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Working Capital Management and Stock Performance: Evidence from an Emerging Market

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Abstract

Previous research found a negative relationship between net working capital (NWC) and firm risk without accounting for investor protection. Bangladesh is different. We find a positive relationship between NWC and firm risk in an environment with weak governance and lax protection of property rights. Higher NWC must maintain to balance firm risk. Financial reporting quality (FRQ), liquidity risk, revenue uncertainty and weak capital market access have impact on firm risk. Poor FRQ adversely affects cost of capital and also limited financing choice. Changes in NWC have a significant impact on stock performance in firms with slower sales growth and less access to external capital. Our finding's reliability is supported by both the fixed-effects panel and GMM regressions. The results have implications for Bangladeshi investors and firm managers as well as for other emerging markets with limited capital market access, high cost of bank debt and weak enforcement of property rights.

1. Introduction

This paper examines the impact of working capital management on stock performance while considering the impact of firms' access to external capital in Bangladeshi markets where the quality of accounting statements and the reporting environment are low. Low quality financial reporting has a negative impact on the cost of capital and limits financing choice. We use stock excess return (industry-median adjusted return) and firm risk as substitutes for firm performance.

Liquidity concerns are very important for firms and other economic agents who want to take advantage of good deals, conduct exchanges of assets or carry out other urgent business transactions. For many years, financial and monetary economists have focussed their research on liquidity. Liquidity is also linked to corporate operating performance and profitability of the business enterprise in published financial research. Previous research focused on the short-term aspects of liquidity and the problems with managing cash inventory. Attempts were also made to link Cash Conversion Cycles (CCC) measurement to firm profitability. If one has reliable and detailed accounting data, such an approach extends static liquidity measures like current and quick ratios into a dynamic setting that can link short and long-term decision making[1]. The quality of accounting statements and the reporting environment is low in most developing countries such as

[1]Examples of this approach are the papers by Richards and Laughlin (1980); Jose, Lancaster and Stevens (1996); Wang (2002); Zeidan and Shapir (2017); Chang (2018) and Wang (2019). They generally find a negative relationship between CCC and firm profitability. Firms that aggressively reduce their CCC in these countries analyzed are more profitable.

Bangladesh. This is clearly evidenced by World Bank Group reports on Bangladesh (WBG 2020) and other published academic reports[2].

Most liquidity research in recent years has focussed on its importance for capital structure decisions, precautionary motives and long-term future investment opportunities[3]. If the future is very uncertain and there are macroeconomic shocks, profitable projects and external financing may dry up. This exposes corporations to liquidity risks. In such cases asset maturity transformation may become impossible. Credit supply is very procyclical. Internal liquidity guards against the need to raise costly external finance when considering future investments when such funds may be least available[4].

Working Capital Management (WCM), a short-term view of liquidity is linked to the availability of internal liquid assets and the managing of the associated short-term liabilities[5]. Liquidity risk must therefore be actively considered when there is variable demand for the firm's products. Emery (1987) recommended the use of trade credit in such situations. Recent papers by Deloof (2003), Eljelly (2004), Sharma and Kumar (2011), Baños -Caballero, Garcia-Teruel and Martinez-Solano (2014) and Aktas, Croci and Petmezas (2015) show that there is an optimal level of NWC. The latter authors report that decreases (increases) in excess NWC are associated with positive or negative excess stock performance within one year[6]. Optimal WCM protects the corporation from the risks of default and distress and adequately supports sales growth. Higher levels of firm working capital imply higher firm liquidity. It is a signal of the firm's ability to raise internal finance at very short notice. However, it is a double edged sword[7].

Recently the finance literature has focused on the role of cash on corporate balance sheets. This emphasis has coincided with a period of long strong stock market growth and low funding costs for corporations[8]. According to Kieschnick, Laplante and Moussawi (2013), net operating working capital accounts for an average of more than 27% of the assets of US businesses. Recognizing the importance of working capital in its working Capital Survey, CFO Magazine reports annual studies of the WCM performance of firms around the world. The annual working capital reports of Price Waterhouse Coopers (PWC) show that €1.2 trillion in excess working capital is tied up on global balances for the year 2019-2020 and that €1.3 trillion could be released from the balance sheets of global listed companies by addressing their poor WCM performance for the year 2018-2019.

Numerous studies emphasize the effects of NWC on firm profitability and stock returns. See Jose et al. (1996); Shin and Soenen (1998); Deloof (2003); García-Teruel and Martínez-Solano (2007); Aktas et al. (2015) among others. These studies frequently find that reduction in NWC is associated with an increase in firm profitability or stock returns. However, few research investigate the impact of NWC on firm risk apart from Kieschnick et al. (2013); Aktas et al. (2015) and Le (2019). A limited research investigate the impact of capital access on the relationship between WCM and profitability namely Kieschnick et al. (2013); Baños -Caballero et al. (2014) and Le (2019). Interestingly, literature using US data, in particular documents that investment in NWC is more valuable for firms with greater sales growth Schiff and Lieber (1974); Sartoris and Hill (1983); Kim and Chung (1990) and Kieschnick et al. (2013)[9].

A completely unexplored topic in the literature is the detailed relationship between high sales growth rate firms, the usage of NWC and stock returns. We hypothesise that the same reductions in NWC should result in

[2]The World Bank Group reports detail their efforts to improve the public oversight capability of the accounting and auditing functions in Bangladesh. Bangladeshi firms have weak internal controls, report misleading information on external financing, have poor financial statement quality, have high rates of non-compliance with mandatory required disclosures and routinely manipulate accounting numbers. See Akhtaruddin (2005); Hasan and Hosain (2015); Rahman and Khatun (2017) and Rahman and Hasan (2019).

[3] Studies by Mian and Santos (2018) investigate maturity management over the business cycle. Covas and Den Haan (2011); Becker and Ivashina (2014) and McLean and Zhao (2014) all provide strong evidence of the cyclical nature of debt financing. Braun and Larrain (2005) show that firms and industries which are more dependent on external finance are heavily impacted by financial shocks. This is exacerbated if the firms are located in regions with poor financial contractability.

[4] Liquidity risk is priced in global markets and this should affect capital costs of all firms involved in trade. For recent evidence on the pricing of liquidity risks see Abankwa and Blenman (2021). Hardy and Saffie (2019) explores the connections between the carry trade and trade credit. Earlier work Udomsirikul, Jumreornvong, and Jiraporn (2011) also showed the link between liquidity and choice of capital structure. Ng (2011) explores the link between information quality. liquidity risk and cost of capital.

