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# Financial constraints and optimal working capital – evidence from an emerging market

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## Abstract

**Purpose** – The purpose of this paper is to investigate the existence of an optimal or target level of working capital for the Indian manufacturing firms, and whether firms intensely follow the target or not.

**Design/methodology/approach** – The paper uses cash conversion cycle as a measure of net working capital and employs partial-adjustment dynamic panel models to test its target-following behavior.

**Findings** – The empirical results show that there is no evidence of systematic target-following behavior of working capital for the Indian manufacturing firms. The results hold true even after dividing the sample into four groups depending on the sign and magnitude of deviation. The results further show that lack of target-following tendency is not quite influenced by varying firm-specific characteristics and, therefore, seems to be a systematic feature across firms in India.

**Research limitations/implications** – Scarcity of such working capital management studies across emerging economies, facing several financial constraints, limits the comparison of findings. Future studies should be conducted to confirm the results.

**Practical implications** – The findings imply that even though an optimal working capital might exist, emerging market firms may not be able to actively pursue it on account of several financial constraints and managerial considerations.

**Originality/value** – The study contributes to the scant existing literature on the target-following behavior of working capital management in the Indian manufacturing firms, representing a typical emerging market facing several financial constraints.

**Keywords** India, Financial constraints, Cash conversion cycle, Working capital, Target following

**Paper type** Research paper

## 1. Introduction

Working capital management is one of the least researched areas of corporate finance. Working capital management strives to maintain a delicate balance between the components of working capital and provides vital support for revenues or inter-temporal cash flows of the firms (Afrifa, 2016). Firms can reduce their financing cost and/or increase the availability of funds for expansion by minimizing the amount of money locked up in their net current assets (Hill *et al.*, 2010)[1]. On the contrary, a higher level of net current assets equips the firms to deal with contingencies such as input price fluctuations, stock out costs of inventories, and build relationships with customers by providing higher trade credits (Petersen and Rajan, 1997). Hence, substantial managerial efforts could be required to strike a balance and decide the right amount of working capital requirements. Optimally managed working capital can achieve the trade-off between risk and efficiency that maximizes the value of the firm (Smith, 1973, 1980; Deloof, 2003; Howorth and Westhead, 2003; Wasiuzzaman, 2015).

Sound management of working capital is important to any firm and more so for firms operating in emerging economies. The firms in these economies are usually smaller, growing in nature, and with limited access to capital market and institutional finance for long-term funds. Further, the emerging economies are characterized by higher interest rate, poor corporate governance, greater political instability, unequal distribution of wealth, and underdeveloped formal financial markets. Therefore, quite often firms tend to rely on internal sources of funding like working capital (Allen *et al.*, 2012). In the aftermath of liberalization and rapid globalization, the firms in these economies faced, and continue to



face, intense competition from the stronger players from developed economies. Therefore, it becomes all the more imperative for these firms to manage their working capital judiciously.

However, at the same time, since a significantly larger number of these firms are in the nascent stage of their product lifecycle[2] and face several future uncertainties, they may not always be able to follow the optimal working capital management policy systematically. Therefore, even though an optimal level of working capital exists, the firms in these emerging markets may not always actively pursue it for several other operational or financial constraints and varying strategic considerations.

In this paper, we attempt to examine the target-following behavior in the management of working capital using a large data set of the Indian manufacturing firms since the liberalization of the Indian economy in the early 1990s. We undertake the study of these firms because the Indian economic, financial, and legal systems have some unique characteristics not common to other countries that could impact management of working capital of firms. First, in India, the sources of external financing mainly comprise of non-banking and non-market channels which are backed by trust and relationship. Allen and Qian (2010) argue that these alternative sources of financing seem to be more efficient than bank and market-based financing for Indian firms. Allen *et al.* (2012) further show that Indian firms rely heavily on internal finance, which contributes 45 percent of their total annual financing. Alternative sources other than banks and capital markets meet 30 percent of the financing requirements of these firms. A very small percentage of financing – 18.2 and 6.5 percent, respectively, is provided by banks and financial markets. Second, small and homogeneous countries (like Singapore) can tailor their financial and legal systems to cater to the domestic economy at a relatively lower cost, which is not possible for a vast and diverse country like India. Finally, India is one of the fastest growing economies in the world with a comparatively significant contribution to the gross domestic product by smaller high growth firms. Given these differences in socio-economic landscape and the financial system, a close examination of the management of internal funds by the way of optimally managing the working capital is warranted for the Indian firms[3].

Although very little literature support exists to identify target-following behavior of the firms with respect to their working capital management, in rare attempts, Baños-Caballero *et al.* (2010, 2012, 2014) and Aktas *et al.* (2015) investigate the existence of an optimal or target level of working capital and confirm the target behavior for more developed western economies. However, to the best of our knowledge, no study has been conducted on this issue in an emerging market set up for fairly large data set. We try to fill this gap in this paper.

Using a large sample of 17,161 Indian manufacturing firms for a relatively extended period, from 1993 to 2015, we study the mean reversion of net working capital for these firms. The divergent socio-economic set up of India, prevalent financial constraints, and the large pool of the Indian manufacturing firms in an emerging economy lend us a perfect laboratory to study this feature. As used in the previous studies (Soenen, 1993; Deloof, 2003; Padachi, 2006; Baños-Caballero *et al.*, 2010; Garcia-Teruel and Martinez-Solano, 2007), we use the cash conversion cycle (CCC) as a measure of the working capital deployed by the firms. Similarly, we use the partial-adjustment dynamic panel model used in the past literature (Baños-Caballero *et al.*, 2010) to study the mean reversion in the CCC, as a measure of working capital requirement.

To motivate a detailed analysis of mean reversion, we first identify the target cash cycles for individual firms using the functional form of estimation used by Baños-Caballero *et al.* (2010) at  $t=0$  and then segregate them based on the sign and degree of deviations. Specifically, we divide our data set into firms with positive and negative deviations and further into two sub-groups based on the strength of the deviation within them[4]. These sub-groups are classified as most negative (G1), moderately negative (G2), moderately positive (G3), and most positive (G4), based on their degree and sign of deviation.

