

Leverage, Liquidity and Firm Performance: Evidence from Indian Listed Firms

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Abstract

Purpose – Capital structure decisions are a central topic in corporate finance and remain debated. Leverage is a double-edged sword: it can create firm value or destroy it. This study examines the relationship between leverage and performance among major listed firms in India. It also tests whether liquidity moderates this relationship.

Design/methodology/approach – The study uses an unbalanced panel of NSE 500 companies from 2015 to 2024 (5,272 firm-year observations; 4,479 in the full-control models). It estimates pooled and two-way (firm and year) fixed-effects regressions with firm-clustered robust standard errors. Return on assets (ROA) is the primary performance measure, and return on equity (ROE) serves as a robustness check. The moderating role of liquidity is tested using a leverage $\times$ liquidity interaction term. The models control for firm age, size, current ratio, asset tangibility and capital expenditure.

Findings – Leverage has a negative and significant effect on ROA. In the two-way fixed-effects model, $\beta = -0.173$ ($p < 0.01$). A one-standard-deviation increase in leverage lowers ROA by about 2.9 percentage points, roughly 43% of mean ROA. Liquidity significantly moderates this relationship: the leverage $\times$ liquidity interaction is negative and significant ($\beta = -0.117$, $p < 0.01$). The debt penalty on ROA is therefore steeper for firms that hold more liquid assets, which suggests that liquidity funded by debt drags down asset returns. On its own, liquidity is weakly positive for ROA ($\beta = 0.020$, $p < 0.10$). The ROE models confirm the adverse leverage effect ($\beta = -0.150$, $p < 0.05$) and show a strong positive direct effect of liquidity ($\beta = 0.078$, $p < 0.01$). However, the interaction is not significant for ROE. Firm size is insignificant throughout.

Practical implications – Holding large liquid reserves does not protect a highly levered firm. Managers should avoid combining high debt with idle liquidity. Lenders and analysts should not read high liquidity as a safety cushion against leverage; they should read it as a possible sign of inefficient capital use.

Originality/value – The study provides evidence on liquidity as a moderator of the leverage–performance relationship for a broad, multi-sector sample of Indian firms in the decade after the Insolvency and Bankruptcy Code (IBC) was enacted. It quantifies the economic cost of leverage and

shows how that cost varies with the firm's liquidity position. The results support the trade-off and agency-cost (free cash flow) theories of capital structure.

Keywords: *Capital structure; Financial leverage; Liquidity; Moderation; Firm performance; ROA; ROE; India*

Paper type: *Research paper*

Introduction

A classic financial management issue concerns the optimal debt-to-equity ratio, which stems from the Modigliani–Miller (1958) capital structure irrelevance proposition in perfect capital markets. The inclusion of real-world frictions, such as corporate taxation, financial distress costs, informational asymmetry, and agency frictions, gives rise to different theoretical frameworks and empirical consequences. The optimal leverage proposition holds that the best leverage level would increase firm enterprise value through the tax deductibility of interest payments until the marginal penalties from default become more significant (Kraus & Litzenberger, 1973; Modigliani & Miller, 1963). By contrast, pecking order theories suggest that higher profitability makes debt less necessary because there is a strong hierarchy that favours internal financing through retained earnings (Myers, 1984; Myers & Majluf, 1984). Moreover, agency explanations view fixed-income debt as a monitoring device to address free-cash-flow inefficiencies (Jensen, 1986), and at the same time identify potential governance conflicts between shareholders and creditors that give rise to risk-shifting and underinvestment strategies by the latter (Jensen & Meckling, 1976; Myers, 1977). A wide range of empirical studies reveal inconclusive results, including positive, inverse, statistically negligible, and non-monotonic leverage–performance relationships in various national contexts (González, 2013; Ibhagui & Olokoyo, 2018; Le & Phan, 2017).

This inquiry becomes especially relevant in a new paradigm of the Indian economy, which is emerging in an environment of bank-centric financial markets with weak protections for creditors, highly skewed equity holdings among promoters, and little development of corporate debt markets (Majumdar & Chhibber, 1999). The time period studied experienced significant changes in corporate borrower structure. The Insolvency and Bankruptcy Code (IBC) brought about a change in the control rights from the defaulting promoters to financial creditors in 2016 and the banking sector has worked through the huge stock of non-performing exposures. At the same time, the major businesses were forced to undertake extensive deleveraging due to macroeconomic shocks such as demonetisation in 2016, Goods and Services Tax (GST) in 2017 and the COVID-19 shock in 2020-21. These macroeconomic changes had a fundamental impact on the net leverage trades, but empirical evidence from home is still conflicting. While earlier panel studies found inverse performance linkages (Majumdar & Chhibber, 1999), later studies show no significant relationship with asset returns or market valuation though they show negative linkages with equity yields (Chadha & Sharma, 2015). Negative leverage-performance interactions between specialized industry sectors and governance conditions have also been highlighted from the contemporary empirical studies (Bhatia & Kumari, 2026; Devi & Shiralashetti, 2025; Mathur et al., 2021; Nikhil et al., 2024).

A potential determinant of this observed heterogeneity is firm liquidity. Leverage and liquidity are closely related financing choices, but their joint effect on performance is not clear. Under the financial flexibility argument, liquid firms can meet debt obligations and absorb shocks without expensive external finance, which should soften the negative effects of leverage (Arslan-Ayaydin et al., 2014; Opler et al., 1999). Under the agency argument, a firm that borrows while holding large liquid balances pays interest on funds that earn little, and surplus liquidity may be wasted by managers (Jensen, 1986) — which magnifies the negative effects of leverage. In Indian setting, however, liquidity is more of a control variable than a moderating variable, and the effect of liquidity on the performance disadvantage of debt has yet to be studied empirically.

This study addresses a gap. It examines how leverage affects the ROA of NSE 500 companies over the period 2015–2024 and tests whether the relationship between leverage and ROA is moderated by liquidity, while controlling for firm age, size, current ratio, asset tangibility, and capital expenditures. ROE is used to check the robustness of the results. The NSE 500 comprises about the 500 largest listed companies across various industries and offers greater cross-sectoral diversification than the Nifty 50 or any single-sector samples commonly used in most Indian literature. What impact does leverage have on accounting performance after controlling for unobserved firm heterogeneity and common time shocks? (i) Is the effect economically and statistically significant? (ii) Is there a moderating effect of liquidity, and in which direction? (iii) Is liquidity an independent predictor of performance? (iv) Do the results hold for shareholder returns (ROE)?

The study is significant in four ways. First, it offers direct evidence of the moderating effect of liquidity in a large-population index of firms across a broad cross-section of Indian industry in the post-IBC decade and shows that, contrary to the financial flexibility view, liquidity amplifies rather than cushions the leverage penalty on asset returns. Second, comparing baseline and two-way fixed-effects estimates yields a figure for the performance cost of leverage about 68% larger than cross-sectional comparisons suggest, emphasizing the importance of controlling for unobserved heterogeneity. Third, it goes beyond the statistical significance to the economic size, revealing a leverage cost of around 43% of mean ROA per standard deviation, compared with around 19% of mean ROE, an asymmetry in line with the equity-multiplier effect in the DuPont identity. Fourth, it shows that liquidity plays different roles for asset returns and shareholder returns, in line with the financial flexibility arguments of Arslan-Ayaydin et al. (2014) and Opler et al. (1999).

The organization of the structure of the paper is as follows: Section 2 presents thorough literature review, both theoretical and empirical. In the core hypotheses (Section 3), the primary hypotheses are stated. The data set, variable operationalization and empirical method for this study are described in Section 4. The empirical results are summarized in Section 5, a rigorous discussion of the results is provided in Section 6, theoretical and practical implications are presented in Section 7, limitations of the study and opportunities for future studies are discussed in Section 8, and concluding remarks are given in Section 9.

Theoretical Background and Review of Literature

In this section, students will learn about 2.1 Capital structure theories and their predictions of performance.

