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LEVERAGE AND INVESTMENT OF THE INDIAN CORPORATE SECTOR - IS INVESTMENT ON A RECOVERY PATH?

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Abstract: In the context of ongoing subdued investment, globally as well as in India, this paper revisits investment dynamics in India from the standpoint of the 'augmented accelerator' hypothesis. On an analysis of Indian corporate data for the period 1980-81 to 2018-19, we found that financial variables are assuming a greater role in determining the investment dynamics of the Indian corporate sector together with business expectations of the corporates and economic policy uncertainties. The paper attempts to provide a model-driven estimate of a threshold for Indian corporate leverage — estimated at around 60 per cent for debt-to-equity ratio and 28 per cent for debt-to-asset ratio, beyond which corporate leverage drags growth. An upcycle of investment is expected as the debt may build up for the corporates in the near future, which in a scenario of high capex from the government sector, would crowd in private investment and ensure durable growth recovery in the economy.

JEL Classification: E220, E710, G310, G380, Y10

Keywords: Investment, GDP, accelerator, business investment, policy uncertainty, business expectations

1. INTRODUCTION

After the global financial crisis (GFC) in 2008, the slowdown in investment has been observed across the globe, including both advanced economies (AEs) and emerging market economies (EMEs) mainly due to lack of active involvement of the private corporate sector —the main drivers of the investment. The

Covid-19 outbreak in 2020 disrupted the global economic activities and created deep economic distress across various economies including in India. Since March 2020 the pandemic spread across India in two phases, has resulted in contraction in GDP, which in turn adversely affected the business intentions and confidence of the corporate India as evidenced in the business expectations index, which dropped into contraction zone for Q2:2020-21. A vast literature covering both country-specific and cross-country studies has emerged after the GFC concluding that the net effect of the crisis was the global growth slowdown mainly due to subdued investment activity (Chen *et al.*, 2019; World Bank, 2010; Kumar and Pankaj, 2009). Despite the policy measures pursued, particularly with regard to foreign investments and easy availability of finance, external borrowings, initiatives to ease of doing business, effective foreign exchange management, etc., the investment slowdown witnessed after the GFC has not been fully recovered so far, thus raising the question whether the decline in investment is a result of weaker economic environment alone? Another key question is the extent to which corporate debt, which has increased post-GFC in many advanced and emerging market economies due to a credit boom in the pre-crisis period, which is acting as a drag on investment. In the Indian context, Nagaraj (2013) observed that the growth in the Indian economy from 2003 to 2008 was a private corporate debt-driven growth before getting subdued after the GFC period. Globally, corporates resorted to bank borrowing for investment in infrastructure and commodity-related business. The slump in these sectors hit corporate profits to new lows, and with corporates not being able to repay, debt ballooned in the balance sheets of the corporates, which turned as bad assets in the books of the creditors. Consensus is veering towards the conclusion, as shown by several studies, that the reasons for the investment slowdowns include macro-fundamentals, excessive borrowings, policy uncertainties and lack of business confidence. In addition, investment and leverage are seen to have a non-linear relationship implying that there will be a threshold of debt beyond which the investment may fall.

The key role of financial conditions has increased in importance for many economies – a phenomenon observed particularly after the global financial crisis. According to the financial accelerator mechanism, a firm's financial position influences its real decision – an important feature of the financial accelerator is the double asymmetry — the balance sheet effects are expected to be stronger during downturns than upturns and more severe for small than

large firms (Gertler and Gilchrist, 1993; Oliner, Rudebusch and Sichel, 1995). This suggests that a firm's investment decision is important particularly during the crisis period, which is expected to affect the overall corporate investment as firms have their own choices to make investment decisions. However, looking at country-level studies, several papers have found that the contribution of financial variables to real fluctuations is heterogeneous across countries (Chirinko *et al.*, 2008; Hubrich *et al.*, 2013).

The influence of finance on growth is linked to monetary policy with the latter exerting its control over credit demand in the economy. Hadulla and Thurwachter (2020) shows that by extending standard empirical macro model with finance variables like bank credit and corporate bonds, debt structure of firms affects the transmission of monetary policy shocks to the economy. They found that corporate debt financing structure is highly significant for the monetary policy transmission. Although there is literature suggesting the importance of financial variables on growth and investment, the central banks' short-term policy interest rate has a significant impact on cost of capital for the business thereby affecting the aggregate demand. This is the traditional interest rate channel of monetary policy. Monetary policy impulses propagated through the shift in supply of credit is termed as 'credit channel' of monetary transmission, which in turn consists of 'balance sheet channel' and 'bank lending channel' (Raj, *et.al*, 2020). As the monetary policy transmission to the credit markets has significant impact on credit demand, the level of borrowings by the corporates has an influential impact on their investment. However, the corporate borrowing from the credit market sometimes can be beyond certain limits, which could have implications on financial stability. Bernanke, *et al.* (1999) noted that developments in credit markets amplify and propagate shocks to the macro economy. Dees (2016) also shows that the importance of credit and asset price variables in explaining real economic fluctuations are relatively large.

Corporate leverage tends to amplify shocks, as corporate deleveraging could lead to depressed investment and higher unemployment, and corporate defaults could trigger losses and curb lending (IMF, 2019). Elevated corporate debt reflecting rising debt and often weak debt service capacity could lead to a rise in the debt-at-risk measures like interest coverage ratio, net debt-to-asset ratio. This could result in losses for banks and non-bank financial institutions with significant exposures to highly indebted non-financial firms. In the Indian context, few studies have mentioned about the negative impact of

excess leverage in investment (Shukla and Shaw, 2020; Reserve Bank of India, 2018). Notwithstanding several studies in India at the sectoral level on the relationship between debt and investment, there is a dearth of empirical studies at the aggregate level on the relationship between investment and leverage; the present study seeks to fill this gap in the literature.

With this backdrop, the study examines how the financial variables impact the investment scenario in India. This includes analyzing the role of policy uncertainty and business confidence in determining the revival of stalled investments and the cyclicity of the corporate investment in the Indian context. Secondly, the relationship between investment and leverage is studied at the aggregate level of the Indian corporate sector to establish if there exists a threshold level of corporate leverage in India.

The rest of the paper is organized into six sections. Section 2 presents a brief review of the existing literature on corporate investment and leverage. Some of the stylized facts related to investment are presented in Section 3. The methodology and modelling approach including data sources are presented in Section 4. Section 5 deals with the empirical analysis followed by discussions; and finally, concluding observations are given in Section 6.

2.   REVIEW OF LITERATURE

Corporates generally finance their investment activities using external funds or/and internal funds. Both have pros and cons. Debt funds are mainly long-term borrowings from banks or financial institutions and equity funds raised through public subscriptions. Lack of funds for investment implies that firms are constrained in obtaining external funds and unable to manage enough internal funds. Firms often prefer to use internal funds to finance investment if it is cheaper than external funds, the latter seen in respect of specific sectors like technology and mining (Fazzari *et al.*, 1988). The finance literature establishes both negative and positive effects of financing investment through debt. The positive effect of debt financing is the tax advantages of the firms as compared to other sources of financing (Modigliani and Miller, 1963) whereas, on the negative side, high corporate indebtedness causes higher interest expenses and thus lowers funds available for investment. The intention to clean-up weak balance sheets to lower external finance costs leads firms to increase savings and to waive possibly profitable investment opportunities (Myers, 1977). In the case of developed and emerging economies, the level of financial development is good only up to a point, after which it becomes a drag on growth. Specifically, more

finance leads to an inverted U-shaped effect on growth (Reinhart and Rogoff, 2009; Cecchetti *et al.*, 2012; Cecchetti and Kharroubi, 2012). However, studies proved that higher levels of financial development do better in the allocation of capital investment, which enables growth (Marconi and Christian, 2017). A strand of the literature has established that in the post-GFC, highly leveraged companies are seen to be a drag on investment with the relation between debt and investment being non-linear, *i.e.,* there will be a threshold beyond which firms' indebtedness might be negatively related to investment. If debt levels are below a certain threshold, it positively affects investment to the extent that the costs of holding debt are lower than marginal returns from further investment. However, high debt levels on firms' balance sheets exert a negative effect on investment, as costs associated with high debt holdings increase significantly and thus reduce marginal returns on investment (Cecchetti *et al.*, 2012; European Central Bank, 2013; Kalemli-Ozcan *et al.*, 2015).

The non-linear relationship between leverage and firm's investment can also be attributed to agency cost of debt; these are internal costs incurred due to the competing interests of shareholders (principals) and the management team (agents) - expenses incurred for fear of agency cost problems arising from the separation of ownership and control that are associated with resolving this disagreement and managing the relationship. A higher level of debt may be, beyond the threshold level, increases the bankruptcy cost too, even though increased levels of debt reduce the agency cost of free cash flow (Li and Cui, 2003; Zhang and Li, 2008).