[5] Both the level of money supply and trade credit provide transactions services to corporations. However, traditional liquidity measures like current and quick ratios, are narrow static ones that measure only the level of liquidity (of the firm's assets) and not its overall liquidity risk. Liquidity risk is the risk that the level of liquidity is subject to unforeseen variation and the firm cannot adjust swiftly and appropriately. Liquidity risk is therefore objectively lower when there is a supply of cheap money. This observation builds upon an insight of Meltzer (1960). Available evidence suggests that liquidity risk should vary across the business cycle and respond to macroeconomic and credit supply shocks. See Costello (2020); Altinoglu (2021) and Alfaro, García-Santana, and Moral-Benito (2021) for example. Early work, Meltzer (1960) also suggested that there is substitution between bank and trade credit across the business cycle.

[6] Kim, Mauer, and Sherman (1998) using US data, developed in a theoretical framework the costs and benefits of liquidity levels (low yielding very short-term assets), and some testable hypotheses. However, their focus was rather different, as they considered the costs of not investing in higher yielding physical assets. Recent work by Le (2019) shows a more relevant tradeoff, in the context of firms, examining the links between NWC and profitability, firm risk and business cycle. In Vietnam listed firms are mainly government owned.

[7] Working capital management encompasses the use of and source of short-term funds. Cash, receivables, and inventory on the uses side are just as important as the source of those funds, short-term payables, short-term debt, trade credit and bank loans. It is therefore a balancing act between the costs of being too liquid, forgone sales if inventory is too low and cash too high, versus the benefits of being highly liquid. In emerging markets, the range of capital market financing instruments is highly restricted. Bank debt and trade credit are therefore very important funding sources.

[8] These conditions by and large are not met in developing markets. In Bangladesh the cost of money is very high. Average loan rates on short-medium term debt were 10%-16% per year, for preferred borrowers. Currently reported loan rates are almost 9%, for business loans. So, we would expect to see cash balances to be relatively low. We would also expect to see inventory and inventory turnover to be high for firms with good sales growth. Since bank debt is relatively costly as well, we would expect to see some trade credit use.

[9] The relation between NWC and sales growth is also studied by Fisman and Love (2003); Atanasova (2007); Love and Zaidi (2010); Hill, Kelly, and Highfield (2010) and Ferrando and Mulier (2013). There is an endogeneity problem in analyzing this link and researchers have typically used lagged sales growth (as regressor) instead of current sales.

less returns for firms with high sales growth than for firms with low sales growth by combining the findings showing that NWC is more valuable for firms with higher sales growth and those showing that reductions in NWC are associated with higher returns. For firms to have higher growth rates, more investment in NWC is required. Consequently, a reduction in NWC increases stock returns but the increase is less for firms with higher sales growth rates. However, to our information no existing literature provides empirical support for this claim.

We examine the effects of WCM on excess stock returns and firm risk in order to fill the gaps in the literature We also investigate how firms' access to external capital and their sales growth rates affect the relationship between their NWC and stock performance. We analyze a panel dataset of Bangladeshi listed companies using fixed-effects panel regressions and generalized method of moments (GMM) regression techniques. Faulkender and Wang (2006) argue that an excess-stock-returns approach is a better way of measuring valuation effects than the market-to-book ratio method. The difference between stocks' buy-and-hold annual returns and the median value of the industry's yearly buy-and-hold returns for that year is used in this paper to determine the industry- median adjusted excess returns to shareholders. Le (2019) documents that WCM is particularly important for firms with lower access to external capital. Demigurc-Kunt and Maksimovic (2001) documented that banking sector development is associated with the availability of short-term financing.

The Bangladeshi market is an appealing example to analyze when examining the effects of NWC on stock returns and firm risk and how access to external capital affects the relationship between NWC, stock returns and risk. As a developing country, Bangladeshi businesses have less access to capital markets than in developed countries. Bangladesh might be considered as a country where finance is more available from the banking sector than via stock markets.

Despite the fact that Bangladesh as a potential market, research on WCM used by Bangladeshi firms is still limited. Studies on working capital management have been conducted in the country but they focus mostly on the cement industry. (See (Hoque, Mia & Anwar, 2015; Quayyum, 2011; Rahman & Hasan, 2019)). A recent exception is Hasan and Hosain (2015) studied a broader group of 54 firms over a three-year period[10]. We could find no studies done on purely financial firms.

Global investors may be particularly interested in studying the downside of external equity investments in emerging markets. However, no existing research studies the relationship between NWC and firm risk in Bangladeshi markets[11]. Such markets are also highly subject to policy uncertainty. Moreover, in Bangladesh, there is a high degree of non-compliance with Bangladesh law even in published financial statements. Uncertainty about the quality of firm financial data increases not only the cost of capital but changes the form in which it could be accessed[12]. The high quality of earnings, type, frequency and quantity of the disclosures also positively affect the cost of capital and reduce mispricing of stock. See Leuz and Verrecchia (2000); Einhorn (2005); Francis, Nanda, and Olsson (2008); Perotti and Wagenhofer (2014) and Chen, Gee and Neilson (2021).

This paper finds a negative relationship between NWC and excess returns. The same reduction in NWC is associated with higher returns for firms with lower sales growth than for firms with higher sales growth. The difference is even magnified for firms with less access to external capital (higher cost of debt capital. It is found that stock returns increase as trade payables increase or trade receivables decrease. However, an increase in NWC is associated with higher firm risk. The results of firm risk regressions hold using both fixed-effects panel regression and GMM models. Finally, the same reduction in NWC is associated with higher increases in returns for firms with less access to external capital[13].

This paper contributes to the WCM literature in several ways. First, it extends the research on the impact of NWC on excess stock returns and firm risk to the Bangladesh market. To our knowledge, this paper is the first to examine the impact of NWC on both stock returns and firm risk in Bangladeshi markets. The evidence implies the need to reduce the level of NWC, information asymmetry, cost of capital, liquidity risks and increasing FRQ in order to enhance firm value and reduce risk in listed firms on the Dhaka Stock Exchange. All these activities will help Bangladeshi firm management and investors. This finding is related to Shin and Soenen (1998) who compared the WCM of Walmart and Kmart in 1994, albeit for the US taking into

[10] They provide strong evidence of the poor reporting standards, and weak financial statement quality of Bangladeshi firms, regardless of size or profitability of the company. Most of the listed companies do not comply with mandatory compliance requirements and fewer still satisfy any voluntary disclosure rules. Bangladesh has weak regulatory oversight as evidenced in World Bank Group (2020); reports. Gipper, Leuz, and Maffett (2020) show that public regulatory oversight and credibility risk in financial statements is priced and negatively affects the cost of capital.

