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RESEARCH BULLETIN



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THE INSTITUTE OF COST ACCOUNTANTS OF INDIA
Statutory Body under an Act of Parliament
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Vision Statement

The Institute of Cost Accountants of India would be the preferred source of resources and professionals for the financial leadership of enterprises globally.

Mission Statement

The CMA professionals would ethically drive enterprises globally by creating value to stakeholders in the socio-economic context through competencies drawn from the integration of strategy, management and accounting.

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FOREWORD

"When entering on new ground we must not be afraid to express even risky ideas so as to stimulate research in all directions."

Claude Bernard

Subho Bijoya!!!

Established paradigms often lead to incremental improvements. Pioneering discoveries usually start as fundamental, seemingly implausible concepts that challenge the prevailing standard. When entering on new ground we must not be afraid to express even risky ideas - this thought highlights the importance of intellectual valour and broadmindedness in innovation. When exploring unfamiliar territory—whether in science, technology or business—progress relies on breaking away from orthodox thinking.

It gives me an immense pleasure to present before you Research Bulletin Vol.51, No. III & IV issue. This publication brings you in-depth research insights on a wide range of topics on contemporary issues well-written by researchers, academicians and professionals.

This bulletin aimed to publish original and thought-provoking papers that will contribute to the knowledge and provide a highly readable and valuable addition to the research work, consequently will serve as an indispensable reference tool for the forthcoming years. It will provide a medium through which academicians and researchers all over the world publish their scholarly applied and fundamental research works on emerging trend on general management, social sciences, business law, finance and investment, etc. from empirical studies and theoretical developments to practical applications or any closely related fields.

I would also like to express gratitude to all the contributors who have made this issue possible, as well as the authors, reviewers and editor for their professional contribution. Last but not least, the assistance of the editorial team is fully appreciated.

Wish you all a happy reading and hope you would find it to be an extremely beneficial tool to enrich your knowledge base.

CMA Chittaranjan Chattopadhyay
President
The Institute of Cost Accountants of India

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CHAIRMAN'S COMMUNIQUÉ

"To do successful research, you don't need to know everything, you just need to know one thing that isn't known."

-Arthur L. Schawlow

Greetings and best wishes of festive season ahead!!!

Authentic discovery occurs by detecting a specific question or missing piece of data that nobody else has figured out yet. Research is the systematic process of whirling that sole unknown into a known fact through experiments, evidence and analysis.

I feel privileged to place before you the present volume of Research Bulletin, Vol.51 Nos. III & IV. Our Research Bulletin mainly highlights on pragmatic research articles and has a much wider reader base consisting of academicians, researchers, industry professionals and practitioners.

The vision of this bulletin is to provide an academic platform to researchers to publish their empirical and high-quality research work. It proposes to encourage research relating to newest drifts and practices in business, finance, social responsibility and emerging paradigms in allied areas of management. It intends to reach the researchers with plethora of knowledge to generate a pool of research content and propose problem solving models to address the current and emerging issues.

Further, it aims to share and broadcast the empirical research findings with academia, industry, policy makers, and consultants with an approach to incorporate the research recommendations for the benefit of one and all.

I appreciatively acknowledge the efforts made for publication of this volume.

The readers are requested to place their valuable suggestion towards improvement of Research Bulletin.

CMA Harshad Shamkant Deshpande
Chairman
Journal & Publications Committee
The Institute of Cost Accountants of India

EDITOR'S NOTE

Greetings and wish Goddess Durga bless you with good health, wealth, success and prosperity on this pious festive season. Stay healthy and stay cheerful!!!

The Institute started publication of the 'Research Bulletin' since 1982. It has been included in the International Serial Directories [ISSN 2230 9241]. It includes both theme based and non-theme based articles on the blazing issues. Inputs are mainly received both from academicians and the corporate stalwarts. The objective of this bulletin is to highlight the dynamism in environmental, social, economic and market-related issues so that the researcher can analyze the surroundings, adapt the changes in a better manner and can take decisions strategically. This edition is a testament to the contributors for their valued contributions for about more than five productive decades.

This Research Bulletin, Vol.51, Nos. III & IV issue includes conceptual and empirical articles and insights that would surely improve the knowledge base of readers.

The first article- *Impact of Foreign Direct Investment on International Trade in India: An Empirical Analysis* examines the impact of Foreign Direct Investment (FDI) on international trade and economic growth in India using time-series data for the period 1990–2023. The analysis employs the Augmented Dickey-Fuller (ADF) unit root test, Autoregressive Distributed Lag (ARDL) bounds testing approach, Error Correction Model (ECM), and Granger causality test to investigate both long-run and short-run relationships among GDP, FDI inflows, exports, imports, manufacturing output, trade openness, and inflation. The study suggests that policies should focus on strengthening export competitiveness, promoting manufacturing, attracting quality FDI, and maintaining macroeconomic stability to achieve sustainable long-term growth.

The second paper - *Investors' Perception of Cryptocurrency: Evidence from Kolkata* aims to find out the factors affecting cryptocurrency investment behaviour, and whether cryptocurrency investment behaviour is affected by demographics. The factors affecting cryptocurrency investment behaviour were found to be 'long term investment in cryptocurrency', regulation of cryptocurrency', 'loss aversion behaviour, 'negative opinion about cryptocurrency', and 'risk-taking in cryptocurrency'. Also, demographics like age, gender and income do impact cryptocurrency investment behaviour.

The third research study *Invisible Labour, Visible Loss: The Economic Value of Women's Unpaid Work in India* examines the economic significance of women's unpaid domestic work in India using evidence from the Time Use Survey 2024. The study specifically analyses how marital status and educational attainment influence the allocation of time to unpaid household activities. The findings reveal a pronounced gender disparity in the distribution of unpaid domestic and caregiving responsibilities, with women consistently spending substantially more time on these activities than men. The result further indicates that marital status significantly increases women's household responsibilities, while higher levels of education only moderately reduce the time devoted to unpaid domestic work without eliminating the gender gap. By highlighting these gender differences in time-use

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patterns, the paper demonstrates how unpaid work constraints women's participation in paid employment and contributes to their economic invisibility.

Next article, *Psychological Drivers of Retail Equity Investment in Northern India: A Behavioural Finance Perspective* investigates how behavioural factors (Risk Appetite, Financial Greed, Financial Literacy, External Influencers, and Procedural Ease) along with demographic factors influence retail investors' preferences for equities over traditional assets in UP & MP. The region has its own socio-economic characteristics, which makes this study relevant. The Fifth article - *Quality Management & Assurance – Integration with Big Data & AI* explains Big Data and AI have revolutionized QM&A, transforming it from reactive inspection to predictive, proactive systems. Organizations adopting these technologies achieve lower defect rates, cost savings, improved customer trust, and competitive advantages. Integrating AI with Six Sigma enables faster, data-driven improvements and continuous operational excellence. A phased adoption strategy, starting with pilot projects, can help businesses scale AI initiatives effectively.

The last article on *Union Budget "2026 -27": An Empirical Analysis of Fiscal Consolidation and Tax Reforms* empirically analyses the fiscal consolidation in the Union Budget 2026-27, using 12 years of fiscal data (FY2015-16 to FY2026-27 BE), and tested five hypotheses using multiple regression, correlation matrices, and paired t-tests. The Union Budget 2026-27 demonstrates a credible fiscal consolidation path. The empirical evidence supports the government's strategy of reducing borrowings, increasing capital expenditure, and improving revenue mobilization. If these trends continue, the debt-to-GDP ratio is likely to reach the 2030-31 target of 50±1%. However, continued monitoring of GST revenue and state-level capex absorption is essential. The paper concludes that the budget demonstrates a credible fiscal consolidation path, but GST revenue performance and state-level capex absorption remain key risks.

We are extremely happy to convey that our next issue of *Research Bulletin,* would be a non-theme one.

We look forward to constructive feedback from our readers on the articles and overall development of the Research Bulletin. Please send your mails at ***research.bulletin@icmai.in*****.**

We express our earnest gratitude to all the contributors and reviewers of this issue and wish our readers get requisite insight from the articles.

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IMPACT OF FOREIGN DIRECT INVESTMENT ON INTERNATIONAL TRADE IN INDIA: AN EMPIRICAL ANALYSIS

Basavaraja Malipatil
Basavaraj S. Benni

Abstract

This study examines the impact of Foreign Direct Investment (FDI) on international trade and economic growth in India using time-series data for the period 1990–2023. The analysis employs the Augmented Dickey-Fuller (ADF) unit root test, Autoregressive Distributed Lag (ARDL) bounds testing approach, Error Correction Model (ECM), and Granger causality test to investigate both long-run and short-run relationships among GDP, FDI inflows, exports, imports, manufacturing output, trade openness, and inflation. The ADF results indicate a mixed order of integration among variables, justifying the use of the ARDL model. The bounds test confirms the existence of a long-run equilibrium relationship among the variables. The long-run estimates reveal that exports and manufacturing output are the primary drivers of economic growth, while FDI has a positive but moderate impact. Imports also contribute positively, reflecting their role in supporting domestic production. The ECM results indicate a stable adjustment process, with approximately 56% of short-run disequilibrium corrected annually. The Granger causality analysis shows unidirectional causality from FDI to GDP, bidirectional causality between exports and GDP, and strong causality from manufacturing output to GDP. The findings support the export-led growth hypothesis and highlight the complementary role of FDI and trade in India's economic development. The study suggests that policies should focus on strengthening export competitiveness, promoting manufacturing, attracting quality FDI, and maintaining macroeconomic stability to achieve sustainable long-term growth.

Keywords

GDP, FDI Inflows, Exports, Imports, Inflation, Economic Growth

Introduction:

India's Foreign Direct Investment (FDI) policy has been designed with investors in mind, opening up the majority of sectors to full foreign ownership through an automatic approval route. The government continuously revisits and refines this framework to keep India positioned as a compelling and competitive destination for global capital. These sustained policy initiatives have contributed to a substantial rise in FDI inflows, increasing from USD 36.05 billion in FY 2013–14 to a provisional USD 81.04 billion in FY 2024–25, reflecting a 14% increase over the USD 71.28 billion recorded in FY 2023–24[1].

In FY 2024 - 25, the services sector claimed the largest share of FDI equity inflows, drawing in 19% of the total, with computer software and hardware coming in second at 16%, and trading accounting for 8%. Investment into the services sector surged by 40.77%, reaching USD 9.35 billion - up from USD 6.64 billion the previous year.

India is also solidifying its standing as a preferred destination for manufacturing investment. FDI in this segment grew by 18% in FY 2024 - 25, rising to USD 19.04 billion from USD 16.12 billion in FY 2023 - 24.

On a regional level, Maharashtra dominated FDI equity inflows, capturing a 39% share in FY 2024 - 25, with Karnataka and Delhi following at 13% and 12%, respectively. In terms of origin, Singapore was the leading source country with a 30% share, ahead of Mauritius at 17% and the United States at 11%.

Zooming out over the past eleven financial years (2014 - 25), India attracted a cumulative FDI of USD 748.78 billion - a remarkable 143% increase over the preceding eleven-year period (2003 - 14), which had recorded USD 308.38 billion in inflows. This eleven-year total accounts for nearly 70% of the USD 1,072.36 billion in FDI that India has received over the last 25 years.

Further reflecting India's broadening global appeal, the number of countries investing in India expanded from 89 in FY 2013 - 14 to 112 in FY 2024 - 25.

On the policy front, the government has implemented a series of far-reaching regulatory reforms to ease FDI norms across key sectors. Between 2014 and 2019, major changes included raising investment caps in defence, insurance, and pension, while relaxing rules in construction, civil aviation, and single brand retail trading. From 2019 to 2024, the government went a step further by permitting 100% FDI through the automatic route in coal mining, contract manufacturing, and insurance intermediaries.[2] Most recently, the 2025 Union Budget proposed raising the FDI ceiling from 74% to 100% for insurance companies that reinvest their entire

1 https://www.investindia.gov.in/india-fdi-investment-key-sectors

2 https://www.pib.gov.in/PressReleasePage.aspx?PRID=2131716&reg=6&lang=1

premium income within India.[3] Union Budget 2026-27 reaffirmed and carried forward these full domestic investment and foreign ownership frameworks.

Taken together, these trends firmly reinforce India's emergence as a globally preferred investment destination - underpinned by an adaptive policy environment, a maturing business ecosystem, and growing international confidence in the country's long-term economic potential.

GDP Growth:

Real GDP growth for FY 2025 - 26 was at 7.6%, up from 7.1% recorded in FY 2024 - 25, while nominal GDP is projected to grow by 8.6% in the same period. Manufacturing recorded double-digit growth, and both the secondary and tertiary sectors posted growth rates exceeding 9%, with the Trade, Hotels, Transport and Communication sector expanding at 10.1%. This revised figure ties for the sharpest expansion rate since FY 2022, surpassing the government's initial projection of 6.3%–6.8%, which had anticipated headwinds from US tariffs and reduced Russian oil imports[4].

Inflow of Foreign Direct Investment in India:

India's FDI trajectory remains strong, with total gross inflows for the fiscal year 2025-26 was $90 billion. While the global economic environment remains complex, India has maintained high investment levels through a combination of stable domestic demand, infrastructure development, and a focused push toward becoming a global manufacturing hub[5].

Key Sectors Attracting Investment

The services sector remains the largest beneficiary, accounting for nearly 46% of total inflows. Financial services, software development, and digital platforms continue to dominate, reflecting India's role as a global digital market. In the manufacturing sector government's focus on the 'Make in India' initiative and Production Linked Incentive (PLI) schemes has bolstered investment in electronics, semiconductor components, and telecommunications hardware. Besides, *Data Centers & Digital Infrastructure, Automobiles & EVs, Renewable Energy sector* Green hydrogen, continue to attract long-term sovereign wealth and infrastructure funds.

Exports and imports of India:

India's exports and imports have expanded significantly in recent years, reflecting deeper integration with the global economy. India's total exports reached about US$ 860 billion in 2025–26, while imports stood at nearly US$ 979 billion, resulting in a trade deficit of around US$ 119 billion. On the export side, major commodities include petroleum products, engineering goods, electronics, pharmaceuticals, and agricultural products, with a notable shift toward high-value sectors like electronics and digital services**.** In contrast, imports are

3 https://www.pib.gov.in/PressReleaseIframePage.aspx?PRID=2098394&reg=48&lang=2

4 https://www.pib.gov.in/InfographicsDetails.aspx?Id=2718

5 https://www.pib.gov.in/FeaturesDeatils.aspx?NoteId=153288&ModuleId=2

dominated by crude oil, gold, electronics, and capital goods, indicating India's continued dependence on energy and technology imports. The direction of trade shows the United States and the United Arab Emirates as major export destinations, while China remains the largest source of imports. Despite robust export growth, the persistent trade deficit highlights structural challenges such as high import dependence, especially on energy, and relatively weaker manufacturing competitiveness. Empirical studies suggest that exports contribute positively to economic growth, while imports of capital goods support industrial expansion.

Review of Literatures:

This study investigates how trade openness and inflation influence GDP growth across nine West African economies over a twenty-year span, from 1998 to 2017. Findings reveal that inflation exerts a statistically significant negative effect on GDP growth under both the Pooled OLS and Random Effects models, though its effect becomes insignificant under the Fixed Effects specification. Similarly, trade openness negatively and significantly affects GDP growth in the Pooled OLS model, but yields insignificant results under both Fixed and Random Effects estimations. The Real Effective Exchange Rate demonstrates a consistently positive and significant relationship with GDP growth across all three models, whereas investment remains statistically insignificant throughout[6] (**Gibbson Adu-Gyamfi et al., 2020)**. Since India's economic liberalization in 1991, Foreign Direct Investment (FDI) has become a central pillar of growth strategy, supported by progressive deregulation and initiatives like Make in India. This study analyzes FDI inflow patterns between 2000 and 2025, assessing their sectoral spread, regional reach, and broader economic impact - including employment, exports, technology absorption, and infrastructure. Drawing on secondary data from RBI, DPIIT, UNCTAD, and IBEF, the findings confirm FDI's positive role in GDP expansion, industrial development, and global market integration, though gains remain geographically and sectorally uneven. The study recommends targeted infrastructure investment, inclusive regional policies, and stronger regulatory frameworks to attract high-quality, sustainable FDI[7] **(Jagdish Chandra bhatt, 2026).** This study examines how financial development and key macroeconomic variables influence FDI inflows and economic growth in India, using panel data spanning 2001 to 2022. Moderated regression analysis is applied, with GDP growth rate as the dependent variable. Two composite indices - a financial development index and a macroeconomic indicator - are constructed via a weighted average approach to capture interactive effects with FDI. Results confirm that financial development plays a significant role in attracting FDI. These findings offer actionable guidance for investors and policymakers seeking to strengthen India's FDI policy framework[8] **(Amit Hedau and Sarbesh Mishra 2025)**. FDI equity inflow trends from twelve major source countries were analysed over FY 2000–01 to 2019–20. All countries recorded a

gradual upward trajectory, with India's total FDI registering a compound annual growth rate (CAGR) of 16.24%. Mauritius led with a 30.13% share, followed by Singapore at 20.78%. Country-level CAGRs ranged from 7.13% (Germany) to 40.35% (Cyprus), with notable growth from UAE (33.82%) and Cayman Islands (39.15%). Based on ARIMA projections for 2029–30, Singapore is forecast to be the largest contributor at USD 23,023 million, followed by Mauritius (USD 18,496 million) and Cayman Islands (USD 7,915 million)[9] **Swati Singh, (2021)**. Foreign direct investment (FDI) plays a critical role in bridging the savings-investment gap that domestic capital alone cannot address, making it essential to a developing economy's growth. This study examines FDI inflow trends in India from 2000 to 2022, including country-wise and sector-wise distributions from April 2000 to March 2022. Regression analysis is employed to assess the relationship between FDI and key economic indicators — foreign exchange reserves (FER), GDP growth, and exports of goods and services[10] **(Veena Panjwani and Sneha Jain 2022).** Foreign direct investment (FDI) serves as a vital link between India and the global economy, accelerating growth through capital, technology, and market access. Following the liberalization reforms of the 1990s, India has steadily grown as a preferred destination for international capital across manufacturing, services, and IT sectors. This study examines the determinants and sectoral distribution of FDI inflows over recent decades, evaluating their impact on GDP growth, employment, infrastructure, and regional equity. Policy recommendations are proposed to maximize FDI's developmental impact and ensure more balanced economic outcomes across sectors and regions[11] **(Md Shoaib 2025)**. This study analyses FDI inflow trends into India from 2000 to recent years, drawing on secondary data from DPIIT, RBI, and UNCTAD. FDI has been a significant channel for capital, technology, and employment, with services, computer software or hardware, and telecommunications consistently attracting the largest sectoral shares. The findings indicate that market size, economic stability, and policy liberalization are primary determinants of inflow patterns. To sustain and broaden FDI, the study recommends reinforcing institutional capacity, upgrading infrastructure, and adopting targeted regional investment strategies[12] **(Rachana B S and Kundan Basavaraj 2025)**. Since the 1991 liberalization, FDI has reshaped India's economic landscape significantly. This paper examines FDI inflow trends, sectoral composition, and macroeconomic effects from 2000 to 2025, using data from DPIIT, RBI, UNCTAD, and Government of India sources. A mixed-method approach - combining time-series analysis, sectoral review, and secondary econometric evidence - reveals FDI's positive contributions to GDP growth, exports, productivity, and technology absorption, especially in services and high-value manufacturing. Persistent challenges include regional concentration, limited MSME linkages, and inflow volatility. The study concludes that India must shift its FDI approach from pure volume maximization

toward quality, stability, and equitable regional distribution[13] **(Khushboo Singh and Anup Kumar Roy 2025).**

Research Gap:
India has received increasing foreign direct investment over the years, and international trade has also expanded significantly. However, the extent to which FDI influences India's trade performance is not fully clear. It is important to examine whether FDI promotes exports, affects imports, and contributes to trade-led growth.

Objective of the Study:
- To examine the trend of FDI inflows and international trade in India.
- To analyse the impact of FDI on exports and imports in India.
- To suggest policy measures for improving trade performance through FDI.
- To study the causal relationship between FDI and international trade.

Hypothesis of the Study:
- H1: FDI has a positive impact on exports in India.
- H2: FDI significantly influences imports in India.
- H3: There is a significant relationship between FDI and international trade in India.

Data and Methodology:
The study adopts a quantitative and empirical research design to examine the impact of Foreign Direct Investment (FDI) on international trade (exports and imports) in India. It uses time-series econometric techniques to analyze the long-run and short-run relationships between variables.

Model Specification:
The functional relationship is expressed as:

Export Model

$$EX_t = \beta_0 + \beta_1 FDI_t + \beta_2 GDP_t + \beta_3 EXR_t + \mu_t$$

Import Model

$$IM_t = \alpha_0 + \alpha_1 FDI_t + \alpha_2 GDP_t + \alpha_3 EXR_t + \epsilon_t$$

Where:

- EX_t= Exports
- IM_t= Imports
- FDI_t= Foreign Direct Investment
- GDP_t= Economic growth indicator
- EXR_t= Exchange rate
- μ_t, ϵ_t= Error terms

1. ARDL Model:

Model:

$$EX_t = \beta_0 + \beta_1 FDI_t + \beta_2 GDP_t + \beta_3 EXR_t + \beta_4 INF_t + u_t$$
$$IM_t = \alpha_0 + \alpha_1 FDI_t + \alpha_2 GDP_t + \alpha_3 EXR_t + \alpha_4 INF_t + v_t$$

Where:

- EX = exports
- IM = imports
- FDI = foreign direct investment
- GDP = gross domestic product
- EXR = exchange rate
- INF = inflation

ARDL helps examine both **long-run and short-run impact** of FDI on exports and imports.

Pooled Ordinary Least Squares (OLS) Results

Results and Analysis:

Model Specification:

$$GDP = \beta_0 + \beta_1 FDI + \beta_2 EX + \beta_3 IM + \beta_4 MFG + \beta_5 TRADE + \beta_6 INF + \epsilon$$

Data Sources and Period;

The study is based on secondary data collected from reliable sources such as: Reserve Bank of India, World Bank, UNCTAD, Ministry of Commerce and Industry and Macrotrends.

The data covers a period of 1990–91 to 2023–24, capturing the post-liberalization phase of the Indian economy.

Table 1; Descriptive Statistics

Variable	Mean	Median	Max	Min	Std. Dev.
GDP	1317.8	940.26	3568	270.11	1048.72
FDI	21.43	20.03	64.36	0.07	18.52
Exports	288.64	253.08	779.45	22.64	230.17
Imports	337.54	302.8	897.55	22.94	265.91
Manufacturing	206.48	205	461.38	42.34	129.88
Trade-GDP (%)	37.94	40.08	55.79	15.51	12.05
Inflation	7.34	6.67	13.87	3.33	2.94

Source: Authors Calculations, Macrotrends and RBI Handbook 2023.

The descriptive statistics indicate that India's GDP shows a consistent increasing trend with high variability, reflecting economic expansion over the study period. Exports and imports also exhibit significant growth, indicating increasing trade integration. FDI inflows show substantial fluctuations, suggesting sensitivity to policy and global conditions. The trade-to-GDP ratio reflects increased openness, while inflation remains moderate but volatile.

Table 2; ADF Unit Root Test

Variable	Level (t-stat)	First Difference (t-stat)	Order of Integration
lnGDP	-1.85	-5.92***	I(1)
lnFDI	-2.11	-6.34***	I(1)
lnExports	-1.67	-5.78***	I(1)
lnImports	-1.72	-5.96***	I(1)
lnManufacturing	-1.94	-5.41***	I(1)
Trade-GDP Ratio	-3.21**	—	I(0)
Inflation	-4.02***	—	I(0)

Note: *** p<0.01, ** p<0.05
Source: Authors Calculations, Macrotrends and RBI Handbook 2023.

The Augmented Dickey-Fuller (ADF) unit root test was conducted to examine the stationarity properties of the variables included in the model, namely GDP, FDI inflows, exports, imports, manufacturing output, trade openness (trade-GDP ratio), and inflation.

The results indicate that **lnGDP, lnFDI, lnExports, lnImports, and lnManufacturing are non-stationary at level**, as their ADF test statistics are lower (in absolute terms) than the critical values. However, after taking the **first difference**, all these variables become statistically significant at the 1% level, as indicated by the large negative t-statistics (e.g., lnGDP = -5.92, lnFDI = -6.34). This confirms that these variables are **integrated of order one, I(1)**.

In contrast, the **trade-GDP ratio and inflation rate are stationary at level**, as their ADF statistics (-3.21 and -4.02 respectively) are significant without differencing. Therefore, these variables are **integrated of order zero, I(0)**.

Table 3; ARDL Bounds Test (Cointegration)

Test Statistic	Value
F-statistic	**5.87**
Critical Value (Lower Bound, 5%)	**2.45**
Critical Value (Upper Bound, 5%)	**3.61**

Since F-statistic > Upper Bound, cointegration exists
Source: Authors Calculations, Macrotrends and RBI Handbook 2023.

The ARDL Bounds testing approach was applied to examine the existence of a long-run equilibrium relationship between GDP and its explanatory variables (FDI, exports, imports, manufacturing output, trade openness, and inflation).