Considering the adjustment cost concerns which could prevent firms to mean-revert immediately in the next period, we then observe the mean reversion of cash cycle for the following five years window after  $t=0$  for the four groups of firms (G1-G4). The plot showing this reversion suggests that different groups of firms show different speeds of reversion toward their target for subsequent five years period. However, we do not find these speeds to be significant enough to call for a substantial target following even in a relatively large span of five consecutive years' post-deviation from their targets.

Results of our empirical analysis corroborate our preliminary findings and suggest that unlike the sample of firms in Baños-Caballero *et al.* (2010), the speed of reversion in our data set is indeed very low. To examine our results even more deeply, we proceed further with our analysis by recognizing that the target behavior may differ across firms with the sign and magnitude of deviation with respect to their targets. We then study the behavior of optimal CCC for all these four groups of firms separately. Our findings of very slow reversion remain unchanged even when we decompose our data set to such granularity. Thus, despite the fact that working capital management is crucial for the Indian manufacturing firms, our results suggest that they do not exhibit any perceptible working capital target behavior at an aggregate level.

Although target behavior is not observed at an aggregate level, we nevertheless explore the extent to which firm-specific factors could explain the target behavior. We consider the influence of firm-specific variables used in the past studies as determinants of working capital management (Chiou *et al.*, 2006; Kieschnick *et al.*, 2006; Baños-Caballero *et al.*, 2010), on the target-following behavior of the Indian manufacturing firms. We find that although most of the variables are statistically significant, they are not quite significant in economic terms. Moreover, the sign of the coefficients of most of the firm-specific variables is exactly opposite for the positive and the negative deviation firms. This would mean, for example, while larger firms tend to exhibit more target-following than smaller firms for firms with positive deviations, such is not the case for firms with negative deviations. Hence, we conclude that these determinants may not be the first order determinants of target following or working capital management for our data set of the Indian manufacturing firms. The lack of target-following tendency, therefore, may not be ascribed to these firm-specific factors and it seems to be a systematic feature across Indian firms.

The study contributes to the existing literature in various ways. First, it adds to the scant literature of target-following behavior of working capital management in the Indian manufacturing firms, thus representing the state of affair in a typical emerging market. The findings of the paper may be of interest to researchers in other emerging economies in general and South-East Asian countries in particular, where financial constraints are more prevalent. Second, we extend the existing research that focuses on finding the speed of reversion at an aggregate level by showing that the target-following behavior varies with sign and degrees of deviation from the target and, therefore, the different set of firms should be studied separately. Finally, we test the influence of firm-specific factors as the determinants of cash cycle on the target-following behavior and find that they are not very influential, thus suggesting a greater role for systematic factors.

The remainder of the paper is arranged as follows: previous work on working capital management is reviewed in Section 2. Section 3 explains the methodology and the data used in the study. Section 4 discusses the key results and Section 5 presents the robustness checks conducted in order to validate the results. In Section 6, we explore the determinants of target behavior, and in Section 7, we summarize the findings of our study.

## 2. Determinants of working capital and previous literature

Practitioners often question whether firms over invest in working capital, and if so, then how this excess cash tied up can be translated into productive investments and higher firm

performance. Buchmann *et al.* (2008) discuss the power of net working capital, which is often neglected by the firms, as a potential source of funds. Over investment in working capital means additional funds being locked up in working capital which has some opportunity costs and leads to value destruction of the firm (Kieschnick *et al.*, 2013). Therefore, firms with high level of working capital incur high-interest expenses on one hand and, on the other hand, face difficulties in financing value-enhancing projects at least in the short run.

In frictionless perfect capital markets proposed by Modigliani and Miller (1958), the investment decision of the firm only depends on the availability of investment projects with positive net present value. Under this scenario, every firm has unlimited access to external finance, which becomes the perfect substitute for internal funds. Therefore, working capital has no opportunity cost for the firm and hence there is no need to manage it efficiently. In reality, this situation does not exist. The investment decisions are constrained by the availability of the external funds, which are limited and more expensive than internal funds. In this situation, firms try to optimize the level of working capital to reduce the financing cost and/or increase the availability of internal funds for investment projects. By doing so, they also seek to achieve the trade-off between risk and efficiency and thereby maximize the firm value.

Previous studies on working capital have tried to establish the relationship between the components of working capital, financial constraints, and the operating characteristics of the firm. They measured the quality of working capital based on the CCC (Soenen, 1993; Padachi, 2006). The CCC is a metric of net operating working capital measured in the number of days[5]. The shorter the cycle, the smaller the funds locked up in the working capital. In the following subsections, we discuss how different variables relate to and influence the CCC.

### 2.1 Size

The size of the firm usually shows a positive correlation with the level of working capital (Chiou *et al.*, 2006). Larger firms tend to be more diversified, have better access to capital markets, and can exploit these advantages to ensure more trade credits (Niskanen and Niskanen, 2006). On the other hand, smaller firms face more financial constraints in the form of higher cost of credit and lack of credit facilities from different sources. They try to use more trade credits and reduce the level of inventories, which translates to lower CCC (Fazzari and Petersen, 1993; Petersen and Rajan, 1997). Contrary to these results, however, Baños-Caballero *et al.* (2010) report that the size does not have any material influence on CCC. We define the variable size as the natural logarithm of total assets reported in the balance sheet.

### 2.2 Leverage

Firms with high debt ratio incur high-interest expenses as they are perceived to be riskier and hence financially more constrained. Chiou *et al.* (2006) and Baños-Caballero *et al.* (2010) show that highly levered firms reduce the net working capital level to reduce the overall interest expenses. Hence, a negative relationship is expected between debt ratio and CCC. Leverage (LEV) is defined as the ratio of total interest bearing debt (debt in current liabilities and long-term debt) to total assets.

