



A comparative analysis of camel and financial ratios: Evidence from the Indian aviation industry

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Abstract

The paper makes a humble effort to analyse the comparative relationship between CAMEL ratios and traditional financial with a focus on Indian aviation sector in pre-COVID period. CAMEL is a multi-dimensional framework which was widely applied in banking sector. In this research an attempt has been made to extend the scope of the framework in capital intensive aviation sector for evaluating its Capital Adequacy, Asset Quality, Management Efficiency, Earnings, and Liquidity. The research further enhanced its scope by integrating CAMEL ratio with traditional measures of profitability, operational efficiency, solvency, and liquidity ratios to estimate the financial performance of three key airline companies of India: Jet Airways, Air India, and SpiceJet. Mean values and Coefficient of Variation (CV%) is utilised as the tool to determine absolute performance and consistency of select airline companies during 2004-05 to 2018-19. The current approach creates a meaningful linkage between CAMEL ratios and conventional financial ratios through correlation analysis, offering a robust framework which can assess the financial health of airlines as well as can also determine their resilience and stability. The results of the analysis will significantly help the investors, policymakers, and managers in evaluating financial performance, risk, and sustainability in the airline sector of India.

Keywords: CAMEL model, financial ratios, airlines, CV%, correlation analysis, Tukey's HSD

Introduction

Financial ratios have been widely and successfully used to evaluate and measure the performance of corporate entities by focussing on parameters like profitability, solvency, liquidity and efficiency. Although, these ratios provide valuable insights but at times fails to provide a multi-dimensional overview about the financial health of the organisation. To bridge this gap, the current study applies CAMEL framework along with traditional financial ratios to analyse the performance of three important airline companies of India, Air India, Jet Airways and Spice Jet. Previously CAMEL framework was particularly used in the banking sector for assessing institutional performance (Muralidhara & Lingam, 2017) ^[15]. With passage of time, CAMEL has been extensively applied to non-banking financial institutions, microfinance institutions, and insurance companies (Yakop, Yusop, Radam, & Ismail, 2012^[25]). However, its application to non-banking sectors, especially the capital-intensive and risk-prone airline industry, remains relatively underexplored. Prior research have extensively used financial ratios to study the volatile airline industry (Dhanda & Sharma, 2018^[6]). Yet, limited or no effort has been made to integrate CAMEL Ratios with conventional financial ratio analysis in this sector. Establishing the relationship between the two ratios will help us to reveal some specific financial indicators that can broaden the dimensions of financial sustainability. The study first applies the correlation analysis to explore the strength and direction of relationships between CAMEL components and financial ratios. Thereafter, Tukey's Honest Significant Difference (HSD) test is conducted to identify statistically significant differences among airlines. The

application of these combined approaches will not only validate the relationship between CAMEL and financial ratios but it will strengthen the process of performance evaluation, providing a holistic framework for the aviation sector.

Past Studies

The evaluation of the past literature shows that, financial performance of different sectors have extensively relied on financial ratio analysis and CAMEL models. Rao and Dutta (1998) ^[17] is one of the pioneers in application of the CAMEL model in India banks, developing 21 parameters to analyze nationalized banks. Their findings of the study highlighted important variations in inter-bank performance, and concluded that Corporation Bank as the best. Sisodiya *et al.* (2008) ^[22] analyzed 68 private and public sector banks across all CAMEL dimensions, demonstrating varying strengths and weaknesses across different components. Kumar *et al.* (2012) ^[10] has drawn-out a comparative framework over a period of 11-years, emphasizing relatively higher financial soundness of private banks over public sector banks. Jaffar and Manarvi (2011) ^[13] made a similar study on Islamic banks in Pakistan and found that conventional banks outperform in terms of capital adequacy and liquidity. However, recent researches have extended the scope of CAMEL ratios beyond banking industry. Yakob *et al.* (2012) ^[25] applied CAMEL Model to Malaysian Life Insurance Company and proposed it a superior alternative to traditional indicators like solvency margin. Aviation industry is volatile, where profitability and sustainability remain unstable due to operational and financial constraints, integrating CAMEL with financial ratios can enhance

performance evaluation and variability assessment. Composite measures using mean and coefficient of variation (CV%) allowed us to analyse both consistency and efficiency across airlines. By applying the CAMEL model to these aviation companies in the current study an effort has been taken to bridge a gap in literature and to apply CAMEL-based diagnostics to explore the financial soundness of this sector. Antoniou (1992) ^[1] highlighted the high profitability of international air carriers and contributed the success towards competent fleet management, high passenger load factors, and optimized capacity costs. Under similar logic, Singal (1998) ^[20] associated airline financial health to safety, and found a negative correlation between bond ratings and accident possibilities. In the Indian context, Hashim (2003) documented escalation in unit costs and a deterioration in productivity primarily due to ineffective fleet expansions, while Gayathridevi & Mallikarjunappa (2012) ^[10] predicted the sector's potential amidst financial fragility. Mahesh & Prasad (2012) ^[10] concentrated on the post-merger performance of the airline companies in India post 2008, and noted a mixed outcome in both profitability and liquidity. Gopichand *et al.* (2013) and Muthusamy & Muthumeena (2015) ^[11, 16] emphasized on financial inefficiencies of private airlines arising from high input cost and feeble fiscal control. Dizkirici *et al.* (2015) and Teker *et al.* (2016) ^[16, 24] both applied ratio analysis and harmonic indices respectively to draw a correlation between profitability and traditional financial metrics. Safiuddin (2019) ^[19] observed that market volatility and rising operational costs is the main cause of distress among the Indian carriers. Fardnia *et al.* (2020) ^[9] further

address the problem of safety of airline industry and linked it with financial stability, emphasizing on the factors that influences liquidity, asset utilization, and macroeconomic variables. Thus, collectively, these studies highlight the factors responsible for financial and structural inefficiencies of airline industry, unstable cost structure, and erratic financial governance, demanding a comprehensive performance evaluation of the sector.

