Mean reversion in corporate leverage: evidence from India

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Abstract

Purpose – Recent papers on target capital structure show that debt ratio seems to vary widely in space and time, implying that the functional specifications of target debt ratios are of little empirical use. Further, target behavior cannot be adjudged correctly using debt ratios, as they could revert due to mechanical reasons. The purpose of this paper is to develop an alternative testing strategy to test the target capital structure.

Design/methodology/approach – The authors make use of a major "shock" to the debt ratios as an event and think of a subsequent reversion as a movement toward a mean or target debt ratio. By doing this, the authors no longer need to identify target debt ratios as a function of firm-specific variables or any other rigid functional form.

Findings – Similar to the broad empirical evidence in developed economies, there is no perceptible and systematic mean reversion by Indian firms. However, unlike developed countries, proportionate usage of debt to finance firms' marginal financing deficits is extensive; equity is used rather sparingly.

Research limitations/implications – The trade-off theory could be convincingly refuted at least for the emerging market of India. The paper here stimulated further research on finding reasons for specific financing behavior of emerging market firms.

Practical implications – The results show that the firms' financing choices are not only depending on their own firm's specific variables but also on the financial markets in which they operate.

Originality/value – This study attempts to assess mean reversion in debt ratios in a unique but reassuring manner. The results are confirmed by extensive calibration of the testing strategy using simulated data sets.

Keywords Capital structure, Trade-off theory, Mean reversion, Dynamic aspects of corporate leverage, Speed of adjustment, Target debt ratio

Paper type Research paper

1. Introduction

Benefits of corporate debt in its primitive version were conceptualized by Modigliani and Miller (1958, 1963) and later envisioned as a trade-off between taxes and bankruptcy costs by Kraus and Litzenberger (1973). Over the period of time, the trade-off theory has witnessed several developments, both in terms of theoretical descriptions and empirical testing. Starting with a static framework of a trade-off between taxes and bankruptcy in 1980s, the trade-off theory has moved to find the optimal capital structure in dynamic settings in the last decade.

Fischer *et al.* (1989) tested for the dynamic aspects of corporate leverage by introducing a model that could plausibly capture the required mean reversion of debt ratios. Dynamic trade-off discussing similar mean reversion has subsequently been tested with much intent and rigor in several influential articles in the new millennium[1]. The core focus of almost all these studies is to see mean reversion of firms to a said target debt ratio. In these studies, the target debt ratio has been characterized as a function of firm-specific variables, which were found significant in testing of the static version of the theory earlier. By employing the idea of mean reversion to the said target, these models estimated the speed of adjustment (SOA) of a firm towards its target. Although all these studies tested for the dynamic trade-off with similar models, their results were quite different. They estimated the SOA ranging from 6 to 35 percent in a year, indicating sluggish and aggressive target behavior, respectively.

The arguments in favor of mean reversion were made all the more convincing in non-parametric analyses of these papers in which they showed that debt ratios revert back to their previous levels after a major issuance or retirement of equity or debt[2].

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While elegant in its own exposition, the mean reversion literature also surfaced severe criticism. Shyam-Sunder and Myers (1999) and Chen and Zhao (2007) showed that mean reversion in debt ratios of the firms could be simply due to mechanical reasons.

A critical thought in the testing of dynamic trade-off was introduced by Chang and Dasgupta (2009) when they showed that the existing models for testing of dynamic trade-off lack adequate power to do so. They argued that mechanical mean reversion exists in simulated data sets independent of any target behavior. Importantly, they showed that similar SOAs can be attained even if firms follow a random financing behavior without any intended target at all. An important inference in this seminal paper was to seek testing strategies for target behavior by avoiding direct confrontations with debt ratios of the firms. According to Chang and Dasgupta (2009, p. 1794), "Looking at leverage ratios is not enough, and even possibly misleading."

Addressing the above-mentioned concerns raised by Chang and Dasgupta (2009), a new testing strategy was developed by Chauhan and Huseynov (2018) to examine the difference between intentional targets and random financing behavior. Here, the authors focus on the firm's financing choices or issuance activity as a measure of target following rather than the movement of the debt ratio from the targets, as used in the past studies. The authors find lack of any consistent target following by US firms.

Interestingly, DeAngelo and Roll (2015) showed that although the time series variation in corporate leverage is extensive, we still do not know much about determinants of corporate leverage. Accordingly, estimation of target debt ratios is fraught with difficulties and may not be of much use, given the current state of research to model them.

Our paper here builds on the above-mentioned methodological concerns to assess the extent of mean reversion in corporate leverage. The approach in this paper differs from the previous attempts of studying mean reversion in subtle but reassuring manner. To study mean reversion, first, we largely follow the approach of Chauhan and Huseynov (2018) and focus on issuance activities only and consider the firms' choice of debt or equity as conscious attempts to shift their debt ratios to their mean levels. However, unlike Chauhan and Huseynov (2018), second, we make use of a major "shock[3]" to the debt ratios as an event and think of a subsequent reversion as a movement toward a mean or a possible target debt ratio. By doing this, we no longer need to identify target debt ratios as a function of firm-specific variables or any other rigid functional form. Since we use firms' financing choices rather than movement in debt ratios *per se* to infer mean reversion, our study is also related to Maroney *et al.* (2019)[4].

Unlike the existing empirical evidence mostly on developed countries, India offers an emerging market setting. Emerging markets are endowed with inherent information asymmetry, underdeveloped credit markets, weaker creditors' protection and inordinate financial constraints that could affect firms' financing choice in a different manner than in a developed country[5]. Further, unlike other emerging markets, corporate financing in India follows some unique trends. For example, many small and big firms in India are owned by either family (business groups) or government (public sector enterprises). Further, informal sources of funding dominate formal financing channels (Allen *et al.*, 2012).