### 2.3 Cash flow

According to the pecking order theory (Myers and Majluf, 1984), information asymmetry exists between insiders and external investors, which results in higher cost of external funds as compared to internal funds. Fazzari and Petersen (1993) and Baños-Caballero *et al.* (2010) show that firms that have higher ability to generate cash flows (or are financially less constrained) choose to have higher working capital, as the cost of internal funds is lower. Baños-Caballero *et al.* (2014) also suggest that high cash flow generating firms can offer

longer credit period to their customers resulting in a higher CCC. On the contrary, Chiou *et al.* (2006) find that the high cash flow generating firms manage their working capital more efficiently and have better net liquidity balance; hence, they conclude that firms with high cash flows have lower CCC. Afrifa (2016) divides his sample on the basis of median cash flow and illustrates that firms with cash flows below the sample median have the lower investment in working capital, while firms with cash flows above the sample median show higher investment in working capital. The cash flow (CFLW) is defined as the ratio of net profit plus depreciation to total assets.

#### 2.4 Profitability

Prior research points to the existence of a relationship between the components of working capital and profitability of the firm. Lazaridis and Tryfonidis (2006) and Deloof (2003) empirically show a negative relationship that exists between corporate profitability and working capital management. Eljelly (2004) finds a significant negative relationship between firm's profitability and its level of liquidity. Deloof and Jegers (1996) and Petersen and Rajan (1997) find a positive relationship between a firm's trade credit and profitability through improved sales. Higher trade credits allow the customers to check the quantity and quality of the product before they pay. It also helps to build trust and long-term relationship with the customer (Ng *et al.*, 1999). In the similar line, the level of inventory and sales has a positive correlation. Subsequently, the same relationship holds true between the level of inventory and profitability. Blinder and Maccini (1991) posit that a high level of inventory reduces the supply costs and input price fluctuations and consequently prevent the stoppage of production and business losses. On the other hand, Ng *et al.* (1999) and Wilner (2000) show that the accounts payable and profitability are negatively correlated. A firm may maintain a low level of accounts payable by paying early and can avail trade discounts to increase the profitability.

A firm with consistently high profitability exhibits less financial constraints and slowly emerges as an industry leader and gains larger bargaining power with customers and suppliers. Petersen and Rajan (1997) show that companies have greater access to credit from suppliers as their profitability increases. Therefore, profitable firms can successfully operate with a lower level of net working capital. The profitability (PRF) is measured as the ratio of operating income to total assets[6].

#### 2.5 Asset tangibility

Intuitively, firms with more tangible assets can raise external funds quickly and at a lower cost, as these tangible assets serve as collateral against the loan. Thus, firms with higher tangible assets may invest more funds into working capital. Contrary to this intuitive belief, Fazzari and Petersen (1993) argue that under financial constraints, fixed assets compete for funds with the level of current assets; hence, the level of fixed assets negatively influences the CCC. This argument is empirically supported by Kieschnick *et al.* (2006) and Baños-Caballero *et al.* (2010). We measure the asset tangibility (ATN) as the ratio of net fixed assets to total assets.

#### 2.6 Growth opportunity

If firms expect the growth in future sales, the current level of inventories also increases proportionately to support the higher sales (Blazenko and Vandezande, 2003). Petersen and Rajan (1997) argue that growing firms exercise more credit sales to increase their sales especially during the period of weak demand. Cunat (2007) claims that when firms experience slower growth, they face more financial constraints due to the unavailability of alternative sources of finance and, hence, use their trade credit as a source of finance.

Thus, there seems to be a positive relationship between growth opportunities and level of working capital. But more recently, literature documents that with the widespread adoption of just-in-time inventory system, there is a substantial decrease in the level of inventory across the firms (Gao, 2014). Moreover, Baños-Caballero *et al.* (2010) show that the growth opportunities have no significant influence on the CCC. Growth opportunity (GRWT) is measured by the growth of revenues over the previous year.

### 2.7 Median industry cash cycle

Working capital requirement changes significantly across time and within industries [7]. Ng *et al.* (1999) show that firms follow a conventional norm of credit policy within a particular industry, but this credit policy varies widely across industries. Niskanen and Niskanen (2006) confirm the above findings. We identify the industries based on National Industrial Classification codes and estimate the median cash cycles for each industry and each year. Apart from controlling the industry effect, median industry cash cycle (MED) also represents respective industries in a given year.

### 3. Mean reversion, methodology, and data

In a view to study the target behavior of working capital, we follow previous research and use CCC as a measure of net working capital. We assume the target cash cycle of a firm to be dependent on firm-specific factors, in line with Baños-Caballero *et al.* (2010). Thus, the target CCC is a linear function of the list of explanatory variables defined in the previous section and can be estimated as follows:

$$\begin{aligned} CCC_{i,t} = & \alpha + \beta_1 SIZE_{i,t-1} + \beta_2 LEV_{i,t-1} + \beta_3 CFLW_{i,t-1} + \beta_4 PRF_{i,t-1} \\ & + \beta_5 ATN_{i,t-1} + \beta_6 GRWT_{i,t-1} + \beta_7 MED_{i,t-1} + \eta_i + \gamma_t + \varepsilon_{i,t} \end{aligned} \quad (1)$$

where,  $\varepsilon_{i,t}$  is the random error term;  $\eta_i$  represents the time invariant firm-specific attributes and captures characteristic of the firm as well as the industry in which it operates; and  $\gamma_t$  is the year fixed effect, a time dummy that changes with time but remains constant for all firms in a particular period. These variables indicate the influence of economic variables that impact the firm's CCC and yet cannot be explicitly controlled.