The modern theory of capital structure begins with the irrelevance proposition put forward by Modigliani and Miller (1958) which holds that the value of a firm is determined by the earning power of its real assets only and is independent of the manner in which the assets are financed. The proposition is based on the fact that there are no taxes, no bankruptcy costs, and no information asymmetry, and the value comes from understanding which friction can cause financing to become important. It was Modigliani and Miller (1963) who themselves showed that interest was tax deductible, and thus had a tax advantage over equity, while it was Kraus and Litzenberger (1973) who made the static trade-off between tax shield and the expected bankruptcy costs of the firm formal. Thus the trade-off argument implies that leverage should be negatively related with value: value goes up when the probability and the cost of distress are moderate and value goes down when the probability and cost of distress rise.

The pecking order theory makes a different conclusion than the information asymmetry assumption. External equity (Myers, 1984; Myers & Majluf, 1984): The external equity is an expensive source of capital to the firm because the manager has an advantage over the outside investor in that regard. The theory indicates a negative correlation between the profitability of the firm and the degree of the leverage of the firm because highly profitable firms can accumulate retained earnings and

consequently, will need less debt. This is one of the most consistent stylised facts in the determinants literature (Frank and Goyal, 2009; Rajan and Zingales, 1995; Titman and Wessels, 1988) and meta-analytic reviews confirm that the pecking order model is the most dominant in the determinants literature, especially in emerging markets (Kumar et al., 2017).

An additional level of complexity is added by agency theory. Inside equity can also create agency costs, because the more highly-g geared a firm is, the greater the degree of concentrated ownership by the firm's managers, which will lower the agency costs of outside equity, but at the same time it will also increase the agency costs of inside equity because shareholders of a levered firm will have an incentive to engage in riskier investments at the creditor's expense (Jensen and Meckling 1976). There is also a complementary underinvestment problem, in that very highly leveraged firms will be hesitant to invest in projects with positive NPVs, since the benefits will be captured mainly by the creditors, according to Myers (1977). The discipline factor is raised to the fore by Jensen (1986): Free cash flow is being diverted into fixed interest obligations that managers might be able to waste. The signalling theory states that a company will be able to do so because of borrowing money, if it has a good prospect (Ross, 1977). These theories imply that the leverage–performance relationship may be both positive and negative and is subject to a heterogeneous response by firm characteristics and that the leverage–performance relationship may be different depending on the institutional setting where lenders monitor borrowers.

Quality of living and human resources: international evidence.

Numerous empirical tests examine these theories, using various settings and methods. Berger and Udell (2006) investigate agency theory by modeling profit efficiency and capital structure in the US banking sector. They find a positive link between profit efficiency and leverage, suggesting that higher leverage reduces outside equity agency costs. Similarly, Margaritis and Psillaki (2007), employing data envelopment analysis (DEA) on New Zealand firms, observe that more efficient companies tend to have higher leverage, though this relationship becomes negative at very high leverage levels. Campello (2006) uncovers a concave trade-off: moderate debt correlates with sales gains during industry booms, whereas high debt links to market share losses during downturns.

Research conducted on accounting profitability, on the other hand, typically find negative relationships. Zeitun and Tian (2007) conclude that leverage has a negative impact on both accounting and market performance of firms in Jordan. Salim and Yadav (2012) found that for the Malaysian listed companies, short term debt has a negative correlation with ROA and ROE and long term debt and total debt have negative correlation with ROA and ROE, but Tobin's Q has positive correlation with some debt measures. Le and Phan (2017) find that in Vietnam, all leverage measures negatively affect firms' performance and Nguyen and Nguyen (2020) report that 488 out of 500 non-financial firms in Vietnam experience negative impacts from all leverage measures. Bendana (2012), however, discovers that the short term debt and total debt have a positive relationship with ROE in Ghanaian listed companies but long term debt has a negative relationship among the Ghanaian listed companies. González (2013) finds that leverage exacerbates the negative impact of industry downturns across 39 countries; and that the impact of leverage is stronger the less developed and less institutionalized a country's financial and institutional framework. The study by Ramli et al. (2019) illustrates that there is country-specific heterogeneity in the relationship between capital structure determinants and performance as shown by the moderating effect of leverage (with PLS-SEM).

There are still contingent effects, as revealed by some recent research. Le et al. (2026) found that the positive relationship between intellectual capital and the performance of the top 200 of Vietnam companies is mitigated by financial leverage, while Madwe (2026) shows that financial leverage partially mediates between corporate governance and financial performance for carbon-intensive companies in South Africa. All these studies suggest a direct effect of leverage on performance, along with a channel and conditioning effect; this latter is an invitation to look at moderators of the effect.

The new and bank-based economies are embedded in an institutional context that needs to be understood.

Most of the capital structure theory is based on the market-based systems of the U.S. and UK capital markets and may not be relevant to emerging markets. Although the determinants of leverage for firms are the same across the 10 developing countries, Booth et al. (2001) conclude that country-specific factors (such as inflation, capital market development and the tax regime) affect the level and composition of debt. According to Beck et al. (2005), financial and legal obstacles are the most critical for the smallest firms, and financial and institutional growth has the greatest impact on the growth of smaller firms. The role of institutions in borrowing, therefore, not only affects the quantity of borrowing by firms but also who bears the cost of borrowing.

This is a replica of India. They feel that historically, both short and long term lending were held by the state owned institutions and in India, the role of debt does not play as an agency theory suggested it would, which means that there is a negative relationship between debt and performance. In India, the debt as predicted by agency theory did not seem to be followed as short and long term lending activities were dominated by state owned lending institutions and thus, resulted in negative relation between lending activity and debt performance as predicted by the agency theory (Majumdar and Chhibber, 1999). Over the past few years, the ownership of lending is becoming more diversified, the rights of creditors are being strengthened by the IBC and the corporate bond market is being encouraged to grow, while bank credit still dominates corporate borrowing. The job of these reforms is to offer a natural surroundings to inquire whether The interest burden of Indian firms has been as high as reported in the prior literature.

Evidence from India

Indian evidence on determinants of leverage broadly confirms the pecking order prediction. Bhaduri (2002) demonstrates that size, growth, cash flow and asset uniqueness influence the leverage ratio of Indian companies and that it takes a lot to reach the company's target leverage ratio. In line with pecking order, Singh et al. (2026) conclude that profitability, size, tangibility and liquidity are all factors that determine leverage in the Indian FMCG sector, with more profitable firms being less leveraged. Profitability is also an important factor in determining leverage, so the reverse causality is a major issue in all studies of profit-leverage relationship.

The performance implications of leverage are also negative, as are studies of its consequences for the economy. However, Majumdar and Chhibber (1999) find a significant negative correlation across a large cross-section of Indian companies. For 422 manufacturing firms listed on the BSE from 2003 to 2013, Chadha and Sharma (2015) find that leverage has no effect on ROA or Tobin's Q but a significantly negative effect on ROE, along with significant effects on size, age, and tangibility. According to Mathur et al. (2021), high debt is detrimental to the accounting performance of BSE 500 pharmaceutical companies, and competitive intensity moderates the negative relationships. Nikhil and co. (2024) find that leverage reduces profitability, and the implementation of Indian Accounting Standards (Ind AS) negatively affects leverage's relationship with profitability in their study of 3,120 firm-years in 401 non-financial firms. According to Devi and Shiralashetti (2025), leverage negatively impacts performance measured in terms of ROA, ROE, and ROCE for NSE-listed power companies during the period 2014-2023, due to the financial distress faced by the firms. Firm size and firm age have a significant impact on performance. Bhatia and Kumari (2026) conclude that while leverage has a negative impact on Business Today 500 companies, the impact is reversed by robust corporate governance (CG). The literature in India, therefore, has increasingly focused on the conditional nature of the relationship between leverage and performance, while liquidity, the financing choice most closely linked to leverage, has yet to be tested as a moderator in a wide-ranging Indian index.

Liquidity as a contingency in the leverage–performance relationship

There are two opposite explanations in the theories as to why liquidity would condition the effect of leverage. The buffering view is based on financial flexibility. A levered firm with enough liquid resources can pay interest, avoid distress sales of assets and continue to invest without costly external finance (Arslan-Ayaydin et al., 2014; Opler et al., 1999). In that case, the same amount of leverage is less harmful to a liquid firm.