Indian firms tend to prefer debt over equity because of less developed equity markets, more information asymmetry, concerns for dilution of ownership and less penalty for bankruptcy, etc. Consequently, they may be deviating more from optimal leverage and would have less incentive for mean reversion. This is especially true for overlevered firms, which form the majority in our sample. However, at the same time, being emerging market growing firms, these firms are also cash starved, looking desperately for raising capital from financial markets, and hence they may have more incentives to revert to their optimal levels. These conflicting corporate financing features of Indian firms are unlike firms in the developed countries.

We develop several non-parametric tests to see through the data patterns in a unique but comprehensive manner. These tests provide us with testable implications for the mean reversion in corporate leverage. We also perform extensive calibration of our testing strategies by conducting the tests on simulated data sets for intentional mean reversion of varying intensity along with data sets crafted for possible random financing. Such calibrations validate our testing strategies and also act as robustness checks for our empirical analysis. We show that our tests reliably differentiate between firms' actual and random financing behavior.

We find that similar to the empirical evidences in developed economies, there is no perceptible and systematic mean reversion by these firms, and unlike developed countries, there is a strong support for the form of pecking order where proportionate usage of debt to finance firms' marginal financing deficits is extensive; equity is used rather sparingly.

The remaining paper is organized as follows. Section 2 discusses the data and development of several non-parametric analyses for drawing key implications about mean reversion supposedly followed by the firms in our data set. Section 3 tests these implications for the possibility of systematic mean reversion as per the trade-off theory. We also conduct several robustness checks along with the empirical testing in Section 4. Section 5 concludes the paper.

2. Data and perspectives on issue choice

We start our analysis by observing data patterns in the cross-section of firms to gain insights about possible mean reversion towards a target. Our data consist of all non-financial[6] (excluding real estate and utility firms) firms that were listed in National Stock Exchange (NSE) or Bombay Stock Exchange (BSE)[7] in India anytime between 1993 and 2016 (both inclusive) and for which data are available in Centre for Monitoring of Indian Economy databases. The data set consists of reported annual financial data of 5,105 firms during this period. For a given year, we have data for some or all of these firms. We have chosen this time period so as to study the behavior of the Indian firms post-liberalization and after initiation of structural reforms made in the early 1990s. Exclusion or inclusion of a subset of the total firm-year observations depends on the type of analysis performed below, and it is discussed in the relevant sub-sections thereof. The description of our key variables of interest in this paper is given in Table AI.

2.1 Target behavior: Non-parametric analysis

In this section, we develop a testing strategy to conduct a series of non-parametric tests. Through these tests, we wish to estimate the firms' probability to exhibit target behavior in a given year. While performing these tests, we focus on the transition points associated with major transitions in the actual debt ratios (ADRs). Since the median change in ADRs for the firms in our data set is 0.059 on the positive side and −0.049 on the negative side, we use the change in the magnitudes of more than −/+ 0.05 in ADRs to classify them as major transitions at $t = 0$[8].

Using this framework of analysis, we have two possibilities at $t = 0$: the shock at $t = 0$ might have digressed a firm from its equilibrium leverage (or target) or the shock has helped a firm to attain its target. In the former case, the firm would like to retrace its leverage after the shock, and in the latter, the firm might have been trying to attain its target for quite some time even before making the transition. Accordingly, we focus on the "target" behavior of the former type of firms in the future for the next five years, that is at $t = 1$–5, and also for the latter type of firms in the past five years, that is at $t = -4$–0.

At $t = 0$, a firm might have faced shock of magnitude more than 0.05 in the positive or negative side as changes in their ADRs over last year ($t = -1$). Based on the type of transition (positive or negative) at $t = 0$, we have four categories of firms at any time t, which are as follows:

- Category 1 (C1): firms facing negative shock of magnitude more than 0.05 as change in their ADRs at $t = 0$ and a positive financing deficit (PDEF) in any period t.

- Category 2 (C2): firms facing negative shock of magnitude more than 0.05 as change in their ADRs at $t = 0$ and a negative financing deficit (NDEF) in any period t.
- Category 3 (C3): firms facing positive shock of magnitude more than 0.05 as change in their ADRs at $t = 0$ and a PDEF in any period t.
- Category 4 (C4): firms facing positive shock of magnitude more than 0.05 as change in their ADRs at $t = 0$ and a NDEF in any period t.

Financing deficit is the sum of externally raised capital through debt and/or equity in a particular year, t. Following Chauhan and Huseynov (2018), our definition of target behavior is motivated by the movements in ADRs brought about by net security issuances only. The categorization above helps us to define target behavior in terms of issuing activity only, as suggested by Chang and Dasgupta (2009).

For analyzing the future target behavior, we seek reversion in their ADRs, assuming that these firms wish to revert to their ADRs (the target) just before the transition, that is ADRs at $t = -1$. Thus, for C1 firms at any time t in future, when they have faced a sharp drop in ADRs at $t = 0$, a reversion could occur if they issue debt in the future period t, unless they have successfully retraced back to their targets before t. Although their actual movement in ADRs could be different because of simultaneous equity issuances and due to the effect of retained earnings, we define this act as a conscious attempt for reversion. Unless these firms could revert back fully to their initial levels at or before t, such an attempt would always bring the next period ADRs closer to their levels before the transition, irrespective of the changes in retained earnings to affect ADRs[9]. Even if the ADRs just before the transition might not have been the precise targets for the firms, this is the best firms could do to follow their targets while being in a given category (i.e. for a given a shock and financing deficit). If firms would like to revert back, this is precisely what we would call as a "target" behavior. Following this idea, we define target behavior for each category as follows:

- C1: firm issues debt at any time t in the future.
- C2: firm retires equity at any time t in the future.
- C3: firm issues equity at any time t in the future.
- C4: firm retires debt at any time t in the future.

