4. Research Method

4.1 Factors affecting corporate saving
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4. Research Method

4.1 Factors affecting corporate saving

We have identified research objectives as mentioned in the previous chapter and observed the following variables as the possible determinants of corporate saving in India. Variables have been selected at four dimensions namely firm level; macroeconomic level; industry level and management level.

Figure-8

Factors affecting corporate saving

Note- The sign of expected association between corporate saving and a possible determinant is given in the parenthesis.
4.2 Variable Specification

The variable of interest (dependent variable) for this study is ‘Corporate Saving’ that can be crudely measured as current income over current expenditure. This study worked with the gross saving of firm and incorporated the definition of corporate saving in India used by RBI/CSO as below-

“The gross saving of public and private limited companies is taken as equivalent to the retained profits (excluding non-operating surplus/deficit) plus depreciation provision” (CSO sources and method, 2012 report).

The non-operating surplus, deficit comprises

(a) Profit/loss on account of
   (i) sale of fixed assets, investments etc.,
   (ii) revaluation/devaluation of foreign currencies,
(b) Provisions no longer required, written back,
(c) Insurance claims realized, and
(d) Income or expenditure relating to the previous years and such other items of non-current nature.

One of the observed limitations of national accounts statistics is that the estimates for public and private limited companies are obtained separately by blowing up the sample results on the basis of coverage of paid-up capital (PUC) of sample companies in the PUC of all companies. This becomes a limitation because this global PUC does not get its filtering done by removing the shut down firms; those that have ceased their business operations. Moreover, this global PUC is not partitioned with respect to sectoral PUC. This becomes important because there may be variations among the sectoral PUC. The proposed study will incorporate sector level differences by analysing the two broad sectors manufacturing and services separately.
In earlier literature, corporate saving has been captured in two broad approaches, one is the cash holding approach (cash saving) and the other is total firm-level corporate saving. In this study, corporate saving (gross saving) as mentioned above is calculated as ‘retained profits minus prior-period and extraordinary income plus prior-period and extraordinary expenses plus depreciation’. It is normalised by total assets at the beginning of year. Other studies have used different definitions for capturing corporate saving (see Table-10).

Identified firm level determinants from earlier literature (see Table-11) include previous year’s saving, profitability, effective corporate tax, interest burden, and Tobin’s Q. Macroeconomic level determinants (see Table-12) may include GDP growth rate, real effective exchange rate, inflation rate, public debt to GDP, and financial depth.

**Lagged corporate saving:** It is the dependent variable at period, t-1, that has been introduced to test the preposition that previous year’s saving will positively affects current year's saving (Bhole & Mahakud, 2005; Özmen et al., 2012). This variable has been brought from the literature on aggregate saving (Loayza et al., 2000; Grigoli et al., 2014). Lagged saving is found to have a positive effect on current saving. This variable captures the dynamic persistence in saving behaviour that is the positive effect of previous year’s saving on current year’s saving. This variable captures how much last year’s decision of saving may affect this year’s decision of saving. In the Indian context, Bhole and Mahakud (2005) analyzed firm level variables and found that the lagged values of retention ratios positively affect the current retention ratio. However, our study attempts to bring the effect of lagged corporate saving on current corporate saving in the presence of both firm and macroeconomic level variables.
**Profitability:** Profitability (profit margin) has been defined as ‘profit after tax (PAT) divided by sales’. An increase in profit reflects the increase in source of saving, thus current profitability may have a positive relationship with corporate saving (Auerbach (1982); Bhole & Mahakud, 2005; Jangili & Kumar, 2011; Lintner (1956); Özmen et al., 2012). Higher firm level of profits would suggest an increase in the saving capacity of the firm.

