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Research Article

Assessing Financial Efficiency In The Indian Cement Industry Through Key Turnover Ratios

Manjur Alam[1*], Rabin Mazumder[2]

1*Assistant Professor, Lalbaba College, Department of Commerce, University of Calcutta, Kolkata, alammanjur1982@gmail.com
[2]Associate Professor, Institute of Engineering and Management, Department of Business Administration, rabinmazumder@iem.edu.in

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ABSTRACT

The financial performance of cements companies is a critical indicator of their operational efficiency, liquidity, and long-term sustainability. The Indian cement industry plays a significant role in infrastructure development and economic growth, yet financial performance varies across firms due to differences in credit policies, asset utilization, and market conditions. Understanding these financial trends is crucial for stakeholders, including investors, managers, and policymakers. This study aims to analyse the financial efficiency of leading Indian cement companies by examining key financial ratios, including Trade Receivable Turnover Ratio, Cash Turnover Ratio, Fixed Assets Turnover Ratio, and Inventory Turnover Ratio, across multiple financial years. A comparative financial analysis was conducted using yearly financial data to identify patterns, strengths, and inefficiencies in receivables management, liquidity, asset utilization, and inventory turnover. The findings reveal that companies such as Ultratech, Grasim, and JK Lakshmi have demonstrated strong financial management, while firms like Dalmia, India Cement, and Star Cement have experienced fluctuations, reflecting operational and financial challenges. The results highlight the impact of credit policies, cash flow management, and asset utilization strategies on financial performance. This study's novelty lies in its integrated approach, evaluating multiple financial metrics together to provide a comprehensive perspective on financial efficiency trends within the cement sector. The findings offer valuable insights for policymakers in formulating financial regulations, credit policies, and investment strategies to enhance the financial stability of the cement industry. Future study could explore the influence of macroeconomic factors, regulatory policies, and global comparisons to further refine financial strategies and improve industry-wide performance.

Keywords: Financial performance, Cement industry, Turnover ratios, Credit management, Asset utilization

Introduction

Efficiency analysis plays a fundamental role in financial research, offering a structured approach to evaluating how well a company utilizes its resources to generate revenue (Ghaemi-Zadeh & Eghbali-Zarch, 2024). This aspect of financial management is critical for business sustainability, as it enables stakeholders, including investors, managers, and policymakers, to assess operational effectiveness and identify areas for improvement (Fu & Pirabi, 2023). The study of efficiency is often conducted through financial ratios, which provide quantifiable measures of a company's ability to manage its receivables, cash flow, fixed assets, and inventory (Lee,2023). These metrics serve as key indicators of financial health, guiding strategic decision-making and performance optimization (Alfina et.al.,2024). Among the most widely used efficiency ratios are the trade receivable turnover ratio, cash turnover ratio, fixed assets turnover ratio, and inventory turnover ratio (Lee, 2023). The trade receivable turnover ratio assesses the effectiveness of a company's credit policies and its ability to collect outstanding payments from customers (Sim & Prabhu, 2022). The cash turnover ratio measures the frequency at which cash resources are utilized and replenished, offering insights into liquidity management (Baker et al.,2019). The fixed assets turnover ratio evaluates how efficiently a company employs its long-term assets to generate sales, reflecting asset utilization (Ahmad et al., 2023). Finally, the inventory

turnover ratio analyses how quickly stock is sold and replaced over a given period, highlighting inventory management efficiency (Boisjoly et al., 2020).

Efficiency ratios are crucial in financial analysis because they provide insights into how well a company can convert its resources into revenue without unnecessary waste or inefficiencies (Asiaei et al., 2022). A company with strong efficiency ratios is more likely to achieve financial stability, competitive advantage, and sustainable growth (Zopounidis & Lemonakis,2024). These ratios not only help companies compare their performance against industry benchmarks but also assist in identifying potential areas for operational enhancements (Kraus et al.,2020). Understanding and applying these financial ratios is essential for businesses aiming to maximize profitability while maintaining operational agility (Škare & Soriano, 2021). This research aims to provide a comprehensive analysis of these key turnover ratios, their significance, and their impact on business performance. By examining these efficiency metrics, companies can gain valuable insights into their financial operations, identify inefficiencies, and implement strategic improvements. The findings of this study will contribute to the broader understanding of financial efficiency, assisting businesses in enhancing profitability and long-term sustainability through informed decision-making.

Through an empirical approach, this study will examine the practical applications of these efficiency ratios across different industries. The results will not only demonstrate the importance of financial efficiency in corporate performance but also highlight best practices that organizations can adopt to optimize their operational effectiveness. By leveraging efficiency ratios, businesses can enhance financial planning, mitigate risks, and achieve sustainable growth in a dynamic economic environment. (Akhtar et al., 2022) Additionally, this study will explore the relationship between efficiency ratios and financial performance indicators such as profitability, return on investment (ROI), and cash flow stability. Furthermore, as global markets continue to evolve, businesses face increasing pressure to operate efficiently and respond to economic uncertainties (Ochie et al., 2022). By incorporating efficiency ratio analysis into financial decision-making, organizations can enhance their adaptability and resilience (Settembre-Blundo et al., 2021). For instance, companies with a high inventory turnover ratio can better manage supply chain disruptions, while firms with a strong trade receivable turnover ratio can maintain steady cash inflows even during economic downturns (Ivanov, 2024). These financial indicators not only provide insights into internal operations but also reflect a company's ability to sustain growth in a competitive environment (Abid, 2024).

Moreover, an in-depth understanding of efficiency ratios allows businesses to anticipate potential challenges and devise proactive strategies. For example, firms with low fixed assets turnover ratios might need to reassess their investment strategies, ensuring that capital expenditures align with revenue-generating activities. Similarly, organizations with a weak cash turnover ratio may need to optimize their working capital management to ensure liquidity and operational stability. This study will also examine how efficiency ratios vary across industries, providing valuable insights into sector-specific challenges and best practices. Additionally, in a rapidly changing financial landscape, businesses must continuously monitor and analyse their efficiency ratios to adapt to evolving market conditions. The impact of technological advancements, globalization, and regulatory changes on financial efficiency will be explored, highlighting how companies can leverage digital tools and automation to improve operational performance. Businesses that proactively integrate financial analysis into their strategic planning can better position themselves for long-term success, minimizing inefficiencies and enhancing competitiveness.

However, efficiency analysis is a vital component of financial assessment that helps businesses understand their operational strengths and weaknesses (Khedr.,2024). The integration of turnover ratios in financial strategy formulation enables companies to make data-driven decisions that improve performance and long-term sustainability (Hannila et al., 2022). As businesses strive to achieve optimal resource utilization, continuous monitoring and analysis of these efficiency ratios will remain essential for maintaining financial stability and competitive positioning in an ever-changing economic landscape (Zopounidis & Lemonakis, 2024). By understanding, interpreting, and acting upon efficiency ratios, organizations can enhance their financial resilience, drive growth, and ensure long-term success in an increasingly complex business environment (Bai,2022).

Review of Existing Literature

The measurement of operational efficiency through financial ratios has been extensively examined in the literature, with key metrics such as Trade Receivable Turnover Ratio, Cash Turnover Ratio, Inventory Turnover Ratio, and Fixed Assets Turnover Ratio serving as core indicators. Trade receivable turnover, which reflects the efficiency of credit management and collections, is emphasized in studies by **Deloof (2003)** and **Lazaridis and Tryfonidis (2006),** who found a strong link between efficient receivables management and firm profitability. These studies highlight how timely collection of receivables contributes to liquidity and overall operational performance.

In parallel, the Cash Turnover Ratio, though less commonly studied, is discussed in financial management texts such as those **by Pandey (2015) and Van Horne and Wachowicz (2008),** where it is used to evaluate how effectively firms utilize cash to generate revenue, signalling liquidity efficiency and cash flow strength.

Inventory Turnover Ratio has been widely used as a benchmark for operational and supply chain efficiency**. Shin and Soenen (1998)** showed that higher inventory turnover leads to better firm performance, while

Gaur, Fisher, and Raman (2005) provide evidence from the retail sector, demonstrating that managing inventory efficiently can significantly enhance profitability and responsiveness.

Fixed Assets Turnover Ratio, which indicates how well a firm uses its long-term assets to generate sales, has been explored **by Hussey and Ong (2000) and Chen and Huang (2006),** particularly in capital-intensive industries. These studies underscore the importance of capital utilization in maximizing output from fixed investments. For a broader perspective, Ghosh and Maji (2004) incorporate multiple turnover ratios, including trade receivables and inventory, in their analysis of Indian industries to assess overall efficiency. Together, this literature supports the use of these turnover ratios as effective tools for evaluating different dimensions of operational and financial efficiency in firms.

