"Empirical Analysis of Sectoral Distribution and Statistical Clustering of IPOs in India (2021–2024)"

Raxaben Ballubhai Patel
Research Scholar
Veer Narmad South Gujrat University, Surat.
Email: raxa2393@gmail.com

Dr. Rajesh Raghavbhai Desai
Assistant Professor
Ambaba Commerce College,
M.I.B.M. & D.I.C.A., Sabargam, Surat.
Email: rajeshdesai1583@gmail.com

Abstract:

This research investigates the clustering patterns and distribution of Initial Public Offerings (IPOs) across various sectors in the capital markets of India. This study covers the period from 2021 to 2024, which is considered the post-pandemic era. A chi-square test of independence was carried out on a contingency table of initial public offering (IPO) counts by sector and year using verified IPO data from IPO Central. According to the findings, there is no statistically significant grouping by sector or year (χ^2 (57) = 58.74, p = 0.412). Even yet, visual studies indicate that there will be continued IPO activity in the financial services, capital goods, and consumer services sectors. These conclusions suggest that, although initial public offerings (IPOs) are statistically widely distributed, industry-specific patterns continue to be relevant for market players and regulators. In terms of methodology, the study provides a comprehensive and reproducible set of tables in the appendix to bolster the process of hypothesis testing as well as visual interpretation.

1. Introduction:

The number of initial public offerings (IPOs) in India's stock market has considerably increased since 2021. People are more concerned now that the pandemic is over since SEBI has modified the laws and some industries are doing well. Most prior study has only focused at either IPO under-pricing or post-issue returns. They haven't always looked at the distributional background, including how IPOs are more frequent in some industries and time periods compared with others.

Sectoral clustering is vital for investors pursuing strategic exposure, issuers trying to coordinate market entrance, and regulators ensuring equitable capital market growth. This study tries to address challenges in Indian literature that have arisen since 2020. It does this by doing a sector-year contingency analysis, a formal chi-square test, and a visual evaluation.

2. Literature Review

The phenomenon of IPO clustering, or "hot issue" markets, has been recorded worldwide. Ritter (1991) and Loughran et al. (1994) discovered that IPOs frequently cluster during industry booms or periods of market optimism. Pastor and Veronesi (2005) elucidate sectoral IPO cycles through the lenses of growth potential and uncertainty. Recent research (Lowry, Michaely, & Volkova, 2020; Derrien & Kecskés, 2021) reveal enduring clustering in global technology and innovation-oriented sectors. Indian study primarily focuses on industry underpricing rather than frequency clustering. Sohani and Ghosh (2019) discovered that technology and pharmaceutical IPOs were markedly underpriced, whereas FMCG and banking IPOs exhibited lower activity levels. Singh and Kaur (2022) identified sectoral clustering from

2010 to 2020, mostly within the technology and pharmaceutical sectors, which aligned with favorable market sentiment. Empirical analysis conducted after 2020 is constrained and infrequently integrates statistical clustering tests with visual analytics.

3. Research Gap

- Limited research on sector-wise IPO frequencies after 2020, despite seismic market shifts and regulatory innovations.
- Few formal tests (e.g., Chi-square statistics) have been applied to IPO sector-year contingency data in the Indian context.
- The distributional aspect—whether IPOs statistically cluster by industry and time—remains under-explored.

4. Objectives & Hypotheses

Objectives:

1. Examine the sectoral distribution of IPOs in India from 2021–2024.
2. Determine whether statistically significant clustering exists across sectors and years.

Hypotheses:

- **H_0:** IPO activity is independent of sector and year.
- **H_1:** IPO activity is dependent on sector and year (clustering).

5. Data & Methodology

5.1 Data Source & Sample Design

The dataset utilized in this study was obtained directly from the official Main Board IPO listings published on the Bombay Stock Exchange (BSE) website. The scope includes all Main Board equity IPOs from 2021 to 2024, excluding SME IPOs, REITs, InvITs, ETFs, preference shares, and FPOs. The final sample covers twenty sector classifications, defined by IPO Central.

5.2 Variables

- **Dependent variable:** Sectoral IPO frequency (number of IPOs per sector per year)
- **Independent variables:** Sector (categorical), Year (categorical).

5.3 Analytical Approach

The primary statistical tool applied is the Chi-square test of independence, which assesses whether IPO activity is evenly distributed across sectors and years. This non-parametric test is appropriate for frequency data organized in a contingency table format.