The behavior of firms may be distinguished between those having high leverage and low leverage ratio. In times of financial distress, firms with high leverage are concerned about default risk and their focus will be restoring the leverage threshold and they may give up their investment opportunities. But low leveraged firms face low financial constraints, and they may utilize their borrowing power (Modigliani and Miller, 1963). A vast empirical literature on investment and leverage can be found evidencing high corporate leverage to be having negative effects on investment (Vermeulen, 2002; Benito and Hernando, 2007; Martinez-Carrascal and Ferrando, 2008; Pal and Ferrando, 2010; Kalemli-Ozcan *et al.*, 2015; Barbiero *et al.*, 2016). Many of these findings emerged after the global financial crisis in 2008. Due to excessive borrowings by corporates, the indebtedness has gone up drastically resulting in firms struggling to service their debt as the return from their investment is getting curtailed.

A plausible explanation of low investment in a fixed asset is uncertainty in return due to weak business expectations which lack profitable investment opportunities. Increases in uncertainty make firms reluctant to undertake investment (Bloom *et al.*, 2007; Guiso and Parigi, 1999). In advanced countries like the United States, even though firms are confident of the future demand conditions, they hesitate to invest in new projects. With the strong growth of debt and equity issuance, firms use new debt to finance share buybacks (Van Rixtel and Villegas, 2015).

An IMF study (2018a) based on non-financial corporates across major industrialized countries suggests that large firms accumulated higher gross corporate savings, which have not supported a proportionate increase in fixed capital investment but led to a build-up of liquid financial assets, over the last two decades. The findings of a recent study by Joseph, et.al., (2019) suggested that firms with high cash holdings have a significant role in the investment activities as compared with those who are cash-poor, especially during the recovery period after the GFC. Cash-rich firms continued their investment and accumulated more profits over the long–run where cash-poor firms failed to survive in the post-GFC period.

Akin to the global research on trends in corporate leverage, there are a few studies focused on Indian corporate leverage (Bhaduri, 2008; Chauhan, 2017; Herwadkar, 2019; Shukla and Shaw, 2020; Sony and Bhaduri, 2021). In contrast to other developed and developing countries, studies on India indicated that due to increasing number of non-manufacturing firms which requires low capital leads to maintain a low leverage ratio. Moreover, Indian firms are more conservative as they use internal funds and many times do not substitute debt by raising more equity to finance their capital requirements. Therefore, the debt ratios are low as compared with other developing countries. Apart from the firm-specific factors, institutional and other country-specific factors like the underdevelopment of credit markets also significantly explain the decline in debt ratios in India (Chauhan, 2017). Note that their study is based on a small sample of 371 companies during the period 2003 to 2016 on monthly data. However, in the aftermath of the GFC 2008, the debt ratio of the corporates has increased in the EMEs. Herwadkar (2019) examined corporate leverages of EMEs including Indian firms based on annual accounts data during the period 1996-2014, comparing the determinants of corporate leverage between pre-GFC and post-GFC period across EMEs. The study found that a changing macroeconomic environment led to sharp rise in

corporate leverage in EMEs in the post- GFC period. International factors are responsible for the corporate leverage than firm-specific factors in the post-GFC period. Similar research concluded that global financial conditions are responsible for the rising corporate leverage in EMEs. This is more pronounced for financially constrained firms, such as small- and medium-sized enterprises (Alter and Elekdag, 2020).

The relationship between leverage and investment in connection with financial constraints of Indian manufacturing firms studied by Bhaduri (2008). The study points that financially constrained[2] firms exhibit a much higher investment-cash flow sensitivity than that of financially unconstrained. Specifically, leverage has a negative influence on the investment decision for financially constrained firms, while it has a positive impact on investment for financially unconstrained firms. Further, though it is not related to investment leverage dynamics, Bhaduri (2005) on an analysis of the investment patterns of 362 Indian manufacturing firms during the period 1989-1990 to 1994-1995 found that the liberalization effort succeeded in relaxing financial constraints faced by the Indian firms.

As indicated earlier, excess leverage is expected to have a negative impact on investment. Shukla and Shaw (2020) analyzed the firm's leverage on corporate investment in India based on the firm-level data during the period 2004-2017. Their result concluded that the high leverage of firms has an adverse impact on their capital expenditure. Furthermore, they found a non-linear relationship between leverage and firm investment using a cubic regression indicating a firm's leverage adversely affects its investment activity after a higher threshold. However, they have not explicitly estimated the threshold level of the corporate investment.

Most of the studies described above highlighted the positive and negative effects of debt funds on investment, the impact of excess financing on growth, the determinant of leverage, financing choices between debt and equity, the relationship between debt and investment, the impact of cash holdings on investment etc.*,* especially for the private non-financial corporates. As we have already alluded to, one of the objectives of our study is to find a threshold for corporate leverage in India, which can be considered as a benchmark and could be considered as useful for policymakers and analysts. If the leverage exceeds the benchmark, it could have adverse implications in financial stability. To the best of our knowledge, no studies are found in the Indian context arriving at a threshold of debt at an aggregate level, which is our contribution to the literature.

3.   SOME STYLIZED FACTS

Few stylized facts relating to credit, leverage and investment are set out in this section of the paper.

3.1.   Credit and Investment

Credit plays an important role in any economy, as it direly relates to the economic and investment activity. GFC and subsequent global recession have further strengthened the importance of studying the interaction between credit with other real sectors in the economy. The co-movement between credit cycle with that of investment and business cycles reflects the relation between financial and real sectors of the economy. However, studies have proved that credit expansion or the credit booms are often associated to the period of economic distress. The credit expansion or influence of finances of other modes or asset prices have greater impact on the investment or output like real variables. Fig.1 presents co-movement between the credit cycle, investment cycle and the GDP cycle in India.
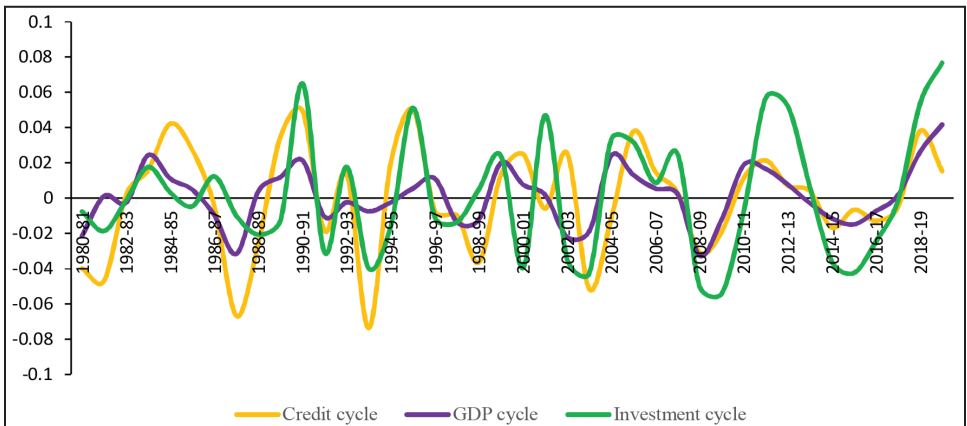

Fig. 1: Co-movement between macro-economic cycles

Note: Credit is the total non-food bank credit extended by all scheduled commercial banks in India, Gross fixed capital formation represents proxy for total investment. GDP is the real GDP is based on the base year 2011-12.

Cyclical components are extracted using Christiano – Fitzgerald (CF) Filter.

Pro-cyclicality of the financial system refers to the mutually reinforcing interactions between the real and financial sectors of the economy that amplify the business cycle. The pro-cyclicality of credit has been emphasized as a major driver in increasing the amplitudes of the business cycles (Banerjee, 2011). The

Indian corporate sector (representing private non-financial corporations and public non-financial corporations together) contributes around 44 per cent of the total investment[3] in March 2020. Any financial sector shocks have serious consequences on the real sector —through their relationship with investment and hence, growth of an economy. Owing to the greater correlations between financial and real variables, any form of negative financial shocks will have an adverse impact on the investment and hence the output (GDP). The correlations between credit cycle, investment cycle and GDP cycle have been presented in Table 1. Investment and GDP cycles are found to have high correlation (around 70 per cent) while credit and investment cycles have around 52 per cent.