The **Cash Turnover Ratio**, though not as extensively studied as other efficiency ratios, plays a critical role in understanding liquidity and cash utilization efficiency. It measures how effectively a company uses its available cash to generate revenue. Authors such **as Pandey (2015) and Van Horne and Wachowicz (2008)** discuss cash turnover in the broader context of working capital management, noting that firms with higher cash turnover typically exhibit strong internal financing capacity and operational fluidity. In a more empirical context, studies like that of Gill, Biger, and **Mathur (2010)** highlight the indirect influence of cash flow efficiency on profitability, reinforcing the importance of managing cash-related operations efficiently in small and medium-sized enterprises (SMEs).

Recent research underscores the continued relevance and evolving methodologies in utilizing financial ratios to assess operational efficiency. **In 2023, Rebuin et al.** analysed the effectiveness of trade receivable management by examining the turnover and average age ratios of receivables in Indonesian hospitals. Their findings highlight the importance of structured internal programs and stakeholder involvement in enhancing receivables management strategies.

2. Materials and methods

The dataset for this study is sourced from the Capitaline Corporate Database, maintained by Capital Market Publishers (India) Ltd., Mumbai. This database provides a comprehensive and reliable collection of financial and operational data for a wide range of Indian companies, ensuring accurate and credible financial insights. To assess financial efficiency, key financial ratios have been employed, including the Trade Receivable Turnover Ratio, Cash Turnover Ratio, Fixed Assets Turnover Ratio, and Inventory Turnover Ratio. The Trade Receivable Turnover Ratio measures how efficiently a company collects its receivables from customers, calculated as the ratio of net credit sales to average trade receivables. A higher ratio indicates effective credit and collection policies, whereas a lower ratio may suggest inefficiencies in receivables management. The Cash Turnover Ratio evaluates how efficiently cash is utilized in generating revenue, derived from net sales divided by average cash and cash equivalents. A high ratio signifies effective cash management, while a low ratio indicates inefficient utilization or excessive cash holding. The Fixed Assets Turnover Ratio assesses the efficiency of fixed asset utilization in revenue generation, calculated as net sales divided by average net fixed assets. A higher ratio implies optimal asset utilization, whereas a lower ratio may indicate underutilization or inefficiencies. Similarly, the Inventory Turnover Ratio measures inventory management efficiency by comparing the cost of goods sold (COGS) to average inventory. A high ratio suggests effective inventory management, whereas a low ratio may indicate overstocking or slow-moving inventory. The study follows a structured methodology, starting with data collection from the Capitaline Corporate Database, followed by data processing where financial ratios are computed using standard accounting formulas. The analysis phase involves evaluating trends in financial efficiency across companies and sectors, and finally, the interpretation phase derives meaningful conclusions on financial performance and operational efficiency. To examine financial efficiency in the Indian cement sector, 15 cement companies were selected based on their market capitalization, financial stability, and operational scale. These include UltraTech Cement Ltd., Shree Cement Ltd., Ambuja Cements Ltd., ACC Ltd., Dalmia Bharat Ltd., Ramco Cements Ltd., JK Cement Ltd., India Cements Ltd., Orient Cement Ltd., HeidelbergCement India Ltd., Prism Johnson Ltd., Birla Corporation Ltd., Sagar Cements Ltd., Nuvoco Vistas Corporation Ltd., and Star Cement Ltd. This selection comprises a mix of large-cap, mid-cap, and small-cap firms, providing a diverse sample for assessing financial efficiency in the industry. The study aims to identify industry trends and compare financial efficiency across different firms, offering valuable insights into the financial health and operational effectiveness of cement companies in India.

3. Results

3.1 Trade receivable turnover ratio

In the financial year 2022-23, Ultratech recorded a value of 18.23 compared to 18.64 in 2021-22 (**Table S1 and Fig. 1 and 2**). Grasim Industries saw an increase from 19.59 in 2021-22 to 20.74 in 2022-23. Ambuja Cement experienced a decline, moving from 45.80 in 2021-22 to 35.13 in 2022-23. Shree Cement also showed a decrease from 20.45 in 2021-22 to 17.85 in 2022-23. ACC Cement recorded 26.69 in 2022-23, lower than 28.24 in the previous year. Dalmia, however, saw an increase from 18.63 in 2021-22 to 21.41 in 2022-23. JK Cement slightly increased from 20.27 in 2021-22 to 21.44 in 2022-23. Ramco Cement showed improvement, rising from 16.52 in 2021-22 to 20.00 in 2022-23. Nuvoco saw a slight decline from 17.35 in 2021-22 to 16.10

in 2022-23. JK Lakshmi Cement recorded a significant rise from 120.84 in 2021-22 to 126.85 in 2022-23. India Cement recorded a slight decrease, moving from 6.50 in 2021-22 to 6.39 in 2022-23. Star Cement saw an increase from 17.06 in 2021-22 to 23.17 in 2022-23. Heidelberg showed a marginal increase from 62.66 in 2021-22 to 62.94 in 2022-23. Orient Cement, however, saw a decline from 25.88 in 2021-22 to 21.23 in 2022-23. In the financial year 2020-21, Ultratech recorded a value of 18.05 compared to 16.41 in 2019-20, while Grasim Industries saw an increase from 10.94 to 15.08. Ambuja Cement experienced significant growth from 30.09 to 49.09, and Shree Cement also showed an increase from 12.23 to 19.36. ACC Cement recorded a rise from 25.58 to 35.36, while Dalmia grew from 14.92 to 16.77. JK Cement saw a slight decline from 22.11 to 21.00, whereas Ramco Cement improved from 10.59 to 11.71. Nuvoco experienced a slight decrease from 13.50 to 12.99, while JK Lakshmi Cement recorded significant growth from 42.43 to 62.86. India Cement saw a minor decline from 7.00 to 6.94. Star Cement experienced a slight drop from 13.86 to 13.55, while Heidelberg showed a decline from 85.10 to 71.76. On the other hand, Orient Cement increased from 15.21 to 18.88, and Sagar Cement also recorded notable growth from 9.80 to 14.06.

The financial performance of cement companies in India during 2018-19 compared to 2017-18 exhibits a dynamic trend influenced by multiple economic and industry-specific factors. Several companies demonstrated positive growth, such as Ultratech Cement with an increase from 16.03 to 16.62, ACC Cement rising from 19.31 to 20.96, Ramco Cement improving from 9.19 to 11.07, Nuvoco growing from 14.66 to 15.42, JK Lakshmi Cement increasing from 40.22 to 40.85, and Star Cement moving up from 11.46 to 12.62, suggesting efficient operational management and favorable market conditions. However, a notable decline was observed in companies such as Grasim Industries, which dropped from 13.89 to 12.98, Ambuja Cement declining from 23.29 to 22.84, Shree Cement falling significantly from 25.58 to 16.93, Dalmia decreasing from 19.64 to 17.82, JK Cement reducing from 22.94 to 21.33, India Cement dropping from 9.30 to 8.30, Heidelberg Cement experiencing a sharp decline from 125.13 to 96.71, Orient Cement falling from 19.06 to 16.09, and Sagar Cement decreasing from 14.81 to 13.21. The sharpest decline was recorded by Heidelberg Cement, followed by Shree Cement, indicating potential challenges in demand, cost structures, or supply chain disruptions. These variations can be attributed to macroeconomic factors such as fluctuations in infrastructure investment, changes in raw material costs, particularly limestone, coal, and gypsum, government policies on construction and industrial development, and overall market demand. The decline in some companies' performance may also be linked to regional economic conditions, environmental regulations, and competitive pressures within the industry. The results underscore the need for strategic adaptation, cost optimization, and innovation to maintain resilience in the highly competitive cement sector.

The financial performance of cement companies in India for the given years reflects varying trends influenced by market conditions, cost factors, and strategic business decisions. Several companies demonstrated growth, indicating strong market demand, operational efficiency, and competitive positioning. Ultratech Cement showed a slight decline from 15.83 to 15.55, while Grasim Industries also saw a minor decrease from 13.64 to 13.39. Ambuja Cement experienced a significant drop from 37.76 to 27.26, while Shree Cement, in contrast, grew from 20.50 to 29.11. ACC Cement saw a slight reduction from 24.61 to 23.68, and Dalmia declined from 14.82 to 12.51. JK Cement remained relatively stable, shifting marginally from 22.49 to 22.52. Ramco Cement declined from 9.71 to 8.92, while Nuvoco witnessed strong growth from 9.65 to 13.13. JK Lakshmi Cement experienced a decrease from 38.40 to 35.14, while India Cement recorded a slight increase from 10.28 to 10.82. Star Cement showed improvement from 4.65 to 5.29, and Heidelberg Cement recorded a substantial increase from 85.34 to 104.48. Orient Cement grew from 20.65 to 23.34, and Sagar Cement remained relatively stable, moving from 13.61 to 13.43. The fluctuations in performance can be attributed to factors such as raw material price volatility, infrastructure development, government policies, and industry competition. Companies that improved their financial performance likely benefited from operational efficiencies, cost control measures, and favorable market demand, while those that declined may have faced challenges such as increased production costs, weak demand, or competitive pressures. These variations emphasize the need for strategic adaptation, cost optimization, and innovation to sustain growth in the evolving cement industry.