Following Deloof (2003), Padachi (2006), Garcia-Teruel and Martinez-Solano (2007) and Baños-Caballero *et al.* (2010), we measure the working capital based on CCC, where,  $CCC_{i,t}$  is the actual CCC for firm  $i$  at time  $t$  measured as follows:

$$CCC_{i,t} = \text{Receivable days}_{i,t} + \text{Inventory days}_{i,t} - \text{Payable days}_{i,t} \quad (2)$$

where the ensuing terms are defined as:

$$\text{Receivable days} = \frac{\text{Account receivables}}{\text{Net sales}} \times 365$$

$$\text{Inventory days} = \frac{\text{Total inventories}}{\text{Total cost of goods sold}} \times 365$$

$$\text{Payable days} = \frac{\text{Account payable}}{\text{Total cost of goods sold}} \times 365$$

We take the lagged values of the firm-specific variables to eliminate any simultaneous estimation or endogeneity to estimate target cash cycles using Equation (1) for all the firms in our sample. We study the mean reversion in cash cycle at time  $t = 0$  as a transition point

where a typical firm experiences a deviation of the actual cash cycle from its estimated target. We define the deviation from the target as follows:

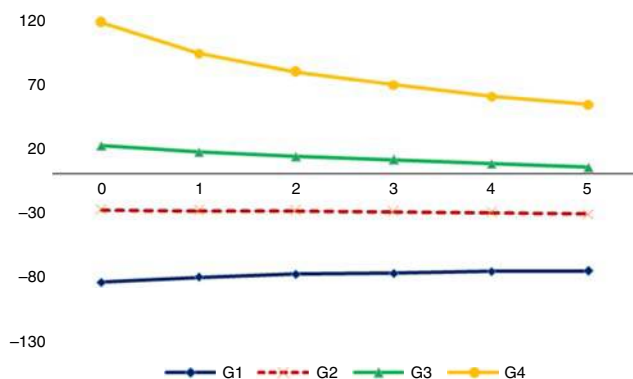
$$\Delta CCC_{i,t} = CCC_{i,t} - TCC_{i,t} \tag{3}$$

where  $TCC_{i,t}$  is the target cash cycle estimated by using (1).

We then segregate the firms according to their deviations in four groups depending on the sign and severity of the deviations at  $t=0$ . We study the mean reversion in cash cycles for these different group of firms by observing the deviations from the target for the following five years after  $t=0$  for each firm in our data set. These groups are classified as experiencing most negative (G1), moderately negative (G2), moderately positive (G3), and most positive (G4) deviations at  $t=0$ . By design, groups G1 and G2 (G3 and G4) consist of firm-year observations with negative (positive) deviations and are equal in size. Finally, we calculate the median of the deviations ( $\Delta CCC_t$ ) for all the five years (i.e. from  $t=1$  to  $t=5$ ) after time  $t=0$  for all the four groups defined at  $t=0$ . The analysis over a longer period reveals the impact of any possible adjustment costs and other frictions that might cause persistent deviation of actual cash cycles of the firms from their targets.

Figure 1 depicts the plot for the median of the deviations for all the four groups. The figure shows that the speed of reversion is quite different for firms in all the four groups. Firms with positive deviations (G3 and G4) seem to show relatively more aggressive reversion as compared to those with negative deviations (G1 and G2). Specifically, firms with moderately positive deviations (G3) seem to revert most rapidly so as to bridge half of their deviations in just about two years. This is followed by firms in group G4 which could bridge half of their deviations in about four years. On the other hand, firms in group G1 show very slow reversion, about 10 percent of their deviations in subsequent five years. Firms with moderately negative deviations (G2) show no reversion at all. Overall, therefore, the speed of reversion seems to be very slow for firms in our data set.

The patterns in Figure 1 reveal some interesting facets of mean reversion in cash cycles. First, firms with negative and positive deviations of their cash cycles exhibit different target behavior with respect to their targets. Second, even among firms with the similar sign of deviations, the firms may exhibit a varying speed of reversion, if any, depending upon the magnitude of deviation. Accordingly, these observations motivate us to follow an



**Notes:** G1, most negative; G2, moderately negative, G3, moderately positive; G4, most positive deviation. This figure shows the median of deviations of cash cycles from their target for all four groups over the next five years after experiencing a deviation

**Figure 1.** The medians of the deviations of cash cycles from their targets overtime



important testable implication for the cross-section of firms in our data set, that is, are there any firm-specific differences that explain the difference in their target behavior? We try to answer this question in Section 6.

Next, we test the speed of reversion by using the partial-adjustment dynamic panel model for Indian firms to confirm the existence of optimal CCC. In a frictionless world, firms always maintain the target or optimal level but in the presence of adjustment costs, they make a trade-off with the adjustment cost against the benefit of operating at a suboptimal level. We estimate a model that allows partial adjustment of firms' CCC toward their target within each period.

The standard partial adjustment model is given by:

$$(CCC_{i,t+1} - CCC_{i,t}) = \lambda (CCC_{i,t+1}^* - CCC_{i,t}) \quad (4)$$

where  $CCC_{i,t+1}^*$  is the firm  $i$ 's desired (or target) CCC at period  $t+1$ . Every year, firm closes a proportion  $\lambda$  of the gap between its actual and its desired CCC level.

Substituting Equation (1) for target CCC into Equation (4), we get the following model:

$$CCC_{i,t} = \lambda\alpha + (1-\lambda)CCC_{i,t-1} + \lambda\beta_2 SIZE_{i,t-1} + \lambda\beta_3 LEV_{i,t-1} + \lambda\beta_4 CFLW_{i,t-1} + \lambda\beta_5 PRF_{i,t-1} \\ + \lambda\beta_6 ATN_{i,t-1} + \lambda\beta_7 GRWT_{i,t-1} + \lambda\beta_8 MED_{i,t-1} + \eta_i + \gamma_t + \varepsilon_{i,t} \quad (5)$$

where  $1-\lambda$  can be renamed as  $\beta_1$ .

Firms try to achieve the target CCC by adjusting their current level of the CCC. We estimate the speed of reversion for the firms in our data set using the methodology suggested by Baños-Caballero *et al.* (2010). In order to overcome the problems of endogeneity and serial correlation, we estimate the coefficients of Equation (5), using the system GMM approach of Blundell and Bond (1998) for the full sample of firms.

The reversion is studied through the coefficient of lagged cash cycle ( $1-\beta_1$ ) in a partial-adjustment dynamic panel model. The value of  $\beta_1$  ranges between 0 and 1. If the  $\beta_1$  is 1, it indicates that the firms do not adjust their CCC and remain at the previous year level. However, if  $\beta_1$  is close to 0, it indicates that the firms immediately adjust their CCC to the target level.

