WORKING CAPITAL LEVEL INFLUENCE ON SME PROFITABILITY

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Abstract

This paper aims to report the results of an investigation of the relationship between working capital level, measured by the cash conversion cycle and profitability of Small and Medium Enterprises (SMEs). The paper employs panel data regression analysis on a sample of 160 Alternative Investment Market (AIM) listed SMEs for the period from 2005 to 2010. The empirical results show that there is a concave relationship between working capital level and firm profitability and that there is an optimal working capital level at which firms' profitability is maximised. Furthermore, an examination as to whether or not deviations from the optimal working capital level reduce firm profitability indicate that deviations above or below the optimum decrease profitability. The sample is limited to AIM listed SMEs, and therefore the findings cannot be generalised to all firms. Overall, the evidence suggests that firms should strive and attain the optimal working capital level in order to maximise their profitability. The results are of importance to both SMEs and policy makers providing insight into the nature of cash conversion cycle and its relationship to SMEs profitability.

Keywords – Working capital level, cash conversion cycle, profitability, small and medium enterprises, Alternative Investment Market.

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1. Introduction

Most researchers have come to the conclusion that working capital is the lifeblood of any firm (Padachi, 2006). Smith (1980) suggests that working capital management (WCM) is important because it affects firm's profitability and risk. However, there is a massive debate in the existing literature as to whether high or low levels of working capital are best for firms. In this study, cash conversion cycle (CCC) is used as a measure of working capital level, which has been used in previous studies (Soenen, 1993; Deloof, 2003; Garcia-Teruel and Martinez-Solano, 2007; Banos-Caballero et al., 2010; Banos-Caballero et al., 2012; Tauringana and Afrifa, 2013) and also given the criticism of static measures such as current ratio and quick ratio (Emery, 1984; Soenen, 1993). The extant literature assumes a linear relationship exists between WCM and firm profitability.

One notable exception from the extant research is the study by Banos-Caballero et al. (2012) in Spain that has investigated the possibility of a non-linear relationship between WCM and firm profitability. They argue that even though the general consensus is that low investment in working capital is associated with a higher return, it may result in loss of sales and interruptions in the production process therefore leading to lower profitability. However, this present study differs in the sense that the sample size consists of small and medium enterprises (SMEs) that are listed on the stock exchange in the United Kingdom (UK). It is interesting to know how the working capital level influences the profitability of SMEs in the UK, given that the UK operates a well-developed financial market and banking system (Martinez-Sola et al., 2013). A research by Demirguc-Kunt and Maksimovic (2002) shows that firms in such countries will extend more trade credit to their customers. Also, the definition of SME in the UK is different from those in other countries (Storey, 1994), such as Spain where Banos-Caballero et al. (2012) conducted their research. Whilst Spain uses the definition established by the European Commission recommendation 96/280/CE of 3rd April 1996, the UK uses the definition of the UK Companies Act 2006, section 382 and 465 for SMEs (see Appendix 1).

Secondly, three different measures of firms' profitability are employed in order to ascertain the robustness of the results. Researchers such as Garcia-Teruel and Martinez-Solano (2007), Deloof (2003) and Padachi (2006) all found a negative relationship between CCC and profitability. On the other hand, Samiloglu and Demirgunes (2008) and Gill et al. (2010) and Nobanee (2009) found a positive relationship between CCC and profitability.

Both high and low levels of WCM have benefits and costs to firms (Deloof, 2003; Banos-Caballero et al., 2012; Tauringana and Afrifa, 2013), meaning an optimal working capital level may exist at which the profitability of the firm is maximised (Banos-Caballero et al., 2012). High levels of working capital may improve profitability because it can stimulate sales (Banos-Caballero et al., 2010), prevent production interruptions (Tauringana and Afrifa, 2013), strengthen long-term relationships with customers (Ng et al., 1999), and influence the acquisition of merchandise at times of low demand (Emery, 1987). On the other hand, minimising the investment in working capital may result in higher profitability (Deloof, 2003; Banos-Caballero et al., 2014) because of lack of finance in general and the expensive nature of external finance in particular (Banos-Caballero et al., 2014). Autukaite and Molay (2011) argue that effective WCM leads to a reduction in a firm's risk, which attracts cheaper financing from both shareholders and lenders. Ganesan (2007) asserts that reducing the requirement in working capital reduces the need for financing and cost of capital, so increasing the cash available to shareholders. Based on these two contrasting effects of working capital level on firm profitability, it can therefore be argued that the relationship between WCM and firm profitability may be concave instead of linear as previously suggested (see, Jose et al., 1996; Shin and Soenen, 1998; Garcia-Teruel and Martinez-Solano, 2007) and therefore might be better examined by use of a quadratic relationship.

The results obtained confirm the hypothesis which suggests a concave relationship between working capital level and Alternative Investment Market (AIM) listed SME profitability.

This means that profitability increases as working capital level rises but then starts to decline if it rises beyond a certain level.

WCM is important to firms because it involves a trade-off between risk and profitability (Smith, 1980; Tauringana and Afrifa, 2013). However, studies show that WCM is more important to SMEs than to larger firms (Banos-Caballero et al., 2010). In the UK, Hughes (1997) studied the financial structure of large and SME businesses and found that SMEs tend to rely more on short-term debts as compared with large firms. McCosker (2000) argues that although WCM problems can be experienced by businesses of any size, it is usually SMEs that have most problems. The importance of WCM to SMEs stems from their lack of access to external finance (Whited, 1992; Fazzari and Petersen, 1993) and heavy reliance on working capital as a source of finance (Padachi, 2006). Also, SMEs have high liquidity as compared with large firms (Tauringana and Afrifa, 2013), which makes WCM very important in relation to their profitability. According to Padachi (2006) and Vanhorne and Wachowicz (2001), SMEs' current assets and liabilities represent a higher percentage of total assets and liabilities than in larger firms. For example, a study by Garcia-Teruel and Martinez-Solano (2007) found that the current assets of Spanish SMEs represent 69% of their total assets, and their current liabilities more than 52% of their total liabilities.