Table 1: Correlations between macro-economic cycles

Variable	Credit and Investment	Credit and GDP	Investment and GDP
Correlation Coefficient	0.526***	0.610***	0.698***
	(0.002)	(0.001)	(0.001)

Note: Figures in brackets represent p-values. ***$p<0.01$

The virtuous cycles enable animal spirit in the economy, which mutually reinforce investment, productivity growth, job creation, demand and exports (Economic Survey, 2018-19). Ample credit or credit growth is an indicator of financial development and also a leading indicator of growth. Investment in fixed assets, generally reflected as gross fixed capital formation (GFCF) in the National Accounts. Investment could be influenced by decisions to postpone capital expenditure (capex) on weak demand conditions, volatility of factors affecting profit expectations and availability of external financing. Bank credit is one of the main financing sources for capex projects and this source has traditionally supported financing for high value capex projects as well as small ticket investments in India. The infrastructure sector attracts the highest share among the total industrial credit extended by the banking sector in India. Credit growth in the infrastructure sector has been decelerating in the recent years due to subdued demand and low investment activities. It was around 37 per cent in March 2010, while it decelerated to 9 per cent in March 2021. Although the banking sector has been beset with non-performing assets (NPAs)[4] at 8.4 per cent in 2019-20, the impact of declining bank credit has been counterbalanced by other sources of funds like external commercial borrowings (ECBs) and resource mobilization from the capital market[5]. The alternate sources of finance mainly substitute the traditional form of bank credit.[6] This has been empirically

observed by several studies. Non-bank sources often finance investment as a substitute for bank credit if the bank credit is costlier or not easily available for the investor. However, there is evidence to suggest that a large reliance on non-bank debt or market-based finance, relative to bank credit, should facilitate economic growth and financial stability (Gambacorta, *et. al.*, 2014; Bats & Houben, 2017). Contrary to the bank credit, growth in non-bank funds can be a leading indicator of currency crises or sovereign debt crisis (Kemp, *et.al.*, 2018). Some of the empirical facts on movement of credit growth, investment growth, growth in new investment projects is given in Fig.2. Growth in new investment[7] projects and credit growth are much closer than the co-movement between bank credit growth and realized investment. Other forms of finance also move in tandem with credit and investment.

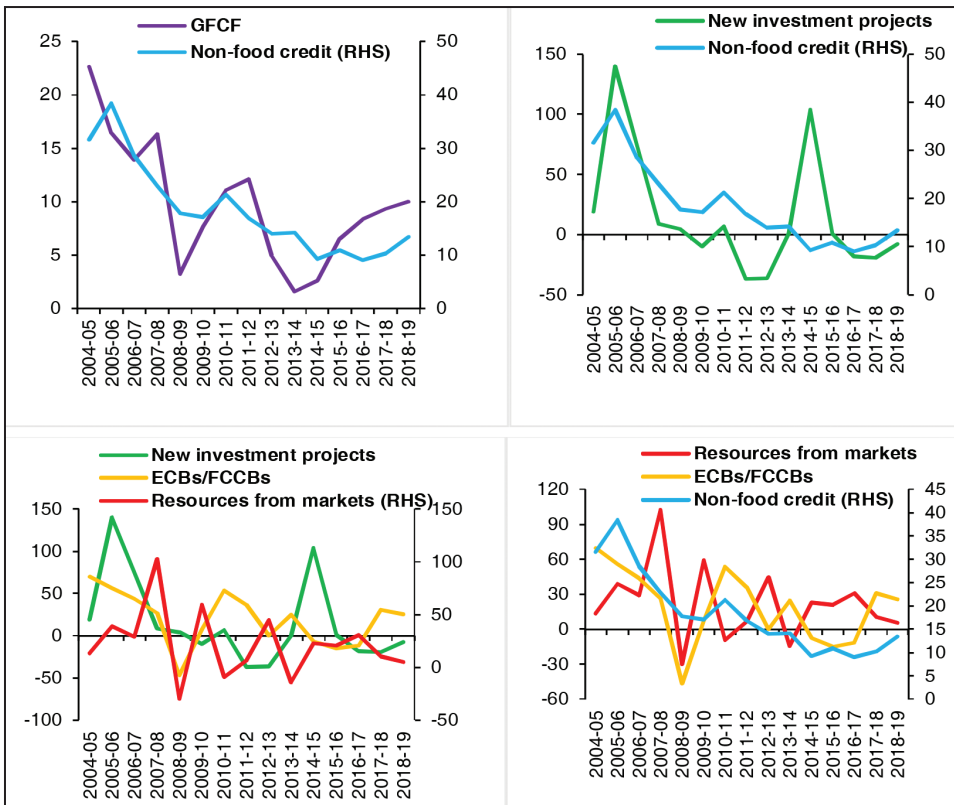**Fig. 2. Growth in Credit and Investment**

Note: growth rates are in year-on-year and percentages.
Sources: Centre for Monitoring Indian Economy; National Statistical Office; Securities and Exchange Board of India; and Reserve Bank of India.

3.2. Corporate Cash Holdings

Savings constitute a key determinant of economic growth and of financing investment. Emerging market economies' savings are significantly higher than that of advanced economies such as the US and the UK as reflected in the savings/GDP ratio for the advanced economies (AEs) and emerging market and developing economies (EMDEs) which stood at 22.7 per cent and 32.5 per cent, respectively in 2019. Emerging and developing Asian countries' saving rates are even higher (39.6 per cent in 2019) than the AEs and EMDEs (IMF, 2020). Literature suggests that corporate savings have been increasing over the last 15 years in advanced economies across the countries. The increased savings can be reflected in the cash holdings of the corporate sector. The increasing trends in cash holdings evidenced in non-financial firms, especially in large firms across industries. However, studies evidenced that higher corporate savings resulted in accumulating liquid financial assets rather than fixed investments.

The general conjecture is that firms hold cash and other liquid assets to beat the uncertainty and to take advantage of profitable future investment opportunities. However, cash holdings also have an opportunity cost, as idle cash does not generate any income. Existing literature suggests that conflicts and financing frictions are important determinants of corporate cash holdings. Past studies on cash holdings focused on agency conflicts. Opler *et al.* (1999) argued that self-interested managers seek to accumulate cash as they are risk averse and want flexibility to pursue personal goals. Myers and Rajan (1998) also observed similar finding that managers have strong incentives to hold cash as it is a matter of managerial discretion.

In the Indian context, cash holdings of both public limited and private limited companies, as a percentage of their total assets, have been plotted in Fig.3 from 1980-81 to 2018-19 based on their financial statements. An upward trend in cash holdings can be found in the recent period in the case of private limited companies, whereas the opposite trend has seen in the case of public limited companies. The empirical evidence suggests that corporate cash holdings in India are mainly due to the corporate governance and recently, to hold cash to service their debt. Specifically, some studies in India attempted to analyze the corporate cash holdings. For instance, Roy (2018) analyzed the relation between cash holding and firm-level corporate governance for the Indian companies and found that quality of corporate governance has important implications in deciding corporate cash holdings. Arora (2019) examined the pattern of cash holdings of 266 Indian companies for the period

2005 - 2015 to know the factors that influence the level of cash balances. They found that firms with large cash balances have higher leverage. Moreover, large cash balances have strong growth opportunities, larger cash flows, higher cash flow volatility and higher level of promoter holding and particularly if the company belongs to the government-owned sector. However, their study does not find evidence of a significant relationship between cash balances and many other variables such as firm size and capital expenditure. Motivated by these findings, we have also included cash holding of the companies, in our analysis, to see whether the cash holdings have a significant impact on the investment, or it is used as a risk mitigating tool.
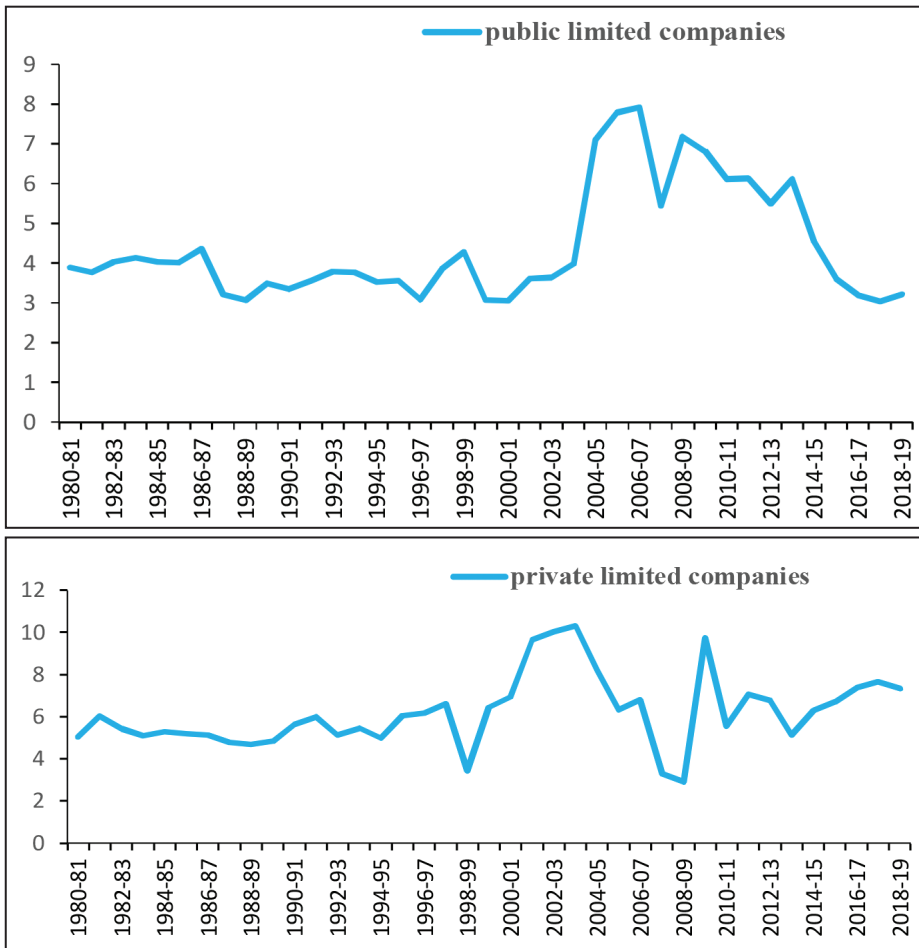

Fig. 3: Share of Cash Holdings in Total Assets (In per cent)

Sources: Reserve Bank of India; and Ministry of Corporate Affairs, Government of India.

