase of the inventories may lead to a decrease in sales which leads to lower profit for the companies.

Thus the hypothesis will be;

**H2**: There is significant negative relationship between Inventory Conversion Period (ICP) and Profitability of the firm.

The formula to calculate ICP is:

$$\text{ICP} = \frac{\text{Ending Inventories}}{\text{Cost of Goods Sold}} * 365\text{days}$$

### 3.5.2.3. Accounts Payable Days (APD)

Account payable days used to proxy for payment policy and tell us how long it takes the firm to repay for purchasing of inventory. Account payable is an interest free form of short term financing and many companies use them to the last day possible before payment is due. Positive relationship between accounts payable period and profitability can be explained by the increased availability of funds caused by the delayed payment of accounts payable because such funds can thus be used for productive purposes that can increase profitability. (Arshad, 2013, Lazaridis and Tryfonidis (2006) stated that account payable is the largest source of short term financing for American corporation.

**H3:** There is significant and positive relationship between account payable days (APD) and Profitability.

The formula to calculate APD is:

$$\text{APD} = \frac{\text{accounts payable}}{\text{cost of sales}} * 365\text{days}$$

### 3.5.2.4. Cash Conversion Cycle (CCC)

Cash conversion cycle (CCC) is a comprehensive measure of working capital management. It shows the time lag between expenditure for the purchases of raw materials and the collection of sales of finished goods. The longer the cycle, the larger the funds blocked in working capital hence the greater for the needs of financing of current asset.

In their studies Wang (2002), shin and Soenen (1993), Lazaridis and Tryfonidis (2006), Falope and Ajilore (2009) examined the empirical relationship between CCC and ROA show a significant and negative relationship.

**H4:** There is significant and negative relationship between Cash Conversion Cycle (CCC) and Profitability of the firm.

The formula to calculate CCC is:

$$CCC = [ARD + ICP] - APD$$

Where: CCC: cash conversion cycle;

ARD: Account receivable days;

ICP: Inventory conversion period;

APD: Accounts payable days;

### *3.5.2.5. Current Assets to Total Assets Ratio (CATAR)*

The above four measurements of working capital assets management policy, namely accounts receivable period, inventory holding period, accounts payable period and cash conversion cycle, indicate how efficient are firms in managing their collection, inventory and payment policies. Investment in working capital assets, however, is broader than managing collection, inventory and payment policies. It also includes management of cash and other short term assets. For this reason, we need to have another comprehensive measurement of working capital investment policy which is Current Assets to Total Assets Ratio.

This ratio is used to find out the investment policy of working capital adopted by the firms under consideration. This investment policy can be of two types, first is the aggressive policy and second the conservative policy. In aggressive investment policy of working capital, less investment is made in the form of current assets as compared to fixed assets to get more returns. On the other hand, in conservative investment policy of working capital, more investment is placed in the form of current assets as compared to fixed assets. Aggressive

investment policy allows getting more profits through investing major portion of resources in fixed assets. Conservative investment policy helps to avoid the risk of bankruptcy. A lesser value of Current assets to total assets ratio demonstrates more aggressive policy**.** Wang (2002), shin and Soenen (1993), Lazaridis and Tryfonidis (2006), Falope and Ajilore (2009) have been used this ratio as an independent variable to find the impact of working capital management on profitability. They all suggested that this ratio has a negative relationship with profitability. In finance literature, there is a long argument on the determinants and the risk/return tradeoff between the different working capital policies. More aggressive working capital policies are associated with higher return and higher risk while conservative working capital policies are concerned with the lower risk and return. So, in this study as well an inverse relation is expected between profitability and current assets to total assets ratio.

**H5:** there is a strong negative relation between CATAR and firms profitability of the firm

The formula to calculate CATAR is:

CATAR = Total current assets/Total assets

### *3.5.2.6. Current Liabilities to Total Assets Ratio (CLTAR)*

Current Liabilities to Total Assets Ratio included in the study to discover the working capital financing policy. It can also be of two types, aggressive financing policy and conservative financing policy. In aggressive financing policy a greater portion of current liabilities is used than long-term debts. In conservative financing policy, more long-term debts are used than current liabilities.

Kaddumi (2012), Falope and Ajilore (2009) have found a direct relation between current liabilities to total assets ratio and profitability. So, the expected relation between this ratio and profitability is positive.

**H6:** there is strong and positive relation between Current loablties to Total Assets Ratio and profitability of the firm.

The formula to calculate the CLTAR is:

$$\text{CLTAR} = \frac{\text{Currentl iabilities}}{\text{Total Assets ratio}}$$

### 3.5.3. Control Variables

Control variables play an active role in quantitative studies. These variables are a special type of independent variable that is measured in a study because they potentially influence the dependent variable. In this study the researcher uses firm size, inflation and GDP ratio as a control variable.

The most widely used type of measurement for firm size is the natural logarithm of total asset, which is used by many researchers like Lazaridis & tryfonidis( 2006) ,Padachi (2006) the size of the firm has been measured by the logarithm of its total assets, as the original large value of total assets may disturb the analysis. The variable GDP was also selected as a control variable since change in economic conditions in the country affect the profitability of firms. It used as a control variable in Lamberson (1995). The third control variable Inflation was selected as a control variable because according to the recent theory of information asymmetry in the credit market an increase in the rate of inflation drives down the real rate of return not just on money, but on assets in general. The implied reduction in real returns exacerbates credit market frictions. Inflation is calculated based from consumer price index.

Table 3.1 Dependant Independent and control variables

| | |
|---|---|
| Dependant variable | Return on asset(ROA) |
| Independent/explanatory variables | Account receivable days (ARD) |
| | Inventory conversion period(ICP) |
| | Account Payable Days(APD) |
| | cash conversion cycle (CCC) |
| | Current Asset To Total Asset Ratio(CATAR) |
| Control variables | Size ( log of total Asset) |
| | GDP |
| | Inflation |

## 3.6. Model Specification

The equation to investigate the relationship between working capital management and profitability will be as follows: The researchers has been used the model that was employed by akoto,A.V, & angmor, (2013), Raheman A,(2007).The general forms of the model is:

$$ROAit=\beta 0 + \Sigma \beta X_{it} + uit \qquad \textbf{(Eq. 3.1)}$$

Where:

ROAit: Return on Asset of firm i at time t.

β0: The intercept of equation;

βi: Coefficients of $X_{it}$ variables;

*X*it: The different independent variables for working capital Management of firm i at time *t (*Time);

uit: The error term;

Specifically, the above panel least squares model is converted into specified variables it becomes:

$$ROAit=\beta 0+\beta_1 ARDit+\beta_2 APDit+\beta_3 ICP+\beta_4 CCCit+\beta_5 CATAR_{it}+\beta_6 CLTAR_{it}+\beta_7 DROA113+\beta_8 DROA1115+\beta_9 LOSit+\beta_{10} GDPit+\beta_{11} INFit+uit. \quad \text{(Eq. 3.2)}$$

Where:

β0: The intercept of equation;

ROA: the return on assets;

ARD: accounts receivable days;

APD: accounts payable days;

ICP: inventory Conversion Period;

CCC: Cash Conversion Cycle;

CATAR: current asset to total asset ratio;

CLTAR: current liability to total asset ratio;

LOS: Natural logarithm of total asset;

GDP: gross domestic product;

INF: inflation;

uit: The error term;

*β7DROA113and β8DROA1115 are dummy variables in the year 2011.*

The definition of all the variables in the model follows standard finance literature

| **Table 3.2 explanatory variables and their expected effect on the dependent variables** | | |
|---|---|---|
| ROA | Return on asset(ROA) | |
| ARD | Account receivable days (ARD) | Negative |
| ICP | Inventory conversion period | Negative |
| APD | Account Payable Days(APD) | Positive |
| CCC | Cash Conversion Cycle (CCC) | Negative |
| CATAR | Current Asset To Total Asset Ratio | Negative |
| CLTAR | Current liability To Total Asset Ratio | Positive |
| | Size ( log of total Asset) | |
| | GDP | |
| | Inflation | |

# CHAPTER FOUR: DATA PRESENTATION AND ANALYSIS

### Introduction

This chapter presents the results of the various indicators for performance of manufacturing firms and their respective working capital variables. The research has employed 10 variables for the analysis purpose, nine independent and control variables and one dependent profitability measurement variable. Six independent variables are proxies for working capital investment and financing policies of the sample firms. Other three variables (firm size as measured by the natural logarithm of total asset inflation made by consumer price index and the GDP growth rate of Ethiopia) are independent control variables.

## 4.1. Descriptive Statistics

In this section the results from descriptive statistics are discussed. Descriptive analysis shows the average, and standard deviation of the different variables of interest in the study. It also presents the minimum and maximum values of the variables which help in getting a picture about the maximum and minimum values a variable can achieve.

