DETERMINANTS OF WORKING CAPITAL REQUIREMENTS: EVIDENCE FROM COLOMBO STOCK EXCHANGE

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ABSTRACT

Working capital management is one of the crucial factors in shaping the financial performance of firms while ensuring their existence and growth. The study aims to investigate the determining factors of working capital requirements in the Sri Lankan context. The study was conducted using secondary data, manually collected from a sample of 37 firms listed on the Colombo Stock Exchange over a six-year period from 2013/14-2018/19. The working capital requirement has been proxied through the working capital ratio as the dependent variable of the study whereas firm-specific and macroeconomic determinants were taken as the independent variables. Profitability, Cash conversion cycle, Leverage, Tobin's Q, Firm size, and Altman Z-score have been used as firm-specific determinants and the GDP growth rate, Interest rate, and Inflation has been considered as the macroeconomic determinants of the study. Initially, summary statistics were obtained for the sample along with the diagnostic tests of normality and multicollinearity. The regression models were specified to test the hypotheses developed for the study where the analysis was performed using the Statistical Package for the Social Sciences (SPSS). The results were obtained by carrying out the Ordinary Least Square (OLS) regression method as an overall and specific analysis. Results of the overall analysis indicated that all firm-related variables except firm size have a significant relationship with the working capital requirements. Nevertheless, only the interest rate demonstrated a significant association with working capital amongst the macroeconomic factors analyzed in the study. The specific analysis provided slightly different results with both firm size and GDP growth reflecting a significant relationship with the working capital of firms. It was concluded that the profitability, cash conversion cycle, Altman z-score, leverage, and interest rate are the most influential determinants of working capital requirements amongst the factors considered under the analysis and also that the firm-specific variables are crucial over macro-economic variables in determining working capital requirements in the Sri Lankan context.

Keywords: Firm-specific, Macroeconomics, Working Capital Requirements

1. INTRODUCTION

Studies on working capital management have gradually flourished, especially after the 2008 global financial crisis which encouraged firms to unlock their cash holdings tied up in Working Capital Cycle (Moussa, 2018; Jayarathne, 2014: Niresh, 2012; Chauhan and Banerjee, 2017; Ramiah et al. 2014; Panda and Nanda, 2018). Corporate financing decisions comprise three core categories i.e., Capital

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structure, Capital budgeting, and Working capital management decisions. Amongst the three key decisions, working capital management is recognized as the principal element given its effect on the liquidity and thereby the profitability of a business. Nevertheless, an analysis of prior studies depicts that working capital management is a less attractive area amongst the scholars, compared to the literature on Capital budgeting and Capital structure available in the Finance field (Nurullah and Kengatharan, 2015; Chiou et al. 2006).

Working capital is the share of the firm's capital that is essential to meet the routine expenses related to the operational activities of the firm. Correspondingly, the difference between the firm's total current assets and total current liabilities can be identified as the working capital of a business (Sardo and Serrasqueiro, 2021). Components of working capital would typically include current asset items; cash and cash equivalents, inventory, accounts receivables, short-term investments, and current liability items primarily accounts payables. The upkeep of an accurate level of working capital in an organization is considered to be challenging for a firm. The current assets portion of a company tends to account for more than half of the structure of its total assets; therefore, maintaining excess current assets in a firm will lead to an overall poor return on its investments. On contrary, if the firm experiences a shortfall of current assets, which leads to an inadequate level of liquidity, the firm may be unable to meet its daily operating responsibilities as they become due (Perera and Wickramasinghe, 2010; Sardo and Serrasqueiro, 2021; Panda, 2012). This signals how inefficient working capital management may increase the likelihood of a firm’s bankruptcy and failure and thereby cause overall financial distress within the firm (Tahir and Anuar, 2016; Yazdanfar and Ohman, 2020). Consequently, maintaining an optimum working capital level will guarantee the firm’s long-term survival while ensuring efficient performance in the short run. Given its importance in maximizing firm value, in practice, financial managers devote approximately 60% of their time to working capital management (Deloof, 2003; Gitman and Maxwell, 1985). Working capital management is used not only to protect firms from any potential financial turmoil but also to strengthen the competitive edge and cost-effectiveness, as the broader perspective contributes in generating more opportunities to create wealth (Achchuthan and Rajendran, 2013; Darun, 2008).

Identifying the variables that affect the working capital requirements is vital given the significance of managing working capital. Albeit the abundant preceding studies available on the link between working capital management and its impact on profitability and firm performances (Kodithuwakku, 2015; Morawakage and Lakshan, 2010; Prasad et al. 2019; Raheman and Nasr, 2007; Singhania and Mehta, 2017; Pais and Gama, 2015; Seth et al. 2020) there is a dearth of studies on the determinants of working capital. Pandey (2015) has proved the absence of set rules or formulae for determining a firm's working capital requirement, but the presence of a broad range of factors serving different purposes that influence working capital requirements.

The elements that directly influence the business’s investments in current assets and current liabilities are identified as working capital determinants. Prior studies have

found that quantifying a firm's working capital is a challenging task given the uncertain conditions that exist in a volatile business environment (Lambersome, 1995; Deloof, 2003). It was discovered that firms' working capital requirements may differ based on the firm's attributes such as gearing, profitability, capital expenditure, and cash conversion cycle in addition to the nature and size of the business (Bei and Wijewardena, 2012; Nazir and Afza, 2009; Abbadi and Abbadi, 2012; Lotfinia, Mousavi and Jari, 2012; Manoori and Muhammed; 2012). Further, Pandey (2015) asserted that firm-related factors such as supply and demand conditions, technological development, business nature, credit policy, manufacturing policy, supplier credit terms, and efficiency of operations as the influencing factors in the working capital management of a company. However, macroeconomic factors are also important in determining the working capital requirements of a business (Cetenak et al. 2017). Therefore, this study aims to shed some light on the determinants that affect the working capital requirements of firms in the Sri Lankan context.

This paper offers the following contributions. Firstly, to the best of our knowledge, this is one of the early studies to identify the determinants of the working capital requirements in Sri Lanka despite the large number of published studies addressing the link between working capital and profitability and firm performance available in the Sri Lankan context. Secondly, empirical evidence observed in the literature is inconclusive with a greater focus on developed markets while invariably ignoring key variables that are necessary for understanding the determinants of working capital requirements from a developing country's perspective. Thirdly, our study is expected to contribute new intuitions to the extant field given a better understanding from the findings on the influence of various internal and macroeconomic variables on working capital requirements.

