



IJSRIS
journal
ISSN: 2820-7157

INTERNATIONAL JOURNAL OF

**SCIENTIFIC RESEARCH AND
INNOVATIVE STUDIES**

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RECEIVED
17 August 2026



ACCEPTED
09 September 2026



PUBLISHED
1 October 2026



October 2026



Volume 5



Number 5



Pages from:
568 to 579

Liquidity risk in the agri-food industry of Kinshasa: A statistical assessment

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ABSTRACT

This study assesses the liquidity risk of seven agri-food companies in Kinshasa over the period 2018–2024, using secondary financial data from the National Balance Sheet Centre of the Permanent Accounting Council of Congo (CPCC). The analysis is based primarily on the standard

deviation and coefficient of variation (CV) of current liquidity, supplemented by a two-factor ANOVA and Tukey's post-hoc test. The results show an overall standard deviation of 1.95 per cent and a coefficient of variation (CV) of 104.31 per cent, indicating low absolute dispersion but very high relative variability in liquidity. Based on the standard deviation, the risk is very low for four companies, namely the Compagnie des Margarines, Savons et Cosmétiques au Congo

(CMSCC), the Compagnie Sucrière, the Industrie des Boissons au Congo (IBC) and the Minoterie de Matadi (MIDEMA); low for Afro American Industries (AAI); moderate for the Usine de Panification de Kinshasa (UPAK); and high for BRABANTA. The ANOVA reveals a significant difference between companies ($F = 4.168$; $p = 0.0028$). The study therefore concludes that liquidity risk is low in absolute terms but high in terms of relative variability, with particularly marked instability in several of the companies studied.

Keywords: liquidity risk, agri-food industry.

1. Introduction

The agri-food industry is a vital link in economic systems, notably through the processing of agricultural products, value creation, contributions to food security and job creation. In the Democratic Republic of the Congo, the agricultural sector accounts for nearly 20 per cent of Gross Domestic Product (GDP) and employs between 70 and 75 per cent of the economically active population (World Bank, 2021). Against this backdrop, the development of agri-food activities is a key priority for adding value to agricultural production, creating jobs and improving food supply.

However, agri-food systems remain vulnerable to various shocks and disruptions that may affect supply chains. The COVID-19 pandemic, in particular, has highlighted the fragility of these systems in the face of disruptions to , production, transport, distribution and market access (FAO, 2021). Against this backdrop, between 2018 and 2024, agri-food businesses have faced an environment characterised by trade disruptions, supply difficulties and constraints likely to increase operating and financing costs. These various constraints can put pressure on cash flow and, consequently, increase businesses' exposure to liquidity risk.

Liquidity risk refers to the possibility that a company may not have, at the appropriate time, the financial resources necessary to meet its short-term obligations as they fall due. This issue is of particular importance in the agri-food industry due to the need to finance the purchase of raw materials, stock, processing and distribution operations, whilst ensuring the settlement of debts owed to suppliers, employees, the State and financial institutions. A mismatch between cash inflows and outflows can therefore lead to cash flow pressures and jeopardise business continuity.

It is therefore appropriate to assess the liquidity risk of agri-food companies in the city of Kinshasa in order to evaluate their ability to meet their short-term obligations and ensure the continuity of their operations. However, whilst the agri-food

industry has been extensively studied in developed and emerging countries, it remains poorly documented in the Congolese context. This lack of empirical research limits our understanding of the actual level of financial vulnerability of agri-food firms operating in a particularly unstable economic environment. Furthermore, the sometimes-limited quality of accounting data, the effects of inflation and the specific economic characteristics of Africa can at times influence the relevance of the indicators used. In light of this gap, this study aims to assess the liquidity risk of the agri-food industry in the city of Kinshasa over the period from 2018 to 2024.

In light of the above, the central research question is formulated as follows: Can liquidity risk be assessed in the agri-food industry in the city of Kinshasa? The following specific questions arise from this central research question: what is the level of liquidity risk in agri-food enterprises in the city of Kinshasa during the period from 2018 to 2024? Is there a significant difference between the liquidity risks of agri-food enterprises in the city of Kinshasa? In relation to the specific questions raised above, we put forward the following hypotheses:

- H1: liquidity risk appears low in terms of absolute dispersion, but high when assessed in terms of relative variability;
- H2: Although they belong to the same sector, there are statistically significant differences in the level of liquidity risk amongst the firms under study.

The contribution of this research is twofold. From a scientific perspective, it enriches the literature on the assessment of liquidity risk in African economies, and more specifically in the Congolese context. From a managerial perspective, it will serve as a guide for decision-makers in agri-food sector companies in the Democratic Republic of the Congo. The article is organised into six main sections. The second is devoted to the literature review, the third to the research methodology adopted, the fourth to the presentation of the results, the fifth to their discussion, and the sixth and final section is dedicated to the conclusion.

2. Literature review

Liquidity risk refers to a company's limited or insufficient ability to meet its short-term obligations as they fall due without incurring excessive costs or jeopardising the continuity of its operations. Traditionally, it is assessed through liquidity ratios, working capital and the ability of current assets to cover short-term liabilities. However, the

literature shows that liquidity cannot be reduced to a mere accounting interpretation.