**Effective corporate tax rate:** It is defined as ‘total taxes paid divided by profit before tax’. Effective corporate tax rate may have a negative or positive sign that effectively depends on whether this variable has decreased or increased over the time period. A decline in this variable will increase the firm level saving. Also if the change in this variable is purely due to increase in profits it may observe a positive relationship with saving even if the total tax paid has risen over time. Feldstein and Flemming (1971) and Hsieh and Parker (2006) found that a consistent decrease in effective corporate tax rate over the time period results in increased level of corporate saving for the firms in the Britain and Chile respectively. Also IMF study (2006) studied the corporate saving of G-7 countries and found that higher corporate saving is mainly because of lower taxes for some countries. An increase in corporate tax payments will reduce the available source of saving. In the Indian context, Bhole and Mahakud (2005) and Jangili and Kumar (2011) have used corporate tax rate as ‘total tax payments to total profits after tax’. These studies have found a negative association with retention ratio. Thus the effect of effective corporate tax rate for Indian context remains untested. Our intentions for considering the ‘profit before tax’ instead of ‘profit after tax’ is to capture the effective tax rate, that a firm is paying on an annual basis that also suggests the buoyancy of the firm’s paid tax to taxable profits.
**Interest burden:** It is defined as ‘interest payment/gross profit (profit before interest, tax, depreciation and amortisation)’ that may have a negative relation with corporate saving. High level of interest burden suggests the high debt servicing cost that a firm has to pay on its existing debt levels. If the decrease in interest burden is purely through increased gross profit, it may have a positive effect on saving; however, if the decrease in interest burden is due to reduction in interest rates, it may have a negative relationship with saving (Jangili & Kumar, 2011).

**Tobin’s Q:** This variable is used as a proxy for higher expected future investment opportunities that may have a positive relationship with saving. This variable is defined as ‘Market capitalisation plus book value of total debt divided by total assets’. A rise in future opportunity will motivate firms to increase internal funds in the presence of costly external financing sources (Brufman et al., 2013; Horioka & Terada-Hagiwara, 2013; IMF study, 2006; Özmen et al., 2012). Firm’s saving will increase with rising Tobin’s Q that suggests profitable investment opportunity for the firm in the near future. This will encourage firms to retain the income instead of distributing to shareholders.

**GDP growth rate:** This variable is defined as the annual real GDP growth rate that is expected to have a positive relationship with corporate saving. High GDP growth rate level captures the favourable and increasing demand conditions in the economy that in turn supports the argument that better demand conditions will generate a larger source for the firm to save (Grigoli et al., 2014; Özmen et al., 2012).

**Real effective exchange rate:** It is the annual REER (real effective exchange rate) index value defined over a basket of 36 currencies; its increase suggests an appreciation of
rupee with respect to other selected currencies. Apart from capturing the exchange rate volatility it also suggests how much corporate saving is getting affected by rupee movement. For instance, if rupee appreciates then profitability of a net exporter firm will decrease while that of net importer will rise. Özmen et al. (2012) studied listed firms in Turkey and found that REER negatively affects corporate saving and profitability in both manufacturing and non-manufacturing sectors. They also found that “real appreciation has a more negative effect on savings rates the larger a firm’s export share”. In a study to understand the effect of real effective exchange rate on the saving and growth rates of an economy, Montiel and Serven (2009) found that “there is no clear-cut association between more depreciated real exchange rates and higher savings rates”. There could be indirect channels through which exchange rate may affect firm level profitability and saving. However, the net impact of the currency appreciation on saving depend on market orientation, industry competition, cost structure of production, and hedging strategies of firms (Priestley & Ødegaard, 2007).

**Inflation rate:** It is defined as the percentage change in WPI (Wholesale Price Index). This variable is used to capture the macroeconomic uncertainty in a country (Grigoli et al., 2014). A rise in inflation resembles the volatile macro environment and costly external capital funds, firm may increase the internal funds expecting more future uncertainty (Grigoli et al., 2014). The rise in corporate saving due to rise in macroeconomic uncertainty suggests the presence of precautionary saving motives for a firm. The theory of precautionary motive (Deaton, 1989) suggested that a household will save more in the presence of high current and future uncertainty and volatile income stream. Similarly, due to the presence of high and volatile inflation, a firm may save high expecting future uncertainty in business environment.
**Public debt to GDP:** This variable is used to capture the association of ‘crowding out’ with saving. It is defined as ‘public debt (the domestic liabilities of central government) to GDP’. A high public debt to GDP ratio signifies a less amount of total funds available for firms, implying that firms have to save money at hand for future investment opportunity (Özmen et al., 2012). Large public deficits (government fiscal position) often crowd out private financing activities where firms largely depends on bank funding and firms face serious difficulty in raising bank funds. Public debt to GDP ratio may have a positive effect on firm level saving.