We have also examined the long-term relationship between cash holding and investment by conducting a Granger-Causality test. Results of the Granger-Causality test do not confirm a causal relationship[8] from cash holding to investment, implying that cash holdings and investment does not possess a permanent long-run relationship.

3.3. Trend in Investments

World has witnessed two crises in the last two decades — the global financial crisis (GFC) in 2008 and the Covid-19 pandemic-induced crisis in 2020. The GFC in 2008 resulted in global investment slowdown, while the pandemic crisis led to excessive leverage, particularly in the non-financial sector, on the back of relatively loose financial conditions. Sluggish growth, mainly due to muted investment activity, was a major concern for most of the economies in the post GFC period. Investments in fixed assets have significant implications for economic growth, especially in the emerging market economies (EMEs) including India as sustainable growth of an economy is critically dependent on the sustainability of the large investment projects undertaken by the corporates. The financial turbulence triggered by GFC, which had impacted the investments, has not settled down so far. Revival of investment cycle is yet to happen in most of the developed economies and EMEs including India. Despite several policy initiatives by authorities to strengthen investments, the growth of real investment has not yet reached the pre-GFC level. Post-GFC, the slowdown continued and spread to developing economies (Magud & Sosa, 2015; Kose, Ohnsorge, Ye, & Islamaj, 2017). Country-specific explanations are often provided in the literature. There are various reasons for the investment slowdowns- they include the outsourcing of labour-intensive production, lower labour force participation, due to technological change, and reduced government spending etc., (Fernald, Hall, Stock, & Watson, 2017; Alexander & Eberly, 2018). However, these explanations cannot be generalized across the economies. Yang and Strauss (2019) argue, particularly for the advanced economies, that the investment slowdown reflects demand-side corporate secular stagnation - an excess of cash flow over torpid investment opportunities.

The Covid-19 crisis further deteriorated the confidence of investors across the countries. However, EMEs and AEs and other group of countries have diverse compositions of investments (Fig. 4).
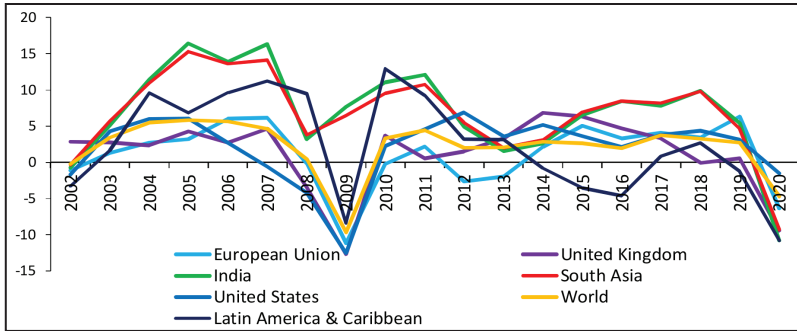
Fig. 4: Global Investment Growth (Select Economies)

Source: World Bank data.

3.4. Corporate Investment Cycle in India

In this section, we present the cyclical pattern of the private corporate investment measured as a ratio of gross investment to total assets based on our sample data from the period 1980-81 to 2018-19. Cyclical components are extracted using asymmetric Christiano – Fitzgerald (CF) Filter[9]and the turning points are estimated using National Bureau of Economic Research (NEBR) dating procedure. NEBR procedure is given in the Appendix.

A major downturn in the investment cycle noticed after the GFC continued till 2016-17, *albeit* with a short upcycle portrayed during 2012-13 to 2014-15. The estimated investment cycle based on the available data plotted in Fig.5, which suggests that the average duration of the corporate investment
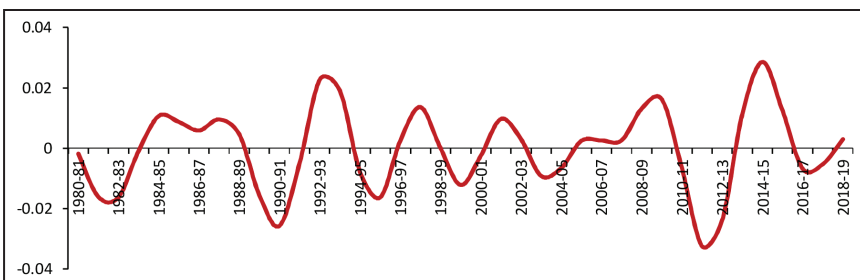
Fig. 5: Investment Cycle of the Indian Corporate Sector

Note: (i) Corporate sector meaning the financials of non-government non-financial public limited companies and non-government non-financial private limited companies. The investment cycle plotted in Fig.1 is different from Fig.6 given above as the former represents total investment proxied by GFCF. (ii) Gross investment to total assets is considered for the construction of investment cycles. (iii) Cyclical components are extracted using Christiano – Fitzgerald (CF) Filter.

Source: Reserve Bank of India.

cycle is 7 years while durations of the contraction phases (4 years) are larger than the expansion phases (3 years)[10] (Table 2). Unavailability of the related set of published time series data from 2019-20, renders it difficult to construct the latest turning points of the cycle.

Table 2: Average Durations of Corporate Investment Cycle

Cycle Phases	Average Durations in Years
Contraction Phase	4
Expansion Phase	3
Full Cycle	7

Note: Durations are calculated using National Bureau of Economic Research (NEBR) dating procedure setting medium cycle of 4 to 12 years.

Due to the Covid-19 induced lockdowns which have disrupted economic activities, central banks and government authorities all over the world have taken extraordinary measures to support and sustain the economic activities. The Reserve Bank of India and the Government of India have taken several policy measures to support the Indian economy through various fiscal and monetary packages. The financial resources raised by the Indian corporate sector have witnessed some encouraging trend, especially after the Covid-19 pandemic, which may have some salutary impact on the investment of the corporate sector. Moreover, the near-term outlook for the private corporate investment based on the phasing plans of their project proposals suggest a fillip by deferred pipeline investment from 2020-21 to 2021-22 positively increasing overall thrust to private investment, though persisting near-term risks is prevailing (Chavhan, *et al.*, 2021).

The outstanding bank credit to the corporate sector has increased to Rs.51.59 lakh crore in March 2021 from the pre-pandemic level of Rs.48.46 lakh crore in March 2019. Resources mobilised from the capital markets marked a record high in calendar year 2021. A surge in FDI also portrays a very cheering picture as far as far the Indian corporate sector is concerned (Table 3). In view of the above developments, the debt may build up for the corporate, filling up the leverage space which along with high capex from the government sector, could crowd in private investment, moving forward.

3.4.   Policy Uncertainty, Business Expectations and Investment

Policy-related uncertainty has important economic consequences. A business decision is subject to various factors such as uncertainty regarding the timing of

Table 3: Fund from Various Sources

(Amounts in Rs. crore)				
Bank Credit to Corporate Sector	43,76,741	48,46,039	50,86,660	51,59,294
Fund Mobilisation from capital markets*	6,98,912	6,34,040	7,51,751	8,81,958
External Borrowings to India	158527	199288	279516	210691
FDIs in India	415421	453100	551647	639521

Note: outstanding bank credit to corporate sector is the credit to medium and large industries and credit to the services sector. * Includes IPOs, FPOs, Rights issues and Private placement of debt and equity.

business investment, potential impact of policy decisions, political conditions etc. The role of economic policy uncertainty[11] and business expectations[12] in corporate investments have been studied recently by various researchers (Anand and Tulin, 2014; Gulen and Ion,2016; Gennaioli, *et al.*, 2016 Klaus *et al.*, 2016). Several studies documented the importance of policy uncertainties, as a high degree of economic policy uncertainties may be a drag on investment. Gulen and Ion (2016) indicated in their study based on the US corporations that a strong negative relationship between policy uncertainty and capital investment of the US public corporations. They also mentioned that the relationship between uncertainty and investment is not uniform across firms. In a study done by Klaus *et al.*, 2016 in Swiss firms, they evidenced an increase in policy uncertainty leads firms to reduce their investment plans. Higher economic policy uncertainties pull-down investment growth, while higher business confidence index or positive business expectations promote higher investment growth (Fig. 6).
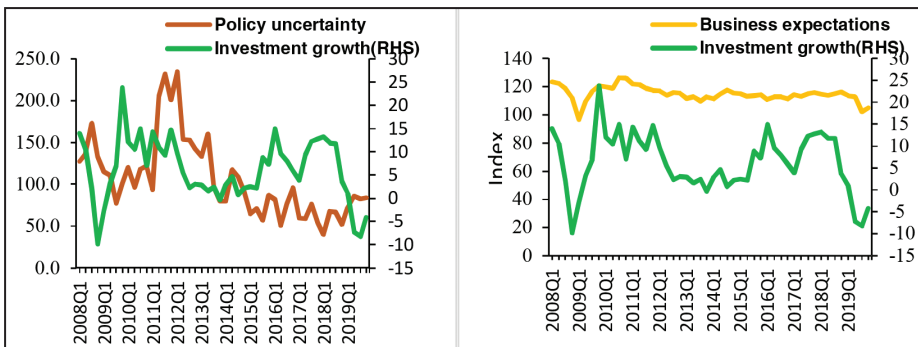
Fig. 6: Policy Uncertainty, Business Expectations and Investment.