2.1. Review of the theoretical literature

From a precautionary perspective, liquidity constitutes a reserve enabling a firm to cope with uncertainty and cash flow shocks. Almeida, Campello and Weisbach demonstrate, in particular, that firms subject to financial constraints tend to hold more liquidity in order to protect themselves against future financing difficulties (Almeida et al., 2004). However, this view conflicts with agency theory, according to which an excessive accumulation of liquidity may lead to an inefficient use of resources. Liquidity thus appears to represent a trade-off between financial security and the opportunity cost of resources.

The models proposed by Baumol and by Miller and Orr extend this line of thinking by treating cash holdings as a stock to be optimised in light of transaction costs, uncertainty and financing requirements (Baumol, W. J., 1952; Miller, M. H., and Orr, D., 1966). Their limitation, however, lies in their difficulty in accounting for environments characterised by high volatility in prices, exchange rates or supplies. This limitation is particularly significant for agri-food firms, whose liquidity also depends on stocks, trade receivables, trade payables and the regularity of supplies.

The working capital theory offers a more operational perspective by linking liquidity to the cash conversion cycle. Deloof, Shin and Soenen emphasise the importance of effective management of stocks, receivables and short-term liabilities (Deloof, M., 2003; Shin, H.-H., and Soenen, L., 1998). However, an excessive reduction in current assets can itself disrupt production and sales. There is therefore a tension between reducing financial fixed assets and maintaining a sufficient level of current resources.

Furthermore, Myers and Majluf's pecking-order theory of capital structure emphasises that firms generally prioritise internal resources over external financing (Myers, S. C., and Majluf, N. S., 1984). In an environment where access to credit is limited or costly, low internal liquidity can thus increase financial vulnerability. Bolton also demonstrates the interdependence between liquidity and solvency: cash flow difficulties can undermine solvency, whilst a deteriorated financial position can reduce access to finance (Bolton, P., 2011).

Thus, the literature agrees on the importance of liquidity for business continuity, but differs on the optimal level of liquidity. It also shows that analysing a ratio at a given point

in time is not sufficient to fully assess risk, as liquidity can vary significantly over time. From this perspective, a dynamic approach involves examining the trends and variability of liquidity indicators over several years. This study follows this approach by using the standard deviation to measure the levels of liquidity risk observed from 2018 to 2024. The higher the standard deviation, the more unstable immediate liquidity is over the period, which indicates greater exposure to liquidity risk when risk is defined as the variability of liquidity, reflecting greater vulnerability.

2.2. Review of the empirical literature

Empirical studies generally show that effective working capital management helps to improve companies' financial position. In particular, Shin, Soenen and Deloof establish a relationship between the operating cycle and financial performance (Deloof, M., 2003; Shin, H.-H., and Soenen, L., 1998). Baños-Caballero et al. also show that a lengthening of the cash conversion cycle can reduce firms' profitability, highlighting the risk associated with the excessive tying up of resources in stocks and receivables (Baños-Caballero et al., 2012).

In the agri-food sector, Liu et al., drawing on data from Chinese firms observed between 2006 and 2021, show that working capital management significantly influences performance and that this relationship varies depending on the crisis context (Liu, L., et al., 2024). In Africa, Dary and James highlight the role of trade credit in financing the operating cycle of agri-food firms (Dary, S. K., and James, H. S., Jr., 2019). These findings show that liquidity depends not only on cash holdings but also on relationships with customers, suppliers and financial institutions.

Research conducted in sub-Saharan Africa also confirms the existence of multiple sources of financial vulnerability in agri-food enterprises. In Ghana, Agyapong highlights the value of an approach that simultaneously integrates operational, market, credit and liquidity risks (Agyapong, D., 2021). In Kenya, Othuon et al. show that working capital management significantly influences the financial performance of small coffee processing units in Kenya (Othuon D. O., et al., 2021).

In the Democratic Republic of the Congo, recent studies have focused more on operational risk, financial health and the bankruptcy of agri-food enterprises than on liquidity risk per se. The work of Vanga Mbolo et al. highlights the importance of operational risk in Congolese agri-food enterprises (Vanga Mbolo A., et al., 2025), whilst Tekasala Nlandu Julien, using Altman's Z-score model, reveals the financial vulnerability of

certain agri-food enterprises in the city-province of Kinshasa (Tekasala Nlandu, J., 2026).

The literature therefore presents a twofold gap: international research often focuses on the relationship between working capital and performance, whilst Congolese studies tend to concentrate more on bankruptcy or general risks. Few studies directly assess the liquidity risk of agri-food firms in the city-province of Kinshasa over a period of several years. This research fills this gap by analysing how liquidity risk has evolved over the period 2018–2024, with the aim of determining the level of liquidity vulnerability of the firms studied and contributing to a better understanding of their financial situation.