From the evaluation of the past literature, it was evident that little effort has been undertaken to combine CAMEL and financial ratios for a robust performance evaluation of an organization especially in the aviation sector. This study takes a humble effort to fill that gap by establishing an empirical relationship between CAMEL-based indicators and financial ratios to provide a comprehensive performance evaluation of selected airlines companies. Further, use of advanced statistical approaches like correlation analysis and Tukey's HSD test enables profound assessment of the interrelationships between ratios, highlighting significant differences in firm performance.

Objectives of the Study

The main objectives of the study are as follows:

1. To analyze the correlation between CAMEL Ratios and Financial Ratios in estimating the financial position of select airline companies;
2. To group the select airline companies based on significant divergence ratio during the period of study.

Research Methodology

1. Data Set

Table 1: Summary of Data Set

Sample Drawn	Basis of Sampling	Time Period of survey
Financial data of three airline companies, Air India, Jet Airways & Spice Jet has been selected. Financial Data has been acquired from their respective Financial Statements like, Profit & loss Account, Balance Sheet & Cash Flow Statement. Based on the absolute figures of the financial statement, financial ratios have been constituted.	Convenience Sampling is used to select three airline companies. Only in the case of these three companies' continuous financial data is available for the selected period of study.	Secondary data for the chapter has been collected from 2004-05 to 2018-19 from the financial statements of respective airlines. Financial Statements of the select airline companies were collected from Capitaline Database and DGCA website.

2. Method of Analysis

2.1 CAMEL Model

For analyzing the comparative performance of the select airline companies and their overall performance, CAMEL Model has been used. CAMEL stands for Capital Adequacy, Asset Quality, Management Efficiency, Earnings, and Liquidity.

Table 2: Description of Components of CAMEL Model used for the Study

Category	Ratio	Significance
Capital Adequacy (C)	1. Debt Equity Ratio	This ratio indicates the airline company's financial leverage. The ideal debt to equity ratio will vary depending on the industry because some industries use more debt financing than other. Higher debt-equity ratio however indicates high risk.
	2. Proprietary Ratio	This ratio is a general indicator of financial stability and is useful to assess the ratio of shareholder's funds employed out of the total assets of the company.
Asset Quality (A)	1. Total Investment to Total Asset Ratio	This ratio is used as a tool to measure the percentage of total assets locked up in investments, which does not form part of the core income of the airline industry. A higher ratio means the airline company has conservatively kept a high cushion of investment to guard future loss if any.
	2. Fixed Asset to Total Asset Ratio	It indicates how much fixed assets are held by a company in comparison to total asset. It shows the extent to which company funds are frozen in the form of fixed assets and cannot be used as working capital.
Management Efficiency (M)	1. Return on Asset Ratio	The ratio is a metric that indicates a company's profitability in relation to its total assets. Return on Assets can be used to determine whether a company uses its assets efficiently to generate a profit. A higher Return on Assets means a company is more efficient and productive at managing its balance sheet to generate profits while a lower Return on Assets indicates there is room for improvement.

	2. Return on Net Worth Ratio	The ratio is expressed as the relationship between net profit after tax to net worth, where Net worth refers to the residual value of a business obtained by deducting total liabilities from total assets, indicating the owners' funds or shareholders' equity. High Return on Net Worth Ratio is desirable. $\text{Net Worth} = \text{Equity and Preference Share Capital} + \text{Reserves \& Surplus} - \text{Accumulated Losses}$.
Earnings (E)	1. Net Profit Margin Ratio	The ratio signifies the percentage by which a company's total sales or revenue exceeds or is less than the sum of its expenses. If a company has a positive net profit margin during a certain period of time, it means the company made more money during that period than it spent whereas a negative net profit margin means the company spent more than it made.
	2. Return on Equity (ROE) Ratio using Average Shareholders' Equity	ROE using average Shareholders' equity is widely preferred in financial analysis because it captures the firm's true earning performance over a period, rather than relying on a single-point (year-end) equity figure. Shareholders' equity refers to the residual ownership interest of shareholders in a company's assets after deducting all liabilities, representing the net worth of the business. A high ROE suggests better returns to equity investors, making the firm more attractive for investment.
Liquidity (L)	1. Current Asset to Total Asset Ratio	The proportion of liquid asset to total assets indicates the overall liquidity position of the company.
	2. Current Ratio	It is an efficiency ratio that measures the company's ability to pay off its short-term liabilities with its current assets.

[Source: Rostami (2015) ^[18] & Srinivasan & Saminathan, 2016^[23]]

2.2 Financial Ratios

The study has made an attempt is made to analyze the performance of select airline companies using some financial ratios. For this purpose, the ratios have been categorized under four broad heading:

- Profitability

- Operating Efficiency
- Solvency
- Liquidity

Financial Ratios selected under these broad categories are discussed as follows:

