THE JOURNAL OF RESEARCH REVIEW

P-ISSN: 3006-2632 | E-ISSN: 3006-2640
Vol. 2. No. 03 (July-Sept) 2025 | Page 121-133

Financial and Operational Performance Analysis of Pakistan's Chemical Sector an Evaluation Using Profitability and Efficiency Ratios

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Abstract: *Over the years 2018 to 2023, I reviewed the performance of 43 chemical companies in Pakistan to see how well they were doing both financially and operationally. I focused on four key measures: the factory overhead ratio, the share of revenue spent on raw materials, the net profit ratio, and the gross profit ratio. What stood out first was the consistency in net profit. On average, the net profit ratio hovered around 10.34%, which is impressive considering how unpredictable the economy has been in recent years. Looking through the companies' annual reports, it's clear that many of them managed to keep earnings stable even when conditions were far from ideal. The gross profit margins, however, told a different story. Since 2021, they've been in negative territory mostly a result of rising production costs and generally tougher market conditions. The proportion of income eaten up by raw materials also went up sharply. Across the period, the material cost ratio averaged 65.37%, and by 2023 it had climbed to nearly 79.7%. That suggests not only that inputs became more expensive, but also that some companies might not be running their operations as efficiently as they could. Factory overhead costs had a better year in 2020, but the improvement didn't last, and the numbers moved up and down over the rest of the period. The overall average settled at about 11.9%. All in all, while profitability across the group has held up surprisingly well, there are still big differences in how effectively these companies manage their core operations.*

Keywords: Profitability, Operating Efficiency, Financial Ratios, Chemical Sector, 43 Companies

Introduction

The chemical sector in Pakistan stands as a central pillar of the country's industrial framework, exerting a strong influence on its overall economic trajectory. It processes fundamental raw materials into a broad spectrum of essential goods from critical manufacturing inputs to everyday consumer items supporting growth across multiple industries. Its contribution is especially vital, as it supplies necessary inputs to key domestic sectors such as textiles, pharmaceuticals, agriculture, and construction, while also generating export earnings and contributing to foreign exchange inflows. Because these downstream industries are significant drivers of Pakistan's GDP, the financial health of the chemical sector has a clear and immediate impact on the wider economy. In recent years, however, the sector has encountered mounting challenges. Profitability and daily operations have been under pressure due to a mix of factors: a heavy reliance on imported feedstocks, unstable global commodity prices, rising energy costs, and a steadily depreciating currency. These issues became even more pronounced after

2020, pushing up production costs and weighing down gross profit margins (Bhutto, 2023). In such an environment, assessing the sector's financial condition becomes essential. Stakeholders from business leaders to policymakers and investors depend on such evaluations to spot problem areas, strengthen cost controls, and guide long-term, sustainable growth. The chemical sector is also one of the most established and diverse industries in Pakistan. According to the Chemicals Sector Study (2021), it accounts for about 4.5% of total exports but nearly 12% of all imports. The trade disparity reveals a core structural weakness heavy dependence on imported raw materials and intermediate chemicals. This reliance makes the sector highly susceptible to global price swings and fluctuations in currency exchange rates. The industry's estimated worth stands between Rs. 550 and Rs. 600 billion, while chemical imports contribute close to 17% of the nation's total import bill (Naz & Ijaz & Naqv, 2016).Even with this impressive output, local manufacturers often fall short of meeting the country's full demand. If the sector is to make a bigger contribution to national economic growth, there is a need for more resource focused industrial planning, stronger encouragement for local manufacturing, and a more deliberate push to cut reliance on imports. Studying the sector's performance through measures of profitability and operational efficiency is an important step in identifying where it excels and where there is room for improvement (Rida, 2011). At its simplest, profit is the amount a business retains after paying all its expenses from the revenue earned during a given period most often a financial year. Profitability ratios go a step further by relating these earnings to sales, assets, or shareholders' equity, providing a clearer picture of how effectively a company can generate returns. These ratios serve as important tools for company executives, investors, and financial institutions when making decisions and gauging a firm's overall stability. Healthy profit levels reassure lenders about the business's ability to meet interest and debt obligations, while shareholders and owners can anticipate achieving satisfactory returns on their investments. A finance manager, therefore, must consistently monitor and evaluate the company's performance in terms of profitability. Beyond profitability, a company's ability to manage its operations efficiently is crucial for sustaining long-term success (Kurniati and Pratama, 2022). One of the most widely applied measures for this purpose is the operating ratio, which compares overall operating costs with net sales to gauge cost efficiency in generating revenue. A lower ratio generally indicates stronger efficiency because it shows that the business is earning more revenue in relation to what it spends on operations (Ristyawan, 2019). On the other hand, a rising operating ratio can point to climbing expenses or weaker revenue generation both of which may prompt management to tighten cost controls in order to protect profits. This metric is often reviewed alongside measures such as Return on Assets (ROA) and Return on Equity (ROE) to develop a well-rounded understanding of a company's financial and operational position (Abdulkareem, 2021)