In line with past studies (Chiou *et al.*, 2006; Baños-Caballero *et al.*, 2010), we also estimate Equation (5) using the ordinary least square (OLS) and fixed-effect model along with the system GMM approach to test the robustness of our broad results. The OLS has the inherent drawback of not being able to control for endogeneity and hence can seriously affect the estimation results. An OLS estimate is further inconsistent in the presence of serial autocorrelation.

Hsiao (2003) shows two major properties that are well established for dynamic panel models where we use the lagged-dependent variable as an explanatory variable. First, the estimated coefficient of the lagged-dependent variable with a pooled OLS estimator is biased upward. Second, the estimated coefficient, using standard approach of mean differencing (or the fixed effects) the model, is biased downward. We expect the system GMM proposed by Blundell and Bond (1998) to overcome these shortcomings.

Our sample consists of a large panel data set of listed and unlisted 17,161 Indian manufacturing firms for which the annual financial data are available at Center for Monitoring of Indian Economy Prowess database between 1993 and 2015.

While estimating target cash cycles using Equation (1), we exclude firm-year observations with values of leverage (total debt to total assets) less than 0 or greater than 1, with the negative net fixed assets or with missing values for any variable of interest. Further, we also exclude firm-year observations with the subsequent period change in cash cycles exceeding ten times in magnitude of the cash cycle at time  $t$  and winsorize all firm-specific variables at first and the 99th percentile to remove the effect of outliers.

After applying these filters, the final data set consists of a total of 56,682 firm-year observations. The descriptive statistics for the variables of interest are shown in Table AI. It is important to notice that the minimum values of cash cycles, as well as their medians (not reported), are negative. Negative cash cycles, in a way, signify negative net operating working capital for firms. That means working capital acts as a source of financing for these firms. Further, industries, where working capital requirements are very low, may have negative median cash cycles too[8].

#### 4. Results

The target behavior or the reversion in cash cycle is studied through the coefficient of lagged cash cycle ( $1-\beta_1$ ) in the partial-adjustment dynamic panel model in Equation (5). The results are reported in column 1 of Table I using the system GMM estimation. The coefficient of the lagged-dependent variable suggests a speed of reversion of approximately 13 percent (1-0.866) per year. This would mean that although firms in our data set do mean revert, they do so rather very slowly. We also test for these coefficients using the OLS and fixed-effect models. The coefficients, although they differ markedly, are nonetheless similarly sensitive toward sample composition. The results are reported in columns (2) and (3) in Table I, respectively. The speed of reversion differs markedly between the OLS and fixed-effect model. In the case of the OLS, the coefficient of the lagged-dependent variable suggests absolutely no reversion; however, the fixed-effect model shows the reversion of 32 percent in a year. The results verify that while using OLS, the coefficients are overestimated and using fixed-effects they are underestimated as compared to those of using the system GMM. This is in line with the methodological drawbacks pointed out by Hsiao (2003), and Huang and Ritter (2009) in using the pooled OLS and fixed-effect model. Thus, the results reported in column (1) using the system GMM are indeed more reliable.

Using similar methodology, Baños-Caballero *et al.* (2010) found that Spanish SMEs actively chase the target CCC level by adjusting their current CCC to the target very quickly. The speed of reversion for Spanish SMEs was found to be as high as 87 percent. Their results suggest that under financial constraints, the SMEs may have to pay a significant cost when they are unable to manage their working capital properly by deviating from their target.

Although the firms in India are facing severe financial constraints, in general, due to the lack of developed capital markets and formal channels of financing, our results in Table I do

Dependent variable $CCC_t$	(1)	(2)	(3)
$CCC_{(t-1)}$	0.866***	0.993***	0.679***
CFLW	-50.051***	-8.855*	-8.509
GRWT	6.566***	-0.327	-2.291***
LEV	-73.514***	-4.194	-8.168
ATN	52.213***	-7.311***	0.656
PRF	18.019	2.606	-9.968
SIZE	4.569***	-1.071***	6.703***
MED	-0.225***	-0.008	0.054
Const	23.956***	14.094***	15.032**
<i>n</i>	42,816	56,682	56,682

**Notes:** CFLW, cash flow generating ability; GRWT, growth opportunity; LEV, leverage; ATN, asset tangibility; PRF, profitability; SIZE the natural logarithm of total asset; CCC, cash conversion cycle; MED, median industry cash cycle. The table shows that the speed of mean reversion of CCC, is the dependent variable.  $CCC_{(t-1)}$  is the dependent variable of the lagged cash conversion cycle. Column (1) shows the system GMM estimate, Columns (2) and (3) show the estimate by OLS and fixed-effect models, respectively. \*, \*\*, \*\*\*Significant at 10, 5 and 1 percent levels, respectively

**Table I.**  
Mean reversion in  
cash conversion cycle

not suggest a keen managerial stance to manage their working capital optimally. In contrast to Spanish SMEs, firms in India do not actively revert to their means so often. In fact, an important implication of our findings is that they cast doubt on a possibility of standard optimal working capital levels for firms in emerging markets such as India.

## 5. Robustness checks

### 5.1 *Stability of coefficients*

Results in Table I suggest that the coefficients in column (1) using the system GMM approach and those in columns (2) and (3) using OLS and fixed-effect models are quite different. The reason could be plausibly attributed to the procedure used in the system GMM estimation, which uses the lagged values of the predetermined and endogenous variables in first differences as instruments for the estimation. These instruments could cause a systematic shift in the mean values of the estimated coefficients. However, we check the robustness of these coefficients by simulating the CCC at time  $t+1$  using their values at time  $t$  to suggest intentional target and random cash cycle following in the next period. Subsequently, we test for the intensity of target following using the system GMM, OLS, and fixed-effect models, respectively.