[11] Bangladesh is a fast-growing economy with hugely underdeveloped capital markets. It is also very open economy where the degree of openness is measured by the sum of Import and Exports as % of gross domestic product. So essentially Bangladeshi companies must choose between bank finance and trade credit as the market for short-term debt issuance by firms is almost non-existent. This low level of development means that they have more choices from trade credit and must heavily rely on establishing banking relationships to secure working capital.

[12] See Easley and O'hara (2004) on information risk and its impact on cost of capital. Lambert, Leuz, and Verrecchia (2007) demonstrated the deleterious impact of information quality on cost of capital of a firm. This was further confirmed by Costello and Wittenberg-Moerman (2011) who also showed the impact of financial reporting quality on the form of debt contracting. Weak internal controls shift the focus from debt covenants to price-based measures of control. Rahman and Hasan (2019) provide evidence of the poor quality of financial reports on the cement industry, which was the first to be listed (1969) on the Bangladeshi stock exchange but still has years of missing reported financial data. Costello (2020) shows the adverse impact of liquidity risk on trade and bank credit provisioning.

[13] Access to external capital can depend both on trade risks as well as political risk. See Ross and Pike (1997) for the offer based on pure export risks. Kesse and Blenman (2021) show that political risks are priced in international markets.

consideration the effects of financing costs[14]. The findings also support the claims that firms hold excess working capital may incur high interest expenses and potentially bankruptcy risk (Aktas et al., 2015)[15].

Second, this study is among the first to examine how firm sales growth rates affect the relationship between changes in NWC and excess stock returns in Bangladesh. We found a significant effect of firm sales growth on the relationship between WCM and excess stock returns. Fisman and Love (2003); Love and Zaidi (2010); Hill et al. (2010) and Ferrando and Mulier (2013) focused on related issues, such as how trade credit channel use and intermediary development impacted industry growth. Hill et al. (2010) is closest to our work but does not examine excess stock returns.

Third, this paper contributes to the sparse literature on the effects of WCM on firm risk. Aktas et al. (2015) and Le (2019) uses the data of the US and Vietnamese markets.[16] This paper reveals a positive relationship between NWC and firm risk. The difference may come from the different constitutional settings and development levels among these countries. The US has better FRQ and more highly developed markets than Bangladesh. Hence firms try to set optimal levels of NWC in the USA's markets. Consequently, firm managers must make a trade-off between firm profitability and risk objectives in managing their working capital.

Vietnam and Bangladesh may have similar development levels. However, while Big 4 auditors have direct relationships with audit firms in Vietnam, they need local affiliated agencies in Bangladesh. Further, Big 4 auditors can reduce earnings management in Vietnam (Le and Moore (2021). Big 4 affiliates do not have an impact on curbing earnings management in Bangladesh(Kabir, Sharma, Islam and Salat (2011). This implies that the FRQ may be higher for Vietnam than Bangladesh. Further, there are several state-owned enterprises in Vietnam. These firms have better access to capital markets and a lower cost of capital than other firms. See (Le, 2019, 2020). In addition, Bangladesh is dominated by family-owned businesses in which there is a higher propensity to real earnings management[17]. Finally, the importance of WCM in developing markets particularly for firms with limited access to external capital is also discussed.

Fourth, we contribute to the literature by explicitly linking firm statement quality in the market with weak corporate governance and property protection rights to firm capital costs and price transparency. Poor statement quality increases information asymmetry costs, lowers investor confidence in a stock, reduces its liquidity (how frequently it trades), raises the firm's cost of capital and reduces profitability. It obscures a company's real value and would often lead to poor stock price performance. Akhtaruddin (2005); Rouf and Abdur (2011); Hasan and Hosain (2015) and World Bank Group (2020) all provide evidence of the poor state of accounting reporting in Bangladesh[18].

Quayyum (2011) examines the data of five Bangladeshi cement firms from 2005 to 2009. He reports a negative relationship between the Cash Conversion Cycle (CCC) and return on assets and net profit margins. However, the quality of the accounting data is low. Our paper differs in three important ways: Firstly, we examine the entire Bangladeshi market over a 16-year period from 2001 to 2016 while he investigates five firms over five years. Secondly, different from Quayyum (2011), this paper employs GMM and fixed-effects panel regression methods. Thirdly, this paper investigates the impact of WCM on firm risk and examines how capital access and sales growth affect the relationship between WCM and excess returns.

Our findings are important for investors and firm managers who conduct business in the Bangladeshi market. They help in more realistically connect reported short-term WCM measures with long-term financing decisions and goals. Global investors may be interested in exploring how each country's unique the institutional setting, capital market development and financial accounting or reporting environment of each country as well as their effects. The relationship between WCM and firms' stock returns and risk may be of interest to global investors. We contribute to the limited number of studies on the impact of access to external capital on the relationship between NWC and profitability or stock returns in Bangladesh. Bangladesh has a high-growth rate economy but there is still a lot of uncertainty about effective returns to shareholders even in the presence of improving corporate governance practices and WCM attitudes.(See Muttakin, Monem, Khan, and Subramaniam (2015); Khan, Muttakin, and Siddiqui (2015) for more information).

We organize the remainder of this paper as follows: Section 2 includes a review of the existing literature and presents our hypotheses. Section 3 explains the research methodologies. Section 4 describes the data. Section 5 discusses the regression results and section 6 concludes.

[14] Shin and Soenen (1998) provide mixed evidence of net trade cycle (NTC) and profitability. Their correlation coefficients Pearson and Spearman rank measure both report a negative relationship. However, their Spearman rank correlation (Pearson) measure was positive (negative) for the relation between NTC and return on sales. Their current ratio measure reports a positive relation with profitability in 6 out of 7 cases.

[15] The average Bangladeshi firm holds twice as much in NWC as the typical US firm and is even higher that the average NWC level of Vietnam.

[16] Aktas et al. (2015) document a negative relationship between excess NWC (the industry-median adjusted NWC) and firm risk for the US markets. Le (2019) also finds a negative relationship between NWC (net working capital scaled by the book value of assets) and firm risk for Vietnamese markets.

[17] Bangladesh is dominated by family-owned firms. For references see (Razzaque, Ali, & Mather, 2016; Razzaque, Ali, & Mather, 2020) for a thorough investigation of this issue. All of this means that the reported accounting numbers have low credibility in Bangladesh.

