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LIQUIDITY-PROFITABILITY TRADE-OFF: EVIDENCE FROM SAUDI ARABIAN FOOD AND BEVERAGES PRODUCTION COMPANIES

Rym Bounouala
Faculy of Economics, Commerce and Management Sciences, University of Jijel, Jijel, Algeria
https://orcid.org/0009-0001-6446-4416

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ABSTRACT

The growth and survival of firms depend on liquidity and profitability, which are often in conflict due to the competing allocation of financial resources. This study aims to investigate the liquidity-profitability trade-off in a sample of 21 companies operating in the food and beverage sector and listed on the Saudi Stock Exchange, for the year 2024. Using Data Envelopment Analysis (DEA), the study evaluates the efficiency of the sample firms in managing both liquidity and profitability based on two inputs (total assets, operating expenses) and two outputs (operating cash flow, net profit). Principal Component Analysis (PCA) is then applied; the findings indicate a heterogeneous pattern across firms, with a greater share exhibiting a liquidity-oriented profile compared to those driven by profitability. Only a limited number of firms demonstrate a balanced position between the two dimensions, while a substantial proportion performs weakly in both liquidity and profitability. This pattern reflects a lack of uniform financial behavior among firms and implies that the liquidity–profitability relationship is not systematic and cannot be adequately explained by a simple trade-off mechanism.

1 INTRODUCTION

The performance of any economic activity is primarily conditioned by the existence of liquidity. Liquidity represents a fundamental factor that ensures the continuity of business operations, as firms must maintain sufficient liquid resources to meet their short-term obligations toward suppliers, creditors, and other stakeholders. Firms that fail to maintain adequate liquidity may encounter difficulties in settling their liabilities on time, which may disrupt operational activities, weaken their reputation in the market, and in severe cases lead to financial distress or bankruptcy due to inefficient asset management (Ayoush et al., 2021). At the same time, profitability remains a central objective for any organization, as it reflects the firm's ability to generate returns from its operations and efficiently utilize its available resources.

Liquidity and profitability are two crucial dimensions that organizational management

Address of the corresponding author:
Rym Bounouala
bounoualarym@univ-jijel.dz

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continuously evaluates in order to assess the financial health and sustainability of a firm. However, within the framework of financial management, liquidity and profitability are often characterized by a trade-off relationship. Maintaining an appropriate balance between liquidity and profitability has become a critical challenge for firms operating in increasingly competitive and uncertain environments. While high liquidity ensures the firm's ability to meet short-term obligations and reduces financial risk, it may also imply holding idle resources that could otherwise be invested in profitable opportunities. Conversely, pursuing higher profitability may require reducing liquid assets and increasing investments in long-term or less liquid assets, which can expose the firm to liquidity risk. Consequently, achieving an optimal balance between these two financial objectives constitutes a fundamental challenge for financial managers, as it directly influences both operational efficiency and the strategic sustainability of the enterprise (Sujatha et al., 2025).

This issue becomes particularly significant in the food and beverage production sector, which is characterized by high operational costs, significant inventory requirements, and continuous demand fluctuations. In the context of Saudi Arabia, the food and beverage production industry plays a vital role in supporting economic diversification and ensuring food security. Firms operating in this sector must carefully manage their working capital to maintain sufficient liquidity for day-to-day operations while simultaneously achieving satisfactory levels of profitability in a competitive market environment.

Accordingly, this study aims to investigate the liquidity-profitability trade-off within Saudi Arabian food and beverage production companies. It will be interesting to see if these firms are able to ensure adequate liquidity while achieving profitability. In other words, this study seeks to assess the efficiency of the targeted firms to make a trade-off between liquidity and profitability.

This study addresses the following research question:

RQ: To what extent do Saudi Arabian food and beverage production companies exhibit liquidity-profitability trade-off, and how does this trade-off vary across firms when assessed through Data Envelopment Analysis (DEA) and Principal Component Analysis (PCA)?

Accordingly, the following hypotheses are proposed:

H_1: PCA reveals distinct liquidity–profitability patterns among Saudi Arabian food and beverage production companies.

H_2: DEA-efficient firms exhibit a more balanced liquidity–profitability profile compared to DEA-inefficient firms.

H_3: Firms listed on the Main Market exhibit a stronger liquidity orientation than firms listed on the Nomu Parallel Market.

The rest of this study is organized as follows: section 2 reviews the concept of liquidity and profitability, as well as the extant literature about the relationship between them; section 3 reports the specific procedure of data collection and research method; section 4 provides the results and discussion. The study concludes with a summary of the findings and the directions for future research.

2 THEORETICAL FRAMEWORK AND LITERATURE REVIEW

Liquidity has different meanings across contexts. In this study, it refers specifically to liquidity in non-financial firms. In such context, liquidity means the degree to which an asset or security can be quickly bought or sold in a market without affecting the asset's price (Schwartz et al., 2023). Liquidity refers to the conversion of funds. Almost all of a firm's assets, whether current or non-current, can be converted into cash. However, the time required for this conversion varies depending on the type of asset. Receivables and other short-term assets are typically converted into cash more quickly, whereas long-term assets require a longer period to be transformed into cash. Therefore, liquidity can be understood as a measure of an asset's ability to be transformed into cash (Štangová & Víghová, 2021).