**Financial depth:** This variable captures the development level of the financial system in the economy. It is defined as ‘domestic credit to private sector by banks as a % of GDP’. If there is enough financial depth in the economy, then firms might get sufficient credit from the banking sector that may lead firms to keep lesser funds at hand (Grigoli et al., 2014; Özmen et al., 2012). Better the credit availability in the economy the lesser will be the requirements at firm level to raise internal funds albeit firms will prefer to distribute the income to shareholders and take the bank credit given that the cost of borrowing is comparable to the opportunity cost of holding saving at hand. This variable does not capture the available sources of financing for inorganic growth in India because as per Reserve Bank of India norms\(^9\), firms are not permitted to use bank credit for domestic share buying.

Apart from standard control variables (see Table-13) such as firm size and debt to equity ratio, the study has also used capital formation, volatility of sales, cost of borrowings, and leverage ratio. Dividend payout ratio has also been considered that may control the status of financial constraints.

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**Firm size:** Özmen et al. (2012) have used firm size as the capacity of a firm to save. Large firms tend to have high savings due to their higher saving capacity and so do the firms in their growth phase. They require quick and easy access to capital that comes from own saving. Almeida et al. (2004) and Horioka & Tereda-Hagiwara (2013) have used firm size as a proxy for financial constraints. They found that small firms need to keep more saving compared to large firms because large firms are financially non-constrained and large firms might generate easy credit due to better bank-firm relations. IMF study (2006) also suggests that bigger firms should have easier or cheaper access to external financing, so large firms might have less savings. Previous literature remains ambiguous with respect to association of firm size with firm level saving. Our study has defined firm size as log of total assets that may have a negative sign with the firm level saving.

**Capital formation ratio:** Our study has used this variable to control the capital-investment position of the firm. The variable is adjusted by the total assets at the beginning of the year. This may also suggest the firm’s future investment and financing requirements. The increased capital requirements can be fulfilled either by raising internal funds or external funds. If the firm has high debt levels then it may prefer internal funds over external funds. Jangili and Kumar (2011) measured this as the ratio of fixed assets and inventory to total assets of the firm and found a positive association with saving. For our study, this variable is defined as ‘changes in net fixed assets divided by total assets at the beginning of year’ and is expected to have a positive association with firm level saving.

**Volatility of sales:** This variable has been used in earlier studies to capture the uncertainty in business environment, which is defined as ‘five-year rolling standard deviation of annual sales growth’ of a firm (Brufman et al., 2013; IMF study, 2006). Given the high
levels of uncertainty in operating environment, firms will face more uncertain sales revenues especially the firms operating in a competitive environment. Such firms are likely to hold buffer stocks of saving that may be used as and when required. This variable is expected to have a positive association with corporate saving.

**Cost of borrowing:** This variable captures the external debt financing cost that may suggest the levels of prevailing interest rates in the debt markets. Jangili and Kumar (2011) found that when cost of borrowing increases; the total expense in the form of payable interest may rise and that may result in the decrease of retention ratio. Also if external financing becomes more costly, firms may prefer retaining income that may support current and future business operations. Our study has defined cost of borrowings as ‘total interest payments divided by total outstanding borrowings of the firm’ that is expected to have a negative relation with corporate saving because in the presence of high borrowing levels firms facing high cost of borrowing will end up with less sources of saving.

**Leverage Ratio:** This variable has been defined as ‘debt to equity ratio’ that may negatively affect corporate saving (Brufman et al., 2013; Özmen et al., 2012). Due to high debt servicing cost given the high cost of borrowing, the indebted firm may face high interest burden. This high repayment cost will effectively reduce source of saving at the firm level. Özmen et al. (2012) found that high indebtedness had significantly reduce firm level saving in Turkey and suggested that financial market development should consider not only the increase in supply of funds but also in decreasing the cost of external financing. IMF study (2006) also found that a highly indebted firm may explicitly decide to repay debt rather than reinvest in business or distribute to shareholders that may reduce the firm level savings.
**Indicator of Financial Constraints:** Earlier literature has found that a financially constrained firm may save higher than the non-constrained one (Almeida et al., 2004; Brufman et al., 2013; Horioka & Tereda-Hagiwara, 2013; Riddick & Whited, 2009). These studies have suggested that a firm faces financing constraints may be because of its small size, inability to mortgage any assets, relatively new in industry, low value of Tobin’s Q, and high value of debt to equity ratio. In the previous literature, ‘dividend payout ratio’ has been used as an indicator of financial constraints (Almeida et al., 2004; Brufman et al., 2013). High dividend payout implies low financial constraints on the firm and it suggests that the firm can manage future financing needs from the market. In other words, a firm is paying lower dividend because it might face difficulties in arranging future funding requirements and so the firm will prefer saving today to meet its future financing requirements. In the Indian context, there are firms that generally follow market conventions of dividend payments or may follow sticky dividend policy rule thus in our study, it became important to control the financially constrained status of the firm and then identify what else may determine firm level saving in India. It is expected that dividend payout may have a negative association with saving.
Table -10
Specification of Dependent Variable