The financial performance of cement companies in India for the given years highlights a mix of growth and decline, influenced by industry trends, operational efficiency, and market dynamics. Companies such as Ultratech Cement with 16.65 compared to 16.21 in the previous year, Grasim Industries with 14.14 compared to 13.90, Dalmia with 17.11 compared to 15.94, JK Lakshmi Cement with 45.34 compared to 43.01, India Cement with 11.67 compared to 12.06, Heidelberg Cement with 76.28 compared to 46.30, and Orient Cement with 24.69 compared to 23.84 showed positive growth, reflecting strong demand, efficient cost management, and strategic market positioning. However, others experienced a decline, including Ambuja Cement with 41.31 compared to 48.25, Shree Cement with 18.57 compared to 21.41, ACC Cement with 29.59 compared to 32.46, JK Cement with 27.22 compared to 28.34, Ramco Cement with 12.26 compared to 13.94, Nuvoco with 16.81 compared to 16.93, Star Cement with 6.78 compared to 9.91, and Sagar Cement with 11.92 compared to 11.03, possibly due to increased raw material costs, fluctuating demand, or competitive pressures. Heidelberg Cement demonstrated the most significant increase, rising from 46.30 to 76.28, suggesting improved operational performance or favourable market conditions, while Ambuja Cement recorded a noticeable decline. These variations underscore the impact of macroeconomic factors, government policies, and industry-specific challenges on company performance, emphasizing the need for strategic adaptability and cost-efficient operations to maintain competitiveness in the evolving cement market.

3.2 Cash turnover ratio

In the financial year 2022-23, Ultratech recorded a significant increase in performance with a value of 83.83 compared to 44.45 in 2021-22 (**Table S2 and Fig. 1 and 2**), indicating strong growth and improved efficiency. Grasim Industries also showed notable improvement, rising from 22.28 in 2021-22 to 33.77 in 2022-23. Ambuja Cement experienced an increase from 2.48 to 5.31, reflecting a positive trend. Shree Cement witnessed a substantial jump from 30.08 in 2021-22 to 79.24 in 2022-23, highlighting enhanced market demand and operational effectiveness. ACC Cement also demonstrated remarkable growth, moving from 3.24 in 2021-22 to 12.25 in 2022-23. However, Dalmia saw a slight decline from 71.46 to 68.73, indicating some challenges in its financial performance. JK Cement nearly doubled its value, increasing from 11.06 in 2021-22 to 22.86 in 2022-23, reflecting improved sales or operational efficiencies. Ramco Cement recorded an increase from 37.25 in 2021-22 to 46.77 in 2022-23, showing steady growth. Nuvoco showed an impressive surge from 27.43 in 2021-22 to 62.89 in 2022-23, suggesting strong demand and business expansion. JK Lakshmi Cement also improved, rising from 11.47 to 17.06, while India Cement experienced a notable decline from 112.41 in 2021-22 to 63.78 in 2022-23, indicating potential operational or market challenges. Star Cement, too, recorded a decrease from 13.10 to 7.34, suggesting a drop in demand or increased competition. Heidelberg Cement saw a slight dip from 5.65 in 2021-22 to 4.63 in 2022-23. Orient Cement experienced a decrease from 76.88 to 55.22, while Sagar Cement demonstrated growth, rising from 8.17 to 12.87. These financial results reflect the dynamic nature of the cement industry, where companies face fluctuations based on factors such as market demand, raw material costs, operational efficiencies, and broader economic conditions.

In the financial year 2020-21, Ultratech experienced a decline in performance, dropping from 66.32 in 2019-20 to 35.11, suggesting potential operational challenges or market fluctuations. Grasim Industries also witnessed a decline, moving from 24.04 in 2019-20 to 16.72 in 2020-21. Ambuja Cement showed a slight increase from 2.68 to 2.81, reflecting stable performance. Shree Cement recorded a decrease from 24.43 in 2019-20 to 20.51 in 2020-21. ACC Cement also experienced a marginal decline from 2.64 to 2.43, indicating consistent yet slow performance. Dalmia, on the other hand, showed substantial growth, rising from 28.62 in 2019-20 to 54.41 in 2020-21, reflecting improved operational efficiency or market demand. JK Cement saw a drop from 10.94 in 2019-20 to 7.37 in 2020-21. Ramco Cement declined from 57.04 to 44.47, highlighting a downturn in sales or efficiency. Nuvoco also recorded a decrease, moving from 21.38 in 2019-20 to 12.18 in 2020-21. JK Lakshmi Cement faced a massive drop from 167.27 to 23.37, indicating significant financial or market challenges. India Cement remained relatively stable, recording 108.30 in 2020-21 compared to 112.90 in 2019-20. Star Cement experienced a decline from 18.22 in 2019-20 to 12.86 in 2020-21. Heidelberg also showed a minor decrease from 5.37 to 4.69. Orient Cement dropped slightly from 80.11 in 2019-20 to 71.13 in 2020-21. Sagar Cement faced a sharp decline, moving from 44.38 in 2019-20 to 11.59 in 2020-21. These figures reflect the varying market conditions and company performances, with some companies growing despite challenges while others experienced significant downturns due to industry fluctuations, demand shifts, or operational inefficiencies.

In the financial year 2018-19, Ultratech saw remarkable growth, increasing from 25.11 in 2017-18 to 86.80, indicating strong operational performance and market expansion. Grasim Industries also improved, rising from 30.86 to 48.39, showing a positive growth trend. Ambuja Cement, however, recorded a slight decline from 4.11 to 3.43, suggesting a minor dip in efficiency or sales. Shree Cement experienced a sharp decline from 84.74 in 2017-18 to 44.82 in 2018-19, reflecting a potential slowdown in market demand or production. ACC Cement also witnessed a decline from 5.20 to 4.15, maintaining a relatively low turnover. Dalmia recorded a drop from 40.09 in 2017-18 to 24.09 in 2018-19, indicating financial or operational challenges. JK Cement showed slight growth, increasing from 10.00 to 10.81, demonstrating stable business operations. Ramco Cement, on the other hand, saw an increase from 36.87 to 48.01, reflecting stronger market performance. Nuvoco declined from 108.90 in 2017-18 to 86.31 in 2018-19, suggesting a downturn in efficiency or demand. JK Lakshmi Cement faced a significant drop from 330.98 to 270.78, which could indicate strategic shifts or operational difficulties. India Cement remained stable with a slight decline from 115.10 to 112.86. Star Cement saw a drastic fall from 289.53 in 2017-18 to 44.89 in 2018-19, reflecting major business challenges. Heidelberg also dropped from 16.68 to 7.76, showing signs of slowed market activity. Orient Cement, however, grew significantly from 48.90 to 86.38, indicating strong business strategies and improved performance. Lastly, Sagar Cement showed substantial growth, rising from 6.61 to 21.34, reflecting better operational management and increased sales. These fluctuations highlight the varied performance trends across companies, influenced by market conditions, operational efficiencies, and strategic business decisions.

In the financial year 2016-17, Ultratech experienced a significant decline from 19.07 in 2015-16 to 11.24, indicating potential operational or market challenges. Grasim Industries also saw a drop from 25.11 to 15.63, reflecting a similar downturn in performance. Ambuja Cement declined slightly from 5.42 to 4.37, suggesting a small dip in efficiency. Shree Cement, however, showed impressive growth from 28.23 to 88.53, demonstrating strong market expansion and demand. ACC Cement experienced a notable drop from 10.79 to 5.73, indicating a slowdown in turnover. Dalmia, on the other hand, recorded substantial growth from 11.12 to 37.38, showcasing improved business strategies and market reach. JK Cement showed a minor decline from 11.26 to 10.11, maintaining relative stability. Ramco Cement also saw a decline from 46.52 to 37.62, suggesting reduced sales or market penetration. Nuvoco, however, improved from 25.37 to 41.53, reflecting positive business performance. JK Lakshmi Cement experienced significant growth from 102.00 to 135.89, showing

strong financial health and expansion. India Cement, in contrast, saw a sharp decline from 227.62 to 140.10, indicating market or operational struggles. Star Cement grew slightly from 234.29 to 240.29, maintaining steady performance. Heidelberg experienced remarkable growth from 21.40 to 156.35, highlighting strong operational improvements. Orient Cement remained stable with a slight increase from 39.07 to 39.53. Sagar Cement also showed a small rise from 5.58 to 6.18, indicating gradual growth. These variations in turnover ratios reflect the different market dynamics, strategic changes, and operational efficiencies across the cement industry.