Table 3: Description of Components of Financial Ratio Model Select for the Study

Category	Ratio	Significance
Profitability Ratio	1. Return on Investment Ratio (ROI)	ROI is a performance measure used to evaluate the efficiency or profitability of an investment or compare the efficiency of a number of different investments. ROI tries to directly measure the amount of return on a particular investment, relative to the investment's cost.
	2. Earnings per Share Ratio (EPS)	EPS is an indicator of a company's profitability. EPS indicates how much money a company makes for each share of its stock, and is a widely used metric to estimate corporate value.
	3. Operating Profit Margin Ratio	Operating Profit Margin is the profitability ratio used to determine the percentage of the profit the company generates from its operations before deducting the taxes and the interest and reflects how much an investor earns from a firm in terms of operating profit.
Operating Efficiency Ratio	1. Capital Turnover Ratio	The intent capital turnover ratio is to measure the proportion of revenue that a company can generate with a given amount of equity. It is also a general measure of the level of capital investment needed in a specific industry in order to generate sales.
	2. Employee Cost Ratio	The employee-cost ratio represents the cost of staff in a business as a percentage of revenue. The ratio helps to understand the sustainability of a company because it reflects the relationship between labour costs and overall sales revenue as a percentage.
	3. Total Asset Turnover Ratio	The total asset turnover ratio measures the value of a company's sales or revenues relative to the value of its assets. The ratio can be used as an indicator of the efficiency with which a company is using its assets to generate revenue.
Solvency Ratio	1. Capital Gearing Ratio	The capital gearing ratio is used to indicate the relative proportion of fixed cost-bearing securities such as preference shares and debentures to the ordinary share capital in the capital structure. Proper capital gearing is very important for the smooth running of the enterprise as it affects the profitability of the concern.
	2. Total Debt to Total Asset Ratio	The total debt-to-total assets ratio shows the overall risk of the company. The ratio determines the risk by telling how much amount is owned by creditors in relation to the number of assets owned by the shareholders of the business.
	3. Interest Coverage Ratio	The interest coverage ratio is a solvency ratio used to determine how easily a company can pay interest on its outstanding debt. The ratio is used to determine a company's riskiness relative to its current debt or for future borrowing.
Liquidity Ratio	1. Cash Position Ratio	A cash position ratio reflects an organization's level of cash relative to its expenses and liabilities. A stable cash position is one that allows a company or other entity to cover its current liabilities with a combination of cash and liquid assets.
	2. Quick Ratio	The quick ratio is an indicator of a company's short-term liquidity position and measures a company's ability to meet its short-term obligations with its most liquid assets. The quick ratio is considered a more conservative measure than the current ratio, which includes all current assets as coverage for current liabilities.
	3. Net Working Capital to Sales Ratio	The Net working capital to sales ratio shows a company's ability to pay costs related to generating new sales without the need to take on additional debt.

[Source: (Sinha, 2012) ^[21]]

3. Application of Statistical Tools

The statistical tests on different parameters with objectives are mentioned here:

Table 4: Application of Statistical Tools

Objectives	Statistical Tools
To analyze the correlation between CAMEL Ratios and Financial Ratios to estimate the financial position of select airline companies	Association between continuous variables are captured by Pearson's Correlation Coefficient
To group the select airline companies based on Significant Divergence Ratio during the period of study	Pairwise comparison is done using Tukey's Post Hoc Test

Results and Discussions

1. Financial Performance of Select Airlines in India

In this chapter, financial performance analysis has been conducted on three airlines, which are selected on the basis of convenience sampling method. Based on available continuous data set of last 15 years (2004-05 to 2018-19), one public airline and two private airlines have been selected namely, Air India, Spice Jet and Jet Airways. Financial performance of these companies has been analyzed using following two methods:

1. Financial performance analysis of select Airlines on the basis of CAMEL Model in order to measure Capital Adequacy, Asset Quality, Management Efficiency, Earnings, and Liquidity based on mean and CV%;
2. Financial Performance Analysis of select Airlines on the basis of other financial ratios in order to measure Profitability, Solvency, Operational efficiency, and Liquidity based on mean and CV%.

Financial soundness is one of the key factors in the efficiency of any organization. The airline industry is an important contributor towards economic development of any country. The three select airlines on which financial performance analysis has been conducted are:

1. Air India
2. Spice Jet
3. Jet Airways

1.1 Air India

Air India, the premier flight carrier of India is one of the most extensive flight service providers in India. Air India, founded in 1932 (as Tata Airlines) that grew into an international airline owned by the Indian government; it serves southern and east Asia, the Middle East, Europe, Africa, the United States, and Canada. Its headquarters are in Mumbai. After being granted permission from the Government of India, on 15 July 2007, Indian Airlines and Air India merged and started to operate as a single entity. Post-merger the new airline was renamed as Air India. The new airline became the member of the Star Alliance, the largest airline alliance (Chaudhury & Saha, 2007). According to data compiled by the Directorate General of Civil Aviation (DGCA), Air India's domestic market share in 2017-18 was 12.2% based on market demand. The carrier is the 4th largest aviation company in India (DGCA, 2018) [6]. With the arrival of the other aviation companies, the market share has been reducing but with the strong fleet it is continually acted as a leader in this industry.

1.2 Spice Jet

Earlier known as Royal Airways, SpiceJet is a reincarnation of ModiLuft, one of India's first post-deregulation airlines, launched in 1994. The company entered into a management agreement with Lufthansa to manage their entire Airline

operations but the company shut down its operation in 1996 after dissensions grew between Lufthansa and the company (Business Standard, 2025) [2]. SpiceJet was launched in May, 2005, and is being promoted by Ajay Singh and the Kansagra family. Spice Jet Limited is an Indian low-cost airline headquartered in Gurgaon, India. According to the data released by the DGCA, Spice Jet occupies the third position in the airline industry with 12.3 per cent market share based on market demand (DGCA, 2018).

1.3 Jet Airways

Jet Airways was incorporated on April 1, 1992 as a private company with limited liability under the Companies Act. The company commenced operation as an Air Taxi Operator on May 5, 1993 with a fleet of four aircrafts. They were granted scheduled airline status on January 14, 1995. Jet Airways became a deemed public company on July 1, 1996. On January 19, 2001, Jet Airways was reconverted into a private company. Jet Airways again became a public company on December 28, 2004 (The Economic Times, 2025) [8]. According to the data released by the DGCA, Jet Airways occupies the second position in the airline industry with 14.6 per cent market share based on market demand as on 2017-18 (DGCA, 2018).