This study seeks to make a number of contributions to the extant WCM literature on SMEs. First, it tests if firms have an optimal working capital level at which their profitability gets maximised by considering a nonlinear (concave) association between working capital level and firm profitability. If a concave association exists, deviations from the maximum point will reduce firm profitability. Thus, does firms' profitability decrease if the level of working capital moves away from the optimum point? In order to answer this question, this study follows similar procedure of Tong (2008) and Martinez-Sola et al. (2013) by including the residuals of the optimum working capital level regression.

Second, the paper reports the results of WCM effect on SME profitability. The available literature on WCM effect on firm profitability almost exclusively focuses on larger firms, with limited empirical evidence on SMEs. The few notable previous studies that have focused on SMEs includes (Garcia-Teruel and Martinez-Solano, 2007; Afeef, 2011; Stephen and Elvis, 2011; Banos-Caballero et al., 2010; Banos-Caballero et al., 2012; Tauringana and Afrifa, 2013). The reason for the lack of literature on this subject stems from the fact that data on SMEs are difficult to find. SMEs are reluctant to give out information for fear that it will be disclosed to and used by their competitors (Afrifa, 2013). This study empirically shows that an optimal level of working capital exists at which firms profitability is maximised, for a sample of 160 AIM listed SMEs during 2005 and 2010, and that deviations from the optimum level reduce firm profitability. The use of three different proxies for firm profitability (Return on Assets (ROA), Return on Capital Employed (ROCE) and Return on Equity (ROE)) shows the robustness of the results.

Third, models were estimated by using panel-data methodology. Panel data allow for the control of individual heterogeneity (Hsiao, 2003). This can be achieved by using either one- or two-way analysis to control for the individual and time invariant variables, but not by a time-series or cross-section study alone. Panel data are also more informative, and give greater variability, freedom and efficiency (Baltagi, 2005). Also, by combining time-series and cross-section observations, panel data can significantly increase the number of observations. According to Wooldridge (2002), panel data can be used to obtain consistent estimators in the presence of omitted variables.

The rest of the paper is structured as follows. The next section examines the literature review and development of hypotheses. The study data and research methodology are then discussed. The next section evaluates the empirical results. The last but one section discusses the robustness of the results, and the final section gives the summary and conclusion.

2. Literature review and development of hypotheses

Many researchers have examined the relationship between WCM and firm profitability (Jose et al., 1996; Shin and Soenen, 1998; Padachi, 2006; Garcia-Teruel and Martinez-Solano, 2007; Banos-Caballero et al., 2010; Afeef, 2011; Stephen and Elvis, 2011; Banos-Caballero et al., 2012; Tauringana and Afrifa, 2013). CCC is used here as the measure of WCM (Richard and Laughlin, 1980). It measures the time lag between expenditure for the purchase of raw materials and the collection of sales of finished goods. Soenen (1993) asserts that the length of the CCC determines the degree to which the firm must rely on external financing. However, the nature of the relationship between working capital level and firm profitability depends on the particular WCM strategy chosen by a firm (Garcia-Teruel and Martinez-Solano, 2007; Afrifa, 2013; Tauringana and Afrifa, 2013); firms can pursue a conservative or aggressive WCM strategy (Nazir and Afza, 2009). As argued by Banos-Caballero et al. (2012), the particular WCM chosen by a firm may significantly impact on both risk and profitability.

A conservative strategy may lead to higher investment in working capital. This strategy is aimed at stimulating sales by increasing both inventories and trade receivables in order to increase profitability (Tauringana and Afrifa, 2013). An increase in inventories may prevent production disruptions (Garcia-Teruel and Martinez-Solano, 2007), reduce the risk of running out of inventory (Deloof, 2003), and reduce supply costs and price fluctuations (Blinder and Maccini, 1991). Also, an increase in trade receivables can increase sales because it allows customers time to pay (Long et al., 1993; Deloof and Jegers, 1996). A conservative strategy may also improve firm profitability because it reduces the information asymmetry between buyer and seller by increasing the trade credit level (Smith, 1987). Allowing more trade credit through the conservative strategy can increase profitability because it can serve as a product differentiation strategy (Shipley and Davis, 1991; Deloof and Jegers, 1996; Nadiri, 1969; Blazenko and Vandezande, 2003). Increasing trade credit level may strengthen supplier/customer long-term relationship (Wilner, 2000). It can serve as effective price cut (Brennan et al., 1988); it can help to

reduce transaction costs (Ferris, 1981; Emery, 1987); to entice customers to acquire merchandise at times of low demand (Emery, 1987). However, increasing investment in working capital may result in the opportunity cost of cash being tied up in stock and accounts receivable, which could reduce the profitability of the firm (Deloof, 2003). Soenen (1993) suggests that high investments in working capital could lead to bankruptcy of firms.

Gill et al. (2010) made use of a sample of 88 American manufacturing firms listed on the New York Stock Exchange for the period of 3 years from 2005 to 2007 to accentuate the relationship between WCM and profitability and recorded a positive coefficient of CCC; therefore arguing that the higher the CCC, the higher the profitability of the firm. The association between CCC and profitability was found to be positive and significant by researchers including Samiloglu and Demirgunes (2008) and Nobanee (2009), which supports the conservative strategy of WCM.