The results of the Bounds test show that the calculated F-statistic is 5.87, while the critical values at the 5% level are 2.45 (lower bound) and 3.61 (upper bound).

Table 4; ARDL Long-Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
lnFDI	0.18	0.07	2.57	0.015
lnExports	0.52	0.11	4.73	0
lnImports	0.21	0.09	2.33	0.025
lnManufacturing	0.39	0.1	3.9	0.001
Trade-GDP Ratio	0.012	0.005	2.4	0.022
Inflation	-0.008	0.003	-2.67	0.012
Constant	1.85	0.54	3.42	0.002

Source: Authors Calculations, Macrotrends and RBI Handbook 2023.

The ARDL long-run estimation results explain the impact of FDI, trade variables, manufacturing output, trade openness, and inflation on India's economic growth (GDP) over the study period.

FDI has a positive and statistically significant impact on GDP. The coefficient indicates that a 1% increase in FDI inflows leads to a 0.18% increase in GDP in the long run. This suggests that FDI contributes to economic growth through capital formation, technology transfer, and improved productivity.

Exports have the strongest positive impact on GDP. A 1% increase in exports increases GDP by 0.52%, confirming the export-led growth hypothesis in India. This highlights the importance of global trade integration in driving economic expansion.

Imports also show a positive and significant effect on GDP. A 1% increase in imports raises GDP by 0.21%, indicating that imports—particularly of capital goods, technology, and intermediate inputs—support domestic production and growth.

Manufacturing output has a strong positive impact on GDP. A 1% increase in manufacturing output leads to a 0.39% increase in GDP, emphasizing the importance of industrial development and structural transformation in economic growth.

Inflation has a negative and significant impact on GDP. This implies that rising prices adversely affect economic growth by reducing purchasing power, discouraging investment, and creating macroeconomic instability.

Table 5; Short-Run Dynamics (Error Correction Model)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ΔlnFDI	0.09	0.04	2.21	0.034
ΔlnExports	0.31	0.09	3.44	0.002
ΔlnImports	0.14	0.06	2.18	0.037
ΔlnManufacturing	0.25	0.08	3.12	0.004
ΔTrade-GDP	0.007	0.003	2.33	0.026
ΔInflation	-0.004	0.002	-2.01	0.049
ECM (-1)	-0.56	0.12	-4.67	0

ECM = -0.56 → 56% adjustment per year, Strong short-run impact of exports & manufacturing
Source: Authors Calculations, Macrotrends and RBI Handbook 2023.

The Error Correction Model (ECM) captures the short-run adjustments of GDP in response to changes in FDI, exports, imports, manufacturing output, trade openness, and inflation, along with the speed of adjustment toward long-run equilibrium.

FDI has a positive and statistically significant short-run impact on GDP. A 1% increase in FDI leads to a 0.09% increase in GDP in the short run, indicating that foreign investment contributes to immediate economic activity through capital inflows and business expansion.

Exports have a strong and significant short-run effect on GDP. A 1% increase in exports increases GDP by 0.31%, confirming that external demand plays a vital role even in the short run.

Manufacturing output has a significant and positive short-run impact, where a 1% increase leads to a 0.25% rise in GDP, indicating the importance of industrial activity in driving short-term growth.

Table 6; Granger Causality Test

Null Hypothesis	F-Statistic	Prob.	Result
FDI does not cause GDP	4.12	0.026	Reject H_0
GDP does not cause FDI	2.01	0.142	Accept H_0
Exports do not cause GDP	6.45	0.005	Reject H_0
GDP does not cause Exports	3.88	0.032	Reject H_0
Imports do not cause GDP	2.67	0.081	Weak
Manufacturing does not cause GDP	5.92	0.008	Reject H_0

Source: Authors Calculations, Macrotrends and RBI Handbook 2023.

The Granger causality test was applied to examine the direction of causality between GDP and its key determinants such as FDI, exports, imports, and manufacturing output.

The findings indicate that there exists a unidirectional causality from FDI to GDP, as the null hypothesis that FDI does not cause GDP is rejected at the 5% level ($p = 0.026$), while the reverse relationship is not significant. This suggests that foreign direct investment plays a significant role in driving economic growth through capital inflows, technology transfer, and productivity enhancement, but higher GDP does not necessarily attract FDI inflows in the short run.

In the case of exports, the results reveal a bidirectional causality between exports and GDP, as both null hypotheses are rejected ($p = 0.005$ and $p = 0.032$ respectively). This indicates a feedback relationship, where exports contribute to economic growth by expanding markets and increasing foreign exchange earnings, while economic growth, in turn, enhances the country's capacity to produce and export goods and services. This finding strongly supports the export-led growth hypothesis in the Indian context.

Table 7; OLS Regression Output:

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FDI	5.87	2.14	2.74	0.01
Exports	2.36	0.48	4.91	0
Imports	1.42	0.39	3.64	0.001
Manufacturing	3.18	0.72	4.41	0
Trade-GDP	8.95	3.27	2.73	0.011
Inflation	-12.63	5.12	-2.46	0.019
Constant	-210.45	98.33	-2.14	0.04

Source: Authors Calculations, Macrotrends and RBI Handbook 2023.

Table 8; Model Summary Statistics

Statistic	Value
R^2	0.94
Adjusted R^2	0.92
F-statistic	48.67
Prob(F-statistic)	0
Durbin-Watson	2.01

Source: Authors Calculations, Macrotrends and RBI Handbook 2023.

The pooled OLS regression results reveal that exports, imports, manufacturing output, FDI inflows, and trade openness have a positive and statistically significant impact on India's GDP. Among these variables, exports show the strongest influence, indicating that international trade plays a crucial role in economic growth. A one-unit increase in exports leads to an increase of approximately 2.36 units in GDP, highlighting the importance of export-led growth.

Manufacturing output also shows a strong positive relationship with GDP, suggesting that industrial development significantly contributes to economic expansion. Imports exhibit a positive impact, indicating that India's imports mainly consist of capital goods and intermediate inputs that support production and growth.

FDI inflows have a positive and statistically significant effect on GDP, implying that foreign investment contributes to capital formation and economic development. The trade-to-GDP ratio also shows a positive influence, reflecting the benefits of trade openness.

However, inflation has a negative and significant impact, indicating that higher inflation adversely affects economic growth by reducing purchasing power and creating macroeconomic instability.

The model shows a high explanatory power with $R^2 = 0.94$, indicating that 94% of the variation in GDP is explained by the selected variables. The Durbin-Watson statistic (2.01) suggests no serious autocorrelation problem.

Conclusions and Policy Implications:

The present study examined the impact of Foreign Direct Investment (FDI) on international trade and economic growth in India using time-series data for the period 1990–2023. The econometric analysis, based on the ADF unit root test, confirmed that the variables are integrated of mixed order, thereby justifying the use of the ARDL bounds testing approach. The ARDL results established the existence of a long-run equilibrium relationship between GDP, FDI inflows, exports, imports, manufacturing output, trade openness, and inflation. The long-run estimates revealed that exports and manufacturing output are the most significant drivers of economic growth, while FDI exerts a positive but relatively moderate influence. Imports were also found to have a positive effect, suggesting that India's import structure supports domestic production through capital goods and intermediate inputs. Trade openness contributes positively to growth, indicating the benefits of global integration, whereas inflation has a negative impact, reflecting the importance of macroeconomic stability.

The short-run dynamics, captured through the Error Correction Model (ECM), indicated that deviations from long-run equilibrium are corrected at a speed of 56% annually, confirming the stability of the model. The Granger causality results further showed that FDI has a unidirectional causal relationship with GDP, exports exhibit bidirectional causality with GDP, and manufacturing output strongly influences economic growth. Overall, the findings support the export-led growth hypothesis

and highlight the complementary role of FDI and trade in India's economic development.

Based on the empirical findings, several policy implications emerge. First, given the strong impact of exports on economic growth, the government should focus on enhancing export competitiveness by promoting high-value manufacturing, improving product quality, and expanding access to international markets. Strengthening export-oriented industries such as electronics, pharmaceuticals, and engineering goods can significantly boost growth. Second, although FDI has a positive effect, its impact is relatively moderate, suggesting the need to attract quality and sector-specific FDI rather than focusing solely on volume. Policies should encourage FDI in manufacturing, infrastructure, and export-oriented sectors to maximize technology transfer, employment generation, and productivity gains.

Third, the positive relationship between imports and GDP indicates the importance of facilitating imports of capital goods and advanced technology. However, policies should aim to reduce excessive dependence on non-essential imports by promoting domestic production through initiatives such as industrial development and supply chain strengthening. Fourth, the significant role of manufacturing output highlights the need for continued emphasis on industrialization. Programs aimed at improving infrastructure, ease of doing business, and skill development should be strengthened to enhance the contribution of the manufacturing sector to GDP. Fifth, the positive influence of trade openness suggests that India should continue to pursue trade liberalization policies while ensuring strategic protection of emerging domestic industries. Expanding bilateral and multilateral trade agreements can further enhance trade performance.

Finally, the negative impact of inflation on economic growth underscores the importance of maintaining price stability through prudent monetary and fiscal policies. Controlling inflation will create a stable macroeconomic environment conducive to investment and sustained economic growth.

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INVESTORS' PERCEPTION OF CRYPTOCURRENCY: EVIDENCE FROM KOLKATA

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Abstract

With the growth of cryptocurrency, its acceptability and accessibility are being put in the spotlight. It is an excellent investment if the investor wants direct exposure to digital currency's demand. However, investment in cryptocurrency is riskier than other asset classes. This study focuses on how investors in Kolkata perceive cryptocurrency as an investment option. This paper aims to find out the factors affecting cryptocurrency investment behaviour, and whether cryptocurrency investment behaviour is affected by demographics.

Data was collected through a survey with a structured questionnaire using judgemental sampling method. 172 respondents constitute the sample for this study. To identify the factors affecting cryptocurrency investment behaviour, factor analysis (principal component analysis) has been used. In order to find out the demographic variables impacting cryptocurrency investment behaviour, chi-square tests have been used.

The factors affecting cryptocurrency investment behaviour were found to be 'long term investment in cryptocurrency', regulation of cryptocurrency', 'loss aversion behaviour, 'negative opinion about cryptocurrency', and 'risk-taking in cryptocurrency'. Also, demographics like age, gender and income do impact cryptocurrency investment behaviour.

Keywords

Cryptocurrency, Investment Behaviour, Demographics, Investor Perception, Chi- Square Test, Factor Analysis

1. Introduction

The world has been witnessing a very important digital revolution. The boom that cryptocurrency has experienced is a milestone in this generation of decentralized economies. Cryptocurrency is essentially decentralized digital money, based on blockchain technology and is secured by cryptography. It is a digital ledger whose access is given to authorized users. The ledger takes a record of transactions in relation to a variety of assets. The access lies with the users and information is transparent, immediate, and immutable, assuring that anything recorded on the blockchain remains there and cannot be modified or tampered with.

The need for a transparent, secure, and accessible financial system is apparent and is caused by the failure of a centralized financial system to provide both financial freedom and credibility. Decentralized finance can offer higher security and transparency and may replace conventional financial processes. With the growth of cryptocurrency, its acceptability and accessibility are being put in the spotlight.

Cryptocurrencies have experienced wide market acceptance and rapid development despite their recent conception. Various hedge funds and asset managers have begun to take in cryptocurrency-related assets in their portfolios and trading plans *(Fang et al., 2022).*

It is an excellent investment if the investor wants direct exposure to digital currency's demand. However, investment in cryptocurrency is riskier than other asset classes. The growth of cryptocurrency, although highly ambitious, is not like any other investment. The presence of extreme volatility, frequent crashes, and relatively low transparency in cryptocurrency markets could increase the variation in risk and rewards *(Bianchi & Dickerson, 2018).*

The success of any cryptocurrency is not assured, but early investors have found it to be richly rewarding in the long-term. This study focuses on how investors in Kolkata perceive cryptocurrency as an investment option. The decision of the Union Government to impose taxation on cryptocurrency investments gives a hint regarding probable future regulations on cryptocurrency, which serves as a novelty of our study. Therefore, it becomes very important to analyze the perception of investors towards cryptocurrency investments. Besides, this is the first-ever research on cryptocurrency investment behaviour considering sample from the city of Kolkata, India.

2. Literature Review

2.1 Cryptocurrency: Justifications

Dourado & Brito (2014) analyzed the various problems that have plagued digital cash in the past. There are a plethora of technological advancements that have made cryptocurrency a reality. Although cryptocurrency is an impressive technical achievement, it is less likely for it to replace fiat currencies.

Chiu & Koeppl (2017) provided an analysis of whether cryptocurrency can support bilateral trade. It is a challenge to overcome double-spending by reliance on

competition to update the blockchain and delays settlements. Cryptocurrency could challenge retail payment systems if scaling limitations could be addressed.

Foley et al. (2019) analyzed the illegal conduct linked to Bitcoin transactions. Bitcoin was responsible for over $72 billion in criminal activities each year, which is similar to the illegal drug markets in Europe and the United States. However, as popular interest in Bitcoin has grown and other opaque cryptocurrencies emerge.

Sharma (2022) discussed that Indian investors prefer to make investments in the conservative avenues because of the lack of information, security issues, and the non-existence of regulations. The worldwide accessibility adoption rate is high in India because of the decentralized system, no intervention, and less cost of transaction. The reason for cryptocurrency's threats and weaknesses are volatile market, security threats, no regulations, and fears related to unknown identities.

2.2 Cryptocurrency: Comparative Analysis

Jani (2017) attempted to measure the growth of bitcoin usage to provide a transparent picture from a practical aspect. The paper looks at how 21 countries have dealt with cryptocurrencies with respect to rules and regulations, in order to build a holistic view of their effect on India's numerous laws.

Shakya et al. (2021) evaluated cryptocurrencies, and their workings, and conduct a comparative analysis between China and India using a literature review. It also evaluates the current state and potential of cryptocurrencies in India.

Anamika et al. (2021) revealed that Bitcoin perception has noticeable influence in the predicting the prices of Bitcoin. The perception of the leading cryptocurrency influences the prices of other cryptocurrencies. When the market investors' sentiment is bearish, there is a rise in cryptocurrency prices, which is a sign that cryptocurrency can act as an alternative investment avenue.

2.3 Cryptocurrency: Indian Situation

Mathur (2018) discussed the Union Budget of 2018-19 where the government announced that cryptocurrency of any form, would not be regarded as legal tender because it has several market risks and uncertainties. There is no regulatory authority which would consequentially lead to an environment where criminals would be propagated.

Singh et al. (2020) discussed about the Supreme Court judgement in RBI Internet and Mobile Association v RBI, the Apex Court allowed a batch of pleas that challenged the 2018 RBI circular and struck down the ban on trading virtual cryptocurrencies in India. The Court in its judgment held that the ban failed to fulfil the requirements of proportionality because the RBI too did not find any such adverse impact or harm caused by the trading of such virtual currencies.

Sikarwar and Shukla (2022) discussed the Union Budget 2022, where the government

will tax all virtual digital assets at 30percent from the 1st day of April 2022. The government has also introduced a 1percent TDS on digital assets.

Roychowdhury and Mishra (2022) discussed about cryptocurrency's potential in India. Data and cryptocurrency security have been a serious worry. Interestingly, even though the legal status of cryptocurrencies in India is unclear, the country may impose a Goods and Services Tax on cryptocurrency trade.

3. Objectives

1. To find out the factors affecting cryptocurrency investment behaviour.
2. To find out whether cryptocurrency investment behaviour is affected by demographics, i.e., age, gender, and income.

4. Methodology

4.1 Data Collection

A structured questionnaire has been designed and circulated among the respondents to collect data for this study. The questionnaire comprised of three questions regarding the respondents' demographics and 21 questions on cryptocurrency investment behaviour.

4.2 Data and Sample

The study is focused on the cryptocurrency investors in Kolkata. The sample size of this research is 172. Judgemental sampling has been employed to choose the respondents.

4.3 Tools and Techniques

Statistical Package for Social Sciences has been applied to examine the data and various statistical tests have been conducted. To identify factors affecting cryptocurrency investment behaviour, Factor Analysis (Principal Component analysis) has been used. In order to find out the demographic variables impacting cryptocurrency investment behaviour, chi-square tests have been used.

5. Results & Discussions

5.1 Reliability Test

Table 1:Reliability Statistics

Cronbach's α	Items
.754	14

Source: Authors' own tabulation

It can be observed that the value of Cronbach's α is 0.754, thus the data is satisfactory enough to be termed as reliable.

5.2 Hypotheses Tests

Chi- Square tests have been conducted between the demographic variables and the cryptocurrency related variables at 5 percent level of significance. Here,

H0: No statistically significant relation exists between a demographic variable and a cryptocurrency related variable.

H1: A statistically significant relation exists between a demographic variable and a cryptocurrency related variable.

Tests with significant relations are shown below.

5.2.1 Age & Awareness of Cryptocurrency

Table 2: Chi Square Test of Age & Awareness of Cryptocurrency

	Value	df	Significance
Pearson Chi-Square	64.304	6	.000

Source: Authors' own tabulation

It can be noted that the p-value is 0.000 which is less than 0.05, so we reject the null hypothesis concluding that a statistically significant relation exists between age and awareness of cryptocurrency.

Table 3: Cross Tabulation of Age & Awareness of Cryptocurrency

Yes		Awareness of Cryptocurrency			Total
		No	Maybe		
Age	15-17	0	0	2	2
	18-20	54	4	2	60
	21-25	80	0	2	82
	25<	28	0	0	28
Total		162	4	6	172

Source: Authors' own tabulation

Table 3 displays that people aged from 15 to 17 years are moderately aware of cryptocurrency. On the other hand, people of other age groups are mostly aware of cryptocurrency.

5.2.2 Age & Source of Awareness

Table 4: Chi Square Test of Age & Source of Awareness

	Value	df	Significance
Pearson Chi-Square	23.777	12	.022

Source: Authors' own tabulation

It is noteworthy to mention that the p-value is 0.002 which is less than 0.05, so we reject the null hypothesis inferring that a statistically detectable relation exists between age and source of awareness of cryptocurrency.

Table 5: Cross Tabulation of Age & Source of Awareness

Internet surfing		Source of Awareness					Total
		Social Media	Work place	Friends and Family	Others		
Age	15-17	0	0	0	2	0	2
	18-20	22	18	2	18	0	60
	21-25	24	28	2	22	6	82
	25<	12	0	0	14	2	28
Total		58	46	4	56	8	172

Source: Authors' own tabulation

Table 5 displays that people aged from 15 to 17 years are aware of cryptocurrency from their family and friends only. On the other hand, people aged from 18-20 years are mostly aware of cryptocurrency from internet surfing. The major source of awareness for people aged from 21 to 25 years is social media, while for people above 25 years of age, friends and family is the major source of awareness.

5.2.3 Age & Intention of Investing in Cryptocurrency

Table 6: Chi Square Test of Age & Intention of Investing in Cryptocurrency

	Value	df	Significance
Pearson Chi-Square	13.369	6	.038

Source: Authors' own tabulation

A p-value of 0.038 interprets that a statistically indicative relationship exists between age and intention of investing in cryptocurrency.

Table 7: Cross Tabulation of Age & Intention of Investing in Cryptocurrency

Yes		Intention of Investing in Cryptocurrency			Total
		No	Maybe		
Age	15-17	0	0	2	2
	18-20	38	8	14	60
	21-25	44	20	18	82
	25<	12	4	12	28
Total		94	32	46	172

Source: Authors' own **tabulation**

Table 7 displays that people aged from 15 to 17 years are not so sure about investing in cryptocurrency. Majority of people aged from 18-20 years are interested to invest in cryptocurrency. Majority of people aged from 21-25 years are interested to invest in cryptocurrency, while for people above 25 years of age, equal strength of people are in favour of investing in cryptocurrency and also indifferent about investment in cryptocurrency.

5.2.4 Age & Investment in Other Securities

Table 8: Chi Square Test of Age & Investment in Other *Securities*

	Value	df	Significance
Pearson Chi-Square	19.180	3	.000

Source: Authors' own tabulation

It can be noted that the p-value is 0.000, which indicates that there is a statistically adequate relation between age and investment in other securities.

Table 9: Cross Tabulation of Age & Investment in Other Securities

Yes		Investment in Other Securities		Total
		No		
Age	15-17	2	0	2
	18-20	28	32	60
	21-25	54	28	82
	25<	26	2	28
Total		110	62	172

Source: Authors' own tabulation

Table 9 displays that people aged from 15 to 17 years are investing in other securities apart from cryptocurrency. Majority of people aged from 18-20 years invest in cryptocurrency, compared to other securities. Majority of people aged from 21-25 years invest in other securities except cryptocurrency, while people above 25 years of age invest in other securities rather than cryptocurrency.

5.2.5 Age & Reason for Not Investing

Table 10: Chi Square Test of Age & Reason for Not Investing

	Value	df	Significance
Pearson Chi-Square	28.970	12	.004

Source: Authors' own tabulation

It can be noted that the p-value is 0.004, which asserts that there is a statistically adequate relation amongst age and reason for not investing in cryptocurrencies.

Table 11: Cross Tabulation of Age & Reason for Not Investing

I am not hesitant		Reason for Not Investing					Total
		Seems too risky	Did research and concluded bleak future	Did not do research yet	Others		
Age	15-17	0	0	0	2	0	2
	18-20	22	10	4	21	2	60
	21-25	32	14	6	28	2	82
	25<	4	16	0	6	2	28
Total		58	40	10	58	6	172

Source: Authors' own tabulation

People aged from 15-17 years are sceptical regarding investment in cryptocurrencies as they do not conduct proper research regarding the same. Majority of people aged from 18-25 years of age are in favour of investing in cryptocurrencies. People above 25 years of age find crypto investments to be very risky.

5.2.6 Gender & Awareness of Cryptocurrency

Table 12: Chi Square Test of Gender & Awareness of Cryptocurrency

	Value	df	Significance
Pearson Chi-Square	91.377	4	.000

Source: Authors' own tabulation

It can be noted that the p-value is 0.000, which indicates that there is a statistically adequate relation between gender and awareness of cryptocurrencies.

Table 13: Cross Tabulation of Gender & Awareness of Cryptocurrency

Yes		Awareness of Cryptocurrency			Total
		No	Maybe		
Gender	Male	116	0	2	118
	Female	46	2	4	52
	Other	0	2	0	2
Total		162	4	6	172

Source: Authors' own tabulation

The above table indicates that males are more aware of cryptocurrencies compared to others.

5.2.7 Gender & Presence of Cryptocurrency in Portfolio

Table 14: Chi Square Test of Gender & Presence of Cryptocurrency in Portfolio

	Value	df	Significance
Pearson Chi-Square	15.813	2	.000

Source: Authors' own tabulation

It can be noted that the p-value is 0.000, which indicates that there is a statistically adequate relation between gender and presence of cryptocurrencies in portfolio.

Table 15: Cross Tabulation of Gender & Presence of Cryptocurrency in Portfolio

Yes		Presence of Cryptocurrency in Portfolio		Total
		No		
Gender	Male	64	54	118
	Female	12	40	52
	Other	0	2	2
Total		76	96	172

Source: Authors' own tabulation

The above table is suggestive of the fact that males prefer to keep more cryptocurrencies in their portfolio unlike others.

5.2.8 Gender & Intention of Investing in Cryptocurrency

Table 16: Chi Square Test of Gender & Intention of Investing in Cryptocurrency

	Value	df	Significance
Pearson Chi-Square	18.099	4	.001

Source: Authors' own tabulation

It can be noted that the p-value is 0.001, which indicates that there is a statistically adequate relation between gender and intention of investing in cryptocurrencies.

Table 17: Cross Tabulation of Gender & Intention of Investing in Cryptocurrency

Yes		Intention of Investing in Cryptocurrency			Total
		No	Maybe		
Gender	Male	72	14	32	118
	Female	22	16	14	52
	Other	0	2	0	2
Total		94	32	46	172

Source: Authors' own tabulation

Males are more interested to invest in cryptocurrencies compared to others. It is significant to note that females are also included towards investment in cryptocurrencies.

5.2.9 Gender & Investment in Other Securities

Table 18: Chi Square Test of Gender & Investment in Other Securities

	Value	df	Significance
Pearson Chi-Square	10.618	2	.005

Source: Authors' own tabulation

It can be noted that the p-value is 0.005, which indicates that there is a statistically adequate relation between gender and investment in other securities.

Table 19: Cross Tabulation of Gender & Investment in Other Securities

Yes		Investment in Other Securities		Total
		No		
Gender	Male	84	34	118
	Female	26	26	52
	Other	0	2	2
Total		110	62	172

Source: Authors' own tabulation

It can be observed that Males also invest in other securities actively unlike Females, who have a moderate view of investing in other securities.

5.2.10 Income & Source of Awareness

Table 20: Chi Square Test of Income & Source of Awareness

	Value	df	Significance
Pearson Chi-Square	39.219	12	.000

Source: Authors' own tabulation

It can be noted that the p-value is 0.000, which indicates that there is a statistically adequate relation between income and source of awareness regarding cryptocurrencies.