3. Research methodology

3.1. Nature and approach of the study

This study adopts a quantitative approach, based on the statistical analysis of secondary financial data. It aims to assess the liquidity risk of companies in the agri-food sector in the city of Kinshasa from 2018 to 2024.

The study is both descriptive and comparative. It is descriptive in that it seeks to characterise the trends and variability of liquidity risk within each firm. It is comparative in that it also aims to determine whether the level of liquidity risk differs significantly from one firm to another.

3.2. Population and sample

The study population consists of officially registered agri-food enterprises operating in the city of Kinshasa. The reference framework was established using the General Directorate of Taxes' (DGI) updated general register of taxpayers, in particular enterprises falling under the Directorate of Large Enterprises (DGE).

Given the availability and accessibility of financial data, a purposive sampling method was adopted. Seven companies were thus selected, namely Afro American Industries, BRABANTA, the Sugar Company, the Kinshasa Bakery (UPAK), the Congo Margarine, Soaps and Cosmetics Company (CMSCC), the Congo Beverage Industry (IBC) and the Matadi Flour Mill (MIDEMA).

The choice of these companies was based primarily on their belonging to the agri-food sector and, above all, on the availability of financial data series allowing for a relatively consistent analysis over the period studied.

As the sample was selected on the basis of a reasoned choice and limited to seven companies, the results cannot be statistically generalised to the agri-food industry in Kinshasa as a whole. They do, however, enable the identification of trends and observable differences within the selected companies.

3.3. Sources and nature of the data

The data used are secondary financial data, extracted from the summary financial statements available from the National Balance Sheet Centre of the Permanent Accounting Council of the Congo (CPCC). The data cover the financial years 2018 to 2024 and relate in particular to the elements necessary for assessing liquidity and its variability over time. The financial statements thus constitute the main empirical source for the study.

3.4. Processing of monetary data

To ensure better cross-period comparability of the financial data, nominal amounts have been converted into constant Congolese francs. This is intended to limit the effect of general price trends on the financial figures observed. Deflator coefficients were calculated using the annual inflation rates published by the Central Bank of Congo (BCC) according to the following formula:

$$D_t = \frac{1}{1+i}$$

Table 1: Deflator coefficient.

Headings	2018	2019	2020	2021	2022	2023	2024
Inflation rate	6.70%	4.80%	11.00%	9.40%	9.10%	19.50%	18.20%
Deflator coefficient t	0.937	0.954	0.9009	0.914	0.917	0.837	0.844

Source: Author, based on the summary of the BCC's Annual Reports from 2018 to 2024.

The transformation can be represented by the following relationship:

$$X_t^c = X_t^n \times D_t$$

Where:

X_t^c = financial value in constant Congolese francs in year t;

X_t^n = nominal financial value in year t;

D_t = deflator coefficient for year t.

This transformation helps to reduce the risk of attributing to a change in liquidity a variation that is solely linked to inflation.

3.5. Measuring liquidity risk

In this study, based on data relating to observed immediate liquidity from 2018 to 2024, the analysis of liquidity risk relies primarily on two statistical measures, namely the standard deviation and the coefficient of variation.

3.5.1. Standard deviation

The standard deviation, calculated from immediate liquidity levels over the period 2018–2024, measures the dispersion of the observations around their mean. In the context of this study, it serves as an indicator of the variability of immediate liquidity and thus enables an assessment of the degree of stability or instability of each company's liquidity position over the period under review. The higher the standard deviation, the greater the variability in immediate liquidity levels over the period, which indicates greater liquidity instability and, consequently, greater exposure to liquidity risk.

It is calculated as follows:

$$\sigma = \sqrt{\frac{\sum_{t=1}^n (X_t - \bar{X})^2}{n-1}}$$

Where:

σ = standard deviation;

X_t = the observed immediate liquidity value in year t;

$\bar{X}$ = average liquidity risk;

n = number of observations.

A high standard deviation indicates greater dispersion of the observations around the mean and therefore greater volatility in liquidity risk.

The standard deviation is a widely used measure of absolute dispersion for assessing risk when risk is defined as the uncertainty or variability of a variable around its mean. In finance, the dispersion of observations around their mean is a fundamental aspect of risk assessment; in the mean-variance approach, Markowitz formalises, in particular, the use of

variance as a measure of risk (Markowitz, H., 1952). The standard deviation, which corresponds to the square root of the variance, allows this dispersion to be expressed in the same unit as the variable under study (Markowitz, H., 1952). In this study, it is therefore used as an indicator of the absolute risk associated with immediate liquidity. The higher the standard deviation, the greater the fluctuations in immediate liquidity around its mean, and the greater the likelihood of instability in the capacity for immediate payment.

In the absence of universally accepted thresholds for classifying the level of liquidity risk based on the standard deviation, this study adopts, as an analytical convention, four levels of interpretation: a standard deviation of less than 1 per cent corresponds to a very low risk; a value between 1 per cent and 2 per cent corresponds to a low risk; a value between 2 per cent and 5 per cent corresponds to moderate risk, and a value of 5 per cent or more corresponds to high risk. This classification is indicative and is primarily intended to facilitate the comparative interpretation of results. It does not constitute a universal standard for measuring liquidity risk.