The amplifying view is based on agency and cost-of-carry arguments. When a firm borrows and at the same time holds large liquid balances, it pays interest on the debt while earning low returns on idle assets, which reduces returns on the total asset base. Jensen (1986) argues that surplus liquidity in the hands of managers invites wasteful spending, so high debt together with high liquidity may signal weak capital allocation rather than safety. In that case, liquidity makes the negative effect of leverage stronger, especially for asset-based measures such as ROA. Indian studies include liquidity only as a control, so which of these two views holds for large listed firms is not clear.

Non-linearity, thresholds and financial distress are included here.

An associated literature suggests that the linear models can obscure the prediction of the trade-off theory that there is an interior optimum. For 1,503 Chinese manufacturing firms, Dalci (2018) discovered an inverted U-shaped leverage-profitability relationship, as tax-shield benefits outweigh on low leverage and distress/agency costs outweigh on high leverage. Similar sign reversals are reported by Margaritis and Psillaki (2007) and Campello (2006) while Bolarinwa et al. (2026) estimate different thresholds for short- and long-term leverage and leverage total. Several Indian studies also suggest threshold effects: leverage becomes beneficial only to a certain extent. The results indicate that the results of the average linear effect should be supplemented by tests for curvature and regime dependence, which will constitute a direction for future research.

Liquidity, financial flexibility and performance 2.7 Liquidity, financial flexibility and performance

Leverage is related to liquidity, but not the same. The reason for holding liquid assets is precautionary – especially when external finance is expensive (Opler et al., 1999). As per Arslan-Ayaydin et al (2014), during the Asian crisis (1997–1998), the conservatively leveraged firms invested more and performed better than their counterparts but the gains were less during the credit crisis (2007–2009). However, liquidity can enhance its performance by enabling the firms to benefit from opportunities and cushion against shocks without the need for external financing which is often expensive. When liquidity is high, it can actually indicate underutilization of the funds and agency issues. A model of the impact of leverage which ignores liquidity risks giving a false impression that they were the result of leverage.

Asset structure, firm age and investment

The most common appearance in the literature of the concept of asset tangibility is as a determinant of borrowing capacity: tangible assets are used as collateral, which reduces the cost of borrowing and increases borrowing capacity (Frank & Goyal, 2009; Rajan & Zingales, 1995). It is not known whether it is beneficial or harmful to profitability, as asset-heavy companies could be expected to make lower returns on a greater asset base. Firm age, as a proxy for accumulated learning, experience and reputation, and rigidity of organisation. Coad et al. (2018) provide a review of the evidence that supports both channels and find that age is an important factor in financial performance in India in the specific case of Chadha and Sharma (2015). Capital expenditures measure investment intensity; they are current expenditures that lower the short-run profit but might increase the long-run profit. When estimating the effect of leverage, one needs to control for these characteristics.

This chapter treats methodological arguments regarding heterogeneity and endogeneity as well as statistical inference as separate topics.

Part of the differences in findings in literature can be attributed to methodological decisions. Pooled cross-sectional regressions obscure the impact of leverage from unobservables that are time-invariant such as firm characteristics like managerial quality, business model or group affiliation, which also influence profitability. The Hausman (1978) test is usually adopted to select the appropriate model between fixed and random effects and both are free from this kind of bias (Wooldridge, 2010). Leverage can also be endogenous as finance decisions affect profitability; Berger and Udell (2006) deal with this issue using simultaneous equations and Wintoki et al. (2012) find that the use of dynamic panel GMM estimators is required when current performance depends on past performance. There must also be between-firm independence of residuals over time, which is why Petersen (2009) demonstrates the need for standard errors clustered by firm in financial applications. Last, interpretation of interaction models must be done with care: the coefficient for the constituent of an interaction term is a conditional effect at the value of zero for the moderator; and the marginal effects over the range of the moderator observed should be reported (Brambor et al., 2006). A lot of the applied literature on the leverage and performance in emerging markets fails to follow these practices, which can be one reason for the inconsistent results reported.

Research gap

The following three gaps emerged from the review. First, the relationship between leverage and performance is more conditional in the Indian literature, and despite the increase in number of such studies, liquidity is included only as a control variable in those studies and is never tested as a moderator, even though theory gives opposite predictions about its role. Second, very few Indian studies make a distinction between the within-firm leverage and the cross-sectional association effects, and few studies report the economic size of the within-firm leverage effect. Thirdly, the broad, multi-sector samples that have been available for the decade after IBC are less available; most studies are based on a single sector or the top 50 to 100 companies. This study seeks to fill the gaps by employing a two-way fixed-effects moderation design of NSE 500 firms, covering the period from 2015 to 2024.

Hypotheses Development

This empirical study is based theoretically on the trade-off theory and the agency cost theory. The theory of capital structure argues that debt financing carries significant operational and financial risks, such as agency conflicts between equity holders and debt holders, high costs of financial distress and covenants that limit managerial flexibility of optimal capital allocation. These operational frictions are accentuated in the Indian corporate landscape by higher borrowing cost in comparison with developed markets and limited monitoring capability of institutional lenders in the past and stricter penalties on default post implementation of Insolvency and Bankruptcy Code (IBC). As such, the empirical literature on Indian firms mostly reports negative performance effects of financial debt. On the other hand, the theoretical impact on Return on Equity (ROE) is less clear cut because the debt capital by itself will mechanically push the ROE into positive, even if operating profitability has been reduced, and this effect will be partly offset by the rise in the equity multiplier ($ROE = ROA \times \text{Assets/Equity}$). The leverage effect is not enough, however, to offset a decline in the net returns on equity if the return on assets is less than the cost of the debt used to finance the additional assets.

Accordingly:

From a particular resource base. These operational frictions are further accentuated by the high cost of borrowing for Indian corporations, limited monitoring capacity of institutional lenders in India (Majumdar and Chhibber, 1999), and adverse penalties for default after the enactment of the

Insolvency and Bankruptcy Code (IBC). Thus, the literature on the Indian companies has been mainly focused on the negative effect of financial debt on the performance of Indian companies (Chadha & Sharma, 2015; Devi & Shiralashetti, 2025; Nikhil et al., 2024). Besides that, credit allocation is rigid, administrative burdens for non-performing assets resolution and tight enforcement of covenants further restricts operational flexibilities of levered entities. The theoretical impact on Return on Equity (ROE), on the other hand, is more complex: the use of debt capital mechanically increases ROE ($ROE = ROA \times \text{Assets/Equity}$), which partly offsets any drop in operating profitability. But if the return on assets is less than the marginal cost of debt, this leverage effect is not enough to prevent a net reduction in equity returns. Debt-service requirements can eat up large portions of discretionary cash flow, and constrain reinvestment in higher-margin strategic opportunities. Accordingly:

H1: Financial leverage has a statistically significant negative effect on the ROA of NSE 500 companies.

Liquidity may condition this effect in two opposite ways. Financial flexibility theory suggests that liquid firms can service debt and avoid distress costs without the expensive resourcing of external finance, which would weaken the negative leverage effect (Arslan-Ayaydin et al., 2014; Opler et al., 1999). Agency theory suggests that holding large liquid balances alongside debt raises the cost of carry and invites wasteful use of free cash flow, which would strengthen the negative leverage effect (Jensen, 1986). As the direction is not clear from theory, the hypothesis is stated as non-directional. Accordingly:

H2: Liquidity significantly moderates the relationship between financial leverage and ROA.

Financial flexibility theory holds that liquid firms are more likely to be able to capture opportunities and cope with shocks without requiring the expensive resourcing of external finance (Arslan-Ayaydin et al., 2014; Opler et al., 1999). Accordingly:

H3: Liquidity has a positive effect on return on assets.

Since the effect of leverage on ROE is less clear-cut ($ROE = ROA \times \text{Assets/Equity}$), ROE is not hypothesised separately; instead, all models are re-estimated with ROE as the dependent variable to test the robustness of the results.

The conceptual framework is shown in Figure 1. The two research dimensions that can be tested directly with the estimated models are the cost of leverage and whether it depends on the liquidity position of the firm (RQ1), and whether the within-firm impact of leverage differs from its cross-sectional association after controlling for common macroeconomic shocks and holds for shareholder returns (RQ2).