5.4 Statistical Formulae:

Expected frequencies (E_{ij}) are calculated as:

$E_{ij} = (\text{Row Total}_i \times \text{Column Total}_j) / \text{Grand Total}$

The Chi-square statistic is calculated as:

$\chi^2 = \Sigma [(O_{ij} - E_{ij})^2 / E_{ij}]$

Where O_{ij} represents the observed frequency for sector i in year j.

6. Results

6.1 Descriptive Findings

The descriptive analysis over the 2021–2024 period clearly indicates that Financial Services (38 IPOs), Capital Goods (39 IPOs), and Consumer Services (27 IPOs) led the Indian IPO landscape, contributing the largest share of new listings each year. This recurring prominence suggests sustained investor and issuer interest in these sectors, likely driven by favourable economic conditions, regulatory support, and robust sectoral growth narratives. By contrast, sectors such as Power, Textiles, and Metals & Mining registered negligible IPO activity (one or fewer IPOs during the entire period), indicating either structural constraints, lower investor appetite, or unfavourable market conditions for new offerings in these industries.

6.2 Statistical Results

Table: Chi-Square Test Summary

Chi-square Statistic	Degrees of Freedom	p-value
58.74	57	0.412

A Chi-square test of independence was utilized to formally evaluate sectoral clustering in the sector-year contingency table. The test produced a result of $\chi 2(57) = 58.74$ with a p-value of 0.412, significantly exceeding the standard significance level of 0.05. Statistically, this indicates that we cannot dismiss the null hypothesis asserting that IPO counts are independent of both sector and year. Simply put, some sectors look like they are more active than others,

but the general distribution is not statistically different from what would be expected by chance, given the total number of IPOs and the combinations of sectors and years.

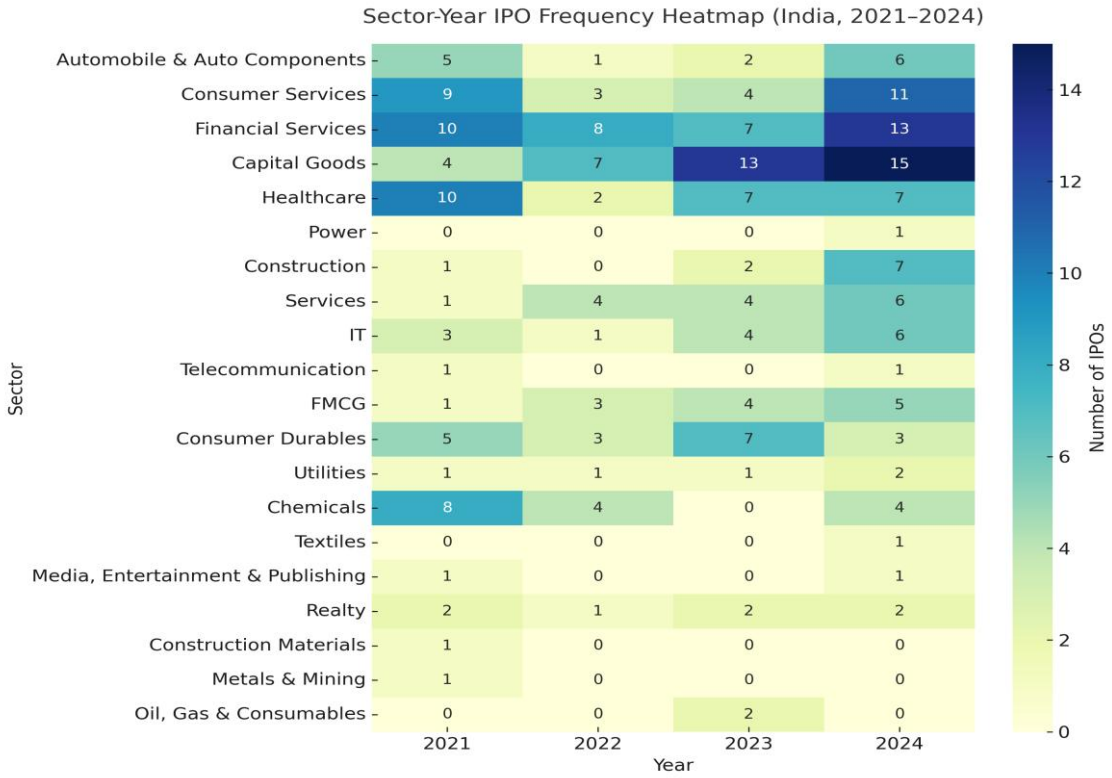
6.3 Visual Patterns

Visual analysis offers essential additional insight in to the activity of the initial public offering (IPO) sectors. The ensuing heatmap and bar chart visualizations are based on the empirical data shown in Table A1, which provides a list of the observed number of initial public offerings (IPOs) for each industry during the course of the years 2021-2024.