2. Analyzing the correlation between CAMEL Ratios and Financial Ratios to estimate the financial position of select airline companies

The financial performance of the select airline companies is measured through two sets of ratios, CAMEL Ratios, and Financial Ratios. In this segment, the relationship between the CAMEL Ratios and Financial ratios is measured during the period of study. Table 6 establishes the relationship between the CAMEL Ratios and Financial Ratios using Pearson's correlation coefficient. The correlation between CAMEL Ratios and Financial Ratios has been explored by using the actual ratios during the period of study. The correlation gives the association between the independent variable (CAMEL Ratios) and the dependent variable (Financial Ratios).

2.1 Pearson Correlation Coefficient

Pearson correlation coefficient measures the strength of association between two variables. It is denoted by r , which ranges from + 1 to -1. Here, 0 indicates no association between two variables. A value less than 0 indicates a negative correlation and greater than 0 indicates a positive correlation.

2.2 Test of Significance of Correlation Coefficient (r) using t-Test during the study period

Correlation is a statistic that describes the association between two variables. Correlation statistics can be used for continuous variables or binary variables or a combination of

continuous and binary variables. In contrast, the t-test examines whether there is a significant difference between the two group means. In our study, comparing CAMEL Ratio with Financial Ratio suggests whether the independent variable (CAMEL Ratios) has a significant impact or association

With the dependent variable (Financial Ratios). Significant group differences will thereby indicate a correlation between the independent and dependent variables. Under this section, the significant linear relation between CAMEL Ratio and Financial Ratio is tested using a t-test in the following way:

Table 5: Showing Methodology of CAMEL Ratios and Financial Ratios

Hypothesis	▪ H₀: There is no significant correlation between CAMEL Ratios & Financial Ratios. ▪ H₁: There is a significant correlation between CAMEL Ratio & Financial Ratios.
Period of Test	2004-05 to 2018-19
Test Statistic	t-Test
Significant Level	5%
Number of Observation	45
Decision Rule	If P-Value is less than 0.05, H ₀ is rejected.

Table 6: Result of Person's Correlation coefficient between CAMEL Ratios & Financial Ratios

Correlations											
		Proprietary Ratio	Debt Equity Ratio	Total Investment by Total Asset Ratio	Fixed Asset to Total Asset Ratio	Return on Asset	Return on Net worth	Net Profit Margin Ratio	ROE	Current Assets to Total Asset	Current Ratio
ROI	Pearson Correlation	0.634	-0.031	0.135	-0.138	0.991	-0.067	0.059	0.634	-0.688	-0.432
	p Value	0.000	0.842	0.375	0.366	0.000	0.664	0.700	0.000	0.000	0.003
EPS	Pearson Correlation	-0.314	-0.353	0.256	0.315	-0.095	0.352	-0.024	-0.314	0.115	0.188
	p Value	0.036	0.017	0.090	0.035	0.537	0.018	0.876	0.036	0.452	0.216
Operating Profit Margin Ratio	Pearson Correlation	0.100	-0.028	0.115	-0.198	-0.006	-0.004	0.999	0.100	0.025	0.067
	p Value	0.514	0.858	0.453	0.193	0.971	0.981	0.000	0.514	0.872	0.664
Capital Turnover Ratio	Pearson Correlation	-0.860	-0.044	0.186	0.322	-0.605	0.055	0.107	-0.860	0.876	0.628
	p Value	0.000	0.776	0.221	0.031	0.000	0.719	0.486	0.000	0.000	0.000
Employee Cost Ratio	Pearson Correlation	-0.078	0.031	-0.108	0.191	0.033	-0.008	-0.997	-0.078	-0.055	-0.100
	p Value	0.610	0.839	0.480	0.208	0.832	0.960	0.000	0.610	0.718	0.514
Total Assets Turnover Ratio	Pearson Correlation	-0.854	-0.035	0.175	0.365	-0.579	0.056	0.111	-0.854	0.878	0.643
	p Value	0.000	0.818	0.251	0.014	0.000	0.715	0.469	0.000	0.000	0.000
Capital Gearing Ratio	Pearson Correlation	0.029	1.000	-0.053	0.001	-0.019	-0.658	-0.023	0.029	0.001	0.008
	p Value	0.851	0.000	0.730	0.993	0.903	0.000	0.878	0.851	0.993	0.960
Total Debt to Total Asset Ratio	Pearson Correlation	-0.929	-0.034	0.310	0.390	-0.697	0.099	0.130	-0.929	0.781	0.429
	p Value	0.000	0.823	0.038	0.008	0.000	0.516	0.393	0.000	0.000	0.003
Interest Coverage Ratio	Pearson Correlation	0.288	-0.099	0.212	-0.048	0.532	-0.063	0.560	0.288	-0.274	-0.233
	p Value	0.055	0.518	0.161	0.754	0.000	0.682	0.000	0.055	0.068	0.124
Cash Position Ratio	Pearson Correlation	-0.736	0.018	-0.012	-0.018	-0.582	0.032	0.057	-0.736	0.942	0.665
	p Value	0.000	0.904	0.936	0.905	0.000	0.833	0.710	0.000	0.000	0.000
Quick Ratio	Pearson Correlation	-0.416	0.012	-0.196	-0.011	-0.413	-0.015	0.078	-0.416	0.746	0.999
	p Value	0.004	0.937	0.196	0.942	0.005	0.922	0.612	0.004	0.000	0.000
Net Working Capital to Sales Ratio	Pearson Correlation	-0.110	0.010	-0.094	0.203	0.012	0.018	-0.995	-0.110	-0.006	-0.026
	p Value	0.473	0.950	0.540	0.181	0.936	0.904	0.000	0.473	0.971	0.864