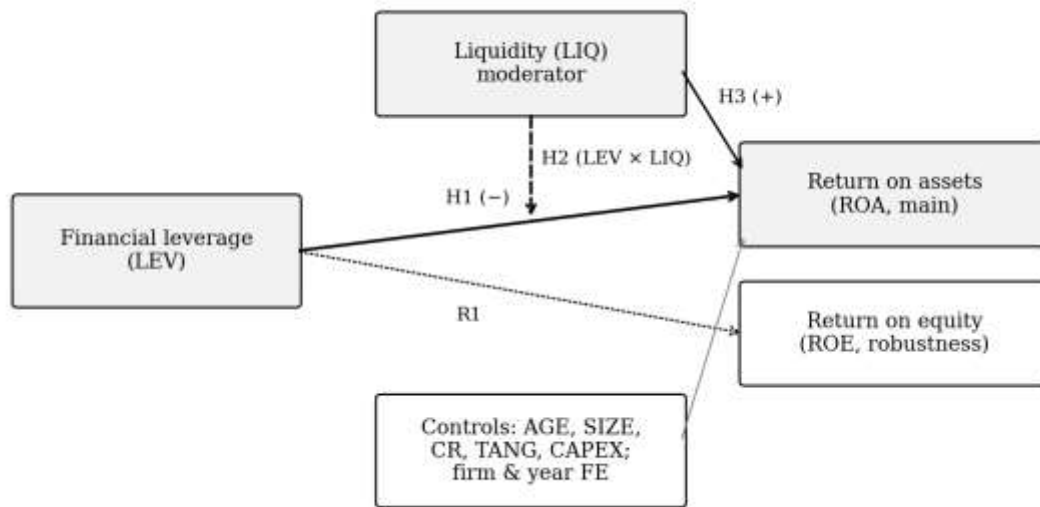


Figure 1. Conceptual framework

Author(s)' elaboration of the source. Direct effects are represented with solid arrows, the hypothesized moderating effect of liquidity is represented with the dashed arrow, and the ROE robustness test is represented with the dotted arrow.

Research Methodology

Research design

This study used an explanatory research design with positivist orientation, secondary firm-level panel data. The deductive nature of the design involves testing hypotheses drawn from the capital structure theory with panel regression models which use the variation across firms and within firms over time. The panel structure has three main advantages over cross-sectional designs: (i) it removes unobserved time-invariant heterogeneity, (ii) it distinguishes common macroeconomic shocks from firm-specific ones, and (iii) it boosts the number of degrees of freedom and the efficiency of the estimates.

Population, sample and data

The population consists of companies listed in the NSE 500 which comprise approximately 500 of the largest companies traded on the National Stock Exchange of India across all the major industries of the economy. The study period covers 10 years from 2015 to 2024, which encompass the demonetisation (2016), the introduction of the IBC (2016), the introduction of the Goods and Services Tax (2017) and the COVID-19 pandemic (2020–21). The financial information has been sourced from [CMIE Prowess IQ – confirm database]. Confirm / exclude treatment for financial firms (banks, NBFCs and insurance companies). The panel is unbalanced due to firms coming and going from the index and the fact that some data was not reported in some years. The number of firm-year observations ranges from 4,608 (current ratio) to 5,283 (leverage, liquidity, size and age). The baseline models are based on 5,272 (ROA) and 5,269 (ROE) observations of 490 firms; the fully specified fixed-effects models, which require no missing values on any of the controls, are based on 4,479 observations of 453 firms. No firms with incomplete records are excluded, resulting in less survivorship bias, since unbalanced panels are dealt with directly by the within estimator.

Variables and measurement

The variables are defined in Table 1. In the light of the literature, accounting performance is assessed using ROA that measures the efficiency with which the total asset base generates profit regardless of

financing, while ROE measures the return earned by the shareholders after the impact of financial leverage (Chadha & Sharma, 2015; Le & Phan, 2017). ROA is the main performance measure, and ROE is used to check the robustness of the results. Leverage is a book value debt ratio. Liquidity is the moderating variable. The natural logarithm of firm size (total assets) is used to reduce skewness and make coefficients interpretable in terms of proportional change on the scale. The control variables are based upon the known determinants of performance and capital structure (Frank & Goyal, 2009; Rajan & Zingales, 1995; Titman & Wessels, 1988).

Table 1. Definition and measurement of variables

Variable	Symbol	Measurement	Supporting literature
<i>Dependent variables</i>			
Return on assets (main)	ROA	Net profit / total assets [confirm numerator: PAT or EBIT]	Le & Phan (2017); Chadha & Sharma (2015)
Return on equity (robustness)	ROE	Net profit / shareholders' equity	Salim & Yadav (2012); Abor (2005)
<i>Independent variable</i>			
Financial leverage	LEV	Total debt / total assets [confirm definition]	Rajan & Zingales (1995); Ibhagui & Olokoyo (2018)
<i>Moderator</i>			
Liquidity	LIQ	[Insert exact formula of the liquidity measure]	Opler et al. (1999); Arslan-Ayaydin et al. (2014)
<i>Interaction</i>			
Leverage × liquidity	LEV × LIQ	Product of LEV and LIQ	Brambor et al. (2006)
<i>Control variables</i>			
Firm age	AGE	Number of years since incorporation	Coad et al. (2018)
Firm size	SIZE	Natural log of total assets (₹ million)	Titman & Wessels (1988)
Current ratio	CR	Current assets / current liabilities	Ramli et al. (2019)
Asset tangibility	TANG	[Insert formula, e.g., net fixed assets / total assets]	Frank & Goyal (2009)
Capital expenditure	CAPEX	Capital expenditure during the year (₹ million)	Myers (1977)

Source: Author(s)' compilation.

Model specification

The three stages of analysis are of increasing rigor, and are estimated separately for ROA and, as a robustness check, for ROE. Model 1 is a baseline regression of the performance on the leverage alone, which accounts for the raw association:

$$PERF_{it} = \alpha + \beta_1 LEV_{it} + \varepsilon_{it} \quad (1)$$

Model 2 (main specification) adds the control vector, firm fixed effects (μ_i), with all the time-invariant firm characteristics (such as industry, business model, promoter group, managerial quality) being absorbed, and year fixed effects (λ_t) to capture shocks to all firms during a given year, such as demonetisation, the introduction of GST, the ups and downs of the interest-rate cycle and the pandemic:

$$PERF_{it} = \beta_1 LEV_{it} + \gamma' X_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (2)$$

Model 3 is a test of the moderation hypothesis, which includes liquidity and a variable for the interaction between liquidity and leverage:

$$PERF_{it} = \beta_1 LEV_{it} + \beta_2 LIQ_{it} + \beta_3 (LEV_{it} \times LIQ_{it}) + \gamma' X_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (3)$$

The dependent variable is $PERF_{it}$, which is either ROA or ROE of firm i in year t , and the control vector is X_{it} , which includes AGE, SIZE, CR, TANG and CAPEX. Model 3 has a marginal effect of leverage of $\partial PERF / \partial LEV = \beta_1 + \beta_3 \cdot LIQ$. A significant β_3 would favour H2; a negative β_3 suggests that the leverage penalty increases with liquidity, and a positive β_3 that it decreases. Since LIQ is not mean-centred, β_1 is the effect of leverage for a firm with liquidity close to zero, which is the lower end of the observed range (minimum 0.004), and β_2 is the effect of liquidity for a debt-free firm. Therefore, the implied marginal effects are assessed over the range of observations of LIQ (Brambor et al., 2006).

The student identifies and applies an estimation strategy and makes inferences.

Estimates are obtained using the within (fixed-effects) estimator of the models. From a theoretical point of view, fixed effects is the preferred method because the unobserved firm-specific factors that affect profitability, such as managerial ability, group affiliation and market position, are also likely to affect financing decisions, thus violating orthogonality, which is a necessary condition for random effects (Wooldridge, 2010). The fixed-effects estimator is the same regardless of the presence of this correlation. Standard errors are grouped around the firm level; hence they are not sensitive to heteroscedasticity and to arbitrary serial correlation in the firm (Petersen, 2009). The reported R^2 values for the fixed-effects models are within- R^2 values that represent the percentage of within-firm variance in time explained by the time-varying regressors.