Note: policy uncertainty and business expectations are indices and investment growth in percentage.

Sources: Reserve Bank of India; and www.policyuncertainty.com

We present here the impact of policy uncertainties and business expectations on stalling of investment projects on India. Studies have highlighted that stalling of investment projects has been increased, particularly after the GFC (Anand and Tulin, 2014). Stalled investments mean projects which are delayed during the implementation phase due to various reasons[13]. Stalled investment is regressed with business expectations, policy uncertainties and industrial capacity utilisation. Similarly, another proxy of stalled investment—gap between the investment intentions[14] and the realised investments has also been considered for our analysis. The regression results suggest that policy uncertainty has a significant role in stalling of investment projects. Likewise, increased uncertainty may increase the gap between the investment intentions and realisations. Business expectations also have a similar role in the investment with positive business expectations having negative influence on stalling of projects. On including inflation expectations of the households in the model, the sign of the coefficient is found to be negative as expected, but with no statistical significance. This might be due to the household expectations being different from industry expectations on inflation. Capacity utilisation is also found to be insignificant in explaining stalling of projects. The regression results are presented in Table 4.

Table 4: Estimated Coefficients of Uncertainties and Expectations

Variable	Stalled Investments (1)		Unrealised investments (2)	
	Coefficient	*Prob.*	*Coefficient*	*Prob.*
Constant	0.449	0.179	4.292	0.451
Capacity utilisation	0.007	0.245	-0.005	0.953
Inflation expectations	-0.001	0.302	-0.008	0.521
Policy uncertainty	0.001**	0.016	0.015***	0.002
Business expectations	-0.008**	0.018	-0.036	0.538
R-square	0.22		0.20	
ARCH Test (p-value)	0.91		0.40	

Note: ***p<0.01, **p<0.05, *p<0.1
Sources: Centre for monitoring Indian economy; Reserve bank of India.

3.5. Two Measures of Leverage

Leverage or financial leverage is referred as the amount of debt a firm uses to finance its assets. It is commonly presented as debt-to-equity ratio or debt-to-asset ratio. However, there is no consensus in the literature as to, which is the best form of leverage due to the different components appearing in the numerator and denominator of these ratios.

The most important leverage measures are ratio of debt-to-equity and the ratio of debt- to-total assets[15]. The GFC led to an increase in leverage, especially in the private corporate sector. This in turn reduced the ability of private firms to raise funds for their investment projects. Country-specific studies found evidence in holding back of investment due to high debt by the corporates. However, for firms with low levels of debt, the relationship between debt and investment is less robust and depends on a number of firm-specific characteristics and the macroeconomic environment (IMF, 2017). The Indian corporate sector leverage measures are presented in Fig.7. Both measures have shown co-movement over the period[16]. From the year 2015-16 both the leverage measures have declined reflecting deleveraging undertaken by the Indian corporate sector notwithstanding a mild increase in 2018-19. Based on the annual accounts data, the debt equity ratio and debt asset ratio of Indian corporate sector are around 48 per cent and 19 per cent respectively in 2018-19.
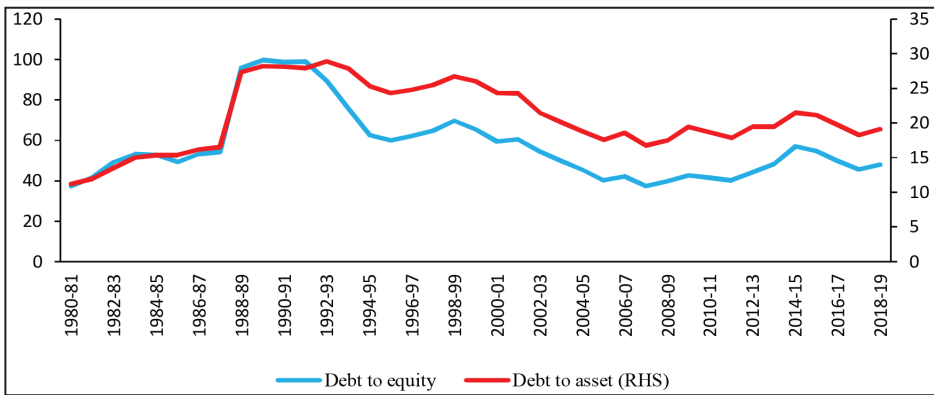
Fig. 7: Measures of Leverage

Source: Reserve Bank of India

The leverage measures will have a long run relationship with investment. We have performed Granger-Causality test to find the presence of any causal relationship between leverage and investment. The analysis ascertains a unidirectional causal relationship between both the leverage measures and the investment indicating long-run relationship between debt-to-equity and debt-to-asset to investments of the Indian corporates in general. However, empirical studies suggest that exceeding certain threshold of leverage may have nonlinear effects on investment, in the short run. The results are provided in Table 5.

Table 5: Granger-Causality Test: Causal Relationship between Investment and Leverage Cycle

Hypothesis	F-statistics	Prob.
Debt-to-equity does not cause investment	3.595***	0.03
Investment does not cause debt-to-equity	2.198	0.12
Debt-to-asset does not cause investment	3.828***	0.03
Investment does not cause debt-to-equity	1.600	0.22

Note: lag length of 2 was selected based of lag selection criteria for testing granger causality, *p<0.1

4.   DATA AND METHODOLOGY

The study has used both annual and quarterly data on corporate investment at an aggregate level. The annual data are based on audited annual accounts of the non-government non-financial public limited companies and private limited companies registered with the Ministry of Corporate Affairs (MCA). Aggregate variables such as investment, cash holdings, debt-to-equity, debt-to-asset etc. derived from the balance sheets of the non-government non-financial public limited companies and non-government non-financial private limited companies. The data covers the period 1980-81 to 2018-19 published by the Reserve Bank of India[17]. All modelling exercise was carried using annual data while quarterly data has been used to present some of the stylized facts relating to investment (given in section 3) and the verification of accelerator hypothesis (given in appendix Tables A1 and A2).The quarterly data has been sourced from Centre for Monitoring Indian Economy (CMIE) capex and Prowess database for obtaining the stalled investment projects and some of the quarterly financial variables of the companies in order to model the investment. Further, data on gross domestic product (GDP), gross fixed capital formation (GFCF) and bank credit has been sourced from Database on Indian Economy (DBIE) – the data warehouse of RBI. Survey-based indices are collected from the various issues of RBI bulletins. Data on economic policy uncertainty index are obtained from the website of the Economic Policy Uncertainty. The descriptive statistics of the annual variables are mentioned in Appendix Tables A3 and Information about the variables and its definitions along with the duration of data etc. are mentioned in Appendix Table A4.

Two modelling approaches, namely, the accelerator approach and a threshold approach, have been used in the study. Following IMF (2018b), the augmented accelerator model specification for investment is as follows:

The investment in time t (I_t) can be expressed as a function of a desired stock of capital (K) and its lags to account for inertia in the adjustment of the capital stock to its desired level, and the capital depreciation rate (ρ).

$$I_t = \Sigma_{j=0}^{n} \delta_j \Delta\dot{K}_{t-j} + \rho K_{t-1} \tag{1}$$

The accelerator model assumes proportional relationship between changes in desired stock of capital and changes in output:

$$\Delta\dot{K}_t = \Delta Y_t \tag{2}$$

Using (2) in (1), and dividing both sides by K_{t-1}, and lagging the output by one year to address the endogeneity issues yield the following baseline empirical specification:

$$\frac{I_t}{K_{t-1}} = \rho + \Sigma_{j=1}^{n} \delta \frac{\Delta Y_{t-j}}{K_{t-1}} + \varepsilon_t \tag{3}$$

The baseline specification (3) allows modelling the dynamics of investment based solely on output developments. The baseline model has been augmented with additional determinants of the investment as follows:

$$\frac{I_t}{K_{t-1}} = \rho + \Sigma_{j=1}^{n} \delta_j \frac{\Delta Y_{t-j}}{K_{t-1}} + \gamma_m \Sigma_{m=1}^{M} F(m) + \varepsilon_t \tag{4}$$

where $F(m)$ represent the additional financial variables driving investment.