Similarly, to analyze the target behavior in the past, that is before $t = 0$, we assume that at any time t in the past ($t = -5$–-1), firms wish to intentionally attain a level of ADR just after the transition (a target) at $t = 0$. Thus, for example, for C1 firms at any time t in the past, they could reach closer to their targets if they issue equity at t+1. As mentioned before, this is the best a firm could do to attain its target while being in a given category at time t. Following this idea, for each category of these firms, target behavior can be defined as follows:

- C1: firm issues equity at any time t in the past.
- C2: firm retires debt at any time t in the past.
- C3: firm issues debt at any time t in the past.
- C4: firm retires equity at any time t in the past.

To explore the target behavior for the firms in our data set, we start by estimating the probability of target behavior at any time t in the past and in the future after $t = 0$. To do this, we follow the definition of the target behavior mentioned above for each category of firms distinctly and subsequently identify the number of firms showing target behavior and not showing target behavior. The probability of target behavior at any time t is then defined as the ratio of firms showing target behavior to the sum of the firms showing target

and non-target behavior. While doing so, we check for those firms that have attained their target at any time t before $t = 5$ (for future) and after $t = -4$ (for past). For a particular period in which firms could attain their targets, we include such firms as showing target behavior and subsequently drop them from the analysis from the next period onwards. The exercise is repeated for each transition point from 1994 to 2016.

To show the results in a concise manner, we averaged the probability for any time t across all the transition points from 1994 to 2016, and they are shown for $t = -4$–+5 in Figure 1. As can be seen, the probability that a firm exhibits target behavior in any given year is not much better than the probability that could emerge if the firm would rather finance itself on the basis of tossing of a coin. This implies that the probability that a firm would issue debt when it should have issued equity to follow its target, as per the classification above, is roughly equal. Thus, there seems to be no perceptible target behavior.

The above-mentioned analysis has an important dimension to consider slow adjustments towards a target, given the concerns over adjustment costs and other friction, as in Leary and Roberts (2005). We, therefore, analyzed the behavior of these firms for five years before and after the transition. Further, the methodology adopted to test the target behavior seems robust to the assumption of any functional form of target debt ratios. Even when firms' targets are not strictly ADRs just before and just after the transition at $t = 0$ but any level closer to them, the estimation of probabilities simply reflects the proportion of the firms moving towards the target as compared to those firms that do not do so in a given period t. Given such concerns, if firms are really chasing a target, while facing some adjustment costs, they would gradually exhibit an increase in target behavior over time after they have made the transition at $t = 0$. However, such is not the case.

To further accommodate adjustment costs and slow response of these firms after the transition, we assess the cumulative target behavior of these firms before and after the transition in the next leg of our testing. In this part, we hypothesize that a firm may not immediately exhibit target behavior due to adjustment costs, and therefore it would exhibit target behavior over time. In such a case, cumulative issuances of debt and equity up to any time t after the initiation of the target chase would be considered instead of issuance or retirements only in a given period.

For analyzing the future (past) target behavior, it is assumed that firms reckon their targets, which are ADRs just before (after) the transition at $t = 0$, at the initiation of their target chase at $t = 0$ ($t = -4$) and prepare themselves to attain them in the coming times. To clarify the matter, for example, we observe the cumulative target behavior in the past, supposing time $t = -3$, by finding total debt and equity issued or retired by a firm from $t = -4$ to $t = -3$ and then see if it has an overall PDEF or NDEF. Based on the transition at $t = 0$, then this firm can be classified as C1–C4. It can be assumed that this firm turns

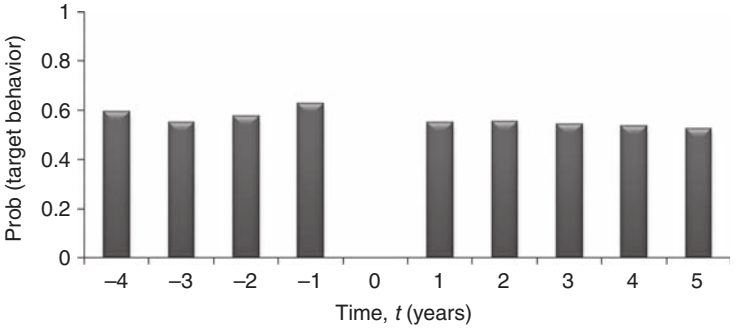


Figure 1.
Probability of exhibiting target behavior

out to be C2; then, according to the definition of target behavior set above, this firm should have retired debt on an aggregate from $t = -4$ to $t = -3$. In case it fails to do so, then it does not exhibit target behavior. Similarly, to analyze the target behavior in the future, we study net debt and equity issuances for each firm up to any time t in the future starting from $t = 0$.

Figure 2 shows the result of this exercise wherein the figure is drawn similar to Figure 1. As can be seen, the results are not different from our previous analysis for the single period target behavior. Target behavior is largely absent even when we consider adjustment costs concerns.

In this series of testing for target behavior, we also estimated the proportion of firms that continue to exhibit target behavior once they exhibit such a behavior at the start of their target chase. For this exercise, we identified firms that exhibit target behavior at $t = -4$ and $t = 1$ according to their target being ADR levels just after or just before the transition at $t = 0$, respectively. Subsequently, we observed their behavior going ahead from $t = -3$ to 0 and from $t = 2$ to 5, respectively. We then estimated their proportions with respect to their initial strength at $t = -4$ or $t = 1$. While doing this, if a firm has already attained its said target, then we included this firm as a firm showing target behavior in all remaining periods. The results of this exercise are shown in Figure 3. By design, the fraction of firms showing target behavior starts at $t = -4$ and $t = 1$, respectively, for the two types of targets. As can be seen, even firms that exhibited target behavior in the past do not persist to follow targets in the coming times. Quite contrary to target behavior, an increasing number of firms deviate from the said target behavior over a period of time.