In the financial year 2014-15, Ultratech's trade receivable turnover ratio declined from 81.20 in 2013-14 to 67.70, indicating a slowdown in the efficiency of converting receivables into cash. Grasim Industries, however, showed improvement, increasing from 73.92 to 78.52, reflecting better credit management. Ambuja Cement recorded a slight drop from 4.16 to 3.57, maintaining a stable but low turnover ratio. Shree Cement experienced a decline from 36.96 to 27.65, suggesting a decrease in operational efficiency. ACC Cement, in contrast, demonstrated significant growth from 29.07 to 59.60, indicating better collection efficiency. Dalmia saw a sharp drop from 59.15 to 12.83, highlighting potential collection challenges. JK Cement recorded a slight improvement from 8.04 to 9.02, indicating marginally better performance. Ramco Cement experienced a decline from 81.13 to 67.53, reflecting reduced efficiency in receivables collection. Nuvoco also declined from 28.40 to 24.81, showing a small deterioration in turnover. JK Lakshmi Cement maintained relative stability, with an increase from 41.03 to 43.51. India Cement displayed a remarkable surge from 584.79 to 704.30, indicating a highly efficient receivables management system. Star Cement also showed strong growth from 292.76 to 307.85, reinforcing its financial strength. Heidelberg experienced an increase from 12.91 to 15.70, showing an improvement in collection efficiency. Orient Cement also improved from 18.06 to 25.65, reflecting better cash flow management. Sagar Cement, however, witnessed a drastic decline from 106.99 to 4.90, indicating severe collection challenges or a major shift in business operations. These changes in trade receivable turnover ratios across the cement industry indicate varying degrees of efficiency in managing receivables, operational challenges, and strategic financial planning among different companies.

3.3 Fixed assets turnover ratio

In the financial year 2022-23, Ultratech's Fixed assets turnover ratio increased slightly from 0.77 in 2021-22 to 0.86, indicating a modest improvement in its efficiency of converting receivables into cash (**Table S3 and Fig. 1 and 2**). Grasim Industries also saw an increase from 0.90 to 1.02, reflecting better credit management. Ambuja Cement, however, experienced a slight decline from 1.24 to 1.01, suggesting a slowdown in collections. Shree Cement showed marginal improvement, rising from 1.01 to 1.06. ACC Cement witnessed a sharp drop from 2.58 to 1.57, indicating challenges in receivables collection. Dalmia, on the other hand, significantly improved from 0.51 to 1.08, showing enhanced efficiency in credit management. JK Cement saw a slight increase from 0.92 to 0.95, maintaining stable performance. Ramco Cement increased from 0.52 to 0.61, reflecting better collections. Nuvoco showed minor improvement from 0.48 to 0.53. JK Lakshmi Cement, however, saw a notable decline from 1.14 to 0.58, indicating a slowdown in collections. India Cement exhibited strong growth from 0.58 to 1.17, demonstrating better credit recovery. Star Cement showed a drastic decline from 1.48 to 0.19, suggesting severe collection challenges. Heidelberg improved significantly from 1.02 to 1.57, indicating better financial control. Orient Cement remained stable, increasing slightly from 1.04 to 1.05. Sagar Cement also improved from 0.80 to 0.94, reflecting better efficiency. These variations in trade receivable turnover ratios highlight the differing financial strategies and credit management efficiency among cement companies.

In the financial year 2020-21, the Fixed assets turnover ratio for Ultratech saw a slight increase from 0.65 in 2019-20 to 0.67, indicating stable credit collection efficiency. Grasim Industries improved marginally from 0.69 to 0.75, while Ambuja Cement increased from 0.94 to 1.03, reflecting better credit management. Shree Cement showed notable growth, rising from 1.12 to 1.30. ACC Cement also improved, increasing from 1.43 to 1.59. Dalmia remained nearly stable, decreasing slightly from 0.51 to 0.50. JK Cement maintained its position at 0.84. Ramco Cement declined from 0.59 to 0.52, indicating slower collection efficiency. Nuvoco also experienced a decrease from 0.48 to 0.40. JK Lakshmi Cement saw a slight improvement from 1.00 to 1.03. India Cement declined from 0.62 to 0.53, showing weaker efficiency in receivables collection. Star Cement dropped significantly from 1.63 to 1.35. Heidelberg showed a slight decline from 1.00 to 0.96. Orient Cement saw a small drop from 0.91 to 0.88. Sagar Cement, however, improved from 0.72 to 0.87, indicating better collection efficiency. These variations highlight the diverse financial strategies and credit management performance among cement companies in 2020-21.

The fixed assets turnover ratio for cement companies in 2018-19 compared to 2017-18 shows mixed trends. Ultratech (0.88 to 0.77) and Grasim Industries (1.00 to 0.89) experienced slight declines, while Ambuja Cement remained stable at 1.08. Shree Cement saw a significant drop from 1.82 to 1.46, indicating slower collections, whereas ACC Cement remained constant at 1.70. Dalmia's ratio declined from 0.72 to 0.56, suggesting weaker receivable turnover. JK Cement (0.85 to 0.86), Ramco Cement (0.55 to 0.60), Nuvoco (0.49 to 0.53), JK Lakshmi Cement (0.96 to 1.03), India Cement (0.69 to 0.72), Star Cement (1.58 to 1.70), Heidelberg (0.94 to 1.01), and Orient Cement (0.97 to 0.99) all showed improvements, indicating better efficiency. However, Sagar Cement saw a slight decline from 0.94 to 0.92. While some companies, like Shree Cement and

Dalmia, faced a downturn, others, such as Star Cement and JK Lakshmi Cement, improved their trade receivable turnover, reflecting stronger collection management.

The fixed assets turnover ratio for cement companies in 2016-17 compared to 2015-16 reveals varying trends. Ultratech (0.92 to 1.04) and Grasim Industries (0.93 to 1.07) showed improvement, indicating better collection efficiency. Ambuja Cement declined from 1.31 to 1.09, while Shree Cement saw a significant rise from 1.32 to 2.27, reflecting faster receivable turnover. ACC Cement improved from 1.27 to 1.70, whereas Dalmia had a slight dip from 0.63 to 0.60. JK Cement remained relatively stable at 0.84 to 0.83, and Ramco Cement saw a minor increase from 0.56 to 0.58. Nuvoco experienced a steep decline from 1.12 to 0.46, suggesting weaker collections. JK Lakshmi Cement (0.81 to 0.95), India Cement (0.71 to 0.75), and Star Cement (1.07 to 1.16) improved, while Heidelberg (0.84 to 0.98) and Orient Cement (1.00 to 0.96) showed mixed results. Sagar Cement declined from 1.13 to 0.84. While companies like Shree Cement and ACC Cement displayed strong improvements, others such as Nuvoco and Sagar Cement saw a drop in efficiency.

The fixed assets turnover ratio for cement companies in 2014-15 compared to 2013-14 shows mixed trends. Ultratech (0.95 to 0.87) and Grasim Industries (0.95 to 0.87) experienced a slight decline, indicating slower collections. Ambuja Cement (1.00 to 0.91) and Shree Cement (1.02 to 0.92) also saw minor decreases, while ACC Cement (1.21 to 1.17) remained relatively stable. Dalmia (0.75 to 0.74) and Ramco Cement (0.63 to 0.60) showed slight dips, whereas JK Cement (1.10 to 0.99) and JK Lakshmi Cement (0.79 to 0.69) saw moderate declines. Nuvoco had a significant improvement from 1.27 to 1.62, reflecting better collection efficiency. India Cement (0.74 to 0.73) remained almost unchanged, while Star Cement (0.72 to 0.94) showed notable growth. Heidelberg improved from 0.68 to 0.75, and Orient Cement (1.31 to 1.39) also showed efficiency gains. Sagar Cement increased from 1.07 to 1.17, indicating better turnover. While some companies, like Nuvoco and Star Cement, saw significant improvements, others, such as Ultratech, JK Cement, and Grasim Industries, faced declines in their receivable turnover efficiency.

3.4 Inventory turnover ratio

The inventory turnover ratio for cement companies in 2022-23 compared to 2021-22 presents varied trends (**Table S4 and Fig. 1 and 2**). Ultratech saw a slight decrease from 10.94 to 10.36, while Grasim Industries also declined from 12.17 to 11.37. Ambuja Cement remained stable at 10.36 compared to 10.39. Shree Cement showed a drop from 7.13 to 6.79, whereas ACC Cement improved from 11.52 to 12.26, indicating better inventory management. Dalmia saw a decline from 14.19 to 13.22, suggesting slower inventory movement. JK Cement improved from 8.13 to 8.87, and Ramco Cement increased from 8.37 to 9.50. Nuvoco slightly improved from 11.56 to 11.63, while JK Lakshmi Cement saw a drop from 11.44 to 9.48. India Cement remained relatively stable at 6.89 compared to 6.74. Star Cement declined from 10.33 to 9.50, while Heidelberg showed a reduction from 13.76 to 12.85. Orient Cement faced a sharp decline from 17.21 to 11.70, indicating a significant slowdown in inventory movement. Sagar Cement also declined from 10.52 to 9.85. Overall, companies like ACC Cement, JK Cement, and Ramco Cement improved their turnover efficiency, while others such as Orient Cement, JK Lakshmi Cement, and Heidelberg experienced slowdowns.