[18] Existing research by Diamond and Verrecchia (1991); Botosan (1997); Lambert et al. (2007); Lang and Maffett (2011) and Lang, Lins, and Maffett (2012) conclusively show that poor disclosure quality adversely affects the cost of capital of a firm.

2. Literature Review and Hypotheses

Various studies examine the effects of short-term assets (cash, inventory and trade receivables) and liabilities (accounts payable) on firms' performance. Kieschnick et al. (2013) find that an incremental dollar invested in NWC is worth less than an additional dollar held in cash. Some studies revealed a negative relationship between cash holdings and firm value. See Lee and Lee (2009); Harford, Mansi, and Maxwell (2008); Kalcheva and Lins (2007); Pinkowitz, Stulz and Williamson (2006) and Luo and Hachiya (2005). However, others document a positive relationship. See Bates, Kahle and Stulz (2009); Isshaq, Bokpin and Onumah (2009) and Faulkender and Wang (2006). Dittmar, Mahrt-Smith and Servaes (2003) and Dittmar and Mahrt-Smith (2007) show that with good governance, the value of cash holdings in a firm will increase.

The impact of trade receivables management on firms' performance is also supported by recent studies An increase in credit grants to customers (trade receivables) promote long-term relationships with clients which could improve a firm's profitability (Brennan, Maksimovics & Zechner, 1988) and Wilson and Summers (2002). However, Kieschnick et al. (2013) asserts that an increase in NWC requires additional financing. In addition, firms with excess working capital may face high interest expenses and potentially bankruptcy risk (see, Aktas et al. (2015)). Recent evidence supports our view that poor receivable management and high levels of working capital can be potentially disastrous to firm's stability [19].

Current research shows the significant effects of WCM on global firms' performance. This literature examines the impact of NWC on firm profitability or valuation. Authors worldwide use various measures of NWC such as net working capital to sales, net working capital to assets or the CCC. Most researches examine a negative relationship between the CCC and firm profitability (García-Teruel & Martínez-Solano, 2007; Jose et al., 1996; Lazaridis & Tryfonidis, 2006; Le, 2019; Shin & Soenen, 1998; Wang, 2002; Wöhrmann, Knauer, & Gefken, 2012). Using sample data for Belgian markets, Deloof (2003) finds a negative and insignificant relationship between NWC or CCC and firm performance. Quayyum (2011) analyses the data of five Bangladeshi cement firms from 2005 to 2009 and examines a negative relationship between the CCC and return on assets and net profit margins.

Consistent with the previous studies, we hypothesize the following:

H1. There is a negative relationship between the level of NWC and excess stock returns.

Hypothesis 1 implies that a reduction in the level of NWC is associated with an increase in firm valuation. We mentioned the findings of Schiff and Lieber (1974); Sartoris and Hill (1983); Kim and Chung (1990) and Kieschnick et al. (2013) who note that investment in NWC is more valuable for firms with greater sales growth. Combining the two aforementioned points, we argue that although firms can reduce their levels of NWC to increase their firms' value and sales growth rates. In other words, compared with lower-sales-growth-rate firms, higher-sales-growth-rate firms need more investment in NWC. Hence, the reductions in the NWC of higher-sales-growth-rate firms have less impacts on stock returns.

H2. For firms with a higher sales growth rate, the changes in NWC levels have less impacts on excess stock returns.

Interestingly, recent studies noted that there exists an optimal NWC that enhances a firm's valuation. Eljelly (2004) proposes the efficient WCM theory which requires a sufficient level of current assets to address short-term obligations and avoid excessive investment in current assets. Using data on UK firms from 2001 to 2007, Baños -Caballero et al. (2014) find a concave relationship between the CCC and profitability. They argue that there exists an optimal level of NWC that enhances a firm's value. Berk, DeMarzo and Harford (2009) argue that the efficient WCM level reallocates the available cash flow or underutilized resources to pursue higher-value projects to create firm value. Aktas et al. (2015) and Le (2019) investigate the relationship between NWC and firm profitability and risk as measured by stock returns volatility and highlighted a negative relationship between NWC and firm risk. Aktas et al. (2015) further find that the negative relationship between NWC and firm risk is only robust for firms whose investment in NWC is lower than or equal to their industry's median investment in NWC. However, in firms that have higher investments in NWC than the industry median, the relationship between NWC and firm risk is insignificant.

The efficiency of WCM may affect firm risk because large investment in NWC increases the need for financing Kieschnick et al. (2013). A firm's inability to meet its capital demands may negatively affect its performance. Holding excess working capital may cause firms to incur high interest expenses and potentially bankruptcy risk Aktas et al. (2015). For instance, in a US context, Shin and Soenen (1998) analyzed the case of Walmart and Kmart in 1994 and show that between the two, Kmart made substantially higher investments in NWC. Consequently, Kmart faced financial problems related to financial costs and had to close 110 stores across the country that year. Hence, firms' access to capital is more limited in developing markets than in developed ones. Hence, the negative consequence of over-investment in NWC may be more serious in a developing market. Bangladesh is a developing market where firms' access to capital is more limited than it is for firms in developed markets. Hence, if a Bangladeshi firm invests too much in NWC, it may need additional financing which involves opportunity costs. Altogether, we argue that the relationship between NWC and firm risk may be positive or negative. The positive relationship is more possible if the investment in NWC is too high and firms' capital access is limited. We argue that the level of NWC affects Bangladeshi firms' risk.

[19] Martínez-Sola, García-Teruel, and Martínez-Solano (2013) provide supporting empirical and theoretical evidence. They derive a quadratic relation between trade credit and profitability. They show that at low receivable levels firms are profitable but high receivables levels lead to firm losses.

H3. A change in NWC affects firm risk in Bangladeshi markets.

Le (2019) noted that a dollar of NWC is more valuable in firms with less access to external capital than in firms with more access to capital. Consistent with Le (2019), we hypothesize that the effects of the level NWC on a firms' returns and risk are more pronounced in firms with limited access to external capital.

H4. Firm performance is more sensitive to changes in NWC for firms with less access to external capital than for firms with higher access to external capital.