The paper is structured as follows. Section 2 represents the existing literature from past studies whereas the third section contains the methodology and the data analysis is discussed in the fourth section. Finally, section five provides a conclusion and directions for future studies.

2. LITERATURE REVIEW

2.1 Concept of Working Capital Management

A firm's net working capital is known as its net current asset position, or the surplus of current assets compared to its current liability base (Sagan, 1955). In the research conducted by Eljelly (2004) on the relationship between liquidity and profitability, he argued that working capital includes all components reported on the Statement of Financial Position as current assets, whereas networking capital eliminates current liabilities. A prior study conducted in working capital management incorporating FMCG companies in India recognized working capital management as one of the significant categories of business management and all firms, public or private, profit or not-for-profit oriented, regardless of scale or nature of operations, must maintain a sufficient amount of working capital (Mehrota, 2013; Bagchi and Khamrui, 2012).

Working capital management requires upholding a sufficient level of liquidity in the daily operations of a firm to guarantee the uninterrupted flow of company operations. A prior study conducted in the Sri Lankan context by analyzing its manufacturing sector has proved that a firm's decision on its investments in current assets requires an equilibrium between risk and return (Niresh, 2012). Further, Bandara and Weerakoon (2011) elucidated those massive investments in current assets result in lowering the risk given higher potential in meeting short-term obligations, but may cause a decline in the bottom line of a firm given its incapacity to invest in lucrative long-term investments, emphasizing the risk-return trade-off within firms. Consequently, effective working capital management is a critical element of the overall business strategy for maximizing shareholder wealth.

A study on management perceptions of the working capital process has illustrated that working capital decisions are recurrent and repetitive in nature, and thus their individual influence is insignificant (Gentry et al. 1979). Therefore, in contrast to capital investment decisions, routine working capital decisions can be reversed over time. However, Choong (2016) argued that irrespective of the aforesaid nature of working capital, the significance of working capital management should not be underrated, and it is critical to investigate them independently. Working capital is also recognized as a firm's lifeblood, where its well-organized management can confirm the firm's success and existence (Niresh, 2012). Nevertheless, inefficient management of working capital may drive the firm into danger. Efficient working capital management is described by Eljelly (2004) as an activity that entails planning and controlling current assets and current liabilities in such a way to eliminate any risks of not meeting short-term obligations when they fall due which also prevent any excessive investments in these assets. Furthermore, numerous studies concentrating on working capital management have drawn attention from the scholars in literature in the Sri Lankan context emphasizing the importance of understanding the determinants of working capital (Thenuwara and Ekanayake, 2021; Jayarathne, 2014; Nimalathasan, 2010; Jahfer, 2012).

2.2 Determinants of Working Capital Management

Various determinants of Working Capital Management have been discovered in previous studies including profitability, firm size, leverage, growth, tangibility, operating cash flows, and firm age (Singh and Kumar, 2017; Chiou et al. 2006; Gill, 2011). Many studies have been published in this research area, examining various determinants and the influence on working capital management in both developed and emerging economies. Pandey (2005) goes into great length regarding the factors of working capital and proved the absence of defined guidelines for an equation that can be employed to calculate a firm's working capital requirements. Pandey pointed out a variety of elements with varying degrees of importance that influence a company's working capital requirements. Nature of company, demand and market conditions, policies with respect to technology, production and credit facilities, supplier credit terms, operating efficiency, and price level variations are amongst such determining elements recognized and explored. Amongst numerous studies concentrating on the relationship between different variables and working capital

management, the firm profitability has drawn a lot of attention from the scholars in literature in the Sri Lankan context (Thenuwara and Ekanayake, 2021; Jayarathne, 2014; Nimalathasan, 2010; Jahfer, 2012). The higher number of prior studies available in this study context identifying the relationship between the working capital management and profitability reflects that the other determinants of working capital have remained untouched by the scholars. Therefore, it is vital to analyze the determinants of working capital in the Sri Lankan context.

Hawawini et al. (1986) proposed that there is a considerable industry influence on firm working capital practices, and hence, firm working capital requirements differ from one industry to the next. They investigated the industry's impact on corporate working capital decisions and concluded that there is a considerable and consistent industry impact on a firm's working capital investment. Further, Moussawi et al. (2006) examined certain determinants that may affect working capital management by analyzing a sample of US firms. It was observed that the efficiency of a firm's working capital management is positively linked with firm size and uncorrelated with industry concentration. Further, it was found that when the number of external directors on a board is high and the CEO's remuneration is high, the companies tend to have better working capital management. However, the findings were contrary when the CEO's portion of the firm's stock is larger. The results were also in line with the findings of Hawawini, Viallet, and Vora (1986) who proved that there is a significant effect of the industry on the firm's working capital management practices.

In a study of the variables that influence working capital requirements of Palestinian industrial firms, Abbadi and Abbadi (2012) discovered a significant, positive relationship amongst return on assets, cash conversion cycle, operating cash flow, and working capital requirements whereas, firm size and leverage reflected a significant negative relationship with working capital requirements. Further, the evaluated economic variables such as the rate of real GDP growth and interest rates, reflected the absence of a substantial effect on working capital. This is congruent with the findings of Pandey and Perera (1997), who concluded that company size had an impact on the firm's total working capital policy and approach.

Furthermore, in the study conducted by Manoori and Muhammed (2012) by incorporating Singapore firms in order to examine the determinants of working capital management, it was found that capital expenditure, firm size, operating cash flow, and GDP have a significant negative relationship with the cash conversion cycle. Further, a positive link was identified between profitability and cash conversion cycle whereas they emphasized the absence of a relationship between leverage and cash conversion cycle. By researching 132 manufacturing enterprises listed on the Karachi Stock Exchange, Nazir and Afza (2009) investigated both internal and outside factors that influence a firm's working capital requirements. It was observed that there is a significant relationship between Return on Assets, operating cycle, Leverage, and Tobin's Q and Working capital requirements of the firms. Furthermore, it was evident that working capital practices are industry-specific, with different businesses having varying working capital requirements. However, the study found no statistically significant association between working capital

requirements and business size, operating cash flows, revenue growth, and economic activity. These findings are consistent with Lamberson (1995), who demonstrated that the response of businesses to fluctuate their working capital management techniques in accordance with economic activities is not significant.