Two identification problems need to be noted. Firm age is included in Models 2 and 3 for comparison, but it is not interpreted because it is almost perfectly collinear with the firm and year fixed effects. Second, financing choice may be endogenous since profits may lead to financing. This is because fixed effects do not control for the effect of time-invariant confounding factors but not time-varying reverse causality, so the fixed effects estimates represent conditional associations, not causal effects. Future research for overcoming this is discussed in Section 8.

There's a record of diagnostic and other analytical dimensions: 4.6.

The variance inflation factors (VIFs) are calculated as the diagonal elements of the inverse of the correlation matrix of the regressors, and are used to assess multicollinearity. In addition to hypothesis testing, the study derives four more dimensions from the estimated models. (i) Economic significance: The impact of a one std change in each significant regressor in percentage points, percentage of sample mean and std coefficient. (ii) Implied marginal effects: the marginal effect of leverage is evaluated at the sample minimum of LIQ, at the mean of LIQ, at one standard deviation above and below the mean and at the sample maximum. (iii) Coefficient stability: runs the same type of analysis as coefficient-stability analysis in Altonji et al. (2005) and Oster (2019), tracing the leverage coefficient and its 95% confidence interval across Models 1 and 2 to assess the influence of unobserved heterogeneity and time shocks. (iv) The asymmetry of asset and equity returns: standardised effect on ROA and ROE as per the DuPont identity.

Results

Descriptive statistics

Table 2 presents the descriptive statistics. The average NSE 500 firm has an ROA of 6.7%, and an ROE of 13.2% with a standard deviation of 9.4% and 18.2%, respectively, indicating high dispersion in profitability including loss making firm-years (minimum ROA of -80.7%). The mean leverage is 0.134;

the range of the leverage is between zero (debt-free firms) and 0.949. Average leverage is also low as compared to international standards, which reflects conservative financing and deleveraging of large Indian companies since IBC. There is also a lot of variation between the individual entries of the index: The mean of log total assets is 11.12 (SD 1.90). The average firm age is 39 years, ranging from 2 to 121 years and the average current ratio of 2.03 is quite comfortable in the short-term. Capital expenditure is very right-skewed, (Mean ₹8,730 million, Standard Deviation ₹29,166 million). The mean liquidity is 0.758 (SD 0.459), ranging from 0.004 to 2.073.

Table 2. Descriptive statistics

Variable	N	Mean	SD	Min	Max	CV
ROA	5,269	0.067	0.094	-0.807	0.469	1.41
ROE	5,269	0.132	0.182	-1.202	1.026	1.38
LEV	5,283	0.134	0.167	0.000	0.949	1.25
LIQ	5,283	0.758	0.459	0.004	2.073	0.61
SIZE (ln total assets)	5,283	11.12	1.90	-0.511	16.70	0.17
AGE (years)	5,283	39.25	25.33	2	121	0.65
CR	4,608	2.027	1.804	0.150	18.26	0.89
TANG	4,866	0.118	0.129	0.000	0.583	1.09
CAPEX (₹ million)	5,171	8,730	29,166	0.50	309,026	3.34

Note: CV = coefficient of variation (SD/mean), calculated by the author(s). Variables are defined in Table 1.

Testing the normality assumption.5.4 One-way ANOVA.

Pearson correlations between various variables are shown in Table 3. As for the second hypothesis, that Leverage is negatively related to ROA ($r = -0.411$) and ROE ($r = -0.206$), both at 1% level are significant, thus supporting preliminary support to H1 and to the ROE robustness check. The correlation with ROA is about double that with ROE, as predicted in the asymmetry examined in Section 5.5. Also, the current ratio ($r = -0.370$) and liquidity ($r = -0.167$) are negatively correlated with leveraging, and tangibility ($r = 0.228$) is positively correlated with leveraging, which is consistent with the role of fixed assets as collateral for, and replacement of, liquidity. Capital expenditure and age are positively correlated with size ($r = 0.502$, $r = 0.297$, respectively). The absolute values of all the correlations between the regressors are less than 0.51. The VIFs are from 1.17 to 1.54 (mean 1.29) and much lower than the conventional value of 10 and more conservatively of 5 indicating that multicollinearity is not a problem.

Table 3. Pearson correlation matrix and variance inflation factors

	ROA	ROE	LEV	AGE	SIZE	LIQ	CR	TANG	CAPEX	VIF
ROA	1									—
ROE	0.724**	1								—
	*									
LEV	-0.411*	-0.206*	1							1.26
	**	**								
AGE	0.087**	0.089**	-0.119*	1						1.17
	*	*	**							
SIZE	-0.055*	-0.018	0.135**	0.297**	1					1.54
	**		*	*						
LIQ	0.036**	0.144**	-0.167*	0.034**	-0.217*	1				1.20
		*	**		**					
CR	0.185**	0.024	-0.370*	-0.123*	-0.195*	0.036**	1			1.26
	*		**	**	**					
TANG	-0.073*	-0.060*	0.228**	0.046**	0.150**	-0.336*	-0.252*	1		1.23
	**	**	*	*	*	**	**			
CAPEX	-0.069*	-0.027*	0.168**	0.052**	0.502**	-0.206*	-0.144*	0.192**	1	1.39
	**		*	*	*	**	**	*		

Note: *** p < 0.01, ** p < 0.05, * p < 0.1. Significance levels are based conservatively on the smallest estimation sample (N = 4,479); critical values of |r| are 0.038 (1%), 0.029 (5%) and 0.025 (10%). VIFs are the diagonal elements of the inverse correlation matrix of the regressors in Model 3 (excluding the interaction term).

Leverage and return on assets

The ROA regressions are given in Table 4. The coefficient (β) of leverage in the Model 1 is negative and highly significant ($\beta = -0.103$, $t = -6.89$). When controls, firm fixed effects and year fixed effects are included (Model 2), the coefficient becomes more negative ($\beta = -0.173$, $t = -8.95$). The within R^2 of the primary specification is 0.107, indicative of the 11% of the year-to-year variation in ROA being explained by the model in the within-firm dimension, which is a respectable amount for within-firm profitability regressions. None of the controls is significant once firm and year fixed effects are introduced. The hypothesis H1 is thus confirmed: there are significantly lower ROAs in the same firm for years with higher leverage.

Table 4. Regression results – dependent variable: ROA

Variables	Model 1 Pooled OLS	Model 2 Two-way FE	Model 3 Moderation
LEV	-0.103*** (-6.891)	-0.173*** (-8.949)	-0.073** (-2.098)
LIQ			0.020* (1.702)
LEV × LIQ			-0.117*** (-2.993)
AGE		0.001 (1.191)	0.001 (1.240)
SIZE		0.005 (0.692)	0.005 (0.701)
CR		0.003 (1.529)	0.002 (1.417)
TANG		-0.031 (-0.703)	-0.034 (-0.774)
CAPEX		-0.000 (-0.201)	-0.000 (-0.459)
Constant	0.080*** (39.921)	0.010 (0.173)	-0.010 (-0.180)
Firm fixed effects	No	Yes	Yes
Year fixed effects	No	Yes	Yes
Observations	5,272	4,479	4,479
Number of firms	490	453	453
R ²	0.034	0.107	0.116

Note: t-statistics based on firm-clustered robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. R² for Models 2–3 is within-R². The AGE coefficient in Models 2–3 is weakly identified owing to near-collinearity with firm and year fixed effects (see Section 4.5).

The moderating role of liquidity

H2 is tested with Model 3 in Table 4. The leverage × liquidity interaction is negative and highly significant ($\beta_3 = -0.117$, $t = -2.99$), and adding liquidity and the interaction raises the within-R² from 0.107 to 0.116. H2 is therefore supported. The negative sign means that liquidity amplifies the leverage penalty on ROA rather than cushioning it: the more liquid assets a firm holds, the more its ROA falls for a given rise in leverage. This supports the amplifying (agency and cost-of-carry) view and not the buffering (financial flexibility) view.

As discussed in Section 4.4, the leverage coefficient in Model 3 ($\beta_1 = -0.073$, $t = -2.10$) is the effect of leverage for a firm with liquidity close to zero. The economically relevant value is the marginal effect $\beta_1 + \beta_3 \cdot \text{LIQ}$ over the observed range of liquidity, presented in Table 5 and Figure 2. The leverage penalty on ROA roughly doubles, from -0.108 at one standard deviation below mean liquidity to -0.215 at one standard deviation above it. At mean liquidity the marginal effect is -0.162, very close to the Model 2 value (-0.173), so adding the interaction does not change the average leverage penalty. In practical terms, a one-standard-deviation rise in leverage lowers ROA by about 1.8 percentage points for a low-liquidity firm but by about 3.6 percentage points for a high-liquidity firm.