Table 21: Cross Tabulation of Income & Source of Awareness

Internet surfing		Source of Awareness					Total
		Social Media	Work place	Friends and Family	Others		
Income	0-2 lakhs per annum	22	26	2	18	4	72
	2-5 lakhs per annum	6	10	0	6	2	24
	5-10 lakhs per annum	4	8	2	18	0	32
	10+ lakhs per annum	26	2	0	14	2	44
Total		58	46	4	56	8	172

Source: Authors' own tabulation

The main source of awareness of cryptocurrencies for people having an annual income upto Rs 5 lakhs is Internet surfing and some people within this income range are also aware about this from their family and friends. Majority of people with an annual income ranging from 5 to 10 lakhs get to know about cryptocurrencies from their family and friends. Internet surfing again appears to be a major source of awareness regarding cryptocurrencies for people having an annual income of more than 10 lakhs.

5.2.11 Income & Presence of Cryptocurrency in Portfolio

Table 22: Chi Square Test of Income & Presence of Cryptocurrency in Portfolio

	Value	df	Significance
Pearson Chi-Square	9.986	3	.019

Source: Authors' own tabulation

It can be noted that the p-value is 0.019, which indicates that there is a statistically adequate relation between income and presence of cryptocurrencies in portfolio.

Table 23: Cross Tabulation of Income & Presence of Cryptocurrency in Portfolio

Yes		Presence of Cryptocurrency in Portfolio		Total
		No		
Income	0-2 lakhs per annum	26	46	72
	2-5 lakhs per annum	14	10	24
	5-10 lakhs per annum	10	22	32
	10+ lakhs per annum	26	18	44
Total		76	96	172

Source: Authors' own tabulation

It can be inferred that people not having a taxable income (i.e. up to 2 lakhs per annum) do not prefer to invest in cryptocurrencies. People having an annual income ranging from 2 lakhs to 5 lakhs are more inclined towards investment in cryptocurrencies compared to the former income group. People having an annual income ranging from 5-10 lakhs are less interested in crypto investments unlike people with an annual ranging from. 2-5 lakhs. Majority of people having an annual income of more than 10 lakhs like to invest in cryptocurrencies.

5.2.12 Income & Investment in Other Securities

Table 24: Chi Square Test of Income & Investment in Other Securities

	Value	df	Significance
Pearson Chi-Square	29.328	3	.000

Source: Authors' own tabulation

It can be noted that the p-value is 0.000, which indicates that there is a statistically adequate relation between income and investment in other securities.

Table 25: Cross Tabulation of Income & Investment in Other Securities

Yes		Investment in Other Securities		Total
		No		
Income	0-2 lakhs per annum	30	42	72
	2-5 lakhs per annum	16	8	24
	5-10 lakhs per annum	26	6	32
	10+ lakhs per annum	38	6	44
Total		110	62	172

Source: Authors' own tabulation

It can be clearly stated that investment in other securities is directly proportional to the annual income of the respondents. As the annual income of increases, tendency to invest in other securities also increases.

5.2.13 Income & Reason for Not Investing

Table 26: Chi Square Test of Income & Reason for Not Investing

	Value	df	Significance
Pearson Chi-Square	21.936	12	.038

Source: Authors' own tabulation

It can be noted that the p-value is 0.038, which indicates that there is a statistically adequate relation between income and reason for not investing in cryptocurrencies.

Table 27: Cross Tabulation of Income & Reason for Not Investing

		Reason for Not Investing					Total
		I am not hesitant	Seems too risky	Did research and concluded bleak future	Did not do research yet	Others	
Income	0-2 lakhs per annum	6	10	8	48	0	72
	2-5 lakhs per annum	4	14	0	4	2	24
	5-10 lakhs per annum	10	10	0	10	2	32
	10+ lakhs per annum	24	10	2	6	2	44
Total		58	40	10	58	6	172

Source: Authors' own tabulation

Majority of people falling under non-taxable income bracket have not researched about cryptocurrencies and are sceptical regarding crypto investments. People with an annual income ranging from 2 lakhs to 5 lakhs consider crypto investments to be very risky and therefore they are less likely to invest in cryptocurrencies. People with an annual income of 5-10 lakhs are indifferent between investment in cryptocurrencies, risk aversion and research regarding cryptocurrencies. People with an annual income over 10 lakhs do not hesitate to invest in cryptocurrencies.

4.3 Factor Analysis

To determine the factors contributing to cryptocurrency investment, a principal component analysis was conducted on 14 items with orthogonal rotation (varimax). The Kaiser–Meyer– Olkin measure showed a value of 0.645 confirming adequacy of the sample. Bartlett's test of sphericity showed χ^2 (91) = 598.257 and $p < 0.001$ confirming that the sample large enough for conducting factor analysis.

Table 28: KMO and Bartlett's *Test*

KMO Measure of Sampling Adequacy.		.645
Bartlett's Test of Sphericity	Chi-Square	598.257
	df	91
	Sig.	.000

Source: Authors' own tabulation

It is seen that five factors have eigenvalues more than 1, and they can together explain 65.671 percent of the variance, therefore these five factors have been considered for the final analysis.

Table 29: Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	percent of Variance	Cumulative percent	Total	percent of Variance	Cumulative percent	Total	percent of Variance	Cumulative percent
1	2.937	20.975	20.975	2.937	20.975	20.975	2.624	18.746	18.746
2	2.230	15.932	36.907	2.230	15.932	36.907	2.271	16.221	34.967
3	1.604	11.455	48.362	1.604	11.455	48.362	1.732	12.369	47.336
4	1.259	8.993	57.355	1.259	8.993	57.355	1.312	9.371	56.707
5	1.164	8.316	65.671	1.164	8.316	65.671	1.255	8.964	65.671

Source: Authors' own tabulation

The variables that gather around the components suggest its name. The variables in Factor 1 signifies 'Long Term Investment, the variables in Factor 2 denotes 'Regulation', the variables in Factor 3 characterizes 'Loss Aversion', the variables in Factor 4 signifies 'Negative Opinion', and the variables in Factor 5 denotes 'Risk Taking'. These 5 factors have been found to be critical in determining the investors' cryptocurrency behaviour.

Table 30: Rotated Component Matrix

	Component				
	Long Term Investment	**Regulation**	**Loss Aversion**	**Negative Opinion**	**Risk Taking**
Intention of Holding Crypto in the Long Run	.807	**-.028**	.042	.046	-.182
Decentralized finance is the reason for investing	.792	**-.145**	.051	.024	.319
Long term plan is the reason for investing	.756	**.010**	-.072	.152	.094
Trust in Bitcoin	.701	**-.026**	.150	-.339	-.036
Authorities should regulate Cryptocurrency	-.101	**.855**	-.130	-.064	.055
Government should generate revenue from Cryptocurrency	-.194	**.701**	.132	.108	.031
Regulation will lead to price stability	.039	**.670**	-.050	.183	.059
Dominance of Bitcoin in 10 years	.366	**.610**	.250	-.237	-.155
Investment only with large cap alt coins	.036	.058	**.840**	-.009	-.096
Investment only up to loss bearing capacity	-.016	.003	**.661**	.302	.237
Negative Impact of Government Policy	.098	.056	.208	**.806**	-.060
Preference of Stock Exchange over Cryptocurrency	-.173	.433	-.405	**.482**	-.088
Quick Gains is the reason for investing	.175	.036	.178	-.189	**.816**
Alt coins form majority of portfolio	.167	-.087	.467	-.239	**-.579**

Source: Authors' own tabulation

6. Conclusion

Findings reveal that the factors affecting cryptocurrency investment behaviour are found to be 'long term investment in cryptocurrency', regulation of cryptocurrency', 'loss aversion behaviour, 'negative opinion about cryptocurrency', and 'risk-taking in cryptocurrency'.

Further, it can be inferred that the age of the investor affected his/her awareness of cryptocurrencies, the source of this awareness, his/her intention of investing in cryptocurrency, his/her investment in other securities, and his/her reason for not investing in cryptocurrencies. The gender of the investor affected his/her awareness of cryptocurrencies, his/her presence of cryptocurrency in the portfolio, his/her intention of investing in cryptocurrency, and his/her investment in other securities. The income of the investor affected his/her presence of cryptocurrency in the portfolio, his/her investment in other securities, and his/her reason for not investing.

This study offers several theoretical and managerial implications. The findings of the study contribute to the extant literature of cryptocurrency. In particular, the current work would guide the policymakers in the government as well as the corporates to get a comprehensive picture of the investors' attitude towards cryptocurrencies. This will aid the government in framing policies regarding regulation and legalisation of cryptocurrencies. The people of our society will also be aware regarding the viewpoint of people towards cryptocurrencies and will get an idea whether cryptocurrency is a reliable investment option in the long run. It can be recommended that increasing orientation of people towards blockchain technology and other technical terms related to cryptocurrencies will accelerate cryptocurrency espousal among investors.

Besides, this study provides scope for further research. To be more specific, this study is focussed on a population segment based in Kolkata only. The research could have been more extensive if we would have focussed on India as a whole. The results might have differed if the geographical area had been extended. In addition, the consumption of energy in cryptocurrency transactions through various blockchain networks is huge, therefore research addressing this issue can be conducted and some probable solutions can be provided for the same.

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INVISIBLE LABOUR, VISIBLE LOSS: THE ECONOMIC VALUE OF WOMEN'S UNPAID WORK IN INDIA

Arpita Saha

Abstract

Unpaid domestic work constitutes a significant yet largely unrecognized component of economic activity across the world. In most societies, the burden of household and caregiving responsibilities disproportionately falls on women due to deeply embedded gender norms and patriarchal social structures. Despite its vital contribution to household welfare and the broader economy, such work remains excluded from conventional state economic accounting systems. This paper examines the economic significance of women's unpaid domestic work in India using evidence from the Time Use Survey 2024. The study specifically analyses how marital status and educational attainment influence the allocation of time to unpaid household activities. The findings reveal a pronounced gender disparity in the distribution of unpaid domestic and caregiving responsibilities, with women consistently spending substantially more time on these activities than men. The result further indicates that marital status significantly increases women's household responsibilities, while higher levels of education only moderately reduce the time devoted to unpaid domestic work without eliminating the gender gap. By highlighting these gender differences in time-use patterns, the paper demonstrates how unpaid work constraints women's participation in paid employment and contributes to their economic invisibility.

Keywords

Unpaid domestic work, Care economy, Gender inequality, Time use survey, Household production

Introduction:

Domestic works are carried out by men and women in a household. In general, women share a greater burden of household work than men. However, these domestic activities are rarely recognized as "productive work" within the conventional economic framework because they do not involve direct monetary transactions. As a result, a large share of labour—primarily performed by women—remains invisible in official economic statistics and policy discussions. The conventional economy often fails to recognize these aspects of work where women stand hidden and unacknowledged. This type of work was termed as the 'Economy of Care' by Elson (Thakare & Shivhare,2022). The care economy encompasses activities necessary for maintaining and reproducing the labour force, yet these contributions are often undervalued because they occur within the private sphere of the household rather than in the formal market.

The exclusion of unpaid domestic work from national accounting systems reflects a major limitation of the United Nations System of National Accounts, which generally categorizes household services produced for own consumption as non-market activities**.** Consequently, these activities remain outside the measured boundaries of Gross Domestic Product (GDP). This exclusion results in a distorted understanding of economic productivity, as it ignores the extensive time and effort devoted to household maintenance and care.

Understanding the magnitude and determinants of unpaid work is, therefore, crucial for evaluating gender inequality in economic participation. Time-use data provide an important tool for analysing how individuals allocate their daily time across various activities. In the Indian context, the Time Use Survey 2024 offers comprehensive information on how men and women divide their time between paid employment, domestic work, caregiving, and leisure. This study examines the distribution of unpaid domestic work among women in India with particular attention to marital status and educational attainment. Marriage often increases women's household responsibilities, while education may influence both the type and intensity of care activities performed. By analysing these dimensions, the study aims to highlight the hidden economic contribution of women's unpaid work and its implications for gender equality and labour market participation.

Literature Review:

Invisibility of the Care Economy

A significant body of literature highlights the persistent trade-off between paid and unpaid work in women's daily lives, where unpaid domestic activities remain largely unrecognised as productive labour despite their essential role in sustaining households and the labour force (Thakare & Shivhare, 2022). Within the system of national accounts, such household services are classified as non-market or Non-SNA activities, leading to their exclusion from national income

and Gross Domestic Product (Yadav & Sharma, 2021). This exclusion not only underestimates economic output but also reflects deeper structural inequalities, as women's domestic labour is often viewed as a natural extension of gender roles rather than as economic contribution (Thakare & Shivhare, 2022). Consequently, the absence of valuation for unpaid work leads to the neglect of skills developed through caregiving and household management, resulting in the systematic undervaluation of women's contribution in both market and non-market contexts (Yadav & Sharma, 2021).

Socio-Cultural Norms and the Gendered Division of Labour

We live in a patriarchal world where gender roles and expectations are deeply ingrained in most societies and women are expected to take on majority of household tasks and responsibilities while men are viewed as the primary bread-earners for any household. This patriarchal setup creates a binary where the male is the 'breadwinner' and the female is the 'caregiver'. The data highlights a stark contrast in participation: while nearly all women (90.3 per cent to 93.3 per cent) engage in unpaid domestic services, only a small fraction of men (around 26 per cent to 28 per cent) participate in similar activities (Das & Nayak, 2022). Studies indicate that while a woman's domestic workload increases significantly after marriage, a man's contribution typically remains stagnant or even decreases (Choudhary et al., 2008). In India, domestic work is frequently viewed as a woman's "natural duty," which serves as a major barrier to her participation in the formal labour market (Rathore, 2024).

The Education-Care Paradox

A significant and counter-intuitive finding is the positive association between a woman's education and the time she spends on caregiving. Data shows that women with higher education levels (secondary and above) often spend *more* time on childcare than those with lower education (Rathore, 2024). This is attributed to "intensive mothering" norms, where educated parents invest more time in their children's educational and developmental outcomes to ensure future success. Specifically, while education may reduce the time spent on "routine" housework such as cleaning, it increases the time devoted to "high-investment" caregiving. This suggests that education alone cannot bridge the gender gap in unpaid work without changes in societal expectations of care (Rathore, 2024).

Effects on GDP and National Income

A growing body of literature suggests that the exclusion of unpaid domestic work from national income accounting leads to a significant underestimation of the true size and productivity of the economy. Conventional measures such as Gross Domestic Product capture only market-based transactions and fail to account for the large volume of household production. Since a substantial share of this work is performed by women, its exclusion obscures their economic contribution to national development. Studies indicate that if unpaid household work were valued at market rates, its contribution would be

substantial. One estimate places its value at US$612.8 billion, accounting for nearly 61 per cent of GDP at the time of the study (Choudhary et al., 2008). This highlights the magnitude of invisible labour and the limitations of traditional economic indicators. By excluding such activities, the system of national accounts fails to capture the implicit subsidy provided by women to the formal economy through the unpaid production and maintenance of the labour force (Thakare & Shivhare, 2022).

Research Gap:

Despite the growing recognition of unpaid domestic work in academic literature, its implications for women's economic participation in India remain insufficiently explored. In particular, the interaction between unpaid household responsibilities and women's engagement in paid employment requires closer examination.

In this context, the present study seeks to address two key research questions: First, it examines the extent to which Indian women face a trade-off between time allocated to unpaid domestic work and participation in paid employment. Second, it investigates how socio-demographic factors, specifically educational attainment and marital status, influence women's involvement in unpaid household activities. By analysing these dimensions, the study aims to provide a clearer understanding of the structural determinants of women's unpaid labour and its implications for their economic empowerment.

Research Methodology and Database:

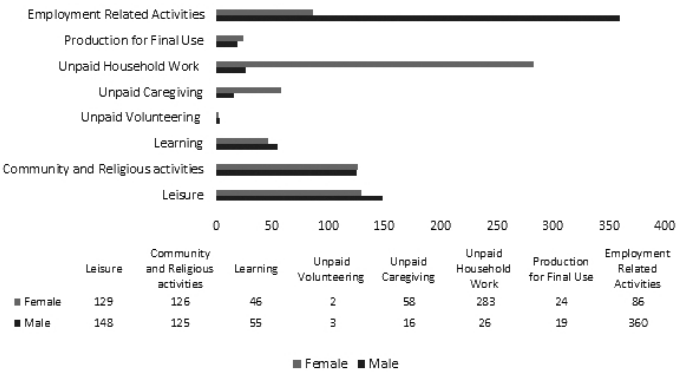
The paper uses unit-level data from the Indian Time Use Survey. The National Statistics Office (NSO), Ministry of Statistics and Programme Implementation (MoSPI) completed the second all-India Time Use Survey (TUS) conducted during January-December, 2024, following the first survey conducted during January-December, 2019. The distinguishing features of Time Use Survey from other household surveys is that it can capture time disposition on different aspects of human activities. Indeed, time-use surveys are particularly useful for capturing all forms of work: work in the household sector, as well as work that is not accounted for in national accounts, such as unpaid domestic work and caring for household members. This survey covered 1,39,487 households (rural: 83,247 and urban: 56,240). Information on time use was collected from each member aged 6 years and above of the selected households. This survey enumerated 4,54,192 persons of age 6 years and above (rural: 2,85,389 and urban: 1,68,803). Data was collected for one day in a week in a 24-hour time diary- from 4 am to 4 am the next day- using face-to-face interviews. This time diary was divided into 30-minute time slots and each time slot collected at the most three activities, and only those activities for which 10 minutes or more were recorded.

The primary objective of Time Use Survey (TUS) was to measure the participation of men and women in paid and unpaid activities. It is an important source of information on the time spent in unpaid caregiving activities, unpaid volunteer

work, and unpaid domestic service producing activities of the household members. The components of interest for this research exercise are 'Unpaid domestic services for household members' and 'Unpaid caregiving services for household members', and the respective two-digit activities (childcare, care for dependent adults etc.) in each of them. By combining both these components we can determine the total time spent in a day (in minutes) by each individual on unpaid domestic work including caregiving activities.

Figure 1 presents the average time spent (in minutes per day) by men and women in India across different categories of activities based on the Time Use Survey 2024. The figure clearly highlights the gender disparities in the allocation of time between paid and unpaid activities.

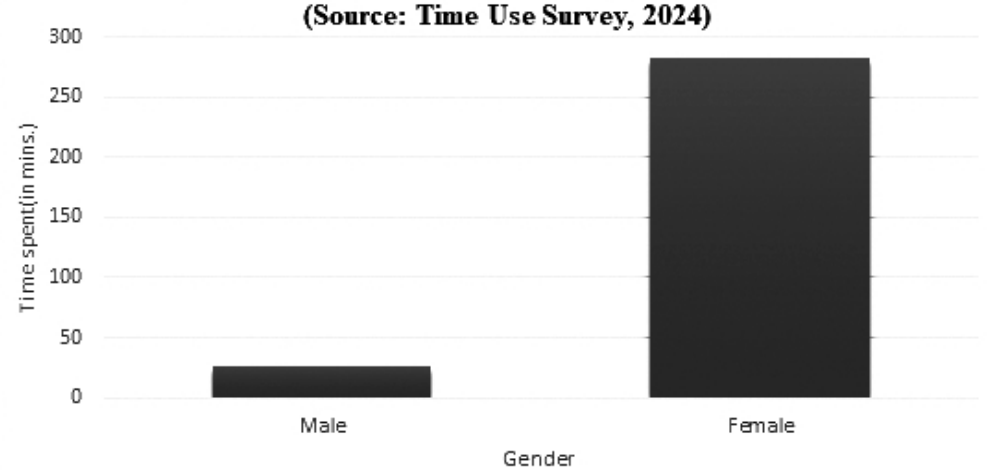
Figure 1: Time Spent on Various Activities- All India Average
(Source: Time Use Survey, 2024)



	Leisure	Community and Religious activities	Learning	Unpaid Volunteering	Unpaid Caregiving	Unpaid Household Work	Production for Final Use	Employment Related Activities
Female	129	126	46	2	58	283	24	86
Male	148	125	55	3	16	26	19	360

Men spend a significantly larger portion of their day in employment-related activities, averaging about 360 minutes, compared to only 86 minutes for women. In contrast, women devote a substantial amount of time to unpaid household work, spending approximately 283 minutes per day, whereas men spend only 26 minutes on similar activities. A similar pattern is observed in unpaid caregiving activities, where women spend around 58 minutes daily, compared to 16 minutes for men. The gender difference in time allocation indicates a clear division of labour within households. While men spend more time in market-based activities and paid employment, women carry the primary responsibility for unpaid domestic and caregiving tasks. Additionally, men enjoy relatively higher leisure time (148 minutes) compared to women (129 minutes), further reflecting the unequal distribution of household responsibilities. These patterns provide preliminary evidence of the trade-off between paid employment and unpaid domestic work faced by women, which forms the central focus of this study.

Figure 2: Average Time Spent on Unpaid Domestic Work (Source: Time Use Survey, 2024)



What does the evidence reveal about the gender gap in unpaid domestic work? Figure 2 presents the average time spent by men and women on unpaid domestic activities in India based on the Time Use Survey 2024. The data show a significant disparity, with women spending approximately 283 minutes per day compared to only 26 minutes by men. This significant difference highlights the unequal distribution of household responsibilities within families.

Participating and Time Spent by Women and Men in Unpaid Domestic Work by Marital Status: Does Marital Status Influence Women's Time Allocation to Household Activities?

Having examined the overall gender disparity in unpaid domestic work, it is important to explore whether marital status influences women's involvement in household activities. In many societies, marriage is associated with increased domestic responsibilities for women, including household management and caregiving duties. As a result, women's time allocation to unpaid work may vary significantly across different marital categories. To understand this relationship, Figures 3 and 4 present the average time spent by women on various forms of unpaid work across different marital status groups using data from the Time Use Survey 2024 India.

Figure 3: Average Unpaid Work by Women – Marital Status

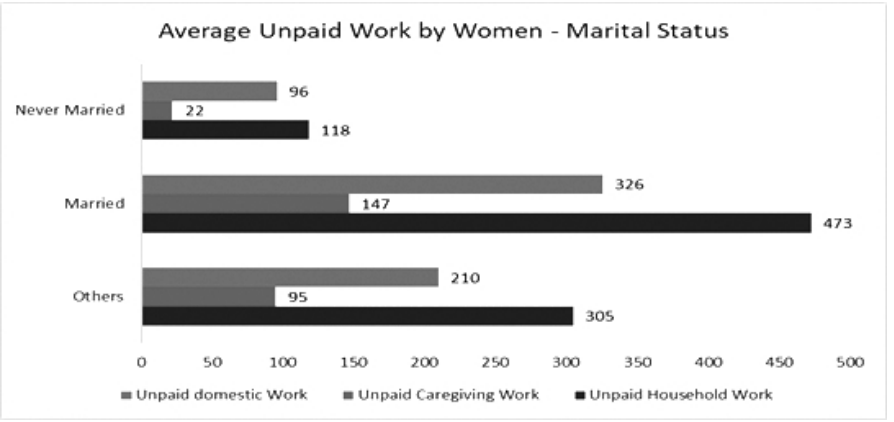
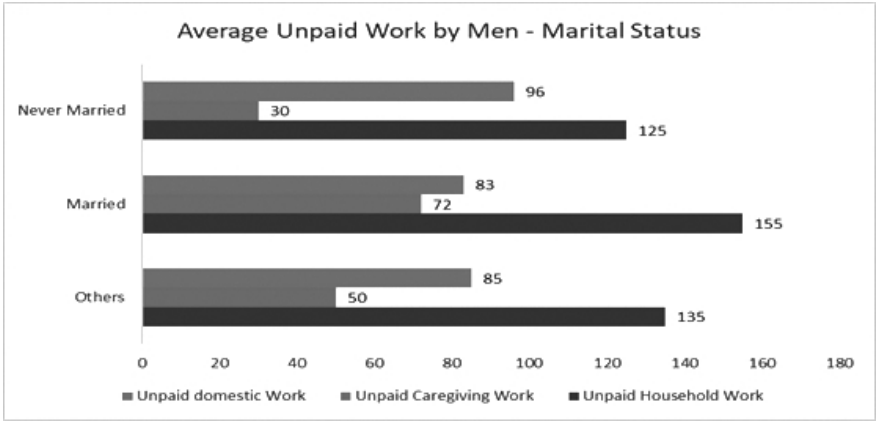


Figure 3 indicates that married women spend the highest amount of time on unpaid household activities, with about 326 minutes on unpaid domestic work and 147 minutes on caregiving, total around 473 minutes of unpaid household work per day. In comparison, never-married women spend significantly less time, averaging 96 minutes on domestic work and 22 minutes on caregiving, resulting in 118 minutes of total unpaid household work. Overall, the figure indicates that marital status significantly influences women's time allocation to unpaid household activities, with married women bearing the largest share of domestic and caregiving responsibilities.