We have used financial variables derived from the balance sheet and profit and loss statements of the Indian companies. The major variables used are leverage ratios, profitability ratios, size of the firms, cash balances etc., which are listed in the Appendix Table A4.

For estimating the threshold values of the corporate leverage, a threshold regression model (Hansen, 1999; 2011) was employed by empirically modelling the relationship between investment and corporate leverage and estimating the threshold levels of leverage, as follows:

$$I_{(d/e)t} = \alpha_0 + \alpha_1 D_{(d/e)t-1} I(D_{(d/e)t-1} \leq \tau_1) + \alpha_2 D_{(d/e)t-1} I(D_{(d/e)t-1} > \tau_1) + \varphi X_{t-1} + \varepsilon_t \tag{5}$$

$$I_{(d/a)t} = \beta_0 + \beta_1 D_{(d/a)t-1} I(D_{(d/a)t-1} \leq \tau_2) + \beta_2 D_{(d/a)t-1} I(D_{(d/a)t-1} > \tau_2) + \psi Z_{t-1} + \varepsilon_t \tag{6}$$

Where and are the investment equations at time t estimating threshold for debt-to-equity and debt-to-assets, respectively. $D_{(d/e)}$ and $D_{(d/a)}$ are the indicator variables denoting the leverage measures, debt-to-equity ratio and debt-to-asset ratio respectively for which the thresholds and are estimated. Threshold values are estimated sequentially by finding an initial threshold value

that minimises the residual sums of squares and then for additional values that minimise the residual sum of square until the desired number of thresholds are determined. The covariates in the models are represented by the vectors X and Z with coefficient vectors φ and ψ. We have used lagged variables of the leverages and covariates to address the endogeneity issues. The covariates used for controlling the investments are interest coverage ratio, profitability, Debt Service Coverage Ratio (DSCR) and assets size, and represents the residual error. Annual data has been used explicitly in the accelerator model and in the threshold regression model to study investment dynamics and estimating threshold value of leverage. Quarterly data has been used mainly to analyze the influence on policy uncertainty and businesses expectations on investments and as longer time series of these data are not available.

5.   EMPIRICAL ANALYSIS

We use a multi-layer framework to analyze the corporate leverage and investment dynamics in India. Our approach is based on two-step accelerator modelling wherein the investment dynamics are examined through the output variable first (accelerator model) and then augmented with financial variables in the baseline accelerator model (Barkbu *et al.*, 2015; IMF, 2015; and IMF, 2018b).

To begin with, the modelling was carried out on the India's real investment, proxied by GFCF and real output, i.e., GDP, using the quarterly data during the period 1998Q1 to 2019Q4. The estimation results of the baseline accelerator model with 8 quarterly lags show that the dynamics of the investment are significantly explained by the output as expected. The R-square value of the baseline accelerator model indicated that around 30 per cent of the investment dynamics are explained by the changes in output, which is only a partial explanation. The residual of the model also shows a large variation and found a wide gap between the estimates by the model and the actual observed values. In the second stage, we have included some of the financial variables like interest coverage ratio, profitability, and credit growth augmented with the baseline accelerator model. We observed the explanatory power of the model increased by around 30 per cent. We also tried with another set of market variables like market volatility, short term interest rates and another set of expectations and uncertainty indicators in the baseline accelerator model. The net effect is the improvement of the baseline accelerator model in terms of its goodness of fit. The baseline and augmented accelerator model estimates are given in Appendix

Table A1 and Table A2 respectively. The above analysis establishes the fact that the investment in India follows an augmented accelerator model, given the joint relevance of output and financial variables in behavior of investment. We now turn to proceed with the corporate data to model the investment dynamics of the Indian corporate sector. In the next step, we have used two sets of models each with gross investment[18] and net investment as dependent variables. The lagged and contemporaneous financial variables have been used as determinants. The estimated coefficients of each investment model have been given in Table 6 below.

Table 6: Estimated Coefficients of Corporate Investment Model

Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Gross Investment			Net Investment		
Constant	1.010***	1.010***	1.15***	0.644***	0.630***	0.584***
Debt-to-equity					-0.003***	
Debt-to-equity(lag1)	-0.002**	-0.003***		-0.003***		
Debt-to-asset					0.014***	
Debt-to-asset(lag1)	0.009**	0.014***	0.006**	0.014***		0.003**
ICR	0.045***	0.013	.029***		0.016**	
ICR(lag1)				0.013		0.027**
DSCR	-0.530**				-0.375***	
DSCR(lag1)		-0.241	1.016	-0.336**		-0.417**
Cash holdings		0.628			-0.512	
Cash holdings(lag1)	-2.691**		-2.324**	-0.637		-1.301*
Size		-0.059***	-0.061***		-0.029***	
Size(lag1)	-0.050***			-0.031		-0.019***
R-square	0.81	0.82	0.80	0.82	0.82	0.65
ARCH test (p-value)	0.697	0.697	0.135	0.703	0.744	0.220

Note: Gross investment is the dependent variables for model (1), model (2) and model (3); and Net investment is the dependent variables for model (4), model (5) and model (6).
***p<0.01, **p<0.05, *p<0.1

The coefficients of the leverage measure, as proxied by debt-to-equity ratio, show a negative relation with investment as expected as per the existing literature However, it is to be noted here that in our model, this relationship

holds at the aggregate level corporate data. At the firm level, leverage of a firm can affect the investment either negatively or positively depending upon the size of the firm or sector in which the firm operates. However, the standard results in the literature suggest that debt-to-equity affects negatively on investment.

Another proxy of leverage, debt-to-asset is found to be positively impacting on investment. Studies has also show that debt ratios (debt-to-assets) affect either positively or negatively or both on investment and other profitability measures like gross profit, return on equity *etc.* depends on the magnitude of the debt ratios (Gebauer et.al., 2017; Berger and Bonaccorsi, 2006; Nunes, et.al., 2009; Kajananthan and Nimalthasan, 2013; Phan, 2018). Shukla and Shaw (2020) reported that besides debt-to-equity, debt-to-asset ratio also have a negative influence on investment in the Indian firms. Keeping in view their result, though on a disaggregate firm level study, we have excluded the debt-to-equity ratio from our investment model and estimated the model parameters separately (listed in model 3 and model 6 in Table 6). We found that the coefficients of debt-to-asset ratio appeared consistently positive across the models. This may be due to the low debt ratio generally observed in the Indian context. As already mentioned, debt ratio of EMEs and AEs are higher as compared with debt ratio of Indian non-financial corporate sector. There are several reasons for low debt ratios in India. Chauhan (2017) highlighted various reasons for having lower debt ratio for the Indian companies. In the next section of the paper, we have addressed the non-linear effect of the leverage on investment.

Apart from the leverage measures, cash holding of the corporates is also conceptualized as a key determinant of investment the empirical literature. Empirical studies suggest that firms with high cash holdings have a significant role in the investment activities as compared with those who are cash-poor, especially in the recovery period after the GFC. Cash-rich firms can continue their investment and accumulate more profits over long-run when cash-poor firms could fail to survive in the post GFC period (Joseph, et.al., 2019). But at the same time, cash holding may not necessarily materialize into the fixed investment. This being an empirical question, in view of this finding, we have also included cash holding of the corporates in the corporate investment model. We found that cash holding of the companies has a negative impact on investment in the Indian context, implying cash holdings are not realizing in to fixed assets suggesting that Indian companies when in a cash rich position might be investing in other financial assets rather than fixed assets.

We also performed a Granger-causality test for verifying any long-term causal relationship between cash holdings and investment. However, the test does not confirm a causal relationship. Given the context of subdued investment in India during the study period, particularly estimating the threshold of debt, cash holding is negatively affecting investment. Corporates invest in financial assets or financial markets if the return from the financial assets makes the firms more profitable, they may switch their investment plan from fixed assets to financial assets, might be for mitigating the risks. Therefore, our results may be viewed in the context of prolonged subdued investment environment prevailed during the study period. Financial assets like investment in stock markets, or bond markets are viable for the cash rich firms so that they invest in financial assets and keep their balance sheet strong. Literature also indicated negative and positive influence of cash holding on investment.

Moreover, interest coverage ratio (ICR) has a positive impact on investment and DSCR has a negative influence on investment. Though ICR is sometimes referred as a leverage measure, it is an expenditure ratio which considers interest payments or expenses and not payments made on principal debt. It is only dealing with the serviceability of interest. But DSCR is a debt service ratio which takes into account the serviceability of debt including the interest expenses. Higher the values of both measures better the firm's ability to repay the interest or debt. However, in view of the investment ability of firm, higher the DSCR may negatively affect the investment as serviceability of the outstanding debt (repayments and prepayments) or deleveraging may lead to cut back their investment. Therefore, it can negatively affect investment.