The principal objective of liquidity management is always to maintain liquidity so that a firm can continue to meet its commercial objectives. But there is also the task of managing the liquidity in an optimal way in the best interests of the organisation. The general approach to liquidity

management in practice has already been set out as safety, liquidity and profitability (Moir, 1999).

Profitability is the ability of firm to earn profits in relation to sales, total assets and own capital. The firm's ability to earn profits will describe the level of effectiveness of the firm's management (Wiriastini et al., 2021). Profitability denotes a firm's ability to generate income relative to its expenses over a specific period. It is a measure of efficiency. Profitability is driven by the effective utilization of both the effective long-term and short-term assets to produce goods and services that yield revenue exceeding costs (Sujatha et al., 2025). Profitability refers to the firm's ability to generate revenues more than the cost of generating such revenues (Uremadu et al., 2012). Profitability is a picture that measures how well the firm can generate profits from operational processes that have been implemented to ensure the continuity of the firm in the future (Reschiwati et al., 2020).

Liquidity and profitability are two vital aspects of corporate business life (Vishnani & Shah, 2007). In order to achieve the desired performance, firms must maintain acceptable levels of liquidity (Ayoush et al., 2021). Corporations are required to maintain a daily balance between liquidity and profitability while conducting their operations (Kaddumi & Ramadan, 2012). It is, therefore, essential to maintain an adequate degree of liquidity for smooth running of the business operations. Liquidity should be neither excessive nor inadequate. Excessive liquidity indicates idle funds that do not generate, while inadequate liquidity negatively affects the firm's creditworthiness, disrupts production, and limits earning capacity (Vishnani & Shah, 2007).

While both liquidity and profitability are essential, they are often in conflict due to the allocation of financial resources. Maintaining high liquidity generally requires cash holding or current assets that yield low returns whereas, maximizing profitability involves investing in long-term or higher-return assets, potentially reducing liquidity. This conflict is known as the liquidity-profitability trade-off. This trade-off has attracted considerable attention in various industries, particularly in manufacturing, where financial managers are required to balance risk and return (Safdar et al., 2016).

The relationship between liquidity and profitability has been widely debated in literature, with mixed empirical evidence. Early research on working capital and liquidity management has predominantly centered on the liquidity–profitability nexus (Chen & Yu, 2021) . Much of this literature explores the extent to which liquidity indicators, such as working capital and the current ratio, influence firm profitability (Duan & Niu, 2020).

(Rehman et al., 2015) studied the relationship between liquidity and profitability of firms listed in Saudi Stock Exchange (Tadawul). The overall results revealed that there is only one positive significant relationship between Return on Assets and Current Ratio. Further, it is revealed that there is negative but insignificant relationship between the Return on Assets and Quick Ratio and Cash Ratio. Likewise, in the case of Return on Equity, there is insignificant relationship with the three selected independent variables, namely, Current Ratio, Quick Ratio and Cash Ratio.

A significant stream of empirical studies reports a negative association between liquidity and profitability, arguing that excessive liquidity may reflect inefficient resource allocation, where idle funds generate lower returns (Ayoush et al., 2021, Tan & Tuluca, 2023). In this context, (Syifa et al., 2026) found that profitability has a significant negative effect on cash holding. (Al Barak, 2025) showed that excessive liquidity may reduce profitability due to underutilized resources, while insufficient liquidity increases financial risk despite the potential for higher returns. The study further emphasized the importance of achieving an optimal balance between liquidity and profitability to ensure financial stability and sustainability.

In contrast, other studies suggest the existence of a positive association, indicating that adequate liquidity can enhance a firm's operational flexibility and financial performance. In this regard, (Bibi & Amjad, 2017) found that the current ratio, a key liquidity measure, was significantly positively related to profitability among firms listed on the Karachi Stock Exchange. Similarly, Jaworski and Czerwonka (2021) indicate that in environments with high availability of private sector credit, profitability and liquidity tend to grow together, reflecting a positive dependence. (Shubita, 2023)

found a significant positive relationship between cash flow and profitability in Jordanian banks, indicating that banks can improve their profitability by increasing their cash flow. Jaworski and Czerwonka (2021) conducted a meta-analysis on the relationship between profitability and liquidity across multiple empirical studies and found that the direction and strength of this relationship vary significantly depending on macroeconomic and institutional conditions, indicating that there is no universally consistent effect of liquidity on profitability.

Such inconsistencies suggest that the liquidity–profitability relationship is highly context-dependent rather than structurally fixed. Firm-specific characteristics, industry dynamics, and temporal conditions appear to play a critical role in shaping this relationship (Czerwi ´nska-Kayzer et al., 2021). While (Rodriguez, et al., 2024) explains the liquidity–profitability trade-off, through firm life cycle theory, by showing that young firms prioritize profitability to support growth, while mature firms shift their focus toward maintaining higher liquidity to ensure financial stability and meet operational needs.