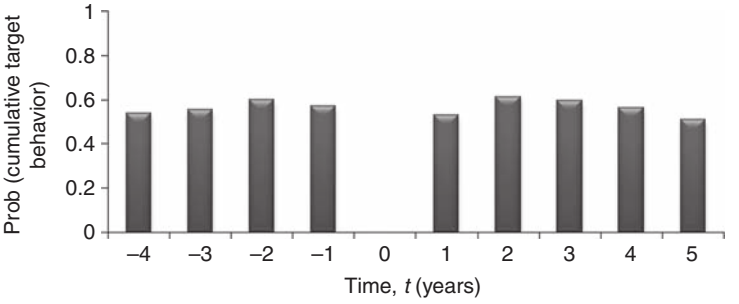


Figure 2.
Probability of exhibiting cumulative target behavior

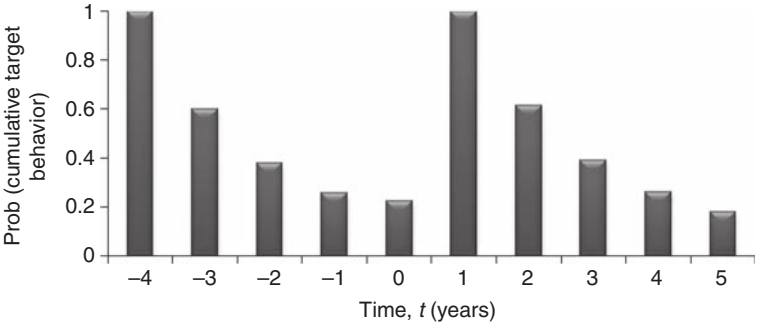


Figure 3.
Probability of exhibiting cumulative target behavior for firms that continue to exhibit target behavior

3. Target behavior: empirical testing

Non-parametric analysis in the previous section strongly rejects the notion of any perceptible target behavior or mean reversion. However, it is imperative to statistically analyze the cross-sectional and time series variation in the firms' financing behavior to draw final conclusions and to shed light on relative importance of financing choices of these firms. In this section, we test for target behavior of the firms in our data set.

We build our methodology on three important concerns relating the tests of mean reversion in corporate leverage. First, the use of ADRs could be misleading due to mechanical mean reversion in debt ratios (Chen and Zhao, 2007; Shyam-Sunder and Myers, 1999). Second, Chang and Dasgupta (2009) showed through several simulations that the dynamic panel models used in the past literature to estimate SOA lack the power to do so. SOAs, estimated using a simulated data set for random financing, are found to be very much similar to those identified through these models. Finally, since DeAngelo and Roll (2015) found extensive, but largely unexplained, time-series variation in debt ratios, the estimation of target debt ratios using firm-specific characteristics may not be useful.

Heeding to these concerns, and following Chauhan and Huseynov (2018), we propose a testing strategy that could take care of these concerns, at least partially. First, we try to focus only on issuance activities of the firms and not on the movement of ADRs, *per se*, to conclude about the target behavior. However, unlike Chauhan and Huseynov (2018) and following concerns in DeAngelo and Roll (2015), we avoid defining targets as a function of firm-specific variables. Instead, we define targets as the value of ADRs just before a major shock to these ADRs anytime during the period of analysis[10].

We make use of the target behavior as defined in the previous section for firms facing negative or positive shocks to their ADRs and also facing a positive or NDEF. Whenever firms tend to exhibit mean reversion, as per the shock and the financing deficit faced by them, we expect "right" issuance or retirement of the securities chosen. Thus, for example, the "right" security of choice to exhibit target behavior for C1 firms is to issue debt and for C2 firms is to retire equity.

To assess the extent of right issuance or retirement, we classify and segregate firms for a given period in one of the four categories identified in Section 2.1. We then make use of the basic model used by Shyam-Sunder and Myers (1999), referred as SSM model henceforth, to test for the extent of the "right" security in the financing deficit for a given period. However, instead of only debt being used as a dependent variable in the SSM tests, we test for the extent of the usage of the "right" or the specified security for a particular category in the form of debt or equity using the basic model. Thus, the model to test for mean reversion toward a target is:

$$S_{i,t} = \alpha + \beta.\mathrm{FDEF}_{i,t} + \varepsilon_{i,t}, \tag{1}$$

where $S_{i,t}$ refers to the net debt or equity issuance (the "right" security) for a firm i in period t and FDEF is the total financing deficit. For a firm to exhibit target behavior in period t, the extent of the usage of the "right" security will simply outweigh the usage of the "wrong" security. The extent of usage will be simply represented by the slope coefficient, β, for FDEF. A perfect target behavior would have $\beta = 1$ and perfect non-target behavior would have $\beta = 0$. Interestingly, since the sum of the "right" and the "wrong" security is always unity, the number $(1-\beta)$ will reflect the usage of the "wrong" security. The adjusted R^2 of the relation would further suggest the degree of association of the dependent and independent variable by reflecting the percentage variation explained.