H3 receives only weak support. The coefficient of liquidity is positive but significant only at the 10% level ($\beta_2 = 0.020$, $t = 1.70$), and because of the interaction it is the effect of liquidity for a debt-free firm. The marginal effect of liquidity, $\beta_2 + \beta_3 \cdot \text{LEV}$, falls to about 0.004 at mean leverage (0.134) and turns negative once leverage exceeds about 0.17. Liquidity therefore improves ROA only for low-levered firms; for highly levered firms, more liquid assets go with lower asset returns.

Table 5. Marginal effect of leverage at selected levels of liquidity (Model 3)

Level of liquidity	LIQ	$\partial \text{ROA} / \partial \text{LEV}$	$\partial \text{ROE} / \partial \text{LEV}$
Sample minimum	0.004	-0.073	-0.112
Mean - 1 SD	0.299	-0.108	-0.127
Mean	0.758	-0.162	-0.149
Mean + 1 SD	1.217	-0.215	-0.172
Sample maximum	2.073	-0.316	-0.214
Interaction coefficient β_3 (t-statistic)		-0.117*** (-2.99)	-0.049 (-0.46)

Note: Marginal effects are calculated as $\beta_1 + \beta_3 \cdot \text{LIQ}$ from Model 3 in Table 4 (ROA) and Table 7 (ROE). Because β_3 is significant for ROA, the ROA marginal effects differ significantly across liquidity levels; because β_3 is insignificant for ROE, the differences in the ROE column are not statistically different from zero.

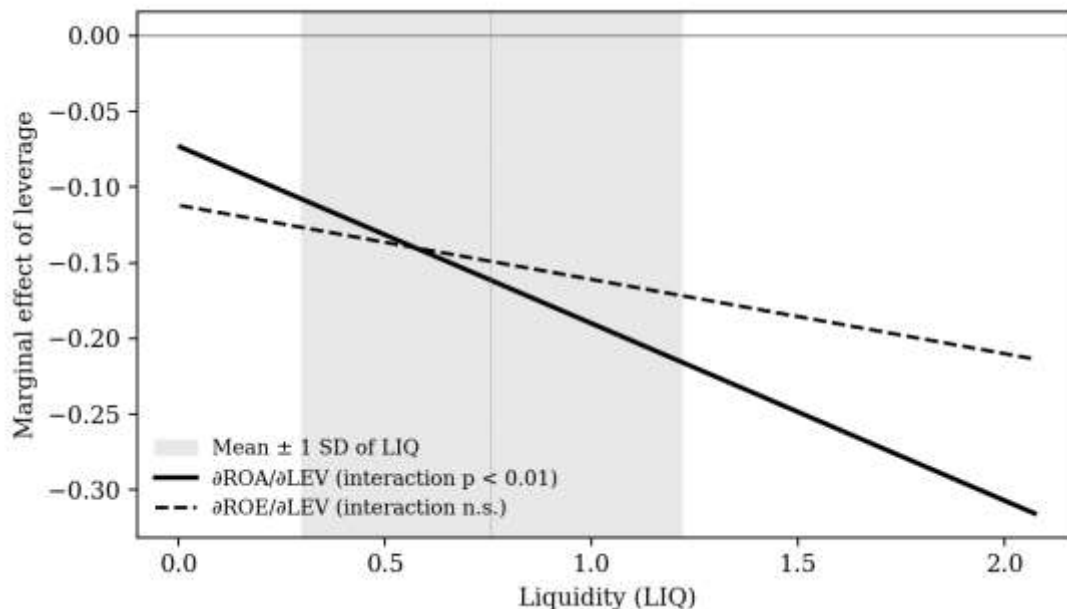


Figure 2. Marginal effect of leverage on performance across the range of liquidity

Calculated by the author(s) from Model 3 in Tables 4 and 7. The shaded band represents mean $\pm$ 1 SD of LIQ and lines indicate point estimates. The interaction is significant for ROA and not significant for ROE.

The relationship between ROA and ROE is not symmetrical and that is what creates economic significance. The economic significance is due to the lack of symmetry between ROA and ROE.

A significant effect does not imply that there is an impact in practice. The economic magnitude of the main coefficients is shown in Table 6. Each increase in leverage by one standard deviation (SD) (0.167) decreases ROA by 2.89 percentage points, or 43.1% of the mean ROA or 0.31 SD of ROA. In the ROE robustness model, the same increase decreases ROE by 2.50 percentage points which is 19.0% of the mean ROE or 0.14 SD. The two effects have a similar magnitude in absolute figures, but in relative terms the impact of leverage is roughly twice as bad on ROA as on ROE. The moderation effect is also economically meaningful: one SD higher liquidity makes the leverage slope on ROA steeper by 0.054 (0.117×0.459), which adds about 0.9 percentage points to the ROA cost of a one-SD rise in leverage.

From the DuPont identity, ROE is the product of ROA and (total assets/equity), this asymmetry can be easily understood. ROA can be decreased with a rise in leverage, due to the additional interest costs, distress costs and agency frictions, but ROE can also be increased due to the mechanical effect of the equity multiplier. For shareholders, there is a partial offsetting effect between the two forces, and the total penalty on ROE is proportionately less. If the net impact on ROE is still fairly negative, then it means that the additional return on assets financed by debt is still less than the additional cost of the debt. Liquidity has an economic effect of a similar magnitude and opposite direction on ROE: evaluated at mean leverage, an increase in liquidity by one standard deviation increases ROE by 3.28 percentage points or 24.8% of the mean.

Table 6. Economic significance of the main effects

Effect	Model	Coefficient	SD of regressor	Change in performance (pp)	% of mean performance	Standardised β
LEV $\rightarrow$ ROA	Model 2	-0.173	0.167	-2.89	-43.1%	-0.307
LEV $\times$ LIQ $\rightarrow$ ROA slope	Model 3	-0.117	0.459	slope -0.054 per SD of LIQ	–	–
LEV $\rightarrow$ ROE (robustness)	Model 2	-0.150	0.167	-2.50	-19.0%	-0.138
LIQ $\rightarrow$ ROE (robustness)	Model 3	0.071 ^a	0.459	+3.28	+24.8%	+0.180

Note: Δ performance = coefficient $\times$ SD of regressor (in percentage points); % of mean = Δ performance / mean of dependent variable (ROA 0.067; ROE 0.132); standardised β = coefficient $\times$ SD(regressor) / SD(dependent variable). ^a Marginal effect of LIQ on ROE evaluated at mean leverage (0.078 – 0.049 $\times$ 0.134). Computed by the author(s) from Tables 2, 4 and 7.

Coefficient stability, unobserved heterogeneity and time shocks

The leverage coefficient along with its 95% confidence interval is plotted for Models 1–2 in Figure 3. There are two features which stand out. First, adding controls together with firm and year fixed effects leads to a roughly 68% increase in the coefficient of ROA (from -0.103 to -0.173) and a roughly 46% increase in the coefficient of ROE (from -0.103 to -0.150). The baseline cross sectional association is thus an underestimate of the within-firm cost of debt. An alternative explanation is that the positive effects in pooled comparisons are actually attributed to unobserved firm characteristics, such as market power, reputation or group affiliation, that simultaneously increase the firm's borrowing capacity and profitability. This comparison is indicative and not a formal decomposition because the number of observations in the estimation sample is changed from 5,272 to 4,479 observations, and Model 2 adds the controls and both sets of fixed effects together. But the direction of the change is important. In the coefficient-stability analysis literature (Altonji et al., 2005; Oster, 2019), an estimate that moves away from zero with the addition of observed controls and fixed effects makes it less likely that unobservables of similar nature would shift the coefficient to the opposite sign.

Second, because Model 2 includes year fixed effects, the leverage penalty is not a result of common macroeconomic shocks faced by all firms, including demonetisation, implementation of GST, a credit cycle after the IBC, and the pandemic. Rather, it tells of the stable differences in debt across firms.