Despite the extensive literature examining the relationship between liquidity and profitability, most previous studies have relied primarily on conventional econometric techniques, such as correlation and regression analysis. While these approaches provide useful insights, they may not fully capture the multidimensional nature of firms' financial performance. Moreover, prior research has mainly focused on general manufacturing sectors, with limited attention given to food and beverage production companies, particularly within the Saudi Arabian market. To address these gaps, the present study provides new empirical evidence on the liquidity–profitability trade-off by integrating Data Envelopment Analysis (DEA) and Principal Component Analysis (PCA) methods to evaluate food and beverage production companies listed on the Saudi stock exchange.

3 DATA AND METHODOLOGY

This study uses quantitative research design. The research design is cross-sectional, which means that data is collected at a single point in time. This design is appropriate for investigating the relationship between two variables (liquidity and profitability) in a specific population (Saudi Arabian companies). The sample in this study comprises 21 companies operating in the food and beverage sector and listed on the Saudi Stock Exchange. The sample was selected based on the availability of consistent and complete data and represents 67% of the total number of food and beverage production companies listed on the Saudi Stock Exchange (Tadawul) for the year 2024.

This section describes the DEA method used to assess the efficiency of the sampled firms. The DEA model is a deterministic nonparametric method for estimating the technical efficiency of decision-making units (DMUs). Measurement of efficiency by the DEA model can be done according to two orientations: output orientation, orientation towards the maximization of outputs; and input orientation, oriented towards the minimization of inputs (Benbachir, 2025).

The suitable number of input-output variables is determined by meeting the recommended assumption prior to performing DEA (Cooper et al., 2002):

$$N \geq \text{Max}\ (I \,.\, J,\ 3(I + J)) \qquad (1)$$

Where N = number of DMUs; I = number of inputs; and J = number of outputs.

This study specified two inputs (total assets, operating expenses) and two outputs (operating cash flow, net profit) to evaluate the efficiency of the firms under study in managing liquidity and profitability.

The correlation between the two outputs, operating cash flow and net income is 0.31, indicating a weak relationship. This means that firms with higher liquidity don't necessarily achieve proportionally higher profitability and supports the inclusion of operating cash flow and net income as separate dimensions in the DEA model to capture both liquidity and profitability.

In this analysis, we use the CCR model, initiated by Charnes et al. (1978), and BCC model, initiated by Banker et al. (1984). The CCR model measures the technical efficiency of each DMU assuming that the returns to scale are constant (CRS), while the BCC model decomposes the technical efficiency into two components, the pure technical

efficiency and the scale efficiency, by considering the variable returns to scale (VRS). Our model is input oriented, which means that it minimizes the level of input for a given level of output. DEA efficiency scores were computed using DEAP (Version 2.1). The results are presented in Table 1.

Table 1. CRS and VRS scores of the sampled companies

Companies	CRS	VRS	Scale
Savola Group	**1.000**	**1.000**	**1.000**
Sadafco	0.540	**1.000**	0.540
Almarai	0.477	**1.000**	0.477
Tanmiah	0.125	0.125	0.999
Naqi	0.405	0.426	0.953
First Mills	0.490	**1.000**	0.490
Modern Mills	0.596	**1.000**	0.596
Arabian Mills	0.478	0.938	0.510
Fourth Milling	0.619	**1.000**	0.619
Entaj	0.146	0.149	0.980
Sinad Holding	0.030	0.034	0.871
Hb	0.313	0.316	0.990
Nadec	0.385	0.736	0.523
Aljouf	0.296	0.298	0.994
Fesh Fash	0.683	**1.000**	**0.683**
Fadeco	0.265	0.488	0.544
Nofoth	**1.000**	**1.000**	**1.000**
Balady	**1.000**	**1.000**	**1.000**
Horizon Food	0.243	0.768	0.317
Sama Water	0.680	0.733	0.928
Smc	0.588	0.687	0.856

Source : Author's calculations using DEAP, version 2.1

Based on the DEA results, the sampled companies can be classified into two categories as follows :

Category 1: Efficient Companies

Group 1: Fully efficient companies (technical and scale efficiency)

A limited number of companies achieved full efficiency under both CRS and VRS assumptions, with scale efficiency equal to unity. These companies operate on the efficiency frontier and serve as benchmark units for the rest of the sample. This group includes Savola Group, Nofoth, and Balady**.**

Group 2: Technically efficient but scale inefficient companies

This group comprises companies that achieved full pure technical efficiency (VRS = 1) but exhibited scale inefficiency (CRS < 1), indicating suboptimal operating size despite sound managerial performance. Companies in this category include Sadafco, Almarai, First Mills, Modern Mills, Fourth Milling and Fesh Fash**.**

Category 2: Inefficient Companies

Group 1: Technically inefficient companies with near-optimal scale

Companies in this group operate at a scale close to the optimal level but display relatively low technical efficiency, suggesting that inefficiency is mainly driven by internal managerial or operational factors. This group includes Tanmiah, Naqi, Entaj, Hb, Aljouf, and Sama Water.