To prepare the data for these tests, we identify the shock to ADR for each firm with respect to its level in the immediately preceding year. We identify such shocks for each year from 1994 to 2015[11]. We have included all firm-year observations with a shocks to

their ADRs exceeding 0.05 in magnitudes. Subsequently, we have identified the financing deficit faced by these firms in the next year of incurring the shock. This is the sum of net debt and equity issuances in a given year. Thus, for example, to be included in the analysis, a firm in the year 1994 ($t = 0$) should have faced a positive or negative shock to its ADR of more than 0.05 with respect to its level in the year 1993 ($t = -1$) and a positive or NDEF in the year 1995 ($t = 1$).

Using the shock at $t = 0$ and financing deficit faced at $t = 1$, we then categorize the firms in four categories as mentioned before. The variables $S_{i,t}$ and $\text{FDEF}_{i,t}$ are scaled by total capital, which is the sum of total debt and equity in the previous year, that is at $t = 0$. To exclude outliers from the analysis, we have included firm-year observations with magnitude of both these variables less than unity only.

We conduct the tests by using (1) for all the four categories of firms separately in our data set. Results for the entire data set and for the four categories are shown in Table I. Right securities to be followed for C1–C4 are debt issuance, equity retirement, equity issuance, and debt retirement, respectively. As can be seen from Table I, only C1 and C4 firms show relatively larger usage of right security for target behavior. C1 shows modest target behavior, whereas C4 shows aggressive target behavior. However, it would be misleading to conclude that firms in any particular category show target behavior. This is because the results only interpret relative usage of debt or equity, and the implications for target behavior follow from their correct usage. Observing the results in Table I, it can be seen that debt usage is relatively more in all the four categories (lower slope coefficients for equity in C2 and C3 signify less equity or equivalently more debt usage in these categories). This is conforming to our analysis in the previous sections. Further, instead of implicating target behavior for C1 and C4, extensive debt usage for all the firms indicates the pecking order of financing where debt is preferred over equity. Thus, the observed target behavior in C1 and C4 categories may be in part a response to follow a pecking order led by debt.

Summarizing the results in this section, we find that similar to the empirical evidences in developed economies, there is no perceptible and systematic mean reversion or target following by these firms, and unlike developed countries, there is a strong support for a form of pecking order where proportionate usage of debt to finance firms' marginal financing deficits is extensive; equity is used rather sparingly. Although we do not formally identify the reasons for such financing behavior in this paper, we recall several possibilities. These results may be reflective of inordinate information asymmetry between firms and investors in a typical emerging market. Further, since firms are largely family owned in India, equity issuance could dilute family stakes and, hence, could have adverse implications for their control over these firms. Moreover, since capital markets are

Right security	Debt		Equity		Equity		Debt	
Category	C1		C2		C3		C4	
	Coefficients	*t*-stat.	Coefficients	*t*-stat.	Coefficients	*t*-stat.	Coefficients	*t*-stat.
Intercept	0.020	9.103	0.006	6.435	−0.020	−11.212	−0.007	−6.579
FDEF	0.668	90.509	0.061	9.096	0.329	50.749	0.939	144.170
Adj. R^2	0.554		0.021		0.229		0.856	
N	7,904		4,579		10,392		4,199	

Table I.
Target following behavior for shocks to ADRs more than 0.05 in magnitude

Notes: All the firms are classified into four categories on the basis of the type of shock to their debt ratios (positive or negative). For example, C1 represents the category of firms facing negative shocks to their ADR at $t = 0$ coupled with positive financing deficit in any period t; accordingly, the right security required for reversion in their ADR would be debt. We test the target following financing behavior by using Equation (1). The slope coefficient of FDEF indicates the extent of the issuance of the right security

still developing in India, smaller firms would find it relatively difficult to raise capital through equity and hence may be using debt extensively. Additionally, financing through banks and informal channels are the dominant source of funding in India, implying a disproportionate use of debt for marginal financing[12].

4. Robustness

4.1 Simulated target and random financing behavior

To compare the relative usage of right security by the firms, we next deploy our testing strategy to a simulated data set of aggressive target behavior and then to a data set formed out of random financing choices. Results from these simulations should show βs close to unity for right security in case of target behavior and βs close to 0.5 in case of random financing.

To simulate the data set for target behavior, we define aggressive target behavior as follows. We assign a probability of 0.5 for a firm-year observation to be financed only with the "right" security, a probability of 0.35 for a firm-year observation to finance 90 percent of the financing deficit with the "right" security and the remaining 10 percent with the "wrong" security, a probability of 0.10 for a firm-year observation to finance 10 percent of the financing deficit with the "right" security and the remaining 90 percent with the "wrong" security, and a probability of 0.05 for a firm-year observation to be financed only with the "wrong" security. Table II summarizes the results for this version of simulated target behavior. As can be seen, the slope coefficients and the adjusted R^2 indicate the extensive use of "right" security in financing the deficit.

We next simulate the random financing behavior by assuming that the "right" security for a firm-year observation is a fraction of the financing deficit where the fraction is uniformly distributed between 0 and 1; the difference of the financing deficit and the "right" security is then financed with the "wrong" security. Table III shows the results pertaining to this simulation. As expected, the slope coefficients are almost equal to 0.5 and the R^2 for both types of securities are equal and moderate in values.

The results pertaining to simulated data sets show that the model has sufficient power to reject alternative financing behavior as compared to an assumed target behavior. To reinforce this idea, we further tested the model for an alternative but weaker target behavior. Our testing strategy could successfully differentiate a weaker form of target behavior from a stronger form. However, we do not report these findings for the sake of brevity.