A firm can also adopt an aggressive strategy of WCM by reducing investment in both the inventory and accounts receivable (Afrifa, 2013). Minimising inventory holding period through the aggressive strategy will lead to enhanced firm profitability due to a reduction in inventory holding costs such as warehouse storage cost, insurance, spoilage, theft etc. (Kim and Chung, 1990). An aggressive strategy may also lead to higher firm profitability by reducing accounts receivable period, which will increase the cash flow available to the firm. Such funds may be used to finance the day-to-day operations, therefore avoiding the need to source for expensive external finance (Autukaite and Molay, 2011). Moreover, such funds can be left in the bank to earn interest or be invested elsewhere to generate more profit. An aggressive strategy of WCM may also increase profitability by delaying payment to suppliers. As argued by Falope and Ajilore (2009), delaying payments to suppliers, will lead to higher level of working capital available to use. However, Ng et al. (1999) argue that delaying payments to suppliers may reduce profitability because of the loss of discounts for early payment, which can exceed 20%, depending on the discount rate and discount period granted.

Nobanee and Alhajjar (2009) examined a panel data of 2,123 Japanese non-financial firms listed on the Tokyo Stock Exchange for the period from 1990 to 2004 and found a negative relationship between profitability and CCC; concluding that managers could increase profitability by shortening the CCC. Lazaridis and Tryfonidis (2006) employed a sample of 131 firms listed on the Athens Stock Exchange (ASE) for the period from 2001 to 2004 and postulated a negative relationship between CCC and profitability. They therefore concluded that a decrease in the CCC would generate more profits for a firm. Researchers such as Garcia-Teruel and Martinez-Solano (2007), Deloof (2003) and Padachi (2006) also found a negative association between CCC and firm profitability, consistent with the aggressive strategy of WCM.

The arguments for and against these two WCM strategies are evident from the mixed extant empirical literature. According to Modigliani and Miller (1958), investment decisions are independent of financing decisions in perfect markets. However, since firms do not operate in a perfect market means that financial decisions will affect their profitability (Banos-Caballero et al., 2014). Firms obtain external funds at a cost and as argued by Banos-Caballero et al. (2010), internal and external finance are not perfect substitutes in practice. Nevertheless, accessing external financing can help a firm fulfil its investment opportunities. Investment decisions are dependent on financing decisions; hence a lower or higher working capital will have associated costs and benefits. Therefore, a non-linear (concave) technique is used to test for the costs and benefits trade-off between the two WCM strategies. This study estimates the optimal working capital level as the equilibrium between the costs and benefits of working capital. The conservative strategy suggests that maintaining higher working capital is beneficial for firms. In contrast, the aggressive strategy postulates that lower working capital improves firm profitability. Thus, this study investigates two different effects of working capital on firm profitability. Therefore, at lower levels of working capital, the conservative strategy will predominate, and so an increase in working capital level is the sign to increases in firm profitability. On the other hand, at higher levels of working capital, the aggressive strategy will predominate, and so an

increase in working capital is the indication of reduction in firm profitability. Thus, a nonlinear (concave) association is likely to exist between working capital level and firm profitability. Based on the extant empirical evidence on the relationship between WCM and firm profitability, the following hypotheses are tested by this study:

H_1 there is a concave relationship between working capital and firm profitability

H_2 deviation from the optimal working capital level reduces firm profitability

3. Sample, Data And Methodology

3.1 Sample selection and data

The target population of this study was all the firms listed on the AIM. As at 8th of March 2011, 1,316 firms were listed on the AIM. Financial firms (such as banks and insurance firms) were excluded because they have different accounting requirements and asset structure; this left 1,124 firms available for selection. The decision to exclude all financial institutions is consistent with Deloof (2003) and Tauringana and Afrifa (2013). Two criteria were then used to justify the inclusion of a firm into the sample. First, all firms that met the definition of SMEs as defined by the UK Companies Act 2006 (sections 382 and 465) were selected, which left 250 firms representing 19% of the whole AIM population. Second, firms were included in the sample if they had data available for all the six years under investigation from 1 January 2005 to 31 December 2010 inclusive, and this gives 160 firms in the final sample, representing 64% of all non-financial SMEs listed on the AIM. This gives 960 firm-year observations. In order to get enough firms per sector for analysis purposes and also due to the large number of sectors to which the final sample of SMEs belong, this research follows the path of Gray et al. (1995) and Afrifa (2013) by amalgamating similar sectors. This action is justified by the fact that most sectors are closely related and have similar characteristics.

The criteria were set for two reasons, including to allow for comparability with similar studies and to permit the use of balanced panel data, which has the advantage of more degrees of

freedom and less multicollinearity among variables (Gujarati, 2003). The financial and accounting data used in this study were obtained from Analyse Major Databases from European Sources (AMADEUS). This database contains both annual accounts and management details of about 330,000 public and private firms in 41 European countries, including the UK. The reliability of AMADEUS data is evident from its extensive use by other researchers (see Garcıa-Teruel and Martınez-Solano, 2007). The sample was collected from the AIM because it is one of the few stock exchanges around the world established specifically for SMEs (Mendoza, 2007), and is by far the most successful second-tier market (Colombelli, 2010). ROA is used as the main profitability measure because it is an indicator of the performance of management with regard to the given resources, and because it can remove size effects, therefore allowing for inter-industry comparison (Lev and Sunder, 1979).

3.2 Variables

The dependent variable to be analysed is ROA which has been used extensively in the extant literature to measure firm profitability (Martinez-Sola et al., 2013; Tauringana and Afrifa, 2013). Two additional proxies for firm profitability are also included to test the robustness of the results, namely: ROCE and ROE. The key independent variable is CCC (see, Garcia-Teruel and Martinez-Solano, 2007; Banos-Caballero et al., 2012; Afrifa, 2013) and its square CCC^2. The inclusion of these two variables serves to test the costs and benefits effect associated with high and low working capital level and therefore the existence of a nonlinear relationship.