To simulate the next period CCCs for intentional target behavior, we define a form of aggressive target behavior as follows. We assign a probability of 0.75 for a firm-year observation where the cash cycle at  $t=1$  will be estimated with a normal distribution with a mean of 70 percent and a standard deviation of 10 percent of the actual cash cycle at  $t=0$ . We then assign a probability of 0.25 for a firm-year observation such that the cash cycle at  $t=1$  will be estimated with a normal distribution with a mean of 120 percent and a standard deviation of 10 percent of the actual cash cycle at  $t=0$ . Thus the simulated CCCs represent extensive proportions of target-following firms (75 percent in this case), and higher intensity (extent of mean reversion by the ensuing cash cycle at  $t=1$ , which is closer to 0) for the target-following firms and lower intensity (extent of divergence by the ensuing cash cycle at  $t=1$ , which is closer to 1) for the non-target-following firms. This way we accommodate for the target behavior such that firms are reluctant in having their cash cycles away from targets and hence would attempt to be closer to the targets as far as possible in the presence of some adjustment costs.

Next, we simulate the CCCs in the next period for random target following by the firms. To simulate this data set, the cash cycle at  $t=1$  will be estimated with a normal distribution with a mean of 0 percent and a standard deviation of 50 percent of the actual cash cycle at  $t=0$ . Such large standard deviation is used to signify subsequent movements of cash cycles in a rather unpredictable way. However, since there is no sense of target following in the constituent firms, their subsequent period cash cycle is assumed to be mean-centered around their initial levels.

The results shown in columns (1)-(3) in Table II are, respectively, for the three estimation procedures. We find that the coefficients are quite similar to their counterparts in Table I for the several estimators. Thus, the coefficients determined using the three different models are robust. Further, we find that the estimated speed of reversion is sensitive to aggregate target following in the data set. These findings further confirm our results in Table I.

### 5.2 *Mean reversion with respect to sign and magnitude of deviation*

Figure 1 in Section 3 shows that mean reversion varies with sign and magnitude of deviation of the cash cycles from their respective targets. Following this, and to assess the robustness of the results in column (1) of Table I, we split our sample into firms facing negative and positive deviations with respect to their targets identified through Equation (1). Using partial-adjustment dynamic panel model and following the system GMM approach, we estimate the coefficient of Equation (5) for the two sub-samples. The results are reported in columns (1) and (2) of Table III, respectively. The results suggest that the speed of reversion

**Table II.** Results for simulated CCCs for intentional target and for random target following by the firms

Dependent variable $CCC_t$	Intentional target following			Random target following		
	(1)	(2)	(3)	(1)	(2)	(3)
$CCC_{(t-1)}$	0.587***	0.647***	0.512***	1.021***	1.127***	0.997***
CFLW	-35.521**	-6.685*	-10.753*	-41.238***	-7.873*	-7.872
GRWT	10.325***	-0.471	-4.364***	7.862***	-0.541	-3.271***
LEV	-58.421**	-8.292	-6.664	-49.237**	-6.892	-7.239
ATN	47.365**	-3.234*	1.027	42.473**	-5.334**	0.875
PRF	7.964	7.675*	-11.685	12.796	6.775*	-8.379
SIZE	7.539***	-3.582***	9.63***	2.861**	-5.384***	7.567***
MED	-0.734***	-0.012	0.091	-0.174*	-0.117	0.068
Const	32.538***	23.129***	19.549**	28.338***	19.764***	21.991***
<i>n</i>	46,763	56,682	56,682	45,783	56,682	56,682

**Notes:** The table shows the results of simulated CCCs for two measures. In the first case, we consider the firms following intentional targets and in the second case the firms following random targets. Column (1) shows the system GMM estimate, Columns (2) and (3) show the estimate by OLS and fixed-effect models, respectively, for two different target following cases. \*, \*\*, \*\*\*Significant at 10, 5 and 1 percent levels, respectively

**Table III.** Mean reversion in CCC for firms with negative and positive deviations from targets

Dependent variable $CCC_t$	(1)	(2)
$CCC_{(t-1)}$	0.666***	1.161***
CFLW	-27.005***	-107.872***
GRWT	3.496***	27.524***
LEV	-61.474***	-57.467***
ATN	28.628***	68.275***
PRF	13.507**	57.201*
SIZE	7.819***	-32.791***
MED	-0.101***	-0.130*
Const	8.575***	76.102***
<i>n</i>	24,467	12,561

**Notes:** Columns (1) and (2) show the speed of reversion using partial-adjustment dynamic panel model or system GMM estimator for firms with negative and positive deviations with respect to their targets, respectively. \*, \*\*, \*\*\*Significant at 10, 5 and 1 percent levels, respectively

differs markedly for the two sub-samples. While firms with negative deviations exhibit reversion to the extent of 33 percent in a year, the firms with positive deviation do not revert at all, but show an altogether divergent non-target behavior. Further, the coefficients of other control variables used in the partial-adjustment model (5) differ to a large extent in the two sub-samples, suggesting substantial differences in the cross-sectional characteristics of the two sub-samples. This justifies our attempt to study the mean reversion by splitting the sample into firms facing positive and negative deviations.

In order to incorporate the influence of the magnitude of deviation on the speed of reversion, we segregate the firms according to their deviations in four groups (G1-G4) discussed earlier, depending on the sign and severity of deviation. Similarly, we measure the target behavior for these four groups.