Group 2: Technically and scale inefficient Companies

Several companies suffer from inefficiency in both technical and scale dimensions, as all efficiency scores are below unity, reflecting managerial shortcomings and inappropriate scale of operation. This group includes Arabian Mills, Sinad Holding**,** Nadec, Fadeco, Horizon Food and Smc.

The results derived from DEA are subject to certain limitations, as the computation of a single efficiency score for each firm—based on the simultaneous use of inputs and outputs—primarily reflects the efficiency without clearly distinguishing between liquidity and profitability orientations. Given that the main objective of this study is to examine the trade-off between liquidity and profitability, a more disaggregated approach is adopted. Specifically, efficiency scores are calculated for each possible combination of inputs and outputs using DEA. These scores are subsequently analysed using PCA, thereby enabling a more refined assessment of the liquidity and profitability positions of the firms within the sample.

If total assets are denoted by **A**, operating expenses by **B**, operating cash flow by **1**, and net profit by **2**, this yields nine distinct components based on the possible input–output combinations. The partial efficiency measures (A1, A2, A12, AB1, AB2, AB12, B1, B2, and B12) are computed using VRS assumption of the DEA model, as it allows the isolation of pure technical efficiency by controlling for scale effects. This choice ensures that the subsequent PCA captures managerial performance in generating liquidity and profitability, rather than differences attributable to firm size.

Table 2. Partial Efficiency Scores of the Sampled Companies

Companies	A1	A2	A12	AB1	AB2	AB12	B1	B2	B12
Savola Group	0.299	1.000	1.000	0.299	1.000	1.000	0.148	1.000	1.000
Sadafco	0.903	0.353	1.000	0.903	0.353	1.000	0.378	0.284	0.502
Almarai	1.000	0.124	1.000	1.000	0.238	1.000	1.000	0.238	1.000
Tanmiah	0.123	0.082	0.125	0.123	0.091	0.125	0.058	0.057	0.058
Naqi	0.386	0.252	0.403	0.426	0.294	0.426	0.274	0.241	0.274
First Mills	0.567	0.199	0.596	0.889	0.578	1.000	0.889	0.578	1.000
Modern Mills	0.946	0.319	0.977	0.966	0.559	1.000	0.915	0.559	0.993
Arabian Mills	0.721	0.186	0.728	0.919	0.411	0.938	0.919	0.411	0.938
Fourth Milling	0.963	0.287	0.967	1.000	0.513	1.000	1.000	0.513	1.000
Entaj	0.133	0.050	0.133	0.149	0.080	0.149	0.131	0.080	0.131
Sinad Holding	0.027	0.028	0.034	0.030	0.032	0.034	0.024	0.027	0.027
Hb	0.287	0.135	0.287	0.316	0.135	0.316	0.119	0.083	0.119
Nadec	0.629	0.261	0.727	0.629	0.349	0.736	0.433	0.349	0.617
Aljouf	0.290	0.141	0.290	0.298	0.227	0.298	0.298	0.227	0.298
Fesh Fash	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Fadeco	0.452	0.488	0.488	0.452	0.488	0.488	0.285	0.294	0.294
Nofoth	1.000	0.503	1.000	1.000	0.503	1.000	0.128	0.093	0.128
Balady	1.000	0.660	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Horizon Food	0.229	0.323	0.323	0.662	0.768	0.768	0.662	0.768	0.768
Sama Water	0.680	0.318	0.680	0.733	0.321	0.733	0.380	0.279	0.380
Smc	0.684	0.499	0.684	0.687	0.499	0.687	0.239	0.219	0.239

Source: Author's calculations using DEAP, version 2.1

As shown in Table 2**,** interpreting the efficiency score results, which fall within nine possible combinations (A1, A2, A12, AB1, AB2, AB12, B1, B2, and B12), is difficult. Therefore, the PCA method is employed as a complementary approach to the DEA method in order to improve its ability to distinguish between firms toward liquidity and profitability. This is achieved by reducing the number of variables in a manner that facilitates a clearer analysis of liquidity and profitability indicators of the sampled firms.

4 RESULTS AND DISCUSSION

The application of the PCA method involves several steps, which were implemented using the Statistical Package for the Social Sciences (SPSS), version 20.

4.1 Evaluation of Data Suitability: KMO, Bartlett's Test and communalities

The Kaiser-Meyer-Olin (KMO) Test and Bartlett's test are shown in Table 3 with necessary interpretations.

Table 3. *KMO test and Bartlett's test table*

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy		0.655
Bartlett's Test of Sphericity	Approximate Chi-Square	415.563
	Df	36.
	Bartlett Significance	0.000

Source: Author's calculations using SPSS, version 20

Sampling adequacy is measured using the Kaiser-Meyer-Olkin (KMO) index, which is considered significant if it exceeds 0.5. KMO reached 0.655, indicating an acceptable level of suitability for applying PCA. This value suggests that the correlations among the variables are sufficient to proceed with factor extraction.