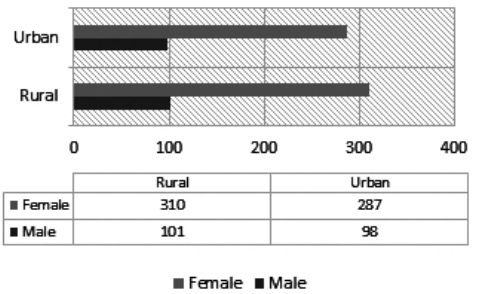
Figure 4: Average Unpaid Work by Men – Marital Status



A similar pattern can also be observed in the case of men, although the overall time spent on unpaid work remains significantly lower compared to women. Figure 4 shows that married men spend relatively more time on unpaid domestic and caregiving activities than never-married men, indicating that marital status also influences men's participation in household work. However, the magnitude of time spent by men remains considerably smaller than that of women across all marital categories.

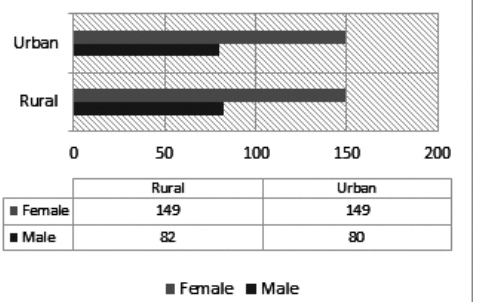
Participating and Time Spent by Women and Men in Unpaid Domestic and Caregiving Services by Education Levels: Does Higher Education have an impact on Women's Time Spent on Unpaid Domestic & Care Work?

Figure 5: Average Time Spent on Unpaid Domestic Work by Education level (Graduate & Above)



	Rural	Urban
Female	310	287
Male	101	98

Figure 6: Average Time Spent on Unpaid Caregiving Work by Education Level (Secondary & Below)



	Rural	Urban
Female	149	149
Male	82	80

With an increase in educational qualification, the time spent by both men and women declines slightly, but the disparity remains pronounced. For those with graduate-level education and above, rural females still spend 207 per cent more time than rural males on domestic work (310 vs. 101 minutes), and urban females spend 193 per cent more than urban males (287 vs. 98 minutes). In unpaid caregiving, the pattern is similar, but the percentage gaps are somewhat smaller.

A similar pattern exists in unpaid caregiving work at the secondary education and below level. Rural women spend 149 minutes per day on caregiving compared to 82 minutes for men**,** which is 82 per cent higher**.** In urban areas, women spend 149 minutes while men spend 80 minutes**,** showing 86 per cent higher contribution by women**.**

Overall, these findings indicate that higher education slightly reduces the time spent on unpaid domestic work but does not eliminate the gender gap**.** Women consistently perform a much larger share of unpaid household labour than men, reflecting persistent social norms and gender roles within households.

Conclusion

Unpaid domestic and caregiving work constitutes a vital yet largely invisible component of the Indian economy. Using evidence from the Time Use Survey 2024, this study highlights the persistent gender imbalance in the distribution of household labour. Women devote substantially more time to unpaid domestic and caregiving activities than men, while marital status considerably increases women's unpaid workload. Although higher educational attainment is associated with a modest reduction in time spent on unpaid domestic work, it does not eliminate the gender gap. The findings therefore suggest that women's unpaid labour is not merely a private household matter but an economic issue with significant implications for labour-force participation, economic autonomy and gender equality.

This imbalance needs to be addressed through a broader policy framework because what remains invisible today is not marginal, but indispensable to the very foundation of the economy. Expanding women's access to education, paid employment, credit, entrepreneurship and social protection can contribute to reducing their economic dependence and expanding their choices. However, access to income-generating opportunities alone may not be sufficient if the unequal distribution of unpaid domestic and caregiving responsibilities remains unchanged.

Policy Responses and Recognition:

Existing policy interventions provide important forms of income and social support to women, but their effectiveness in addressing women's economic position may be strengthened further when income support is accompanied by measures that reduce the time burden associated with unpaid domestic and caregiving work. Welfare schemes such as Lakshmir Bhandar (transformed to Annapurna Bhandar after the recent change of guard in West Bengal politics) have been utilised precisely to obfuscate this issue. It mainly provides direct cash support for improving women's access to financial resources. At the same time, such transfers should be viewed as complementary to, rather than substitute for recognising and reducing the unpaid domestic work. The policy challenge is therefore not only to provide additional income, but also to reduce the amount of unpaid time that women are required to devote to household production and care.

A similar pattern is visible in the promotion of Self-Help Groups and rural microfinancing. These programmes can expand women's nominal access to credit, savings, and draw large numbers of rural women into savings and lending networks. However, the effectiveness of this programme in promoting genuine economic empowerment largely depends on whether women are able to convert access to credit into sustainable income-generating opportunities without adding financial and repayment responsibilities to an already unequal unpaid workload. Thus, credit-based empowerment should be accompanied by measures that address time poverty, access to markets, skills, and household-level sharing of care responsibilities.

The policy objective should consequently

move beyond treating women's economic marginalisation primarily as a problem of inadequate income or credit. It should also recognise the unequal allocation of time within households. The Time Use Survey provides an important empirical basis for this approach because it makes visible activities that conventional economic statistics generally do not capture.

Alternative Pathways: Formal Employment versus Informal Precarity: Greater access to stable and productive paid employment represents another important pathway towards reducing women's economic dependence on unpaid domestic work. While income-support programmes and access to credit can improve women's financial position, sustained participation in productive employment can provide a more direct avenue for strengthening economic autonomy and expanding women's choices.

The experience of Bangladesh provides a comparative illustration. The ready-made garment industry has become a major source of employment for Bangladeshi women and an important contributor to the country's export economy. Recent World Bank evidence indicates that this sector employed approximately 4.2 million workers in 2024, with women constituting the majority of the workforce, while the industry generated US$38.48 billion in export earnings. This suggests that access to stable, formal work may be the more decisive lever for reducing women's dependence on unpaid domestic labour rather than providing compensatory transfers alone.

India's experience with export-oriented and organised female employment remains comparatively limited, which may partly explain why unpaid domestic and caregiving work continues to absorb a large share of women's time despite various welfare interventions. A less visible dimension of women's economic vulnerability concerns the conditions under which women may seek income-generating opportunities when secure employment and social protection are limited. In this context, commercial surrogacy provides an important example of the need for adequate legal and social protection. India's Surrogacy (Regulation) Act, 2021 prohibits commercial surrogacy and provides a regulatory framework for permitted forms of surrogacy. The broader policy lesson is that women's economic choices should be supported through secure employment, sustainable livelihoods and adequate social protection so that economic vulnerability does not restrict the range of opportunities available to them.

Ultimately, the goal should not merely be to reduce the amount of unpaid work performed by women, but to ensure that the responsibility for essential household and caregiving activities is recognised and shared more equitably. By making invisible labour visible and creating greater opportunities for women to participate in productive and remunerative activities, India can move towards a more inclusive, equitable and sustainable economic system in which women's time, labour and capabilities are fully valued.

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PSYCHOLOGICAL DRIVERS OF RETAIL EQUITY INVESTMENT IN NORTHERN INDIA: A BEHAVIORAL FINANCE PERSPECTIVE

Geetanjali Shrivastava
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Abstract

More people are investing in market-linked options such as mutual funds and equities than before. Despite of extensive research on demographic factors, limited attention have been given to psychological drivers such as Financial Greed, Procedural Ease, and External Influencers responsible for shaping retail equity investment preferences among investors. This study examines the role of these factors causing shift from traditional to modern investment options. Using an exploratory descriptive design, data were collected via structured questionnaires from 220 retail investors in Uttar Pradesh and Madhya Pradesh (Northern India), analysed with SmartPLS Structural Equation Modeling (SEM). Findings confirm a significant shift toward equity investment ($p < 0.05$), driven by Financial Greed ($p < 0.001$, $\beta = 0.453$), Financial Literacy ($p = 0.006$, $\beta = 0.219$), and Risk Appetite ($p = 0.036$, $\beta = 0.131$), particularly among younger investors (40% aged 18-25). External Influencers ($p = 0.438$) and Procedural Ease ($p = 0.215$) have insignificant impacts. The study offers practical implications for designing targeted financial literacy programmes and accessible trading platforms, while providing useful insights for policymakers and brokers to enhance retail investor participation..

Keywords

Financial Education, Financial Awareness, Investor Preferences, Psychological Factors, Risk Takers, Savings.

Introduction

It is commonly believed that investors are rational and always take investment decisions through the best available information and in-depth market analysis. Financial knowledge is one side of investing, but there is another side as well- the emotions and mind-set of the investors. Behavioural finance reveals that psychological biases such as overconfidence, loss aversion, and greed shape investment choices (Kahneman & Tversky, 1979; Benos, 1998).

In India, retail equity investment has increased rapidly in recent years. In FY24-25, 41.1 million new demat accounts were opened, mainly driven by young investors and the growing use of digital platforms (Business Standard, 2024). This sharp rise has been supported by easy-to-use digital platforms and mobile apps that have made buying and selling shares much simpler than before. As a result, many investors are slowly moving away from traditional options such as fixed deposits, gold, and post-office savings towards equities and mutual funds.

Despite this growth, limited attention has been given to the behavioural factors that influence this change, especially in UP & MP. Earlier studies have focused on demographic factors such as age, gender, occupation, and income. However, there is still a lack of research on psychological drivers such as risk appetite, financial greed, financial literacy, influence of others, and procedural ease. This gap becomes more important because of the changing investment behaviour of retail investors in the present financial environment.

This study investigates how behavioural factors (Risk Appetite, Financial Greed, Financial Literacy, External Influencers, and Procedural Ease) along with demographic factors influence retail investors' preferences for equities over traditional assets in UP & MP. The region has its own socio-economic characteristics, which makes this study relevant.

The main objectives of the study are:

1. To understand the changing investment preferences of retail investors in UP & MP.
2. To examine the influence of behavioural factors (Risk Appetite, Financial Greed, Financial Literacy, External Influencers, and Procedural Ease) and demographic factors on retail investors' preference for equity investments.
3. To identify the key reasons behind the shift from traditional investment options to equity and mutual funds.

The findings of this study will be useful for stockbrokers, broking firms, and policymakers. They can use these insights to design better strategies and encourage more people to participate in the equity market in a responsible manner.

REVIEW OF LITERATURE

Equity markets in India have witnessed unprecedented growth; with 41.1 million

new demat accounts opened in FY24-25, driven by increased retail participation (Business Standard, 2025). This surge is attributed to the liquidity, low transaction costs, and flexibility of equity products compared to traditional assets like fixed deposits and gold (Lim et al., 2016). The rise of digital trading platforms, such as Zerodha and Groww, has further democratized access, particularly among young investors (Business India, 2025). Media coverage significantly influences investor behaviour, with stocks receiving attention attracting higher trading volumes (Fang et al., 2014). Kumar and Singh (2023) note that social media platforms, including X, amplify retail investor engagement by disseminating real-time market insights, shaping trading decisions in India's dynamic market.

But, Behavioural finances also challenge the assumption of investor rationality, highlighting psychological biases in decision-making. Kahneman and Tversky's (1973) prospect theory explains how investors overweigh losses relative to gains, influencing equity investment choices. Overconfidence leads to excessive trading, often with suboptimal outcomes (Benos, 1998), while mental accounting affects portfolio allocation (Thaler, 1999). Lo et al. (2005) found that emotional reactions to financial gains or losses impair trading performance. Recent studies, such as Sharma and Mehta (2024), confirm that post-COVID market volatility exacerbated biases like herding and optimism among Indian retail investors, driving speculative trading during market rallies.

To overcome the sentimental investing financial literacy is crucial for informed investment decisions. Van Rooij et al. (2011) demonstrate that higher literacy correlates with greater stock market participation, as educated investors better understand risk diversification. In India, low financial literacy often deters equity investments, with investors relying on informal advice from peers (Mishra, 2018). Guiso et al. (2008) highlight trust as a determinant of market participation, particularly in emerging markets. Gupta and Sharma (2023) note that India's digital literacy initiatives, coupled with increased internet penetration, have enhanced financial knowledge, encouraging retail investors to explore equities over traditional avenues.

Along with behavioural finances and financial literacy demographic factors also shapes the investment preferences. Paisarn et al. (2021) found that younger investors (under 45) in Thailand hold diversified portfolios, a trend mirrored in India; where millennials dominate new demat account openings (Business Standard, 2025). Gender differences persist, with men exhibiting higher overconfidence (Lim et al., 2016). High-income investors prefer diversified equity portfolios, while elderly investors favour safer options like fixed deposits (Velmurugan et al., 2015). Jyothi and Asha (2022) developed a model linking age, income, and education to Indian investors' attitudes, emphasizing the need for tailored financial education.

Incorporating the above factors, mutual funds are gaining popularity in India, due to professional management and risk

diversification. Viswanadham and Yadav (2019) attribute their growth to increased awareness, with individual investments rising 20% from 2023 to 2025 (AMFI, 2025). Singal and Manrai (2018) note that moderate returns and lower risk make mutual funds attractive to risk-averse investors. Sivaramakrishnan et al. (2017) emphasize financial literacy and trust as key drivers of mutual fund participation, particularly in UP & MP, where investor education campaigns have gained traction (Gupta & Sharma, 2023).

Alam et al. (2020) found that macroeconomic events also significantly influence investor behaviour, i.e., Indian investors adapted positively during the COVID-19 lockdown, achieving higher returns than in earlier panic phases. The 2020-2025 periods saw a retail investment boom, fuelled by lockdown-induced financial exploration and digital access (Livemint, 2024). Social media sentiment, particularly on X, correlates with stock price movements, amplifying retail trading (Tan & Tas, 2021). Agrawal and Singh (2020) suggest that retail investors' ability to predict market trends, informed by past experiences and media, drives equity participation.

RESEARCH GAP-Despite extensive research on demographic factors influencing investment decisions in India, such as age, gender, and income (Velmurugan et al., 2015; Paisarn et al., 2021), there is a paucity of studies examining the psychological and behavioral drivers of retail investors' preferences for equity investments, particularly in the context of India's rapidly growing financial markets. While global studies have explored behavioral biases like overconfidence and loss aversion (Benos, 1998; Kahneman & Tversky, 1973), their application to Indian retail investors remains limited. Existing Indian studies focus primarily on financial literacy and risk tolerance (Mishra, 2018; Singal & Manrai, 2018), but underexplore constructs such as Financial Greed, Procedural Ease, and the role of External Influencers in shaping equity investment perceptions. Moreover, with 41.1 million new demat accounts opened in FY25 (Business Standard, 2025), driven by increased internet penetration and post-COVID retail participation (Livemint, 2024), there is a critical need to investigate how these behavioral factors influence the shift from traditional to equity investments in UP & MP, a region with unique socio-economic dynamics. This study addresses this gap by using primary data and Structural Equation Modeling to examine the interplay of behavioural and demographic factors in shaping retail investor perceptions in Uttar Pradesh and Madhya Pradesh.

CONCEPTUAL FRAMEWORK- This study examines how demographic (age, gender, education, income) and behavioural factors influence retail investors' perceptions of equity investments in UP & MP, contributing to behavioural finance. Investor Perception (IP) is the dependent variable, shaped by five independent behavioural factors: Risk Appetite (RA), Financial Greed (FG), Financial Literacy (FL), External Influencers (EI), and Procedural Ease (PE). The framework, illustrated in Figure 1, is grounded in

behavioural finance theories: Risk Appetite reflects loss aversion from prospect theory (Kahneman & Tversky, 1973), Financial Greed aligns with overconfidence bias (Benos, 1998), and Financial Literacy relates to bounded rationality (Van Rooij et al., 2011). External Influencers and Procedural Ease draw from the theory of planned behaviour, emphasizing social norms and perceived behavioral control (Ajzen, 1991). Demographic factors moderate these relationships, capturing India's diverse investor profile in a market with 41.1 million new demat accounts in FY24–25 (Business Standard, 2025).

To analyse this relationship, Investor Perception (IP) is treated as the dependent variable**,** while the following five behavioural factors are considered independent variables:

- **Risk Appetite (RA)**
- **Financial Greed (FG)**
- **Financial Literacy (FL)**
- **External Influences (EI)**
- **Procedural Ease (PE)**

The study investigates whether these factors significantly impact equity investment decisions and perceptions among retail investors.

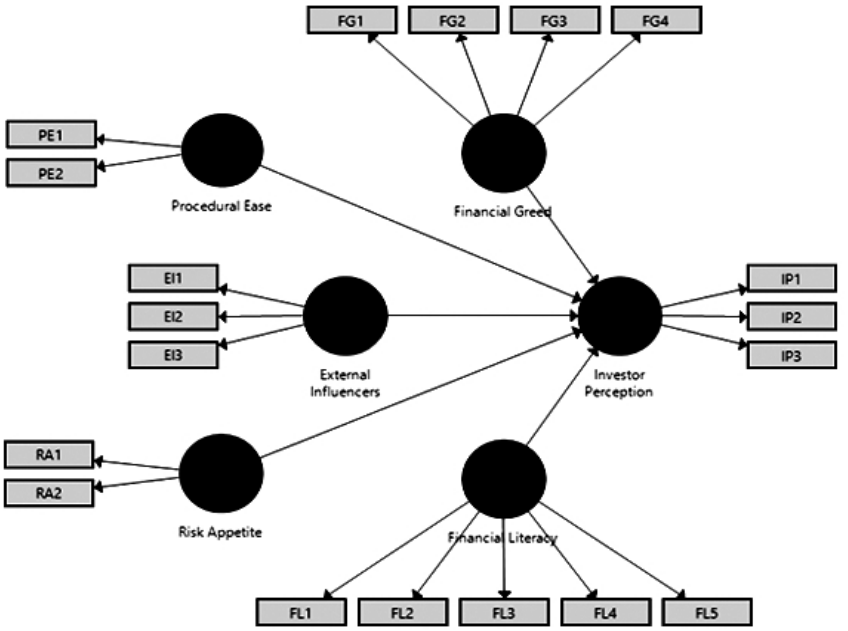


Figure 1: Conceptual Framework

HYPOTHESES DEVELOPMENT

Based on the conceptual framework and the literature reviewed earlier, the following hypotheses are developed. Each hypothesis reflects the expected relationship between the behavioural factors and investor perception towards equity investment.

Research Hypotheses

- **H_{10}**: There is no significant change in public perception towards equity investment.
- **H_{20}**: Financial greed has no significant impact on an investor's perception towards equity investment.
- **H_{30}**: Financial literacy has no significant impact on an investor's perception towards equity investment.
- **H_{40}**: External influencers have no significant impact on an investor's perception towards equity investment.
- **H_{50}**: Procedural ease of investing has no significant impact on an investor's perception towards equity investment.
- **H_{60}**: Risk appetite has no significant impact on an investor's perception towards equity investment.

RESEARCH METHODOLOGY

DATA COLLECTION

SAMPLING AND DATA SOURCES- Primary data were collected via an online structured questionnaire distributed through Google Forms, targeting retail investors in Uttar Pradesh and Madhya Pradesh, India. A sample of 220 participants was selected using snowball sampling, effective for accessing interconnected investment communities (Hair et al., 2010). The sample size was determined using G*Power, assuming a medium effect size ($f^2 = 0.15$), 80% power, and $\alpha = 0.05$, yielding a minimum of 200 respondents. This method reflects the demographic driving India's retail investment surge, with 40% of respondents aged 18–25 (Business Standard, 2024). Secondary data were sourced from credible websites (e.g., Business Standard, 2024).

QUESTIONNAIRE DEVELOPMENT- The questionnaire was adapted from validated behavioral finance scales, including Financial Literacy (Van Rooij et al., 2011) and Financial Greed (Lo et al., 2005). Items were measured on a 5-point Likert scale and pilot-tested with 20 respondents to ensure clarity and reliability. The descriptive research approach examined relationships between demographic (age, gender, education, income) and behavioural factors (Risk Appetite, Financial Greed, Financial Literacy, External Influencers, Procedural Ease) and Investor Perception.

DATA ANALYSIS-Data were analysed using SmartPLS Structural Equation Modeling (SEM) to test hypotheses with high accuracy (Hair et al., 2010). The model assessed the impact of behavioural factors on equity investment preferences, with results reported in the "Hypotheses Testing" section.

ETHICAL CONSIDERATIONS- Participants provided informed consent, participation was voluntary, and data were anonymized to ensure confidentiality.

DATA REPRESENTATION AND INTERPRETATION

DEMOGRAPHIC PROFILE-The following figure presents the tabulated summary analysis of the demographic characteristics of the sample. The data has been processed using JAMOVI software, with results displayed in terms of frequency, percentage, and cumulative percentage.

Table 1: Summary Analysis of Demographic Profile

Frequencies of Age			
Levels	**Counts**	**% Of Total**	**Cumulative %**
18 – 25	88	40.0%	40.0%
26 – 35	40	18.2%	58.2%
36 – 45	33	15.0%	73.2%
46 – 55	39	17.7%	90.9%
Above 55 years	20	9.1%	100.0%
Frequencies of Gender			
Levels	**Counts**	**% Of Total**	**Cumulative %**
Female	106	48.2%	48.2%
Male	114	51.8%	100.0%
Frequencies of Qualification			
Levels	**Counts**	**% Of Total**	**Cumulative %**
Doctorate	38	17.3%	17.3%
Graduate	64	29.1%	46.4%
Intermediate	31	14.1%	60.5%
Post Graduate	87	39.5%	100.0%
Frequencies of Annual Income			
Levels	**Counts**	**% Of Total**	**Cumulative %**
10 – 15 lakhs p.a.	20	9.1%	9.1%
15 – 20 lakhs p.a.	12	5.5%	14.5%
5 – 10 lakhs p.a.	47	21.4%	35.9%
Less than 5 lakhs p.a.	114	51.8%	87.7%
More than 20 lakhs p.a.	27	12.3%	100.0%

Source: Researcher's calculations using JAMOVI

The demographic profile based on gender showed that 51.8% of respondents were male (114 participants), while 48.2% were female (106 participants). Regarding educational qualification, the largest group of participants held a postgraduate degree, accounting for 39.5% (87 participants), followed by graduates at 29.1% (64 participants). The doctorate category represented 17.3% (38 participants) of the total 220 respondents. Participants with Intermediate as their highest qualification constituted the smallest group at 14.1%, which may be attributed to the fact that individuals at this education level are less likely to have started investing.

CONFIRMATORY COMPOSITE ANALYSIS: MEASUREMENT MODEL-Reliability refers to the consistency and replicability of a construct. In this study, the reliability of the constructs was assessed using confirmatory composite analysis of the measurement model. The evaluation employed Cronbach's Alpha, Composite Reliability, and Rho A, with a threshold value of 0.7. All constructs exhibited values exceeding 0.7 for Cronbach's Alpha (Nunnally, 1978), Composite Reliability (Hair et al., 2010), and Rho A (Henseler, 2015), indicating high reliability of the questionnaire. Additionally, the Average Variance Extracted (AVE) values met the required criterion of being greater than or equal to 0.50. Therefore, the data satisfies the reliability requirements for the measurement model.

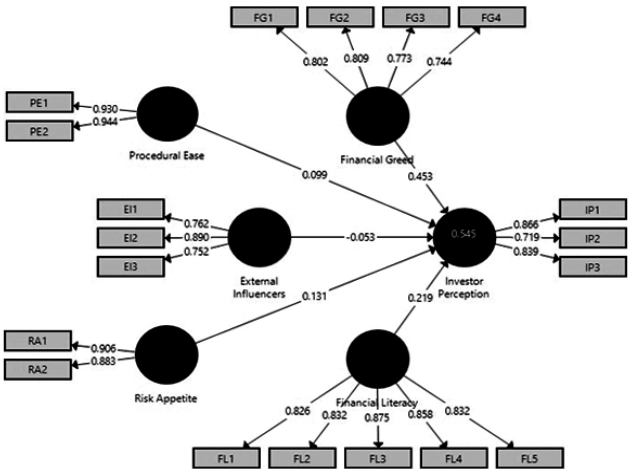


Figure 2

Table 2: CONSTRUCT RELIABILITY & VALIDITY

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
External Influencers	0.729	0.780	0.845	0.647
Financial Greed	0.789	0.792	0.863	0.612
Financial Literacy	0.900	0.902	0.926	0.714
Investor Perception	0.742	0.780	0.851	0.657
Procedural Ease	0.862	0.869	0.935	0.878
Risk Appetite	0.751	0.756	0.889	0.800

Source: Researcher's calculations using SmartPLS

DISCRIMINANT VALIDITY

Discriminant validity is used to determine whether the variables are truly distinct from one another. It helps to verify that measures which appear unrelated are indeed uncorrelated.

FORNELL-LARCKER CRITERION: This traditional method evaluates variables based on the degree of shared variance between them. Table 3 summarizes the results of the Fornell-Larcker Criterion, showing that the square root of the average variance extracted (AVE) for each construct is greater than its correlations with other constructs. This confirms that the research constructs exhibit adequate discriminant validity.