The results are reported from column (1)-(4) in Table IV. Columns (1) and (2) (4 and 3) show results for firms with more intense and moderate deviations, respectively, for firms facing negative (positive) deviations. Consistent with the analysis in the previous sub-section (Figure 1), the model correctly identifies the varying degree of reversion for all the four groups. The speed of reversion varies from 32 percent for firms in G1 to no reversion at all for firms corresponding to G4. The statistical results suggest relatively

**Table IV.**

Mean reversion in CCC for firms with varying magnitude of deviations from their targets

Dependent variable $CCC_t$	(1)	(2)	(3)	(4)
$CCC_{(t-1)}$	0.686***	0.716***	0.866***	1.346***
CFLW	-30.823**	28.960**	2.412	-53.551
GRWT	-0.4304	13.697***	17.443***	29.701***
LEV	-39.924***	-69.233***	-52.922***	-25.150
ATN	3.638*	52.052***	42.633***	42.150
PRF	16.726***	18.936*	40.343*	-59.855
SIZE	2.677***	-4.917***	-8.980***	-56.783***
MED	-0.108***	-0.057	0.121**	0.016
Const	21.485***	33.949***	32.176**	78.047**
$n$	10,601	9,158	4,085	5,225

**Notes:** The table shows the speed of reversion using partial-adjustment dynamic panel model or system GMM estimator for firms divided in four groups according to sign and magnitude of deviation. Columns (1)-(4) report results for most negative (G1), moderately negative (G2), moderately positive (G3), and most positive (G4) deviation, respectively. \*, \*\*, \*\*\*Significant at 10, 5 and 1 percent levels, respectively

stronger reversion for firms with negative deviation. The results in Tables III and IV suggest the possibility that firms with low cash cycles (or with negative deviations) are less constrained to revert to their targets than firms with higher cash cycles. It is also possible that these results are reflective of the fact that firms with higher cash cycles are less efficient or indifferent in managing their working capital.

Notwithstanding these results, the speed of reversion identified for the Indian manufacturing firms is very slow as compared to that of the Spanish SME firms examined by Baños-Caballero *et al.* (2010), which show aggressive reversion (speed of adjustment of 87 percent in a year) in the very next period. The results in Tables III and IV, therefore, confirm the results of Table I, that is, we do not find any systematic target following for firms in our data set at an aggregate level.

## 6. Determinants of target behavior

In the previous section, the results suggest that working capital management decisions of the firms are not consistent with a systematic target-following behavior. However, it is still not evident if the target behavior (or its absence) is influenced by firm-specific factors and to what extent. Kieschnick *et al.* (2013) and Hill *et al.* (2010) show the influence of firm-specific characteristics on designing the working capital policy of the firm. Therefore, we explore whether there are characteristic differences between firms following target behavior from those that are not.

To examine this, we use target cash cycles for the individual firm's estimated using Equation (1) and observe the movement in cash cycles in subsequent years.

Let us assume,  $CCC_t$  and  $CCC_{t+1}$  are the cash cycles for a firm at time  $t$  and  $t+1$ , respectively, and  $TCC_t$  is the target cash cycle at time  $t$ . We define a measure called "GAP" as the following ratio:

$$GAP = \frac{CCC_{t+1} - TCC_t}{CCC_t - TCC_t} \quad (6)$$

The denominator in Equation (6) represents the total deviation of cash cycle of a firm with respect to its target initially, and the numerator represents the remaining deviation in the subsequent year with respect to the same target. GAP, then, denotes the fraction to be recovered after a period of target following, if any. In case the firm chooses to revert, we expect this ratio to be less than unity. A ratio greater than 1 would signify non-target behavior with respect to the cash cycles[9].

We divide our data set into two groups of firms following target and non-target behavior in the subsequent periods. Next, we explore whether there are characteristic differences between these two groups of firms by using the following Probit model:

$$TAR_{i,t} = \alpha + \sum \beta_j X_{i,t-1} + \varepsilon_{i,t} \tag{7}$$

where,  $TAR_{i,t}$  represents the dummy for target behavior for firm  $i$  in period  $t$  set equal to 1 if the firm follows target in the subsequent period, and 0 otherwise; and  $X_{i,t-1}$  represents the set of variables used earlier to estimate target cash cycles, i.e., size, profitability, cash flows, asset tangibility, growth option, and median industry leverage. In order to understand the influence of firm-specific factors more precisely, we further divide our sample into two parts, that is, firms with a negative and positive deviation of their cash cycles with respect to their targets. Then we apply the Probit model on these two groups separately.

The results are shown in panels A and B of Table V for firms with the negative and positive deviation of their cash cycles with respect to their targets, respectively. Although, consistent with past literature, firm-specific characteristics indeed influence the CCC, the signs of the coefficients of firm-specific variables in the two panels suggest that such influence is different for firms with positive and negative deviations. The signs of all firm-specific variables, except asset tangibility, are different for the two panels in Table V. For example, although larger firms tend to exhibit more target behavior for firms with positive deviations (panel B), the relationship is reversed for firms with negative deviations (panel A). While this finding raises a doubt on the predicted signs of the relationship between CCC and firm-specific variables in past studies, it also justifies our attempt to study the mean reversion for firms with positive and negative deviations separately. Varying signs of the firm-specific variables suggest that these attributes may not be systematically linked to target-following tendency of the firms whose deviation from targets may vary in time.

Besides the statistical significance of the variables, we also estimate their economic significance, which suggests the change in the probability of target behavior by one standard deviation change in the variables. Among the variables, size and leverage have the highest economic significance followed by profitability and growth. For example, a one standard deviation increase in the size of the firm decreases (increases) the probability of target following for the firms with negative (positive) deviation by 6.27 percent (2 percent).

Deviation w.r.t target CCC	Panel A Negative		Panel B Positive	
	Coeff.	Eco sig.	Coeff.	Eco sig.
CFLW	0.039	0.40%	-0.121**	-2.03%
GRWT	0.088***	4.860%	-0.006*	-1.77%
LEV	-0.331***	-7.31%	0.112*	2.48%
ATN	0.149***	2.99%	0.099**	1.86%
PRF	0.481***	5.48%	-0.51***	-5.98%
SIZE	-0.033***	-6.53%	0.011**	2.00%
MED	0.0005*	1.10%	-0.0002	-0.51%
Const	-0.212***	0	0.298***	0
$n$	36,243		20,439	
Pseudo $R^2$	0.008		0.003	

**Notes:** CFLW, cash flow generating ability; GRWT, growth opportunity; LEV, leverage; ATN, asset tangibility; PRF, profitability; SIZE, natural logarithm of total asset; MED, median industry cash cycle. The table shows the results of Probit regression. Dependent variable is a dummy set equal to 1 if the firm follows target behavior as adjudged by Equation (6) and 0 otherwise. \*, \*\*, \*\*\*Significant at 10, 5 and 1 percent levels, respectively

**Table V.**  
Determinants of  
target following

Given that we found no systematic target following for the aggregate firms and very slow speed of reversion, the impact of this magnitude may not be economically meaningful in explaining their marginal target behavior. Similarly, though most of the variables are statistically significant, they are not quite so significant in economic terms. This suggests that some other factors, such as macroeconomic influences or behavioral aspects, may cause persistence in deviation of firms from their optimal working capital levels for the firms under study. It is quite possible that since firms in India operate in a very uncertain environment, several non-economic factors significantly influence their managerial decision making. Whether such is the case is an open question for future research.