[Source: Compilation of secondary data using SPSS 20.0]

To investigate the relationship between various financial ratios (dependent variables) and CAMEL ratios (independent variables) for select airline companies, correlation analysis was conducted for the study. Pearson product correlation and testing significance through t-tests was applied to study the positive as well as negative associations, shedding light on the financial health, efficiency, and structural soundness of the select airline companies as under:

1. **Return on Investment Ratio (ROI):** ROI demonstrated a very strong and statistically significant positive correlation with Return on Assets (ROA) ($r = 0.991$, $p < 0.05$). The results signify that higher ROI is directly associated with improved asset utilization. Furthermore, ROI displayed significant positive relationships with the Proprietary Ratio and Return on Equity (ROE) ($r = 0.634$, $p < 0.05$). Nonetheless, ROI had significant negative correlations with the Current Asset to Total Asset Ratio ($r = -0.688$, $p < 0.05$) and the Current Ratio ($r = -0.432$, $p < 0.05$), indicating that higher profitability may reduce dependence on short-term liquidity. However, no significant association was found between ROI and other CAMEL ratios like Debt-Equity Ratio, Fixed Asset Ratio, Net worth Ratio, and Profit Margin Ratio.
2. **Earnings per Share Ratio (EPS):** the result of EPS showed significantly low but positive correlations with Fixed Asset to Total Asset Ratio ($r = 0.315$, $p < 0.05$) and Return on Net Worth Ratio ($r = 0.352$, $p < 0.05$). However, negative correlations were observed with Proprietary Ratio ($r = -0.314$), Debt-Equity Ratio ($r = -0.353$), and ROA/ROE ratio ($r = -0.314$). This reinforces the fact that EPS growth is linked to efficient deployment of fixed asset and equity performance tends to decline with higher leverage and disproportionate asset-equity structures. The results indicate that EPS has no significant relationship with other CAMEL ratios.
3. **Operating Profit Margin Ratio (OPM):** almost perfect correlation was established between OPM and Net Profit Margin Ratio (NPM) ($r = 0.999$, $p < 0.05$), signifying higher operating efficiency which directly enhances net profitability. However OPM's relationships with other ratios were statistically insignificant, reflecting the dominance of core operational performance over structural or capital ratios in driving profitability.
4. **Capital Turnover Ratio (CTR):** CTR represented a very strong positive correlations with Current Asset to Total Asset Ratio ($r = 0.876$, $p < 0.05$), Current Ratio ($r = 0.628$, $p < 0.05$), and Fixed Asset to Total Asset Ratio ($r = 0.322$, $p < 0.05$). On the other hand, it was negatively related with Proprietary Ratio ($r = -0.860$), ROA ($r = -0.605$), and ROA/ROE Ratio ($r = -0.860$). This point out the fact, higher turnover ratios improve the liquidity position but actually it deteriorates asset returns and equity performance.
5. **Employee Cost Ratio (ECR):** ECR demonstrated a strong positive correlation with Net Profit Margin Ratio

($r = 0.997$, $p < 0.05$), signifying that higher employee expenses are accompanied by superior profitability, reflecting the importance of skilled manpower in airline's financial performance. However, no other significant associations with other ratios were detected.

6. **Total Asset Turnover Ratio (TATR):** TATR recorded a strong and positive correlations with Current Asset to Total Asset Ratio ($r = 0.878$), Current Ratio ($r = 0.643$), and Fixed Asset to Total Asset Ratio ($r = 0.365$), all are statistically significant. Conversely, it showed negative correlations with Proprietary Ratio ($r = -0.854$), ROA ($r = -0.579$), and ROE ($r = -0.854$). These results highlight that efficient utilization of assets augments the liquidity but at the same time weakens returns on equity and profitability.
7. **Capital Gearing Ratio (CGR):** Perfect correlation was observed between CGR and Debt-Equity Ratio ($r = 1.000$, $p < 0.05$), specifying a direct alignment of leverage with gearing. Conversely, CGR showed a negative relationship with Return on Net worth Ratio ($r = -0.658$), suggesting higher gearing decreases returns to equity holders.
8. **Total Debt to Total Asset Ratio (TD/TA):** positive correlations was found between TD/TA and Current Asset to Total Asset Ratio ($r = 0.781$), Total Investment to Total Asset Ratio ($r = 0.310$), Fixed Asset to Total Asset Ratio ($r = 0.390$), and Current Ratio ($r = 0.429$). However, TD/TA recorded negative correlations with Proprietary Ratio ($r = -0.929$), ROA ($r = -0.697$), and ROE ($r = -0.929$). Hence, it can be inferred that increased debt improves liquidity and investment but deteriorates profitability and returns.
9. **Interest Coverage Ratio (ICR):** ICR recorded moderate but positive correlations with ROA ($r = 0.532$) and Net Profit Margin ($r = 0.560$), both of which are statistically significant. The findings suggest that better coverage enhances profitability and asset performance. However, no significant relationship was established between ICR and other ratios.
10. **Cash Position Ratio (CPR):** CPR is highly and positively correlated with ratios like Current Asset to Total Asset Ratio ($r = 0.942$) and Current Ratio ($r = 0.665$), which indicates healthy liquidity position. Although, negative correlations were also observed with ratios like Proprietary Ratio ($r = -0.736$), ROA ($r = -0.582$), and ROE ($r = -0.736$), inferring liquidity improvement might compromise returns.
11. **Quick Ratio (QR):** QR exhibited a very strong as well as positive correlation with Current Ratio ($r = 0.999$) and Current Asset to Total Asset Ratio ($r = 0.746$). Nonetheless, QR is negatively correlated with Proprietary Ratio ($r = -0.416$), ROA ($r = -0.413$), and ROE ($r = -0.416$).
12. **Net Working Capital to Sales Ratio (NWCSR):** NWCSR showed a very strong negative correlation with only one ratio i.e., Net Profit Margin Ratio ($r = -$

0.995, $p < 0.05$). The result suggests that higher working capital is relative to sales which reduces profitability, indicating inefficiencies in resource utilization.