1. Literature review

Determinants of Capital Structure: A Case of Pakistan Chemical Industry, in this paper company has selected by convenience sampling has used to select the sample; the period of the study is 2006 to 2011. Size, profitability, tangibility, non-debt tax shield, growth in asset, liquidity and interest coverage ratio has used to analyse their linear relationship with capital structure (Rasheed & Mukhtar & Ishaq, 2022).The Influence of Profit Earning (PE) ratio in share price using the Earning per Share (EPS), Dividend per Share (DPS) and Profit Earning Ratio. Z-Stat, T-state and AIC test are used for analysis of impact of share price. The financial data used from 2013-2017. Results declared selected ratios are creating the smaller impact when comparing with other ratios (Attari & & Raza, 2012). Growth and Productivity Analysis of Chemical Industry in Tamilnadan, the main purpose of this paper is to analyse the growth and productivity in Chemical industry I Tamilnadan for the period of pre and post liberalization i.e. 1980-81 to 2001-02. The labour productivity was better and the capital productivity was low during pre and post liberalization. It is necessary that both public and private investment should be enhanced in chemical research and technology for sustaining productivity growth in the long run (Iqbal, Manzoor, Akhtar, & Amin, 2020). Profitability ratio creating the effect on the capitalization decision of industries in India. Return on Capital employed, earning per share, Dividend Payout Ratio,

Net Profit Margin, Return on Equity and return on net worth are considered as the variables which are influencing the capitalization of the company. The five-year data from 2009-2014 in the 23-infrastructure company has been used. The regression and correlation analysis done on the study. From that, it was understood there is a relationship in capitalization due to the variable of Return on capital employed and earnings per share (Iqbal e. , 2024). Productivity in Pakistan Chemical sector an intra sect oral analysis, in this study researcher divided the study period into two phases were pee reform period (1980-81 to 1990-91) and post reform period (1991-92 to 2001-02) such as a classification of period was essential to find the impact of economic reforms on the improvements of the total productivity. The study has been estimated the trend in growth of total productivity of Pakistan Chemical Industry at the sub-sect oral level and the study sources took from ASI and RBI publications. The study also estimated TFP (total-factor productivity) using Tran slog model. The result showed that TFPG (total-factor productivity growth) of drugs and pharmaceutical paints and varnishes Basic chemical and dyes and dyestuff industries are better in the period of post reform as the change is significance and the decline in extent of negative productivity growth. It suggested that while making policy decisions based on aggregates, the consideration of intra-sect oral variation would provide more decisions that are valuable (Bhutto, 2023). An Investigation of Financial Leverage Influences on the Financial Performance of Chemical Sector Listed Companies in Pakistan This study examines 18 listed chemical firms in Pakistan from 2018 to 2022, using a random-effects panel regression. It finds a significant negative relationship between financial leverage and profitability, while leverage shows no significant impact on Tobin's Q, asset turnover, or liquidity (Iqbal, Akhtar, & & Amin, 2020). Impact of Working Capital Management on Sustainable Growth and Profitability: Evidence from Chemical and Manufacturing Sectors of Pakistan Analysing data from 36 chemical firms, this study employs multiple regression to demonstrate that effective working capital management significantly improves both profitability and sustainable growth. The Determinants of Capital Structure of the Chemical Industry in Pakistan Exploring 26 firms listed on the Karachi Stock Exchange between 1993 and 2004, this pooled regression study finds that firm size, profitability, income variation, non-debt tax shields, and growth explain 90% of variations in leverage (Muhammad Rafiq, Iqbal & Atiq , 2008). The study confirms industry-specific determinants of capital structure. Analysing the Working Capital Management on Company's Performance: A Case Study of Chemical Sector Listed in KSE A six-year panel (2009–2014) of 22 chemical companies reveals that working capital efficiency, measured by receivables, inventory days and leverage, is negatively related to firm performance, indicating potential inefficiencies (Muthumurugan, Balamurugan, & & Elumalai, 2015). The Impact of Working Capital Management on Corporate Performance: A Study of Firms in Cement, Chemical and Engineering Sectors of Pakistan Using pooled OLS on data from 2007–2011, the study finds that average payment period is negatively correlated, and the cash conversion cycle is positively correlated with ROE, showing that effective working capital management significantly impacts financial performance (Malik & Bukhari, 2014). An Investigation into Efficiency of Working Capital by Chemical Firms in Pakistan This nine-year panel (State Bank data) examines multiple efficiency indices. Regression analysis shows that working capital is managed only satisfactorily, and its efficiency is declining over time, highlighting the need for stronger current asset policies (Shahid & Nouman, 2011).