The recent study conducted by Cetenak et al. (2017) identified the determinants of working capital management by considering industry and country levels in addition to business levels, which contributes to the existing literature on working capital management. The research incorporated a sample of 1253 manufacturing firms operating in 14 emerging markets across 13 industries. It was proved that Return on Assets has a negative relationship with working capital where Altman Z score and Tobin's Q share a positive relationship at the firm level. Furthermore, the HH index, Lerner index, Exchange rate, and rule of law manifested a positive relationship with working capital whereas a negative relationship was reflected in private sector credit variable at the industry-country level analysis. According to the findings of Singh and Kumar (2014), research on working capital management can be primarily divided into two dominant streams i.e., the impact of working capital management on the profitability of firms and working capital management practices. It is visible that the majority of scholars have focused on how working capital affects company performance where the performance has been proxied through the firm's profitability and market performance. However, the literature available in the Sri Lankan context has revealed positive (Safeena and Banu, 2014) as well as negative (Jayarathne, 2014) relationships amongst the elements of working capital management and profitability.

Numerous theoretical criteria were found by Pandey (2015) that would affect a firm's working capital requirements. Although there are prior studies concentrating on this topic, there is a limited number of studies on determinants of working capital management, therefore, a research vacuum in the literature exists especially in the Sri Lankan setting. The study attempts to identify and address that gap by creating knowledge of the determinants of working capital requirements in a Sri Lankan setting, considering business level variables as well macroeconomic variables.

2.4 Development of Hypotheses

Following hypotheses have been developed to explain the impact of each of the determining factors on working capital requirements:

Firm-specific factors:

H_1: Firm's cash conversion cycle has an impact on the working capital requirements

H_2: Firm's profitability has an impact on the working capital requirements

H_3: Firm's size has an impact on the working capital requirements

H_4: Firm's leverage has an impact on the working capital requirements

H_5: Growth potential of the firm has an impact on the working capital requirements

H_6: Firm's risk from bankruptcy affects the working capital requirements

Macroeconomic factors:

$H_{7:}$ Real cost of borrowing money affects the working capital requirements of the firm

$H_{8:}$ Country's change in economic activity affects the working capital requirements of the firm

$H_{9:}$ Country's inflation rate affects the working capital requirements of the firm

2.5 Conceptual framework

The conceptual framework of the study was formed after reviewing the existing literature on working capital requirements. Figure 1 below elucidates the conceptual framework of the study. It shows the firm-specific and macroeconomic factors as the independent variables of the model and the working capital ratio which is a measure of working capital requirements as the dependent variable.

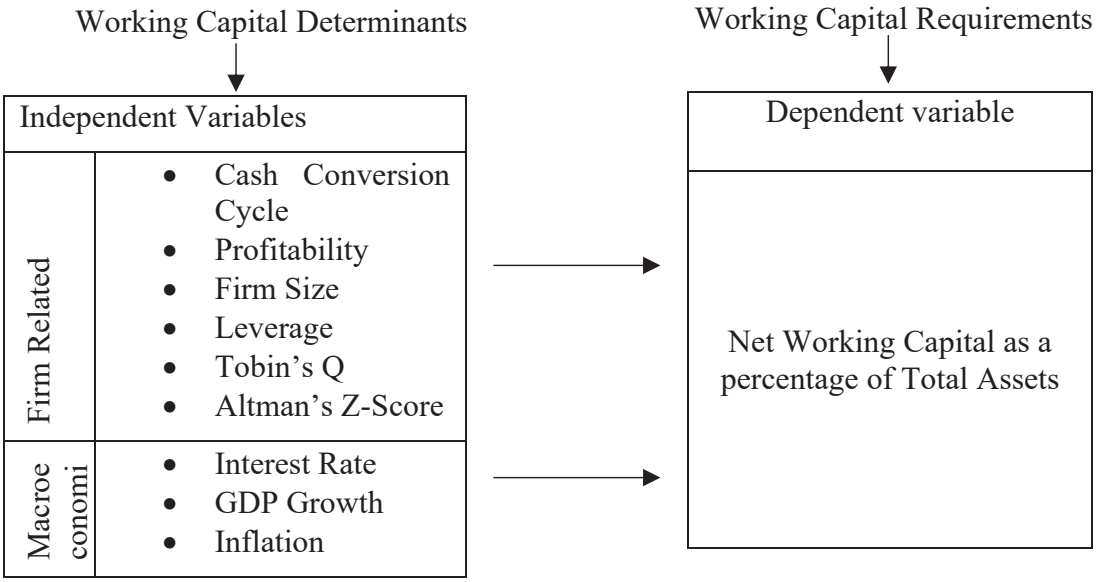

Figure 1: Conceptual framework

3. METHODOLOGY

The study aims to investigate the factors affecting the working capital requirements of Sri Lankan listed companies. The Colombo Stock Exchange (CSE) classifies listed firms under 20 industrial sectors based on the nature of the activity of firms. However, the Bank, Finance and Insurance, Diversified Holdings, Hotels and Travels, Investment Trusts, Land and Property, and Plantations sectors have been omitted from the sample given the nature of operations of the firms. Moreover, in order to investigate the industry effects, sectors with an insignificant number of companies have also been excluded from the sample. Thus, the final sample consists of firms across three industrial sectors namely, Beverage, Food and Tobacco, Chemicals and Pharmaceuticals, and Manufacturing.

The final sample was selected from the aforesaid sectors randomly by identifying the firms that met all the required conditions. Firstly, most of the omissions in the Beverage, Food, and Tobacco sector were due to the unavailability of inventory in the company financials which is a crucial figure in working capital calculations. Secondly, the sample includes only the companies with their financial year ending on the 31st March and companies which had been listed on the Colombo Stock Exchange on or before the commencement of the 2010/11 financial year so as to maintain consistency and comparability. Thirdly, the presence of outliers in the dependent or independent variable made some firms to be excluded at the analysis stage of the study. The selected sample represents 54 percent of the three industries and the distribution of the sample companies according to the industrial sectors, can be depicted below.

Table 01: Composition of Sample

Sector	Number of Companies Available	Number of Companies Selected	Percentage of the Selected Sample
Beverage Food and Tobacco	21	10	48%
Chemical and Pharmaceutical	10	6	60%
Manufacturing	38	21	55%
Total	69	37	54%

A set of 222 firm-year observations were obtained by analyzing 37 firms over the six-year period from 2014/13-2019/18. The period of the study was selected after consideration, in order to avoid any unnecessary effects of war and the COVID-19 pandemic. A quantitative research design has been employed where the secondary data were manually collected from the annual reports published by the companies listed on the CSE. Further, the required economic variables-related data were captured mainly through the Central Bank Annual Reports during the aforementioned period and also the World Bank website. All economic variables were adjusted in accordance with the financial years of the firms by taking a weighted average of the average annual data to better reflect the economic effect.