Table: 4.1.Presents descriptive statistics for 19 manufacturing firms in Addis Ababa for a period of five years, from 2010 to 2014.

| | ROA | ARD | APD | AID | CCC | CLTAR | CATAR | SIZE | GDP | INF |
|---|---|---|---|---|---|---|---|---|---|---|
| Mean | 0.053111 | 45.79063 | 66.52968 | 254.0344 | 227.3405 | 0.988200 | 0.664379 | 18.74011 | 10.16000 | 0.201895 |
| Median | 0.040000 | 32.00000 | 18.00000 | 257.0000 | 249.0000 | 0.350000 | 0.700000 | 18.57000 | 10.30000 | 0.180000 |
| Maximum | 0.300000 | 430.0000 | 758.0000 | 755.0000 | 767.0000 | 57.00000 | 0.980000 | 20.60000 | 11.40000 | 0.340000 |
| Minimum | -0.250000 | 0.000000 | 0.000000 | 0.000000 | -392.0000 | 0.019000 | 0.110000 | 16.18000 | 8.700000 | 0.080000 |
| Std. Dev. | 0.085148 | 57.63315 | 137.3791 | 152.2280 | 200.5143 | 5.813238 | 0.229110 | 0.956442 | 0.900520 | 0.093812 |
| Skewness | -0.285916 | 3.590898 | 3.687808 | 0.652176 | -0.131937 | 9.564908 | -0.815829 | 0.189653 | -0.323956 | 0.221680 |
| Kurtosis | 5.002435 | 22.74700 | 17.29701 | 3.843000 | 3.770059 | 92.66475 | 3.104199 | 2.498602 | 2.162814 | 1.630770 |
| Jarque-Bera | 17.16625 | 1747.692 | 1024.433 | 9.547427 | 2.622875 | 33272.63 | 10.58129 | 1.564624 | 4.435987 | 8.199127 |
| Probability | 0.000187 | 0.000000 | 0.000000 | 0.008449 | 0.269433 | 0.000000 | 0.005039 | 0.457347 | 0.108827 | 0.016580 |
| Sum | 5.045580 | 4350.110 | 6320.320 | 24133.27 | 21597.35 | 93.87900 | 63.11600 | 1780.310 | 965.2000 | 19.18000 |
| Sum Sq. Dev. | 0.681524 | 312228.6 | 1774064. | 2178296. | 3779361. | 3176.612 | 4.934196 | 85.98950 | 76.22800 | 0.827259 |
| Observations | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 |

*Source: eviews 6 data summary statistics result based on annual reports of sample Firms for the study period*

As it is displayed in table 4.1 the mean value of firms return on asset is 5.3 percent of total assets. The higher the return on assets indicates that the firms is effective enough in generating profit from its available assets and the reverse is true for decrease in return on assets. The standard deviation is 0.085 it means that value of profitability can deviate from mean to both sides by 8.5 percent. Its minimum value is -25 percent while the maximum is 30 percent.

Likewise, the Accounts receivable period, a measurement for collection policy, is averaged to 45.79 days for the sampled firms. This average of the account receivable period shows that, firms in the sample wait 45.79 days on average to collect cash from credit sales. The Account receivable period can vary by 57.63 days to both sides of the mean value. The minimum and the maximum Account receivable period for the sampled firms are 0 and 430 days respectively. The minimum value of zero means the firm didn't use account receivable at all or a firm use cash to sell its product.

The Mean value of Inventory conversion days is 254.03 days. This means, firms in the sample needs on average 254.03 days to sell inventory. As it is shown in the above table, the standard deviation of inventory holding period is 152.22 days. To the sample firms the inventory holding period ranges between zero and 755 days of minimum and maximum values respectively.

The Mean value of Accounts payable period as a proxy for payment policy is 66.53 days with the standard deviation of 137.38 days. The minimum and maximum period ranges between 0 zero and 758 days.

In addition to the above three specific variables, other two variables cash conversion cycle (CCC) and current asset to total asset ratio (CATAR) are used as comprehensive measures of the efficiency of working capital asset management/investment policy.

The Mean time for converting inventory to cash is 227.34 days with the standard deviation of 200.51 days. The minimum value of -392 days shows a firm records a large inventory turn-over and/or cash collections from credit sales before making a single payment for credit purchases. It means that the accounts receivable period and/or the inventory holding period are very short and/or the accounts payable period of the firm is very long. On the other hand, the maximum time for cash conversion period is 767 days which is a very long period and it shows that a firm records a large inventory turn-over and/or cash collections from credit and/or shortest payment period for credit purchases. It means the accounts receivable period and/or the inventory holding period are very long and/or the accounts payable period of the firm is very short.

The other comprehensive measure of working capital investment policy used is the proportion of current assets to the total assets ratio of firms. It measures the firms' degree of aggressiveness/conservativeness in working capital investment. The lower the amount of the investment in current assets, the more aggressive is the firm in working capital investment. Because when the current asset is low, the risk would be high because of liquidity problem, and the return also high. Here, the sample firms have on average about 66.4% of the total assets in current form. This amount can deviate by 22.9 percent to both sides. The minimum value is 11 percent and this value relatively highly aggressive condition while the maximum value of current assets to total assets ratio is 98 percent which represent the relatively higher conservative condition in the sampled firms during the study period. The average value of 66.4 percent shows that on average manufacturing share companies in Addis Ababa are relatively conservative while managing their current assets.

In measuring working capital financing policy, current liabilities to total assets ratio is used. It measures the firm's degree of aggressiveness/conservativeness in financing its working capital requirements. The higher the value of current liabilities to total assets ratio means the more aggressive is the firm in

financing its working capital requirements, and the lower the value of current liabilities to total assets ratio means relatively more conservative is the firm in financing its working capital requirements. The average current liabilities proportion in financing the total assets of the sampled companies is 98.8 percent this highest ratio of current liabilities to total assets ratio shows the more aggressiveness of the firm in financing their working capital requirements. The standard deviation is 58.0. The minimum value is 1.9 percent which represents the more conservative condition in financing their working capital while the maximum is 87.0 percent which indicates aggressive approach in financing working capital.

When we look at the average current assets proportion in total assets of sampled firms (66 percent) and the average proportion of current liabilities used in financing total assets (98 percent) together, the sampled firms are relatively aggressive in financing their working capital requirements than in their investment policy.

In addition the explanatory variables, the above table also includes the descriptive statistics of control variables that are used in the study. To control the size effect, firm size as natural logarithm of total asset is used as a control variable. The mean value of natural logarizm of total asset is 18.74 (134,009,000.00 Br.) while the standard deviation is 0.95. The maximum value of natural logarism of total asset for a company in a year is 20.6 and the minimum is 16.18.

The other control variable is GDP which has annual average growth rate of Ethiopia is 10.16 percent with a standard deviation of 0.9 on the study period. The lower and higher annual GDP growth rates during the study period are 8.7 percent and 11.4 percent respectively**.**

Inflation was used as a control variable in the study and has a mean value of 0.2 for the study period. The lower and higher inflation rates during the study period are 8 and 34 percent.

## 4.2. Correlation Analysis

Prior to regression result, it is important to check the correlation between different variables on which the analysis is built. Correlation is a way to index the degree to which two or more variables are associated with or related to each other.

Table: 4.2 presents the result of the correlation analysis of Profitability Measure of return on asset with inventory holding period, account receivable conversion period, accounts payable period, cash conversion cycle current asset to total asset ratio and current liability to total asset ratio, GDP, firm size, and inflation.

## Table 4.2 correlation matrix of variables

| | ROA | ARD | APD | AID | CCC | CLTAR | CATAR | SIZE | GDP | INF |
|---|---|---|---|---|---|---|---|---|---|---|
| ROA | 1.000000 | | | | | | | | | |
| ARD | -0.048006 | 1.000000 | | | | | | | | |
| APD | 0.342589 | 0.540461 | 1.000000 | | | | | | | |
| AID | -0.079043 | 0.145682 | 0.006425 | 1.000000 | | | | | | |
| CCC | -0.332378 | -0.077084 | -0.553263 | 0.726048 | 1.000000 | | | | | |
| CLTAR | 0.066677 | -0.071813 | -0.031879 | 0.041304 | 0.038064 | 1.000000 | | | | |
| CATAR | 0.376695 | -0.025468 | -0.274038 | 0.160710 | 0.364928 | 0.044505 | 1.000000 | | | |
| SIZE | 0.480240 | -0.215242 | -0.250361 | 0.082756 | 0.173176 | 0.082120 | -0.099482 | 1.000000 | | |
| GDP | 0.052436 | -0.035348 | 0.025128 | 0.135563 | 0.062243 | -0.044692 | -0.064090 | -0.020387 | 1.000000 | |
| INF | 0.009324 | 0.114065 | 0.025165 | -0.128047 | -0.117132 | -0.065840 | -0.051579 | -0.089400 | -0.415915 | 1.000000 |

***Source**: Financial statement of sampled manufacturing firms and own computation through Eviews*

Findings of correlation analysis in *table 4.2* reveal that there exist negative relationships between account receivable period and profitability measures of return on asset. The implication of this relationship may because of, the collection of receivables in a short period of time may help firms to reduce the probability of uncollectable from default and in addition to that firms can invest the money on other profitable operation, so that it would increase the profit. The correlation analysis also shows that, the relationship between Average inventory days and profitability measures is negative this relationship may exist because in the case of a sudden drop in sales accompanied with a mismanagement of inventory will lead to tying up excess capital at the expense of profitable operations. The correlation between account payable days and the Return on asset show a positive relationship this relation exist because in this case firms make delayed payment it helps to get interest free money to invest on some other profitable operation.