Objectives of the study

- To evaluate the profitability performance and operating position of selected chemical companies in Pakistan.
- To evaluate financial performance of selected chemical companies in Pakistan.

2. Research Methodology

This study reviews the operational and financial outcomes of forty-three chemical companies in Pakistan for the years 2018–2023 using a quantitative research approach. Key financial ratios serve as the main performance measures, forming a structured basis for examining both profitability and

efficiency. The methodology involves calculating these ratios, applying statistical techniques, and conducting descriptive evaluations to draw meaningful conclusions about the sector's overall performance.

Research Design

This study employs a research design that blends descriptive and analytical approaches. It draws on secondary financial data rather than primary methods such as surveys or interviews. The descriptive component is used to highlight recurring trends and patterns over time, while the analytical element focuses on examining and interpreting differences in financial performance across the selected companies.

Population and Sample

The study's population includes all chemical companies listed on the Pakistan Stock Exchange (PSX) and with the key criterion being the availability of complete financial statements for the years 2018–2023.

Data Collection

The analysis draws solely on secondary data. Sources include the published annual reports of the selected chemical firms, together with their financial statement's income statements, balance sheets, and cash flow statements. Additional data was gathered from industry studies and official publications of the Pakistan Stock Exchange (PSX). The collected information covers key financial metrics such as net profit, sales, cost of goods sold, raw material consumption, and factory overhead costs, all of which are necessary for calculating the profitability and operational efficiency ratios examined in this study.

Analytical Framework and Ratios: - The financial performance of the companies is evaluated through the computation of four core ratios:

Variable Operationalization			
Name	**formula**	**Description**	**Reference**
Net Profit Ratio	**NPR= Net Profit x 100 / sale**	Measures the company's ability to convert revenue into net profit after all expenses. This ratio highlights overall profitability and operational effectiveness	(Rida, 2011). (Arshad, Hussain, & Shah Khan, 2022) (Naz & Ijaz & Naqv, 2016)
Gross Profit Ratio	**GPR= Gross Profit x 100 / sale**	Evaluates how efficiently a company generates profit after accounting for the cost of goods sold. A declining trend may indicate rising input costs or weak pricing strategies.	(Arshad, Hussain, & Shah Khan, 2022) (Attari & & Raza, 2012)
Material Cost Ratio	**MCR= Material Cost x 100 / sale**	Reflects the proportion of revenue consumed by direct material costs. This metric provides insight into procurement efficiency and raw material management	(Abrar, Raza, & Arshad, 2024) (Iqbal e. , 2024)
Factory Overhead Ratio	**FOR= Factory Expenses x 100 / sale**	Measures the percentage of indirect factory costs relative to total sales. This ratio highlights the efficiency of managing indirect production expenses.	(Rasheed & Mukhtar & Ishaq, 2022)

Statistical Tools and Analysis

The study uses a time-series approach to examine how each ratio changed annually between 2018 and 2023. Descriptive statistics covering the minimum, maximum, and average values are applied to summarize overall performance across the six years. Trend analysis is also conducted to determine whether the indicators for profitability and cost efficiency moved upward, declined, or remained stable during the study period.

Tools and Techniques

Microsoft Excel was used to compile, organize, and analyse the financial data. The software facilitated ratio computations, preparation of tables, and creation of graphical presentations. Its statistical functions were further applied to develop trend charts and calculate descriptive measures.

Rationale for Methodology

The chosen method allows for a detailed evaluation of financial performance, addressing both profitability and operational efficiency. Through ratio analysis, it becomes possible to observe changes in performance over time and identify the main cost elements that shape profitability. Using secondary data strengthens the reliability and comparability of the results, as the information is drawn from audited financial statements and other verified official sources.