<table>
<thead>
<tr>
<th>Operational Variable</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. (Retained Profits –Prior Period and</td>
<td>The dependent variable for the proposed study</td>
</tr>
<tr>
<td>Extraordinary Income + P&amp;E Expenses +Depreciation)/Total Assets(t-1)</td>
<td></td>
</tr>
<tr>
<td>2. (RP + Depreciation)/Total Assets(t-1)</td>
<td>Aron and Muellbauer (2000)</td>
</tr>
<tr>
<td>4. Excess Saving= (Gross saving (Net Income + Depreciation-Cash Dividends) - Gross</td>
<td>OECD study (2007); Brufman et al. (2013)</td>
</tr>
<tr>
<td>capital formation)/Total assets(t)</td>
<td></td>
</tr>
<tr>
<td>5. Saving rate (the ratio of undistributed profits to net sales (%))</td>
<td>Özmen et al. (2012);</td>
</tr>
<tr>
<td>6. Retained Profit (Net profit less dividends paid) / total assets(t)</td>
<td>Bayoumi et al. (2010)</td>
</tr>
<tr>
<td>7. Retained Profit (Net profit less dividends paid)/GDP</td>
<td>Karabarbounis and Neiman (2012)</td>
</tr>
<tr>
<td>8. Retention Ratio (Ratio of retained profits to net profit after taxes)</td>
<td>Bhole and Mahakud (2005); Jangili and Kumar (2011)</td>
</tr>
</tbody>
</table>
### Table-11
Specification of Explanatory Variables

<table>
<thead>
<tr>
<th>Conceptual Variable</th>
<th>Operational Variable</th>
<th>Rationale of using this variable</th>
<th>ES</th>
<th>References</th>
<th>Signs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lagged CS</td>
<td>Dependent Variable(t-1)</td>
<td>Previous year’s saving will positively affect current year's saving.</td>
<td>(+)</td>
<td>Bhole and Mahakud (2005); Özmen et al. (2012)</td>
<td>(+); (+)</td>
</tr>
<tr>
<td>Profitability (Profit margin)</td>
<td>Profit After Tax/Sales</td>
<td>Current increase in profits is positively related with current year's saving, as increase in profit reflects the increase in source of saving.</td>
<td>(+)</td>
<td>Bhole and Mahakud (2005); Jangili and Kumar (2011); Özmen et al. (2012)</td>
<td>(+); (+); (+)</td>
</tr>
<tr>
<td>Effective Corporate Tax Rate</td>
<td>Total Taxes Paid/Profit Before Tax</td>
<td>Increase in current effective tax will reduce current saving at hand.</td>
<td>(-)</td>
<td>Bhole and Mahakud (2005) [total tax payments to PAT]; Jangili and Kumar (2011) [total tax payments to PAT]</td>
<td>(-); (-)</td>
</tr>
<tr>
<td>Interest Burden</td>
<td>Interest Payment/Gross Profit(PBITDA)</td>
<td>If a firm is paying huge sums of money as interest payments, firm will be left with less money at hand for saving.</td>
<td>(-)</td>
<td>Jangili and Kumar (2011)</td>
<td>(+/-)</td>
</tr>
<tr>
<td>Tobin’s Q</td>
<td>(Market Capitalisation+ Book Value Total Debt)/Total Assets</td>
<td>This variable acts as a proxy for investment opportunity, if it increases then there should be high requirement of internal funds.</td>
<td>(+)</td>
<td>IMF (2006); Özmen et al. (2012); Horioka &amp; Hagiwara (2013); Brufman et al. (2013)</td>
<td>(+); (+); (+); (+)</td>
</tr>
</tbody>
</table>