The inventory turnover ratio for cement companies in 2020-21 compared to 2019-20 shows mixed trends. Ultratech improved from 10.25 to 10.91, while Grasim Industries increased from 9.82 to 11.72, indicating better efficiency. Ambuja Cement remained stable at 13.21 compared to 13.09. Shree Cement saw a significant rise from 7.18 to 9.93, reflecting faster inventory movement. ACC Cement improved from 13.49 to 14.85, while Dalmia showed strong growth from 9.38 to 12.14. JK Cement saw a slight increase from 8.83 to 9.13. Ramco Cement slightly declined from 8.92 to 8.49, and Nuvoco dropped from 11.44 to 10.51. JK Lakshmi Cement improved from 10.48 to 11.17, and India Cement remained relatively stable at 6.27 compared to 6.14. Star Cement showed minor growth from 6.90 to 7.00, while Heidelberg remained stable at 13.81 compared to 13.86. Orient Cement saw a slight rise from 12.28 to 12.61, and Sagar Cement had a significant increase from 9.08 to 13.42. Overall, ACC Cement, Dalmia, Shree Cement, and Sagar Cement showed the most improvement, while Nuvoco experienced a decline.

The inventory turnover ratio for cement companies in 2018-19 compared to 2017-18 reveals varying trends. Ultratech showed a slight increase from 11.25 to 11.30, while Grasim Industries improved from 11.30 to 11.95. Ambuja Cement increased from 9.62 to 10.72, reflecting better efficiency. Shree Cement showed a minor rise from 7.05 to 7.30, while ACC Cement significantly improved from 9.60 to 11.10. Dalmia experienced a substantial decline from 16.13 to 10.64, indicating slower inventory movement. JK Cement remained stable at around 8.67 compared to 8.73. Ramco Cement saw a rise from 8.06 to 9.20, while Nuvoco declined from 15.92 to 13.90. JK Lakshmi Cement improved from 11.41 to 12.20, and India Cement remained stable at 7.49 compared to 7.40. Star Cement dropped from 7.15 to 6.40, while Heidelberg remained relatively stable at 14.50 compared to 14.72. Orient Cement slightly declined from 15.83 to 15.27, and Sagar Cement dropped from 11.04 to 10.39. Overall, ACC Cement, Ambuja Cement, and JK Lakshmi Cement showed the most improvement, while Dalmia and Nuvoco experienced notable declines.

The inventory turnover ratio for cement companies in 2016-17 compared to 2015-16 highlights significant changes across various firms. Ultratech improved from 10.51 to 11.80, showing better efficiency, while Grasim Industries increased from 8.62 to 9.61. Ambuja Cement experienced a sharp decline from 14.98 to 10.94, indicating slower inventory movement. Shree Cement slightly declined from 9.52 to 9.07, whereas ACC Cement saw a small increase from 10.38 to 10.80. Dalmia Cement improved notably from 13.04 to 15.72, demonstrating

faster inventory turnover. JK Cement saw a minor increase from 8.44 to 8.83, while Ramco Cement improved from 7.72 to 8.13. Nuvoco showed a strong rise from 11.52 to 16.15, suggesting significant operational efficiency. JK Lakshmi Cement declined from 12.45 to 11.58, and India Cement remained almost stable at 8.37 compared to 8.50. Star Cement dropped from 11.08 to 8.38, indicating a slower turnover. Heidelberg Cement saw a notable increase from 10.38 to 12.60, while Orient Cement improved from 14.71 to 16.37. Sagar Cement, however, declined from 11.06 to 8.94. Overall, Nuvoco, Dalmia, and Heidelberg Cement showed the most improvement, while Ambuja Cement, Star Cement, and Sagar Cement experienced considerable declines.

The inventory turnover ratio for cement companies in 2014-15 compared to 2013-14 reveals interesting trends. Ultratech saw a slight increase from 9.52 to 9.91, while Grasim Industries experienced a marginal decline from 8.14 to 8.06. Ambuja Cement also declined slightly from 12.33 to 12.07. Shree Cement saw a notable decrease from 9.77 to 8.30, and ACC Cement also declined from 11.02 to 10.83. Dalmia Cement, however, improved from 10.59 to 11.13, indicating better efficiency. JK Cement increased from 6.41 to 7.25, and Ramco Cement improved from 6.18 to 6.95. Nuvoco showed significant growth from 12.85 to 14.75, while JK Lakshmi Cement experienced a sharp drop from 20.58 to 15.35. India Cement declined from 9.93 to 8.93, whereas Star Cement saw a notable improvement from 7.43 to 11.13. Heidelberg Cement also improved significantly from 6.64 to 9.73. Orient Cement, despite maintaining a high ratio, saw a decline from 21.27 to 20.04. Sagar Cement, on the other hand, improved from 10.49 to 12.20. Overall, Nuvoco, Star Cement, Heidelberg Cement, and Sagar Cement demonstrated strong improvements, while JK Lakshmi Cement, Orient Cement, and Shree Cement experienced significant declines.

4. Discussion

The Trade Receivable Turnover Ratio of Indian cement companies has shown mixed trends across financial years, reflecting differences in credit policies, collection efficiency, and market conditions. In 2022-23, Grasim, Dalmia, JK Cement, Ramco, Star Cement, and JK Lakshmi improved their receivables turnover, indicating stronger credit control and faster collections. However, Ambuja, Shree, ACC, Nuvoco, and Orient Cement saw declines, suggesting delayed collections or increased credit periods. Heidelberg maintained a high turnover, reflecting effective receivables management. In 2020-21, Ambuja, ACC, Shree, and JK Lakshmi Cement experienced significant improvements, while Heidelberg and Nuvoco declined. Orient and Sagar Cement showed positive growth, indicating better cash flow and credit efficiency. In 2018-19, Ultratech, ACC, Ramco, Nuvoco, and JK Lakshmi Cement saw improvements, while Shree, Dalmia, JK Cement, and Heidelberg declined, with Heidelberg experiencing the sharpest drop, possibly due to operational inefficiencies or market conditions. In 2016-17, Heidelberg recorded a significant increase, suggesting strong operational improvements, while Ambuja and Ramco Cement saw declines, indicating weaker collections or extended credit policies. Overall, companies like JK Lakshmi, Heidelberg, and ACC Cement have shown strong receivables management, while Ambuja, Shree, and Nuvoco Cement have exhibited fluctuations. These trends highlight the importance of credit control policies, customer payment behaviours, and market demand in determining financial efficiency within the cement sector.

The cash turnover ratio trends in the cement industry highlight significant fluctuations across companies over multiple financial years. In 2022-23, Ultratech saw a strong improvement from 44.45 to 83.83, reflecting higher efficiency, while Grasim Industries, Shree Cement, ACC Cement, JK Cement, Ramco Cement, and Nuvoco also recorded significant growth, indicating better operational effectiveness and market demand. However, Dalmia, India Cement, Star Cement, Heidelberg Cement, and Orient Cement saw declines, suggesting financial or operational challenges. In 2020-21, many companies, including Ultratech, Grasim, Shree Cement, and JK Cement, experienced declines due to market downturns, while Dalmia showed strong growth, suggesting efficient operations. A similar pattern was seen in 2018-19, where Ultratech, Grasim, and Orient Cement grew, while Shree Cement, Dalmia, and ACC Cement faced declines. Earlier years, such as 2016-17 and 2014-15, reflected diverse trends—Shree Cement, JK Lakshmi, and Heidelberg recorded significant growth, whereas India Cement and Star Cement saw steep declines. The trade receivable turnover ratio also fluctuated, with India Cement and Star Cement excelling in 2014-15, while others, like Sagar Cement and Dalmia, struggled. Industry-wide fluctuations are influenced by market demand, operational efficiencies, and financial strategies. Ultratech, Shree Cement, and Nuvoco have shown consistent long-term improvements, while Dalmia, India Cement, and Star Cement have experienced volatility, indicating potential challenges. Strategic management, economic conditions, and competitive positioning play crucial roles in shaping financial performance. This analysis helps in assessing company stability, investment potential, and market trends within the cement sector.

The Fixed Assets Turnover Ratio in the cement industry has shown varied trends across companies and financial years, reflecting differences in efficiency, asset utilization, and financial strategies. In 2022-23, Ultratech, Grasim, Dalmia, JK Cement, Ramco, and Heidelberg improved their ratios, indicating better utilization of fixed assets, while ACC Cement, Ambuja, JK Lakshmi, and Star Cement faced sharp declines, suggesting operational inefficiencies. In 2020-21, Shree Cement, ACC Cement, and Ambuja showed growth, while Ramco, Nuvoco, and India Cement declined, reflecting differing collection and investment strategies. The industry showed stability with minor fluctuations across most companies. In 2018-19, JK Cement, Ramco, Star Cement, and JK Lakshmi improved, while Ultratech, Grasim, and Dalmia declined, suggesting a mix of strong

credit recovery for some and financial challenges for others. For 2016-17, Shree Cement and ACC Cement experienced notable improvements, while Nuvoco and Sagar Cement saw declines. The performance varied across the industry, with some companies leveraging assets efficiently while others struggled with declining returns. In 2014-15, Nuvoco, Star Cement, and Orient Cement showed strong efficiency gains, while Ultratech, Grasim, and JK Cement saw declines, reflecting differences in asset utilization. Overall, Ultratech, Shree Cement, and Heidelberg have demonstrated long-term resilience, while Dalmia, India Cement, and Star Cement have experienced volatility. The variations indicate that strategic investments, market demand, and operational efficiency play crucial roles in shaping the financial performance of cement companies.