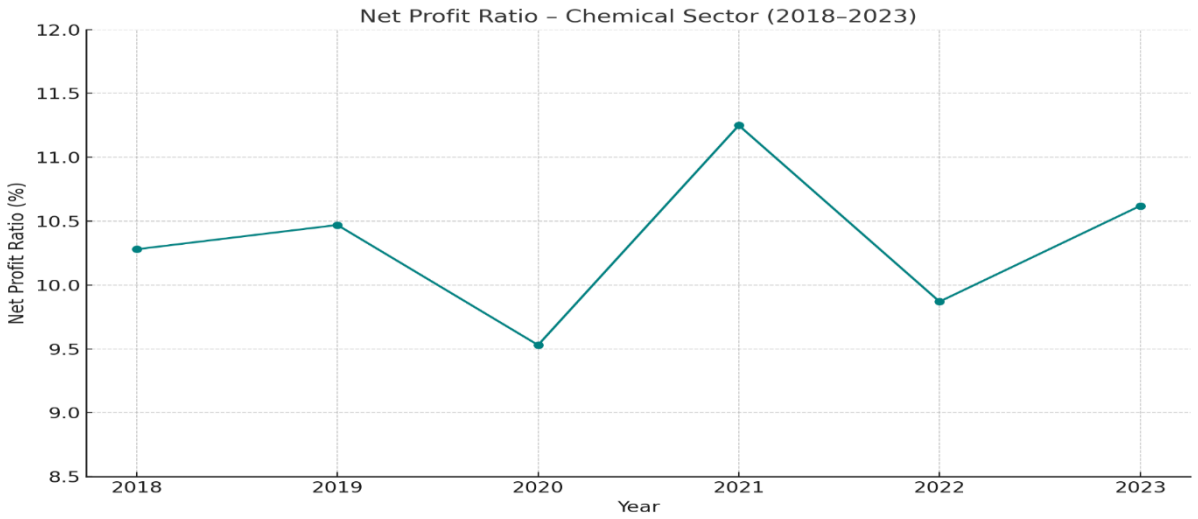
3. Results

Profitability Rations

Year	Net Profit (Rs. in '000)	Sales (Rs. in '000)	Net Profit Ratio (%)	Trend (%)
2018	486,058	4,728,613	10.28	100
2019	547,341	5,226,952	10.47	101.9
2020	665,852	6,987,482	9.53	92.7
2021	738,806	6,568,555	11.25	109.4
2022	791,220	8,015,183	9.87	96.01
2023	889,861	8,383,057	10.62	103.3
Min	486,058	4,728,613	9.53	–
Max	889,861	8,383,057	11.25	–
Average	686,857	6,651,807	10.34	–

(Sources: From Annual Report of Chemicals Industry in Pakistan from the year 2018 to 2023)

Graphical Presentation .1



The table and graph present the net profit ratio trends for Pakistan's chemical sector over the years 2018–2023. During this period, the ratio showed only modest variation, maintaining a generally steady performance. The lowest value, 9.53%, was recorded in 2020, while the highest, 11.25%, occurred in 2021, marking the most profitable year in terms of converting sales into bottom-line earnings. Across the six-year span, the average net profit ratio stood at 10.34%, a level that reflects solid overall profitability for the sector. Despite external pressures, including the global pandemic's disruptions in 2020, the graph illustrates a consistent ability to keep revenues and expenses in balance, underscoring the sector's resilience.

Gross Profit Ratio

Year	Sales (Rs. in '000)	Cost of Sales (Rs. in '000)	Gross Profit (Rs. in '000)	Gross Profit Ratio (%)
2018	4,728,613	3,860,591	868,022	18.36%
2019	5,226,952	4,472,153	754,799	14.44%
2020	6,987,482	5,640,125	1,347,357	19.28%
2021	6,568,555	7,155,468	-586,913	-8.94%
2022	8,015,183	9,766,177	-1,750,994	-21.85%
2023	8,383,057	12,148,514	-3,765,457	-44.92%

(Sources: From Annual Report of Chemicals Industry in Pakistan from the year 2018 to 2023)