The following control variables are included in all regressions because they have been found by previous literature to explain firm profitability (see, Samiloglu and Demirgunes, 2008; Mathuva, 2010; Mohamad and Saad, 2010). These include: firm age (COAGE), firm size (COSIZE), asset tangibility (ATAN), financial leverage ratio (LEV), liquidity ratio (LIQ), short-term financing (SFIN) and industry classification (INDUST). All variables are defined in Table 1 below. We expect COAGE to be positively related to profitability because older firms have

established contacts with customers, and easier access to resources (Coad et al., 2010). COSIZE is expected to negatively relate to firm profitability because smaller firms are more able to adapt to the ever-changing business environments (Yang and Chen, 2009). We predict a negative relation between ATAN and firm profitability because firms need higher proportion of intangible assets such as human capital in order to use the resources with maximum effectiveness (Harris and Robinson 2001). LEV is expected to negatively relate to firm profitability because of the agency cost of debt (Jensen and Meckling, 1976). We expect a negative association between LIQ and firm profitability because the availability of liquidity may be an indication that a firm is forgoing the benefits of investing in profitable opportunities (Hvide and Moen, 2007; Ng and Baek, 2007). The association between SFIN and firm profitability is expected to be negative because SFIN is usually for one year or less which means that firms may have to go through the tedious and costly process of renegotiation at the expiry of the credit period (Afrifa, 2013). A negative relationship between SFIN and profitability was found by Chittenden et al. (1996) and Caesar and Holmes (2003).

[Table 1 about here]

3.3 Methodology

Preliminary data analysis was conducted to test for the presence of outliers due to the wide variation in the sample firms. There are two ways to deal with outliers, including winsorisation or data removal (Beiner, et al., 2006). The method applied in this study was to winsorise the data with outliers at the 5% and 95% levels by replacing the extreme observations with the nearest non-outlier observation (Hellerstein, 2008). The decision not to completely eliminate the outlier observations stems from the fact that balanced panel data is employed for this research. The decision to winsorise the affected data is in line with similar procedures by previous researchers in accounting and finance literature, including Kieschnick et al. (2006), Hill et al. (2010).

In addition to the misspecification checks carried out using outlier-observation tests, other tests were employed. Specifically, heteroscedasticity and serial correlation are tested. The Breusch-Pagan and Breusch-Godfrey tests, and the Woodridge test for autocorrelation, were used to test for - and suggested the presence of - heteroscedasticity and serial correlation. For this reason, a decision was made to employ robust standard error (Lei, 2006) in estimating all models.

Since panel-data regression was used, the Hausman test was performed, to decide whether to use the Fixed Effects (FE) or Random Effect (RE) model by first determining whether there was a correlation between the unobservable heterogeneity (μ_i) of each firm and the explanatory variables of the model. This test accepted the null hypothesis that the unobserved heterogeneity was uncorrelated with the regressors in all models. This finding means that the RE is not significantly different from the FE, and therefore the former is the more consistent and efficient method to use. The estimates of the models are as follows:

$$\mathrm{PROF}_{it} = \beta_0 + \beta_1(\mathrm{CCC}) + \beta_2(\mathrm{CCC}^2) + \sum_{K-1}^{7} \beta_2 \mathrm{CONTROLS}_{it} + \mu_i + \varepsilon_{it} \quad \textbf{(1)}$$

$$\begin{aligned}\mathrm{CCC}_{it} &= \beta_0 + \beta_1(\mathrm{COSIZE}_{it}) + \beta_2(\mathrm{ATAN}_{it}) + \beta_3(\mathrm{LEV}_{it}) \\ &+ \beta_4(\mathrm{CFLOW}_{it}) + \beta_5(\mathrm{INDUST}_{it}) + \mu_i + \varepsilon_{it}\end{aligned} \quad \textbf{(2)}$$

$$\mathrm{PROF}_{it} = \beta_0 + \beta_1(\mathrm{DEVIATION}\ ) + \sum_{K-1}^{7} \beta_2 \mathrm{CONTROLS}_{it} + \mu_i + \varepsilon_{it} \quad \textbf{(3)}$$

$$\mathrm{PROF}_{it} = \beta_0 + \beta_1(\mathrm{DEVIATION}) + \beta_2(\mathrm{INTERACT}) + \sum_{K-1}^{7} \beta_3 \mathrm{CONTROLS}_{it} + \mu_i + \varepsilon_{it} \quad \textbf{(4)}$$

We define all variables in Table 1 above. PROF is the firm profitability (ROA, ROCE and ROE) and the independent variable is CCC, which measures working capital level by firm i at time t. The subscript i denotes the n^{th} firm (i = 1,...160), and the subscript t denotes the n^{th} year (t=1,...6). μ_i is the unobservable heterogeneity (individual effects), which is specific for each firm, and ε_{it} is the error term. These four models will assist in achieving the objective of this paper. First, equation 1 will determine whether a concave relationship exists. The second and

third equations will indicate whether a deviation from the optimal working capital point affect profitability. Lastly, the fourth equation will establish the effect of above and below deviations from the optimal working capital level relationship with firm profitability.

4. Empirical evidence

4.1 Descriptive statistics

Table 2 presents the descriptive statistics of the dependent and independent variables. ROA is on average –13.96%, while the median is –3.35%. The ROCE has a mean of –20.67% and a median of 0%. ROE is on average –31.85% with a median of –1.38%. Important differences exist between the different measures of firm profitability, which justifies why they have been included. The CCC has a mean of 62.41 days, which indicates that AIM listed SMEs are slow both in converting inventory into sales and collecting monies owed by customers but pay their suppliers faster. In other words, it takes more than two months between the outlay and receipt of cash. Similar average CCC days of 69.35 was reported by Mathuva (2010).