Right security	Debt		Equity		Equity		Debt	
Category	C1		C2		C3		C4	
	Coefficients	*t*-stat.	Coefficients	*t*-stat.	Coefficients	*t*-stat.	Coefficients	*t*-stat.
Intercept	−0.002	−1.596	−0.001	−0.776	0.004	3.177	−0.003	−2.192
FDEF	0.847	158.678	0.814	114.497	0.792	154.066	0.789	105.660
Adj. R^2	0.792		0.772		0.732		0.760	
N	7,921		4,634		10,343		4,175	

Notes: All the firms are classified into four categories on the basis of the type of shock to their debt ratios (positive or negative). In this simulation, we assign a probability of 0.5 for a firm-year observation to be financed only with right security, a probability of 0.35 for a firm-year observation to be financed with 90 percent right security and 10 percent with wrong security, a probability of 0.10 for a firm-year observation to be financed with 90 percent wrong security and 10 percent with right security, and a probability of 0.05 for a firm-year observation to be financed with wrong security. We test for target following as before

Table II.
Simulated target behavior for intense target following

Right security Category	Debt C1		Equity C2		Equity C3		Debt C4	
	Coefficients	*t*-stat.	Coefficients	*t*-stat.	Coefficients	*t*-stat.	Coefficients	*t*-stat.
Intercept	−0.002	−2.282	0.000	−0.446	0.001	1.631	−0.001	−2.271
FDEF	0.502	358.353	0.513	291.882	0.498	396.101	0.521	258.706
Adj. R^2	0.678		0.635		0.597		0.621	
N	7,725	0	4,849	0	10,016	0	4,484	

Notes: All the firms are classified into four categories on the basis of the type of shock to their debt ratios (positive or negative). In this simulation, we assume the right security for a firm-year observation is a fraction of the financing deficit where the fraction is uniformly distributed between 0 and 1. The difference of the financing deficit and the right security is then financed with the wrong security. We test for target following as before

Table III.
Simulated target behavior for random financing

4.2 Adjustment cost concerns

In the next stage of our testing of target behavior, we acknowledge that firms may face several constraints in terms of issuing security of their choice so as to conform to target behavior at large[13]. To test for target behavior when firms may move to their targets in rather gradual manner, we observe their behavior several years after they have made the transition at $t = 0$. We continue to hypothetically assume that the target levels are the ADRs just before the transition, that is ADRs at $t = -1$. We control for the movement in subsequent ADRs for the firms; in case they reach the target before a period t, this firm will be excluded from the analysis after the period t.

To develop the testing strategy for accommodating concerns for adjustment costs, we observe the cumulative financing deficit of a firm in the year $t = 2$, 3, 4 and 5, starting from year $t = 1$. Similarly, we sum up the total net issuance of debt and equity over these times. We then test for target behavior in the same manner as described above for the core results. Thus, we acknowledge that although firms might face financing constraints initially and immediately after the transition to revert back, they may gradually move towards the target over a period of time. Therefore, in case firms follow a target, their cumulative ability to issue security of their choice should reveal this intent.

Table IV, panels A–D, shows the result of this test for $t = 2$, 3, 4 and 5 in different panels. The results for any given period are largely similar to any other period. On the contrary, these results are weaker than our core results in Table I. These results, thus, confirm non-conformance to any target behavior even after accommodating the delay associated with the perceived adjustment costs in choosing the "right" security at any given time.

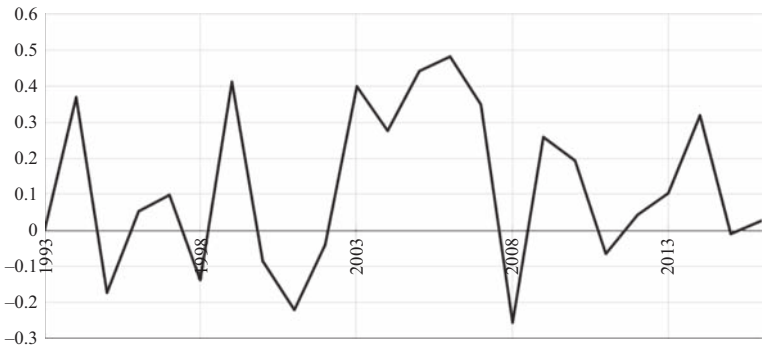
4.3 Effect of economic activity

In our next leg of empirical testing for target behavior, we check whether a target behavior could be exhibited by the firms during economic booms and downturns. This is motivated by the observations in Baker and Wurgler (2002) in which the authors claimed that firms tend to time their equity issuances, and the resulting capital structure at any point in time is the reflection of these issuance activities[14]. It is quite possible that firms may exhibit target behavior during economic booms or depressions. To test for this possibility, we segregated firm-year observations for years in which annual aggregate stock market returns are high and for those years in which they are low. Figure 4 shows the breakup of annual returns on the broad market index, SENSEX, of BSE in India. Based on the data in the figure, we identify financial years with negative returns less than −5 percent as periods of economic downturns and years with positive returns more than 5 percent as periods of economic boom.

Right security	Debt		Equity		Equity		Debt	
Category	C1		C2		C3		C4	
	Coefficients	*t*-stat.	Coefficients	*t*-stat.	Coefficients	*t*-stat.	Coefficients	*t*-stat.
Panel A								
Intercept	0.027	9.957	0.06	25.406	−0.02	−9.177	−0.046	−14.255
FDEF	0.587	73.665	0.581	70.405	0.274	42.632	0.584	66.282
Adj. R^2	0.487		0.591		0.191		0.589	
N	6,809		4,088		9,181		3,649	
Panel B								
Intercept	0.024	6.988	0.061	19.794	−0.016	−4.791	−0.044	−7.975
FDEF	0.567	61.478	0.527	52.615	0.24	28.606	0.668	46.104
Adj. R^2	0.447		0.492		0.11		0.475	
N	5,564		3,412		7,858		2,800	
Panel C								
Intercept	0.018	3.473	0.069	17.478	−0.01	−2.053	−0.054	−6.811
FDEF	0.577	44.019	0.542	43.083	0.228	21.21	0.666	34.237
Adj. R^2	0.336		0.441		0.074		0.387	
N	4,559		2,807		6,688		2,210	
Panel D								
Intercept	0.008	1.305	0.063	13.751	−0.02	−3.227	−0.061	−5.432
FDEF	0.593	39.145	0.492	33.948	0.256	20.458	0.649	23.564
Adj. R^2	0.322		0.367		0.083		0.27	
N	3,837		2,370		5,486		1,788	