The cash conversion cycle has negative relationship with firms' profitability the implication is that the increase or decrease in cash conversion cycle will negatively affect profitability of the firms. It means that the shorter the firm's cash conversion cycle, the higher will be the profitability and vice versa.

On the other hand, the relationship between current assets to total assets ratio and return on assets is positive. This implies that there is negative relationship between aggressiveness in working capital investment policy and firms' profitability. As current assets to total assets ratio increases, the degree of aggressiveness in working capital investment policy decreases (working capital investment is considered to be aggressive when investment in current asses is low) and profitability of firms increases.

The correlation analysis also shows that, positive relationship between current liabilities to total assets ratio and profitability measures. There means there is a positive relationship between degree of aggressiveness in working capital

financing policy and firms' profitability. A firm is said to be aggressive in working capital financing policy when it uses large amounts of current liabilities relative to total sources of funds. The higher the current liabilities to total assets ratio, the higher is the degree of aggressiveness in working capital financing policy, which leads to the corresponding higher level of profitability.

## 4.3. Testing Assumptions of Classical Linear Regression Model (CLRM)

Before running the regressions, the data sets have been tested. Models had normality problem (Observations that are very extreme compared to other observations) that may cause problems in estimating the regression coefficients and some correction actions have been taken. To mitigate this normality problem researcher used dummy variables to remove big outliers in the data that was appeared in a company's at 2013 and at 2015

### Test for weather average value of the error term is zero

The first assumption required is that the average value of the errors is zero. In fact, if a constant term is included in the regression equation, this assumption will never be violated. Therefore, since the constant term (i.e. β) was included in the regression equation, the average value of the error term in this study is expected to be zero.

### Test for Homoscedasticity

It has been assumed that the variance of the errors is constant. This is known as the assumption of homoscedasticity. If the errors do not have a constant variance, they are said to be heteroscedastic. To test this assumption the white's test was used having the null hypothesis of heteroskedasticity. In this case, both the *F*- and *x2* ('LM') versions of the test statistic give the same conclusion that there is no evidence for the presence of heteroscedasticity,

since the *p*-values are considerably in excess of 0.05 we couldn't reject the null hypothesis of homoscedesity .

In addition to that EViews presents three different types of tests for heteroscedasticity. The test statistics in appendix 5 give us the information to determine whether the assumption of homoscedasticity is valid or not. Seeing the auxiliary regression in the second table can provide useful additional information on the source of the heteroscedasticity if any is found. In this case, both the *F*- and *x2* ('LM') versions of the test statistic give the same conclusion that there is no evidence for the presence of heteroscedasticity, since the *p*-values are considerably in excess of 0.05. The third version of the test statistic, 'Scaled expla

ined SS', which as the name suggests is based on a normalized version of the explained sum of squares from the auxiliary regression, suggests in this case that there is also no evidence of heteroscedasticity.

**Test for absence of autocorrelation assumption**

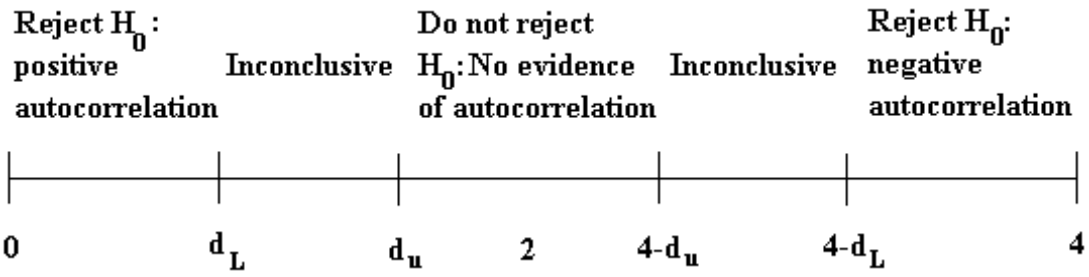
The test for autocorrelation was made by using Durbin and Watson (1951). Durbin--Watson (DW) is a test for first order autocorrelation i.e. it tests only for a relationship between an error and its immediately previous value. DW is approximately equals to $2(1 - \hat{\rho})$, where $\hat{\rho}$ is the estimated correlation. The null hypothesis for the DW test is no autocorrelation between the error term and its lag. According to Brooks (2008), DW has 2 critical values: an upper critical value (dU) and a lower critical value (dL), and there is also an intermediate region where the null hypothesis of no autocorrelation can neither be rejected nor not rejected.

Then we look up the two critical values from the Durbin Watson tables, and these would depend on how many variables and how many observations and how many repressors (excluding the constant this time) you had in the model.

The study used the dL and dU values for 95 observations. As per the DW table in the *appendix 5,* for 95 observations with 9 explanatory variables at 1% level of significance, the dL and dU values are 1.336 and 1.741 respectively. The DW of the regression was 1.823318 and this value lies in the no autocorrelation region.

The rejection / non-rejection rule would be given by selecting the appropriate region from the following diagram:

***Figure 2*** Rejection and Non-Rejection Regions for DW Test




And also In Appendix 7 of the regression output of Breusch-Godfrey Serial Correlation LM Test, EViews offers two versions of the test – an *F*-version and a *x2* version, while the second table presents the estimation from the auxiliary regression. The conclusion from both versions of the test in this case is that the null hypothesis of no autocorrelation should not be rejected. This also agrees with the *DW* test result.

## Test for Normality assumption

A normal distribution is not skewed and is defined to have a coefficient of kurtosis 3. Bera-Jarque formalizes this by testing the residuals for normality and testing whether the coefficient of skeweness and kurtosis are zero and three respectively. Skewness measures the extent to which weather a distribution is symmetric about its mean value or not, and kurtosis measures how fat the tails of the distribution are.

To fulfill a normality assumption the Bera-Jarque probability statistics/P-value is expected not to be significant even at 10% significant level (Brooks 2008). As shown in the histogram in *appendix 3* kurtosis approaches to 3 (i.e. 2.855) and the Jarque-Bera statistics was not significant at 10% level of significance. Hence, the null hypothesis that the error term is normally distributed should not be rejected and it seems that the error term in all of the cases follows the normal distribution.

**Test for absence of series multicollinearity assumption**

This assumption is concerned with the relationship exist between explanatory variables. If an independent variable is an exact linear combination of the other independent variables, then we say the model suffers from perfect collinearity, and it cannot be estimated by OLS (Brooks 2008). When there is multicollinearity, the amount of information about the effect of explanatory variables on dependent variables decreases.

How much correlation causes multicollinearity however, is not clearly defined. However, Hair et al (2006) argue that correlation coefficient below 0.9 may not cause serious multicollinearity problem. Malhotra (2007) stated that multi colinearity problem exists when the correlation coefficient among variables is greater than 0.75 and it leading to inefficient estimation and less reliable results. This indicates that there is no consistent argument on the level of correlation that causes multicolinearity. In this study correlation matrix for 9 variables shown below in the table had been estimated. The results in the following correlation matrix at *table 4.2* show the highest correlation of 0.72604 which is between cash conversion cycle and average inventory days. The result correlation matrix shows there are no correlation which above 0.75 and 0.9 according to, Malhotra (2007) and Hair et al (2006) respectively, we can conclude in this study that there is no problem of multicolinearity.

## 4.4. Choosing Random Effect (RE) Versus Fixed Effect (FE) Models

According to Dougherty 2011, Brooks (2008) stated that if the observations are based on a random sample then both random effect model and fixed effect model are applicable to it. To check that which of these models should be used, Housman's specification test is applied. But the sample is not selected randomly fixed effect model is more appropriate. Hence, the sample for this study was not selected randomly FEM is appropriate.

## 4.5. Results of the Regression Analysis

A major weakness of Correlations is that it doesn't allow identifying causes from Consequences. To overcome this shortcoming, the researcher use regression analysis to investigate the impact of working capital components on dependent variables: Return on Asset (ROA). The results are presented in Appendix 2.