Table 3: FORNELL-LARCKER CRITERIO

	External Influencers	Financial Greed	Financial Literacy	Investor Perception	Procedural Ease	Risk Appetite
External Influencers	0.804					
Financial Greed	0.410	0.782				
Financial Literacy	0.508	0.591	0.845			

Investor Perception	0.346	0.675	0.616	0.811		
Procedural Ease	0.470	0.570	0.786	0.580	0.937	
Risk Appetite	0.423	0.446	0.603	0.500	0.581	0.895

Source: Researcher's calculations using SmartPLS

HETEROTRAIT-MONOTRAIT RATIO (HTMT)

The HTMT compares the average correlations of indicators measuring the same construct with the average correlations of indicators measuring different constructs. The threshold for HTMT is generally set at a maximum of 0.85, as prescribed by Kline (2011) and Henseler et al. (2015), with a more lenient criterion of 0.90 proposed by Teo et al. (2008) and Gold et al. (2001). Table 4 shows that all values are below 0.85 (highlighted in green) or below 0.90 (in black), indicating that the constructs demonstrate discriminant validity according to the HTMT criterion.

Table 4: HETEROTRAIT-MONOTRAIT RATIO (HTMT)

	External Influencers	**Financial Greed**	**Financial Literacy**	**Investor Perception**	**Procedural Ease**	**Risk Appetite**
External Influencers						
Financial Greed	**0.535**					
Financial Literacy	**0.617**	**0.698**				
Investor Perception	**0.440**	0.864	**0.719**			
Procedural Ease	**0.581**	**0.688**	0.892	**0.689**		
Risk Appetite	**0.569**	**0.575**	**0.730**	**0.645**	**0.716**	

Source: Researcher's calculations using SmartPLS

MODEL FIT-A good model fit is indicated by a Standardized Root Mean Square Residual (SRMR) value of less than 0.10 (Hu and Bentler, 1999). As shown in Table 5, the SRMR value is 0.076, which meets this criterion. Hair et al. (2010) suggest that the Normed Fit Index (NFI) should be greater than 0.90 for a good fit; however, the NFI value here is 0.754 (Table 5). Despite the lower NFI, the SRMR value indicates that the model has an acceptable fit.

TABLE 5: MODEL FIT

	Saturated Model	Estimated Model
SRMR	0.076	0.076
d_ULS	1.092	1.092
d_G	0.435	0.435
Chi-Square	596.709	596.709
NFI	0.754	0.754

Source: Researcher's calculations using SmartPLS

HYPOTHESES TESTING-

To statistically test H_{10}, one-sample proportion tests were conducted against a neutral benchmark of 50%. The proportion of respondents who agreed that mutual funds and equity investments have gained significant popularity (78.18%, Z = 10.12, $p < 0.001$) and those who preferred equity investments over traditional avenues (65.90%, Z = 4.98, $p < 0.001$) were both significantly higher than 50%. Therefore, the null hypothesis (H_{10}) is rejected, confirming a significant positive change in public perception towards equity investments.

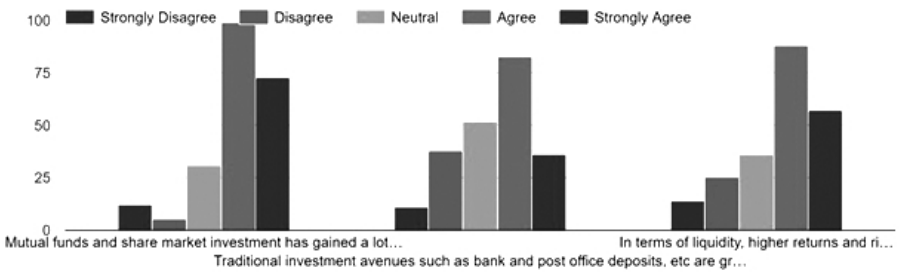


Figure 3: DATA FOR FIRST HYPOTHESIS

For testing the remaining hypotheses, Structural Equation Modeling (SEM) was conducted using SmartPLS with a bootstrapping method (5,000 resamples) to assess the significance of path coefficients and the overall predictive power of the model. The key results are summarized in Figure 4 and Table 6.

Statistical significance was evaluated at $\alpha = 0.05$ ($p < 0.05$). The following results were observed:

Hypothesis	Path Coefficient (β)	t-Value	p-Value	Decision
H20 (Financial Greed → Perception)	0.453	5.539	0.000	**Rejected**
H30 (Financial Literacy → Perception)	0.219	2.775	0.006	**Rejected**
H40 (External Influencers → Perception)	–0.053	0.776	0.438	**Accepted**
H50 (Procedural Ease → Perception)	0.099	1.242	0.215	**Accepted**
H60 (Risk Appetite → Perception)	0.131	2.108	0.036	**Rejected**

- **Financial Greed (H20), Financial Literacy (H30), and Risk Appetite (H60)** have a statistically significant positive impact on investor perception toward equity investment. This implies that the desire for high returns, higher financial knowledge, and greater risk-taking willingness contribute to more favourable perceptions of equity investment.
- **External Influencers (H40) and Procedural Ease (H50)** do not exhibit a significant influence on investor perception in this study, as their p-values exceed the 0.05 threshold.

These results reinforce the relevance of key behavioural factors in shaping investment preferences and provide valuable insights for policymakers, financial advisors, and market participants aiming to promote equity investment.

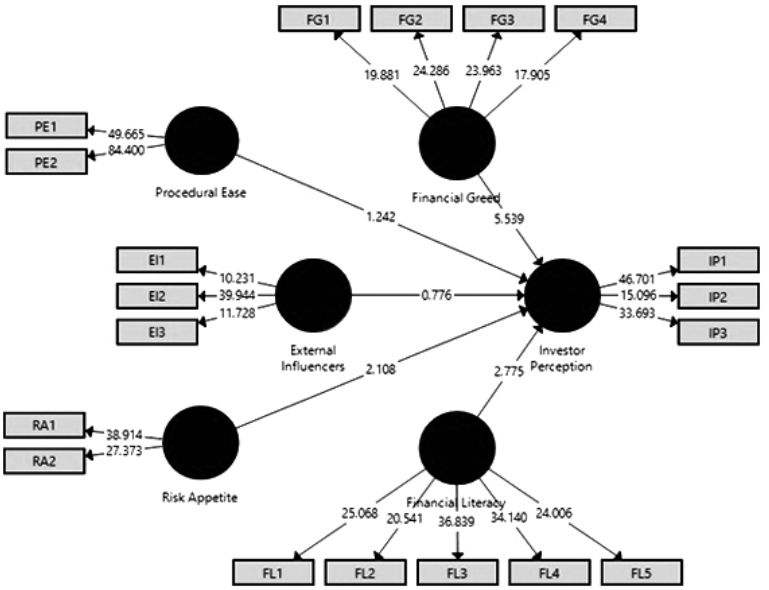


Figure 4: Structural Equation Model

Table 6: RESULTS OF THE STRUCTURAL MODEL HYPOTHESES TESTING

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/ STDEV|)	P Values
External Influencers -> Investor Perception	-0.053	-0.04	0.068	0.776	**0.438**
Financial Greed -> Investor Perception	0.453	0.449	0.082	5.539	**0.000**
Financial Literacy -> Investor Perception	0.219	0.219	0.079	2.775	**0.006**
Procedural Ease -> Investor Perception	0.099	0.097	0.08	1.242	**0.215**
Risk Appetite -> Investor Perception	0.131	0.131	0.062	2.108	**0.036**

Source: Researcher's calculations using SmartPLS

FINDINGS & CONCLUSIONS - This study confirms a significant shift in retail investor perception toward equity investments in UP and MP, rejecting H_{10} ($p < 0.05$). The opening of 41.1 million new demat accounts in FY24–25, alongside record highs in benchmark indices (Sensex ~70,500, Nifty ~21,200), reflects growing investor confidence (Business Standard, 2024; NSE India, 2025).

Structural Equation Modeling (SEM) results highlight the key behavioural drivers. Financial Greed (H_{20} rejected, $\beta = 0.453$, $p < 0.001$) significantly motivates investors through the pursuit of high returns, aligning with overconfidence bias (Benos, 1998). Financial Literacy (H_{30} rejected, $\beta = 0.219$, $p = 0.006$) enhances confident engagement with equity markets, supporting the concept of bounded rationality (Van Rooij et al., 2011). Risk Appetite (H_{60} rejected, $\beta = 0.131$, $p = 0.036$) is particularly pronounced among younger investors (40% aged 18–25), who prefer equities over traditional options, in contrast to the risk-averse preferences of older generations (Kahneman & Tversky, 1973).

Conversely, External Influencers (H_{40} accepted, $\beta = –0.053$, $p = 0.438$) and Procedural Ease (H_{50} accepted, $\beta = 0.099$, $p = 0.215$) show no significant impact. In India's collectivist culture, personal financial goals appear to outweigh social pressures (Hofstede, 1980), while the widespread availability of user-friendly platforms such as Zerodha has reduced the importance of Procedural Ease (Business India, 2025). These findings underscore the dominance of intrinsic motivators-Financial Greed, Financial Literacy, and Risk Appetite-in shaping equity investment preferences.

The surge in retail equity investing in India, accelerated by the COVID-19 pandemic and increased internet penetration, reflects a generational shift from traditional assets such as gold and fixed deposits to equities and mutual funds. In FY24–25, 41.1 million new demat accounts were opened, underscoring robust retail participation, particularly among young investors (Business Standard, 2025).

This study highlights the key behavioural drivers behind this trend in UP & MP. Results confirm that Financial Greed ($\beta = 0.453$, $p < 0.001$), Financial Literacy ($\beta = 0.219$, $p = 0.006$), and Risk Appetite ($\beta = 0.131$, $p = 0.036$) significantly shape Investor Perception, while External Influencers ($p = 0.438$) and Procedural Ease ($p = 0.215$) have minimal impact.

These findings suggest that intrinsic motivations, supported by digital platforms and financial education, are the primary drivers of equity investment preferences. Policymakers, such as SEBI, should prioritise targeted financial literacy programmes for young investors (aged 18-25) to promote informed decision-making. Brokers can leverage Financial Greed by offering accessible trading tools and educational content. Overall, this research provides useful insights for sustaining India's retail investment boom and contributes to the growing literature on behavioural finance in emerging markets.

LIMITATIONS OF THE STUDY- This study's findings are constrained by methodological and contextual factors. First, it focuses on retail investors of Uttar Pradesh and Madhya Pradesh only, limiting generalizability across India's 28 states and 8 union territories, where cultural and economic differences may drive varied investment behaviours (Kumar & Singh, 2022). Second, the online questionnaire likely excluded less digitally literate respondents, skewing the sample toward younger investors (40% aged 18–25, Figure 1), unrepresentative of older or rural investors (Business Standard, 2025).

Third, snowball sampling introduces selection bias, favouring urban, tech-savvy participants, and the cross-sectional design fails to capture temporal shifts in a volatile market with 41.1 million new demat accounts in FY24–25 (Business Standard, 2025; Hair et al., 2010). Finally, the study omits deeper psychological biases (e.g., herding) and socio-cultural factors (e.g., familial expectations), significant in India's collectivist culture (Hofstede, 1980).

SUGGESTIONS FOR FUTURE RESEARCH-Future research should aim to include a wider geographic area covering southern, eastern, and western India to improve representativeness (Kumar & Singh, 2022). Employing randomized sampling methods alongside qualitative techniques like interviews can offer richer insights into investor behavior (Patel et al., 2021).

Longitudinal studies are recommended to observe changes in investor perceptions over time and under varying economic scenarios. Furthermore, integrating psychological biases and socio-cultural influences could provide a more holistic understanding of retail investors' decision-making processes (Sharma & Mehta, 2023).

CONTRIBUTION TO EXISTING KNOWLEDGE- This study advances behavioural finance by examining the psychological drivers of equity investment preferences among retail investors in UP & MP, addressing a relatively under-explored regional research gap. Using Structural Equation Modeling (SEM), it confirms that Financial Literacy ($p = 0.006$), Financial Greed ($p < 0.001$), and Risk Appetite ($p = 0.036$) significantly shape investor perceptions, while External Influencers ($p = 0.438$) and Procedural Ease ($p = 0.215$) have minimal impact (Hair et al., 2010). These findings extend prospect theory and bounded rationality frameworks to India's context, where 41.1 million new demat accounts were opened in FY24–25 (Business Standard, 2025; Kahneman & Tversky, 1973).

The research offers practical implications for enhancing retail investor participation in India's burgeoning equity markets. Policymakers, such as SEBI, should develop targeted financial literacy programs focusing on risk management and equity valuation for young investors (aged 18–25), who dominate new market entrants. Brokers can leverage Financial Greed by offering low-cost trading simulations to build investor confidence.

These insights inform regulatory and educational strategies to foster informed investment decisions in emerging markets.

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QUALITY MANAGEMENT & ASSURANCE – INTEGRATION WITH BIG DATA & AI

Swamy Nunna

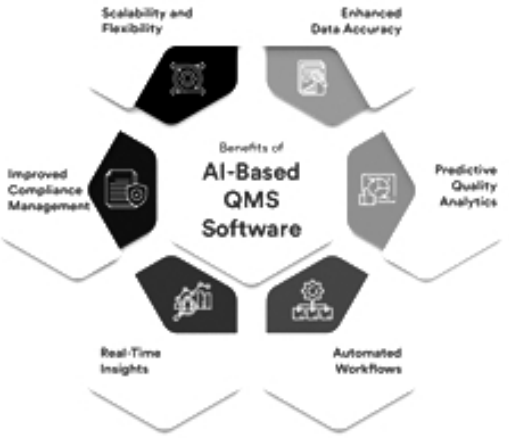
Abstract

Big Data & AI is revolutionizing Quality Management and Assurance (QM&A) by enabling real-time, data-driven decision-making. By collecting vast volumes of structured and unstructured data from sensors, IoT devices, ERP systems, and customer feedback, organizations can detect trends, patterns, and anomalies that traditional methods often miss. Predictive analytics proactively identifies potential defects, reducing scrap, downtime, and customer complaints. In manufacturing, continuous monitoring of parameters such as temperature, pressure, and vibration ensures processes remain within optimal conditions, while root cause analysis links quality issues to specific variables like supplier batches or operator performance. In service industries, sentiment analysis from customer interactions highlights dissatisfaction trends, guiding service enhancements. Integrated with AI and machine learning, Big Data enables adaptive quality systems that automatically adjust processes for efficiency. This shift from reactive to predictive quality management improves compliance, lowers costs, and enhances customer satisfaction, making Big Data a critical driver of competitive advantage.

Keywords

Quality Management (QM), Quality Assurance (QA), Quality Management and Assurance (QM&A), Big Data, Artificial Intelligence (AI),

Quality Management (QM) has evolved significantly since the early 20th century, transitioning from manual inspections to highly sophisticated, technology-driven frameworks designed to ensure superior product and service quality. As industries expanded globally, customer expectations increased, and supply chains became more complex, traditional methods of quality control became inadequate. Enter Big Data and Artificial Intelligence (AI), technologies that have transformed how organizations approach quality management and assurance (QM&A).



1. Scalability and Flexibility

AI-powered Quality Management Systems (QMS) can adapt to evolving business needs without major reconfiguration. Unlike traditional QMS that require manual updates, AI-based solutions can learn from operational changes and adjust processes dynamically.

For instance, a global electronics manufacturer uses an AI-based QMS to manage quality across 12 factories in different countries. When a new product line is introduced, the AI system automatically incorporates updated testing protocols, ensuring uniform quality standards worldwide without extensive manual intervention.

2. Enhanced Data Accuracy

AI minimizes human error by automating data capture, validation, and analysis. Machine learning algorithms detect anomalies, ensure consistency, and flag discrepancies in real time.

For instance, in the pharmaceutical industry, AI-driven QMS ensures accuracy in batch records by cross-verifying sensor

readings from production equipment against expected ranges. This reduces the risk of incorrect dosages or contamination going unnoticed, supporting regulatory compliance and patient safety.

3. Predictive Quality Analytics

Predictive analytics uses AI to forecast potential quality issues before they escalate, enabling proactive intervention. This reduces waste, improves uptime, and boosts customer satisfaction.

An automotive parts supplier uses AI-based predictive analytics to monitor vibration data from CNC machines. The system predicts tool wear several hours in advance, allowing maintenance teams to replace tools before defects occur—avoiding costly production stoppages.

4. Automated Workflows

AI integrates with Robotic Process Automation (RPA) to execute repetitive tasks automatically, such as defect reporting, supplier audits, and compliance document generation. This frees human resources for higher-value tasks.

A medical device company uses AI-driven workflows to automatically route quality inspection results to relevant teams. If a part fails inspection, the system triggers a supplier notification and schedules a follow-up audit without human intervention.

5. Real-Time Insights

AI-based QMS platforms provide dashboards and alerts for instant visibility into quality metrics, allowing faster decision-making and issue resolution.

In a food processing plant, AI continuously monitors temperature, humidity, and contamination risk in real time. If conditions deviate from safe ranges, the system alerts plant managers immediately, preventing potential product recalls.

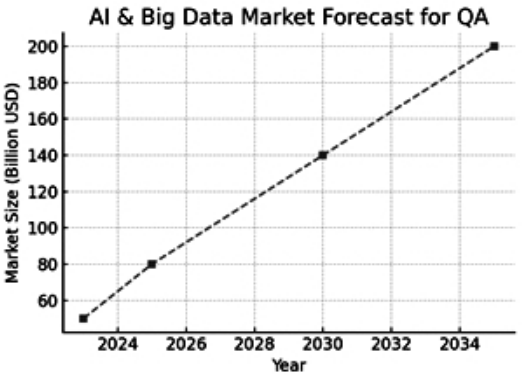
6. Improved Compliance Management

Regulatory compliance is critical in industries like aerospace, pharmaceuticals, and healthcare. AI ensures documentation is complete, up-to-date, and audit-ready at all times.

A biotech firm uses AI-based QMS to track changes in FDA and EMA regulations automatically. The system updates internal procedures accordingly and ensures that all training materials for employees reflect the latest compliance requirements.

Evolution of Quality Management

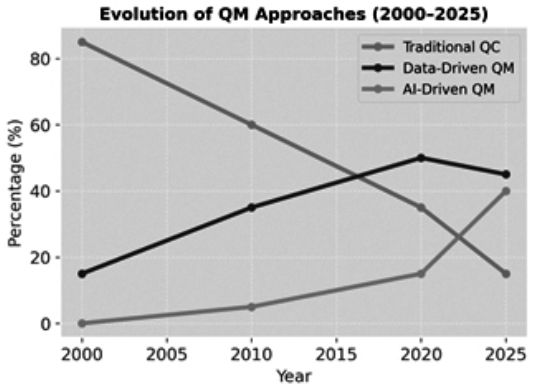
From early 20th-century inspection-focused methods to today's predictive quality systems, QM has undergone tremendous change. The pioneering work of Deming and Juran introduced statistical process control (SPC) and continuous improvement philosophies. TQM and ISO standards further formalized quality frameworks. Motorola's introduction of Six Sigma in the 1980s added rigor through data-driven defect reduction. However, traditional methods depended heavily on manual data collection and analysis, limiting real-time decision-making. With the rise of digital technologies, sensors, and data analytics, QM shifted from reactive inspection to proactive assurance, setting the stage for AI-driven transformation.



the projected growth of the combined Artificial Intelligence (AI) and Big Data market specifically within the domain of Quality Assurance (QA) from 2023 to 2035. The y-axis represents market size in billion USD, while the x-axis shows selected years along the timeline.

In 2023, the market is valued at approximately $50 billion, marking the baseline for this forecast. By 2025, the value climbs significantly to $80 billion, representing more than a 50% growth in just two years. This rapid increase suggests accelerated adoption of AI and Big Data solutions in QA workflows—driven by needs such as automated testing, real-time defect detection, and predictive analytics.

The trend continues upward through 2030, where the market size is estimated at $140 billion. This phase indicates a maturing stage in the technology's integration into QA processes, with organizations likely leveraging sophisticated data architectures and machine learning algorithms to enhance product reliability and reduce release cycles.



"Evolution of QM Approaches (2000–2025)" illustrates the shifting landscape of Quality Management (QM) methodologies over a 25-year period. Three distinct approaches are tracked: Traditional Quality Control (QC), Data-Driven Quality Management (QM), and AI-Driven Quality Management (QM).

In 2000, Traditional QC dominated with approximately 85% usage, while Data-Driven QM accounted for 15% and AI-Driven QM had virtually no adoption. Over the years, Traditional QC steadily declined, dropping to 60% in 2010, 35% by 2020, and further down to 15% in 2025. This decline reflects a shift away from manual inspection and reactive quality measures toward more proactive, technology-driven methods.

Data-Driven QM rose significantly from 15% in 2000 to 50% in 2020, fuelled by the adoption of analytics, statistical process control, and integrated performance monitoring systems. However, by 2025 it slightly decreased to 45%, as AI-driven methods began to take over.

AI-Driven QM saw gradual adoption in the early years, remaining under 10% until 2015. From 2020 onward, its growth accelerated sharply—rising from 15% in 2020 to 40% in 2025—reflecting the rapid integration of machine learning, predictive analytics, and automated decision-making in quality management practices.

Big Data in Quality Management

Big Data is defined by its volume, velocity, variety, and veracity. Modern manufacturing and service environments generate terabytes of data daily from IoT sensors, ERP systems, customer feedback, and supply chains. Cloud platforms (AWS, Azure) and frameworks like Hadoop and Spark allow rapid processing of this data. Real-time dashboards help managers detect anomalies instantly. For example, a leading automotive supplier reduced defects by 35% and saved $5M annually after implementing a Big Data analytics solution that monitored 10,000+ variables in real time. A chart here illustrates improved decision speed and defect reduction over time.

Big Data is transforming Quality Management and Assurance (QM&A) by enabling organizations to make more informed, predictive, and real-time decisions. Traditionally, QA relied on periodic inspections, sampling, and retrospective analysis, which often identified defects after they occurred. Big Data changes this paradigm by continuously collecting and analyzing massive volumes of structured and unstructured data from multiple sources, such as production sensors, IoT devices, ERP systems, customer feedback platforms, and supply chain databases.

With advanced analytics, organizations can identify patterns, trends, and anomalies that would be impossible to detect manually. For example, predictive analytics can flag potential defects before they appear, allowing preventive action. This proactive approach reduces scrap rates, minimizes downtime, and ensures that quality issues are resolved before products reach the

customer. In manufacturing, Big Data enables real-time process monitoring—measuring parameters such as temperature, pressure, or machine vibration—to maintain optimal conditions and avoid deviations that lead to defects.

Big Data also supports root cause analysis by correlating quality issues with process variables, operator performance, supplier batches, or environmental conditions. In service industries, customer sentiment analysis using Big Data can highlight dissatisfaction trends, enabling process improvements that directly impact client retention and brand loyalty.

Furthermore, when integrated with AI and machine learning, Big Data enhances decision-making by automatically adjusting processes based on live data streams. This leads to adaptive quality systems that evolve over time, becoming more efficient and accurate.

In essence, Big Data shifts QM&A from being reactive to predictive and prescriptive, reducing the cost of poor quality, improving compliance, and boosting customer satisfaction. As industries continue to embrace digital transformation, Big Data will be at the heart of next-generation quality ecosystems, ensuring that organizations not only meet but exceed quality expectations.

AI Tools Enhancing QA

Artificial Intelligence (AI) is revolutionizing Quality Assurance (QA) by introducing tools and methods that go far beyond traditional defect detection. Instead of simply identifying errors after they occur, AI-powered QA systems are increasingly predictive, preventive, and adaptive. They integrate seamlessly into production, development, and operational workflows, enabling real-time decision-making and continuous improvement. Below are six key AI capabilities transforming QA, with detailed insights into their applications and benefits.

1. Machine Learning (ML): Predictive Defect Detection

Machine Learning algorithms can process massive datasets from production lines, test runs, or customer feedback to identify subtle patterns that humans might overlook. These models learn from historical defect data, environmental factors, and operational conditions to forecast potential quality issues before they happen.

In semiconductor manufacturing, ML models analyze equipment performance metrics and environmental data to predict wafer defects hours before they occur, allowing preventive adjustments and avoiding costly batch failures.

2. Computer Vision: Microscopic Precision

Computer vision leverages AI-powered image and video analysis to detect surface defects, shape irregularities, or assembly issues—often at a scale impossible for the human eye.

Automotive manufacturers use AI-driven camera systems to inspect paint finishes at millisecond speeds, detecting inconsistencies as small as a human hair. This minimizes rework and ensures brand consistency.

3. Natural Language Processing (NLP): Insight from Unstructured Data

A vast amount of quality-related feedback exists in unstructured formats such as emails, service tickets, or online reviews. NLP algorithms can process and categorize this feedback to identify recurring issues, emerging risks, and customer sentiment trends.

A consumer electronics company uses NLP to automatically analyze thousands of product reviews weekly, identifying recurring complaints about battery performance, which then informs design improvements.

4. Robotic Process Automation (RPA): Eliminating Manual QA Bottlenecks

RPA uses software bots to perform repetitive QA tasks such as logging test results, updating quality databases, or generating compliance reports. Combined with AI, these bots can make decisions—flagging anomalies or initiating rechecks automatically.

For instance, In pharmaceuticals, RPA automates batch record verification, reducing human error and accelerating release cycles while maintaining strict FDA compliance.

5. Digital Twins: Virtual Testing for Real-World Reliability

A digital twin is a virtual replica of a product, system, or process that mirrors its real-world performance. In QA, digital twins allow engineers to test scenarios—such as extreme environmental conditions—without risking actual assets.