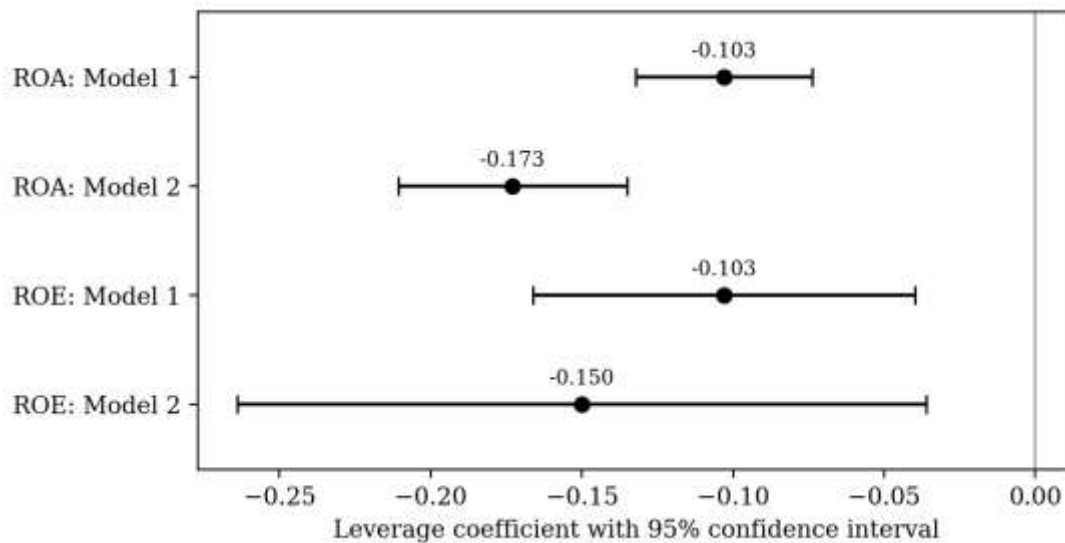


Figure 3. Robustness of the Leverage coefficient for different specifications

Based on the analysis of the author(s) from Tables 4 and 7. The standard errors are recovered as $|\beta/t|$; the bars indicate the range of values of $\beta \pm 1.96$ SE.

Robustness check: leverage and return on equity

The regressions for ROE, estimated as a robustness check, are reported in Table 7. This is similar to the pattern observed for ROA. The coefficient of leverage is negative in the baseline model ($\beta = -0.103$, $t = -3.19$) and even more negative with controls and firm and year fixed effects ($\beta = -0.150$, $t = -2.58$, significant at the 5% level). Thus, the negative leverage effect is confirmed for shareholder returns. There are three differences with respect to ROA results. Firstly, the ROE estimates are not as accurate because the t-statistics are smaller, and the standard deviation of ROE is approximately double that of ROA. Secondly, the impact of liquidity on ROE is positive and highly significant ($\beta = 0.078$, $t = 2.79$ in Model 3) while the impact of liquidity on ROA is weak. Thirdly, the leverage $\times$ liquidity interaction is negative, the same sign as for ROA, but small and not significant ($\beta_3 = -0.049$, $t = -0.46$), so the moderating effect of liquidity is specific to ROA. In Model 3 the leverage coefficient itself is not significant ($\beta_1 = -0.112$, $t = -1.11$), but this is the effect at near-zero liquidity; the implied marginal effect of leverage on ROE stays negative across the whole range of liquidity (Table 5). The within- R^2 values for ROE (0.031–0.037) are smaller than the within- R^2 values for ROA. This is consistent with the higher volatility of equity returns.

Table 7. Robustness check – dependent variable: ROE

Variables	Model 1 Pooled OLS	Model 2 Two-way FE	Model 3 Moderation
LEV	-0.103*** (-3.186)	-0.150** (-2.583)	-0.112 (-1.105)
LIQ			0.078*** (2.793)
LEV × LIQ			-0.049 (-0.459)
AGE		0.004** (1.976)	0.004** (2.049)
SIZE		-0.013 (-0.922)	-0.010 (-0.680)
CR		-0.003 (-0.951)	-0.004 (-1.160)
TANG		-0.133 (-1.134)	-0.106 (-0.905)
CAPEX		-0.000 (-0.376)	-0.000 (-0.364)
Constant	0.146*** (33.493)	0.186* (1.657)	0.071 (0.629)
Firm fixed effects	No	Yes	Yes
Year fixed effects	No	Yes	Yes
Observations	5,269	4,479	4,479
Number of firms	490	453	453
R ²	0.006	0.031	0.037

Note: As for Table 4.

Control variables

After adding the firm and year fixed effects, the firm size, the current ratio, the asset tangibility and the capital expenditure are not significant in the ROA as well as the ROE models. If the collateral value of fixed assets is important to the firm in the sense that it impacts its ability to raise the capital needed to purchase them, then, as the correlations suggest, the importance of the collateral value of fixed assets is more about the capital that can be raised rather than the profit that can be generated from the asset itself. The current ratio's insignificance and the liquidity's importance for ROE suggest that it is the mixture of the liquid resources and not the overall coverage of current liabilities that is important for shareholder returns. Age is positive and significant in the ROE models; however, as discussed in Section 4.5, once the firm and year effects have been included, the measure of age cannot be separated from these general trends over time, so it is not interpreted. The coefficient of capital expenditure in the absolute rupee value is very small and is practically negligible.

Summary of hypothesis tests

Table 8. Summary of hypothesis tests

Hypothesis	Statement	Evidence	Result
H1	Leverage has a negative effect on ROA	$\beta = -0.173$, $t = -8.95$ (Model 2)	Supported
H2	Liquidity moderates the leverage–ROA relationship	$\beta_3 = -0.117$, $t = -2.99$ (Model 3)	Supported (amplifying)
H3	Liquidity has a positive effect on ROA	$\beta = 0.020$, $t = 1.70$ (Model 3, at LEV = 0); ≈ 0 at mean LEV	Weakly supported (low-levered firms only)
R1	Leverage has a negative effect on ROE (robustness)	$\beta = -0.150$, $t = -2.58$ (Model 2)	Confirmed
R2	Liquidity moderates the leverage–ROE relationship (robustness)	$\beta_3 = -0.049$, $t = -0.46$ (Model 3)	Not confirmed
R3	Liquidity has a positive effect on ROE (robustness)	$\beta = 0.078$, $t = 2.79$ (Model 3)	Confirmed

Source: Compiled by the author(s) from Tables 4–7.

Discussion

The main findings, a high negative impact of leverage on ROA, confirmed for ROE, are consistent with the pecking order theory and agency cost of debt theory and contradict the hypothesis of the dominant tax shield and disciplinary role of debt in large Indian firms. The result adds to the negative findings of Majumdar and Chhibber (1999) for the decade after the IBC and for a wider and more diversified sample. In addition, it is in line with recent sectoral and governance-based studies in India (Bhatia & Kumari, 2026; Devi & Shiralashetti, 2025; Mathur et al., 2021; Nikhil et al., 2024) and other emerging Asian markets (Le & Phan, 2017; Nguyen & Nguyen, 2020; Salim & Yadav, 2012). The continued existence of a penalty despite the institutional changes in the period also indicates that the increased creditor rights as part of the IBC have perhaps led to a higher expected personal and control cost to promoters when distressing, thereby aggravating the performance-negative effect of debt. The result is more pronounced for ROA as compared to Chadha and Sharma (2015), whose result indicated that there is no effect on ROA for manufacturing companies in an earlier period. This difference may be attributable to the fact that the within-firm estimation results in a higher cost than the cross-sectional estimation (which is discussed in Section 5.7) and may also be explained by non-familiarity with the within-firm estimation due to its novelty.

The ROA–ROE asymmetry is an aspect that is not explored much in the literature. The shareholders are less penalized than the asset base, since the operating returns are reduced due to leverage, and the EM is increased due to leverage measurements. However, the ROE still falls tells us that the average marginal rupee of debt is giving less profit than it is costing. This finding directly contradicts the trade-off theory in that the typical firm is not operating below the value maximising point of the trade-off curve but rather above it for the average NSE 500 firm, the latter having the marginal distress and agency costs being greater than the marginal tax benefits. However, since it is an average linear effect, it is not a contradiction to benefits from debt at low leverage (Dalcı 2018, Campello 2006).