The panel least squares model were:

$$ROAit=\beta 0+\beta 1ARDit+\beta 2APDit+\beta 3ICP+\beta 4CCCit+\beta 5CATAR_{it}+\beta 6CLTAR_{it}+\beta 7DROA1113+\beta 8DROA1513+\beta 9LOSit+\beta 10GDPit+\beta 11INFit+uit. \quad \text{(Eq. 4.1)}$$

Where:

β0: The intercept of equation;

ROA: the return on assets;

ARD: accounts receivable days;

APD: accounts payable days;

ICP: inventory Conversion Period;

CCC: Cash Conversion Cycle;

CATAR: current asset to total asset ratio;

CLTAR: current liability to total asset ratio;

LOS: Natural logarithm of total asset;

GDP: gross domestic product;

INF: inflation;

The result of the regression output presented in *appendix 4* shows the impact of working capital management variables on the performance of manufacturing companies.

The output shows highest explanatory power of the model. It is measured by $R^2$. The $R^2$ measures the success of the regression in predicting the values of the dependent variable in the sample. In standard settings, may be interpreted as the fraction of the variance of the dependent variable explained by the independent variables. The statistic will equal one if the regression fits perfectly, and zero if it fits no better than the simple mean of the dependent variable. As it said before, R2 values indicate the explanatory power of the model and in this study adjusted R2 value which takes into account the loss of degrees of freedom associated with adding extra variables were inferred to see the explanatory powers of the models.

The p-value shows at what percentage the level of each variable is significant or insignificant. From the appendix 4 the value of adjusted $R^2$ is 0.75. There is a rule of thumb which can be used to determine the adjust R2 value as follows: <

0.1: poor fit, 0.11 to 0.30: modest fit, 0.31 to 0.50: moderate fit, >0.50: strong fit (Muijs, 2004, p. 166). Here in the study adjusted R2 of 0.751 indicates that the formula is strong fit for predicting the ROA.

The value of F-test explains the overall significance of a model. It explains the significance of the relationship between dependent variables and all the other independent variables jointly. We can see from the appendix *4* of regression result F -statistics of 10.79 highly significant at 1% with p-value of 0.000.

In the regression outputs the beta coefficient may be negative or positive; beta indicates that each variable's level of influence on the dependent variable. P-value indicates at what percentage or precession level of each variable is significant. The positive beta coefficient means that variable has a positive impact on your dependent variable, and a negative one has a negative impact. It tell us On average when independent variable increase by 1 percent the dependent increase by beta amount but the independent variables should a statistically significant impact on the dependent variable.

The C is the constant, where the regression line intercepts the y axis, representing the amount the dependent will be when all the independent variables are 0. Here C is –0.67 the probability of the coefficient is significant.

**Operational model:** the operational panel least square regression model used was:

$$ROA_{it}=\beta 0+\beta 1ARD_{it}+\beta 2APD_{it}+\beta 3ICP+\beta 4CCC_{it}+\beta 5CATAR_{it}+\beta 6CLTAR_{it}+\beta 8LOS_{it}+\beta 9GDP_{it}+\beta INF+u_{it}.$$

Specifically, when the above panel least squares model is converted into specified variables with their coefficient it becomes:

$ROA_{it}=\beta 0-8.44ARDit+1.5APDit-0.00016ICP -0.23CCCit +0.001CATAR_{it} +0.008CLTAR_{it}+0.15DROA113-0.17DROA1115+ 0.02LOSit+0.010GDPit+ 0.14INFit+uit.$

From the regression output in *appendix 4*, in line with the initial hypothesis, the results of this regression indicate that the coefficient of account receivable days is negative and significant at p-value of 0.08. In conformity with the initial hypothesis which states that there is significant negative relationship between inventories holding period and profitability of firms. Coefficient of Inventory Holding Period is negative and *p*-value of 0.10 attached to the test statistic. Opposed from the initial hypothesis the result of the regressions analysis shows that, Account Payable days has no significant impact on firms' profitability even at 10% level of significance

In the regression model, the beta coefficient of Cash Conversion Cycle is -0.230 and the *p*-value of 0.0150 attached to the test statistic shows that this hypothesis significance at 5% level.

Opposite to the research hypothesis, the regression output shows that the β-coefficient of current assets to total assets ratio (CATAR) is positive and significant at 10 percent level.

The β-coefficient of current liability to total assets ratio (CLTAR), in line with the research hypotheses is positive 0.0889 and it is significant at 10 percent.

## 4.6. Discussion of the Regression Result

### 4.6.1. Accounts Receivable Days and Profitability

In line with the initial hypothesis, the results of this regression indicate that the coefficient of account receivable days is negative and *p*-value of 0.0885 attached to the test statistic shows significance at 10% level. It implies that the increase or decrease in the number of days taken by firms to collect cash will

significantly and negatively affect profitability of the firm. This negative relationship implies the number of days to collect cash from credit customers becomes too long; it will adversely affect profitability of the firms. The reason may because if a firm collects its accounts receivable quickly, the fund will be available for productive usage. In this sense, the negative relationship between accounts receivable period and firms' profitability is consistent with the view that the lesser the time it takes customers to pay their bills, results more cash available to replenish the inventory, this intern leads to more sales which ultimately results in an increase in profitability. The result is basically consistent with the findings of Deloof(2003), Padachi (2006), Samiloglu and Demirgunes (2008), Lazaridis and Tryfonidis (2006), Sen and Oruc (2009), Falope and Ajilore (2009). All point out negative relation between account receivables and firms profitability.

### 4.6.2. Inventory Holding Period and Profitability

The result from this study is in line with the initial hypothesis which states that there is significant negative relationship between inventory holding period and profitability of firms. Coefficient of Inventory Holding Period is negative and *p*-value of 0.10 attached to the test statistic shows that the variable is almost significant at 10% level. This result is in line with the findings of Deloof(2003), Padachi (2006) ,Teruel and Solano (2007) Samiloglu and Demirgunes (2008), Lazaridis and Tryfonidis (2006), Sen and Oruc (2009), Falope and Ajilore (2009), all points out that the companies with low inventory conversion period have more efficient working capital management. The implication is that the increase or decrease inventory holding period will significantly and negatively affect profitability of the firms. In simple terms, the shorter the firm's inventory holding period, the higher will be the profitability and vice versa. It can be also interpreted as if the inventory takes more time to sell, it will adversely affect profitability. The reason for this could be tied up of more funds plus

deterioration and obsolescence of inventory due to longer inventory period leads to lower profitability.

### 4.6.3. Accounts Payable Days and Profitability

Opposed from the initial hypothesis, the result of the regressions analysis has no significant impact on firms' profitability even at 10%. The result is basically consistent with the findings of Rafuse, (1996) who founds insignificant relationship between accounts payable period and profitability. The researcher accepts these results for two reasons. First, in the literature of working capital, research findings indicated both negative and positive significant relationships between accounts payable period and profitability of firms. A positive significant relationship between accounts payable period and profitability can be explained by the increased availability of funds caused by the delayed payment of accounts payable. Such funds can thus be used for productive purposes that can increase profitability. On the other hand, a negative significant relationship between accounts payable period and profitability can be explained by the benefits of early payment discounts. What if, if these two benefits off-set each other? There will be no significant relationship between accounts payable period and profitability of firms. Second it is not delaying payment or making it fast that matters. What matters is for what purpose we use the fund at hand i.e. if we make it idle we expect no additional profits from delaying payments for accounts payable. On the other hand, if we use it for productive purpose we can expect some additional profits. Therefore, there may not be a significant relationship between accounts payable period and profitability of firms.

### 4.6.4. Cash Conversion Cycle and Profitability

The beta coefficient of Cash Conversion Cycle shows a negative and the *p*-value of 0.0150 attached to the test statistic shows the significance of the variable at 5% level of significance. This negative relationship is consistent with some previous findings of Wang (2002), shin and Soenen (1993), Lazaridis and Tryfonidis (2006), Falope and Ajilore (2009). The implication is that the increase or decrease in cash conversion cycle will significantly and negatively affect profitability of the firms. It means that the shorter the firm's cash conversion cycle, the higher will be the profitability and vice versa. As stated earlier, cash conversion cycle is an additive function of accounts receivable period, inventory holding period and accounts payable period; i.e. cash conversion cycle is equal to accounts receivable period plus inventory holding period minus accounts payable period. Managing cash conversion cycle efficiently, means efficient management of these three items. By managing efficiently the accounts receivable period, inventory holding period and accounts payable period (by making short accounts receivable period and inventory holding period and/or making long accounts payable period) managers can control the efficiency of cash conversion cycle and its impact on profitability.

### 4.6.5. Current Assets to Total Assets Ratio and Profitability

The above four measurements of working capital assets management policy, namely accounts receivable period, inventory holding period, accounts payable period and cash conversion cycle, indicate how efficient are firms in managing their collection, inventory and payment policies. Investment in working capital assets, however, is broader than managing collection, inventory and payment policies. It also includes management of cash and other short term assets. For this reason, we need to have this comprehensive measurement of working capital investment policy. In finance literature, there is a long argument on the

determinants and the risk/return tradeoff between the different working capital policies. More aggressive working capital policies are associated with higher return and higher risk while conservative working capital policies are concerned with the lower risk and return.