Example: Aerospace companies use digital twins of aircraft engines to simulate years of wear and tear, detecting potential failure modes and improving maintenance planning.

6. Generative AI: Designing for Quality from the Start

Generative AI systems can create optimized product designs, manufacturing processes, or test plans by learning from past quality performance data. This shifts QA from reactive checking to proactive design optimization.

In electronics, generative AI proposes PCB layouts that minimize electromagnetic interference, reducing downstream defects and improving reliability.

One of the most impactful applications is test automation. AI tools such as Testim, Applitools, and Mabl can automatically generate, execute, and maintain test scripts, significantly reducing manual effort. These systems adapt to UI changes, predict potential points of failure, and even self-heal broken test cases, ensuring minimal disruption to development workflows.

Predictive analytics is another game changer. By analyzing historical defect data, AI tools like IBM Watson AIOps and Tricentis Tosca can identify patterns that precede failures, enabling teams to address quality risks before they manifest. This proactive approach reduces costly post-release defects and enhances overall reliability.

Natural language processing (NLP) enables AI QA tools to process requirements and automatically generates test cases. For instance, Functionize uses NLP to

understand user stories and create relevant functional tests without extensive manual intervention.

Computer vision in QA—used by tools such as Applitools Eyes—can detect even subtle visual anomalies in user interfaces that human testers might miss. This ensures that visual quality and brand consistency remain intact across devices and platforms.

Continuous testing integration allows AI QA systems to operate seamlessly in DevOps pipelines, enabling real-time quality feedback during every stage of development. This ensures that QA is no longer a bottleneck but an integral, continuous process.

These AI capabilities are not standalone tools—they are increasingly interconnected. For example, ML models feed into digital twins for predictive simulations, while NLP insights influence generative AI-driven product improvements. Together, they form an intelligent, adaptive QA ecosystem that reduces defects, speeds up production, and enhances customer satisfaction. Organizations that integrate these technologies early gain a competitive edge by delivering higher-quality products faster and at lower cost.Artificial Intelligence (AI) is transforming Quality Assurance by moving it beyond traditional defect detection toward predictive, preventive, and fully automated quality management. Modern AI-powered QA tools leverage machine learning, natural language processing, and big data analytics to ensure higher product quality, reduced cycle times, and improved customer satisfaction.

2.4 AI and Six Sigma Synergy

The integration of Artificial Intelligence (AI) with Six Sigma methodologies is creating a new paradigm for operational excellence, blending AI's computational power with Six Sigma's structured process improvement framework. Six Sigma focuses on reducing variation and defects through data-driven decision-making, typically using the DMAIC (Define, Measure, Analyze, Improve, Control) cycle. AI enhances each stage by automating data collection, performing advanced analytics, and providing predictive insights that accelerate problem-solving and sustain improvements.

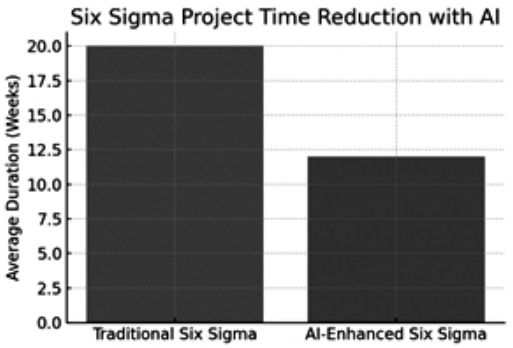
In the Define and Measure phases, AI-powered sensors, IoT devices, and real-time data pipelines eliminate manual sampling and ensure continuous, accurate measurement. During Analyze, AI's machine learning algorithms uncover hidden patterns, correlations, and root causes faster than traditional statistical tools. In the Improve stage, AI simulations and optimization models can predict the impact of changes before implementation. Finally, Control benefits from AI-based monitoring systems that detect deviations instantly and trigger corrective actions autonomously.

Industry Example – Automotive Manufacturing
A leading global automotive manufacturer integrated AI into its Six Sigma quality initiatives to reduce paint defects on vehicle bodies. Traditionally, Six Sigma teams relied on manual inspection and statistical process control, which identified defects

only after production. By incorporating AI-driven computer vision systems, the company could inspect every vehicle in real time on the production line. Machine learning models, trained on historical defect images and process parameters, predicted which environmental or operational factors would cause surface imperfections.

This AI-Six Sigma synergy enabled the manufacturer to reduce paint defects by 35%, cut inspection time by 70%, and save millions annually in reworks and warranty claims. The initiative also freed Six Sigma experts to focus on strategic process improvements rather than repetitive defect detection tasks.

Ultimately, AI and Six Sigma together form a powerful combination—merging human expertise, structured problem-solving, and advanced computational intelligence to deliver sustained quality and operational excellence.



The first bar, representing Traditional Six Sigma, shows an average project duration of 20 weeks. This reflects the conventional process-improvement methodology, which, while effective in reducing defects and improving efficiency, often requires extensive manual data collection, analysis, and iterative testing. These stages demand significant human effort, time, and coordination across teams, leading to prolonged timelines.

In contrast, the second bar, representing AI-Enhanced Six Sigma, shows a drastically reduced average duration of 12 weeks—a reduction of 40%. This substantial improvement is attributed to AI's ability to automate data gathering, accelerate statistical analysis, and detect process inefficiencies in real time. For example, AI algorithms can rapidly identify patterns and anomalies in manufacturing quality metrics, enabling faster root-cause analysis and predictive defect prevention.

This time reduction has important business implications:

Faster ROI: Projects reach completion sooner, allowing organizations to reap benefits earlier.

Increased Capacity: Teams can handle more Six Sigma projects annually, multiplying overall quality improvements.

Agility: Organizations can respond more quickly to market changes, customer feedback, and compliance requirements.

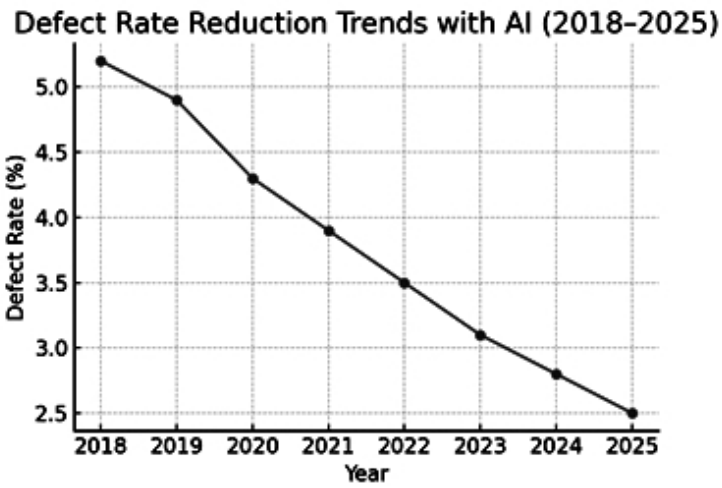
Industries such as automotive, electronics, and healthcare are already using AI-enhanced Six Sigma for rapid defect identification, predictive maintenance, and process optimization. The technology also supports continuous learning, meaning the QMS becomes smarter over time, further shortening future project cycles.

This chart clearly demonstrates that AI is not merely an add-on to Six Sigma—it's a force multiplier. By reducing project durations from 20 to 12 weeks, AI transforms Six Sigma from a traditionally slow, methodical process into a high-speed, data-driven improvement engine, giving organizations a competitive edge in today's fast-paced business environment.

Industry Applications

1. Electronics: Instrumental Inc. reduced manual inspections by 60% and boosted yields by 25%.
2. Automotive: Toyota's AI-enabled robotic arms inspect welds in milliseconds with 99.5% defect-free results.
3. Heavy Industry: Siemens Energy saved $10M annually using AI-driven predictive maintenance.
4. Pharmaceuticals: AI improved FDA compliance, reducing recalls by 40%.
5. Healthcare: AI reduced device production errors by 30%, improving patient safety.

Graphs compare ROI and defect reduction rates (20–60%) across industries.



Future of AI-Driven Quality Management

The next decade will transform Quality Management & Assurance (QM&A) into a hyper-intelligent, fully interconnected discipline. Several emerging technologies and trends will redefine how organizations maintain and improve quality standards.

1. Self-Learning Systems for Adaptive Quality Control

Future AI-driven QMS platforms will go beyond fixed rules and static algorithms. Self-learning systems will continuously adapt to evolving quality challenges by analyzing historical data, monitoring real-time performance, and integrating new process knowledge automatically.

For instance, In the automotive industry, as electric vehicle (EV) battery technology advances, self-learning QMS platforms could automatically update inspection criteria for battery cells, adapting to new chemical compositions or manufacturing tolerances without requiring engineers to rewrite the quality protocols.

2. Blockchain Integration for Traceability and Security

Blockchain technology will enable tamper-proof, decentralized records that make every quality-related transaction verifiable. This will be vital for industries where trust, authenticity, and compliance are critical.

For instance, in the food supply chain, blockchain-enabled QMS could track a product's journey from farm to shelf, ensuring every quality check—from pesticide testing to cold-chain compliance—is recorded and immutable. This would greatly reduce fraud, mislabeling, and contamination risks.

3. Explainable AI (XAI) for Transparent Audits

As AI takes on more decision-making roles, Explainable AI will ensure that every quality-related recommendation can be understood, justified, and traced back to data inputs. This transparency will be crucial for meeting regulatory standards and gaining stakeholder trust.

Example: In aerospace manufacturing, when an AI flags a critical component for rejection, XAI will allow auditors and engineers to see exactly which vibration test results or stress simulations led to the decision—making compliance checks smoother and more defensible.

4. Quantum Computing for Advanced Quality Optimization

Quantum computing will revolutionize QM&A by solving complex optimization problems in seconds—tasks that would take classical computers days or weeks.

Semiconductor fabrication plants could use quantum-powered QMS models to simulate millions of variable combinations in real time, finding the exact conditions that yield maximum chip performance while minimizing defects, drastically reducing production cycles.

5. Market Growth and Economic Impact

According to market forecasts, the AI in QA industry is projected to surpass $200 billion by 2035. This growth will be fueled by advancements in IoT connectivity, real-time analytics, and AI-driven

automation, with adoption spreading from manufacturing and healthcare to finance, logistics, and government sectors. The integration of AI, blockchain, and quantum computing will turn quality management from a cost center into a competitive advantage.

A multinational consumer electronics company could leverage AI-QM&A not just for compliance but as a branding differentiator, marketing its products as "AI-verified for quality" to appeal to quality-conscious customers. Ethical considerations, data governance, and workforce skill transformation will be key challenges.

Big Data and AI have revolutionized QM&A, transforming it from reactive inspection to predictive, proactive systems. Organizations adopting these technologies achieve lower defect rates, cost savings, improved customer trust, and competitive advantages. Integrating AI with Six Sigma enables faster, data-driven improvements and continuous operational excellence. A phased adoption strategy, starting with pilot projects, can help businesses scale AI initiatives effectively.

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UNION BUDGET "2026 -27": AN EMPIRICAL ANALYSIS OF FISCAL CONSOLIDATION AND TAX REFORMS

Akki Maruthi

Abstract

The Union Budget 2026-27 targets a fiscal deficit of 4.3% of GDP against a backdrop of robust domestic growth (real GDP at 7.4% in FY2025-26) and CPI inflation projections for FY27 revised upward to 5.1% from 4.6% (RBI, June 5, 2026). This paper empirically analyzes the budget's fiscal consolidation strategy using fiscal data from FY2015-16 to FY2026-27 BE. Descriptive statistics and paired t-tests are based on 12 years of data (n=12), while multiple regression and correlation analysis are based on 8 years of data (FY2019-20 to FY2026-27 BE, n=8), with a 12-year robustness check. Key findings reveal a structural shift in the quality of expenditure. The RECO ratio (revenue expenditure to capital outlay) declined from 8.2 to 4.4, and the share of capital outlay in the gross fiscal deficit rose from 37% to 56%. Effective capital expenditure is budgeted at 4.4% of GDP (₹17.14 lakh crore), while revenue expenditure is contained at 10.5% of GDP. Net borrowings emerge as the most significant driver of fiscal deficit (coefficient = 1.389, p = 0.0115). Capital expenditure shows a negative relationship with deficit (p = 0.0625). Post-COVID, capital expenditure increased significantly (t = -8.435, p = 0.0004) and the tax-GDP ratio improved (t = -3.51, p = 0.017). The debt-to-GDP ratio is projected to decline to 55.6%, with a favorable interest rate-growth differential supporting debt sustainability. The paper concludes that the budget demonstrates a credible fiscal consolidation path, but GST revenue performance and state-level capex absorption remain key risks.

Keywords

Fiscal Consolidation, Capital Expenditure, Fiscal Deficit, RECO Ratio

1. Introduction & Macro Context

The Union Budget 2026-27 is presented amid a resilient global economy, with the IMF projecting 3.3% growth in 2026 and 3.2% in 2027. In contrast, India's domestic economy is expanding robustly, with real GDP growth estimated at 7.4% in FY2025-26.

The external sector remains resilient. The current account deficit stands at 0.8% of GDP. As of May 29, 2026, India's forex reserves stood at $682.3 billion. Inflation moderated sharply to 1.7% during April-December FY25. The banking sector remains robust, with NPAs at 2.1% and capital adequacy at 17.2%. Collectively, these indicators provide a stable foundation for the budget's strategic interventions (Indian budget 2026).

The Reserve Bank of India, in its June 2026 Monetary Policy Committee meeting, revised its CPI inflation projections for FY27 to 5.1% from 4.6%, citing higher prices of commercial LPG, base metals, plastics, and rubber. However, growth projections for FY27 were revised downward to 6.6% from 6.9% earlier. FDI inflows remained promising in April 2026, though net foreign portfolio investment experienced outflows of $13.7 billion from April to June 2026.

Against this backdrop, the Union Budget 2026-27 targets a fiscal deficit of 4.3% of GDP. This paper addresses three research questions. First, is the fiscal deficit actually declining? Second, does higher capital expenditure reduce the deficit? Third, have post-COVID policies significantly changed fiscal indicators?

2. Global Headwinds and Domestic Context

India is not alone in the global shock; all economies are impacted. It is comparatively more resilient, and the macroeconomic situation remains stable and healthy. The Indian rupee rebounded sharply in Friday's trading session on June 5 as the government announced a tax cut on bond investments by foreign institutional investors (FIIs) to attract overseas capital and stabilize the domestic unit. The rupee appreciated to the day's high of 95.245 against the US dollar from its previous close of 95.74, recording a gain of 50 paisa. The assumption for crude oil price has changed to $95 per barrel from $85 per barrel. As the impact of higher energy prices on the broader economy continues to unfold, the RBI is expected to highlight uncertainty surrounding Brent crude prices amid ongoing geopolitical tensions. Along with the rising risk of El Niño, this could prompt the central bank to raise its FY27 inflation forecast and flag downside risks to growth, said Governor Sanjay Malhotra (Mint, June 5, 2026).

Table 1: Major Economies: Global and India's GDP Statistical Comparison (2026)

Region / Country	IMF Forecast	OECD Forecast	ADB Forecast	World Bank Forecast
Global Economy	3.1%	2.8%	—	2.5%
India	6.5%	6.3%	6.9%	6.6%
China	4.5%	4.4%	—	4.2%
United States	2.3%	2.0%	—	2.2%
Euro Area	—	0.8%	—	0.8%
Japan	0.7%	0.8%	—	0.7%

Source: IMF, World Economic Outlook 2026; OECD 2026; World Bank 2026; ADB 2026.

Major multilateral bodies forecast global real GDP growth of 2.5%-3.1% in 2026. IMF: Projects 3.1%, assuming Middle East trade disruptions ease by midyear. World Bank: Cautions that growth could be about 2.5% and fall to 1.3% if energy crises persist. OECD: Downgrades to 2.8%, warning of recession risks if shipping routes such as the Strait of Hormuz remain restricted. ADB: Estimates growth in developing Asia and the Pacific at 5.1% in 2026. India's economy outperforms peers, boosted by infrastructure, manufacturing, and private-sector resilience. ADB forecasts FY26 growth at 6.9%, rising to 7.3% by 2027, with the World Bank raising its forecast to 6.6%, citing strong domestic demand. China's growth moderates to 4.2%–4.5% amid structural issues in real estate, low consumption, and deflationary efforts. The US economy cools to 2.0%–2.2% due to tight monetary policy, while the Euro Area's growth remains sluggish at 0.8% in 2026 due to energy shocks.

2.1 Post-Budget Development – India's Shift to the Sixth-Largest Economy

According to the new GDP series released by the National Statistics Office on February 27, 2026 (with the base year revised from 2011-12 to 2022-23), real GDP growth accelerated to 7.6 percent in 2025-26, up from 7.1 percent a year earlier, driven by strong domestic demand. Quarterly growth remained high at 7.8 percent in Q3:2025-26, despite a moderation in net exports due to a weak global trading environment (RBI Bulletin, March 2026).

A Statistical Realignment, Not a Loss of Momentum

As of April 2026, India has slipped to the world's sixth-largest economy, overtaken by the United Kingdom in nominal GDP rankings. The International Monetary Fund's (IMF) April 2026 World Economic Outlook estimates India's nominal GDP at $4.15 trillion, just behind the UK's $4.26 trillion. This shift is driven primarily by statistical and currency dynamics rather

than a loss of domestic economic momentum (The Indian Express, April 18, 2026).

Economic Fundamentals vs. Global Ranking

Despite the drop in nominal rank, India's underlying economic performance remains robust. It is the fastest-growing major economy, with a real GDP growth rate of about 6.5%, significantly higher than the UK's (~0.8%) and Japan's (~0.7%).

Purchasing Power Parity (PPP): When adjusted for cost of living, India remains the world›s third-largest economy, trailing only the United States and China.

Future Outlook: Economists at the IMF and S&P Global view this as a temporary setback. Projections suggest India will regain the 4th position by 2027 and remain on track to become the 3rd largest economy by 2031.

Table 2: India's Current Account Components

Metric	Q4 FY 2025-26	Full Year 2025-26
Current Account Status	$7.1 Billion Surplus (0.7% of GDP)	$25.2 Billion Deficit (0.6% of GDP)
Merchandise Trade Balance	$83.4 Billion Deficit	$251.6 Billion Deficit
Net Services Receipts	$60.4 Billion Surplus	Part of $312 Billion Total Invisibles
Foreign Exchange Reserves	$7.2 Billion Accretion	$23.6 Billion Depletion

Source: RBI, Reuters, June, 8 2026

India reported a surprise **current account surplus of $7.1 billion** (0.7% of GDP) for the January–March quarter of fiscal year 2025–26. This positive economic print sharply contrasted market expectations of a $15 billion deficit. While a steep rise in global energy costs and non-monetary gold imports widened the goods trade deficit, it was entirely cushioned by booming invisibles receipts.

3. Theoretical Framework of Taxation

This section outlines the key theoretical principles that inform the empirical analysis of the Union Budget 2026-27.

3.1 Adam Smith's Canons of Taxation

Adam Smith, in The Wealth of Nations (1776), articulated four fundamental principles. The **Canon of Equity (Ability-to-Pay)** justifies progressive direct taxation, where higher incomes bear a proportionally greater burden. The **Canon of Certainty** requires tax liabilities to be clear and non-arbitrary – embodied in the New Income Tax Act, 2025. The **Canon of Economy** emphasizes minimizing collection costs, reflected in trust-based customs administration. The **Canon of Convenience** prescribes that taxes be levied in a manner convenient

to taxpayers, as seen in automated TDS certificates and extended return deadlines.

3.2 The Ability-to-Pay Principle and Equity

The ability-to-pay approach introduces two equity concepts. **Horizontal equity** requires that individuals with equal taxpaying ability be taxed equally. **Vertical equity** requires that those with higher ability pay more, justifying progressive taxation. "The ability to pay tax increases more than proportionately with income increases, because the marginal utility of income declines at an increasing rate as income increases".

3.3 The Ramsey Rule and Commodity Taxation

The Ramsey Rule states that to raise revenue with minimum efficiency loss, taxes should be levied on goods with relatively inelastic demand (Stern, 1987). The distributional characteristic of a good – whether consumed more by the poor or the rich – modifies this rule. Goods disproportionately consumed by people experiencing poverty should be taxed at lower rates, while luxury goods should be taxed at higher rates.

3.4 Optimal Income Taxation: Equity-Efficiency Trade-Off

The modern theory of optimal income taxation, pioneered by Mirrlees (1971) and extended by Stern (1976), addresses the trade-off between equity (redistributing income) and efficiency (avoiding disincentives to work). Using a constant elasticity of substitution utility function with elasticity ϵ=0.4 and inequality aversion v=2, Stern calculated an optimal linear income tax rate of **54%** (Stern, 1976). This provides a theoretical benchmark for evaluating India's direct tax structure.

3.5 The Principle of Maximum Social Advantage

Pigou and Dalton extended the ability-to-pay principle to include the benefits of public expenditure. The **Principle of Maximum Social Advantage** states that government should pursue taxation and public expenditure up to the point where the marginal social benefit of public spending equals the marginal social sacrifice of taxation (Pigou, 1962; Dalton, 1970). This principle provides a normative benchmark for evaluating the budget›s fiscal deficit target and expenditure priorities.

3.6 Relevance to the Union Budget 2026-27

These theoretical principles guide the empirical analysis that follows. The budget's progressive direct tax structure reflects the ability-to-pay principle and vertical equity. The GST rate rationalization balances the Ramsey Rule (efficiency) with distributional concerns. The trust-based customs administration embodies the canons of economy and convenience.

4. Objectives

1. To analyze the fiscal consolidation path in the Union Budget 2026-27, examining the structural shift from revenue to capital expenditure and its implications for debt sustainability.

2. To empirically test the relationship between fiscal deficit and its key determinants – capital expenditure, net market borrowings, and the tax-GDP ratio – using multiple regression and correlation analysis.
3. To examine the statistical significance of pre-COVID and post-COVID differences in capital expenditure, tax-GDP ratio, net borrowings, and fiscal deficit using paired t-tests.

5. Research Methodology

5.1 Nature of Study

The study is descriptive and analytical policy research with a quantitative orientation. It combines descriptive analysis of budget documents and fiscal indicators; inferential statistical analysis to test hypotheses; trend analysis to identify structural shifts in fiscal policy; and comparative analysis of pre-COVID and post-COVID fiscal performance.

5.2 Data Sources

Data have been collected from secondary sources covering the period from FY2015-16 to FY2026-27 BE (12 years), with sample sizes varying based on data availability. Primary budget documents include the Union Budget 2026-27 (Budget at a Glance, Expenditure Budget, Receipts Budget, and FRBM Statement). Central bank publications include the RBI Bulletin (February 2026 and March 2026), the Financial Stability Report (December 2025), and State Finances: A Study of Budgets. Multilateral agency publications include the IMF World Economic Outlook (April 2026), the World Bank India Development Update, and the Asian Development Bank Outlook. The Sixteenth Finance Commission Report (Chairman: Dr. Arvind Panagariya, November 2025), PRS India Legislative Research, the Economic Survey 2026, and Press Information Bureau releases form the other key sources.

5.3 Variables Used in Statistical Analysis

Based on the research objectives and hypotheses, the following variables were identified. The dependent variable (Y) is Fiscal Deficit (percentage of GDP) for the period FY2019-20 to FY2026-27 BE (n=8). The independent variables (X_1, X_2, X_3) are Capital Expenditure (₹ Crore), Tax-GDP Ratio (percentage), and Net Borrowings (percentage of GDP) for the same period. For the paired t-tests, the pre-COVID period covers FY2015-16 to FY2020-21 (n=6) and the post-COVID period covers FY2021-22 to FY2026-27 BE (n=6).

5.4 Statistical Tools and Techniques

The following statistical tools were employed in MS Excel using the Analysis ToolPak to test the hypotheses. Descriptive statistics (mean, median, standard deviation, variance, range, minimum, maximum). CAGR was calculated using the formula =(End/Start) ^(1/n)-1. Correlation matrices and multiple linear regressions were run using the Data Analysis → Regression tool. Paired t-tests were performed using the Data Analysis → t-Test: Paired Two Sample for Means tool.