The most unique result of the study is the moderating role of liquidity. Contrary to the financial flexibility view, liquidity does not cushion the leverage penalty on ROA; it amplifies it. The most likely explanation is a mix of cost of carry and agency costs. A firm that borrows while holding large liquid balances pays interest on its debt but earns low returns on its liquid assets, which lowers returns on

the total asset base. In the terms of Jensen (1986), debt and surplus liquidity held together also suggest that borrowed funds are not being put into productive investment, and that the disciplining role of debt is weaker when managers keep a large cash cushion. This is consistent with the finding that liquidity improves ROA only for low-levered firms and becomes value-reducing once leverage exceeds about 0.17. The interaction is not significant for ROE, which suggests that for shareholders the extra drag on operating returns is offset by the equity-multiplier effect and by the protection that liquidity gives against distress.

The strong positive relationship between liquidity and ROE, and the weak relationship between liquidity and ROA, is consistent with the financial flexibility view (Arslan-Ayaydin et al., 2014; Opler et al., 1999) and suggests that liquid firms insure shareholder returns by avoiding the costs of external financing, and by avoiding distress-related losses, rather than by creating higher operating returns on assets. Combined with the moderation result, the result indicates that the leverage/liquidity mix affects a firm more than just leverage: liquidity protects shareholders, but when it is held alongside debt it lowers the return on the asset base.

Implications

Implications for theory

The results lend support to a contingent theory of capital structure, but to a more limited theory. On average, large Indian firms face high leverage costs, as would be expected, given pecking order and agency arguments. But liquidity, often seen in theory as a buffer against financial distress, does not reduce this cost in the population of large listed firms; it increases it for asset returns. Theories of financial flexibility should be modified to separate the protective role of liquidity for shareholders from its cost for asset efficiency when it is held together with debt. The ROA–ROE asymmetry also implies that tests of capital structure theory must consider both operating and equity returns as opposed to using ROA and ROE as mutually comparable measures of performance.

Managerial implications

The performance costs of the debt are not eliminated by liquidity for the CFO of a big company in India; they are increased by it. The marginal rupee of debt does not pass this test and therefore increases in leverage should be associated with projects that show a positive after-tax marginal return on assets rather than held as idle liquid balances. It seems that appropriate liquidity reserves help safeguard shareholder return and therefore a company's financing policy should take into account the level of leverage and the level of liquidity; instead, it is necessary to treat leverage and liquidity as a whole.

Recommendations to lenders, investors and policy makers

The finding that liquidity amplifies the leverage penalty warns banks and bond investors not to treat high liquidity as a safety cushion when lending to highly levered firms in the large-corporate space. In the case of equity investors, there is evidence that higher levels of leverage for the constituents of an index will lead to lower future accounting returns, but this relationship has not been tested for market-based measures. The ongoing impact of debt following the rollout of the IBC serves as a reminder of the benefits of fostering the corporate bond market and promoting equity finance in order to lessen reliance of large companies on bank borrowing.

Restrictions and recommendations for further studies.

There are some limitations in the study which indicate future directions of research. First, while the introduction of fixed effects eliminates time-invariant factors, leverage could react to the profitability of the past. Dynamic endogeneity is best addressed by using lagged leverage, instrumental variables or system GMM estimators (Wintoki et al., 2012) in future studies. Second, the models model an

average linear effect. The trade-off theory predicts that debt is value-enhancing at low levels, which could be tested using quadratic specifications or panel threshold regressions (Hansen, 1999) with leverage or liquidity as threshold variables. Thirdly, the study has only considered total leverage and not distinguished between short-term and long-term debt, or between bank and market debt, to show which type of debt is penalized. (Abor, 2005; Salim & Yadav, 2012) Fourth, performance is measured by accounting ratios and the extension of analysis to Tobin's Q and stock returns would reveal whether or not markets take into account the leverage penalty. Finally, the moderation test relies on a single continuous liquidity measure in the population of large firms; sub-sample analyses by industry, size and period (before and after COVID-19), alternative liquidity measures such as cash holdings, and the incorporation of smaller listed firms would test the robustness of the amplifying effect. Last but not least, there is recent evidence that the connection between leverage and performance is moderated by corporate governance (Bhatia & Kumari, 2026), accounting regimes (Nikhil et al., 2024) and intellectual capital (Le et al., 2026). Incorporating these moderators, along with ESG performance and firm size would offer a more comprehensive explanation of the effects of debt on value creation or destruction in emerging markets.

Conclusion

The study looked at the impact of FL on the accounting performance of NSE 500 firms for the period 2015-2024 and tested the interaction between FL and liquidity. With two-way fixed-effects panel regressions and firm-clustered standard errors, it discovered that leverage has a statistically significant effect that lowers ROA, the effect is larger than a cross-sectional association would indicate and is not driven by common macroeconomic shocks, and the effect is economically significant: a one-standard-deviation increase in leverage corresponds to a drop of roughly 43% of the mean ROA. The financial flexibility hypothesis does not hold true: liquidity significantly moderates the relationship, but it makes the leverage penalty on ROA steeper, roughly doubling it between low- and high-liquidity firms. The robustness check with ROE confirms the negative effect of leverage, and liquidity is a factor that enhances the returns to shareholders independently, although its moderating effect is not significant for ROE. The results are more in line with the pecking order theory and agency-cost-of-debt theory of capital structure. They show that, for the biggest firms in India, debt is, on average, a value-reducing source of finance at the margin, and that holding liquid assets alongside debt makes it more costly.

References

- Devi, N.S., & Shiralashetti, A.S. (2025). Impact of Leverage on Firm Performance: A Study on NSE-Listed Power Generation and Distribution Companies. *The IUP Journal of Applied Finance*.
- Bolarinwa, S. T., Onyekwelu, U. L., Ojiakor, I., Orga, J. I., Nwakaego, D. A., & Ekwutosi, O. C. (2026). Leverage and firm performance: Threshold evidence from the role of firm size. *Global Business Review*, 27(3), 559–576. <https://doi.org/10.1177/09721509221109571>
- Bhatia A, Kumari P (2026), "Leverage and corporate performance – the moderating role of corporate governance". *Asian Journal of Accounting Research*, Vol. 11 No. 2 pp. 150–165, doi: <https://doi.org/10.1108/AJAR-12-2024-0488>
- Madwe, M. C. (2026). Impact of Corporate Governance Mechanisms and a Firm's Financial Performance: The Mediating Role of Leverage in Carbon-Intensive Firms in South Africa. *Journal of Risk and Financial Management*, 19(3), 198. <https://doi.org/10.3390/jrfm19030198>
- Hanh Thi My Le, Huong T.T. Le, Lai Van Vo, Hoanh Thi Hoang Lam, & Tran Khanh Lam. (2026). INTELLECTUAL CAPITAL AND FIRM PERFORMANCE: EXPLORING THE EFFECTS OF FINANCIAL LEVERAGE IN VIETNAM. *International Journal of Business and Society*, 27(1), 59–85. <https://doi.org/10.33736/ijbs.12813.2026>

Singh, P., Gahlot, R., Yadav, M. P., & Singh, R. (2026). Is financial leverage influenced by the financial performance and firm characteristics in the FMCG sector in India? *Asia-Pacific Financial Markets*, 33(2), 677–698

Arslan-Ayaydin, Ö., Florackis, C., & Ozkan, A. (2014). Financial flexibility, corporate investment and performance: Evidence from financial crises. *Review of Quantitative Finance and Accounting*, 42(2), 211–250. <https://doi.org/10.1007/s11156-012-0340-x>

Margaritis, D., & Psillaki, M. (2007). Capital structure and firm efficiency. *Journal of Business Finance & Accounting*, 34(9–10), 1447–1469. <https://doi.org/10.1111/j.1468-5957.2007.02056.x>

Ramli, N. A., Latan, H., & Solovida, G. T. (2019). Determinants of capital structure and firm financial performance—A PLS-SEM approach: Evidence from Malaysia and Indonesia. *The Quarterly Review of Economics and Finance*, 71, 148–160. <https://doi.org/10.1016/j.qref.2018.07.001>