3.5.2. Coefficient of variation

However, the standard deviation does not always allow for a direct comparison between companies with different average levels of risk. This is why the study supplements the analysis with the coefficient of variation (CV). It is defined as:

$$CV = \frac{\sigma}{\bar{X}} \times 100$$

Where:

CV: coefficient of variation;

σ = standard deviation;

$\bar{X}$ = average liquidity risk.

The coefficient of variation thus measures the relative dispersion of risk relative to its mean level. A high coefficient indicates that fluctuations in risk are significant relative to the observed mean level. Thus, the standard deviation provides information on absolute variability, whilst the coefficient of variation provides information on relative variability.

3.6. Comparative analysis using ANOVA

In order to determine whether liquidity risk differs between the companies studied, a two-factor analysis of variance (ANOVA) was applied, with year as the first factor, comprising seven levels, and company as the second factor, also comprising seven levels.

Year and company, with seven levels corresponding to the seven companies in the sample, represent the two factors under study. The statistical hypotheses are formulated as follows:

$$H_0: \mu_{AAI} = \mu_{BRABANTA} = \mu_{CMSCC} = \mu_{CS} = \mu_{IBC} = \mu_{MIDEMA} = \mu_{UPAK}$$

The null hypothesis states that there is no significant difference between the firms' mean levels of liquidity risk.

The alternative hypothesis is:

H_1 : at least one mean differs from the others. Fisher's statistic is given by:

$$F = \frac{CM_{entreprises}}{CM_{erreur}}$$

Where:

$CM_{entreprises}$ = represents the mean of the squares between groups;

CM_{erreur} = represents the mean of the squares within the groups.

The statistical decision is made at the 5 per cent significance level:

If $p < 0.05$, the null hypothesis H_0 is rejected;

If $p \geq 0.05$, the null hypothesis H_0 is not rejected.

It should be noted, however, that ANOVA establishes the overall existence of a difference between the companies, but does not, on its own, allow us to identify precisely which companies differ in pairwise comparisons. Thus, a Tukey HSD post-hoc test may be used to identify the pairwise comparisons responsible for this overall difference.

4. Results

4.1. Descriptive statistics

Table 2: Descriptive statistics.

		MEAN	MEDIAN	STANDARD DEVIATION	MIN	MAX
AAI	T.E	118727102	74351523	76456170	54360071.9	242819887.1
	P.C	2978610000	2528076427	86,927,880	2047075086	4267523237
BRABANTA	T.E	508660604	478209996	123876055	360,436,689.1	743884044.2
	P.C	1010676000 00	129,140,000 ,000	97435510000	721131826	20975000000 0
CMSCC	T.E	969474017	875765364	526991979	189,225,490.1	1895724834
	P.C	147,728,600 ,000	149,380,000 ,000	354,753,200,000	105,850,000,0 00	18983000000 0
C. SUCRIERE	T.E	1609710608 3	1435957750 3	5249873438	9151425908	24733386901
	P.C	2385432000 0	2514400000 0	9401388000	9887228910	33863000000
IBC	T.E	275347126	80581147	451664141	22,986,538.8	1273110251
	P.C	27,118,860, 000	286,060,000 ,000	569,189,600	16,938,000,00 0	333,420,000, 000
MIDEMA	T.E	1337652548 5	1027084765 0	9149355396	7703812066	33575343855
	P.C	1603949000 00	5306000000 0	279285600000	342,080,000,0 00	79240000000 0
UPAK	T.E	4064875039	736615008	6341210641	471697480.6	16835728603
	P.C	5730304000	3694483785	3801690000	1839082257	10977000000

Source: Author, using Excel.

The descriptive analysis reveals significant variation in cash and cash equivalents and current liabilities amongst the companies studied. Afro American Industries (AAI) has an average cash position of 118.73 million Congolese francs, compared with an average current liabilities figure of 2.98

billion Congolese francs, with a significant variation in cash holdings (76.46 million Congolese francs).

BRABANTA reports an average cash and cash equivalents (C.E.) of 508.66 million Congolese francs against current liabilities (C.L.) of 101.07 billion Congolese francs, the latter showing a high level of variation (97.44 billion Congolese francs). La Compagnie des Margarines, Soaps and Cosmetics in the Congo (CMSCC) recorded an average cash balance of 969.47 million Congolese francs, compared with 147.73 billion Congolese francs in current liabilities, with a standard deviation for cash and cash equivalents of 526.99 million Congolese francs. The Sugar Company has an average cash and cash equivalents (T.E) of 16.10 billion Congolese francs and average current liabilities (P.C) of 23.85 billion Congolese francs, reflecting relatively similar levels. The Congo Beverage Industry (IBC) has a low average cash balance of 275.35 million Congolese francs, with a standard deviation of 451.66 million Congolese francs, indicating high liquidity volatility. The Matadi Flour Mill (MIDEMA) reports an average cash and cash equivalents (C.E.) of 13.38 billion Congolese francs, compared with average current liabilities (C.L.) of 160.39 billion Congolese francs, with an exceptional standard deviation of 279.29 billion Congolese francs for current liabilities (C.L.). The Kinshasa Bakery (UPAK) has an average cash and cash equivalents (C.E) of 4.06 billion Congolese francs and an average current liability (C.L) of 5.73 billion Congolese francs, whilst the standard deviation for cash stands at 6.34 billion Congolese francs. The discrepancies between averages and medians, particularly at the Congo Beverage Industry (IBC), the Matadi Flour Mill (MIDEMA) and the Kinshasa Bakery (UPAK), indicate the influence of outliers on the observed distributions.