3. Methodologies

The paper uses the fixed-effects panel regressions to examine the impact of NWC on excess stock returns. To investigate the effects of NWC on excess stock returns, the paper uses the following linear regression specification:

$$EXCESSRETURNS_{i,t} = \beta_0 + \beta_1 EXCESSNWC_{i,t-1} + \beta_2 CONTROL_{i,t-1} + \beta_3 fe_{i,t} + \varepsilon_{i,t} \quad (1)$$

where $EXCESSRETURNS_{i,t}$ are the *industry-adjusted stock returns* (buy-and-hold investment returns) of stock i in year t. This is the difference between the returns of stock i and its industry's median returns for that year. The interest variable, $EXCESSNWC_{i,t}$, is the industry- median adjusted NWC-to-sales ratio of firm i in year t. This is the difference between the NWC-to-sales ratio of firm i and the median of the NWC-to-sales ratio of its industry in year t. We use this industry-median adjusted NWC-to-sales ratio to control for the industry effects (Aktas et al., 2015). To investigate the impact of firms' growth opportunities on the relationship between NWC and firms' valuations, this study uses DUMMY, a dummy variable that takes the value of one if its sales growth rate is higher than that of its industry median. The non-linear specification is as follows:

$$EXCESSRETURN_{i,t} = \gamma_0 + \gamma_1[EXCESSNWC_{i,t-1} * DUMMY] + \gamma_2[EXCESSNWC_{i,t-1} * (1 - DUMMY)] + \gamma_3 CONTROL_{i,t-1} + \gamma_4 fe_{i,t} + \varepsilon_{i,t} \quad (2)$$

where CONTROL is a vector of the other explanatory variables including CASH, the cash holdings to total assets ratio. LEV is the total debt to total assets ratio used to measure firm leverage. SIZE is the total book assets which are used to control for firm size. CFOSALES and GROWTH are the net operating cash flow to sales ratio and the annual sales growth which are used to measure a firm's ability to generate cash flow and CAPEX is the capital expenditure to assets ratio which is used to measure firm investment. ROE is the return on equity. VOL represents the stock returns volatility and ROASTD is the three-year time horizon standard deviation of the return on assets. To reduce the potential issues of firm performance and NWC being simultaneously determined in equilibrium, all of the explanatory variables are lagged by one year. Further, to reduce the incidence of any issues related to missing variables see also, Aktas et al. (2015) we add $fe_{i,t}$, which represents the firm and year fixed-effects to control for the time-invariant firm characteristics in all regressions. The Appendix 1 presents some descriptions and calculations of the variables.

4. Descriptions of the Data

The data used in this paper was obtained from Compustat. The sample consists of 757 firm years or all the information available for non-financial firms listed on the Dhaka Stock Exchange between 2001 to 2016. According to academic research, the financial statements contained a large number of missing or incomplete data points.

Table 1. NWC by sales ratio by year and major industry.
Panel A. NWC by year.

Year	Obs.	Mean	Std.
2001	3	66.775	31.925
2003	2	26.903	3.210
2004	3	24.414	8.588
2005	3	22.889	6.487
2006	6	15.919	25.056
2007	14	38.112	39.662
2008	28	35.128	26.217
2009	42	33.498	31.180
2010	52	38.899	33.272
2011	76	39.273	35.299
2012	91	40.061	35.138
2013	108	50.383	45.689
2014	118	50.093	42.738
2015	106	48.610	47.997
2016	105	52.823	48.884

Panel B. NWC by industry[20].

Industry	Obs.	Mean	Std.
Non-manufacturing	173 (22.86%)	46.040	39.570
Manufacturing	584 (77.24%)	41.820	48.030
Total	757 (100%)	45.073	41.663

From 2001 to 2016, the net-working-capital-to-sales ratio of firms listed on the Dhaka Stock Exchange is shown in Table 1. Since 2009, the number of listed firms has increased. The average NWC for the entire market is roughly 45 percent with manufacturing firms dominating and having NWC of 46 percent. According to Aktas et al. (2015), the mean of the NWC is only 19.99 percent for US firms. Le (2019) notes that the average NWC by sales ratio in Vietnamese markets is 37.15 percent. The evidence shows that the average level of NWC of Bangladesh firms is substantially higher than that of US firms (firms in a developed market) and higher than that of Vietnamese firms (firms in a developing market)[21].

Table 2. Summary statistics.

Variable	D =0		D =1		p-value - mean test
	Mean	Std.	Mean	Std.	
AP	5.036	9.198	5.189	9.088	0.819
CAPEX	5.014	6.008	6.683	7.325	0.001
CASH	7.449	10.767	7.212	10.281	0.769
CFOSALES	12.540	18.362	10.961	16.140	0.215
COD	0.095	0.071	0.099	0.062	0.843
EXCESSRETURN	5.961	49.239	11.386	44.019	0.132
GROWTH	-2.039	17.847	33.402	42.571	0.000
LEV	49.048	26.661	48.176	30.111	0.674
MTB	1.694	2.556	1.737	1.624	0.795
NWC	48.137	44.864	41.413	37.219	0.027
ROASTD	1.919	2.288	2.238	3.269	0.116
ROE	11.985	31.141	27.025	181.327	0.128
SALES	6568	16228	5722	11198	0.413
SIZE	10442	23001	8132	15527	0.113
TANG	45.321	21.761	46.250	21.106	0.554
VOL	2.998	1.234	2.975	1.261	0.804

Note: The definitions of variables are included in Appendix 1.

Table 2 summarizes the statistics of the data used in the paper. The whole sample is divided into two groups: group 1 includes firms whose NWCs are lower than the industry median (DUMMY =0) and group 2 consists of the other firms (DUMMY =1). We include the p-values for the tests of the hypothesis that the mean values of each variable in the two groups are equal these are shown in the last column of Table 2. The evidence in Table 2 indicates that the firms of group 1 have significantly higher NWC than those in group 2. However, firms in group 1 have lower capital expenditures and returns than those in group 2. The results imply that firms with higher growth rates are larger firms and invest relatively more in long-term assets but relatively less in short-term assets. These firms also earn higher returns on equity.

Table 3. Correlation matrix.

Variables		a	b	c	d	E	f	g	h	I	j	K	l	m
NWC	a	1												
VOL	b	0.00	1.00											
CASH	c	-0.28	-0.10	1.00										
LEV	d	-0.07	0.16	-0.03	1.00									
SIZE	e	-0.13	-0.17	0.03	0.09	1.00								
CFOSALES	f	-0.21	-0.18	0.08	-0.18	0.32	1.00							
CAPEX	g	-0.12	-0.07	0.04	-0.08	0.14	0.20	1.00						
TANG	h	-0.07	0.03	-0.33	-0.26	0.08	0.29	0.24	1.00					
GROWTH	i	-0.09	0.19	0.03	0.04	0.02	-0.02	0.15	0.01	1.00				
ROASTD	j	-0.06	0.04	0.11	0.20	0.00	-0.02	-0.03	-0.05	0.22	1.00			
ROE	k	-0.06	0.10	0.03	0.10	0.00	-0.03	0.01	-0.10	0.13	0.02	1.00		
MTB	l	-0.21	0.06	0.18	-0.06	0.01	0.11	0.14	-0.10	0.16	0.18	0.04	1.00	
AP	m	-0.38	0.05	0.30	0.28	-0.01	-0.06	-0.04	-0.29	0.04	-0.03	0.01	0.09	1

Note: The definitions of variables are included in Appendix 1.