3.1 Variable measurement

Working Capital Ratio was used as the dependent variable where firm-specific variables such as Profitability, Cash Conversion Cycle, Leverage, Firm Size, Share Price Growth, Altman's Z score, Tobin's Q, and macroeconomic variables such as GDP Growth rate, Interest Rate, Exchange Rate, and Inflation were incorporated as the independent variables of the study. While the dependent variable remained unchanged, out of the independent variables, share price growth has been excluded given the very little correlation it showed with the working capital ratio and the exchange rate was omitted due to the multi-co-linearity impact it had on several other variables.

3.1.1 The Dependent Variable

The working capital ratio has been often used by prior studies as a proxy of working capital requirements (Sardo and Serrasqueiro, 2021; Abbadi and Abbadi, 2012; Nazir and Afza, 2009; Cuong and Nhung, 2017). Working capital requirements can be identified as the amount of finance required by a firm to carry out its day-to-day trading activities (Nimalathasan, 2010). This study uses the working capital ratio to determine the working capital requirements of the firms which is the networking capital deflated by total assets. Networking capital is the difference between the current assets and current liabilities and measures the company's capacity to meet its current obligations and cover its expenses with the available current assets (Singh and Kumar, 2017).

3.1.2 The Independent Variables

3.1.2.1 Firm Related

Cash Conversion Cycle

Cash is the most liquid asset of a company; therefore, it is crucial to focus on cash management in order to ensure the availability of cash to meet daily expenses. The Cash Conversion Cycle (CCC) is a measure of the time lag in terms of the average number of days taken by a company to convert raw resources into completed goods and receive payments for inventory sold (Malm and Sah, 2019). It's generally accepted for a firm to have a lower CCC as it would indicate less need for financing of current assets and more profitability (Naser et al. 2013). CCC is a combination of several activity ratios which are days inventory outstanding (DIO), days sales outstanding (DSO), and days payables outstanding (DPO) (Atseye et al. 2015; Mansoori and Muhammed, 2012; Akinlo, 2012). A high DSO would indicate that the firm takes longer to collect its payments and a high DIO would indicate that products remain unsold and idle for a longer period of time. However, a high DPO would reflect the sound credit terms received from the suppliers where it might also send an unfavorable signal to the market denoting a delay in payments to its suppliers.

Profitability

Profitability is a measure of a company's capacity to create profits in relation to its expenses over a given time period. It can be measured using several indicators such as Gross Operating Profit, Return on Assets (ROA), Net Operating Margin, and Return on Equity (ROE). Numerous researchers have used ROA to calculate firm profitability in their working capital management studies (Abbadi and Abbadi, 2012; Nazir and Afza, 2009; Manoori and Muhammad, 2012; Jayarathne, 2014; Cetenak et al. 2017). ROA assesses the profitability of the firm in comparison to assets to see how effective the firm is in deploying its assets to generate sales and at long last profits (Singh and Kumar, 2017). A high ROA would indicate the effective and efficient use of firm assets in maximizing shareholder wealth (Chong, 2016).

Firm size

Several prior studies corroborate a significant impact of the firm size on working capital management (Abbadi and Abbadi, 2012; Pandey and Perera, 1997; Manor and Muhammad, 2012). Chong (2016), stated that access to capital markets may be easier for bigger firms and thus they can relax their trade credit and inventory policies resulting in a positive relationship between firm size and working capital requirements. Nevertheless, findings of Zariyawati et al. (2010) indicate firm size to be negatively related to the working capital management and relate this observation to the affordability of large firms to hire expertise in efficient management of working capital. Firm size has been proxied through the natural logarithm of total assets in the study.

Leverage

Leverage refers to the amount of debt used to finance assets of a firm and thus it can be used as a measure to establish a relationship between the external financing of a company and their total assets. Many prior studies concluded a negative relationship between financial leverage and working capital management (Abbadi and Abbadi, 2012; Lotfinia et al. 2012; Wiguna and Wasistha, 2017). The Pecking Order Theory suggests that a company experiencing a shortage of funds will consider raising funds internally prior to a stock issue or borrowing outside money since internally generated funds will avoid transaction costs, monitoring, and other limitations (Chiou et al. 2006). Firms with high leverage may have less capital allocation for daily operational expenses due to interest and principal repayments. Further, in a study conducted by Nazir and Afza (2009), leverage was used as an independent variable and have observed it to significantly influence the working capital requirements of firms. Further, firms with continuously increasing leverage levels need to pay more attention to efficiently managing working capital in the company to prevent any unnecessary capital tied up on receivables and inventories. Our study measures leverage as a ratio of total debt to total assets of the firm (Moussa, 2018; Singh and Kumar, 2017; Zariyawathi et al. 2016; Akinlo, 2012).

Tobin's Q Ratio

Tobin's Q Ratio takes the sum of the market value of equity and book value of debt of the firm and divides it by the value of total assets of the firm (Moussa, 2018). It is thus a measure of a company's intangible assets and is used as an indicator of fa irm's growth potential in this study. The value of Tobin's Q would give an indication of the market speculation and analysts' views of the prospects for the company as well as the intellectual capital of the firms. Nazir and Afza (2009) found a positive association between Tobin's Q and the requirements of working capital of firms, manifesting the relationship amongst the efficient management of working capital and the stock market performance. Accordingly, given an upsurge in the firm’s market value, managers tend to increase the working capital requirements in order to satisfy investor expectations on a more liquid firm. This aligns with the study conducted by Cetenak et al. (2017) who concluded that firms with higher growth

opportunities require high levels of working capital to meet their potential demand in the future.

Altman Z-Score

Altman Z-Score model is an indicator of a company's credit strength or in fact, it measures a company's probability of bankruptcy (Goh et al. 2021), which asserts an accuracy rate ranging between 75%-90% (Altman et al. 2017). Higher Altman Z-score would imply a lower probability of insolvency. The original Altman Z-Score is grounded on five financial ratios to determine if the company has a high degree of probability of being insolvent (Altman, 1968). However, the current study uses the modified Altman's Z score proposed by MacKie-Mason (1990) which has excluded the market equity to book debt ratio from the original calculation. A study by Graham et al. (1998) stated that elimination of the aforesaid factor from the model was later proposed in the literature, given the presence of information on firm's equity security which frequently has a systematic relationship with other equity value related quantifiers in the model such as Tobin's Q.

This was further elucidated by Lee et al. (2010) who asserted that such a systematic relationship may direct towards identifying a significant relationship between Z-scores and the value-based measures, not due to the existence of a factual relationship, but given that the common equity value component systematically relates to them. Although this is a measure hardly used by scholars as a determining factor of working capital, Cetenak, Vural, and S ökmen (2017), used this as an independent variable and found a positive impact on the working capital level. This reflects that a higher Altman Z-score will result in greater working capital or vice versa.