The descriptive statistics of the control variables indicate an average firm age of 13.35. The average firm size is £4,412,254, which suggests that the majority of the firms are medium-sized firms. According to the UK Companies Act 2006 section 382, a firm is classified as medium-sized if the total asset in a particular year is more than £3.26m but less than £12.9m. The average ATAN is 36.89% with a median of 35%. The average LEV is 22.18%, with a median of 1.49%. The average ratio of LIQ in the sample is 2.37:1; SFIN has a mean of 41.35%, which is common in SMEs (Stephen and Elvis, 2011).

[Table 2 about here]

4.2 Correlation analysis

The results of the Pearson correlation coefficients are presented in Table 3 for all continuous variables included, to assess the association between CCC and profitability. The correlation

results indicate a significant and negative correlation between CCC and all the three measures of profitability (ROA, ROCE and ROE). The correlation between CCC and ROA is –0.125, significant at the 1% level. The coefficient of the correlation between CCC and ROCE is –0.115, significant at the 1% level. CCC and ROE has correlation coefficient of –0.104 and significant at the 1% level. ROA is positive and significantly correlated with COAGE and COSIZE at the 1% level, whilst negatively correlated with LIQ at the 1% level of significance. CCC has a positively significant correlation with COAGE, COSIZE and LIQ at the 10%, 5% and 1% respectively. However, there are negative correlations between CCC and both ATAN and SFIN at the 5% and 1% respectively. The correlations among the remainder of the independent variables suggest that multicollinearity is not a problem in the multiple regression analyses since the coefficient values are low. Field (2005) suggests that multicollinearity becomes a problem only when the correlation coefficient exceeds 0.80. The results in Table 3 show that none of the correlations between independent variables exceeds this threshold value. However, according to Myers (1990), a certain degree of multicollinearity can still exist even when none of the correlation coefficients are very large. Therefore, the variance inflation factors (VIFs) were examined in all models to further test for multicollinearity and all were well below the threshold value of 10 suggested by Field (2005) indicating that multicollinearity does not pose a problem in the regressions.

[Table 3 about here]

4.3 Working capital and firm profitability

The optimum level of working capital is determined by estimating Model 1, where the firm profitability in *i* at time *t* depends on CCC and its square (CCC^2). The two variables are included in order to test for the conservative strategy and aggressive strategy, as well as to determine the optimal breakpoint of profitability-working capital relationship. In order to

confirm the hypothesis stated above, β_1 and $\beta 2$ must be positive and negative respectively. As specified above, the study also includes seven control variables.

Table 4 provides the results from the estimation of Model 1, using three different proxies for firm profitability. The R^2 ranges from 8.8 percent to 13.9 percent. Despite the low values of R^2 (which is comparable to similar studies such as Tauringana and Afrifa, 2013), the higher t-values show significant relationship between variables. In the first column, the calculation of firm profitability is ROA. In the second and third columns, ROCE and ROE are used as alternative measures of firm profitability respectively. Consistent with expectation, CCC is positive and statistically significant at the 5% in column 1 and 1% in columns 2 and 3. However, CCC^2 is negative and significant at the 1% level for the three measures of firm profitability. This means that working capital increases the profitability of AIM listed SMEs up to the breakpoint, after which, increases in the working capital reduces profitability. The significance of the results for all three measures of profitability demonstrates the robustness of the findings in relation to the nonlinear relationship between working capital and firm profitability.

For the control variables, COAGE is positively related to ROA at the 1% level of significance, which indicates that the longer an AIM listed SME is in existence the higher the ROA. This is justified on the premise that older companies are more experienced because they have enjoyed the benefit of learning and therefore can enhance ROA (Stinchcombe, 1965). As for firm size, like Enqvista et al. (2014), we report a negative but insignificant coefficient of COSIZE and ROA. The coefficient of ATAN is negative and significant at the 5% level in column 1, consistent with Onaolapo and Kajola (2010). Corrado et al. (2009) have argued that products and services are becoming more knowledge intensive, which means that the amount of intangible assets in the form of human capital and R&D will maximise profitability. LEV is negative but insignificantly related with ROA, similar to the results by (Afrifa, 2013). The coefficient of LIQ is negative and significant in column 1, indicating that the presence of debt increases the agency cost for firms (Ebaid, 2009). SFIN has a significantly negative coefficient

with ROA, which is consistent with the research by Tauringana and Afrifa (2013). This shows that firms that lower liquidity enhances ROA (Afrifa, 2013).

[Table 4 about here]

4.4 Deviation from the optimal working capital level

As a concave relationship exists between firm working capital level and profitabiilty because of the two opposing effects of CCC and CCC^2, an attempt is made to determine if a deviation from the optimal working capital point will affect profitability. This section provides evidence to support the notion that firm profitability declines if firms move away from the optimum working capital point. Therefore, this section analyses the relation between deviations from optimal woking capital level and firm profitability. A nonlinear woking capital-profitability relationship exists in Model 1, indicating that an optimal point which maximises firm profitability exists and that deviations from this optimal woking capital level may probably reduce firm profitability. To be able to determine the effect of a diviation from the optimal woking capital level, the variable CCC and CCC^2 are eliminated and replaced by the residuals estimated in the benchmark specification for antecedents of CCC as explanatory variable. This is similar to that performed by Martinez-Sola et al. (2013).

In order to do this the study considers equation 2 above as the benchmark specification for antecedents of CCC, similar to those used by previous studies on antecedents of CCC (Banos-Caballero et al., 2010). The result from estimating Model 2 is contained in Appendix 2.