Overall, these results highlight varying levels of instability in cash and short-term liabilities, providing an initial indicator of exposure to liquidity risk.

4.2. Trends in immediate liquidity



Figure 1: Trends in immediate liquidity.

Source: Author, using Excel.

Afro American Industries' (AAI) current liquidity remained low between 2018 and 2022, rising from 1.64 per cent to 3.07 per cent. In 2023, it saw an exceptional increase to 91.04 per cent, before falling back to 9.60 per cent in 2024. This means that, apart from 2023, the company's cash and cash equivalents represent a relatively small proportion of its short-term debt. The sharp rise in 2023 reflects a one-off improvement in immediate payment capacity, but its decline in 2024 shows that this improvement was not sustainable. Afro American Industries (AAI) therefore has generally low and relatively unstable immediate liquidity, with an exceptional peak in 2023.

BRABANTA exhibits the highest volatility. The ratio rose from 81.39 per cent in 2018 to 588.92 per cent in 2019, then fell to 49.98 per cent in 2020 and to just 0.37 per cent in 2021. Between 2021 and 2024, the ratio remains extremely low, at less than 1 per cent. The 2019 figure indicates that cash and cash equivalents were several times greater than short-term liabilities. Conversely, the situation from 2021 onwards reflects very low immediate coverage of short-term liabilities. BRABANTA exhibits very high volatility in immediate liquidity, which is a significant indicator of liquidity risk.

The Compagnie des Margarines, Savons et Cosmétique au Congo (CMSCC) consistently reports the lowest levels: the ratio ranges from 0.18 per cent to 1.53 per cent. Even in 2024, the year in which the ratio peaks, cash and cash equivalents account for only 1.53 per cent of short-term liabilities. The Compagnie des Margarines, Savons et Cosmétique au Congo (CMSCC) has a low capacity to cover short-term liabilities immediately, which indicates a potentially high liquidity risk.

The Compagnie Sucrière presents a different picture. Its ratio remains relatively high throughout the period under review. It stood at 92.20 per cent in 2018, 92.56 per cent in 2019, and then 80.72 per cent in 2020. It fell to 42.46 per cent in 2021, rose to 98.37 per cent in 2022, and then stabilised at around 50 per cent in 2023 and 2024. However, the company never reached 100 per cent. Its cash and cash equivalents therefore remain slightly or significantly lower than its short-term debts. La Compagnie Sucrière has the best and relatively consistent immediate liquidity among the companies studied, even though it does not always have sufficient cash and cash equivalents to fully cover its short-term liabilities.

L'Industrie des Boissons au Congo (IBC) has particularly low ratios. After standing at 7.52 per cent in 2018, the ratio fell to 0.20 per cent in 2019, then remained below 1 per cent throughout the subsequent period, with the exception of 2020, when it reached just 0.34 per cent. In 2021, the ratio stood at 0.08 per cent, its lowest level. L'Industrie des Boissons au

Congo (IBC) has very low immediate liquidity, indicating a significant reliance on other resources to meet its short-term liabilities.

The Matadi Flour Mill (MIDEMA) has higher immediate liquidity than the Congo Margarine, Soap and Cosmetics Company (CMSCC) and the Congo Beverage Industry (IBC), although it remains relatively low. The ratio falls from 29.61 per cent in 2018 to 4.24 per cent in 2022, before rising again to 17.30 per cent in 2023 and 15.44 per cent in 2024. The overall trend is therefore one of decline, despite some recoveries. The Matadi Flour Mill (MIDEMA), for its part, shows low to moderate immediate liquidity, with a particularly noticeable deterioration in 2022.

The Kinshasa Bread Factory (UPAK) shows high volatility. The ratio rose from 12.77 per cent in 2018 to 36.11 per cent in 2019, then remained around 20 per cent in 2020 and 2021. In 2022, it reached an exceptional high of 237.74 per cent, before falling to 7.57 per cent in 2023 and then rising again to 76.98 per cent in 2024. Thus, in some years, cash and cash equivalents far exceed short-term liabilities, whilst in other years they are severely insufficient. The Kinshasa Bread Factory (UPAK) exhibits highly fluctuating immediate liquidity, characterised by periods of high liquidity alternating with periods of low liquidity.

4.3. Calculation of the Standard Deviation and Coefficient of Variation

Table 3: Standard deviation and coefficient of variation.