3.1.2.2 Macroeconomic variables

The real interest rate has been selected as an external factor to investigate the impact on working capital requirements (Seth et al. 2020; Palit, 2013; Al Teleb et al. 2010). It is the interest rate after adjusting for inflation and thus indicates the real cost of borrowing money. The real economic growth rate is a measure of the changes in economic activities which may have an effect on the management of firms more effectively. It indicates the rate of change of a particular country's GDP from one year to the next. The countries experiencing a high GDP growth rate will also observe a parallel significant improvement in working capital (Chong, 2016). Furthermore, the Inflation Rate was selected as another independent variable in our study given its capacity to measure the increase in general price levels of commodities over a specified time period and given its impact on the purchasing power of money. The study has chosen the inflation rate that has been calculated using the Colombo Consumers Price Index (CCPI). The three macroeconomic variables under consideration have been calculated by adjusting to the financial year to be consistent with the other variables. Thus, the weighted average of two years has been calculated by assigning a weight of 0.75 and 0.25 respectively to year 1 and year 2 at each observation.

Table 02: Variables and Measurement

Variable	Symbol	Method of calculation			Authors
Working Capital Ratio	WCR	WCR = (Current Assets – Current Liabilities) / Total Assets			Sardo and Serrasqueiro (2021) Abbadi and Abbadi (2012)
Annual Cash Conversion Cycle	ACCC	ACCC = (Days Inventory Outstanding + Days Sales Outstanding – Days Payable Outstanding) / 365			Malm and Sah (2019) Naser et al. (2013)
		Days Inventory Outstanding = (Inventory / Cost of Sales) * 365	Days Sales Outstanding = (Accounts Receivables / Sales) * 365	Days Payables Outstanding = (Accounts Payables / Cost of Sales) * 365	
Profitability (Return on Assets)	ROA	ROA = Net Income / Total Assets			Nazir and Afza (2009) Manoori and Muhammad (2012) Jayarathne (2014)
Firm Size	SIZE	SIZE = ln (Total Assets)			Abbadi and Abbadi (2012), Chong (2016)
Leverage	LEV	LEV = Total Liabilities / Total Assets			Lotfinia et al. (2012) Wiguna and Wasistha (2017)
Tobin's Q	TOBQ	TOBQ = (Market Value of Share Capital + Book Value of Total Liabilities) / Book Value of Total Assets			Moussa (2018) Cetenak et al. (2017)

Altman's Z-Score	ALTMAN_Z	ALTMAN_Z = 3.3 (EBIT/Total Assets) + 1.0(Sales/Total Assets) + 1.4(Retained Earnings/Total Assets) + 1.2(Working Capital/Total Assets)	Goh et al. (2021) Altman et al. (2017)
Interest Rate	INT	$INT = 0.75(INT_{t-1}) + 0.25(INT_t)$	Seth et al. (2020) Palit (2013)
GDP Growth	GDP	$GDP = 0.75(GDP_{t-1}) + 0.25(GDP_t)$	Chong (2016)
Inflation	INF	$INF = 0.75(INF_{t-1}) + 0.25(INF_t)$	Kulathunge (2013)

3.2 Regression model and method of analysis

In determining the working capital requirements in Sri Lankan firms, the study uses nine explanatory variables which consist of six firm-specific variables, i.e., Profitability, Annual Cash Conversion Cycle, Leverage, Firm Size, Share Price Growth, Altman's Z score, Tobin's Q and macroeconomic variables i.e., GDP Growth rate, Interest Rate, Exchange Rate and Inflation. Several regression models will be used in the study to examine the determinants of working capital; model 1 comprises all variables that may have an impact on Sri Lankan firms' working capital requirement, and it will be utilized to conduct the entire analysis. Following that, models 2-10 were deployed to conduct a detailed analysis of different firm-specific variables and macroeconomic variables. Based on the developed hypotheses, models 2-4 were developed to test the macroeconomic variables i.e., H_7 - H_9 whereas models 5-10 were developed to test the hypothesis H_1 - H_6. Thus, the models developed are as follows:

Overall Model:

Model 1: $WCR_{it} = \alpha + \beta_1 ACCC_{it} + \beta_2 ROA_{it} + \beta_3 SIZE_{it} + \beta_4 LEV_{it} + \beta_5 TOBQ_{it} + \beta_6 ALTMAN\_Z_{it} + \beta_7 INT_{it} + \beta_8 GDP_{it} + \beta_9 INF_{it} + \varepsilon$

Specific Models – Macroeconomic

Model 2: $WCR_{it} = \alpha + \beta_1 ACCC_{it} + \beta_2 ROA_{it} + \beta_3 SIZE_{it} + \beta_4 LEV_{it} + \beta_5 TOBQ_{it} + \beta_6 ALTMAN\_Z_{it} + \beta_7 INT_{it} + \varepsilon$

Model 3: $WCR_{it} = \alpha + \beta_1 ACCC_{it} + \beta_2 ROA_{it} + \beta_3 SIZE_{it} + \beta_4 LEV_{it} + \beta_5 TOBQ_{it} + \beta_6 ALTMAN\_Z_{it} + \beta_7 GDP_{it} + \varepsilon$

Model 4: $WCR_{it} = \alpha + \beta_1 ACCC_{it} + \beta_2 ROA_{it} + \beta_3 SIZE_{it} + \beta_4 LEV_{it} + \beta_5 TOBQ_{it} + \beta_6 ALTMAN\_Z_{it} + \beta_7 INF_{it} + \varepsilon$

Specific Models – Firm related

Model 5: $WCR_{it} = \alpha + \beta_1 ACCC_{it} + \beta_2 INT_{it} + \beta_3 GDP_{it} + \beta_4 INF_{it} + \varepsilon$

Model 6: $WCR_{it} = \alpha + \beta_1 ROA_{it} + \beta_2 INT_{it} + \beta_3 GDP_{it} + \beta_4 INF_{it} + \varepsilon$

Model 7: $WCR_{it} = \alpha + \beta_1 SIZE_{it} + \beta_2 INT_{it} + \beta_3 GDP_{it} + \beta_4 INF_{it} + \varepsilon$

Model 8: $WCR_{it} = \alpha + \beta_1 LEV_{it} + \beta_2 INT_{it} + \beta_3 GDP_{it} + \beta_4 INF_{it} + \varepsilon$

Model 9: $WCR_{it} = \alpha + \beta_1 TOBQ_{it} + \beta_2 INT_{it} + \beta_3 GDP_{it} + \beta_4 INF_{it} + \varepsilon$

Model 10: $WCR_{it} = \alpha + \beta_1 ALTMAN\_Z_{it} + \beta_2 INT_{it} + \beta_3 GDP_{it} + \beta_4 INF_{it} + \varepsilon$

In the above models, while (i) and (t) represent the firm and the year respectively, $\beta_1 - \beta_9$ are the coefficients of the exogenous variables. Model 1 was created to better understand the factors that influence working capital requirements in Sri Lankan businesses while models 2-10 have been developed to identify the impact of each variable on the dependent variable.