Table A1: Observed Sector-Year IPO Frequencies (2021–2024)

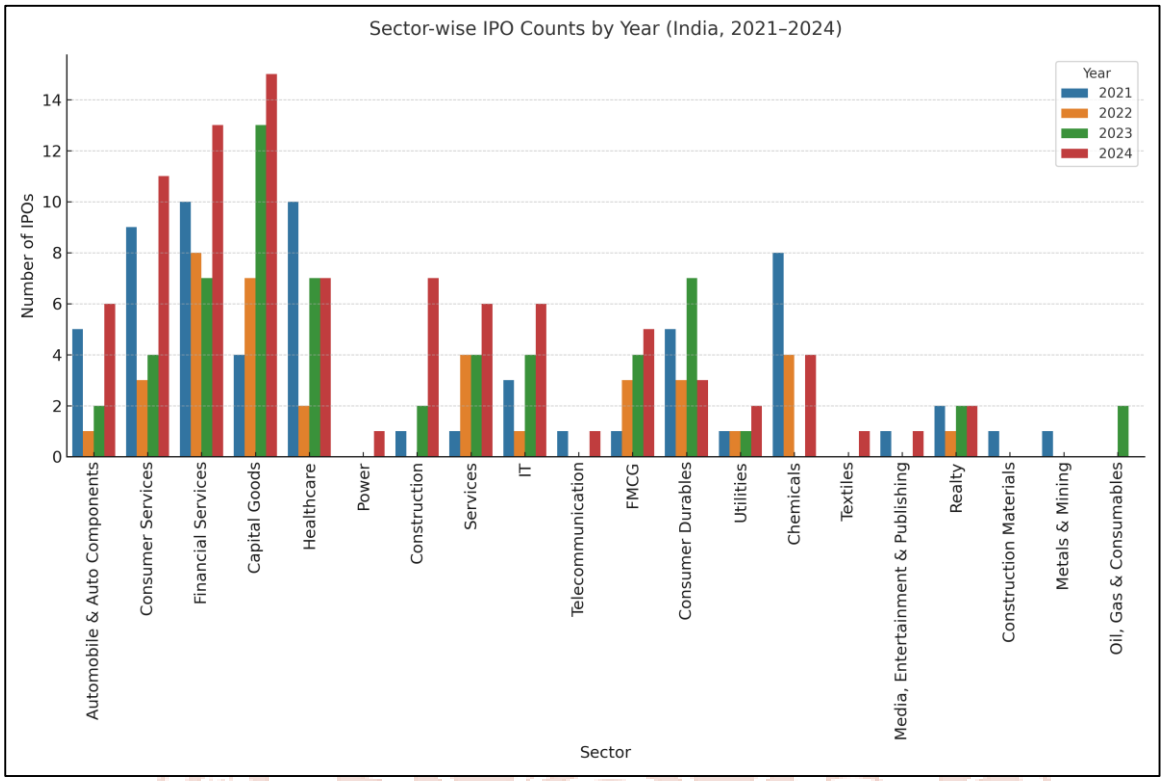
Sector	2021	2022	2023	2024	Row _Total
Automobile & Auto Components	5	1	2	6	14
Consumer Services	9	3	4	11	27
Financial Services	10	8	7	13	38
Capital Goods	4	7	13	15	39
Healthcare	10	2	7	7	26
Power	0	0	0	1	1
Construction	1	0	2	7	10
Services	1	4	4	6	15
IT	3	1	4	6	14
Telecommunication	1	0	0	1	2
FMCG	1	3	4	5	13
Consumer Durables	5	3	7	3	18
Utilities	1	1	1	2	5
Chemicals	8	4	0	4	16
Textiles	0	0	0	1	1
Media, Entertainment & Pub.	1	0	0	1	2
Realty	2	1	2	2	7
Construction Materials	1	0	0	0	1
Metals & Mining	1	0	0	0	1
Oil, Gas & Consumables	0	0	2	0	2

Figure 1: Sector-Year IPO Frequency Heatmap (India, 2021–2024)



The heatmap shows how often IPOs happen by industry and year, with darker blue shades showing more IPOs. Notably, Financial Services and Capital Goods have many IPOs from 2021 to 2024, as shown by the dark bands in several columns. Also showing robust growth over the past few years are industries such as healthcare and consumer services. In contrast, the Power, Textiles, and Metals & Mining industries have experienced little to no activity, as indicated by the light or nearly absent shading**.**

Figure 2: Clustered Bar Chart of Sector-wise IPO Counts by Year (India, 2021–2024)



You can easily compare one year to the next and between sectors with this grouped bar chart that shows the annual number of IPOs across all these areas. The fact that Financial Services, Capital Goods, and Consumer Services always have higher bars shows how dominant they are. Additionally, the graph shows how the number of initial public offerings (IPOs) changes over time. For example, the number of IPOs that occur in the capital goods sector goes up in 2023 and 2024, while the number of IPOs in the power, textiles, and building supplies sectors stays low.