In addition, Bartlett's Test of Sphericity was statistically significant (Chi-square = 415.563, df = 36, $p < 0.001$), confirming the presence of significant correlations among the variables. Therefore, the null hypothesis of an identity correlation matrix is rejected. These results collectively indicate that the dataset is appropriate for conducting PCA.

Table 4 shows the proportion of variance explained for each variable by the extracted factors.

The extraction values ranged between 0.732 and 0.967, indicating that the extracted factors explain a high proportion of variance for all variables within the factor structure and supports the adequacy of the model.

Table 4. Communalities

	A1	A2	A12	AB1	AB2	AB12	B1	B2	B12
Initial	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Extraction	0.882	0.834	0.839	0.949	0.967	0.923	0.732	0.915	0.770

Source: Author's calculations using SPSS, version 20

4.2 Determining the Number of Principal Components

The number of principal components can be determined based on total variance of the studied variables. Table 5 shows the eigenvalue of each component, the percentage of explained variance, as well as the cumulative percentages of variance before and after extraction, in addition to the results after rotation.

Table 5. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	6.319	70.206	70.206	6.319	70.206	70.206	4.531	50.340	50.340
2	1.491	16.568	86.774	1.491	16.568	86.774	3.279	36.434	86.774
3	0.843	9.368	96.142						
4	0.192	2.129	98.272						
5	0.118	1.306	99.577						
6	0.026	0.294	99.871						
7	0.011	0.119	99.990						
8	0.001	0.007	99.998						
9	0.000	0.002	100.000						

Source: Author's calculations using SPSS, version 20

The results of Table 5 indicate that the first two principal components have eigenvalues greater than one (6.319 and 1.491), explaining 70.206% and 16.568% of the total variance, respectively. In accordance with the Kaiser criterion, only these two components were retained, accounting for a cumulative variance of 86.774%, which reflects an adequate level of data representation.

After rotation, the explained variance was redistributed between the retained components, with the first component accounting for 50.340% and the second for 36.434%, while the cumulative explained variance remained unchanged. Overall, the PCA successfully reduced the initial set of nine variables to two meaningful components without significant loss of information.

The calculated Eigenvalue of different components is illustrated in a graphic known as Scree plot.

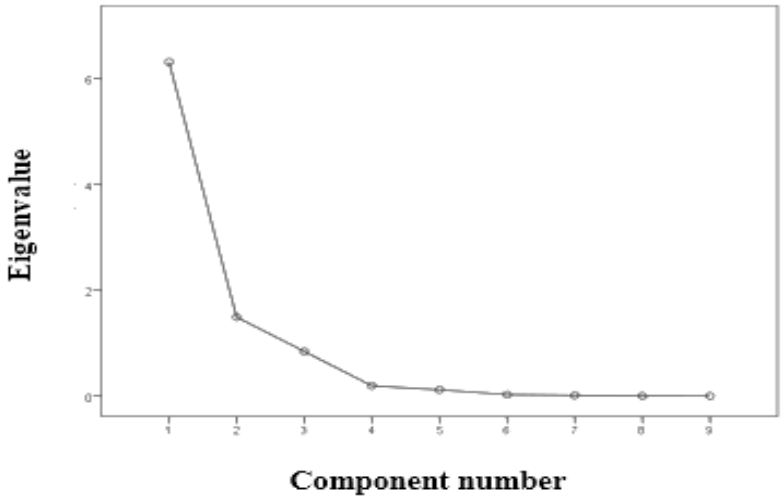

Figure 1. *Scree Plot of Eigenvalues*
Source: Generated using SPSS, version 20

As shown in Figure 1, a clear inflection point (elbow) appears after the second component, followed by a gradual decline in eigenvalues. This indicates that the first two components account for the substantial proportion of the total variance, while the remaining components contribute marginally. The convergence of the Kaiser criterion and the Scree Plot confirms the robustness of retaining two principal components.

4.3 Principal Components and Distribution of Companies

This section presents the principal components matrix before and after rotation (Table 6), followed by the distribution of the companies in a scattered pattern (Figure 2).

The component matrix presented the initial loadings of each variable on the extracted components. As shown in Table 6, most variables have high values on the first component, before rotation, indicating that it accounts for a large portion of the variance. The axes were rotated using the varimax method to achieve a simpler and more interpretable factor structure. After rotation, the high loadings became higher and the low loadings became lower than they were before rotation. Negative loadings also disappeared. Therefore, the rotation improved the interpretation of the two extracted principal components. The variable with the strongest correlation with the first component is AB1, followed by A1, which means that liquidity represents the first principal component. As for the second component, the variable with the strongest correlation is AB2, followed by B2, and then A2, which means that profitability represents the second principal component.