Graphical Presentation .2

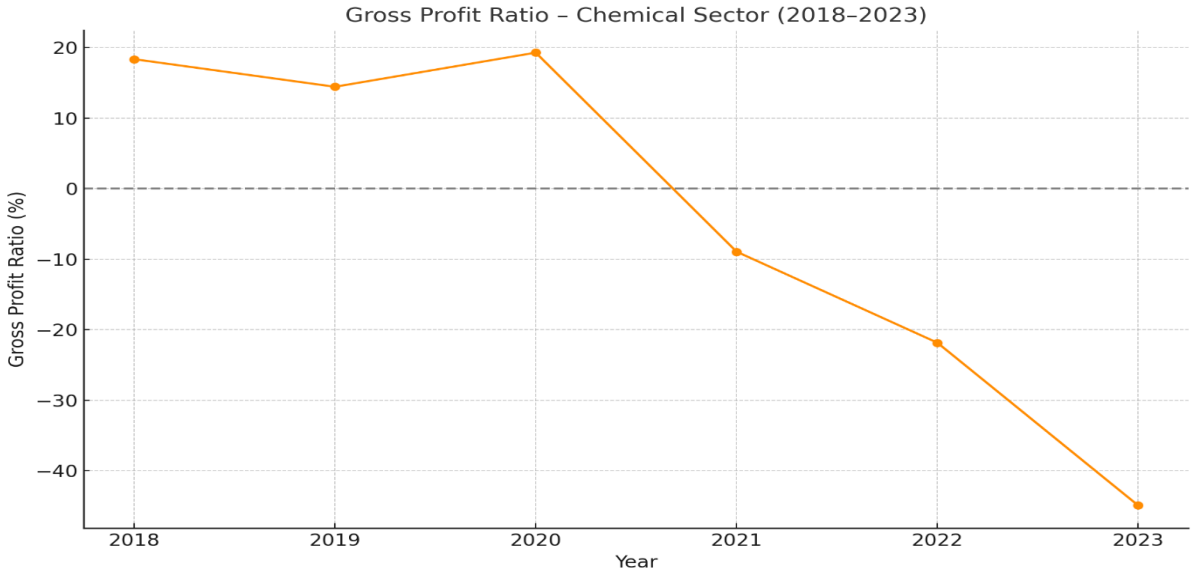


Table No. 2, along with the related graph, illustrates the movement of the gross profit ratio between 2018 and 2023. Over this period, the ratio shifted noticeably, with some years showing profitability and others reflecting losses. The peak performance came in 2020 at 19.28%, suggesting strong management of production costs and a well-positioned pricing approach. At the opposite end, 2023 recorded the lowest value of –44.92%, indicating that the cost of sales had risen sharply in relation to revenue. The overall average for the six-year period stood at approximately –3.27%, pointing to persistent cost pressures that became more pronounced in the later years. The steep decline into negative margins from 2021 onward signals significant operational challenges or unfavourable market conditions that severely

eroded profitability.

Operating Ratios

Year	Material Consumed (Rs. in '000)	Sales (Rs. in '000)	Material Cost Ratio (%)	Trend (%)
2018	2,849,910	4,728,613	60.25	100.00
2019	3,493,625	5,226,952	66.83	110.90
2020	3,077,778	6,987,482	44.06	73.13
2021	4,096,643	6,568,555	62.37	103.51
2022	6,334,964	8,015,183	79.03	131.21
2023	6,678,308	8,383,057	79.68	132.30
Minimum	2,849,910	4,728,613	44.06	—
Maximum	6,678,308	8,383,057	79.68	—
Average	4,421,038	6,651,973	65.37	—

(Sources: From Annual Report of Chemicals Industry in Pakistan from the year 2018 to 2023)

Graphical Presentation.3

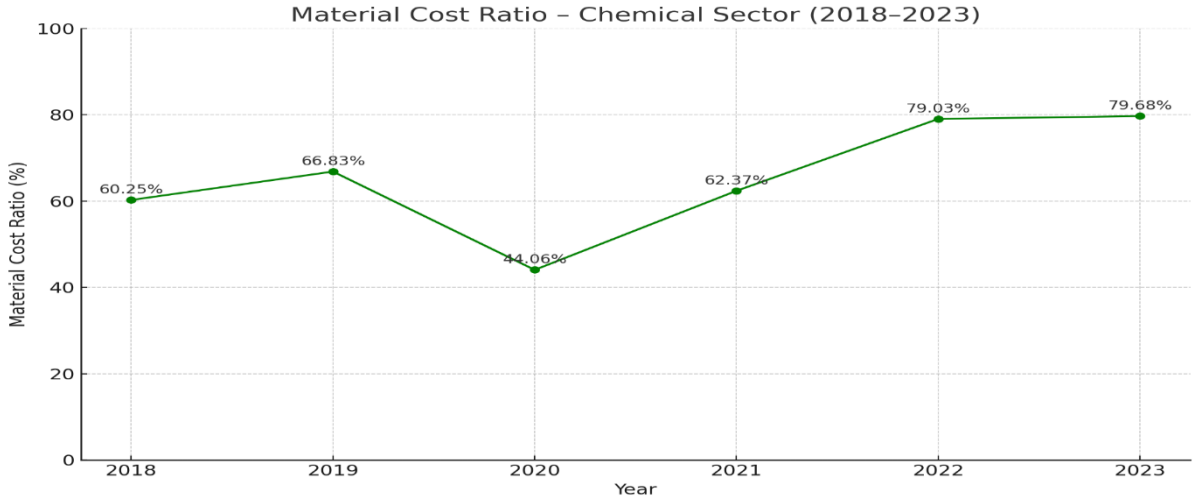


Table No. 3 shows the movement of the material cost ratio for the period 2018–2023. The figures reveal year-to-year changes, reflecting differences in how efficiently raw materials were managed in relation to sales. The peak ratio of 79.68% in 2023 indicates that material costs claimed the largest portion of sales revenue during the period, pointing to significant cost pressure. In contrast, the lowest value, 44.06% in 2020, suggests a year of stronger cost control and better utilization of materials relative to revenue generation. Over the six years, the ratio averaged about 65.37%, meaning that a large share of revenue was consistently spent on raw materials, particularly in the later years. The upward trend in recent years may be linked to higher raw material prices, reduced efficiency in production, or increased pricing constraints in the chemical sector.