	AAI	BRABANTA	CMSCC	C SUCRIERE	IBC	MIDEMA	UPAK	
2018	0.0078 3745	0.01170 385	1.4966 6E-05	1.01E-02	3.32E-03	6.67E-03	2.49E-02	
2019	0.0079 5617	0.26233 77	4.0865 6E-05	1.03E-02	6.40E-04	2.89E-03	1.23E-02	
2020	0.0073 3383	0.02866 168	0.0000 25593	3.90E-03	5.60E-04	1.42E-03	2.07E-02	
2021	0.0067 2174	0.05544 954	9.3488 E-05	1.68E-02	7.02E-04	1.68E-04	2.07E-02	
2022	0.0070 5965	0.05548 96	0.0002 60768	1.34E-02	2.10E-04	7.03E-03	9.65E-02	
2023	0.0404 3662	0.05553 466	3.3763 9E-05	1.26E-02	5.89E-04	2.63E-05	2.77E-02	

2024	0.0035 3248	0.05549 84	0.0004 69042	8.36E-03	6.12E-04	9.77E-04	3.09E-03	
								AVER AGE
Average	0.0115 5399	0.07495 363	0.0001 3407	0.01078	0.0009 47571	0.0027 4019	0.029 4129	0.0186 5374
Standard deviation	0.0128 2359	0.08443 057	0.0001 70591	0.00408 8618	0.0010 582	0.0029 6371	0.030 718	0.0194 578
CV	110.99 %	112.64 %	127.24 %	37.93%	111.67 %	108.16 %	104.4 4%	104.31 %

Source: Author, using Excel.

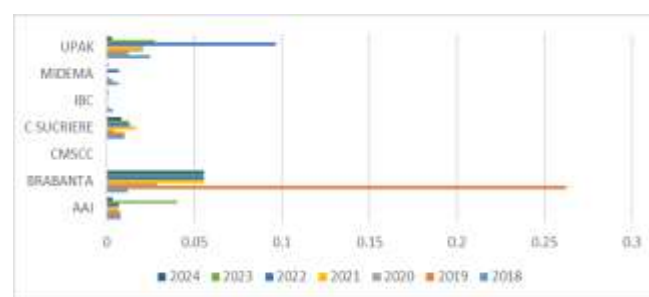


Figure 2: Trend in standard deviation.

Source: Author, based on Table 3.

For Afro American Industries (AAI), the average level of liquidity risk is 0.01155399, or approximately 1.16 per cent. The standard deviation is 0.01282359, whilst the coefficient of variation stands at 110.99 per cent. This result shows that liquidity risk at Afro American Industries exhibits high relative variability between 2018 and 2024. The annual figures remain relatively close to 0.7 per cent between 2018 and 2022, but rise sharply in 2023 to 0.04043662 (4.04 per cent) before falling back to 0.00353248 (0.35 per cent) in 2024. The peak observed in 2023 partly explains the high standard deviation. Thus, Afro American Industries exhibits a relatively low average level of risk in absolute terms, but one that is highly volatile over time, as indicated by its coefficient of variation, which exceeds 100 per cent.

For BRABANTA, the average liquidity risk is 0.07495363, or approximately 7.50 per cent. The standard deviation is 0.08443057 and the coefficient of variation stands at 112.64 per cent. The company has the highest average of the seven companies studied. This average is notably influenced by the exceptionally high value recorded in 2019, which stood at 0.2623377 (26.23 per cent). The figures for other years mainly range between approximately 2.87 per cent and 5.55 per cent.

The standard deviation of 0.08443057 also reflects a significant dispersion of observations around the mean. BRABANTA is therefore characterised by a high and highly variable average level of liquidity risk. Its coefficient of variation of 112.64 per cent indicates that the volatility of the risk is significant relative to its average level.

The Compagnie des Margarines, Savons et Cosmétiques au Congo (CMSCC) has an average of 0.00013407, or approximately 0.0134 per cent. Its standard deviation is 0.000170591, with a coefficient of variation of 127.24 per cent, the highest of the seven companies under review. The figures range from 0.0000149666 in 2018 to 0.000469042 in 2024. Despite a very low average, the relative dispersion is significant. The coefficient of variation of 127.24 per cent means that the standard deviation is approximately 1.27 times the average. The Compagnie des Margarines, Savons et Cosmétiques au Congo (CMSCC) therefore has the lowest average level of risk, but also the greatest relative volatility. In other words, the risk is low in absolute terms, but its annual fluctuations are significant relative to its average.

The Sugar Company has an average of 0.01078, or approximately 1.08 per cent. The standard deviation is 0.004088618 and the coefficient of variation stands at 37.93 per cent. The observed values range from 0.00390 in 2020 (0.39 per cent) to 0.0168 in 2021 (1.68 per cent). Unlike the other companies, the fluctuations are relatively modest. The coefficient of variation of 37.93 per cent is significantly lower than 100 per cent, indicating much lower relative variability. La Compagnie Sucrière exhibits a relatively low and stable average level of risk over the period under review. Among the seven companies studied, it has the lowest coefficient of variation, reflecting the lowest relative variability.