Table 6. *Partial Efficiency Scores of the Sampled Companies*

	Before Rotation		After Rotation	
	Component		Component	
	1	2	1	2
AB1	0.868	-0.443	0.958	0.177
A1	0.821	-0.456	0.929	0.138
AB12	0.950	-0.146	0.843	0.462
B1	0.779	-0.305	0.820	0.244
A12	0.902	-0.156	0.811	0.426
B12	0.877	0.008	0.691	0.540
AB2	0.829	0.529	0.336	0.924
B2	0.798	0.527	0.313	0.904
A2	0.665	0.626	0.147	0.901

Source: Author's calculations using SPSS, version 20

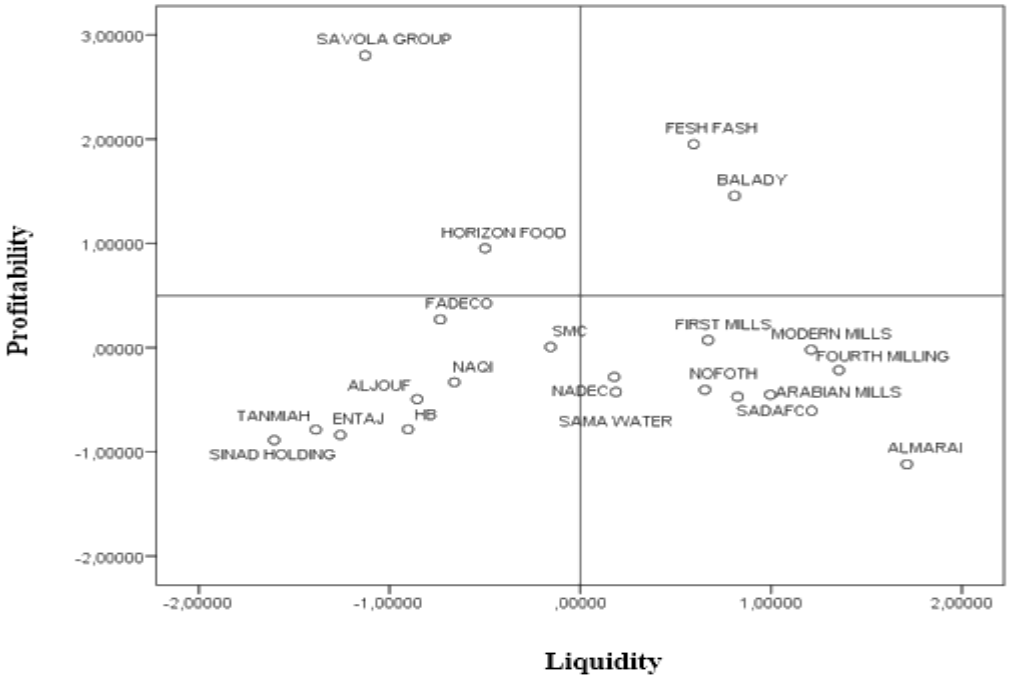

Figure 2. *Screen Plot of Eigenvalues*
Source: Generated using SPSS, version 20

In light of the foregoing, the liquidity-profitability trade-off in Saudi Arabian food and beverages production companies can be examined by analysing the position of each firm on the coordinate system, where the horizontal axis represents liquidity and the vertical axis represents profitability. Based on the Figure 2, out of 21 Saudi Arabian food and beverages production companies, only two companies achieved a balance between liquidity and profitability and were positioned in the upper-right quadrant of the scatter plot. Eleven companies exhibited a liquidity-profitability trade-off; among them, two demonstrated a profitability-oriented profile, and were located in the upper-left quadrant, while nine showed a liquidity-oriented orientation and were positioned in the lower-right quadrant. The remaining eight companies did not display a clear orientation due to weak performance in both liquidity and profitability dimensions and were located in the lower-left quadrant.

According to these findings, Hypothesis 1 (H_1) is accepted, as PCA successfully identified distinct liquidity–profitability patterns among Saudi Arabian food and beverage production companies. Firms were clearly classified into balanced, liquidity-oriented, profitability-oriented, and weak-performance groups, reflecting substantial heterogeneity in financial behavior across firms.

The PCA results reveal the structural orientation of firms along the liquidity–profitability dimensions. Fesh Fash and Balady were identified as balanced, exhibiting intermediate positions on both liquidity and profitability. These firms correspond to the first DEA category, indicating that relative efficiency aligns with a balanced financial profile. This result is consistent with studies that have demonstrated a positive relationship between liquidity and profitability (Rehman et al., 2015, Bibi & Amjad, 2017, Jaworski and Czerwonka, 2021, and Shubita, 2023).

The remaining efficient firms according to DEA, represented by Nofoth, Sadafco, Almarai, First Mills, Modern Mills, and Fourth Milling, primarily emphasize liquidity, while Savola demonstrate a profitability-focused profile. These orientations reflecting that firms prioritizing either dimension can still achieve relative technical efficiency.