The Inventory Turnover Ratio of cement companies has shown fluctuating trends across financial years, reflecting variations in inventory management and operational efficiency. In 2022-23, ACC Cement, JK Cement, and Ramco Cement improved their efficiency, while Ultratech, Grasim, Orient Cement, and Heidelberg experienced slowdowns, indicating slower inventory movement. In 2020-21, ACC Cement, Dalmia, Shree Cement, and Sagar Cement showed significant improvements, while Nuvoco and Ramco Cement declined, reflecting mixed efficiency across the industry. In 2018-19, ACC Cement, Ambuja Cement, and JK Lakshmi Cement demonstrated stronger performance, while Dalmia and Nuvoco saw notable declines, indicating operational challenges in inventory movement. In 2016-17, Nuvoco, Dalmia, and Heidelberg Cement improved their turnover efficiency, while Ambuja Cement, Star Cement, and Sagar Cement saw sharp declines, suggesting slower sales or excess inventory. In 2014-15, Nuvoco, Star Cement, Heidelberg Cement, and Sagar Cement improved significantly, while JK Lakshmi Cement, Orient Cement, and Shree Cement faced major slowdowns, reflecting weaker inventory management. Overall, ACC Cement, Nuvoco, and Dalmia Cement have shown strong long-term inventory turnover efficiency, while JK Lakshmi, Orient, and Star Cement have exhibited volatility. These trends highlight how inventory management strategies, market demand, and production efficiency impact the financial health of cement companies.

5. Conclusion

The financial performance of Indian cement companies varies significantly based on their efficiency in managing receivables, cash, assets, and inventory. The Trade Receivable Turnover Ratio highlights that companies like Grasim, Dalmia, and JK Lakshmi have demonstrated strong receivables management, leading to improved liquidity, while firms like Ambuja, Shree, and Nuvoco have shown fluctuations, suggesting potential inefficiencies in credit collection. The Cash Turnover Ratio trends indicate that efficient cash management is crucial for financial stability, with Ultratech, Grasim, and Shree Cement showing long-term improvements, reflecting strong operational efficiency and liquidity management. However, volatility in companies like Dalmia, India Cement, and Star Cement suggests financial challenges that may impact their ability to fund operations effectively. The Fixed Assets Turnover Ratio highlights asset utilization strategies across companies, where Ultratech, Shree Cement, and Heidelberg have exhibited long-term resilience in leveraging their assets efficiently. In contrast, fluctuations in Dalmia, India Cement, and Star Cement underscore the need for strategic capital allocation and operational improvements. Similarly, Inventory Turnover Ratio trends show that companies such as ACC Cement, Nuvoco, and Dalmia have managed their stock efficiently, while JK Lakshmi, Orient, and Star Cement have experienced volatility, indicating potential inefficiencies in inventory management. These findings reinforce the role of strategic financial planning, market demand, and operational efficiency in shaping a company's financial performance. This study provides a novel perspective by integrating multiple financial ratios to assess operational efficiency trends in the Indian cement sector, highlighting the impact of financial strategies on business sustainability. Its contribution lies in offering a comprehensive analysis that enables stakeholders to make informed investment and managerial decisions. Future study could explore the role of macroeconomic factors, industry regulations, and technological advancements in influencing financial performance, along with a comparative study of global cement companies to derive broader insights into best practices for financial efficiency and growth.

Fig. 1. Box plot representation of key financial ratios including Trade Receivable Turnover Ratio, Cash Turnover Ratio, Fixed Assets Turnover Ratio, and Inventory Turnover Ratio for 15 selected cement companies in India over the period from 2013 14 to 2022 23. The box plot illustrates the distribution, median, interquartile range, and potential outliers for each ratio.

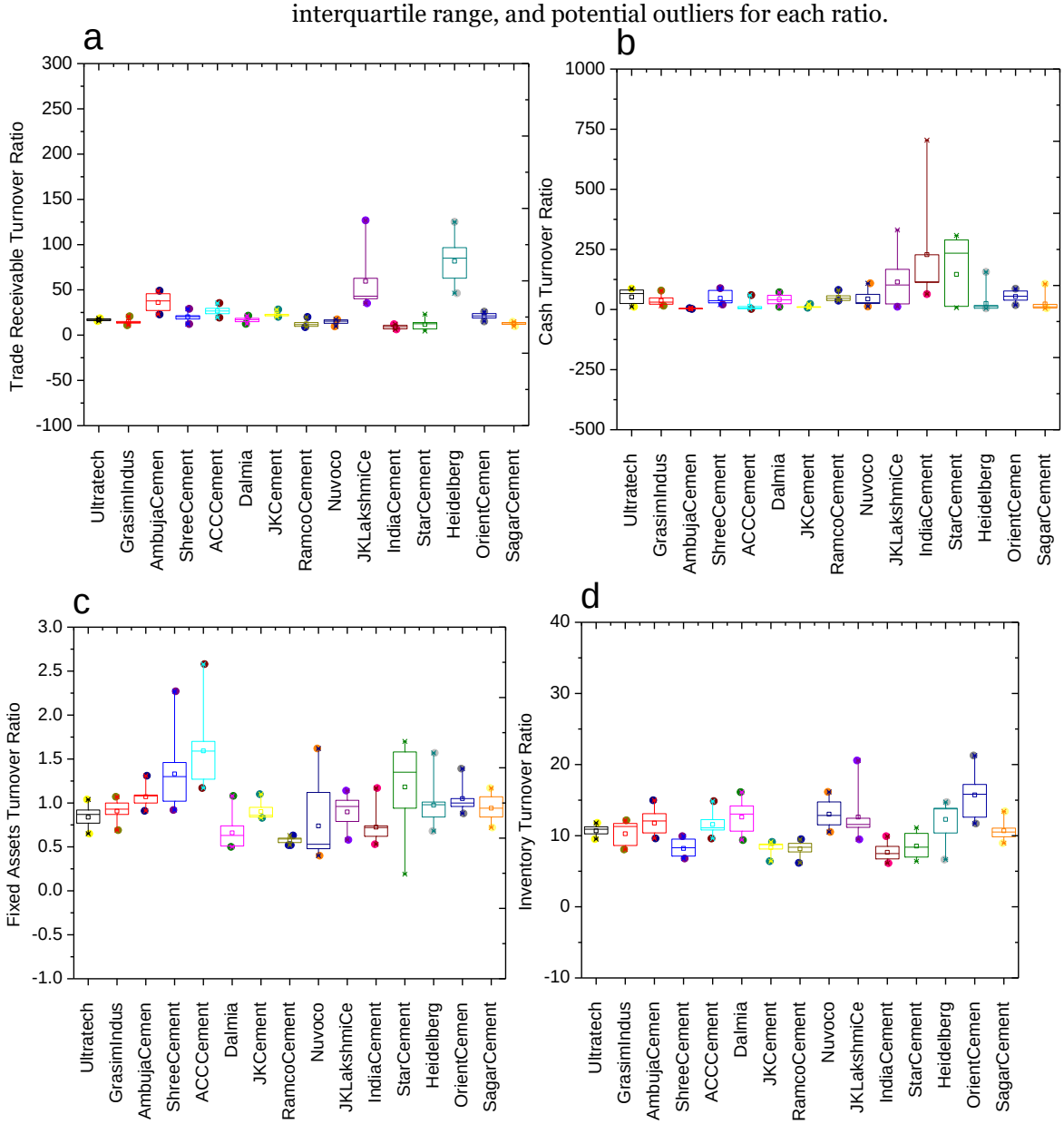

Fig. 2. Reliability and variability of financial ratios used to assess the ability of 15 Indian cement companies to meet current debt obligations without raising external capital.