L'Industrie des Boissons au Congo (IBC), in turn, has an average of 0.000947571, or approximately 0.0948 per cent. Its standard deviation is 0.0010582 and its coefficient of variation stands at 111.67 per cent. The risk is relatively low throughout the period, with a maximum of 0.00332 in 2018 (0.332 per cent) and a minimum of 0.00021 in 2022 (0.021 per cent). Despite this low average level, the standard deviation is above average, which explains the coefficient of variation of 111.67 per cent. The Congolese Beverage Industry (IBC) therefore exhibits a low average level of liquidity risk, but with high relative variability over the period under review.

The Matadi Flour Mill (MIDEMA), for its part, has an average of 0.00274019, or approximately 0.274 per cent. The standard deviation is 0.00296371 and the coefficient of variation is 108.16 per cent. The figures are relatively low but are subject to significant fluctuations: the risk falls from 0.00667 in 2018

(0.667 per cent) to just 0.0000263 in 2023 (0.00263 per cent), before rising again to 0.000977 in 2024 (0.0977 per cent). Thus, the Matadi Flour Mill (MIDEMA) has a relatively low average level of risk, but this varies considerably from year to year. The coefficient of variation, which is over 100 per cent, indicates that the dispersion is slightly higher than the average level of risk.

The Kinshasa Bread Factory (UPAK) has an average of 0.0294129, or approximately 2.94 per cent. The standard deviation is 0.030718 and the coefficient of variation stands at 104.44 per cent.

The figures show significant variation over the period. In particular, the risk falls from 0.0249 in 2018 (2.49 per cent) to 0.0123 in 2019 (1.23 per cent), then rises to 0.0965 in 2022 (9.65 per cent) before falling to 0.00309 in 2024 (0.309 per cent). The 2022 figure represents a particularly high point and contributes significantly to the observed dispersion. Thus, the Kinshasa Bread Factory (UPAK) exhibits a relatively high average level of risk – lower than that of BRABANTA but higher than that of the other companies – and a high degree of relative instability, with a coefficient of variation of 104.44 per cent.

In terms of standard deviation, immediate liquidity generally exhibits low absolute dispersion ($\sigma = 1.95$ per cent). However, the coefficient of variation of 104.31 per cent reveals very high relative variability. Thus, whilst the risk appears low in terms of absolute dispersion, it becomes high when assessed relative to the average level of immediate liquidity.

However, four companies – namely the Compagnie des Margarines, Savons et Cosmétiques au Congo (CMSCC), the Compagnie Sucrière, the Industrie des Boissons au Congo (IBC) and the Minoterie de Matadi (MIDEMA) – present a very low risk according to the standard deviation, Afro American Industries (AAI) presents a low risk, the Usine de Panification de Kinshasa (UPAK) a moderate risk and BRABANTA a high risk.

Conversely, **six** out of seven companies have a coefficient of variation exceeding 100 per cent, indicating high variability in their immediate liquidity relative to their average level. Only the Compagnie Sucrière exhibits both low absolute dispersion and low relative variability.

4.4. Analysis of variance

Table 4: Analysis of variance.

Source of variation	Sum of squares	Degrees of freedom	Mean square	F	Probability	Critical value for F
Years	0.006177	6	0.00103	0.854	0.5375	2.364
Companies	0.030153	6	0.005025	4.168	0.0028	2.364
Errors	0.043402	36	0.001206			
Total	0.079732	48				

Source: Author, using Excel.

The results show that the effect of the year is not statistically significant. Indeed, the F-statistic associated with the years is 0.854, with a probability greater than the 5 per cent threshold. The null hypothesis regarding the absence of a difference between the years cannot therefore be rejected.

However, the calculated F-statistic (4.168) is greater than the critical value (2.364), and the probability (0.0028) is less than 0.05. The null hypothesis is therefore rejected in favour of the alternative hypothesis. The level of liquidity risk differs significantly from one company to another. Thus, at least one company has a liquidity situation that differs from the others.

In order to identify differences between the firms following the overall comparison of means, a Tukey HSD post-hoc test was carried out at a significance level of 5 per cent. The results show that five comparisons reveal statistically significant differences. These are the comparisons between Afro American Industries (AAI) and BRABANTA ($p = 0.0201$), BRABANTA and the Sugar Company ($p = 0.0180$), BRABANTA and the Congo Margarine, Soap and Cosmetics Company (CMSCC) ($p = 0.0035$), BRABANTA and the Congo Beverage Industry (IBC) ($p = 0.0040$), and BRABANTA and the Matadi Flour Mill (MIDEMA) ($p = 0.0053$).

By contrast, no statistically significant difference is observed between BRABANTA and the Kinshasa Bakery (UPAK) ($p = 0.1928$), nor between the other pairs of companies. These results indicate that BRABANTA differs significantly from several companies in the sample in terms of its average level of liquidity risk. In particular, its average risk (0.07553) is

higher than that of Afro American Industries (AAI) (0.01155), the Sugar Company (0.01121), the Margarine, Savons et Cosmétiques au Congo (CMSCC) (0.00013), Industrie des Boissons au Congo (IBC) (0.00095) and Minoterie de Matadi (MIDEMA) (0.00259).