Notes: All the firms are classified into four categories based on the type of shock to their debt ratios (positive or negative). We observe the cumulative financing deficit of a firm in the year t=2, 3, 4 and 5 starting from year t=1 by summing up the total net debt and equity issuance over these times and then test for target following as before

Table IV.
Cumulative target behavior at $t = 2, 3, 4, 5$



Source: Reserve Bank of India

Figure 4.
Broad equity market movement using SENSEX

We repeat the target testing as before by using Equation (1) for the firm-year observations segregated into the two parts. Results for the tests for all four categories of firms and for the two parts are shown in Table V. The results are qualitatively very much similar to each other and to our core results in Table I. There seems to be no influence of economic activities on firms' financing behavior.

Right security Category	Debt C1		Equity C2		Equity C3		Debt C4	
	Coefficients	*t*-stat.	Coefficients	*t*-stat.	Coefficients	*t*-stat.	Coefficients	*t*-stat.
Panel A								
Intercept	0.013	2.776	0.009	4.072	−0.02	−6.174	−0.004	−1.828
FDEF	0.669	43.329	0.11	8.017	0.29	23.745	0.986	101.294
Adj. R^2	0.554		0.066		0.217		0.914	
N	1,802		1,076		2,426		1,149	
Panel B								
Intercept	0.016	5.189	0.009	5.991	−0.011	−5.156	−0.008	−4.953
FDEF	0.682	64.166	0.072	7.722	0.245	32.481	0.961	138.906
Adj. R^2	0.558		0.026		0.171		0.893	
N	3,882		2,637		6,077		2,751	

Table V.
Target behavior in economic downturns and economic booms

Notes: All the firms are classified into four categories based on the type of shock to their debt ratios (positive or negative). We repeat the target testing by using Equation (1) after identifying the financial year with economic downturn and in economic boom (Index returns less than −5 percent)

4.4 Effect of firms' size

In our league to test for target behavior we also check if the target behavior is influenced by the size of the firms. To test this, we segregate firms according to their size into micro, small, medium, large and super large firms. We have used the definition used by Micro, Small and Medium Enterprises Development Act, 2006 of India[15]. To compare the invested capital bases of these firms, we have rescaled their total capital to 2001 currency units of INR using the consumer price index for industrial workers with base year 2001.

Results for target behavior classified according to the size of the firm are shown in Table VI, panels A–E. Results are qualitatively similar for all size of the firms with minor differences. Debt usage is seen to be extensive for micro enterprises for all four categories of the firms. This is probably due to the financial assistance provided by the banking channels to micro enterprises to comply with MSME aid policies of the government in India. They tend to rely primarily on debt for their financing needs. Further, category 2 firms of small and medium enterprises seem to retire relatively more debt than larger firms in the category. Similarly, super large firms in category 3 seem to issue more debt than others, except micro enterprises. Thus, target behavior is violated more often and by the firms of all sizes[16].

5. Conclusion

In this paper, we heed to the three most important concerns regarding the testing of mean reversion in the past literature. These concerns relate to mechanical mean reversion in debt ratios, inability of dynamic panel models to yield correct speed of reversion and the futility of estimating target debt ratios. Accordingly, we relook into the idea of target behavior and redefine target movements in terms of security issuances that could help firms to chase their target debt ratios after they have incurred a shock to their ADRs. Further, we use a major shock to debt ratio to denote a transition from their targets instead of using a functional form of target debt ratios.

For analyzing the target behavior, we confront ourselves with two complementary questions. First, what is the probability for a firm to exhibit target behavior in a given period? This question primarily seeks to find right choice of securities by the firms, for a given shock to their debt ratios and also for a given financing deficit, to make the intended move toward their targets. Second, to what extent the securities are issued in line with the intended target behavior or what is the relative proportion of these securities to finance the deficit in a given period? The first question is addressed through a comprehensive

Right security Category	Debt C1		Equity C2		Equity C3		Debt C4	
	Coefficients	*t*-stat.	Coefficients	*t*-stat.	Coefficients	*t*-stat.	Coefficients	*t*-stat.
Panel A								
Intercept	0.006	0.446	−0.001	−0.544	−0.013	−1.003	−0.004	−1.881
FDEF	0.800	18.357	0.003	0.336	0.211	4.698	0.993	121.670
Adj. R^2	0.646		−0.004		0.098		0.985	
N	221		266		232		269	
Panel B								
Intercept	0.023	7.494	0.008	7.037	−0.025	−10.088	−0.006	−4.724
FDEF	0.665	64.088	0.106	11.761	0.351	38.869	0.955	119.344
Adj. R^2	0.549		0.062		0.249		0.871	
N	4,019		2,488		5,430		2,512	
Panel C								
Intercept	0.029	4.850	0.011	4.386	−0.020	−4.499	−0.007	−2.727
FDEF	0.594	28.867	0.135	7.149	0.303	19.271	0.929	53.347
Adj. R^2	0.464		0.092		0.241		0.873	
N	1,149		591		1,391		495	
Panel D								
Intercept	0.013	3.148	0.015	6.202	−0.021	−5.431	−0.013	−4.582
FDEF	0.672	47.437	0.237	13.110	0.370	27.147	0.848	46.285
Adj. R^2	0.563		0.149		0.239		0.732	
N	2,080		1,165		2,795		937	
Panel E								
Intercept	0.013	1.915	0.007	1.802	0.000	0.033	−0.004	−0.689
FDEF	0.687	23.880	0.201	6.257	0.262	9.398	0.894	21.640
Adj. R^2	0.613		0.182		0.162		0.781	
N	429		205		540		157	