However, there are notable exceptions, including Arabian Mills, Nadec, Sama Water, and Horizon Food, which fall into the completely inefficient DEA category, despite their orientation toward liquidity or profitability in the PCA. This discrepancy

highlights that DEA measures technical efficiency in resource conversion and optimal scale, whereas PCA captures the structural financial orientation independent of absolute efficiency. Such cases illustrate that some firms may pursue one dimension successfully yet remain inefficient overall. These observations are consistent with findings of studies that have demonstrated a negative relationship between liquidity and profitability (Rehman et al., 2015, Ayoush et al., 2021, Tan & Tuluca, 2023, Syifa et al., 2026, Al Barak, 2025). The remaining inefficient firms according to DEA, which constitute the majority of this category, including Sinad Holding, Smc, Tanmiah, Naqi, Entaj, Hb, and Aljouf**,** exhibit poor performance in both liquidity and profitability dimensions, confirming their overall inefficiency.

In light of these findings, Hypothesis 2 (H2) is rejected, as the results do not provide sufficient evidence that firms fully efficient according to DEA exhibit a lower liquidity–profitability trade-off compared to inefficient firms. While some DEA-efficient firms exhibited a balanced liquidity–profitability profile, other efficient firms demonstrated either liquidity-oriented or profitability-oriented strategies. This indicates that DEA efficiency may be achieved through different financial orientations rather than through a perfectly balanced liquidity–profitability position.

The findings of this study reveal a clear divergence in financial behavior between firms listed on the Main Market (Savola Group, Sadafco, Almarai, Tanmiah, Naqi, First Mills, Modern Mills, Arabian Mills, Fourth Milling, Entaj, Sinad Holding, Hb, Nadec, Aljouf) and those in the Nomu Parallel Market (Fesh Fash, Fadeco, Nofoth, Balady, Horizon Food, Sama Water, and Smc). Firms in the Main Market generally demonstrate a liquidity-oriented strategy, reflecting a more conservative financial approach aimed at ensuring stability and reducing financial risk, with the notable exception of Savola Group, which appears more profitability-driven due to its expansion and investment-oriented strategy. In contrast, firms listed on the Nomu Parallel Market tend to prioritize profitability, likely driven by growth pressure and limited financial flexibility. However, Balady and Fesh Fash deviate from this pattern by exhibiting a balanced position between liquidity and profitability, suggesting an optimal financial management strategy that aligns with efficient working capital utilization.

These findings support for Hypothesis (H3), as firms listed on Main Market generally display a higher liquidity-oriented strategy compared to Nomu-listed firms, which tend to prioritize profitability. However, the presence of limited deviations, particularly Savola Group on the Main Market, suggests that firm-specific strategies may partially explain deviations from this general pattern.

These results are consistent with the liquidity–profitability trade-off theory and further support the firm life cycle perspective, which posits that financial priorities shift from profitability in early stages toward liquidity preservation as firms mature Rodriguez et al. (2024).

5 CONCLUSIONS

This study examines the existence of a liquidity–profitability trade-off among Saudi Arabian food and beverages production companies by integrating DEA and PCA. The results reveal a heterogeneous distribution of firms. A relatively larger proportion are oriented toward liquidity compared to those focused on profitability, while only a small number achieve a balanced position. In addition, a considerable group of firms exhibits weakness in both dimensions.

This pattern indicates the absence of a uniform financial behavior across firms and suggests that the relationship between liquidity and profitability cannot be reduced to a simple trade-off mechanism. The firm life cycle perspective further supports this interpretation, as variations in financial behavior may reflect different stages of development rather than a unified strategic choice. Overall, the evidence suggests that the liquidity–profitability relationship is not systematic. Instead, it appears to be context-dependent and influenced by firm-specific characteristics, including their position within the life cycle, as well as operational and financial conditions.

Finally, future research should extend this analysis by incorporating additional variables, examining other sectors and countries, and covering longer time periods. Moreover, combining non-parametric techniques (DEA and PCA), which capture efficiency and structural

patterns, with econometric models that test causal relationships may provide a more comprehensive understanding of the liquidity–profitability relationship.

REFERENCES

Al Barak, T. (2025). Corporate cash holdings, working capital, and profitability: Evidence from Saudi Arabia. *Investment Management and Financial Innovations*, *22*(1), 257–265. https://doi.org/10.21511/imfi.22(1).2025.19

Ayoush, M., Toumeh, A., & Shabaneh, K. (2021). Liquidity, leverage, and solvency: What affects profitability of industrial entreprises the most? *Investment Management and Financial Innovations*, *18*(3), 249-259. https://doi.org/10.21511/imfi.18(3).2021.22

Banker, R., Charnes , A., & Cooper, W. (1984, September). Some models for estimating technical and scale inefficiencies in data envelopment analysis. *Management Science*, *30*(9), 1078–1092. https://doi.org/10.1287/mnsc.30.9.1078

Benbachir, S. (2025). Determinants of banking efficiency in the MENA region: A two-stage DEA-Tobit approach. *Banks and Bank Systems*, *20*(1), 83-97. https://doi.org/10.21511/bbs.20(1).2025.08

Bibi, N., & Amjad, S. (2017). The relationship between liquidity and firms' profitability: A case study of Karachi stock exchange. *Asian Journal of Finance & Accounting*, *9*(1). https://doi.org/10.5296/ajfa.v9i1.10600

Charnes, A., Cooper, W., & Rhodes, E. (1978, November). Measuring the efficiency of decision making units. *European Journal of Operational Research, 2*(6), 429-444. https://doi.org/10.1016/0377-2217(78)90138-8

Chen, N., & Yu, M.-T. (2021). National governance and corporate liquidity in organization of Islamic Cooperation Countries: Evidence based on a Sharia-compliant liquidity measure. *Emerging Markets Review,* (47). https://doi.org/10.1016/j.ememar.2021.100800

Cooper, W., Seiford, L., & Tone, K. (2002). *A comprehensive text with models, applications, references and DEA-solver software.* Kluwer Academic Publishers.