Opposite to the research hypothesis, the regression output shows that the β-coefficient of current assets to total assets ratio (CATAR) is positive and significant at 10 percent level. But this positive result is consistent with some previous findings of Tufail, 2008; Kaddumi, 2012; Afza and Nazir 2007. The positive coefficients of current assets to total assets ratio indicates a negative effect of the degree of aggressiveness of working capital investment policy on firms' profitability. It means that as current assets to total assets ratio increases, degree of aggressiveness decreases, and hence firms' profitability increases. Accordingly, aggressiveness in working capital investment policy affects the profitability of manufacturing share companies negatively.

The result may be acceptable because most of firms included in the study may not yet fully use their fixed production capacities. This means that if they want to increase their profitability, they have to increase their investment in current assets until they reach the cost indifference point. Keeping fixed assets constant (even decreasing through depreciation) and investing more on current assets will then result in increased current assets to total assets ratio. So, it may not be surprising to see positive relationship between current assets to total assets ratio and profitability.

### 4.6.6. Current Liabilities to Total Assets Ratio and Profitability

To this point, the regression analyses were related to working capital investment policy. In examining the effect of management of working capital on firms' profitability, it is also equally important to see the effect of working capital financing policy. Working capital financing policy is measured by the

relative aggressiveness/conservativeness in using current liabilities to finance working capital assets. In measuring the effect of working capital financing policy current liabilities to total assets ratio is used.

The β-coefficient of current liability to total assets ratio (CLTAR) is positive 0.0889 and significant at 10 percent level this result is in line with the research hypothesis and it is consistent with some previous findings of Kaddumi, 2012; Falope and Ajilore, 2009; The positive coefficients in this study point out the positive effect of aggressive working capital financing policy on firms' profitability. The implication is that the increase or decrease in current liabilities to total assets ratio will significantly and positively affect profitability of the firms. The higher the amount of current liabilities the firm uses to finance its working capital assets, the more profitable the firm will be. This implies that there is strong positive relationship between aggressiveness in working capital financing and firms' profitability.

by and large, the researcher failed to reject five hypotheses that indicate the relationship between profitability measurement of return on asset and ARD, ICP,CCC, CATAR, CLTAR whereas, the researcher rejected one hypotheses indicating the relationship between ROA and APD.

Table 4.3 Summary of actual and expected signs of explanatory variables on the dependent variables

| | | |
|---|---|---|
| Independent variables | Expected Impact on return on asset | Actual Impact |
| ARD | Negative and significant | negative and significant |
| ICP | Negative and significant | negative and significant |
| APD | Negative and significant | positive and significant |
| CCC | Positive and significant | negative and insignificant |
| CATAR | Negative and significant | negative and significant |
| CLTAR | Positive and significant | positive and significant |

# CHAPTER FIVE: CONCLUSION, RECOMMENDATIONS AND FURTHER CONSIDERATION

This chapter presents conclusion drawn from the overall overviews of the research by adding the main findings of the analysis part and give recommendation and future research directions.

## 5.1. Summery and Conclusion

As stated by Siddiquee and Khan (2009) it has been observed that, firms which are better at managing working capital are found to be able to build a better competitive advantage. They are also better at generating fund internally and also face lesser trouble while seeking external sources of financing. Efficient level of working capital should be present for smooth running of business regardless of the nature of business.

From this study, it is concluded that maintaining efficient level of working capital is very important for manufacturing sector as well like all other sectors of business.

A sample of 19 manufacturing share companies found in Addis Ababa which covered the period from 2010 to 2014 has been used to conduct the study. The data was analyzed and interpreted descriptively and quantitatively.

The study used return on assets as, dependent profitability variable. Accounts receivable period, inventory holding period and accounts payable period were used as independent working capital investment policy variables. Moreover, cash conversion cycle and current assets to total assets ratio has been used as comprehensive measures of working capital investment policy. On the other hand, current liabilities to total assets ratio has been used as a measure of working capital financing policy. In addition, the study used firm size

measured by logarithm of total asset, annual GDP growth rate and inflation rate as control variables.

There is significant negative relation between profitability and the number of day's accounts receivable. Showing that the shorter it takes firms to receive their receivables the more profitable they will be. This negative relationship can be elaborated as the number of days to collect cash from credit customers becomes too long, it will adversely affect profitability of the firms. This negative relationship may because of, if a firm collects its accounts receivable quickly the fund will be available for other productive usage.

The researcher also found that the negative relationship between inventory conversion period and profitability. It shows that the longer it takes firms to replenish the inventory, the less profitable they will be. This suggests the obsolescence of inventory due to longer inventory period leads to lower profitability.

Opposite to the research hypothesis the study has found that the positive but insignificant relation between account payable day and profitability of manufacturing firms.

The study has found that negative significant relation between cash conversion cycle and financial performance of manufacturing share companies. As stated earlier, cash conversion cycle is an additive function of accounts receivable period, inventory holding period and accounts payable period; i.e. cash conversion cycle is equal to accounts receivable period plus inventory holding period minus accounts payable period. Managing cash conversion cycle efficiently, means efficient management of these three items,

A greater value of current assets to total assets ratio shows less aggressive investment policy of working capital (Afza & Nazir, 2008). From this, it can be concluded that a less aggressive working capital investment policy leads to

more profitability. If a firm invests more in fixed assets then it can generate more profits. If a firm uses more of its resources as current assets then it will lead to wastage of resources. The study has found that positive and significant relation between CATAR and profitability of manufacturing share companies. It implies that, conservativeness in working capital investment policy leads to more profitability.

An increase in current liabilities to total assets ratio leads to high profitability. A higher value of current assets to total assets ratio shows a comparatively more aggressive working capital financing policy, that means more investment in current liabilities as compared to long-term debts. An aggressive financing policy results in high profitability. The study found that a significant positive relationship between CLTAR and profitability of manufacturing share companies. The implication is that an Aggressive working capital financing policy, results in high profitability.

Generally, the results of this study show that conservative investing policy and aggressive financing policy of working capital results in more profitability.

## 5.2. Recommendation

The findings of this study are helpful for the financial managers of the manufacturing companies and it provide the information regarding the management of short-term capital and also inform them about the management policies used by their peers. The information is useful for maintaining a healthy competition and improving own organization.

The researcher based on the above findings and the conclusions drawn, recommends to the managers and employees of these manufacturing share companies.

- Management of CCC is an important factor in working capital management, and mangers of the firms should apply suitable CCC procedures and control mechanism. Result shows there is a negative relationship between CCC and return on assets (ROA). Managing cash conversion cycle efficiently, means efficient management of these three items (ARD, ICP, and APD); therefore, the researcher recommended that to be profitable, manufacturing companies must try to keep these numbers of days to minimum level by developing a clear procedure for collecting the receivables and managing their inventories. If a firm collects its accounts receivable quickly (which is part of CCC) the fund will be available for other productive usage In the sense, that the lesser the time it takes customers to pay their bills, results more cash available to replenish the inventory, this intern leads to more sales which ultimately results in an increase in profitability. In addition to that the collection of receivables in a short period of time may help firms to reduce the uncollectable from default. But In following its collection procedures the circumstance of customer's should be kept in mind. Good customers in temporary complexity should be treated differently from habitual defaulters; otherwise firms may lose their loyal customers. In addition, if managers reducing stock it produce major financial advantages by improving cash flows, reducing operational level costs of inventory (decreasing CCC). In the case of a sudden drop in sales accompanied with a mismanagement of inventory will lead to tying up excess capital at the expense of profitable operations. Moreover the researcher recommends that marketing, purchasing and manufacturing departments should have to create strong linkage and communications so as to feed each other.
- The study found positive significant relationship between current asset to total asset ratio and firm's profitability, which means conservativeness in working capital management investment policies, increases firm's profitability. This is due to adequate investment in current assets

increases the solvency, which intern protects bankruptcy. Thus, the researcher recommends that manufacturing share companies use more conservative way of investing. Specially the companies that are operating in an uncertain environment better to adopt such a policy because they are not sure about the future prices demand and short term interest rate. In such a situation it is better to have a high level of current assets. Conservative working capital policy for a given level of turnover would be associated with maintaining a larger cash balance, perhaps even investing in short-term securities. A firm even be able to reduce the investment in fixed assets by renting or leasing plant and machinery this may increase the CATAR and intern increase profitability.

- Furthermore; the researcher recommends that, the financial managers of manufacturing firms should follow aggressive financing. By financing long term asset with short term debts such as trade credit and short term bank loan, managers could enhance the profitability by paying lesser interest rate but this approach can be proved very risky if the short term interest rate fluctuates or the cash inflow is not enough to fulfill the current liabilities. Especially Such a policy is better to adopt by the companies which is operating in a stable economy and is quite certain about future cash flows. It gives a high return as the high return is associated with high risk.

In general the above discussions demonstrate that collecting payments from customers earlier, (not absolutely), keeping products in stock less time, relatively higher CATAR and CLTAR are all associated with an increase in the firm's profitability.

## 5.3. Further Consideration

This research has opened many avenues for future research especially in context of Ethiopia. There are several potential avenues for future research and improvements in working capital management.