Now, the residuals from Model 2 are obtained and included in Model 1 after eliminating CCC and CCC^2. Therefore, *DEVIATION* is the absolute value for the residuals. The objective is to determine if deviations from the optimal working capital level influence firms' profitability, using estimation of Model 3. *DEVIATION* is the main independent variable in this model, defined as the absolute value of residuals of Equation 2. It is expected that $\beta_1 < 0$ in Model 3, to

imply a negative relationship between deviations from optimal working capital level and firm profitability.

Table 5 contains panel data regression results to explain whether deviations from the optimal working capital level affect all three measures of firm profitability (Model 3). As expected, the coefficient of *DEVIATION* is negative and significant at the 5% level in Column 1 and 10% level in columns 2 and 3. This indicates an inverse relationship between *DEVIATION* and firm profitability. These results confirm the existence of a point at which working capital level maximises firm profitability and that as firms move away from this point their profitability reduces. However, Model 3 does not determine whether these deviations are positive or negative.

[Table 5 about here]

To determine whether these deviations are positive or negative an interactive term is included in Model 4 in order to analyse the way in which both above and below deviations from the optimal working capital level affect firm profitability. The variable *INTERACT* is defined as above-optimal**DEVIATION*. The above-optimal is a dummy variable that takes 1 for positive residuals and 0 otherwise. Therefore, we use estimation Model 4 above. *DEVIATION* is the main independent variable to be analysed.

The main purpose is to determine how *DEVIATION* (coefficient β_1) and *DEVIATION* + *INTERACT* (coefficient $\beta_1 + \beta_2$) affect firm profitability. Hence, the expectation is $\beta_1 < 0$ and $\beta_1 + \beta_2 < 0$. The results from Table 6 imply a negative effect of both above-optimal and below-optimal deviations on firm profitability. If the residuals are positive, above-optimal variable takes the value 1, and $\beta_1 + \beta_2$ account for the effect on firm profitability. Otherwise, if residuals are negative, below-optimal variable takes the value 0, which means that *INTERACT* is 0 and β_1 account for the effect. According to Table 5, *DEVIATION* is negative and statistically significant in all three Columns. On the other hand, *INTERACT* is positively related to firm profitability in all three columns. Here, the interest is the sum of the coefficients $\beta_1 + \beta_2$, all of

which give negative results as predicted. For example, in Column 1 the figures for $\beta_1 + \beta_2$ are (–0.290 + 0.171 = –0.119). These results support H_2, that deviation on either side of the optimal working capital level reduce firm profitability.

[Table 6 about here]

The results are consistent using all three alternative measures of firm profitability. Therefore, a quadratic relationship between working capital level and firm profitability is established. The findings also show that any deviations from the optimal working capital level, either above or below will significantly reduce firm profitability.

5. Robustness test

Both the firms and variables used in this study could be affected by the financial crisis that started as a sub-prime crisis in 2007 but unfolded into the Great Recession in 2009. Also, the working capital level influence on profitability may differ based on whether a firm is making a profit or loss (Banos-Caballero et al., 2010; Manoori and Muhammad, 2012). Therefore, to check the robustness of the results, we first divide the sample into pre-recession (2005-2007) and during the recession (2008-2010). Second, we divide the sample into two based on whether a firm makes a profit or loss in any particular year. The results obtained are not significantly different from the results of running the regression for the whole sample.

The objective of this final analysis is to determine whether the association between working capital level and profitability exhibit a concave relationship for unprofitable or profitable observations and pre- recession or during recession periods. The first two columns of Table 7 contain the results from the estimates of Model 1 for pre-recession observations (2005-2007) and during recession observations (2008-2010). The adjusted R^2 under the pre-recession is 0.1068 and for the recession period is 0.1138. The coefficient of CCC is positive and significant under both pre- and during recession periods at the 10 and 5 percent respectively. However, the CCC^2 is negative and significant at the 5 percent under both pre- and during recession periods. The last

two columns of Table 7 contain the results of running Model 1 for both unprofitable and profitable observations. The R^2 of observations with loss is 0.2619; whiles the R^2 of observations with profit is 0.2835. The results show that the coefficient of CCC is positive and statistically significant under both unprofitable and profitability firms at the 1 and 5 percent level respectively. On the contrary, the coefficient of CCC^2 is negative and significant at the 1 percent level under both unprofitable and profitable firms. These results indicate the robustness of the results obtained above and confirms that the concave relationship between working capital level and profitability is not sensitive to the profitability level of firms or the prevailing economic conditions.

6. Conclusion

The objective of the study was to investigate the relationship between working capital level and firm profitability. The study was based on a panel data regression analysis of 160 SMEs over a six year period (2005 to 2010). First, the study empirically tests for the existence of an optimal working capital level at which firms' profitability is maximised. Second, the paper examines whether deviations from the optimal working capital level reduce firm profitability. The extant research that has investigated the relationship between WCM and firm profitability has mostly assumed a linear association (Jose et al., 1996; Deloof, 2003), with the exception of Banos-Caballero et al., 2012).

WCM is important to firms (Smith, 1980; Padachi, 2006). The conservative strategy suggests higher firm profitability as a result of higher working capital level. Investment in working capital may stimulate sales (Deloof, 2003), may avert production and trading interruptions (Garcia-Teruel and Martinez-Solano, 2007), and reduce the risk of stock out (Tauringana and Afrifa, 2013). However, according to the aggressive strategy, investment in working capital is associated with warehouse storage cost, insurance, lighting and heating, theft and obsolescence and therefore reducing investment in working capital may maximise profitability. These two arguments result in directly opposite expectations concerning the effect

of working capital level on firm profitability. The paper therefore considers the two effects and establishes a concave relationship between WCM and firm profitability. The results show that an optimum working capital level exist which results from comparing the benefits and costs of working capital levels (Banos-Caballero et al., 2012). The results confirm the existence of working capital level which maximises firm profitability. Deviations from the optimal level reduce firm profitability; hence, WCM is an important element for firms.