[20]According to the untabulated data of 2016, for manufacturing firms, the average revenue is 4,010 , the average market capitalization is 9,927 and the average total book assets is 6,361. The corresponding values for non-manufacturing are 15,050, 28,259 and 26,485.

[21] There is basically no difference between the overall market and manufacturing firms. Bangladeshi firms hold twice as much in NWC 45% as the average US firm. Hill et al. (2010) reported a 20% figure whereas Kieschnick et al. (2013) reported a 23% number.

Table 3 shows the correlations between explanatory variables. The magnitudes of the correlation coefficients are small in absolute values.

Table 4. Working capital and stock performance.

Excess return	I	II	III	IV
EXCESSNWC	-0.261 (0)	-0.261 (0)		
EXCESSNWCD			-0.209 (0.009)	-0.208 (0.009)
EXCESSNWC(1-D)			-0.311 (0.000)	-0.310 (0.000)
CASH	0.001 (0.997)	-0.010 (0.958)	0.011 (0.952)	-0.006 (0.997)
LEV	0.177 (0.034)	0.176 (0.034)	0.176 (0.035)	0.174 (0.035)
LOG(SIZE)	0.586 (0.666)	0.534 (0.682)	0.527 (0.698)	0.475 (0.716)
CFOSALES	-0.159 (0.235)	-0.156 (0.243)	-0.152 (0.255)	-0.149 (0.264)
CAPEX	-0.408 (0.182)	-0.396 (0.195)	-0.422 (0.168)	-0.411 (0.180)
GROWTH	0.039 (0.444)	0.036 (0.491)	0.036 (0.487)	0.032 (0.538)
ROE	-0.004 (0.782)	-0.003 (0.788)	-0.003 (0.805)	-0.003 (0.811)
VOL	0.037 (0.983)		-0.020 (0.986)	
ROASTD		0.374 (0.591)		0.382 (0.584)
Industry- and year fixed-effects	Yes	Yes	Yes	Yes
R-squares	0.081	0.082	0.083	0.084
Obs.	430	430	430	430

Note: The dependent variable is excess return. The parentheses contain the p value. D is a dummy variable that has the value of one if the corresponding firm's sales growth rate is higher than the industry median and zero otherwise. The definitions of other variables are included in Appendix 1.

5. Regression Results

5.1. WCM and Excess Stock Returns

The regression results of the excess stock returns are given in table 4. The dependent variable is the annual excess returns. Stocks annual returns are adjusted for their industry's median returns for that year. We lag all of the independent variables by one year with respect to the dependent variable. All of the specifications include the industry and year fixed-effects. Excess net working capital (EXCESS NWC), the explanatory variable of interest is the difference between a firm's net-working-capital-to-sales ratio and its industry median net-working-capital-to-sales ratio in that year. This variable measures the deviations of these firms' NWC with respect to their industry medians. Specifications I and II in Table 4 present the results of the linear models while specifications III and IV show the evidence for the non-linear models. DUMMY takes the value of one if the corresponding firm's sales growth rate is higher than the industry median and zero otherwise.

According to the evidence in the linear model, on average, there is a positive correlation between stock returns in one year and the decline in excess NWC from the prior year. The coefficient estimates are statistically significant at one percent level (p-values = 0). On average, one percent decline in the excess NWC is associated with 0.26 percent increase in excess stock returns in the next period. The evidence in specifications III and IV shows that the coefficient estimates for the two interaction variables are both negative and marginally significant at the one percent level (p-values ≤ 0.01) but are different in magnitude. EXCESSNWC*DUMMY is the interaction between the excess NWC and a dummy variable indicating firms with higher sales growth while EXCESSNWC*(1-DUMMY) is the interaction between the excess NWC and a dummy variable exhibiting firms with lower sales growth. The results suggest that one percent decrease in excess NWC is associated with 0.21 percent increase in excess stock returns for firms with higher sales growth and 0.31 percent increase in excess stock returns for firms with lower sales growth over the next period.

Table 5 provides the regression results for the test on the impact of trade credit on excess stock returns. The evidence in the table suggests that excess stock returns increase as firms use more external funding from

vendors while excess stock returns decrease as firms grant more credit to clients. The coefficients on AP are positive and significant at one percent level (the coefficient = 0.7461 with the p-value =0 in Specification I). However, the coefficient on AR is negative and significant at one percent level (the coefficient = -0.6681 with the p-value = 0.002 in Specification III). Possible explanations may be that firms have high levels of short-term payables (short-term borrowing) but low levels of current accounts payable. The unreported data shows that short-term-note payables account for 17.6 percent of total assets while accounts payable accounts for only 5 percent of total assets.

Table 5. Trade credit and stock performance.

Excess return	I	II	III
AP	0.746 (0.001)	0.773 (0.000)	
AR			-0.668 (0.002)
CASH	0.010 (0.957)	-0.013 (0.944)	0.032 (0.878)
LEV	0.114 (0.205)	0.105 (0.238)	0.168 (0.053)
LOG(SIZE)	-0.149 (0.912)	-0.162 (0.901)	-0.446 (0.734)
CFOSALES	-0.035 (0.789)	-0.031 (0.814)	0.008 (0.956)
CAPEX	-0.284 (0.357)	-0.258 (0.403)	-0.281 (0.386)
GROWTH	0.031 (0.551)	0.021 (0.683)	0.050 (0.342)
ROE	0.002 (0.880)	0.002 (0.868)	-0.004 (0.774)
VOL	-0.261 (0.883)		
ROASTD		0.696 (0.325)	0.535 (0.453)
MTB			-1.309 (0.11)
TANG			-0.227 (0.065)
Industry- and year fixed-effects	Yes	Yes	Yes
R-squares	0.063	0.065	0.064
Obs.	430	430	424

Note: The dependent variable is excess return. p-values are in the parentheses. The definitions of variables are included in Appendix 1.