Czerwinska-Kayzer, D., Florek, J., Staniszewski, R., & Kayzer, D. (2021). Application of canonical variate analysis to compare different groups of food industry companies in terms of financial liquidity and profitability. *Energies*, *14*(4701). https://doi.org/10.3390/en14154701

Duan, Y., & Niu, J. (2020). Liquidity creation and bank profitability. *The North American Journal of Economics and Finance, 54*(2). https://doi.org/10.1016/j.najef.2020.101250

Jaworski, J., & Czerwonka, L. (2021, June). Meta-study on the relationship between profitability and liquidity of enterprises in macroeconomic and institutional environment. *Decision*, *48*(2), 233–246. https://doi.org/10.1007/s40622-021-00280-y

Kaddumi, T., & Ramadan, I. (2012, April). Profitability and working capital management: The Jordanian case. *International Journal of Economics and Finance*, *4*(4). https://doi.org/10.5539/ijef.v4n4p217

Moir, L. (1999). *Managing corporate liquidity.* Glenlake Publishing Company.

Rehman, M., Khan, M., & Khokhar, I. (2015). Investigating liquidity-profitability relationship: Evidence from companies listed in Saudi Stock Exchange (Tadawul). *Journal of Applied Finance & Banking*, *5*(3), 159–173.

Reschiwati, R., Syahdina, A., & Handayani, S. (2020). Effect of liquidity, profitability, and size of companies on firm value. *Utopía y Praxis Latinoamericana*, *25*(6). https://doi.org/10.5281/zenodo.3987632

Rodriguez, V. H. P., Aguilar, H. E. V., Delgado, F. M. C., Cruz, L. D. C. S. S., Benavides, A. M. V., Salazar, C. A. H., Reategui, J. A., Escobar, B. R. P., & Suyón, A. A. (2024). Challenges in the relationship between liquidity and profitability: Perspectives from a literature review. *Revista de Gestaõ social e Ambiental*, *18*(1). https://doi.org/10.24857/rgsa.v18n1-084

Safdar, M., Awan, M., Ahmed, Z., Qureshi, M., & Hasnain, T. (2016). What does matter? Liquidity or profitability: A case of sugar industry in Pakistan. *International Journal of Economics and Financial Issues, 6*(S2), 144–152. https://www.econjournals.com/index.php/ijefi/article/view/2623

Schwartz, R., Byrne, J., & Stempel, E. (2023). *Liquidity: How to find it, regulate it, get it.* Springer.

Shubita, M. (2023). The relationship between profitability and cash flow in Jordanian banks. *Banks and Bank Systems*, *18*(4), 195–208. https://doi.org/10.21511/bbs.18(4).2023.17

Štangová, N., & Víghová, A. (2021, December). Company liquidity as a reflection of receivables and payables management. *Journal of Entrepreneurship and Sustainability, 9*(2). https://doi.org/10.9770/jesi.2021.9.2(16)

Sujatha, L., Shariq, M., Jayashree, T., & Malpure, M. (2025). *Financial Management* (1st ed.). RK Publications.

Syifa, R., Karim, N., & Leon, F. (2026). The effect of working capital and profitability on cash holding in the industrial sector. *International Journal of Accounting and Management Research*, *7*(1), 35–43. https://doi.org/10.30741/ijamr.v7i1.1895

Tan, X., & Tuluca, S. (2023). Liquidity and profitability: Not a “one size fits all” proposition! *Accounting and Management Information Systems*, 22(1). https://doi.org/10.24818/jamis.2023.01003

Uremadu, S., Egbide, B.-C., & Enyi, P. (2012). Working capital management, liquidity and corporate profitability among quoted firms in Nigeria evidence from the productive sector. International *Journal of Academic Research in Accounting Finance and Management Sciences, 2*(1), 97–117. https://doi.org/10.6007/IJARAFMS/v2-i1/9873

Vishnani, S., & Shah, B. K. (2007). Impact of working capital management policies on corporate performance—an empirical study. *Global Business Review*, *8*(2), 267–281. https://doi.org/10.1177/097215090700800206

Wiriastini, N. L., Rini, A. I., & Kawisana, P. G. (2021). The influence of number of credit, growth of the number of customers, and capital adequacy on the profitability of LPD in Kintamani District. *Journal of Tourism Economics and Policy*, *1*(2), 35–40. https://doi.org/10.38142/jtep.v1i3.108