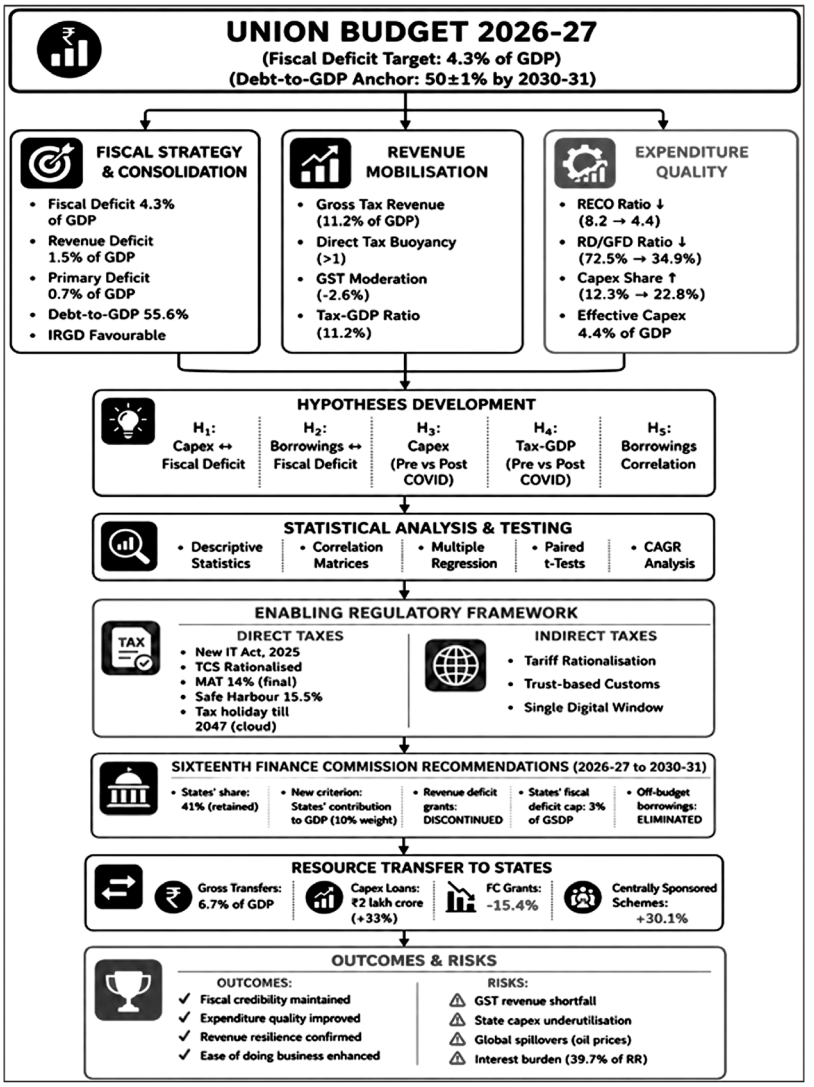
5.5 Justification of Statistical Tools

Multiple regression was chosen to isolate the individual effects of capital expenditure, net borrowings, and the tax-to-GDP ratio on the fiscal deficit. This allows the study to control for confounding variables and identify which factors are statistically significant. Correlation matrices were used to examine pairwise relationships between variables before regression. Paired t-tests were selected to compare pre-COVID and post-COVID periods using the same set of indicators, making the comparison statistically valid. All tests were conducted at a 95% confidence level ($\alpha = 0.05$). Due to limited observations (n=8 for regression), results are interpreted with caution, and a 12-year robustness check is also reported.

5.6 Limitations of the Study

The study is subject to several limitations. First, some analyses (e.g., correlations of fiscal indicators) are based on only three observations (FY2024-25 to FY2026-27 BE), making the results indicative rather than definitive. Second, the analysis relies on budget estimates and revised estimates, which may differ from actual outcomes. Third, the analysis is confined to the Union Budget and does not cover state budgets in detail. Fourth, the impact of regulatory reforms (the New Income Tax Act, 2025, and the Customs Integrated System) can only be assessed prospectively. Fifth, global geopolitical developments, particularly tensions in West Asia and US tariff policies, remain highly dynamic and may alter growth projections. Sixth, correlation analyses indicate relationships but do not imply causation; regression results provide stronger causal evidence but are still subject to model specification.

5.7 Conceptual Framework



Source: Author's compilation based on Union Budget Documents 2026-27, RBI Bulletin, and Sixteenth Finance Commission Report

6. Hypotheses

H_1: There is a statistically significant negative relationship between capital expenditure (in absolute terms) and fiscal deficit (% of GDP) in India during FY2019-20 to FY2026-27 BE. Higher capex is expected to reduce the deficit through growth-multiplier effects.

H_2: There is a statistically significant positive relationship between net market borrowings (% of GDP) and fiscal deficit (% of GDP) in India during FY2019-20 to FY2026-27 BE. Higher borrowings are expected to widen the deficit.

H_3: Capital expenditure (in absolute terms) increased significantly in the post-COVID period (FY2021-22 to FY2026-27 BE) compared to the pre-COVID period (FY2015-16 to FY2020-21).

H_4: The tax-to-GDP ratio improved significantly during the post-COVID period (FY2021-22 to FY2026-27 BE) compared with the pre-COVID period (FY2015-16 to FY2020-21).

H_5: Gross market borrowings and net market borrowings are strongly positively correlated, indicating consistency in the government›s borrowing structure.

7. The Fiscal Strategy: Consolidation, Expenditure Quality, and Revenue Trends

The Fiscal Responsibility and Budget Management (FRBM) framework mandates that the Central Government limit its Fiscal Deficit to 3% of Gross Domestic Product (GDP) by March 31, 2021. It also sets targets for the Central Government to reduce the General Government Debt to 60% of GDP and the Central Government Debt to 40% of GDP by March 31, 2025. In the Revised Estimates (RE) for 2025-26, the government has maintained its Fiscal Deficit target at 4.4% of GDP. Subsequently, in line with the commitment outlined in the Budget Speech for FY 2021-22 and the fiscal consolidation path detailed in the Budget for FY 2025-26, the Fiscal Deficit-to-GDP ratio for FY 2026-27 is projected at 4.3%.

A clear trend is the steady rise in the share of Capital Expenditure, climbing from 12.3% in 2017-18 to a projected 22.8% in 2026-27, reflecting a significant policy shift toward long-term infrastructure and asset creation. Conversely, the share of Revenue Expenditure (excluding Grant-in-Aid Capex) has declined from 78.8% to a projected 67.9%, indicating a relative reduction in routine operational spending. This decline in revenue expenditure reflects fiscal prudence and adherence to fiscal discipline as mandated by the revised FRBM Act.

Table 3: Abstract of Budget Estimates

Key Metrics (₹ Crore)	2024-25 (Actuals)	2025-26 (Budget Estimates)	2025-26 (Revised Estimates)	2026-27 (Budget Estimates)	% Change of RE to BE (2025-26 to 2026-27)
Revenue Receipts	30,36,619	34,20,409	33,42,323	35,33,150	5.7%
Capital Receipts	16,16,249	16,44,936	16,22,519	18,14,165	11.81%
Total Receipts	46,52,867	50,65,345	49,64,842	53,47,315	7.7%
Total Expenditure	46,52,867	50,65,345	49,64,842	53,47,315	7.7%
Revenue Expenditure	36,00,914	39,44,255	38,69,087	41,25,494	6.6%
Capital Expenditure	10,51,953	11,21,090	10,95,755	12,21,821	11.5%
Effective Capital Expenditure	13,24,609	15,48,282	14,03,906	17,14,523	22.12%
Revenue Deficit	5,64,296	5,23,846	5,26,764	5,92,344	12.4%
% of GDP	1.7%	1.5%	1.5%	1.5%	-
Effective Revenue Deficit	2,91,640	96,654	2,18,613	99,642	-54.4%
Fiscal Deficit	15,74,431	15,68,936	15,58,492	16,95,768	8.8%
% of GDP	4.8%	4.4%	4.4%	4.3%	-
Primary Deficit	4,58,856	2,92,598	2,84,154	2,91,796	2.7%
% of GDP	1.4%	0.8%	0.8%	0.7%	-

Source: Author compiled from Budget at a Glance, Budget Documents 2026-27

Capital expenditure, defined as spending that alters government assets or liabilities (e.g., road construction or loan recovery), is projected to rise by about 11.5% in 2026-27, compared with the revised estimates for 2025-26. In contrast, revenue expenditure, covering all other operational expenses such as salaries and interest payments, is expected to increase by 6.6% over the same period (Table 3).

Table 4: Key Indicators (% of GDP)

Item	FY2024–25 Actuals	FY2025–26 RE	FY2026–27 BE
1. Fiscal Deficit	4.8	4.4	4.3
2. Primary Deficit	1.4	0.8	0.7
3. Revenue Deficit	1.7	1.5	1.5
4. Effective Revenue Deficit	0.9	0.6	0.3
5. Gross Tax Revenue	11.5	11.4	11.2
6. Non-Tax Revenue	1.6	1.9	1.7
7. Revenue Expenditure	10.9	10.8	10.5
8. Capital Expenditure	3.2	3.1	3.1
of which: Capital Outlay	2.6	2.5	2.4
9. Effective Capital Expenditure	4.0	3.9	4.4
10. Debt	56.5	56.1	55.6

Source: Author compiled from Union Budget Documents

Notes**:** Effective revenue deficit = revenue deficit minus grants-in-aid for capital assets. Effective capital expenditure = capital expenditure + grants-in-aid for capital assets.

The fiscal consolidation achieved in 2025-26 (GFD at 4.4% of GDP) has been further strengthened in 2026-27, with the GFD budgeted at 4.3% of GDP, moving the debt-to-GDP ratio toward the 2030-31 target of 50±1% (Table 4).

Table 5: Capital Outlay (In ₹ Thousand Crore)

As shown in Table 5, capital outlay growth moderated to 3.8% in 2025-26 (RE) but is budgeted to recover to 6.3% in 2026-27 (BE). Over the period 2020-21 to 2026-27 (BE), capital outlay recorded a CAGR of 20.0%, significantly higher than the 13.2% CAGR achieved during 2014-15 to 2019-20. Major infrastructure (transport, communication, and energy) led with a 29.3% CAGR.

Item	2024-25	2025-26 (BE)	2025-26 (RE)	2026-27 (BE)	Growth (%) 2024-25	Growth (%) 2025-26 (RE)	Growth (%) 2026-27 (BE)
1. Total Capital Outlay	855	895	887	943	8.5	3.8	6.3
2. Defence Services	160	180	218	229	3.6	36.5	5.1
3. Capital Outlay (excluding defence)	695	715	669	714	9.7	-3.8	6.7
(i)Major Infrastructure	624	574	542	609	8.0	-13.2	12.4
a. Transport	545	513	512	561	6.0	-6.1	9.6
Indian Railways	252	252	252	278	3.9	0.0	10.3
Roads & Bridges	292	259	259	282	8.1	-11.3	9.1
b. Communications	75	50	24	46	23.5	-67.6	91.4
(ii) Industry & Minerals	13	12	11	10	102.1	-13.1	-8.7
(iii) Science, Technology & Environment	5	8	7	8	-23.8	26.2	21.8
(iv) Others	53	121	110	87	24.3	105.1	-21.0

Source: Union Budget Documents
Note: All values are in ₹ Thousand Crore except Growth Rate columns, which are in per cent.

Table 6: Ministry-wise expenditure in 2026-27

Ministry	Actuals 2024-25 (₹ Crore)	Budgeted 2025-26 (₹ Crore)	Revised 2025-26 (₹ Crore)	Budgeted 2026-27 (₹ Crore)	% Change of RE to BE (2025-26 to 2026-27)
Defence	6,36,003	6,81,210	7,32,512	7,84,678	7.1%
Road Transport and Highways	2,99,460	2,87,333	2,87,142	3,09,875	7.9%
Railways	2,55,263	2,55,445	2,55,466	2,81,377	10.1%
Home Affairs	2,24,585	2,33,211	2,41,485	2,55,234	5.7%
Consumer Affairs, Food and Public Distribution	2,15,009	2,15,767	2,38,409	2,39,521	0.5%
Rural Development	1,79,307	1,90,406	1,88,753	1,97,023	4.4%
Chemicals and Fertilizers	1,84,993	1,61,965	1,91,186	1,77,061	-7.4%
Agriculture and Farmers' Welfare	1,39,744	1,37,757	1,33,370	1,40,529	5.4%
Education	1,10,736	1,28,650	1,21,949	1,39,289	14.2%
Health and Family Welfare	90,684	99,859	96,854	1,06,530	10.0%
Communications	1,47,832	1,08,105	79,768	1,02,267	28.2%
Jal Shakti	46,720	99,503	41,437	94,808	128.8%
Housing and Urban Affairs	53,255	96,777	57,204	85,522	49.5%
Total Expenditure	**46,52,867**	**50,65,345**	**49,64,842**	**53,47,315**	**7.7%**

Sources: Expenditure Budget, Budget Document 2026-27

In the 2026-27 budget, the 13 ministries with the largest allocations together account for 54% of the government's total estimated expenditure. Leading this group, the Ministry of Defence has the largest allocation at ₹7,84,678 crores, representing 15% of the total central budget. Other ministries with significant shares include Road Transport and Highways (6%), Railways (5%), and Home Affairs (5%) [Table 6].

Table 7: Subsidies in 2026-27 (Rs. crores)

Subsidy Category	Actuals 2024-25 (₹ Crore)	Budgeted 2025-26 (₹ Crore)	Revised 2025-26 (₹ Crore)	Budgeted 2026-27 (₹ Crore)	% Change of RE to BE (2025-26 to 2026-27
Food subsidy	1,99,867	2,03,420	2,28,154	2,27,629	-0.2%
Fertilizer subsidy	1,70,683	1,67,887	1,86,460	1,70,799	-8.4%
Interest subsidy	21,885	27,840	24,666	27,441	11.3%
LPG subsidy	14,479	12,100	15,121	12,085	-20.1%
Other subsidies	15,692	14,969	15,105	16,820	11.3%
Total	**4,22,606**	**4,26,216**	**4,69,505**	**4,54,773**	**-3.1%**

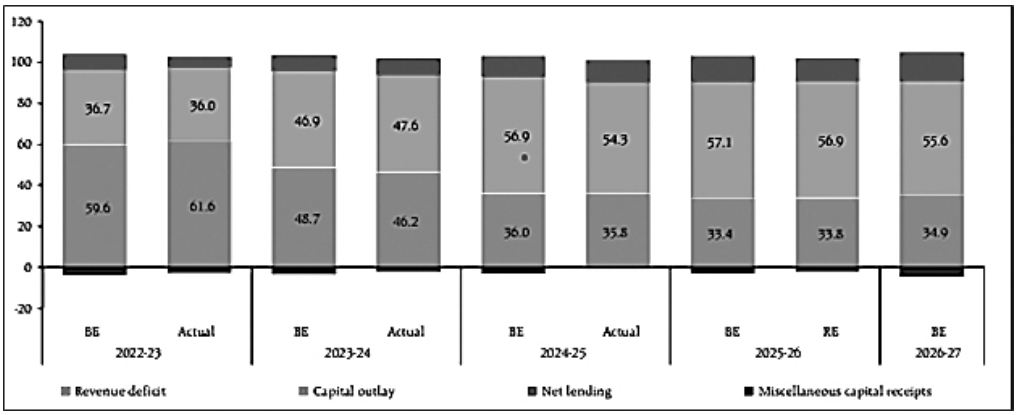
Sources: Expenditure Profile, Union Budget 2026-27; PRS

Total subsidy expenditure for 2026–27 is budgeted at ₹4,54,773 crores, a 3.1% reduction from the previous year's revised estimates. In 2025–26, actual spending on food and fertilizer subsidies exceeded their initial budget allocations by 12% and 11%, respectively. For the upcoming fiscal year, food subsidy is estimated at ₹2,27,629 crores and fertilizer subsidy at ₹1,70,799 crores, together accounting for 87% of the total subsidy outlay. In contrast, the LPG subsidy constitutes 2.6% of the total subsidy outlay (Table 6). Income taxes constitute the largest share of tax revenue, while debt is the single largest source of budgetary revenue (Maruthi A., 2025).

Figure 3: Decomposition of Gross Fiscal Deficit (% of GDP)

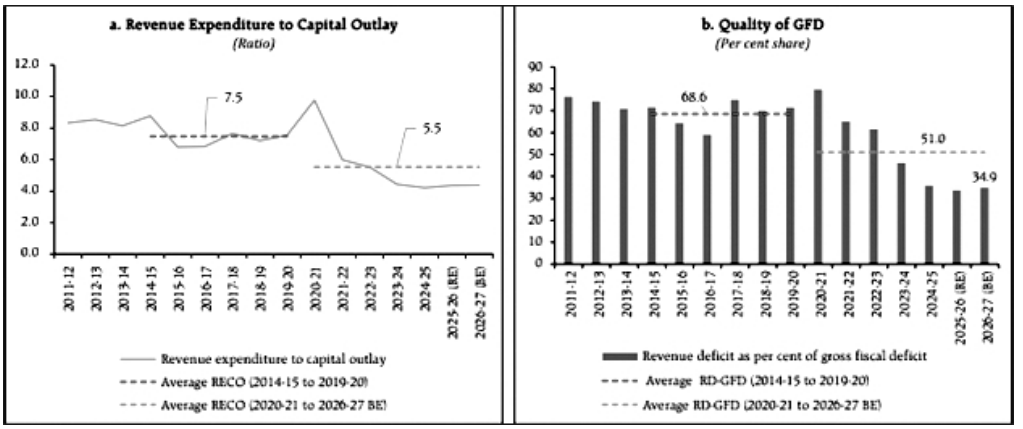
Capital outlay remains the main component of GFD in 2026-27 (BE). The share of capital outlay in GFD, which rose from an average of 37.1 percent during 2019-20 to 2024-25 to 56.9 percent in 2025-26 (RE), is expected to decline slightly to 55.6 percent of GFD in 2026-27. Meanwhile, the share of GFD pre-empted by revenue deficit (RD), which fell from an average of

60.0 percent during 2019-20 to 2024-25 to 33.8 percent in 2025-26 (RE), is projected to rise slightly to 34.9 percent in 2026-27 (Figure 3).



Source: RBI Bulletin February 2026

Figure 4: Quality of Expenditure

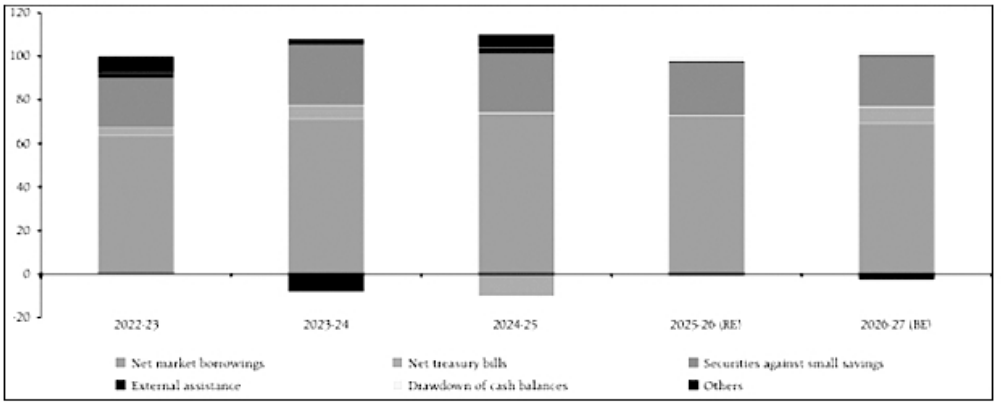


Source: RBI Bulletin February 2026

After COVID, the Union government has focused on streamlining revenue spending while consistently promoting capital expenditure. From 2020-21 to 2026-27 (BE), the compound annual growth rate (CAGR) of revenue expenditure fell to 5.0 percent, down from 9.9 percent during 2014-15 to 2019-20. The ratio of revenue expenditure to capital outlay (RECO), which indicates the quality of government spending, has steadily decreased in recent years—an increasingly lower RECO ratio signals better expenditure quality (see Figure 4a). Likewise, the proportion of revenue deficit (RD) in the gross fiscal deficit (GFD) has been decreasing (see Figure 4b). This positive trend in the quality of public expenditure, as indicated by declining RECO and RDGFD ratios, supports fiscal sustainability.

Figure 5: Sources of Financing Gross Fiscal Deficit

On the financing side, gross and net market borrowings for 2026-27 are projected at ₹17.2 lakh crore (4.4% of GDP) and ₹11.7 lakh crore (3.0% of GDP), respectively. Net market borrowings are forecast to cover 69.2% of the GFD in 2026-27 (BE), down from 72.7% in 2025-26 (RE). As a share of GDP, net market borrowings are expected to decline in 2026-27. Securities issued against small savings and net treasury bills, totaling ₹3.9 lakh crore and ₹1.3 lakh crore, respectively, are planned to finance 22.8% and 7.7% of GFD in 2026-27 (Figure 5).



Source: RBI Bulletin February 2026

After reaching 62.6 percent of GDP in 2020-21 during the COVID-19 pandemic, the Union government's total outstanding debt has steadily declined. Using the debt-to-GDP ratio as the fiscal benchmark, the government reaffirmed its goal to reduce it to 50 (+/-1) percent by March 2031. The debt-to-GDP ratio is projected to decline to 55.6 percent in 2026-27 from 56.1 percent in 2025-26 (Revised Estimate). The ratio of interest payments to revenue receipts is expected to be 39.7 percent in 2026-27, up from 38.1 percent in 2025-26 (RE). The interest rate-growth differential (IRGD), a key indicator of debt sustainability, remains positive.

Table 8: Market Borrowings of the Union Government

Financial Year	Gross Market Borrowings (₹ Cr)	% of GDP	Net Market Borrowings (₹ Cr)	% of GDP
FY2019–20	7,10,000	3.5	4,73,968	2.4
FY2020–21	12,60,116	6.3	10,32,907	5.2
FY2021–22	9,68,382	4.1	7,04,097	3.0
FY2022–23	14,21,000	5.3	11,08,259	4.1
FY2023–24	15,43,000	5.1	11,80,458	3.9
FY2024–25	14,00,697	4.2	11,62,878	3.5
FY2025–26 RE	14,61,000	4.1	11,32,834	3.2
FY2026–27 BE	17,20,000	4.4	11,73,210	3.0

Source: Author compiled from union budget documents.
Notes: 1. Gross market borrowings comprise only fresh borrowings.
2. Net market borrowings exclude the impact of buyback and switching of securities.

The gradual reduction in the Union government's net market borrowing requirements (as a percentage of GDP) toward the pre-pandemic level is expected to increase resources available to the private sector (Table 8).

Table 9: Expenditure on Major Government Schemes

Item	₹ Thousand Crore				Per cent of Total Expenditure			Growth Rate (per cent)		
	2024-25	2025-26 (BE)	2025-26 (RE)	2026-27 (BE)	2024-25	2025-26 (RE)	2026-27 (BE)	2024-25	2025-26 (RE)	2026-27 (BE)
1	2	3	4	5	6	7	8	9	10	11
A. Central Sector Schemes (*of which*) :	1,494	1,622	1,637	1,772	32.1	33.0	33.1	5.0	9.6	8.2
1. PM-KISAN	66	64	64	64	1.4	1.3	1.2	7.6	-4.0	0.0
2. *Pradhan Mantri Garib Kalyan Anna Yojana* (PMGKAY)	200	203	228	227	4.3	4.6	4.3	-	14.2	-0.1
3. Modified Interest Subvention Scheme (MISS)	23	23	23	23	0.5	0.5	0.4	58.6	0.0	0.0
4. PM *Surya Ghar Muft Bijli Yojana*	8	20	17	22	0.2	0.3	0.4	-	117.5	29.4
5. Crop Insurance Scheme	14	12	12	12	0.3	0.2	0.2	11.8	-15.2	-0.5
B. Centrally Sponsored Schemes (*of which*):	402	542	420	549	8.6	8.5	10.3	-9.5	4.4	30.6
1. Mahatma Gandhi National Rural Employment Guarantee Programme (MGNREGA)	86	86	88	30	1.8	1.8	0.6	-3.7	2.5	-65.9
2. *Viksit Bharat*-Guarantee for *Rozgar* and *Ajeevika* Mission (*Gramin*) [VB-G RAM Scheme]	-	-	-	96	-	-	1.8	-	-	-
3. *Jal Jeevan* Mission (JJM) / National Rural Drinking Water Mission	23	67	17	68	0.5	0.3	1.3	-67.7	-24.8	298.1
4. *Pradhan Mantri Awas Yojna* (Rural and Urban)	38	78	40	77	0.8	0.8	1.4	-12.1	5.5	89.9
5. *Samagra Shiksha*	36	41	38	42	0.8	0.8	0.8	10.5	4.7	10.8
6. National Health Programme*	32	30	30	32	0.7	0.6	0.6	27.5	-5.7	6.5
7. *Saksham Anganwadi* and POSHAN 2.0 (Umbrella ICDS - *Anganwadi* Services, *Poshan Abhiyan*, Scheme for Adolescent Girls)	21	22	21	23	0.5	0.4	0.4	-3.6	-0.3	10.3

Source: RBI Bulletin February 2026

Note: VB-G RAM Scheme is intended to replace MGNREGA; however, allocations have been made for both schemes in 2026-27 BE.

Table 9 summarizes allocation trends for major central sector and centrally sponsored schemes. The outlay for central sector and centrally sponsored schemes is budgeted to increase by 8.2 percent and 30.6 percent, respectively, in 2026-27 compared with 2025-26 (RE). Notably, the allocation for the Jal Jeevan Mission has increased by nearly 300 percent in 2026-27 (BE), following a contraction over the previous two years.