3. Grouping the select airline companies based on significant divergence of ratios during the study period using Tukey's HSD Test

In this segment, homogenous subsets are analyzed among the dependent and independent variables using Tukey's HSD Test. Tukey's Honest Significant Difference (HSD) Test in One Way ANOVA. This test is applied to compare the dependent variables, financial ratios, and independent variables, CAMEL Ratios. Here, the Methodology to conduct Tukey's HSD test for the homogenous subsets among the dependent variables is mentioned below:

Hypothesis	▪ H_0: Dependent variables and independent variables are homogeneous. ▪ H_1: Dependent variables and independent variables are not homogeneous.
Period of Test	2004-05 to 2018-19
Test Statistic	Tukey's HSD Test
Significant Level	5%
Number of Observation	45
Decision Rule	If P-Value is less than 0.05, H_0 is rejected.

The result of Tukey's HSD Test is given below:

Table 7: Grouping of Companies Based on their Nearness to CAMEL Ratios and Financial Ratios

Ratios	Airline Company		Mean Difference (I-J)	P Value	Decision Rule	Decision on H ₀
ROI	Air India	Jet Airways	-0.213	0.798	P-Value >0.05	Accepted
		SpiceJet	0.357	0.533	P-Value >0.05	Accepted
	Jet Airways	Air India	0.213	0.798	P-Value >0.05	Accepted
		SpiceJet	0.570	0.210	P-Value >0.05	Accepted
	SpiceJet	Air India	-0.357	0.533	P-Value >0.05	Accepted
		Jet Airways	-0.570	0.210	P-Value >0.05	Accepted
EPS	Air India	Jet Airways	22.488	0.842	P-Value >0.05	Accepted
		SpiceJet	-42.784	0.540	P-Value >0.05	Accepted
	Jet Airways	Air India	-22.488	0.842	P-Value >0.05	Accepted
		SpiceJet	-65.272	0.246	P-Value >0.05	Accepted
	SpiceJet	Air India	42.784	0.540	P-Value >0.05	Accepted
		Jet Airways	65.272	0.246	P-Value >0.05	Accepted
Operating Profit Margin Ratio	Air India	Jet Airways	-0.154	0.976	P-Value >0.05	Accepted
		SpiceJet	0.819	0.518	P-Value >0.05	Accepted
	Jet Airways	Air India	0.154	0.976	P-Value >0.05	Accepted
		SpiceJet	0.973	0.397	P-Value >0.05	Accepted
	SpiceJet	Air India	-0.819	0.518	P-Value >0.05	Accepted
		Jet Airways	-0.973	0.397	P-Value >0.05	Accepted
Capital Turnover Ratio	Air India	Jet Airways	-1.069	0.844	P-Value >0.05	Accepted
		SpiceJet	-6.266	0.006	P-Value <0.05	Rejected
	Jet Airways	Air India	1.069	0.844	P-Value >0.05	Accepted
		SpiceJet	-5.196	0.026	P-Value <0.05	Rejected
	SpiceJet	Air India	6.266	0.006	P-Value <0.05	Rejected
		Jet Airways	5.196	0.026	P-Value <0.05	Rejected
Employee Cost Ratio	Air India	Jet Airways	0.065	0.926	P-Value >0.05	Accepted
		SpiceJet	-0.136	0.715	P-Value >0.05	Accepted
	Jet Airways	Air India	-0.065	0.926	P-Value >0.05	Accepted
		SpiceJet	-0.201	0.485	P-Value >0.05	Accepted
	SpiceJet	Air India	0.136	0.715	P-Value >0.05	Accepted
		Jet Airways	0.201	0.485	P-Value >0.05	Accepted
Total Assets Turnover Ratio	Air India	Jet Airways	-0.762	0.919	P-Value >0.05	Accepted
		SpiceJet	-6.270	0.007	P-Value <0.05	Rejected
	Jet Airways	Air India	0.762	0.919	P-Value >0.05	Accepted
		SpiceJet	-5.508	0.019	P-Value <0.05	Rejected
	SpiceJet	Air India	6.270	0.007	P-Value <0.05	Rejected
		Jet Airways	5.508	0.019	P-Value <0.05	Rejected
Capital Gearing Ratio	Air India	Jet Airways	1.585	0.974	P-Value >0.05	Accepted
		SpiceJet	2.940	0.913	P-Value >0.05	Accepted
	Jet Airways	Air India	-1.585	0.974	P-Value >0.05	Accepted
		SpiceJet	1.355	0.981	P-Value >0.05	Accepted
	SpiceJet	Air India	-2.940	0.913	P-Value >0.05	Accepted
		Jet Airways	-1.355	0.981	P-Value >0.05	Accepted
Total Debt to Total Asset Ratio	Air India	Jet Airways	0.203	0.928	P-Value >0.05	Accepted
		SpiceJet	-0.476	0.668	P-Value >0.05	Accepted