*First*, since there is in general shortage of working capital studies in case of manufacturing share companies in Ethiopia, this study can be extended by using more data from a cross-section of Ethiopian manufacturing S.C. This may improve current understanding of the working capital management and associated performance in developing countries.

*Second*, the future research can be extended in the area of working capital management is, the working capital practices followed in different sectors using the primary data collected directly from the financial managers of different firms. Such type of study will provide a fresh understanding of respective managers that how they perceive and manage the working capital of the firm.

*Third*, another important area is the working capital management for the financial sectors. This is again an area where studies needed to be undertaken because the working capital requirements for the financial sectors are different from those of the non-financial or manufacturing sectors.

*Fourth*, another consideration for further study for the proposed study is that the data used here is only 5 years due to the limitation of lack of availability of data; therefore, this study can be extended in terms of number years as well.

*fifth*, the results estimated from this study should be evaluated keeping in mind that there could be many other dependent and independent variables as well besides the variables mentioned above, that can explain working capital management and profitability correlation and this study is limited only to the effect of selected variables in measuring the efficiency of working capital

management, Therefore, this study can be extended by including some other variables in the model.

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**http://ec.europaeu/enterprise/enterprise_policy/sme_definition/index_en.html***Ibid., p.51(Ibid. 200),2 p.51*

## Appendix 1 Sample Companies Detail

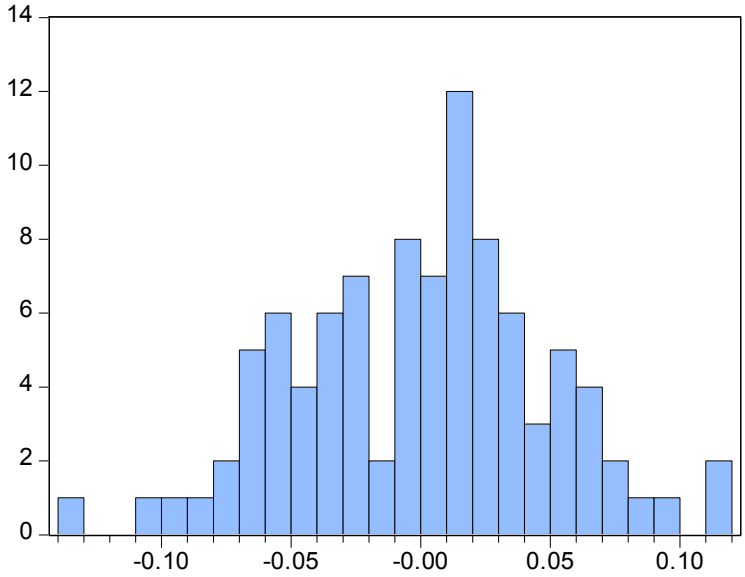
| Name of the firm | H.O<br>Sub city | Telephone |
|---|---|---|
| Moha Soft Drinks S.C | Lideta | 011 2750122 |
| A.A Tannary S.c | Kolfe keranio | 0911 201451 |
| Akaki Spare parts and hand tools S.c | Akaki kality | 0114 340422 |
| A.A bootle and Glass S.c | Kolfe keranio | 0112 701474 |
| Awash Wine S.c | LIdeta | 0113 201391 |
| BM Ethiopia garment and textile S.C | Akaki kality | 0114 420618 |
| Ethiopian Pulp & Paper S.C | Kirkos | 0118 591366 |
| Ethiopian Pharmaceuticals Mfg. S.C | Bole | 0113 712605 |
| East cement S.C | yeka | 0116 452100 |
| AKaki metal S.c | Akaki Kality | 0114 340400 |
| East african bottling s.c | Lideta | 0112756382 |
| Horizon Addis tyre (Mathador) S.c | Akaki Kality | 0114-421555 |
| kality Metal Industry S.C | Akaki Kality | 0114 340162 |
| kaliy food s.c | Akaki kality | 0114 390144 |
| Pittards Products Manufacturing S.C | Nifas Silk Lafto | 0114 400092 |
| BGI | Lideta | 0115 510677 |
| Tsehay manufacturing industry S.c | Yeka | 0116 600123 |
| East Steel S.c | yeka | 0116 600195 |
| Fafa Food S,c | Akaki kality | 0114 343061 |

## Appendix 2

## Previous Empirical Studies Results Vs Current Study Result

| | | | |
|---|---|---|---|
| Variable | Researchers' name | relationship with ROA | current study result |
| account receivable | (Deloof(2003), Padachi (2006) Samiloglu and Demirgunes (2008), Lazaridis and Tryfonidis (2006), Sen and Oruc (2009), Falope and Ajilore (2009),) | negative | Negative |
| | (Arshad, 2013 | Positive | |
| | Rafuse (1996) | Insignificant relationship | |
| Inventory conversion period | (Deloof, 2003), Padachi (2006) ,Teruel and Solano (2007) Samiloglu and Demirgunes (2008), Lazaridis and Tryfonidis (2006), Sen and Oruc (2009), Falope and Ajilore (2009). | Negative | negative |
| | (Arshad, 2013 | Positive | |
| | | Insignificant relationship | |
| account payable | (Deloof, 2003) , Falope and Ajilore (2009) | negative | Insignificant relationship |
| | (Arshad, 2013, Lazaridis and Tryfonidis (2006) | Positive | |
| | Rafuse (1996) | Insignificant relationship | |
| cash conversion cycle | Wang (2002), shin and Soenen (1993), Lazaridis and Tryfonidis (2006), Falope and Ajilore (2009) | Negative | negative |
| | Blinder and Maccini (1991) | Positive | |
| | (Bhunia, 2012), Samiloglu and Demirgunes (2008), Amarjit gill, (2010) | Insignificant relationship | |
| CATAR | Weinraub and Visscher (1998) | Negative | positive |
| | (Tufail, 2008) ,Kaddumi, 2012), Afza and Nazir (2007) | Positive | |
| | | Insignificant relationship | |
| CLTAR | (Tufail, 2008, Weinraub and Visscher (1998), Afza and Nazir (2007) | Negative | positive |
| | (Kaddumi, 2012), Falope and Ajilore, 2009 | Positive | |
| | | Insignificant relationship | |

## Appendix 3 Normality Test




| Series: Residuals | |
|---|---|
| Sample 2010 2014 | |
| Observations 95 | |
| Mean | 4.73e-17 |
| Median | 0.002394 |
| Maximum | 0.117560 |
| Minimum | -0.133297 |
| Std. Dev. | 0.048843 |
| Skewness | -0.119205 |
| Kurtosis | 2.854790 |
| Jarque-Bera | 0.308454 |
| Probability | 0.857077 |

# Appendix 4. Fixed Effect Regression Result for the Impact of Working Capital Management Variables on ROA.

Dependent Variable: ROA

Method: Panel Least Squares

Date: 05/13/15 Time: 08:44

Sample: 2010 2014

Periods included: 5

Cross-sections included: 19

Total panel (balanced) observations: 95

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -0.672207 | 0.196800 | -3.415689 | 0.0011 |
| ARD | -8.442105 | 0.000155 | -0.543666 | 0.0885 |
| APD | 1.550106 | 0.000106 | 0.014611 | 0.9884 |
| AID | -0.000163 | 9.950105 | -1.636261 | 0.1006 |
| CCC | -0.230005 | -7.210005 | -1.280194 | 0.0150 |
| CLTAR | 0.001241 | 0.000850 | 1.460624 | 0.0889 |
| CATAR | 0.081901 | 0.041542 | 1.971522 | 0.0529 |
| DROA113 | 0.153202 | 0.053534 | 2.861761 | 0.0057 |
| DROA1513 | -0.166757 | 0.053794 | -3.099923 | 0.0029 |
| SIZE | 0.028632 | 0.009371 | 3.055485 | 0.0033 |
| GDP | 0.011920 | 0.005693 | 2.093768 | 0.0402 |
| INF | 0.142510 | 0.055337 | 2.575318 | 0.0123 |

Effects Specification

Cross-section fixed (dummy variables)

| | | | |
|---|---|---|---|
| R-squared | 0.828127 | Mean dependent var | 0.053111 |
| Adjusted R-squared | 0.751446 | S.D. dependent var | 0.085148 |
| S.E. of regression | 0.042451 | Akaike info criterion | -3.228846 |
| Sum squared resid | 0.117135 | Schwarz criterion | -2.422358 |
| Log likelihood | 183.3702 | Hannan-Quinn criter. | -2.902964 |
| F-statistic | 10.79955 | Durbin-Watson stat | 1.823318 |
| Prob(F-statistic) | 0.000000 | | |

# Appendix 5 Heteroskedasticity Test: White

Heteroskedasticity Test: White

| | | | |
|---|---|---|---|
| F-statistic | 0.528779 | Prob. F(11,83) | 0.8786 |
| Obs*R-squared | 6.221523 | Prob. Chi-Square(11) | 0.8582 |
| Scaled explained SS | 4.404234 | Prob. Chi-Square(11) | 0.9566 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/13/15 Time: 22:43
Sample: 2010 2014
Included observations: 95