Notes: All firms are classified into five groups: micro (invested capital less than INR2.5m), small (invested capital INR2.5–50m), medium (invested capital INR50–100m), large (invested capital INR100m–1bn) and super large (invested capital more than INR1bn). Again within these five groups, all the firms are classified into four categories on the basis of the type of shock to their debt ratios (positive or negative). We then test for the target behavior as before

Table VI. Target behavior for various size of the firms

non-parametric analysis, whereas the latter is answered by using a systematic statistical approach. While answering these questions, we acknowledge the fact that firms face varying degree of constraints to choose the security of their choice to make an intended move toward their target. This could delay their chase for the target.

Our results in the paper show that firms in our data set do not exhibit any systematic mean reversion or target behavior. Target behavior could not be seen even after acknowledging the delays caused probably due to adjustment costs and other frictions. The results rather tentatively indicate extensive use of debt by firms to finance their deficits.

These findings may be reflective of inordinate information asymmetry between firms and investors in a typical emerging market. Firms in such settings may respond by issuing more debt for their marginal financing needs on account of it being less information sensitive. Further, firms may refrain from issuing equity since they are largely family owned in India, and selling stakes to outsiders may dilute their control over these firms. Additionally, underdeveloped capital markets in emerging markets also lead firms to rely more on debt financing. This is because smaller firms may find it difficult to raise equity, and firms in these emerging markets may rely heavily on bank credit and informal funding.

Our findings have important implications for corporate finance managers and policymakers in the emerging markets. Our findings suggest that emerging market firms tend to treat debt as a relatively flexible source of financing without bothering about their optimal levels at a given time. Further, since India is a bank-based economy, the policy makers can use or refer to this study to strengthen the lending channels, and they can take serious steps to improve the corporate debt market. Strong corporate debt markets could ease borrowings for larger firms, thereby allowing bank funds to be effectively used by much needy smaller firms.

Notes

1. See Hovakimian *et al.* (2001), Goldstein *et al.* (2001), Strebulaev (2007), Hennessy and Whited (2005), Flannery and Rangan (2006), Huang and Ritter (2009), Flannery and Hankins (2013), DeAngelo and Roll (2015), etc.
2. See Leary and Roberts (2005), Alti (2006) and Lemmon *et al* (2008), for example.
3. We referred to a movement in book value debt-to-total capitalization ratios of more than −/+0.05 in values at any time over their previous year levels as a major shock.
4. We thank an anonymous referee to highlight this relational contribution.
5. In emerging markets' context, Tse and Rodgers (2014) showed that firms' borrowing power in underdeveloped credit markets is an important determinant of their financial leverage.
6. Financial firms include banks, insurance and life assurance firms and investment trusts.
7. BSE commenced its operation in 1875, and it is the oldest exchange in Asia. NSE, along with BSE, contributes to more than 99 percent of the trading in equity securities in India.
8. All our findings are qualitatively similar when we use alternate changes of 0.025 or 0.1 in magnitude. Results for such changes are available on request.
9. Unless these firms could revert back fully to their initial levels, the effect of retained earnings to change the ADRs will remain exogenous with respect to firms' financing choices.
10. Even if a firm has such multiple shocks, we include all of them for our analysis. Our analysis essentially reports the effect of only the immediate shock on subsequent financing choices of the firms and treats all of them discretely.
11. ADRs for the year 1993 are used to determine shocks for the year 1994. Further, since data are available till 2016, 2015 will be the last year to estimate shocks, which will be reconciled with the financing choices in 2016.
12. Allen *et al.* (2012) found that 45 percent of the total financing is through internal funds, 30 percent through alternate or informal financing sources, 18.2 percent through banks and only 6.5 percent from markets in India.
13. We continue to ignore, though, that firms may get rationed for the total capital required by them for financing their financing needs. We treat financing deficit as exogenous or given. For the sake of exposition of target behavior, we are only concerned with fraction of financing deficit to be financed by security of their choice.
14. Cotei *et al.* (2011), among others, while analyzing data across the globe also found support for the market timing hypothesis of Baker and Wurgler (2002). We chose the margins of 5 percent each side so as to comfortably exclude the times with very low volatility in stock markets and to ensure that we have sufficient observations to work out statistical tests with adequate confidence.
15. Firms having invested capital less than INR2.5m are classified as micro enterprises; INR2.5–50m as small; INR 50–100m as medium and more than INR100m as large enterprises. We have added another classification of super large firms having invested capital of more than INR1bn.

16. We also categorize firms according to their age (measured as the span of data available for them in the sample duration) and their growth orientation (measured as change in revenue over last year), and we found that the results are qualitatively similar to those reported in Table I.

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Appendix

Table AI. Description of variable of interest and descriptive statistics

Variable	Description	Mean	Median	SD
ADR (D/D+E)	Actual debt ratio	0.424	0.391	0.251
FDEF/(D+E)	Total financing deficit as a proportion of total capital	0.077	0.032	0.218
Debt issue/(D+E)	Net debt issuance as a proportion of total capital	0.053	0.020	0.196
Equity issue/(D+E)	Net equity issuance as a proportion of total capital	0.024	0.000	0.104

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