Factory Overhead Ratio

Year	Factory Expenses (Rs. in '000)	Sales (Rs. in '000)	Factory O/H Ratio (%)	Trend (%)
2018	627,774	4,728,613	13.27	100
2019	644,105	5,226,952	12.32	92.84
2020	672,161	6,987,482	9.62	72.49

2021	802,795	6,568,555	12.22	92.07
2022	854,679	8,015,183	10.66	80.33
2023	948,285	8,383,057	11.31	85.22
Minimum Level	627,774	4,728,613	9.62	–
Maximum Level	948,285	8,383,057	13.27	–
Average Level	758,467	6,651,973	11.9	–

(Sources: From Annual Report of Chemicals Industry in Pakistan from the year 2018 to 2023)

Graphical Presentation.4

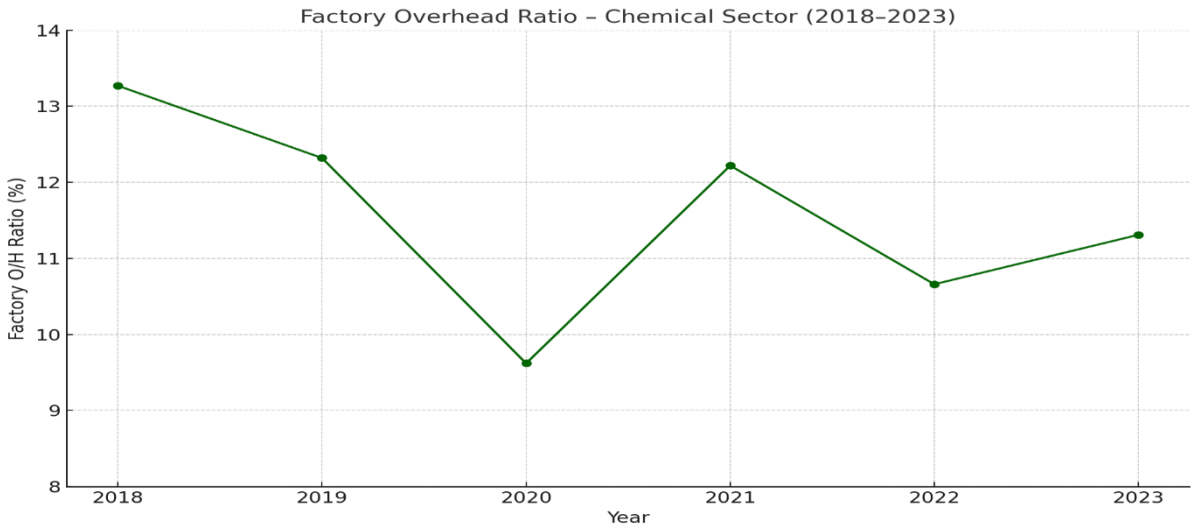


Table No. 4 summarizes the factory overhead ratio trends for the period 2018–2023. The figures show year-to-year variation in how much of sales revenue was spent on factory overheads. The peak value of 13.27% in 2018 indicates that indirect manufacturing costs claimed the largest share of revenue in that year. By contrast, the lowest point, 9.62% in 2020, reflects tighter cost management and greater operational efficiency. Across the six years, the ratio averaged 11.90%, meaning that, on average, close to 12% of sales income was directed toward covering these overhead expenses. The pattern suggests that fluctuations may have been influenced by changes in production scale, efficiency levels, or shifts in cost structures.

4. Findings

Net Profit Ratio

Net Profit Ratio establishes the relationship between net profit and total sales, and it indicates the management's efficiency in manufacturing, administration, pricing, and overall operations. The net profit ratio reflects how successfully a company transforms each rupee of sales into bottom-line earnings. A higher ratio not only points to strong cost control but also demonstrates the firm's resilience in navigating challenges such as rising production costs, economic headwinds, or reduced customer demand. In the Pakistan Chemical Sector, when we analyse the Net Profit Ratio over a six-year period (2018–2023), we observe that the ratio remained consistently in the range of 9.5% to 11.3%, showing financial resilience and operational efficiency. Examining the net profit ratio over the review period shows that 2021 was the standout year, reaching 11.25%. This reflects not only strong profitability but also disciplined cost control and effective resource management. It indicates that Pakistan's chemical companies bounced back well from the pandemic's disruptions, managing operations and pricing with notable efficiency. At the other end of the spectrum, 2020 recorded the lowest figure at 9.53%, a result that can be linked to the global economic slowdown, supply chain interruptions, and reduced industrial demand. Over the six-year span, the average net profit ratio was 10.34%, a solid level for a manufacturing-driven industry such as chemicals. Importantly, no year in the period posted a negative