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.003444 | 0.004846 | 0.710770 | 0.4792 |
| ARD^2 | -1.01E-08 | 2.73E-08 | -0.370432 | 0.7120 |
| APD^2 | -1.97E-09 | 5.90E-09 | -0.333710 | 0.7394 |
| AID^2 | 4.28E-09 | 6.97E-09 | 0.612993 | 0.5416 |
| CCC^2 | -5.33E-09 | 6.40E-09 | -0.831966 | 0.4078 |
| CLTAR^2 | -6.85E-07 | 1.04E-06 | -0.658399 | 0.5121 |
| CATAR^2 | 0.001754 | 0.001379 | 1.271842 | 0.2070 |
| DROA113^2 | -0.003333 | 0.003454 | -0.965041 | 0.3373 |
| DROA1513^2 | -0.001853 | 0.003524 | -0.525944 | 0.6003 |
| SIZE^2 | -7.51E-06 | 1.02E-05 | -0.736495 | 0.4635 |
| GDP^2 | 7.67E-06 | 2.26E-05 | 0.340041 | 0.7347 |
| INF^2 | 0.003811 | 0.010279 | 0.370808 | 0.7117 |

| | | | |
|---|---|---|---|
| R-squared | 0.065490 | Mean dependent var | 0.002361 |
| Adjusted R-squared | -0.058361 | S.D. dependent var | 0.003232 |
| S.E. of regression | 0.003325 | Akaike info criterion | -8.457194 |
| Sum squared resid | 0.000918 | Schwarz criterion | -8.134599 |
| Log likelihood | 413.7167 | Hannan-Quinn criter. | -8.326841 |
| F-statistic | 0.528779 | Durbin-Watson stat | 1.986493 |
| Prob(F-statistic) | 0.878576 | | |

# Appendix 6 Durbin-Watson Statistic

*DURBIN-WATSON* *SIGNIFICANCE* *TABLES*

Durbin-Watson Statistic: 1 Per Cent Significance Points of dL and dU *k‟ is the number of regressors excluding the intercept

| | k'=1 | | k'=2 | | k'=3 | | k'=4 | | k'=5 | | k=6 | | k'=7 | | k'=8 | | k'=9 | | k'=10 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N | dL | dU | dL | dU | dL | dU | dL | dU | dL | dU | dL | dU | dL | dU | dL | dU | dL | dU | dL | dU |
| 6 | 0.390 | 1.142 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 7 | 0.435 | 1.036 | 0.294 | 1.676 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 8 | 0.497 | 1.003 | 0.345 | 1.489 | 0.229 | 2.102 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 9 | 0.554 | 0.998 | 0.408 | 1.389 | 0.279 | 1.875 | 0.183 | 2.433 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 10 | 0.604 | 1.001 | 0.466 | 1.333 | 0.340 | 1.733 | 0.230 | 2.193 | 0.150 | 2.690 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 11 | 0.653 | 1.010 | 0.519 | 1.297 | 0.396 | 1.640 | 0.286 | 2.030 | 0.193 | 2.453 | 0.124 | 2.892 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 12 | 0.697 | 1.023 | 0.569 | 1.274 | 0.449 | 1.575 | 0.339 | 1.913 | 0.244 | 2.280 | 0.164 | 2.665 | 0.105 | 3.053 | ----- | ----- | ----- | ----- | ----- | ----- |
| 13 | 0.738 | 1.038 | 0.616 | 1.261 | 0.499 | 1.526 | 0.391 | 1.826 | 0.294 | 2.150 | 0.211 | 2.490 | 0.140 | 2.838 | 0.090 | 3.182 | ----- | ----- | ----- | ----- |
| 14 | 0.776 | 1.054 | 0.660 | 1.254 | 0.547 | 1.490 | 0.441 | 1.757 | 0.343 | 2.049 | 0.257 | 2.354 | 0.183 | 2.667 | 0.122 | 2.981 | 0.078 | 3.287 | ----- | ----- |
| 15 | 0.811 | 1.070 | 0.700 | 1.252 | 0.591 | 1.465 | 0.487 | 1.705 | 0.390 | 1.967 | 0.303 | 2.244 | 0.226 | 2.530 | 0.161 | 2.817 | 0.107 | 3.101 | 0.068 | 3.374 |
| 16 | 0.844 | 1.086 | 0.738 | 1.253 | 0.633 | 1.447 | 0.532 | 1.664 | 0.437 | 1.901 | 0.349 | 2.153 | 0.269 | 2.416 | 0.200 | 2.681 | 0.142 | 2.944 | 0.094 | 3.201 |
| 17 | 0.873 | 1.102 | 0.773 | 1.255 | 0.672 | 1.432 | 0.574 | 1.631 | 0.481 | 1.847 | 0.393 | 2.078 | 0.313 | 2.319 | 0.241 | 2.566 | 0.179 | 2.811 | 0.127 | 3.053 |
| 18 | 0.902 | 1.118 | 0.805 | 1.259 | 0.708 | 1.422 | 0.614 | 1.604 | 0.522 | 1.803 | 0.435 | 2.015 | 0.355 | 2.238 | 0.282 | 2.467 | 0.216 | 2.697 | 0.160 | 2.925 |
| 19 | 0.928 | 1.133 | 0.835 | 1.264 | 0.742 | 1.416 | 0.650 | 1.583 | 0.561 | 1.767 | 0.476 | 1.963 | 0.396 | 2.169 | 0.322 | 2.381 | 0.255 | 2.597 | 0.196 | 2.813 |
| 20 | 0.952 | 1.147 | 0.862 | 1.270 | 0.774 | 1.410 | 0.684 | 1.567 | 0.598 | 1.736 | 0.515 | 1.918 | 0.436 | 2.110 | 0.362 | 2.308 | 0.294 | 2.510 | 0.232 | 2.174 |
| 21 | 0.975 | 1.161 | 0.889 | 1.276 | 0.803 | 1.408 | 0.718 | 1.554 | 0.634 | 1.712 | 0.552 | 1.881 | 0.474 | 2.059 | 0.400 | 2.244 | 0.331 | 2.434 | 0.268 | 2.625 |
| 22 | 0.997 | 1.174 | 0.915 | 1.284 | 0.832 | 1.407 | 0.748 | 1.543 | 0.666 | 1.691 | 0.587 | 1.849 | 0.510 | 2.015 | 0.437 | 2.188 | 0.368 | 2.367 | 0.304 | 2.548 |
| 23 | 1.017 | 1.186 | 0.938 | 1.290 | 0.858 | 1.407 | 0.777 | 1.535 | 0.699 | 1.674 | 0.620 | 1.821 | 0.545 | 1.977 | 0.473 | 2.140 | 0.404 | 2.308 | 0.340 | 2.479 |
| 24 | 1.037 | 1.199 | 0.959 | 1.298 | 0.881 | 1.407 | 0.805 | 1.527 | 0.728 | 1.659 | 0.652 | 1.797 | 0.578 | 1.944 | 0.507 | 2.097 | 0.439 | 2.255 | 0.375 | 2.417 |
| 25 | 1.055 | 1.210 | 0.981 | 1.305 | 0.906 | 1.408 | 0.832 | 1.521 | 0.756 | 1.645 | 0.682 | 1.776 | 0.610 | 1.915 | 0.540 | 2.059 | 0.473 | 2.209 | 0.409 | 2.362 |
| 26 | 1.072 | 1.222 | 1.000 | 1.311 | 0.928 | 1.410 | 0.855 | 1.517 | 0.782 | 1.635 | 0.711 | 1.759 | 0.640 | 1.889 | 0.572 | 2.026 | 0.505 | 2.168 | 0.441 | 2.313 |
| 27 | 1.088 | 1.232 | 1.019 | 1.318 | 0.948 | 1.413 | 0.878 | 1.514 | 0.808 | 1.625 | 0.738 | 1.743 | 0.669 | 1.867 | 0.602 | 1.997 | 0.536 | 2.131 | 0.473 | 2.269 |
| 28 | 1.104 | 1.244 | 1.036 | 1.325 | 0.969 | 1.414 | 0.901 | 1.512 | 0.832 | 1.618 | 0.764 | 1.729 | 0.696 | 1.847 | 0.630 | 1.970 | 0.566 | 2.098 | 0.504 | 2.229 |
| 29 | 1.119 | 1.254 | 1.053 | 1.332 | 0.988 | 1.418 | 0.921 | 1.511 | 0.855 | 1.611 | 0.788 | 1.718 | 0.723 | 1.830 | 0.658 | 1.947 | 0.595 | 2.068 | 0.533 | 2.193 |
| 30 | 1.134 | 1.264 | 1.070 | 1.339 | 1.006 | 1.421 | 0.941 | 1.510 | 0.877 | 1.606 | 0.812 | 1.707 | 0.748 | 1.814 | 0.684 | 1.925 | 0.622 | 2.041 | 0.562 | 2.160 |
| 31 | 1.147 | 1.274 | 1.085 | 1.345 | 1.022 | 1.425 | 0.960 | 1.509 | 0.897 | 1.601 | 0.834 | 1.698 | 0.772 | 1.800 | 0.710 | 1.906 | 0.649 | 2.017 | 0.589 | 2.131 |
| 32 | 1.160 | 1.283 | 1.100 | 1.351 | 1.039 | 1.428 | 0.978 | 1.509 | 0.917 | 1.597 | 0.856 | 1.690 | 0.794 | 1.788 | 0.734 | 1.889 | 0.674 | 1.995 | 0.615 | 2.104 |
| 33 | 1.171 | 1.291 | 1.114 | 1.358 | 1.055 | 1.432 | 0.995 | 1.510 | 0.935 | 1.594 | 0.876 | 1.683 | 0.816 | 1.776 | 0.757 | 1.874 | 0.698 | 1.975 | 0.641 | 2.080 |
| 34 | 1.184 | 1.298 | 1.128 | 1.364 | 1.070 | 1.436 | 1.012 | 1.511 | 0.954 | 1.591 | 0.896 | 1.677 | 0.837 | 1.766 | 0.779 | 1.860 | 0.722 | 1.957 | 0.665 | 2.057 |
| 35 | 1.195 | 1.307 | 1.141 | 1.370 | 1.085 | 1.439 | 1.028 | 1.512 | 0.971 | 1.589 | 0.914 | 1.671 | 0.857 | 1.757 | 0.800 | 1.847 | 0.744 | 1.940 | 0.689 | 2.037 |
| 36 | 1.205 | 1.315 | 1.153 | 1.376 | 1.098 | 1.442 | 1.043 | 1.513 | 0.987 | 1.587 | 0.932 | 1.666 | 0.877 | 1.749 | 0.821 | 1.836 | 0.766 | 1.925 | 0.711 | 2.018 |
| 37 | 1.217 | 1.322 | 1.164 | 1.383 | 1.112 | 1.446 | 1.058 | 1.514 | 1.004 | 1.585 | 0.950 | 1.662 | 0.895 | 1.742 | 0.841 | 1.825 | 0.787 | 1.911 | 0.733 | 2.001 |
| 38 | 1.227 | 1.330 | 1.176 | 1.388 | 1.124 | 1.449 | 1.072 | 1.515 | 1.019 | 1.584 | 0.966 | 1.658 | 0.913 | 1.735 | 0.860 | 1.816 | 0.807 | 1.899 | 0.754 | 1.985 |
| 39 | 1.237 | 1.337 | 1.187 | 1.392 | 1.137 | 1.452 | 1.085 | 1.517 | 1.033 | 1.583 | 0.982 | 1.655 | 0.930 | 1.729 | 0.878 | 1.807 | 0.826 | 1.887 | 0.774 | 1.970 |
| 40 | 1.246 | 1.344 | 1.197 | 1.398 | 1.149 | 1.456 | 1.098 | 1.518 | 1.047 | 1.583 | 0.997 | 1.652 | 0.946 | 1.724 | 0.895 | 1.799 | 0.844 | 1.876 | 0.749 | 1.956 |
| 45 | 1.288 | 1.376 | 1.245 | 1.424 | 1.201 | 1.474 | 1.156 | 1.528 | 1.111 | 1.583 | 1.065 | 1.643 | 1.019 | 1.704 | 0.974 | 1.768 | 0.927 | 1.834 | 0.881 | 1.902 |
| 50 | 1.324 | 1.403 | 1.285 | 1.445 | 1.245 | 1.491 | 1.206 | 1.537 | 1.164 | 1.587 | 1.123 | 1.639 | 1.081 | 1.692 | 1.039 | 1.748 | 0.997 | 1.805 | 0.955 | 1.864 |
| 55 | 1.356 | 1.428 | 1.320 | 1.466 | 1.284 | 1.505 | 1.246 | 1.548 | 1.209 | 1.592 | 1.172 | 1.638 | 1.134 | 1.685 | 1.095 | 1.734 | 1.057 | 1.785 | 1.018 | 1.837 |
| 60 | 1.382 | 1.449 | 1.351 | 1.484 | 1.317 | 1.520 | 1.283 | 1.559 | 1.248 | 1.598 | 1.214 | 1.639 | 1.179 | 1.682 | 1.144 | 1.726 | 1.108 | 1.771 | 1.072 | 1.817 |
| 65 | 1.407 | 1.467 | 1.377 | 1.500 | 1.346 | 1.534 | 1.314 | 1.568 | 1.283 | 1.604 | 1.251 | 1.642 | 1.218 | 1.680 | 1.186 | 1.720 | 1.153 | 1.761 | 1.120 | 1.802 |