Note: ‘ES’ denotes expected sign from the study and ‘Signs’ denotes the sign obtained by earlier studies.
<table>
<thead>
<tr>
<th>Conceptual Variable</th>
<th>Operational Variable</th>
<th>Rationale of using this variable</th>
<th>ES</th>
<th>References</th>
<th>Signs</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP growth rate</td>
<td>Real GDP growth rate</td>
<td>If GDP growth rate is increasing then it symbolises a favourable positive demand scenario and this will be reflected in higher income levels of firms.</td>
<td>(+)</td>
<td>Özmen et al. (2012); Grigoli et al., (2014)</td>
<td>(+); (+)</td>
</tr>
<tr>
<td>REER</td>
<td>36 currency basket Real Effective Exchange Rate (Increase in REER index suggests appreciation of rupee with respect to other selected currencies)</td>
<td>If rupee is appreciating then for a net exporter firm, total income in rupees term will reduce resulting in less money at hand for saving.</td>
<td>(-)</td>
<td>Özmen et al. (2012)</td>
<td>(-)</td>
</tr>
<tr>
<td>Inflation rate</td>
<td>WPI (Wholesale Price Index) growth rate</td>
<td>Rise in inflation resembles volatile business environment and costly external funds, firm will increase internal funds expecting uncertainty</td>
<td>(+)</td>
<td>Grigoli et al. (2014)</td>
<td>(+)</td>
</tr>
<tr>
<td>Public debt to GDP</td>
<td>Public debt (the domestic liabilities of central government) to GDP</td>
<td>A high public debt to GDP ratio signifies a less amount of total funds available for firms, implying that firms have to save money at hand for future investment opportunity</td>
<td>(+)</td>
<td>Özmen et al. (2012)</td>
<td>(-)</td>
</tr>
<tr>
<td>Financial Depth</td>
<td>Domestic credit to private sector by banks as a % of GDP</td>
<td>If there is enough financial depth in the economy, it implies that firms are getting enough credit from the banking sector and firms might keep lesser funds in hand.</td>
<td>(-)</td>
<td>Özmen et al. (2012); Grigoli et al. (2014)</td>
<td>(+); (+/-)</td>
</tr>
</tbody>
</table>

Note: ‘ES’ denotes expected sign from the study and ‘Signs’ denotes the sign obtained by earlier studies.
<table>
<thead>
<tr>
<th>Conceptual Variable</th>
<th>Operational Variable</th>
<th>Rationale of using this variable</th>
<th>ES</th>
<th>References</th>
<th>Signs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Firm size</strong></td>
<td>Log(Total Assets) and Log(sales)</td>
<td>As the size of a firm increases, its dependence on internal sources of finances reduces as it has high borrowing capacity. So this variable has a negative relation with saving</td>
<td>(-)</td>
<td>IMF (2006); Özmen et al. (2012); Horioka &amp; Hagiwara (2013)</td>
<td>(+/-); (+); (-)</td>
</tr>
<tr>
<td><strong>Capital Formation</strong></td>
<td>Changes Net Fixed Assets/Total Assets(t-1)</td>
<td>This variable acts as a proxy for investment opportunity, if it increases then there should be high requirement of internal funds</td>
<td>(+)</td>
<td>Jangili and Kumar (2011) (ratio of fixed assets and inventory to total assets)</td>
<td>(+)</td>
</tr>
<tr>
<td><strong>Volatility of Sales</strong></td>
<td>5-year rolling standard deviation of sales growth</td>
<td>Increase in this variable suggests high variability in revenues implying a volatile business environment, if so then a firm needs to keep enough amount of precautionary saving at hand</td>
<td>(+)</td>
<td>IMF (2006); Brufman et al. (2013)</td>
<td>(+); (+)</td>
</tr>
<tr>
<td><strong>Cost of Borrowings</strong></td>
<td>Interest Payments/Total Outstanding Borrowings</td>
<td>If cost of external finance is high then internal financing is a preferred source of financing, requiring an increase in corporate saving</td>
<td>(+)</td>
<td>Bhole and Mahakud (2005); Jangili and Kumar (2011)</td>
<td>(+); (-)</td>
</tr>
<tr>
<td><strong>Leverage Ratio</strong></td>
<td>Debt/Equity</td>
<td>Highly leveraged company has to depend more on internal sources of financing, but an increase in this variable will increase the debt servicing cost also.</td>
<td>(-)</td>
<td>Özmen et al. (2012); Brufman et al. (2013)</td>
<td>(-); (-)</td>
</tr>
<tr>
<td><strong>Indicator of Financial Constraints</strong></td>
<td>Dividend payout ratio (Dividends paid/PAT)</td>
<td>Higher the dividend payout, lower the retention implying the firm is lesser financially constrained and can manage future financing requirements</td>
<td>(-)</td>
<td>Brufman et al. (2013)</td>
<td>(-)</td>
</tr>
</tbody>
</table>