result, highlighting the sector's ability to remain profitable even during adverse conditions. Overall, 2021 stands out as the most successful year for net profitability, combining cost efficiency, strong management strategies, and pricing stability. Even in 2020 — the most challenging year — the sector maintained a positive margin, a performance that underscores its resilience in the face of global economic uncertainty. Hence, based on Net Profit Ratio trends, the Pakistan Chemical Sector has shown strong consistency and resilience, placing it in a favourable position compared to other industries during the same period.

Gross Profit Ratio

The gross profit ratio expresses the share of net sales that remains after covering the direct cost of goods sold (COGS). It serves as a key measure of how effectively a business manages production costs in relation to its pricing approach. When this ratio is high, it usually means the company is producing goods at a lower cost or is able to maintain stronger selling prices. A low or negative ratio, on the other hand, can be a sign of escalating input costs, inefficiencies in the production process, or weaker demand in the marketplace. In the case of Pakistan's chemical sector, the gross profit ratio for the years 2018 to 2023 followed a mixed path but generally trended downward. Stronger margins were recorded in the earlier part of the period, while later years saw a gradual erosion that eventually turned negative. In 2018, the sector achieved a healthy and stable margin, pointing to solid control over production expenses and competitive market performance. The peak came in 2020, marking the most efficient year for cost management and pricing strength during the six-year span. This suggests that companies managed their resources, raw materials, and processes optimally. Starting in 2021, the gross profit ratio moved into negative figures, showing that production costs had overtaken sales revenue. This shift reflects a mix of pressures, including escalating raw material expenses, inflationary cost surges, disruptions in supply chains, and limits on the ability to adjust selling prices. The sharpest decline came in 2023, marking the most difficult year in terms of operational performance and market conditions. When margins fall this far, a company's ability to fund expansion, improve capacity, or withstand economic downturns can be seriously weakened. Gross profit ratio trends in this sector highlight both periods of strong operational control and warning signs of declining cost efficiency. The average gross profit ratio during the period was negative, which signals the need for companies to review their procurement strategy, production processes, and cost structures. Therefore, we can say: The year 2020 was the most favourable in terms of gross profitability, indicating that management strategies and production performance were most effective during that time. The years 2021 to 2023 reflect a need for financial restructuring and stronger cost control mechanisms. Overall, the Gross Profit Ratio shows that while the sector has the capacity for efficient performance, sustaining gross profitability requires tighter cost control and operational agility.

Material Cost Ratio

The material cost ratio represents the proportion of sales revenue used to cover the direct cost of raw materials in the manufacturing process. It is a valuable measure of how well a company controls its use of materials and manages input prices. A high ratio means that a large share of revenue is going toward material costs, which reduces the funds available for other expenses and profit. A lower ratio suggests better efficiency in material usage and stronger cost discipline. Across the selected chemical companies in Pakistan, the average material cost ratio for the period 2018–2023 was 65.37%, showing that a significant part of revenue was consistently absorbed by raw materials. The ratio varied from year to year, hitting its lowest point of 44.06% in 2020 and peaking at 79.68% in 2023. The low figure in 2020 points to a period of effective material management and possibly favourable procurement conditions. By contrast, the sharp rise in 2023 indicates mounting raw material costs or inefficiencies in usage, both of which would have eroded profit margins. Taken together, the evidence shows that 2023 was the least efficient year for managing raw material costs, while 2020 stood out as the most efficient. The high overall average of 65.37% reinforces the fact that more than half of sales revenue was routinely spent

on materials, leaving the sector exposed to fluctuations in input prices. The year 2020 stands out as the most efficient year in terms of material usage. The year 2023, with the highest ratio, reflects a period of poor material cost management or external inflationary impact. So, similar to how Himadri Speciality Chemical Limited had the highest Material Cost Ratio in your earlier example, in the case of the Pakistan chemical sector, the year 2023 recorded the highest average ratio of 79.68%, indicating the greatest pressure on profitability from material costs.