Estimation of Threshold Debt for Corporate Investment

As indicated earlier, this exercise is motivated by a strand of literature which suggests that leverage could have a non-linear relation with investment depending on how large the former is, throwing up the question: is there any threshold of leverage beyond which the investment can turn negative? This relationship has been established in the literature for several advanced and emerging market economies. In the Indian case, we have attempted to find out if there exists a threshold for Indian corporate leverage. Our corporate investment models suggest that there exists a negative relationship between leverage and investment at the aggregate level. The threshold regression model suggests that for a debt equity ratio of around 60 per cent and above, the investment tended to turn negative. Therefore, this can be a threshold for the Indian context.

However, it may be noted here that the debt-equity ratio can be higher for highly capital-intensive industrial companies. This may be verified with various industrial sectors using sectoral data in a panel set-up, which is not addressed in this study. The threshold level of debt-to-asset ratio also determined in the same manner where non-linear relation with investment is again seen to exist. The estimated threshold for the debt-to-asset of the Indian corporate sector is about 28 per cent, though investment in the above threshold is not statistically significant. However, we have considered 28 per cent as a threshold level for the debt-to-asset ratio of the corporate sector.

The covariates which are used as non-threshold variables in the models are the lagged values of ICR, DSCR, cash holdings, profitability and size of the firm. The statistically significant coefficients of the non-threshold variables are in line with the expectations and previous empirical findings. ICR is positively affecting the investment, while DSCR is affecting negatively on investment. Profitability has a positive impact on investment as expected whereas the firm size is negatively affecting investment. Though cash holding has shown a mixed effect on investment, it was not statistically significant. The threshold regression estimates for debt-to-equity and debt-to-assets are given in Table 7 and Table 8 respectively.

Table 7: Threshold Regression Estimates: Debt- to- equity

	(1)	(2)
Debt-to-equity < 59.87		
Debt-to-equity(lag1)	0.0036***	0.0055***
Constant	0.1527*	0.2193***
Debt-to-equity >= 59.87		
Debt-to-equity(lag1)	-0.0019***	-0.0013***
Constant	0.4936***	0.6412***
Non-Threshold Variables		
ICR(lag1)	0.0221**	0.0174***
DSCR(lag1)	-1.2294***	
Size(lag1)		-0.0164***
Cash holdings(lag1)	-0.3513	-0.003
Profitability(lag1)	3.8690***	
R-square	0.77	0.81
ARCH-Test (p-value)	0.51	0.92

Note: Dependent variable: net investment/total assets
        ***p<0.01, **p<0.05, *p<0.1

Table 8: Threshold Regression Estimates: Debt- to -asset

	(1)	*(2)*
Debt-to-asset < 27.87		
Deb-to-sset(lag1)	0.0083***	0.0086***
Constant	0.4927***	0.4354***
Debt-to-asset >= 27.87		
Debt-to- asset(lag1)	0.037	0.0358
Constant	0.3985	0.4169
Non-Threshold Variables		
ICR(lag1)	0.0138***	
DSCR(lag1)	-0.2486**	-0.0108
Size(lag1)	-0.0258***	-0.0239***
Cash holdings(lag1)		0.2638
R-square	0.82	0.79
ARCH-Test (p-value)	0.91	0.69

Note: Dependent variable: net investment/total assets
       ***p<0.01, **p<0.05, *p<0.1

6.   CONCLUSION

The extended accelerator model suggests that financial conditions have a significant impact on investment. The decline in investment in India especially after the GFC cannot be explained solely by weaker economic environment, but in combination with the financial conditions of the Indian corporate sector. The leverage has a greater role in determining the investment pattern of the corporates with there being a negative relation between the two. In the Indian context, our results suggest that leverage measured as debt-to-equity ratio gives 60 per cent as the threshold level beyond which debt is found to be negatively affecting investment. With the current level of leverage of around 48 per cent, as per latest available data (2018-19), suggests that there exists a further space for corporate borrowing which will lead to higher investment in a scenario where macro-economy is conducive and better financial conditions prevail. Similarly, the estimated threshold for the debt-to-asset of Indian corporate sector is about 28 per cent, which gives more space to reach the debt threshold from the current debt-to-asset ratio of 19 per cent. These findings provide a macro-level threshold for the leverage measures for the Indian corporate sector which could be useful for the policy makers and researchers.

Our results also suggest that cash holdings of the companies have a negative relation with the fixed investment. This implies cash holdings are not realizing into fixed assets as Indian companies might be investing in other financial assets rather than fixed assets for corporates with higher cash holdings. It is to be stated here that, Joseph et.al. (2019) suggests that firms with high cash holdings have a significant role in investment activities as compared with those who are cash-poor, especially in the recovery period after the GFC. Cash-rich firms with accumulated profits over long-run are able to continue their investment whereas cash-poor firms fail to survive in the post-GFC period. Literature also highlighted the negative and positive effect of cash holding on investment. However, our study does not segregate the investment based on cash holdings pattern of the firms. This could be a further research topic so as to get a better idea of the investment dynamics based on the distribution of cash holding across firms.

The investment cycle of the Indian corporate sector suggests that the average duration of the investment cycle is around 7 years while contraction phases (4 years) are larger than that of expansion phases (3 years). Prolonged contraction has to be controlled through effective policy measures or else contraction can spill over to output, which will have negative impact on growth. An early recognition of cyclical patterns could help in devising appropriate counter-cyclical stabilization policies. Looking ahead, an upcycle of investment is expected to set in as the debt is building up for the corporate sector which in a scenario of high capex from the government sector, could crowd in private investment and ensure a durable growth recovery for Indian economy.

The corporate leverage has increased across the globe in the recent period. According to the global financial stability report, 2021, leverage in the nonfinancial private sector reached historical highs for many economies in the run-up to Covid-19 crisis, as policymakers have stepped in to prevent disruption to the flow of credit to households and firms. Estimating the country level leverage threshold is important, particularly in the context of covid-19 induced economic crisis. Country level corporate leverage threshold will help to determine the optimal level of investment in the context of highly leveraged corporate sector. Therefore, another extension would be to apply our analysis to a set of countries to test whether our main findings are general or whether they are confined to India.

Notes

1. The views expressed in the article are those of the authors and not of the RBI. An earlier version of this article was published as a working paper by the RBI

2. A firm is said to be financially constrained if the cost or availability of external funds prohibits the firms from undertaking an optimal investment decision that it would have taken otherwise, had internal funds been available (Bhaduri, 2005).

3. The household sector contributes 39.4 per cent of the total investment in India according to the March 2020 data. Corporate sectors share was around 43 percent in March2012 while household sector was around 46 per cent.

4. Gross NPA ratio of all banks in India, measured as gross NPAs as per cent of gross advances.

5. Resources mobilised from the capital markets include equities and private placement of debt.

6. Bank credit includes credit extended to the non-bank finance companies (NBFCs). NBFCs are also borrowing from domestic and international markets. Therefore, credit from NBFCs are not considered as other resources of substitution of bank credit.

7. According to CMIE capex database, new investment means announcements of high value green-field projects for setting up industrial or infrastructure projects.

8. A reverse causal relation from investment to cash holding has been observed with a weak statistical significance (at 10 percent level of significance)

9. Christiano-Fitzgerald filter (Christiano & Fitzgerald, 2003) is time invariant filter at any frequency, and it works based on the power spectrum of the time series. This is the advantage over other filters such as HP filter or BP filter which are other commonly used filters for extraction of cyclical components of a time series.

10. Our result is different from Raj *et al.* 2018 mainly due to two reasons. Firstly, they have used total investment rate in the country represented by the ratio of real gross fixed capital formation (GFCF) to real GDP for the construction of the investment cycle. Secondly, the difference in the methodology adopted. Though, Raj *et al.* 2018 has used the NEBR dating procedure, it estimated short cycle of length, generally 1-8 years referred in the business cycle literature.

11. Economic policy uncertainty index is constructed based on three types of components and made a single index. One component covering news sentiments based on newspapers and the second component measures the level of uncertainty regarding tax codes. The third component is based on disagreement among economic forecasters as a proxy for policy uncertainty. This index is available for various countries. For more details about the policy uncertainty indices, please refer to the website: http://www.policyuncertainty.com

12. The Business Expectations Index (BEI) released on a quarterly interval by the Reserve Bank of India gives a snapshot of the business outlook in every quarter. BEI is a composite index calculated as a weighted net response of nine business indicators. The nine indicators considered in the computation of the BEI are: (1) overall business situation; (2) production; (3) order books; (4) inventory of raw material; (5) inventory of finished goods; (6) profit margins; (7) employment; (8) exports; and (9) capacity utilisation. For more information about BEI, please refer to the website: https://rbi.org.in

13. According to CMIE data, reasons for stalling of projects in India are varied covering: (i) lack of clearances, (ii) unfavourable market conditions, (iii) lack of promoters' interest, (iv) land acquisition problems, (v) lack of funds and (vi) lack of raw materials/fuel supply problems.