This paper has contributed to knowledge on how WCM affect firm profitability. Whilst researchers such as (Deloof 2003; Padachi 2006; Garcia-Teruel and Martinez-Solano 2007) highlight the impact of WCM on firm profitability, this study extends the stream of knowledge by indicating how a deviation from the optimal point influences UK listed SMEs profitability. Moreover, compared with previous literature on WCM (Jose et al., 1996; Shin and Soenen 1998), this paper focuses on AIM listed SMEs on the London Stock Exchange. In terms of managerial implications, our finding of a concave relationship between working capital level and the profitability of UK listed SMEs leads us to recommend that firms, especially SMEs should endeavour to determine the optimal working capital level in order to maximise profitability.

The main limitation for this study is that the above findings are limited to 160 non-financial AIM listed SMEs that met our criteria. Nevertheless, given that all SMEs which met our criteria were examined over a six year period, the results are representative of the test of the relationship between WCM and profitability.

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Appendix 1

The UK Companies Act 2006 Section 382 Definition of A Medium and Small Firm.

Medium	Small
A turnover of not more than £25.9 million	A turnover of not more than £6.5 million
A balance sheet total assets of not more than £12.9 million	A balance sheet total assets of not more £3.26 million
Not more than 250 employees	Not more than 50 employees

Appendix 2

Antecedents of Cash Conversion Cycle

Variables	CCC
COSIZE	12.311(9.31)***
ATAN	–61.386(-6.70)***
LEV	0.089(1.99)**
CFLOW	–0.0412(-1.74)*
INDUST	Included
Number	960
Adjusted R^2	0.0662
Constant	–27.56718(-5.40)
Notes: Coefficients are in front of parentheses. ***Significant at 0.01 level; **Significant at 0.05 level; *Significant at 0.10 level, t-statistics are in parentheses. The dependent variable is CCC, which is (inventory/purchase) x 365 + (accounts receivable/ sales) x 365 – (accounts payable/purchases) x 365. Independent variables are defined as follows: COSIZE is firms' total assets, ATAN is fixed assets scaled by total assets, LEV is debt scaled by capital, and CFLOW is profit after tax plus depreciation divided by total assets. INDUST is a dummy variable for each of the six industries: construction and mining, software and communications, food and pharmaceuticals, support services, household and personal goods and electronic and electrical equipment	

Table 1: Summary of Variables Calculations and Definitions

Variables	Acronym	Measurement
Return on total assets	ROA	Profit before interest and tax divided by its total assets at the end of the financial year
Return on Capital Employed	ROCE	Profit before interest and tax divided by capital employed.
Return of Equity	ROE	Profit for the year divided by shareholders equity.
Cash Conversion Cycle	CCC	(inventory/cost of sales) x 365 + (accounts receivable/ sales) x 365 – (accounts payable/cost of sales) x 365
Square of Cash Conversion Cycle	CCC^2	Cash Conversion Cycle multiplied by Cash Conversion Cycle
Company age	COAGE	Number of years between incorporation and the calendar year end of each firm
Company size	COSIZE	The natural log of firm's turnover at the end of the financial year
Financial Leverage	LEV	Ratio of total debt divided by capital at the end of the financial year
Assets tangibility	ATAN	The ratio of fixed assets divided by total assets at the end of the financial year
Liquidity Ratio	LIQ	Current assets divided by current liabilities at the end of the financial year
Short-term financing	SFIN	Current liabilities divided by total assets at the end of the financial year
Industry dummy	INDUST	A dummy variable for each of the six industries: construction and mining, software and communications, food and pharmaceuticals, support services, household and personal goods and electronic and electrical equipment

Table 2: Summary Descriptive Statistics of all Continuous Variables

Variable	Obs	Mean	Std. Dev.	Median	Perc 10	Perc 90
ROA	960	–0.1396	0.2565	–0.0335	–0.5694	0.1087
ROCE	960	–0.2066	0.5045	0	–0.9576	0.1350
ROE	960	–0.3184	0.6356	–0.0138	–1.2789	0.1775
CCC	960	62.4099	110.3767	43.2	–32.525	200.64
COAGE	960	13.3487	15.1829	8.2068	2.8191	27.6164
COSIZE	960	4,412,254	3,538,485	3,820,770	344,500	9,207,500
ATAN	960	0.3689	0.2729	0.35	0.01	0.78
LEV	960	0.2217	0.4040	0.0149	0	0.7812
LIQ	960	2.3650	2.7463	1.33	0.13	6.67
SFIN	960	0.4135	0.3837	0.3	0.04	0.945
All variables are defined in Table I						

Table 3: Correlation Matrix for all Continuous Variables for all (960) Firm Years

	ROA	ROCE	ROE	CCC	COAGE	COSIZE	ATAN	LEV	LIQ	SFIN
ROA	1.000									
ROCE	0.445***	1.000								
ROE	0.553***	0.684***	1.000							
CCC	–0.125***	–0.115***	–0.104***	1.000						
COAGE	0.171***	0.103***	0.160***	0.058*	1.000					
COSIZE	0.148***	–0.014	0.088***	0.206***	0.181***	1.000				
ATAN	–0.036	–0.009	–0.013	–0.066**	–0.070**	0.109***	1.000			
LEV	0.008	–0.201***	–0.273***	0.049	0.074**	0.239***	0.180***	1.000		
LIQ	–0.146***	0.068**	–0.032	0.070**	–0.053*	–0.206***	–0.238***	–0.232***	1.000	
SFIN	0.015	–0.097***	–0.004	–0.107***	–0.084*	0.252***	–0.002	0.113***	–0.468***	1.000