5.2. WCM and Firm Risk

The standard deviation of monthly stock returns in Bangladeshi exchanges is used in this research as a proxy for firms following Armstrong and Vashishtha (2012) . The interest independent variable is NWC. Following previous research (see (Aktas et al., 2015; Le, 2019), we include firm size, leverage, market-to-book ratios and sales growth rates among others as explanatory variables. According to earlier studies, firms that pursue too little NWC might incur high risk due to fluctuations in supply cost and loss of potential sales (see Blinder and Maccini (1991), Fazzari and Petersen (1993) among others). Empirical studies conducted in US and Vietnamese, a significant and negative relationships between NWC and firm risk was founded (see Aktas et al., 2015; Le, 2019). However, holding too much inventory increases the risk of obsolescence and may trigger costly write-offs and reduces profitability. Further, the comparison of WCM between Walmart and Kmart mentioned in Shin and Soenen (1998) shows that heavy investment in NWC among firms face financing and opportunity costs may lead to high firm risk. Table 6 reports the regression results on the impact of NWC on firm risk using both OLS and GMM regressions. The coefficient estimates of NWC are positive and significant at the five percent level in all specifications (*p*-values are around 4 percent). The results in Table 6 are contrary to the findings of Aktas et al. (2015) and Le (2019) for the US and Vietnamese markets. Bangladeshi firms invest more in NWC compared with US and Vietnamese firms. Aktas et al. (2015) and Le (2019) noted that the means of the NWCs are 19.99 and 37.15 percent for US and Vietnamese firms while the corresponding value is 45 percent for Bangladeshi firms. In untabulated results, the number of days in inventory outstanding (DIO) is high.

Table 6. Working capital and firm risk.

VOL	Fixed-Effects Panel	GMM
NWC	0.002 (0.038)	0.004 (0.040)
CASH	-0.004 (0.405)	0.016 (0.259)
LEV	0.005 (0.004)	0.002 (0.750)
LOG(SIZE)	-0.245 (0.000)	-0.266 (0.001)
CAPEX	-0.019 (0.006)	-0.049 (0.003)
GROWTH	0.005 (0.000)	0.017 (0.002)
MTB	0.028 (0.167)	0.080 (0.184)
TANG	0.006 (0.009)	0.009 (0.218)
Industry- and year fixed-effects	Yes	Yes
R-squares	0.312	
Obs.	617	
Wald chi2(10)		183.560
AR(2) – Z		-0.230
Hansen chi2(128)		100.660

Note: The dependent variable is stock return volatility, a measure of firm risk. p-values are in the parentheses. The definitions of variables are included in Appendix 1.

Table 7. The effects of access to external capital.

Panel A. The effects of excess to external capital on the relationship between NWC and return

	High COD				Low COD			
Excess return	**I**	**II**	**III**	**IV**	**I**	**II**	**III**	**IV**
EXCESSNWC	-0.369 (0.001)	-0.355 (0.001)			-0.212 (0.014)	-0.213 (0.013)		
EXCESSNWCD			-0.249 (0.052)	-0.233 (0.060)			-0.248 (0.038)	-0.226 (0.055)
EXCESSNWC(1-D)			-0.527 (0.000)	-0.508 (0.000)			-0.175 (0.151)	-0.199 (0.101)
CASH	0.492 (0.165)	0.524 (0.126)	0.462 (0.190)	0.503 (0.140)	-0.482 (0.143)	-0.437 (0.182)	-0.492 (0.137)	-0.442 (0.180)
LEV	0.319 (0.051)	0.354 (0.026)	0.298 (0.068)	0.333 (0.036)	0.0772 (0.569)	0.124 (0.350)	0.072 (0.598)	0.122 (0.360)
LOG(SIZE)	1.849 (0.453)	1.414 (0.526)	2.311 (0.347)	1.884 (0.399)	0.441 (0.843)	-0.920 (0.666)	0.567 (0.801)	-0.876 (0.684)
CFOSALES	-0.075 (0.741)	-0.117 (0.608)	-0.111 (0.626)	-0.151 (0.509)	-0.127 (0.527)	-0.112 (0.572)	-0.127 (0.525)	-0.112 (0.573)
CAPEX	-0.657 (0.183)	-0.604 (0.210)	-0.706 (0.150)	-0.645 (0.179)	-0.359 (0.443)	-0.344 (0.455)	-0.355 (0.449)	-0.344 (0.457)
GROWTH	0.213 (0.038)	0.218 (0.031)	0.212 (0.037)	0.216 (0.032)	0.028 (0.775)	0.033 (0.733)	0.037 (0.711)	0.036 (0.712)
ROE	-0.022 (0.102)	-0.018 (0.176)	-0.020 (0.123)	-0.017 (0.204)	0.244 (0.126)	0.219 (0.165)	0.237 (0.141)	0.216 (0.175)
VOL	2.868 (0.331)		2.726 (0.352)		4.625 (0.220)		4.747 (0.210)	
ROASTD		-1.087 (0.309)		-1.047 (0.325)		2.631 (0.034)		2.614 (0.036)
Industry- and year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squares	0.280	0.316	0.290	0.323	0.078	0.088	0.083	0.091
Obs.	181	181	181	181	193	193	193	193

Note: The dependent variable is excess return. p-values are in the parentheses. D is a dummy variable that takes the value of one if the corresponding firm's sales growth rate is higher than the industry median and zero otherwise. The definitions of other variables are included in Appendix 1.

Panel B. The effects of excess to external capital on the relationship between NWC and risk

VOL	High COD	Low COD
NWC	0.003 (0.081)	0.002 (0.197)
CASH	0.004 (0.640)	0.005 (0.552)
LEV	0.010 (0.005)	0.002 (0.378)
LOG(SIZE)	-0.229 (0.000)	-0.289 (0.000)
CAPEX	-0.028 (0.021)	-0.017 (0.071)
GROWTH	0.008 (0.000)	0.005 (0.009)
MTB	0.097 (0.000)	0.017 (0.799)
TANG	0.012 (0.005)	0.004 (0.327)
Industry- and year fixed-effects	Yes	Yes
R-squares	0.481	0.565
Obs.	266	276

Note: The dependent variable is stock return volatility, a measure of firm risk. p-values are in the parentheses. The definitions of variables are included in Appendix 1.

In contrast, Bangladesh has a low number of days with payables outstanding (DPO) (the median of the DIO is 130.9 days while the median of the DPO is 15.5 days). Also, the Bangladeshi listed firms in the sample finance their assets using substantially heavier short-term borrowing than vendors' trade credit. The untabulated results show that the median short-term borrowing to total assets is 12.76 percent while the corresponding value for accounts payable to total assets is only 1.41 percent. The evidence suggests that the positive relationship between firm stock returns volatility is possibly due to heavy short-term borrowing. These results confirm that heavy investment in NWC involves financing and opportunity cost among Bangladeshi firms which increases firm risk.