14. Investment intentions meaning planned investment by the firms. This information is obtained from the filings of proposed industrial investments from the Government of India website, https://dipp.gov.in/GOI

15. There are several ways to define both numerator and denominator of the debt ratios. For instance, debt can be long-term and short term. Even though both are interest bearing debts, long-term debt is usually used for investment purpose and short-term debt is generally used for day-to-day requirements like meeting of working capital requirements. If we consider the total debt, it may overestimate the leverage. It is also common to use total assets or total equity to represent denominators. The corporate database released by the RBI defines equity as sum of share capital and reserves and surplus and the long-term debt is used for deriving debt-to-equity ratio. Therefore, we have used same definition to arrive at the leverage ratios.

16. Some higher values of leverage can be seen during the period 1988-90. Large sized companies account for a substantial share in the private corporate business sector during 1987-90. Such companies, particularly in the industrial segments like textiles, cement and shipping, uses external sources of funds for financing their assets. Apart from bank borrowings, they heavily rely on other institutional agencies for borrowings. The debt ratios of such companies are sometimes very high during the period and subsequent years the financing cycle has changed from debt finance to equity finance, the trend has declined.

17. The RBI has been publishing data relating to finances of non-government non-financial private limited companies and public limited companies based on audited annual accounts on an annual basis for the three years period from the publishing years in order to facilitate comparison. To make time series data, we have used latest data published in each year starting from the financial year 1980-81. The sample size of the companies has been increased, especially for the private limited companies since 2011-12 due to the sourcing of data changed to MCA systems.

The sample size varies from 2,665 companies in 1980-81 to 4,642 companies in 2010-11 and a total of 2,45,357 companies in 2018-19. These companies are not common set of companies across the years and the sample size of the companies are varying from year to year. In order to address the varying samples over time, all variables have been expressed as ratios, taking total assets of the companies in the denominator thus normalising the data series. The inferences made in this paper is only based on the data used in this study during the period 1980-81 to 2018-19.

18. As both net and gross investment capture different dimensions of the debt-investment nexus, we use both net and gross investment (IMF, 2018a). Net investment is more relevant from a policy point of view given its close link to an economy's level of productivity (Kalemli-Ozcan *et al.*, 2015) and Gross investment (net investment *plus* depreciation) has a stronger theoretical motivation since financial constraints should affect both investment that replaces depreciated assets and new investment (Ferrando *et al.*, 2017).

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APPENDIX A

Table A1: Estimated Coefficients of Baseline Accelerator Model

	β_1	β_2	β_3	β_4	β_5	β_6	β_7	β_8	$\sum\beta_{\#}$
Coeffi-cient	0.322***	0.260***	0.210***	0.131**	0.106**	0.083	0.067	0.075	10.56**
	(0.001)	(0.001)	(0.001	(0.006)	(0.105)	(0.201)	(0.261)	(0.062)	(0.00)
R square	0.28	0.18	0.12	0.05	0.04	0.02	0.01	0.01	

Note: Dependent variable: change in gross fixed capital formation. Estimation results of the baseline accelerator model used 8 quarterly lags of change in output. Values in parentheses indicate p-values. #The Wald test suggests that the sum of the coefficients is significant at 1 per cent level. The value of t-statistic is indicated in the last column. Estimations are performed using quarterly data for the period 1998Q1 to 2019Q4. ***p<0.01, **p<0.05, *p<0.1

Estimated coefficients of the baseline accelerator model are presented in Table A1. Many of the coefficients of the lagged output variables and the sum of the coefficients are statistically significant supporting the accelerator hypothesis.

Table A2: Estimated Coefficients of Augmented Accelerator Model

(1)		*(2)*		*(3)*	
Variable	*Coeff.*	*Variable*	*Coeff.*	*Variable*	*Coeff.*
Constant	0.258***	Constant	-0.442***	Constant	0.261***
Output	0.529***	Output	0.506***	Output	0.527***
ICR	0.016***	Capacity utilization	0.006***	ICR	0.016***
Profitability	-0.014***	Policy uncertainty	0.001***	Profitability	-0.014***
Credit growth	-0.004***	Short term rate	0.001	Credit growth	-0.004***
		Market volatility	0.001	Stalled investment	-0.039
R-Square	0.520	R-Square	0.480	R-Square	0.520

Note: Dependent variable: investment and independent variables are different combinations of financial and market variables in different models.

*** p<0.01, **p<0.05, *p<0.1

The estimated coefficients of the augmented accelerator models are shown in Table A2. This approach establishes the fact that the investment dynamics are not only explained by output, but financial variables also have a major role in the behavior of investment.

Table A3: Descriptive Statistics (Annual Data)

Statistics	Gross Investment	Net Investment	Cash Holdings	Total Assets	Debt-to-equity	Debt-to-assets	ICR	DSCR	Profitability
Mean	1078333.0	770565.0	110403.7	2204033.0	57.290	20.771	2.745	0.260	0.091
Median	267043.5	189606.5	14065.9	393095.0	53.058	19.479	2.107	0.248	0.090
Maximum	5862554.0	4094665.0	545313.0	12671210.0	99.698	28.859	6.718	0.419	0.128
Minimum	14423.0	7924.3	863.9	21771.9	37.131	11.232	1.441	0.146	0.047
Std. Dev.	1698475.0	1229081.0	173889.3	3688797.0	17.789	4.881	1.466	0.065	0.018
Skewness	169.4	167.9	143.3	172.8	1.250	0.059	1.485	0.747	-0.036
Kurtosis	448.2	440.5	350.1	458.8	3.637	2.003	4.120	3.058	2.890

Note: Amounts are in Rs. crore. Data coverage is from 1980-81 to 2018-19. Net investment is gross investment minus depreciation.

Table A4: Variables - Definitions and Source of Data

Sr. No	Variable	Definition	Source
1	Annual data (1980-81 to 2018-19)		
1.1	Net Investment	Gross fixed assets – Depreciation	DBIE, RBI
1.2	Debt-to-equity	Debt(long-term)/ Equity	DBIE, RBI
1.3	Debt-to-asset	Debt(long-term)/Total assets	DBIE, RBI
1.4	Interest coverage ratio (ICR)	Earnings Before Interest and Taxes (EBIT)/Interest expenses	DBIE, RBI
1.5	Debt service coverage ratio (DSCR)	EBIT/Debt	DBIE, RBI
1.6	Cash holdings	(Cash in hand+ fixed deposit with banks+ other bank balances)	DBIE, RBI
1.7	Size of the company	Log (total assets)	DBIE, RBI
2	**Quarterly Data (2008: Q1 to 2019: Q4)**		
2.1	Investment	Change in real gross fixed capital formation (GFCF)	DBIE, RBI
2.2	Policy uncertainty	Economic policy uncertainty index based on news and other policy related information	https://www.policyuncertainty.com/
2.3	Business expectations	Business expectations index based on qualitative assessments of the business climate by companies in India's manufacturing sector	DBIE, RBI
2.4	Inflation expectations	1-year ahead inflation expectations by household surveys conducted in 18 major cities in India	DBIE, RBI
2.5	Capacity utilisation	Capacity utilisation in per cent based on Order Books, Inventories and Capacity Utilisation Survey (OBICUS) for manufacturing companies in India.	DBIE, RBI
2.6	Credit growth	Non-food credit growth	DBIE, RBI
2.7	Stalled projects	Projects which are stalled during the implementation phase	CMIE, capex
2.8	Investment Intentions	Filing of proposed Industrial Investments	https://dipp.gov.in/GOI

Table A5: Bry- Boschan (NBER) Business Cycle Dating Algorithm

1. Algorithm for estimating the turning points of a cycle is as follows:
2. The first step involves the identification of the possible turning points. *i.e.* local minima (troughs) and local maxima (peaks) in a single time series
3. A technique for alternating the troughs and the peaks *i.e.*, a peak is followed by a trough and a trough by a peak
4. A set of rules that meet pre-determined criteria of the duration and amplitudes of phases and complete cycles after step 1 and 2.
5. Minimum duration ties for the phases and the full cycle. Downturns and upturns have to be persistent to be qualified as cycle phases; *i.e.* each phase (peak to trough or trough to peak) must have a duration of at least six months or two quarters
6. By definition, a peak happens at time t if $Y_{t-k}, \ldots, Y_{t-k+1} < Y_t > Y_{t+1,\ldots,} Y_{t+k}$. *k* needs to be set for example *k* = 2 for quarterly data, k = 5 for monthly data and *k* = 1 for yearly data. *k* is called the symmetric window parameter
7. Other restrictions are often imposed on the phases. Minimum 2 quarters for expansions and contractions are often applied, in line with the rules used by NBER when dating these phases. This is the minimum phase. A complete cycle length (contraction plus expansion duration) of five quarters is also common for quarterly data. This is the minimum cycle. Finally, it may sometimes be desirable to overrule the minimum phase restriction. For example, if the fall in a series is very large one might allow the contraction to be quite short. The parameter controlling this is threshold.