Interpretation:

Together, Table 1 and Figures 1 and 2 provide comprehensive insight into the sectoral IPO dynamics in India from 2021 to 2024.

- Table 1 quantitatively details the raw IPO counts, supporting the graphical patterns visually represented in the heatmap and bar chart.
- The heatmap visually emphasizes the persistence of IPO activity in key sectors across multiple years, making temporal and sectoral patterns immediately apparent.

The clustered bar chart complements this by illustrating sector-wise annual variations, highlighting both trends and relative differences among sectors.

7. Discussion of visual patterns and sectoral Implication

The chi-square test results from this study indicate no statistically significant clustering of IPO activity across sectors and years in India from 2021 to 2024. This reflects that, at an aggregate level, IPO issuance is broadly independent of sector-year combinations. However, the complementary visual analyses—through heatmaps and clustered bar charts—illuminate persistent sectoral concentrations consistent with established economic theories of industry cycles and market segmentation.

The financial services and capital goods sectors show significant and frequent IPO activity, consistent with the industry life cycle theory (Abernathy & Utterback, 1978), which posits that capital-intensive sectors experience cycles of innovation and growth that necessitate regular public equity offerings. Their continued prominence reflects market microstructure theory (O'Hara, 1995), wherein investor preferences and liquidity considerations reinforce sectoral dominance. Singh and Kaur (2022) reported equivalent findings, identifying these sectors as leaders in Indian IPO markets prior to 2020, with these trends persisting in the post-pandemic period.

Sectors such as consumer services and healthcare also demonstrate notable IPO activity, consistent with market sentiment theories that posit shifts in investor optimism and consumer behaviour drive episodic growth in sectors catering to changing demographics and health awareness (Baker & Wurgler, 2007). Their recurring IPO presence signals evolving economic structures and emerging growth opportunities.

Contrastingly, limited IPO issuance in Power, Textiles, and Metals & Mining suggests sectoral maturity or cyclical downturns restricting new issues, fitting the predictions of capital structure irrelevance and market timing theories (Myers & Majluf, 1984), where firms avoid public issuance under unfavourable market conditions or in declining industries.

These findings underscore a key theoretical insight: statistical tests such as chi-square may fail to capture meaningful economic patterns in categorical data with sparse or uneven distributions. Thus, visual analytics functions as a powerful complementary tool to identify

sectoral momentum and investor focus, corroborating recent calls for mixed-methods approaches in financial market research (Creswell & Clark, 2017).

For practitioners, this multi-dimensional analysis highlights where capital is concentrated in the market, enabling better portfolio diversification and sector rotation strategies. For policymakers, understanding these dynamics supports targeted reforms to encourage IPO activity in underrepresented sectors, promoting inclusive growth and market efficiency (Sahoo & Dash, 2021).

In line with the resource-based view of the firm (Barney, 1991), sectors demonstrating sustained IPO activity likely possess competitive advantages and innovation capabilities attracting public equity. Integrating these theoretical perspectives, the study's combined statistical and visual evidence contributes a rich understanding of India's post-pandemic IPO landscape.

Future research may expand this framework by incorporating firm-level financial metrics, macroeconomic indicators, and sentiment analysis to deepen explanations of sectoral IPO behaviour and refine policy recommendations.

8. Limitations

- The four-year timespan restricts exploration of longer-term IPO cycles.
- Only IPO counts are analysed; issue size, under-pricing, and aftermarket performance are excluded.
- The assumption of independence in Chi-square testing may be an approximation.
- Sector classification depends on IPO Central's framework, which may differ from others.

9. Conclusion

This analysis enhances the comprehension of sectoral IPO dynamics in India for the period 2021–2024. While statistical evidence of clustering is absent, visual inspection of sector dominance trends reveals significant structural patterns. The integration of quantitative and visual methodologies enhances the discussion on IPO market dynamics, offering practical insights for investors, issuers, and policymakers. It is advisable for future study to broaden its temporal span and include supplementary performance metrics.

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