Table 6 also indicates that firm risk decreases in larger firms but increases in firms that use more debt. The results regarding the impact of these variables are consistent with previous studies by Aktas et al. (2015) and Le (2019).

5.3. The Effects of Access to External Capital

Table 7 shows the effects of access to external capital on the relationship between WCM and firm performance. We use the cost of debt as a proxy for external capital access. We compute each firm's annual cost of debt and compare it with all firms' median cost of debt (COD) of that year. A high (low) COD indicates that the cost of debt of a firm is higher (lower) than the median cost of debt of all firms in that year. A high (low) COD also suggests that the firm has less (more) access to external capital[22].

Panel A shows that one percent decrease in excess NWC is associated with about 0.36 percent and 0.21 percent increase in excess returns for firms with lower access to external capital and those with higher access. The coefficient is significant at one percent level for the subsample of firms with lower access to capital and at five percent level for the subsample with higher access. These results indicate the association between NWC and firm's financing policy. The evidence also confirms that WCM is more important in firms with limited access to capital.

Panel B of Table 7 shows the results for the effects of a change in NWC on firm risk separately for firms with higher and lower capital access. An increase in the NWC level of firms with limited capital access is associated with a higher risk level. The coefficient is significant at the ten percent level (the coefficient = 0.00334 and p-value = 0.081) for the sub-sample of firms with low capital access but insignificant for the sub sample of firms with better access to external capital.

6. Conclusion

While several studies examine the impact of NWC on firm profitability, very few look at how NWC affects firm profitability and risk. This paper examines the impact of NWC on both excess stock returns and firm risk using all the available data on Bangladeshi listed companies from 2001 to 2016. The paper further examines how sales growth and firm access to external capital affect the relationship between NWC and

[22] There of course is some substitution across debt financing (essentially) bank debt in Bangladesh and trade credit. Several studies report this substitution effect (Meltzer (1960); Blasio (2005) and others). Other theories suggest the role of precautionary balances and the need to be able to conduct transactions Ferris (1981) and corporate financial flexibility (Yung, Li, & Jian, 2015). We do not have data to explore this in more detail at the moment.

returns and risk. These listed firms carry a high level of net working capital relative to sales (on average, firms need to invest $US0.45 in net working capital for each dollar of sales revenue).

The findings show that excess stock returns rise as firms lower their NWC while firm risk decreases. Aktas et al. (2015) and Le (2019) discovered a negative relationship between NWC levels and firm risk in US and Vietnamese firms. This paper finds a positive relationship. Bangladesh is different. Bangladeshi firms invest more heavily in NWC for every dollar of sales than US and Vietnamese firms which may account for this difference or it may be because they desire more flexibility to deal with unexpected events Yung et al. (2015).

Further, the same dollar decrease in NWC is associated with higher dollar increases in the value of firms with relatively low sales growth rates compared to firms with relatively high sales growth rates. Also, since Bangladeshi listed firms more frequently use short-term borrowing rather than trade credit from vendors, their firm value increases as they increase their trade credit from suppliers. However, their firm value declines as they grant more credit to customers.

Access to external capital is critical for firms in developing markets. There is a high association between WCM and the financing policies of the firms in Bangladesh. Reductions in the level of NWC are associated with increased firm performance (higher returns and lower risk). These results are more obvious for firms with limited access to external capital. The findings of this paper would be helpful to firm managers and investors. The average NWC reported by Bangladeshi firms is greater than the Vietnamese average. To improve their firm's stock performance, managers could strive to increase their firms' trade credit from suppliers while limiting the credit they grant to clients. There is already some trade credit use in Bangladesh. They may far better by reducing cost of capital, improving FRQ and corporate governance all of which will add to stock price liquidity. Global investors who may benefit from this paper are those who are interested in exploring how a country's unique institutional setting and capital market moderate the relationship between NWC and firm value. This paper further contributes to the literature in that it documents a positive relationship between NWC and firm risk and confirms that for firms with higher sales growth, excess stock returns are less sensitive to changes in NWC. In future research, we intend to develop composite measures for FRQ, corporate governance, price transparency and liquidity risks of NCW in Bangladesh. We will then do a direct test of these measure on firm capital costs and on profitability. We hypothesize a negative (positive) relation between these composite measures on firm value, profitability and firm capital costs. At the moment, we do not have the data to test these conjectures, but they are open unsolved important questions to be answered.

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Appendix 1. Variable definitions.

AP	**(Accounts payable/ total book assets at year-end)** x **100.**
AR	(Accounts Receivable/total book assets at year-end) x 100
CAPEX	(Total amount spent for purchasing capital assets/total book assets at year-end) x 100
CASH	(Total cash at year end/ total book assets at year-end) x 100
CFOSALES	(Net operating cash flows/ sales) x 100
COD	cos = interest expense/total debt
EXCESSNWC	The difference between NWC of a firm and its industry median NWC in that year
EXCESSRETURN	The difference between annual buy-and-hold return of a firm and its industry median annual buy-and-hold return in that year
GROWTH	Growth rate of sales revenue = (Current year sales-previous year sales/previous year sales) x 100
LEV	Leverage = (Debt/Total book assets) x 100
MTB	Market-to-Book ratio= Market value/Book value per share
NWC	[(Trade receivable + inventories – accounts payable)/sales] x 100.
ROASTD	3 year -standard deviation of return on assets
ROE	Return on equity = (net income/total shareholder equity) x 100
SALES	Total revenue of a year
SIZE	Firm size, equal total book assets
TANG	(PP&E/total book assets at year-end) x 100
VOL	Stock return volatility= Standard deviation of monthly stock return

Note: AP measures accounts payable scaled by total assets. AR measures accounts receivable scaled by total assets. CASH measures the cash holding scaled by total assets. CFOSALES is the ratio between net operating cash flows and total sales revenue. COD is the cost of debt, the ratio between total interest expense of the year and total debt at year end. EXCESSNWC is the difference between net working capital (NWC) of a firm and its industry median NWC. EXCESSRETURN is the difference between buy-and-hold return of a stock and its industry median corresponding value. GROWTH measures the growth rate of sales revenue. LEV is the leverage, measured as the ratio of debt by total assets at year end. MTB is market-to-book ratio. NWC is net working capital. ROASTD is the 3-year standard deviation of return on assets. ROE, return on equity, is the ratio of net income scaled by total equity at year end. SALES is total sales revenue of the year. SIZE measures the firm size, equal total assets at year end. TANG measures tangible assets of the firm. VOL is standard deviation of monthly common stock return, a measure of firm risk.