4. FINDINGS AND RESULTS

4.1 Descriptive Statistics

Table 3 depicts the descriptive statistics for 37 firms listed in the CSE over a period of six years ranging from 2014/13-2019/18. The mean value of the dependent variable, i.e., working capital ratio is 18.76% of total assets with a standard deviation of 0.19. The large positive working capital ratio manifests that firms practice a relatively conservative policy when maintaining their working capital requirements. Further, the mean value of the annual cash conversion cycle is 0.2952 which approximates 108 days with a standard deviation of 92 days, indicating that working capital is invested in the cash conversion cycle for 108 days. It was observed that the minimum cash conversion cycle is -206 days which can be attributable to payable days exceeding the sum of inventory days and receivable days.

The profitability proxied through Return on Assets ratio has an average of 6.67% with a standard deviation of 0.074. The size of firms and their effect on working capital requirements were proxied through the natural logarithm of total assets. The mean value and standard deviation of firm size are 21.53 and 1.16 respectively. When the logarithm values are translated to rupee values, the average of total assets of the sample value up to Rs.2.2 billion. Table 3 reflects that the mean debt ratio for the sample is 0.399 with a standard deviation of 0.164. However, the minimum and maximum values range from 0.39 to 0.815 respectively. The mean of Tobin's Q value which measures firms' growth opportunities is 1.46 with its standard deviation being 0.734. This indicates that on average, Sri Lankan firms are overvalued in the market. The Tobin's Q ratio ranges between 4653 and 5.6816 indicating a potential wide change in the market value of firms through share price changes. The Altman Z-score is used to indicate a firm's distance from bankruptcy. It has a mean value of 1.97 and a standard deviation of 0.89. However, the minimum value is at a -0.64, indicating that some firms may be heading toward financial distress or bankruptcy. The interest rate has a mean of 2.77% and a standard deviation of 4.41%, while the GDP growth rate mean is 6.28% with a standard deviation of 1.88%. Average inflation during the period under consideration is 5.16% and the standard deviation is 2.2%.

Table 03: Summary statistics

	N	Minimum	Maximum	Mean	Std. Deviation
WCR	222	-.2248	.7469	.187632	.1916407
ACCC	222	-.5666	1.8598	.295221	.2513741
ROA	222	-.2795	.3883	.066667	.0745698
SIZE	222	18.3289	24.0454	21.527450	1.1604160
LEV	222	.0390	.8152	.399606	.1638324
TOBQ	222	.4653	5.6816	1.458343	.7340523
ALTMAN_Z	222	-.6438	4.8540	1.972919	.8884294
INT	222	-6.6603	6.8645	2.768500	4.4104613
GDP	222	3.7750	8.5750	6.284583	1.8883194
INF	222	1.6000	7.4250	5.162500	2.2047226

Note: N; Number of observations, WCR; Working Capital Ratio, ACCC; Cash conversion cycle, ROA; profitability, SIZE; Firm size, LEV; leverage, TOBQ; Tobin's Q, ALTMAN_Z; Altman Z-score, INT; interest rate, GDP; GDP growth rate, INF; inflation.

4.2 Normality test

The graphical representation of the histogram complemented with a normal distribution curve was used in testing the normality of our dependent variable; the working capital ratio. According to the histogram, the variable seems to be normally distributed with majority of values concentrating in the middle and the rest spreading out towards both ends without skewing towards the right or left of the distribution. The symmetrical bell-shaped curve also complements the histogram diagram and further suggests that the distribution of the dependent variable is normal.

4.3 Regression results

4.3.1 Correlation analysis

Table 4 reflects the values of correlation for all the variables identified in this study which range from 0.0031 to 0.6561. The highest correlation was amongst the two macroeconomic variables i.e., GDP growth and inflation. However, given all the values were below the threshold value of 0.8, independent variables proved the absence of multicollinearity. Further, the correlation results attribute in gaining an idea about the strength of the correlation between the dependent variable and each independent variable. It was found that the firm-related factors have a higher correlation with the working capital requirements over macro-economic factors. Further, Altman Z-score reflects a greater influence on working capital requirements amongst the rest of the firm-related factors. The correlation between leverage and

working capital requirements is also at a negative high value being -0.539. The results reflect that the independent variables ACCC, ROA, ALTMAN, LEV, TOBQ, and INT are significantly correlated with the working capital requirement. On the contrary the correlation coefficient between SIZE, INT, and INF are not significantly associated with WCR.

Table 04: Correlation Analysis

	WCR	ACCC	ROA	SIZE	LEV	TOBQ	ALTMAN_Z	INT	GDP	INF
1	1									
2	0.250***	1								
3	0.263**	-0.181**	1							
4	-0.165	-0.173**	0.249***	1						
5	-0.539***	-0.064	-0.272**	0.089**	1					
6	-0.051**	-0.158***	0.345**	-0.037	0.076***	1				
7	0.591**	-0.214**	0.548***	-0.067	-0.126**	0.0286**	1			
8	-0.055**	0.003**	-0.040	0.125***	-0.020	-0.384**	-0.056**	1		
9	0.054	-0.019	0.106**	-0.143**	0.016	0.241**	0.076**	-0.407	1	
10	0.020	-0.008**	-0.024	-0.135**	0.009**	0.088	0.015**	-0.385**	0.656***	1

Notes: ACCC; Cash conversion cycle, ROA; profitability, SIZE; Firm size, LEV; leverage, TOBQ; Tobin's Q, ALTMAN_Z; Altman Z-score, INT; interest rate, GDP; GDP growth rate, INF; inflation. *** reflects significance at the 1% level, ** reflects significance at the 5% level

4.3.2 Multiple regression analysis

According to table 5, the adjusted R square value of 0.72 shows that the model fits well. This shows that 72% of the variance in the dependent variable (Working Capital Ratio) can be explained by the nine independent variables under consideration. Further, The F test results of 64.229 and the significance value of 0.000 show that the overall model is significant at a 5% level of significance.