The Tukey test thus confirms that the differences observed in the analysis of variance are mainly attributable to BRABANTA's particular position relative to several other companies. However, the absence of a significant difference compared with the Kinshasa Bread Factory (UPAK) shows that the two companies cannot be considered statistically different in terms of the average level of risk over the period studied.

5. Discussion

In terms of the standard deviation, immediate liquidity generally exhibits low absolute dispersion ($\sigma = 1.95$ per cent). Conversely, the coefficient of variation of 104.31 per cent reveals very high relative variability. Thus, whilst the risk appears low in terms of absolute dispersion, it becomes high when assessed relative to the average level of immediate liquidity.

Based on the standard deviation, the risk is very low for Compagnie des Margarines, Savons et Cosmétiques au Congo (CMSCC), the Compagnie Sucrière, the Industrie des Boissons au Congo (IBC) and the Minoterie de Matadi (MIDEMA); low for Afro American Industries (AAI); moderate for the Usine de Panification de Kinshasa (UPAK); and high for BRABANTA. By contrast, the coefficient of variation reveals high relative variability for six out of seven companies; only the Compagnie Sucrière shows low relative variability.

The calculated F-statistic (4.168) is greater than the critical value (2.364), and the probability (0.0028) is less than 0.05. The null hypothesis is therefore rejected in favour of the alternative hypothesis. The level of liquidity risk differs significantly from one company to another. At least one company has a liquidity situation that is distinct from the others.

The results validate both hypotheses of the study. However, as the sample is limited to seven companies, these conclusions cannot be statistically generalised to the entire agri-food sector in Kinshasa.

The findings of this study will serve as a guide for managers of Congolese agri-food companies in their cash management decisions. It is also the responsibility of the public authorities to improve access to finance and economic stability, which are

prerequisites for a sustainable reduction in the sector's financial vulnerability.

These findings are in line with research advocating an approach that simultaneously integrates operational, market, credit and liquidity risks, with sources of vulnerability varying from one firm to another (Agyapong, 2021), as well as research arguing that working capital management significantly influences the financial position of individual processing units (Othuon et al., 2021). It also aligns with Congolese research highlighting the financial vulnerability of certain agri-food firms in the city of Kinshasa (Tekasala Nlandu J., 2026) and the importance of business risk (Vanga Mbolo et al., 2025). By directly measuring liquidity risk over the period 2018–2024, this research clarifies the nature of this vulnerability: the risk is moderate in absolute terms (overall standard deviation of 1.95 per cent) but high in relative terms (CV = 104.31 per cent), which reflects instability rather than a structurally high level.

6. Conclusion

Focusing on liquidity risk in the agri-food industry of the city of Kinshasa: an assessment using a statistical approach, the core objective of this study was to assess the liquidity risk of the agri-food industry in the city of Kinshasa from 2018 to 2024, that is to say, to determine the level of liquidity risk in agri-food enterprises in the city of Kinshasa from 2018 to 2024 and to examine the differences between the liquidity risks of these enterprises. The results obtained lead to the conclusion that liquidity risk is low in terms of absolute dispersion but high in terms of relative variability; that is to say, liquidity risk is characterised by low absolute dispersion (standard deviation of 1.95 per cent), but by high relative variability (coefficient of variation of 104.31 per cent), reflecting significant instability in relation to the average level of liquidity.

Based on the standard deviation, the risk is very low for Compagnie des Margarines, Savons et Cosmétiques au Congo (CMSCC), the Compagnie Sucrière, the Industrie des Boissons au Congo s (IBC) and the Minoterie de Matadi (MIDEMA); low for Afro American Industries (AAI); moderate for the Usine de Panification de Kinshasa (UPAK); and high for BRABANTA. By contrast, the coefficient of variation reveals high relative variability for six out of seven companies; only the Compagnie Sucrière shows low relative variability.

The calculated F-statistic (4.168) is greater than the critical value (2.364), and the probability (0.0028) is less than 0.05. The null hypothesis is therefore rejected in favour of the

alternative hypothesis. The level of liquidity risk differs significantly from one company to another. At least one company has a liquidity situation that differs from the others.

This research makes a twofold contribution. From a scientific perspective, it enriches the literature on liquidity risk assessment in African economies, and more specifically in the Congolese context. From a managerial perspective, it will serve as a guide for decision-making by executives in the agri-food sector of the Democratic Republic of the Congo.

However, due to its limited size, the sample does not allow for statistical generalisation to the entire agri-food sector in the city.

Future research would benefit from focusing on larger samples, incorporating a wider range of liquidity indicators, employing methods robust to outliers, and explaining risk through its internal and external determinants. Finally, interviews with executives and comparisons with other sectors, provinces and countries would help to determine whether this instability is specific to the agri-food sector in Kinshasa.

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