Note: ‘ES’ denotes expected sign from the study and ‘Signs’ denotes the sign obtained by earlier studies.
4.3 Sources of Data

This study has employed panel data models using firm-level data of publicly listed non-financial firms and aggregate macroeconomic-level data in India for the period of 1999-00 to 2012-13. The unit of time for this study is the fiscal year March-April with the time frame of 14 years. Firm-level data has been obtained from Center for Monitoring Indian Economy-PROWESS database and macro-level data has been obtained from RBI database on Indian Economy. The study has been divided into sub-periods of 1999-00\(^{10}\) to 2002-03 (four years), 2003-04 to 2007-08 (five years) and 2008-09 to 2012-13 (five years).

This division of the fourteen year time frame has originated from the fact that corporate saving in India has observed a significant surge since 2003-04 (see Figure-2 and Table-1). The remaining time period was broken into group 2 (2003-4 to 2007-8) and group 3 (2008-09 to 2012-13) to examine the impact of global financial crisis on corporate saving. The year 2008-09 observed a significant drop in India’s GDP growth rate from 9.3 per cent (2007-8) to 6.7 per cent (see Figure-2). These sub-periods will help to examine the sub-period time dynamics as the study period entails the year of global financial crisis (2007-8) and year 2003-04 from when the spike in the aggregate corporate saving in India has been observed. The sample construction of these sub-periods has considered the inclusion of those firms for which the data was consistently available for a given sub period\(^{11}\).

\(^{10}\) Year 1999-00 observed a significant increase in the level and growth rate of corporate saving in India. http://dbie.rbi.org.in/DBIE/dbie.rbi?site=statistics, accessed on September 15, 2015.

\(^{11}\) That effectively created a balanced panel dataset for the analysis of each sub-period (group-1, group-2, and group-3). For the full sample analysis these groups were merged to construct a superset that created an unbalanced panel. The estimation technique used for dynamic panel analysis (Difference GMM and System GMM) is suitable for both balanced and unbalanced panel datasets (Flannery & Hankins, 2013).
4.4 Empirical Model

For employing static panel data models, both standard models of fixed effects and random effects were tested and after verifying the same by Hausman test, fixed effects model was selected. However, for testing the hypothesis that previous year’s saving will have a positive effect on current year’s saving, dynamic panel data models were employed. Dynamic panel model has the advantages of introducing the dynamic nature to the dependent variable by including the lagged dependent variable as one of the regressors. This model also resolves the endogeneity concerns, if any, of explanatory variables in the system by introducing suitable lagged value of endogenous variable as instruments.

By following the assumption of linear relationship among corporate savings and its determinants; a simple panel equation (1) can be written as

\[ CS_{it} = \sum_{k=1}^{k} \beta_k X_{kit} + \mu_i + \epsilon_{it} \]  

where

\[ CS = \text{Corporate Saving}, \quad i=1, 2, \ldots, n \text{ with time, } t=1,2,\ldots,T. \]

\[ X \text{ represents the explanatory variable; } k \text{ represents the number of explanatory variables} \]

\[ \mu_i = \text{firm specific effects, and} \]

\[ \epsilon_{it} = \text{disturbance term having the properties, } E(\epsilon_{it}) = 0 \text{ and } Var(\epsilon_{it}) = \sigma^2 \]

For bringing dynamic nature to the above Equation (1), dependent variable has been included as a regressor with lag operator. That leads to new equation for dynamic panel analysis for as Equation (2)

\[ CS_{it} = \beta_t CS_{it-1} + \sum_{k=1}^{k} \beta_k X_{kit} + \mu_i + \epsilon_{it} \]
Extended Equation:

\[(\text{Corporate Saving})_{it} = \beta_1(\text{Lagged Corporate Saving})_{it} + \beta_2(\text{Profitability})_{it} + \beta_3(\text{Effective Corporate Tax})_{it} + \beta_4(\text{Interest Burden})_{it} + \beta_5(\text{Tobin's Q})_{it} + \beta_6(\text{GDP growth rate})_{t} + \beta_7(\text{REER})_{t} + \beta_8(\text{Inflation Rate})_{t} + \beta_9(\text{Public Debt to GDP})_{t} + \beta_{10}(\text{Financial Depth})_{t} + \beta_{11}(\text{Firm Size})_{it} + \beta_{12}(\text{Capital Formation})_{it} + \beta_{13}(\text{Volatility of Sales})_{it} + \beta_{14}(\text{Cost of Borrowings})_{it} + \beta_{15}(\text{Leverage Ratio})_{it} + \beta_{16}(\text{Indicator of Financial Constraints})_{it}\]