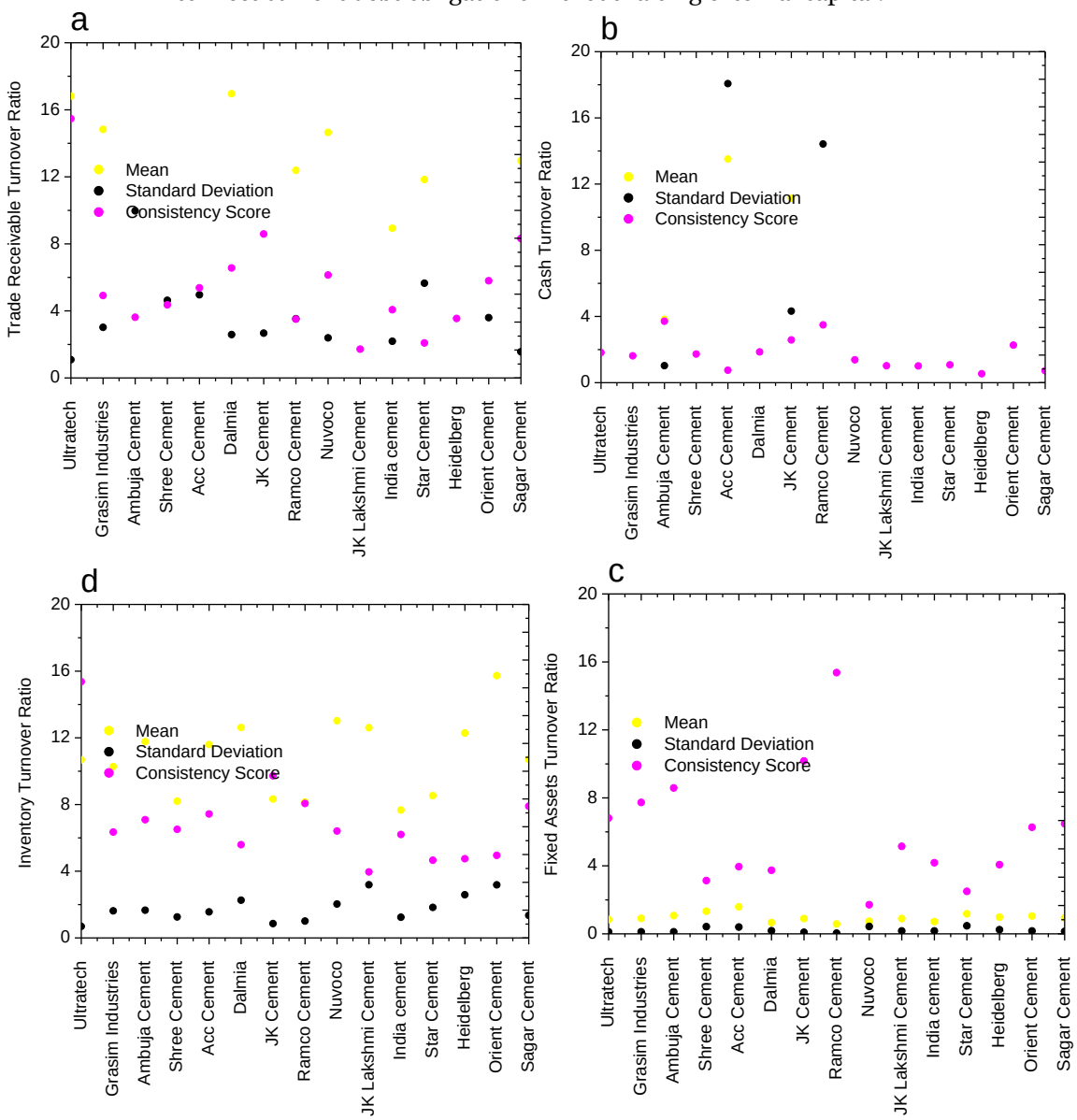

Table S1 Analysis of Trade Receivables Turnover Ratio of the Selected Companies

Company Year	2022-23	2021-22	2020-21	2019-20	2018-19	2017-18	2016-17	2015-16	2014-15	2013-14	Mean	S. D	C.S
Ultratech	18.23	18.64	18.05	16.41	16.62	16.03	15.55	15.83	16.65	16.21	16.82	1.09	15.47
Grasim Industries	20.74	19.59	15.08	10.94	12.98	13.89	13.39	13.64	14.14	13.90	14.83	3.02	4.92
Ambuja Cement	35.13	45.80	49.09	30.09	22.84	23.29	27.26	37.76	41.31	48.25	36.08	9.97	3.62
Shree Cement	17.85	20.45	19.36	12.23	16.93	25.58	29.11	20.50	18.57	21.41	20.20	4.63	4.36
ACC Cement	26.69	28.24	35.36	25.58	20.96	19.31	23.68	24.61	29.59	32.46	26.65	4.96	5.38
Dalmia	21.41	18.63	16.77	14.92	17.82	19.64	12.51	14.82	17.11	15.94	16.96	2.59	6.56
JK Cement	21.44	20.27	21.00	22.11	21.33	22.94	22.52	22.49	27.22	28.34	22.97	2.67	8.59
Ramco Cement	20.00	16.52	11.71	10.59	11.07	9.19	8.92	9.71	12.26	13.94	12.39	3.53	3.51
Nuvoco	16.10	17.35	12.99	13.50	15.42	14.66	13.13	9.65	16.81	16.93	14.65	2.39	6.14
JK Lakshmi Cement	126.85	120.84	62.86	42.43	40.85	40.22	35.14	38.40	45.34	43.01	59.59	34.69	1.72
India cement	6.39	6.50	6.94	7.00	8.30	9.30	10.82	10.28	11.67	12.06	8.93	2.19	4.07
Star Cement	23.17	17.06	13.55	13.86	12.62	11.46	5.29	4.65	6.78	9.91	11.84	5.65	2.09
Heidelberg	62.94	62.66	71.76	85.10	96.71	125.13	104.48	85.34	76.28	46.30	81.67	22.98	3.55
Orient Cement	21.23	25.88	18.88	15.21	16.09	19.06	23.34	20.65	24.69	23.84	20.89	3.60	5.80
Sagar Cement	13.81	13.95	14.06	9.80	13.21	14.81	13.43	13.61	11.92	11.03	12.96	1.56	8.32
Cement Industry											**25.16**	**7.03**	**5.61**

Table S2 Analysis of cash turnover ratio of the selected companies

Company Year	2022-23	2021-22	2020-21	2019-20	2018-19	2017-18	2016-17	2015-16	2014-15	2013-14	Mean	S. D	C.S
Ultratech	83.83	44.45	35.11	66.32	86.80	25.11	11.24	19.07	67.70	81.20	52.08	28.56	1.82
Grasim Industries	33.77	22.28	16.72	24.04	48.39	30.86	15.63	25.11	78.52	73.92	36.93	22.75	1.62
Ambuja Cement	5.31	2.48	2.81	2.68	3.43	4.11	4.37	5.42	3.57	4.16	3.83	1.03	3.71
Shree Cement	79.24	30.08	20.51	24.43	44.82	84.74	88.53	28.23	27.65	36.96	46.52	26.91	1.73
ACC Cement	12.25	3.24	2.43	2.64	4.15	5.20	5.73	10.79	59.60	29.07	13.51	18.07	0.75
Dalmia	68.73	71.46	54.41	28.62	24.09	40.09	37.38	11.12	12.83	59.15	40.79	21.97	1.86
JK Cement	22.86	11.06	7.37	10.94	10.81	10.00	10.11	11.26	9.02	8.04	11.15	4.32	2.58
Ramco Cement	46.77	37.25	44.47	57.04	48.01	36.87	37.62	46.52	67.53	81.13	50.32	14.42	3.49
Nuvoco	62.89	27.43	12.18	21.38	86.31	108.90	41.53	25.37	24.81	28.40	43.92	31.84	1.38
JK Lakshmi Cement	17.06	11.47	23.37	167.27	270.78	330.98	135.89	102.00	43.51	41.03	114.34	112.32	1.02
India cement	63.78	112.41	108.30	112.90	112.86	115.10	140.10	227.62	704.30	584.79	228.22	225.04	1.01
Star Cement	7.34	13.10	12.86	18.22	44.89	289.53	240.29	234.29	307.85	292.76	146.11	135.89	1.08
Heidelberg	4.63	5.65	4.69	5.37	7.76	16.68	156.35	21.40	15.70	12.91	25.11	46.49	0.54
Orient Cement	55.22	76.88	71.13	80.11	86.38	48.90	39.53	39.07	25.65	18.06	54.09	23.81	2.27
Sagar Cement	12.87	8.17	11.59	44.38	21.34	6.61	6.18	5.58	4.90	106.99	22.86	31.88	0.72
Cement Industry											59.32	49.69	1.70