70 1.429 1.485 1.400 1.514 1.372 1.546 1.343 1.577 1.313 1.611 1.283 1.645 1.253 1.680 1.223 1.716 1.192 1.754 1.162 1.792
75 1.448 1.501 1.422 1.529 1.395 1.557 1.368 1.586 1.340 1.617 1.313 1.649 1.284 1.682 1.256 1.714 1.227 1.748 1.199 1.783
80 1.465 1.514 1.440 1.541 1.416 1.568 1.390 1.595 1.364 1.624 1.338 1.653 1.312 1.683 1.285 1.714 1.259 1.745 1.232 1.777
85 1.481 1.529 1.458 1.553 1.434 1.577 1.411 1.603 1.386 1.630 1.362 1.657 1.337 1.685 1.312 1.714 1.287 1.743 1.262 1.773
90 1.496 1.541 1.474 1.563 1.452 1.587 1.429 1.611 1.406 1.636 1.383 1.661 1.360 1.687 1.336 1.714 1.312 1.741 1.288 1.769
95 1.510 1.552 1.489 1.573 1.468 1.596 1.446 1.618 1.425 1.641 1.403 1.666 1.381 1.690 1.358 1.715 1.336 1.741 1.313 1.767
100 1.522 1.562 1.502 1.582 1.482 1.604 1.461 1.625 1.441 1.647 1.421 1.670 1.400 1.693 1.378 1.717 1.357 1.741 1.335 1.765
150 1.611 1.637 1.598 1.651 1.584 1.665 1.571 1.679 1.557 1.693 1.543 1.708 1.530 1.722 1.515 1.737 1.501 1.752 1.486 1.767
200 1.664 1.684 1.653 1.693 1.643 1.704 1.633 1.715 1.623 1.725 1.613 1.735 1.603 1.746 1.592 1.757 1.582 1.768 1.571 1.779

## Appendix 7 Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 3.334979 | Prob. F(4,79) | 0.2141 |
| Obs*R-squared | 13.72421 | Prob. Chi-Square(4) | 0.1182 |

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 05/19/15 Time: 08:14
Sample: 2010 2014
Included observations: 95
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.051975 | 0.143259 | 0.362803 | 0.7177 |
| ARD | 4.50E-05 | 0.000121 | 0.372425 | 0.7106 |
| APD | -4.05E-05 | 8.10E-05 | -0.499564 | 0.6188 |
| AID | 1.21E-05 | 7.27E-05 | 0.166721 | 0.8680 |
| CCC | -3.45E-05 | 7.04E-05 | -0.490700 | 0.6250 |
| CLTAR | -0.000617 | 0.000925 | -0.667210 | 0.5066 |
| CATAR | -0.003865 | 0.025106 | -0.153962 | 0.8780 |
| DROA113 | -0.026766 | 0.051867 | -0.516043 | 0.6073 |
| DROA1513 | 0.008011 | 0.054874 | 0.145995 | 0.8843 |
| SIZE | -0.001476 | 0.005932 | -0.248763 | 0.8042 |
| GDP | -0.000883 | 0.006400 | -0.137904 | 0.8907 |
| INF | -0.031998 | 0.062635 | -0.510854 | 0.6109 |
| RESID(-1) | 0.411730 | 0.116153 | 3.544728 | 0.0007 |
| RESID(-2) | -0.055787 | 0.123518 | -0.451653 | 0.6528 |
| RESID(-3) | 0.076083 | 0.128546 | 0.591869 | 0.5556 |
| RESID(-4) | -0.045505 | 0.116906 | -0.389241 | 0.6981 |

| | | | |
|---|---|---|---|
| R-squared | 0.144465 | Mean dependent var | 4.73E-17 |
| Adjusted R-squared | -0.017978 | S.D. dependent var | 0.048843 |
| S.E. of regression | 0.049280 | Akaike info criterion | -3.030180 |
| Sum squared resid | 0.191854 | Schwarz criterion | -2.600053 |
| Log likelihood | 159.9336 | Hannan-Quinn criter. | -2.856377 |
| F-statistic | 0.889328 | Durbin-Watson stat | 1.950110 |
| Prob(F-statistic) | 0.578334 | | |