4.5 Estimation Approach

As previously mentioned, firm level data for 14 years requires panel data analysis and this study employed dynamic panel data analysis to capture the effect of lagged corporate saving on current year’s saving. In the dynamic panel analysis literature (for details see Appendix 2), two models have been proposed based on generalised method of moments (GMM) estimation.

1. Arellano and Bond Estimation [Arellano and Bond 1991]
2. Arellano and Bover/Blundell and Bond Estimation [Arellano and Bover (1995); Blundell et al (1992)].

Dynamic panel data analysis includes the lagged dependent variable and other lagged independent variables as regressor which brings the covariance issues. In the dynamic model setting OLS coefficients will become biased due to the presence of non zero covariance between firm specific variables and error terms [covariance \((X_{kit}, \mu_i) = \text{non zero}\) (Nickell, 1981; Hsiao, 1985). Moreover, the OLS estimates will be inconsistent because the lagged dependent variable used as the regressor will be correlated with time invariant error term \(\mu_i\) (fixed effects). This problem can be resolved by using first differences of variables which will eliminate the firm specific unobservable effects \(\mu_i\) but again the terms like first
difference of lagged dependent variable and first difference of lagged time invariant effect will be correlated to each other, making OLS estimation inconsistent. Hence OLS cannot be used in this case.

For employing dynamic panel data analysis, two techniques have been used in literature, namely Difference GMM (Generalized Method of Moments) estimation and System GMM estimation. Arellano and Bond (1991) proposed Difference GMM estimation method, which employs additional instrumental variable (IV) to solve the correlation issues of regressor and time invariant error term $\mu_i$ (fixed effects). IVs are constructed based on the existing orthogonality conditions between lagged values of the dependent variables and disturbances. Blundell, Bond, and Windmeijer (2001) and Bond, Hoeffler and Temple (2001) showed that the difference GMM estimator has poor finite sample properties and that the estimator performs weakly when the dependent variable is persistent.

Blundell and Bond (1998) propose the system GMM estimator, which increases efficiency by estimating a system of two simultaneous equations, one in levels (with lagged first differences as instruments) and the other in first differences (with lagged levels as instruments). This estimator requires the additional identifying assumption that the instruments are exogenous to the fixed effects. This two-step variant presents estimates of the standard errors that tend to be severely downward biased (Arellano & Bond, 1991; Blundell & Bond, 1998). However, to resolve this issue, Windmeijer (2005) proposed the finite-sample correction of the two-step covariance matrix which produces unbiased standard errors. Flannery and Hankins (2013) and Wintoki, Linck, and Netter (2012) have empirically established the estimation superiority of two step finite-sample correction and robust standard
errors of system GMM. This study has used Difference GMM and System GMM models with two step estimation method under finite-sample correction and robust standard errors.

Dynamic panel model estimation requires post-estimation tests for verifying the appropriateness of the model:

1. *The correlation test* [*Arellano and Bond 1991*]

This test helps in testing the null hypothesis of no serial correlation by using the second order autocorrelation of obtained residuals under the assumption to be normally distributed with $N(0,1)$.

2. *The Sargan test* [*Sargan 1958*]

This test helps in testing the validity of employed instruments under the null hypothesis of instrument validity by testing the over-identifying restrictions\(^{12}\), those should be asymptotically distributed as Chi-Square.

It is worth mentioning here that the results for the Sargan test have to be interpreted with caution because its size and power properties are yet to be adequately established (Ozmen et al., 2012). Hoxby and Paserman (1998) standard over identification tests may lead to the rejection of the null even if a small intra-group correlation is found. Arellano and Bond (1991) mentioned that the Sargan test often over-rejects the validity of over identification restrictions.

\(^{12}\) One alternative test is Hansen – J test for over-identifying restrictions useful in spotting violations of validity.