Table S3 Analysis of fixed assets turnover ratio of the selected companies

Company Year	2022-23	2021-22	2020-21	2019-20	2018-19	2017-18	2016-17	2015-16	2014-15	2013-14	Mean	S. D	C.S
Ultratech	0.86	0.77	0.67	0.65	0.77	0.88	1.04	0.92	0.87	0.95	0.84	0.12	6.81
Grasim Industries	1.02	0.90	0.75	0.69	0.89	1.00	1.07	0.93	0.87	0.95	0.91	0.12	7.73
Ambuja Cement	1.01	1.24	1.03	0.94	1.08	1.09	1.09	1.31	0.91	1.00	1.07	0.12	8.58
Shree Cement	1.06	1.01	1.30	1.12	1.46	1.82	2.27	1.32	0.92	1.02	1.33	0.42	3.13
ACC Cement	1.57	2.58	1.59	1.43	1.70	1.70	1.70	1.27	1.17	1.21	1.59	0.40	3.95
Dalmia	1.08	0.51	0.50	0.51	0.56	0.72	0.60	0.63	0.74	0.75	0.66	0.18	3.74
JK Cement	0.95	0.92	0.84	0.84	0.86	0.85	0.83	0.84	0.99	1.10	0.90	0.09	10.17
Ramco Cement	0.61	0.52	0.52	0.59	0.60	0.55	0.58	0.56	0.60	0.63	0.58	0.04	15.37
Nuvoco	0.53	0.48	0.40	0.48	0.53	0.49	0.46	1.12	1.62	1.27	0.74	0.43	1.71
JK Lakshmi Cement	0.58	1.14	1.03	1.00	1.03	0.96	0.95	0.81	0.69	0.79	0.90	0.17	5.15
India cement	1.17	0.58	0.53	0.62	0.72	0.69	0.75	0.71	0.73	0.74	0.72	0.17	4.18
Star Cement	0.19	1.48	1.35	1.63	1.70	1.58	1.16	1.07	0.94	0.72	1.18	0.47	2.50
Heidelberg	1.57	1.02	0.96	1.00	1.01	0.94	0.98	0.84	0.75	0.68	0.98	0.24	4.07
Orient Cement	1.05	1.04	0.88	0.91	0.99	0.97	0.96	1.00	1.39	1.31	1.05	0.17	6.27
Sagar Cement	0.94	0.80	0.87	0.72	0.92	0.94	0.84	1.13	1.17	1.07	0.94	0.14	6.48
Cement Industry											0.96	0.22	5.99

Table S4 Analysis of inventory turnover ratio of the selected companies

Company Year	2022-23	2021-22	2020-21	2019-20	2018-19	2017-18	2016-17	2015-16	2014-15	2013-14	Mean	S. D	C.S
Ultratech	10.36	10.94	10.91	10.25	11.30	11.25	11.80	10.51	9.91	9.52	10.68	0.69	15.37
Grasim Industries	11.37	12.17	11.72	9.82	11.95	11.30	9.61	8.62	8.06	8.14	10.28	1.62	6.35
Ambuja Cement	10.36	10.39	13.21	13.09	10.72	9.62	10.94	14.98	12.07	12.33	11.77	1.66	7.09
Shree Cement	6.79	7.13	9.93	7.18	7.30	7.05	9.07	9.52	8.30	9.77	8.20	1.26	6.51
Acc Cement	12.26	11.52	14.85	13.49	11.10	9.60	10.80	10.38	10.83	11.02	11.59	1.56	7.43
Dalmia	13.22	14.19	12.14	9.38	10.64	16.13	15.72	13.04	11.13	10.59	12.62	2.26	5.59
JK Cement	8.87	8.13	9.13	8.83	8.67	8.73	8.83	8.44	7.25	6.41	8.33	0.86	9.72
Ramco Cement	9.50	8.37	8.49	8.92	9.20	8.06	8.13	7.72	6.95	6.18	8.15	1.01	8.06
Nuvoco	11.63	11.56	10.51	11.44	13.90	15.92	16.15	11.52	14.75	12.85	13.02	2.03	6.41
JK Lakshmi Cement	9.48	11.44	11.17	10.48	12.20	11.41	11.58	12.45	15.35	20.58	12.61	3.19	3.96
India cement	6.89	6.74	6.27	6.14	7.49	7.40	8.37	8.50	8.93	9.93	7.67	1.24	6.20
Star Cement	9.50	10.33	7.00	6.90	6.40	7.15	8.38	11.08	11.13	7.43	8.53	1.83	4.66
Heidelberg	12.85	13.76	13.81	13.86	14.50	14.72	12.60	10.38	9.73	6.64	12.29	2.59	4.75
Orient Cement	11.70	17.21	12.61	12.28	15.27	15.83	16.37	14.71	20.04	21.27	15.73	3.18	4.95
Sagar Cement	9.85	10.52	13.42	9.08	10.39	11.04	8.94	11.06	12.20	10.49	10.70	1.35	7.90
Cement Industry											10.81	1.76	7.00

Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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References

1. Ghaemi-Zadeh, N., & Eghbali-Zarch, M. (2024). Evaluation of business strategies based on the financial performance of the corporation and investors' behavior using D-CRITIC and fuzzy MULTI-MOORA techniques: A real case study. Expert Systems with Applications, 247, 123183.
2. Fu, C., Lu, L., & Pirabi, M. (2023). Advancing green finance: a review of sustainable development. Digital Economy and Sustainable Development, 1(1), 20.
3. Lee, C. C. (2023). Analyses of the operating performance of information service companies based on indicators of financial statements. Asia Pacific Management Review, 28(4), 410-419.
4. Alfina, K. N., Ratnayake, R. C., Wibisono, D., Basri, M. H., & Mulyono, N. B. (2024). Prioritizing Performance Indicators for the Circular Economy Transition in Healthcare Supply Chains. Circular Economy and Sustainability, 1-46.
5. Lee, C. C. (2023). Analyses of the operating performance of information service companies based on indicators of financial statements. Asia Pacific Management Review, 28(4), 410-419.
6. Sim, J., & Prabhu, V. V. (2022). The impact of credit risk on cash-bullwhip in supply chain. The Engineering Economist, 67(4), 266-287.
7. Baker, H. K., Kumar, S., & Singh, H. P. (2019). Working capital management: evidence from Indian SMEs. Small Enterprise Research, 26(2), 143-163.
8. Ahmad, N., Shah, F. N., Ijaz, F., & Ghouri, M. N. (2023). Corporate income tax, asset turnover and Tobin's Q as firm performance in Pakistan: Moderating role of liquidity ratio. Cogent Business & Management, 10(1), 2167287.
9. Boisjoly, R. P., Conine Jr, T. E., & McDonald IV, M. B. (2020). Working capital management: Financial and valuation impacts. Journal of Business Research, 108, 1-8.
10. Asiaei, K., Bontis, N., Alizadeh, R., & Yaghoubi, M. (2022). Green intellectual capital and environmental management accounting: Natural resource orchestration in favor of environmental performance. Business Strategy and the Environment, 31(1), 76-93.
11. Zopounidis, C., & Lemonakis, C. (2024). The company of the future: Integrating sustainability, growth, and profitability in contemporary business models. Development and Sustainability in Economics and Finance, 1, 100003.
12. Kraus, M., Feuerriegel, S., & Oztekin, A. (2020). Deep learning in business analytics and operations research: Models, applications and managerial implications. European Journal of Operational Research, 281(3), 628-641.
13. Škare, M., & Soriano, D. R. (2021). A dynamic panel study on digitalization and firm's agility: What drives agility in advanced economies 2009–2018. Technological Forecasting and Social Change, 163, 120418.
14. Akhtar, M., Yusheng, K., Haris, M., Ain, Q. U., & Javaid, H. M. (2022). Impact of financial leverage on sustainable growth, market performance, and profitability. Economic Change and Restructuring, 1-38.
15. Ochie, C., Nyuur, R. B., Ludwig, G., & Cunningham, J. A. (2022). Dynamic capabilities and organizational ambidexterity: New strategies from emerging market multinational enterprises in Nigeria. Thunderbird International Business Review, 64(5), 493-509.
16. Settembre-Blundo, D., González-Sánchez, R., Medina-Salgado, S., & García-Muiña, F. E. (2021). Flexibility and resilience in corporate decision making: a new sustainability-based risk management system in uncertain times. Global Journal of Flexible Systems Management, 22(Suppl 2), 107-132.
17. Ivanov, D. (2024). Cash flow dynamics in the supply chain during and after disruptions. Transportation Research Part E: Logistics and Transportation Review, 185, 103526.
18. Abid, N., Ceci, F., & Aftab, J. (2024). Attaining sustainable business performance under resource constraints: Insights from an emerging economy. Sustainable Development, 32(3), 2031-2048.
19. Khedr, A. M. (2024). Enhancing supply chain management with deep learning and machine learning techniques: A review. Journal of Open Innovation: Technology, Market, and Complexity, 100379.
20. Hannila, H., Kuula, S., Harkonen, J., & Haapasalo, H. (2022). Digitalisation of a company decision-making system: a concept for data-driven and fact-based product portfolio management. Journal of Decision Systems, 31(3), 258-279.

21. Zopounidis, C., & Lemonakis, C. (2024). The company of the future: Integrating sustainability, growth, and profitability in contemporary business models. Development and Sustainability in Economics and Finance, 1, 100003.
22. Bai, X., Han, J., Ma, Y., & Zhang, W. (2022). ESG performance, institutional investors' preference and financing constraints: Empirical evidence from China. Borsa Istanbul Review, 22, S157-S168.