	Jet Airways	Air India	-0.203	0.928	P-Value >0.05	Accepted
		SpiceJet	-0.680	0.443	P-Value >0.05	Accepted
	SpiceJet	Air India	0.476	0.668	P-Value >0.05	Accepted
		Jet Airways	0.680	0.443	P-Value >0.05	Accepted
Interest Coverage Ratio	Air India	Jet Airways	-1.215	0.864	P-Value >0.05	Accepted
		SpiceJet	3.422	0.324	P-Value >0.05	Accepted
	Jet Airways	Air India	1.215	0.864	P-Value >0.05	Accepted
		SpiceJet	4.637	0.133	P-Value >0.05	Accepted
	SpiceJet	Air India	-3.422	0.324	P-Value >0.05	Accepted
		Jet Airways	-4.637	0.133	P-Value >0.05	Accepted
Cash Position Ratio	Air India	Jet Airways	-0.122	0.940	P-Value >0.05	Accepted
		SpiceJet	-0.792	0.088	P-Value >0.05	Accepted
	Jet Airways	Air India	0.122	0.940	P-Value >0.05	Accepted
		SpiceJet	-0.670	0.170	P-Value >0.05	Accepted
	SpiceJet	Air India	0.792	0.088	P-Value >0.05	Accepted
		Jet Airways	0.670	0.170	P-Value >0.05	Accepted
Quick Ratio	Air India	Jet Airways	-0.247	0.914	P-Value >0.05	Accepted
		SpiceJet	-3.980	0.000	P-Value <0.05	Rejected
	Jet Airways	Air India	0.247	0.914	P-Value >0.05	Accepted
		SpiceJet	-3.733	0.000	P-Value <0.05	Rejected
	SpiceJet	Air India	3.980	0.000	P-Value <0.05	Rejected
		Jet Airways	3.733	0.000	P-Value <0.05	Rejected
Net Working Capital to Sales Ratio	Air India	Jet Airways	-0.080	1.000	P-Value >0.05	Accepted
		SpiceJet	-14.778	0.348	P-Value >0.05	Accepted
	Jet Airways	Air India	0.080	1.000	P-Value >0.05	Accepted
		SpiceJet	-14.697	0.351	P-Value >0.05	Accepted
	SpiceJet	Air India	14.778	0.348	P-Value >0.05	Accepted
		Jet Airways	14.697	0.351	P-Value >0.05	Accepted
Proprietary Ratio	Air India	Jet Airways	-0.099	0.982	P-Value >0.05	Accepted
		SpiceJet	1.040	0.156	P-Value >0.05	Accepted
	Jet Airways	Air India	0.099	0.982	P-Value >0.05	Accepted
		SpiceJet	1.139	0.110	P-Value >0.05	Accepted
	SpiceJet	Air India	-1.040	0.156	P-Value >0.05	Accepted
		Jet Airways	-1.139	0.110	P-Value >0.05	Accepted
Debt Equity Ratio	Air India	Jet Airways	1.585	0.974	P-Value >0.05	Accepted
		SpiceJet	2.940	0.913	P-Value >0.05	Accepted
	Jet Airways	Air India	-1.585	0.974	P-Value >0.05	Accepted
		SpiceJet	1.355	0.981	P-Value >0.05	Accepted
	SpiceJet	Air India	-2.940	0.913	P-Value >0.05	Accepted
		Jet Airways	-1.355	0.981	P-Value >0.05	Accepted
Total Investment by Total Asset Ratio	Air India	Jet Airways	-0.106	0.007	P-Value <0.05	Rejected
		SpiceJet	-0.004	0.992	P-Value >0.05	Accepted
	Jet Airways	Air India	0.106	0.007	P-Value <0.05	Rejected
		SpiceJet	0.102	0.009	P-Value <0.05	Rejected
	SpiceJet	Air India	0.004	0.992	P-Value >0.05	Accepted
		Jet Airways	-0.102	0.009	P-Value <0.05	Rejected
Fixed Asset to Total Asset Ratio	Air India	Jet Airways	0.023	0.995	P-Value >0.05	Accepted
		SpiceJet	-0.434	0.195	P-Value >0.05	Accepted
	Jet Airways	Air India	-0.023	0.995	P-Value >0.05	Accepted
		SpiceJet	-0.457	0.164	P-Value >0.05	Accepted
	SpiceJet	Air India	0.434	0.195	P-Value >0.05	Accepted
		Jet Airways	0.457	0.164	P-Value >0.05	Accepted
Return on Asset	Air India	Jet Airways	-0.196	0.844	P-Value >0.05	Accepted
		SpiceJet	0.333	0.616	P-Value >0.05	Accepted
	Jet Airways	Air India	0.196	0.844	P-Value >0.05	Accepted
		SpiceJet	0.529	0.301	P-Value >0.05	Accepted
	SpiceJet	Air India	-0.333	0.616	P-Value >0.05	Accepted
		Jet Airways	-0.529	0.301	P-Value >0.05	Accepted
Return on Net worth	Air India	Jet Airways	-1.349	0.712	P-Value >0.05	Accepted
		SpiceJet	-0.462	0.961	P-Value >0.05	Accepted
	Jet Airways	Air India	1.349	0.712	P-Value >0.05	Accepted
		SpiceJet	0.887	0.863	P-Value >0.05	Accepted
	SpiceJet	Air India	0.462	0.961	P-Value >0.05	Accepted
		Jet Airways	-0.887	0.863	P-Value >0.05	Accepted
Net Profit Margin Ratio	Air India	Jet Airways	-0.239	0.949	P-Value >0.05	Accepted
		SpiceJet	0.731	0.617	P-Value >0.05	Accepted