Comparison with Previous Budgets

Indicator	Budget 2024-25	Budget 2025-26	Budget 2026-27	Change
Fiscal Deficit (% of GDP)	4.8%	4.4%	4.3%	-0.1%
Capex (₹ Lakh Cr)	10.52	10.96	12.22	+11.5%
Effective Capex (% of GDP)	4.0%	3.9%	4.4%	+0.5%
RECO Ratio	4.6	4.5	4.4	-0.1

Source: Author compiled from Union Budget Documents

Center's Fiscal Performance (April-January 2025-26)

The RBI Bulletin (March 2026) provides an update on the Center's fiscal performance for April-January 2025-26. All key deficit indicators, expressed as a percentage of revised estimates, were lower than in the corresponding period of the previous financial year. The lower fiscal deficit was primarily driven by double-digit growth in net tax revenue (10.0 percent) and modest growth in revenue expenditure (1.3 percent), compared with 6.8 percent in the same period last year. Capital expenditure grew at more than twice the pace recorded in the corresponding period of the previous year, reflecting the government's continued focus on expenditure quality.

Within tax revenues, corporation tax increased by 14.7 percent, union excise duty by 10.0 percent, and customs collections by 15.5 percent during April-January 2025-26, significantly higher than the growth rates recorded in the same period of the previous fiscal year.

States' Fiscal Performance

However, the RBI Bulletin notes that state governments' gross fiscal deficit during April-January 2025-26 was higher than the previous year, primarily due to a moderation in revenue receipts relative to budget estimates. Within revenue receipts, **SGST growth decelerated,** while state excise remained strong. Encouringly, states' revenue expenditure grew more slowly than a year ago, and capital expenditure reversed **last year's contraction.**

8. The Enabling Regulatory Framework

8.1 Direct Tax Reforms

The budget overhauls the direct tax regime to simplify it, enhance taxpayer convenience, and improve global competitiveness. The New Income Tax Act, 2025 (effective April 2026), introduces citizen-friendly forms to simplify compliance. Key ease-of-living measures include exempting Motor Accident Claims Tribunal awards from tax and TDS, rationalizing TCS to a uniform 2% for overseas tour packages and LRS remittances for education or medical treatment, issuing lower TDS certificates automatically, and extending the return revision deadline to March 31. A one-time, six-month foreign asset disclosure scheme offers small taxpayers immunity from prosecution upon payment of prescribed tax and fees.

Recognizing that complex litigation hinders investment, penalty and prosecution frameworks are rationalized. Assessment and penalty proceedings are consolidated into a single order, and taxpayers may update returns after reassessment by paying an additional 10% tax. Minor offenses, including failure to produce books and TDS defaults on in-kind payments, are decriminalized. To strengthen IT services leadership, a consolidated safe harbor margin of 15.5% is established for "Information Technology Services," with eligibility raised from ₹300 crores to ₹2,000 crores and an automated five-year approval process. To attract global business, a tax holiday until 2047 is provided for foreign cloud companies using Indian data centers, a 2% profit safe harbor for component

warehousing in bonded zones, and a five-year tax exemption for non-resident experts on non-India-sourced income.

MAT is rationalized into a final tax rate of 14% (down from 15%), eliminating future credit accumulation. Brought-forward MAT credits are available for set-off only for companies under the new regime, and are capped at one-fourth of the tax liability per year. Buybacks are taxed as capital gains for all shareholders, with promoters facing an additional buyback tax (effective rates of 22% for corporate and 30% for non-corporate). STT is recalibrated to 0.05% on futures and 0.15% on options.

These reforms align with Adam Smith's Canon of Certainty (clear, non-arbitrary tax rules), Canon of Convenience (automated processes, extended deadlines), and Canon of Economy (reduced compliance costs through digitalization). The progressive rate structure reflects the Ability-to-Pay principle, where higher incomes bear a proportionally greater tax burden.

8.2 Indirect Tax and Customs Modernization

Indirect tax proposals aim to support domestic manufacturing, export competitiveness, and the simplification of trade processes. Tariff rationalization focuses on growth and the green transition. To boost exports, the duty-free import limit for seafood-processing inputs is raised from 1% to 3% of the previous year's export value, and the benefit is extended to leather footwear as well. Critical manufacturing receives BCD exemptions for capital goods used in lithium-ion cells, critical minerals, parts for civilian and defense aircraft, and microwave ovens. The energy transition is supported by duty exemptions on sodium antimonite for solar glass, exemptions for nuclear power projects until 2035, and the exclusion of biogas value from excise duty. A one-time SEZ measure allows eligible units to sell a prescribed proportion of their output in the Domestic Tariff Area at concessional duties. The ease of living is enhanced by reducing personal import tariffs from 20% to 10% and by expanding duty exemptions for rare-disease drugs.

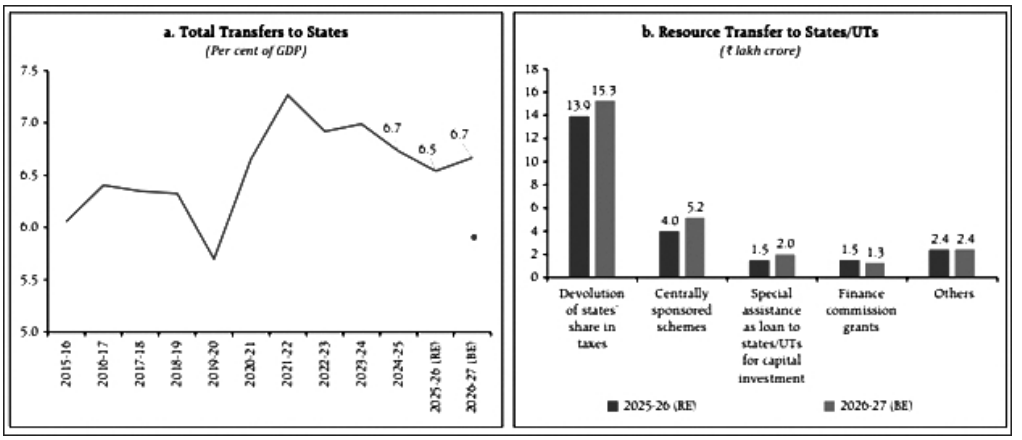
The most transformative element is modernizing customs toward a trust-based, digitally integrated system. Trust-based measures include extending AEO duty deferral from 15 to 30 days, increasing the validity of advance rulings from 3 to 5 years, and enabling "trusted importer" clearance. Ease of doing business improves through a single digital window that integrates multi-agency approvals, with 70% of interdicted cargo operational by April 2026. The Customs Integrated System (CIS) will unify processes on a single platform within two years, supported by AI-driven scanning at major ports. New export opportunities include duty-free treatment for the catch of Indian fishing vessels when landed abroad and the removal of the ₹10 lakh cap on courier exports, thereby empowering artisans and start-ups. Dispute resolution is facilitated by allowing honest taxpayers to settle cases by paying an additional amount rather than a penalty.

The trust-based customs administration – extending AEO duty deferral, enabling "trusted importer" clearance, and integrating multi-agency approvals into a single digital window – exemplifies Smith's

Canon of Economy, which emphasizes minimizing the cost of tax collection.

Figure 6: Gross Resource Transfer to States and UTs

Gross transfers to States are projected to grow by 12.2 percent in 2026-27 (BE), up from 5.0 percent in 2025-26 (RE), driven mainly by transfers through centrally sponsored schemes and special loans to States/UTs (with legislature) for capital projects. As a share of GDP, these transfers are expected to rise slightly from 6.5 percent in 2025-26 (RE) to 6.7 percent in 2026-27 (BE). For 2026-27, the Budget allocates ₹2 lakh crore in 50-year, interest-free loans for State capital expenditure, a 33.3 percent increase over 2025-26 (RE). The largest share of gross transfers is the devolution of the States' share in taxes (Figure 6).



Source: RBI Bulletin February 2026

Table 10: Resource Transfers from Center to States and UTs with Legislature (In ₹ crores)

	2024-25 Actuals	2025-26 Revised Estimates	2026-27 Budget Estimates
I. Devolution of States' share in taxes	1286885	1392971	1526255
II. Some Important Items of Transfer	202664	230144	279110
1. Assistance to States from NDMF	720	3012	2874
2. Assistance to States from NDRF	5356	12048	11496

3. Externally Added Projects - Grants	8174	12957	15745
4. Externally Aided Projects - Loan	34410	47184	47753
5. Grants under Proviso to Article 275 (1) of the Constitution	1171	943	1242
6. Special Assistance as a Loan to States for Capital Investment	149484	144000	185000
7. Special Assistance under the Demand - Transfers to States	3350	10000	15000
III. Finance Commission Grants	120858	152953	129397
1. Grants for Urban Local Bodies (Basic Component)	19260	26023	37272
2. Grant for Urban local bodies - Special Infrastructure Component	…	…	6000
3. Grants for Urban Local Bodies-Urbanization Premium	…	…	2000
4. Grants for Rural Local Bodies	41262	54314	55909
5. Grants-in-Aid for State Disaster Response Fund	20264	24257	22574
6. Grants-in-Aid for State Disaster Mitigation Fund	4984	9258	5642
7. Grants for the Health Sector	10604	25171	…
8. Grants for shared Municipal Services	…	225	…
9. Post Devolution Revenue Deficit Grants	24483	13705	…
IV. Total Transfer to States [Other than (I)+(II)+(III)]	555100	498159	609008
1. Under Centrally Sponsored Schemes (Revenue)	382336	399854	520333
2. Under Central Sector Schemes	19167	67889	77371
3. Under Other Categories of Expenditure	153595	30414	11201
4. Capital Transfers	2	2	102
V. Total Transfer to Delhi and Puducherry	60007	61917	77000

1. Under Centrally Sponsored Schemes (Revenue)	9438	9599	13612
2. Under Central Sector Schemes (Revenue)	159	218	232
3. Under Other Categories of Expenditure (Revenue)	50268	45825	47776
4. Capital Transfers (including SASCI)	142	6275	15380
VI. Total Transfer to States/UTs	2225513	2336144	2620769
VII. Less Recovery of Loans and Advances	24.6	50.3	50.3
VIII. Net Transfers (VI-VII)	2201.0	2285.9	2570.5
IX. Gross Transfers / GDP (percent)	6.7	6.5	6.7
X. Net Transfers / GDP (percent)	6.7	6.4	6.5

Source: Union budget documents.

9. Sixteenth Finance Commission Recommendations (2026-27 to 2030-31)

The Sixteenth Finance Commission (FC-XVI), chaired by Dr. Arvind Panagariya, submitted its report on November 17, 2025. The report covers the award period from 2026-27 to 2030-31 and was laid before Parliament on February 1, 2026. The major recommendations of FC-XVI are outlined below (RBI Bulletin, February 2026).

Tax Devolution: The States' share of the divisible pool remains at 41 percent for vertical devolution. In horizontal devolution, the per capita GSDP distance remains the most significant factor in the sharing formula. The formula has been slightly adjusted, giving more weight to population and less to area and demographic performance. The forest cover criterion remains, but the tax effort criterion has been removed. A new criterion, States' contribution to GDP, has been added with a 10 percent weight.

Grants-in-aid: Revenue-deficit grants to States have been discontinued, marking a significant departure from previous practice. No sector-specific or State-specific grants are recommended, indicating a clear shift from the FC-XV approach. New elements such as the Special Infrastructure Component and the Urbanization Premium have been added to grants for urban local bodies. Disaster management grants now focus more on pre-disaster mitigation and resilience, with greater emphasis on the State Disaster Mitigation Fund alongside the State Disaster Response Fund.

Path to Fiscal and Macro Stability: The Commission recommended capping the State's gross fiscal deficit at 3 percent of GSDP to bolster fiscal credibility. It forecasts the central government's fiscal

deficit will decrease to 3.5 percent of GDP by 2030-31. State debt is expected to rise slightly to 27.2 percent of GDP by 2030-31. With additional special support for capital investment, the total State government debt is projected to reach 29.9 percent of GDP by 2030-31. Although overall debt levels are manageable, regional differences highlight the importance of strict fiscal discipline. States should eliminate off-budget borrowings and ensure transparency through standardized budget reporting and CAG accounts. The Fiscal Responsibility Legislation needs to be amended to support consolidation, enforce reporting of breaches, and include off-budget borrowings within debt and deficit limits.

Structural Transformation: States should privatize DISCOMs and transfer existing debt to a designated vehicle. Prepayment or repayment of this debt could qualify for Union incentives if linked to a specific capital investment scheme. Additionally, states should review and streamline subsidies by keeping only well-targeted ones, adding sunset or exit clauses, stopping off-budget financing, and ensuring transparent disclosure through standardized CAG reports. Both Union and State Governments need to assess the performance of Public Sector Enterprises, shut down inactive entities to ease fiscal pressure, and repurpose their land and buildings for other productive uses.

10. Statistical Analysis, Results, and Discussion

10.1 Dataset for Statistical Analysis (FY2015-16 to FY2026-27 BE)

Year	Fiscal Deficit (%)	Net Market Borrowings (% of GDP)	Capex (₹ Crore)	Tax-GDP (%)
2015-16	3.9	2.97	235253	10.63
2016-17	3.5	2.65	279847	11.2
2017-18	3.5	2.4	263704	11.22
2018-19	3.4	2.22	302959	10.9
2019-20	4.6	2.4	335000	9.9
2020-21	9.2	5.2	426317	10.2
2021-22	6.7	3	592874	11.4
2022-23	6.4	4.1	728274	11.2
2023-24	5.6	3.9	949195	11.7
2024-25	4.8	3.5	1051953	11.5
2025-26 (RE)	4.4	3.2	1095755	11.4
2026-27 (BE)	4.3	3	1221821	11.2

Source: Author's calculations based on Union Budget documents, RBI Bulletin, and PRS.

10.2 Descriptive Statistics of Key Fiscal Indicators (FY2015-16 to FY2026-27 BE)

Statistics	Net Market Borrowings (% of GDP)	Capex (₹ Crore)	Tax-GDP (%)	Fiscal Deficit (%)
Mean	3.21	623579.3	11.04	5.025
Median	3	509595.5	11.2	4.5
Standard Deviation	0.856	369978.33	0.54	1.71
Kurtosis	1.369	-1.549	0.542	2.145
Skewness	1.156	0.48	-1.125	1.456
Range	2.98	986568	1.8	5.8
Minimum	2.22	235253	9.9	3.4
Maximum	5.2	1221821	11.7	9.2
Count	12	12	12	12

Source: Author's calculations based on Union Budget documents.

The 12-year data reveal that the pandemic year (FY2020-21) is a clear outlier, with fiscal deficit peaking at 9.2% and net borrowings at 5.2%. Capital expenditure shows dramatic growth from ₹2.35 lakh crore to ₹12.22 lakh crore, with the post-2021 period driving the upward trend. The tax-GDP ratio remains stable (mean 11.04%, SD 0.54), indicating revenue resilience. This longer dataset provides a reliable pre-COVID baseline (FY2015-16 to FY2019-20) for the paired t-test analysis.

10.3 CAGR of Key Fiscal Indicators (FY2024-25 to FY2026-27 BE)

Indicator	Start Value (2024-25)	End Value (2026-27)	Number of Years	CAGR
Capital Expenditure (₹ Cr)	1051953	1221821	2	8%
Fiscal Deficit (% of GDP)	4.8	4.3	2	-5%
RECO Ratio	4.6	4.4	2	-2%
Tax-GDP Ratio (%)	11.5	11.2	2	-1%
Total Capital Outlay (₹ Cr)	855	943	2	5%

Defence Capex (₹ Cr)	160	229	2	20%
Total Subsidies (₹ Cr)	422606	454773	2	4%
Total Transfers to States (₹ Cr)	2225513	2620769	2	9%
Net Borrowings (% of GDP) - From Peak	5.2	3	6	-9%

Source: Author's calculations based on Union Budget documents

Capital expenditure has grown at an 8% CAGR, reflecting a sustained infrastructure push. Defence capex shows exceptional growth at 20% CAGR, indicating strategic prioritization. The fiscal deficit has declined at a 5% CAGR, consistent with consolidation. Net borrowings measured from the pandemic peak (FY2020-21) declined at a -9% CAGR, indicating a strong return to pre-pandemic borrowing levels.

10.4 Correlation Metrics: Borrowings Indicators (FY2019-20 to FY2026-27 BE)

Variables	Gross Market Borrowings (₹ Cr)	% of GDP	Net Market Borrowings (₹ Cr)	% of GDP
Gross Market Borrowings (₹ Cr)	1	0.37	0.95	0.33
% of GDP	0.37	1	0.48	0.97
Net Market Borrowings (₹ Cr)	0.95	0.48	1	0.5
% of GDP	0.33	0.97	0.502	1

Source: Author's calculations based on Union Budget documents

Gross borrowings and net borrowings (in absolute terms) show a very strong positive correlation (r = 0.95), indicating consistency in the government's borrowing structure. Gross and net borrowings as percentages of GDP also show a strong correlation (r = 0.97). These results support **Hypothesis H5**.

Robustness Check: For transparency, the same correlation matrix was estimated using a 12-year dataset (FY2015-16 to FY2026-27 BE). As expected, the capex-deficit correlation weakened (r = 0.11) due to the inclusion of pre-2019 years when both capex and deficit were low.

Key Fiscal Indicators (FY2024-25 to FY2026-27 BE)

Variables	Fiscal Deficit (% of GDP)	Primary Deficit (% of GDP)	Revenue Deficit (% of GDP)	Effective Revenue Deficit	Gross Tax Revenue (% of GDP)	Debt (% of GDP)
Fiscal Deficit (% of GDP)	1	0.99	0.98	0.94	0.86	0.92
Primary Deficit (% of GDP)	0.99	1	0.99	0.92	0.83	0.89
Revenue Deficit (% of GDP)	0.98	0.99	1	0.86	0.75	0.83
Effective Revenue Deficit	0.94	0.92	0.86	1	0.98	0.99
Gross Tax Revenue (% of GDP)	0.86	0.83	0.75	0.98	1	0.99
Debt (% of GDP)	0.92	0.89	0.83	0.99	0.99	1

Source: Author's calculations based on Union Budget documents.

The fiscal deficit shows strong positive correlations with the primary deficit (r = 0.99) and the revenue deficit (r = 0.98). Gross tax revenue shows a strong positive correlation with effective revenue deficit (r = 0.98) and debt (r = 0.99), indicating that revenue mobilization is closely linked to the government's borrowing and deficit dynamics.

10.5 Multiple Regression Results (Dependent Variable: Fiscal Deficit as % of GDP)

Regression Statistics						
Multiple R	**R Square**	**Adjusted R-Square**	**Standard Error**	**Observations**		
0.947	0.897	0.82	0.704	8		
ANOVA						
	df	SS	MS	F	**Significance F**	
Regression	3	17.41	5.80	11.70	**0.019**	
Residual	4	1.98	0.495			
Total	7	19.4				

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	-2.65	6.342	-0.418	**0.696**	-20.26	14.95
Capex (₹ Cr)	--0.000003	1.284	-2.56	**0.0625**	-6.854	2.757
Tax-GDP (%)	0.553	0.641	0.862	**0.437**	-1.228	2.335
Net Borrowings (% of GDP)	1.389	0.314	4.418	**0.0115**	0.516	2.262

Source: Author's Estimates based on Union Budget documents

The multiple regression model explains 89.7% of the variation in fiscal deficit (R^2 = 0.897) and is statistically significant (F = 11.70, p = 0.019). Net borrowings emerge as the most significant driver, with a coefficient of 1.389 (p = 0.0115)**. H2 is supported,** indicating that a one percentage-point increase in net borrowings as a share of GDP raises the fiscal deficit by 1.389 percentage points. Capital expenditure shows a negative coefficient (-0.000003) and is marginally significant (p = 0.062). **H1 is partially supported**, suggesting that higher capex is associated with lower deficit, approaching conventional significance levels. The tax-to-GDP ratio is not statistically significant (p = 0.437), indicating that its impact on the deficit is indirect, mediated by growth.

The regression equation is: Fiscal Deficit = -2.656 - 0.000003 (Capex) + 0.553 (Tax-GDP) + 1.389 (Net Borrowings).

Robustness Check: The same regression was estimated using a 12-year dataset (FY2015-16 to FY2026-27 BE, n=12). The overall model remained significant (F = 10.09, p = 0.0043), and net borrowings remained strongly significant (p = 0.00098). However, capital expenditure lost statistical significance (p = 0.736), reflecting the non-linear relationship between capex and deficit over the longer time horizon.

10.6 Paired t-Test Results (6 Years Before vs 6 Years After)

Variable	Mean (Before)	Mean (After)	t- Statistic	P-value (two-tailed)	Significant at 95%?	Conclusion
Net Borrowings (% of GDP)	2.97	3.45	-0.821	0.45	No	Not significant – borrowings normalizing

Capital Expenditure (₹ Cr)	3,07,180	9,39,979	**-8.435**	**0.0004**	**Yes**	H3 is strongly supported.
Tax-GDP Ratio (%)	10.7	11.4	**-3.51**	**0.017**	**Yes**	H4 is supported
Fiscal Deficit (% of GDP)	4.7	5.4	-0.565	0.596	No	Not significant – consolidation effective

Source: Author's calculations based on Union Budget documents

The results of paired t-tests comparing key fiscal indicators between the pre-COVID period (FY2015-16 to FY2020-21, n=6) and the post-COVID period (FY2021-22 to FY2026-27 BE, n=6). Capital expenditure increased from a mean of ₹3.07 lakh crore to ₹9.40 lakh crore (t = -8.435, p = 0.0004), providing extremely strong support for **Hypothesis H3**. The tax-GDP ratio improved significantly from 10.7% to 11.4% (t = -3.510, p = 0.017), supporting **Hypothesis H4**.

10.7 Discussion

Finding 1 – Borrowings drive the deficit. Net borrowings have a coefficient of 1.389 (p = 0.0115). A 1-percentage-point reduction in borrowings reduces the deficit by 1.389 percentage points. This supports $\mathbf{H_2}$ and confirms that borrowing reduction is central to fiscal consolidation. This finding is consistent with the Ramsey Rule – borrowing merely shifts the tax burden intertemporally (Stern, 1987).

Finding 2 – Capex helps reduce the deficit. The negative coefficient (-0.000003) with p = 0.0625 approaches significance. Higher capex stimulates growth, expands the tax base, and reduces the deficit-to-GDP ratio. This supports $\mathbf{H_1}$. The expected mechanism is the growth multiplier effect – infrastructure spending increases economic activity, which in turn increases tax revenues.

Finding 3 – Post-COVID structural shift. Capex increased from ₹3.07 lakh crore to ₹9.40 lakh crore (t = -8.435, p = 0.0004). Tax-GDP rose from 10.7% to 11.4% (t = -3.51, p = 0.017). These are statistically significant changes. This confirms a deliberate policy shift toward infrastructure-led growth and revenue mobilization. This strongly supports $\mathbf{H_3}$ and $\mathbf{H_4}$.

Finding 4 – Expenditure quality improved. The RECO ratio fell from 8.2 to 4.4. Effective capex rose to 4.4% of GDP. This indicates a structural improvement in the composition of expenditure, consistent with fiscal consolidation goals.

Finding 5 – Risks remain. GST revenue shortfall and oil price shocks are potential threats. However, forex reserves of USD 687 billion provide a buffer.

Theoretical links: The Ramsey Rule explains why taxing goods with inelastic demand (GST) is efficient. The equity-efficiency trade-off justifies progressive

direct taxes. The Principle of Maximum Social Advantage (Pigou, 1962) justifies the 4.3% deficit target.

11. Conclusion

This paper empirically analyzed fiscal consolidation in the Union Budget 2026-27, using 12 years of fiscal data (FY2015-16 to FY2026-27 BE), and tested five hypotheses using multiple regression, correlation matrices, and paired t-tests. The key findings are summarized below.

First, the fiscal deficit is declining. The deficit is projected to fall from 4.8% (FY2024-25) to 4.3% (FY2026-27 BE). Net borrowings are the most significant driver of fiscal deficit (coefficient = 1.389, p = 0.0115). A 1-percentage-point reduction in net borrowings reduces the deficit by 1.389 percentage points. **H_2 is supported.**

Second, capital expenditure contributes to deficit reduction. The negative coefficient (-0.000003) with p = 0.0625 approaches statistical significance. Higher capex is associated with lower deficit, likely through growth multiplier effects. The paired t-test confirms a dramatic post-COVID increase in capex (t = -8.435, p = 0.0004). **H_1 is partially supported. H_3 is strongly supported.**

Third, revenue resilience is evident. The tax-GDP ratio improved significantly post-COVID (t = -3.51, p = 0.017), indicating that tax reforms have strengthened revenue mobilization. **H_4 is supported.**

Fourth, expenditure quality has improved. The RECO ratio fell from 8.2 to 4.4, and effective capex rose to 4.4% of GDP. This reflects a structural shift toward growth-oriented spending.

Fifth, risks remain. GST revenue shortfall and oil price shocks are potential threats. However, USD 687 billion in forex reserves provide a buffer.

Final Assessment: The Union Budget 2026-27 demonstrates a credible fiscal consolidation path. The empirical evidence supports the government›s strategy of reducing borrowings, increasing capital expenditure, and improving revenue mobilization. If these trends continue, the debt-to-GDP ratio is likely to reach the 2030-31 target of 50±1%. However, continued monitoring of GST revenue and state-level capex absorption is essential.

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