According to the regression analysis, Firm size proved to be non-significant at 5% significance level. The relationship between firm size and working capital requirements is contrary to the findings of Abbadi and Abbadi (2013) and Manoori and Muhammad (2012) but is consistent with the study results of Nazir and Afza (2009). Therefore, hypothesis H_3 was rejected. Further, it can be identified that the cash conversion cycle has a positive and significant relationship with the working capital ratio and is therefore not consistent with the findings of Abbadi and Abbadi (2012). We accepted hypothesis H_1 given the positive significant relationship between the said variables. It indicates that the richer the number of days of the cash conversion cycle, the working capital requirement of the firm increases in order to operate efficiently. If firms want to reduce their investment in working capital, in order to capitalize on profitable projects, they will have to optimize their cash

conversion cycle. Jensen and Meckling (1976) under the agency theory have emphasized that the agency cost increases as a result of an increase in free cash flows of the company given the possibility to utilize unnecessary expenses by the managers. Therefore, firms must optimize their cash conversion cycle if they wish to lower their working capital investment and capitalize on profitable initiatives.

The dependent variable has a significant negative relationship with ROA, which is used as a proxy for measuring firms' profitability. Therefore, hypothesis H_2 was accepted. The negative relationship between profitability and WCM is consistent with the pecking order theory which highlights that managers prioritize internal retained earnings over debt or external sources when funding investment opportunities (Haron and Nomran, 2016). Nevertheless, this result contradicts with findings Abbadi and Abbadi (2012) and Nazir and Afza (2009) who argued that enterprises with larger profits are less concerned with efficient working capital. Consequently, it can be argued that the more lucrative businesses are more likely to hire experts to manage their working capital effectively.

Leverage of the firms denotes a significant negative relationship with the working capital management and is thus consistent with the findings of Lotfinia, Mousavi and Jari (2012) and Abbadi and Abbadi (2012). Therefore, we have accepted hypothesis H_4 given the significant relationship between the aforementioned variables. It signals that companies with a high debt-to-equity ratio should focus more on working capital management to avoid capital getting locked up in current assets. This is also in line with the Pecking Order Theory, as it implies that enterprises with greater leverage have reduced working capital requirements and firms select internal funding sources prior to external funds to source investments.

Tobin's Q, which is used as a proxy for a firm's growth opportunity, has a negative significant relationship with the Working Capital Ratio, which contradicts Nazis and Alza's (2003) and Celenak, Vural, and Sokmen's (2017) findings that suggest that interesting growth opportunities require higher levels of working capital. Therefore, hypothesis H_5 was accepted. The Altman Z-score has a positive and significant link with working capital requirements, indicating that enterprises that are closer to bankruptcy will require more working capital which is in accordance with the findings of Çetenak et al. (2017).

Hence, the hypothesis H_6 was accepted. Despite the findings of Abbadi and Abbadi (2012) on the absence of a significant association between interest rate and working capital, our study results suggest that interest rate has a significant negative relationship with working capital. This can be justified because a country's interest rate is a financial expense that firms must bear. Therefore, we have accepted hypothesis H_7. Further, the regression analysis results depict that GDP growth and inflation proved to be non-significant at 5% significance level, therefore, we have rejected hypotheses H_8 and H_9. Consequently, by analyzing the overall model it can be concluded that the working capital is mostly determined by firm-related factors.

Table 05: Overall analysis

Model 1	Coefficient	Probability
(Constant)	-.024	.876
ACCC	.250***	.000
ROA	-.444***	.001
SIZE	.006	.401
LEV	-.545***	.000
TOBQ	-.041***	.000
ALTMAN_Z	.159***	.000
INT	-.004**	.044
GDP	.007	.169
INF	-.004	.333
R Square		.732
Adjusted R Square		.720
F-Statistics		64.229
Probability(F-Statistics)		.000

Notes; ***, **, *, significant at 0.01, 0.05 and 0.1 level respectively. ACCC; Cash conversion cycle, ROA; profitability, SIZE; Firm size, LEV; leverage, TOBQ; Tobin's Q, ALTMAN_Z; Altman Z-score, INT; interest rate, GDP; GDP growth rate, INF; inflation.

4.3.2.1 Specific Analysis – Macroeconomic

Models 2, 3, and 4 focus on each of the macroeconomic variables interest rate, GDP growth, and inflation respectively, taken with the other firm-specific variables. The adjusted R-square values of all three models are high at 72%, 71.7%, and 71.4% respectively, and therefore imply a higher explanatory power of the model. Further, the F-statistics of the models along with their p-values indicate that the models are valid. However, this can be owing to the fact that the above three models use only one macroeconomic variable in each model with all other variables being firm related. Therefore, these macroeconomic models also can be helpful in identifying that the firm-related determinants play a major role when ascertaining the working capital requirements of firms.

Model 2 denotes the significant negative relationship between interest rate and Working Capital Ratio. The findings indicate that a rise in interest rate results in a reduction in the working capital requirements and vice versa. This contradicts the findings of Filbeck and Kruger (2005), who observed that a rise in the interest rates, reduces the firms' willingness to make payments thereby stretching accounts receivable, accounts payable, and cash accounts. A non-significant relationship between GDP and the working capital ratio was identified in the overall analysis albeit a positive relationship was found between GDP growth and the dependent variable. However, it should be noted that the relationship identified through the specific analysis is significant at a level of 10% only. This indicates that when a country's economy expands, enterprises will demand more working capital. Through

the analysis, it can be observed that the inflation rate does not indicate a significant relationship with Working capital requirements which is similar to the observation of the overall analysis.

Table 06: Specific Analysis – Macroeconomic

Variable	Model 2	Model 3	Model 4
	Coefficient (Probability)	Coefficient (Probability)	Coefficient (Probability)
(Constant)	0.13 (.931)	-.057 (.708)	-.005 (.974)
ACCC	.251*** (.000)	.253*** (.000)	.253*** (.000)
ROA	-.420*** (.001)	-.456*** (.000)	-.435*** (.001)
SIZE	0.005 (.470)	0.005 (.429)	0.004 (.550)
LEV	-.541*** (.000)	-.547*** (.000)	.544*** (.000)
TOBQ	-.040*** (.000)	-.033*** (.002)	-.030*** (.005)
ALTMAN_Z	.158*** (.000)	.158*** (.000)	.158*** (.000)
INT	-.004** (.019)		
GDP		.007* (.082)	
INF			.002 (.479)
R Square	.729	.726	.723
Adjusted R Square	.720	.717	.714
F-Statistics	82.327	81.029	79.719
Probability (F-Statistics)	.000	.000	.000

Notes; ***, **, *, significant at 0.01, 0.05 and 0.1 level respectively. ACCC; Cash conversion cycle, ROA; profitability, SIZE; Firm size, LEV; leverage, TOBQ; Tobin's Q, ALTMAN_Z; Altman Z-score, INT; interest rate, GDP; GDP growth rate, INF; inflation

4.3.2.2. Specific Analysis – Firm Related

Table 7 shows the outcomes of models 5-10 which analyze the impact of firm-specific variables on the dependent variable. The adjusted R-square values of the above-analyzed models are 5.1%, 5.4%, 1.2%, 28.4%, -.6%, and 33.7% respectively indicating very low explanatory powers of the models. Given the preceding models take into account each firm-related variable as well as the three macroeconomic

variables, it is evident that macroeconomic variables have little impact on the determination of working capital requirements.