Factory Overhead Ratio

The Factory Overhead Ratio shows the proportion of sales revenue consumed by indirect factory expenses such as depreciation, repairs, utilities, and indirect labour. This ratio helps assess how efficiently a company is managing its non-material production costs. A higher factory overhead ratio indicates more spending on indirect costs, while a lower ratio reflects better control over overhead expenditures. In the Pakistan Chemical Sector, the average Factory Overhead Ratio for the selected period from 2018 to 2023 is as follows: On average, about 11.90% of total revenue was directed toward covering indirect factory costs during the review period. This share was not constant, ranging from a high of 13.27% in 2018 to a low of 9.62% in 2020. The elevated figure in 2018 points to heavier spending on factory-related overheads compared with sales, a situation that likely placed downward pressure on net profits. In contrast, the reduced ratio in 2020 signals better cost control and improved operational efficiency in managing these indirect expenses. Taken together, the figures identify 2018 as the year with the weakest performance in terms of overhead cost management. On the other hand, 2020 emerged as the most efficient year, with the lowest overhead burden relative to sales. Thus, based on the Factory Overhead Ratios of selected chemical companies in Pakistan: The average ratio of 11.90% suggests that a significant part of revenue is absorbed by factory overheads, which may limit profitability if not controlled. The year 2020 was the most favourable in terms of overhead efficiency. The year 2018 had the highest burden of factory overheads, making it the least efficient year. Therefore, just as Tata Chemicals Limited had the highest factory overhead ratio of 3.61% in your earlier example, in the Pakistan chemical sector, the overall factory overhead burden was considerably higher, with 13.27% in 2018, indicating the highest indirect cost pressure among all selected years.

5. Conclusion

Our detailed examination of Pakistani chemical firms' profitability and operating metrics (2018-2023) reveals net earnings remained remarkably consistent. Net profitability percentages showed minimal annual fluctuations, demonstrating widespread resilience across the sector. Most players successfully preserved earnings power throughout economic shifts and operational pressures. This earnings persistence implies that, despite varying efficiency levels between companies, the industry collectively achieved an equilibrium between income streams and expenditures. Such steadiness points to inherent sector robustness, even confronting increasing production expenses and marketplace volatility. Nevertheless, the prevailing uniformity underscores the critical need for operational efficiency gains to enhance growth potential and competitive positioning moving forward. This implies that the level of net profitability across the sector was uniform, and companies showed similar efficiency in managing their bottom-line earnings. gross profit margins, material expenditure shares, and factory overhead burdens paints a markedly different picture than net profitability. Sharp annual variations and significant company-level differences emerged across these three metrics. Consequently, the null hypothesis must be rejected for each, confirming that operational efficiency and cost discipline diverged substantially throughout the analysis period. Gross profit performance plummeted decisively in later years, signalling intensifying cost headwinds and unresolved operational bottlenecks. Material expenditure relentlessly consumed revenue, peaking in 2023 at an exceptionally high share – stark evidence of the sector's vulnerability to expensive inputs. Factory overhead costs proved volatile, reflecting inconsistent success in managing indirect production outlays. In essence, while net earnings demonstrated resilience, the uneven terrain of gross margins, raw material intensity, and overhead control highlights an imperative:

Companies must implement more rigorous cost governance, superior efficiency protocols, and smarter pricing frameworks. Firms mastering these operational levers will secure stronger defences for their profitability and competitive standing within this persistently demanding marketplace.

6. Future Research Directions

Based on the identified gaps, future studies can focus on:

Cross-Country Post-COVID Analysis

Prepare a comparative study of chemical manufacturing firms in Pakistan and India, covering the years 2018 to 2024. The purpose is to examine how differences in each country's economic policies and market structures have shaped company profitability and approaches to controlling production costs in the period following the COVID-19 pandemic.

Incorporating Macroeconomic Variables

Enhance the ratio analysis by factoring in key macroeconomic influences, including inflation trends, currency exchange rate swings, changes in interest rates, and fluctuations in energy prices. These variables can be integrated into econometric models to evaluate their combined and individual effects on both gross profit margins and net profit margins, offering a clearer picture of the forces shaping financial performance.

Dynamic Panel and Efficiency Models

Employ a mix of econometric and efficiency-assessment tools including fixed-effects and random-effects panel regression models, System GMM estimations, and Data Envelopment Analysis (DEA) to explore how profitability patterns persist over time and to pinpoint gaps in operational efficiency across different companies.

Sub-Sectoral Comparisons

Break down the chemical industry into its main sub-segments such as fertilizers, basic chemicals, and specialty chemicals to examine the unique cost structures and operational characteristics within each category.

Pass-Through and Pricing Power Analysis

Develop cost pass-through models to assess the extent to which rising raw material expenses are absorbed by producers or passed on to customers. This analysis can help explain why gross profit margins have fallen while net profit margins have remained relatively steady.

Structural Break and Regime-Switching Models

Apply break-point detection methods, such as the Chow test or Bai Perron multiple structural break test, to pinpoint significant changes in profitability trends. The focus will be on identifying shifts that took place in the periods surrounding the COVID-19 pandemic and during phases of elevated inflation.

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