Notes: All variables are defined in Table I; coefficients are in front of parentheses. ***Significant at 0.01 level; **Significant at 0.05 level; *Significant at 0.10 level

Table 4: Working Capital Level and Firm Profitability

VARIABLES	ROA	ROCE	ROE
CCC	0.040(1.76)**	0.064(4.03)***	0.109(3.94)***
CCC2	–0.010(–2.63)***	–0.020(–4.24)***	–0.004(–3.42)***
COAGE	0.248(14.26)***	0.417(4.90)***	0.661(6.72)***
COSIZE	–0.320(–1.18)	–1.266(–3.36)***	0.474(0.67)
ATAN	–4.250(–2.01)**	12.473(3.25)***	8.053(1.21)
LEV	–0.019(–0.93)	–0.256(–7.55)***	–0.506(–9.74)***
LIQ	–1.262(–2.15)**	1.109(4.90)***	–1.695(–3.55)***
SFIN	–4.875(–1.83)*	–8.322(–3.50)***	–2.226(–0.87)
INDUST	Included	Included	Included
Adjusted R^2	0.100	0.088	0.139
F-ratio	105.33***	90.85***	152.29***
Hausman test	10.66	1.69	2.29
Number	960	960	960
Constant	–11.233(–7.14)***	–11.131(–6.63)***	–11.636(–7.32)***
Notes: All variables are defined in Table I; coefficients are in front of parentheses. ***Significant at 0.01 level; **Significant at 0.05 level; *Significant at 0.10 level, t-statistics are in parentheses.			

Table 5: Deviation from the Optimal Working Capital Level and Firm Profitability (I)

VARIABLES	ROA	ROCE	ROE
Deviation	–0.140(–2.76)**	–0.110(–1.70)*	–0.070(–1.52)*
COAGE	0.268(11.57)***	0.444(5.00)***	0.702(6.18)***
COSIZE	–0.005(–0.02)	–0.876(–3.17)***	1.072(1.42)
ATAN	–6.242(–2.33)**	9.848(2.27)**	3.908(0.52)
LEV	–0.019(–0.86)	–0.257(–8.65)***	–0.506(–10.66)***
LIQ	–1.704(–2.89)***	0.524(2.85)***	–2.571(–5.69)***
SFIN	–6.637(–2.68)***	–10.609(–3.74)***	–5.708(–1.76)*
INDUST	Included	Included	Included
Adjusted R^2	0.082	0.078	0.124
F-ratio	83.99***	79.60***	133.58***
Number	960	960	960
Constant	–11.131(–6.63)***	–13.669(–2.49)**	–33.269(–6.66)***
Notes: Coefficients are in front of parentheses. ***Significant at 0.01 level; **Significant at 0.05 level; *Significant at 0.10 level, t-statistics are in parentheses.			

Table 6: Deviation from the Optimal Working Capital Level and Firm Profitability (II)

VARIABLES	ROA	ROCE	ROE
Deviation	–0.290(–3.62)***	–0.381(–2.19)**	–0.522(–3.01)***
Interact	0.171(2.82)***	0.084(2.57)***	0.251(6.98)***
COAGE	0.259(10.86)***	0.428(4.73)***	0.676(6.30)***
COSIZE	–0.370(–1.57)	–1.576(–4.45)***	–0.064(–0.09)
ATAN	–5.278(–2.20)**	11.699(3.26)***	6.915(1.06)
LEV	–0.020(–0.90)	–0.259(–8.54)***	–0.509(–10.07)***
LIQ	–1.556(–2.76)***	0.808(3.92)***	–2.109(–3.84)***
SFIN	–6.435(–2.55)***	–10.220(–3.33)***	–5.076(–1.49)
INDUST	Included	Included	Included
Adjusted R^2	0.0879	0.0836	0.1337
F-ratio	91.12***	86.33***	146.06***
Number	960	960	960
Constant	–11.636(–7.32)***	–14.640(–2.70)***	–34.846(–6.84)***
Notes: All variables are defined in Table I; coefficients are in front of parentheses. ***Significant at 0.01 level; **Significant at 0.05 level; *Significant at 0.10 level, t-statistics are in parentheses.			

Table 7: Working Capital Level and Firm Profitability

VARIABLES	Negative ROA	Positive ROA	Pre-recession (2005-2007	During recession (2008-2010)
CCC	0.035(2.09)**	0.014(3.00)***	0.037(1.71)*	0.042(2.21)**
CCC2	–0.089(–4.42)***	–0.057(–3.18)***	–0.017(-2.13)**	–0.021(-2.46)**
COAGE	0.233(10.75)***	0.053(0.38)	0.247(10.53)***	0.254(7.97)***
COSIZE	8.627(7.98)***	1.228(10.53)***	0.115(0.22)	–0.606(-4.84)***
ATAN	18.651(5.40)***	–6.729(–6.24)***	–8.075(-2.57)**	–1.596(-0.69)
LEV	0.022(1.01)	–0.070(–1.02)	–0.062(-5.23)***	0.016(1.34)
LIQ	0.574(0.93)	–0.382(–3.18)***	–2.027(-1.99)**	–0.439(-1.27)
SFIN	–5.862(–0.98)	–1.282(–1.37)	–5.303(-0.89)	–4.256(-1.50)
INDUST	Included	Included	Included	Included
Adjusted R^2	0.2619	0.2835	0.1068	0.1138
F-ratio	175.61***	172.89***	55.69***	59.83***
Number	509	451	480	480
Constant	–0.425(–10.11)***	–1.670(–1.37)	–9.941(-21.77)***	–13.555(-3.48)***
Notes: All variables are defined in Table I; coefficients are in front of parentheses. ***Significant at 0.01 level; **Significant at 0.05 level; *Significant at 0.10 level, t-statistics are in parentheses.				