	Jet Airways	Air India	0.239	0.949	P-Value >0.05	Accepted
		SpiceJet	0.969	0.431	P-Value >0.05	Accepted
	SpiceJet	Air India	-0.731	0.617	P-Value >0.05	Accepted
		Jet Airways	-0.969	0.431	P-Value >0.05	Accepted
ROE	Air India	Jet Airways	-0.099	0.982	P-Value >0.05	Accepted
		SpiceJet	1.040	0.156	P-Value >0.05	Accepted
	Jet Airways	Air India	0.099	0.982	P-Value >0.05	Accepted
		SpiceJet	1.139	0.110	P-Value >0.05	Accepted
	SpiceJet	Air India	-1.040	0.156	P-Value >0.05	Accepted
		Jet Airways	-1.139	0.110	P-Value >0.05	Accepted
Current Assets to Total Asset	Air India	Jet Airways	-0.285	0.999	P-Value >0.05	Accepted
		SpiceJet	-16.303	0.015	P-Value <0.05	Rejected
	Jet Airways	Air India	0.285	0.999	P-Value >0.05	Accepted
		SpiceJet	-16.019	0.017	P-Value <0.05	Rejected
	SpiceJet	Air India	16.303	0.015	P-Value <0.05	Rejected
		Jet Airways	16.019	0.017	P-Value <0.05	Rejected
Current Ratio	Air India	Jet Airways	-0.228	0.927	P-Value >0.05	Accepted
		SpiceJet	-3.842	0.000	P-Value <0.05	Rejected
	Jet Airways	Air India	0.228	0.927	P-Value >0.05	Accepted
		SpiceJet	-3.614	0.000	P-Value <0.05	Rejected
	SpiceJet	Air India	3.842	0.000	P-Value <0.05	Rejected
		Jet Airways	3.614	0.000	P-Value <0.05	Rejected

[Source: Compilation of secondary data using SPSS 20.0]

Grouping and significant difference is explained in the Table 8.

Table 8: Grouping & Significant Difference in Ratios among Select Airline Companies

Variable	Interpretation
Capital Turnover Ratio	Significant difference presents between the Capital Turnover Ratio of - Air India & Spice Jet - Jet Airways & Spice Jet
Total Asset Turnover Ratio	Significant difference presents between the Total Asset Turnover Ratio of - Air India & Spice Jet - Jet Airways & Spice Jet
Quick Ratio	Significant difference presents between the Quick Ratio of - Air India & Spice Jet - Jet Airways & Spice Jet
Total Investment by Total Asset Ratio	Significant difference presents between Total Investment by Total Asset Ratio of - Air India & Spice Jet - Jet Airways & Spice Jet
Current Asset to Total Asset Ratio	Significant difference presents between the Current Asset to Total Asset Ratio of - Air India & Spice Jet - Jet Airways & Spice Jet
Current Ratio	Significant difference presents between the Current Ratio of - Air India & Spice Jet - Jet Airways & Spice Jet

[Source: Compilation on the basis of Table 7]

- Tukey HSD has been conducted to find out the significant difference between the selected companies on the basis of CAMEL Ratio and Financial Ratios based on mean and standard error. Multiple comparisons have been computed where a single airline is compared against two other airlines based on the dependent variables (i.e. Financial Ratios);
- The overall significant difference among the airlines has been calculated through ANOVA and then Tukey HSD has been computed to find out the pairwise significant difference. A significant difference has been observed in the case of Capital Turnover Ratio, Total Asset Turnover Ratio, Quick Ratio, Total Investment by Total Asset Ratio, Current Asset to Total Asset Ratio, and Current Ratio among the select airline companies, and H_0 is rejected;
- On other hand no significant difference is observed in the case of ROI, EPS, Operating Profit Margin Ratio, Employee Cost Ratio, Capital Gearing Ratio, Total Debt to Total Asset Ratio, Interest Coverage Ratio, Cash Position Ratio, Net Working Capital to Sales Ratio, Proprietary Ratio, Debt Equity Ratio, Fixed Asset to Total Asset Ratio, Return on Asset Ratio, Return on Net worth Ratio, Net Profit Margin Ratio, and ROE Ratio. Thus, H_0 is accepted.

Conclusion

The current research aimed to establish a relationship between CAMEL ratios and traditional financial ratios of select airline companies, using correlation analysis and Tukey's HSD test. The findings of the study provided some valued acumens regarding the financial stability and variability of the aviation sector. Through correlation

analysis an attempt has been made to reveal positive as well as negative relationships among several ratios, emphasizing the interdependence of liquidity, profitability, leverage, and efficiency in determining overall performance of the airline companies. The analysis highlights the strong association between liquidity indicators and solvency measures which indicates the airline's ability to manage short-term obligations. Likewise, profitability ratios established moderate connections with management efficiency ratios, suggesting the significance of effective resource utilization. In the second stage of the research Tukey's HSD test was conducted to identify significant pairwise differences across airlines in specific financial parameters, like, Capital Turnover Ratio, Total Asset Turnover Ratio, Quick Ratio, Current Asset to Total Asset Ratio, Total Investment to Total Asset Ratio, and Current Ratio. From the results it is evident that airlines differ considerably in liquidity and operational efficiency, and, reflects divergent financial strategies and risk profiles. Though, no significant differences were observed in ratios like ROI, EPS, Net Profit Margin, ROE, and debt-related measures, indicating homogeneity across firms in profitability and capital structure.

Policy Implications

The findings of the study highlight the critical role of liquidity and operational efficiency ratios, in determining the financial performance of airlines. Thus, management should prioritize efficient asset utilization, working capital management, and liquidity planning to uphold competitiveness and resilience in volatile aviation market. Moreover, the homogeneity in profitability and capital structure ratios recommended that most airlines operate under similar revenue-generation constraints and debt-financing patterns. Thus, it raises the alarm for the industry that competitive advantage cannot be achieved solely through profitability maximisation but should be supplemented through strategic management of liquidity and operational resources. Future research can incorporate advanced statistical and econometric techniques, such as panel data regression, factor analysis, or structural equation modelling, to capture dynamic interactions between financial ratios and performance indicators more effectively. Furthermore, they can expand the dataset and include a larger sample size and time frames to improve the generalization of findings.

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