Summarizing the results in this section, we infer that firm-specific variables used in the past studies as determinants of cash cycles and of target behavior may not be the first order determinants applicable, at least, universally to all data sets, and it is quite possible that the changes in working capital investments, at large, are driven by several unknown managerial considerations.

## 7. Conclusion

Working capital management is one of the least researched areas among several contemporary corporate finance issues. The objective of working capital management is to maintain a fine balance between the components of working capital while providing vital support for revenues and inter-temporal financing. In a fast growing emerging economy, where firms are financially constrained due to limited availability of bank finance and the external finance through capital markets, well-managed working capital could be one of the sources of internal funding. Hence, there is a need for widespread examination of the efficient management of working capital for emerging economies to minimize the need and dependence on external financing.

In our study, we use a large sample of 17,161 Indian manufacturing firms between 1993 and 2015 to study their target-following behavior while managing the working capital. Our large pool of the Indian manufacturing firms lends us a perfect laboratory to undertake this study. Contrary to the previous research conducted on the subject in other countries, the results in this paper suggest that there seems to be no perceptible aggregate target behavior exhibited by the Indian manufacturing firms and that the cash cycle movement varies significantly irrespective of its target across firms. Since we observed the varying speed of reversion for different firms, we divide our sample into four categories based on the sign and severity of deviations and test the target-following behavior. Even after such decomposition of our sample, we do not find any significant reversion pattern or target-following behavior for any of these groups.

Though previous research show varying influence of firm-specific characteristics on designing the working capital management policy of the firm, it is not evident if and to what extent the target behavior (or its absence) is influenced by these firm-specific attributes. We examine whether there are characteristic differences between firms following target behavior from those that are not. We find that firm-specific variables may not be the first-order determinants of the target behavior. However, we find that the signs of the coefficients of firm-specific variables indeed influence the CCC of firms with positive and negative deviations differently. This suggests that different firm-specific attributes affect the target-following tendency of the firms differently, depending on whether the firms face positive or negative deviations with respect to their targets. While these results, on the one hand, add justification to our methodology to study firms with varying deviations separately, on the other hand, it suggests that firms may not be actively pursuing any target working capital on account of their firm-specific attributes. These findings, therefore, reinforce our core finding of no perceptible working capital target behavior at an aggregate level.

Since we find that much of the movements in cash cycles of the firm could not be explained by systematic firm-specific factors, these are probably driven by several

unknown aspects and managerial constraints. Even though an optimal level of working capital exists, firms may not actively pursue it on account of several other operational or financial constraints and varying strategic considerations. Whether such is the case is an open question for future research.

### Notes

1. Net current assets or working capital requirements are measured as inventory plus accounts receivable minus accounts payable in Hill *et al.* (2010).
2. We find that almost 69 percent of the firms were incorporated after the year 1995, while nearly 41 percent of the firms were incorporated after the year 2000.
3. Anand and Gupta (2002) shows that the management of individual components of working capital not only helps in improving the overall performance of working capital management but also contributes to performance evaluation of the top management of the firm.
4. We measure the sign and degree of deviation by subtracting the estimated target CCC from actual CCC. Suppose the estimated target cash cycle is 50 days for a particular firm and the firm's actual CCC is 20 days. So the deviation of actual CCC from the target is negative 30 days. We calculate the sign and magnitude of deviation from target CCC for each firm in our sample and divide them into four sub-samples.
5. CCC measures the length of time between cash outflows to the suppliers and the cash inflows from the customers. It is calculated as the days inventory outstanding plus days sales outstanding minus days payable outstanding.
6. Following previous studies (e.g. Chiou *et al.*, 2006; Baños-Caballero *et al.*, 2010; Afrifa, 2016; Aktas *et al.*, 2015), we use ROA as a measure of firm's profitability.
7. In practice, the financial executives of organizations are struggling to figure out the appropriate level of working capital (Lamberson, 1995).
8. We identified the Spearman correlation matrix and also identified VIF components for all our multivariate analyses and found that the highest VIF value is 3.82. Thus, our results may not be influenced by the multi-collinearity problem among the variables of interest.
9. Although the target cash cycle may change for a firm at  $t+1$ , using Equation (6), we could only observe the subsequent deviation with respect to the initial target. Thus, GAP measured this way prevents the estimation of the dynamic target following. In order to overcome this, we also measure GAP using target cash cycles at  $t+1$  in the numerator of Equation (6) and exclude firm-year observations where the sign of deviation changes in the subsequent year to avoid false interpretation of GAP. The results, using the target for  $t+1$ , remain similar to those using targets at time  $t$ , hence, we do not report them here.

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## Appendix

Variable	<i>n</i>	Mean	SD	Min.	Max.
CFLW	56,682	0.065	0.132	-2.354	12.026
GRWT	56,682	0.341	1.824	-0.999	84.000
LEV	56,682	0.324	0.218	0.000	1.000
ATN	56,682	0.321	0.196	0.000	4.282
PRF	56,682	0.085	0.115	-2.745	1.885
SIZE	56,682	3.357	1.938	-5.596	11.767
CCC	56,682	99.736	105.210	-542.862	1,004.191
MED	56,682	77.338	23.408	-41.854	285.447

**Notes:** CFLW, cash flow generating ability; GRWT, growth opportunity; LEV, leverage; ATN, asset tangibility; PRF, profitability; SIZE, natural logarithm of total asset; CCC, cash conversion cycle; MED, median industry cash cycle

**Table AI.**  
Descriptive statistics  
of variable of interest

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