Based on the study results, Tobin's Q, a measure of a company's growth potential, does not appear to have a significant impact on working capital requirements. According to the overall model, Tobin's Q has a negative significant relationship with the dependent variable, implying that Tobin's Q has no effect on a firm's working capital level when considered independently. However, while cash conversion cycle, profitability, and Altman z-score indicate a significant positive relationship, leverage of firms indicates a significant negative relationship with the dependent variable. Although the overall model showed that firm size had no significant impact on working capital, when analyzed independently, it appears to have a strong negative association with working capital requirements.

Table 07: Specific Analysis – Firm Related

Variable	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
	Coefficient (Probability)	Coefficient (Probability)	Coefficient (Probability)	Coefficient (Probability)	Coefficient (Probability)	Coefficient (Probability)
(Constant)	.112 (.041)	.141 (.008)	.752 (.003)	.422 (.000)	.207 (.001)	-.061 (.208)
ACCC	.191*** (.000)					
ROA		.671*** (.000)				
SIZE			-.026** (.019)			
LEV				-.632*** (.000)		
TOBQ					-.025 (.198)	
ALTMAN_Z						.127*** (.000)
INT	-.002 (.555)	-.002 (.593)	-.001 (.662)	-.002 (.398)	-.003 (.318)	.000 (.737)
GDP	.007 (.466)	.000 (.958)	.005 (.609)	.007 (.396)	.008 (.391)	.000 (.965)
INF	-.003 (.674)	.001 (.927)	-.004 (.620)	-.003 (.614)	-.005 (.552)	.001 (.937)
R Square	.068	.071	.030	.297	.012	.349
Adjusted R Square	.051	.054	.012	.284	-.006	.337
F-Statistics	3.940***	4.160***	1.671	22.909***	.684	29.136***
Probability (F-Statistics)	.004	.003	.158	.000	.604	.000

Notes; ***, **, *, significant at 0.01, 0.05 and 0.1 level respectively. ACCC; Cash conversion cycle, ROA; profitability, SIZE; Firm size, LEV; leverage, TOBQ; Tobin's Q, ALTMAN_Z; Altman Z-score, INT; interest rate, GDP; GDP growth rate, INF; inflation.

5. CONCLUSION

The study aims to explore the determinants of working capital requirements by taking listed companies in Sri Lanka into consideration. The working capital ratio is the dependent variable used in the analysis as the proxy for working capital requirements. This study takes into account independent variables such as cash conversion cycle, firm size, leverage, Tobin's Q, profitability, and Altman Z-score, where inflation, interest rate, and GDP growth rate are recognized as macroeconomic variables. A quantitative research design was used where a set of secondary data has been manually collected from 37 listed companies in CSE from different sectors i.e., Pharmaceuticals and Chemicals, Food and Beverage, Tobacco, and Manufacturing for a period of six years from 2014/13-2019/18. The regression is performed in two stages, firstly, as an overall analysis and secondly, as a specialized analysis using the SPSS package. The review of literature conducted at the initial stage of the study revealed that many works have been carried out to investigate the impact of working capital management on firm performance. However, defining the determinants of working capital requirements has received only a little attention, particularly in relation to the Sri Lankan setting. Therefore, this study was conducted to address this gap identified through the literature.

According to the overall and specific analysis amongst the firm-related variables studied, a significant relationship was identified amongst cash conversion cycle, leverage, profitability, and Altman Z-score with the working capital requirements of firms when analyzed collectively and independently. Nevertheless, amongst macroeconomic variables, only the interest rate indicated a significant relationship with the dependent variable. Interest rate is a financial expense incurred by firms contributing to the investment in working capital, thereby, strengthening the aforementioned relationship. Further, it was evident that firm-specific determinants are more relevant in forecasting the working capital requirements of Sri Lankan businesses. Although Cetenak et al. (2017) found that macroeconomic factors have a substantial association with working capital in 14 countries, this analysis depicts the macroeconomic variables are not essential determinants in the Sri Lankan context.

5.1 Implications of the study

There are a number of studies that have been conducted on the topic of working capital management, but the issue of identifying determinants of working capital has been given only a little focus, especially in the Sri Lankan context. This study will contribute to reducing the knowledge gap in this specific area. The findings of the study will provide insights for the managers of the corporate sector in making working capital decisions. As the study considers country-specific macroeconomic factors, the policymakers can employ the findings when making policy decisions for the country. Finally, the new knowledge and understanding of the study will be beneficial for financial analysis and academic researchers interested in the field of working capital management.

5.2 Limitations of the Study

As with any other research, there are several limitations that need to be taken into account when analyzing the results of this study. Firstly, the study is conducted on a sample of 37 Sri Lankan companies listed on the Colombo Stock Exchange across three industrial sectors and therefore it may not be accurate to generalize the findings to other countries and industries. A major limitation of the study may be that it is completely based on quantitative data and thus does not capture the qualitative effects on working capital management. Lastly, while the independent variables consisted of six firm-related determinants, only three macroeconomic variables have been considered in this study. Therefore, there may be other macroeconomic factors that may impact on determining the working capital of firms, which have not been taken into consideration by this study.

5.3 Suggestions for Further Research

It can be identified that there are not many studies that occupy a qualitative approach when conducting research on this topic. Therefore, it can be suggested to use qualitative data in addition to the quantitative data in further studies. In order to further understand the impact of macroeconomic factors on the working capital management of firms, the study suggests using more macro-level variables in future studies. Further, according to the findings of the study, the Altman Z-score happened to be a highly significant determinant of working capital requirements. However, this factor has been given very little attention in working capital literature. Also, this study finally suggests to further investigate the relationship between financially distressed firms and their requirement for working capital.

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