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Article

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Cash-based credit risk model based on Timothy Jury's template: review and modification with application to manufacturing company (2016-2022)

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Abstract

Research Questions: 1) Can the newly developed by the author methodology based on Timothy Jury's credit risk analysis provide sufficient visibility of the company's financial situation and creditworthiness? 2) Can such methodology based on Timothy Jury's credit risk analysis be a trustworthy indicator of production company bankruptcy and the likelihood of default?

Motivation: nowadays financial institutions use an accrual-based credit risk model for the analysis of the creditworthiness of the companies, however, such models are not always trustworthy due to the data manipulations in the accrual financial statements. Since the cash flow financial statement is more reliable for the determination of the probability of default, the authors developed the cash-based credit risk model and applied it to the production company for the analysis of its likelihood of default.

Idea: This paper looks at Timothy Jury's little-known methodology of credit risk analysis and its underlying template, and proposes a version that the authors improved in accordance with the requirements of International Financial Reporting Standards (IFRSs). The authors used improved methodology for the analysis of a manufacturing company to find out the company's pre-bankruptcy situation and reveal the likelihood of credit risk default.

Data: the company analyzed is a publicly listed production company Linas Agro Group with its shares traded at Nasdaq Baltic. The data for the research was taken from the annual reports, managerial reports, and the auditor's reports issued for seven years 2016–2022.

Tools: Timothy Jury's cash-based analysis template was modified by the authors into the credit risk model.

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Findings: the results show that the modified cash-based credit risk model provides sufficient visibility of the company's likelihood of default and specifies the actual source used to cover the debt. The analysis has shown that the production company paid significant dividends with negative cash available to satisfy capital providers.

Contribution: the present article contributes to the knowledge base about cash flow and credit risk. The article encourages an academic society to further research the topics related to cash flow and cash flow theory, which is currently less researched than accrual-based theory. The article is also beneficial for business owners, investors, and finance professionals to improve investment decision-making, for bank managers to diminish the number of bad loans and for the auditors to determine the pre-bankruptcy state of the company more precisely using the cash-based credit risk model presented in this article.

Keywords: cash-based analysis, credit risk, liquidity, probability of default

JEL codes: M41

1. Introduction

Credit risk modelling becomes an important part of the daily operations to assess a borrower's solvency and liquidity, especially with the increase in the number of applications to obtain business financing (European Central Bank, 2021). However, the researchers and business practitioners question the validity and completeness of the analysis obtained from credit risk modelling based on traditional financial statements, such as income statements and balance sheets (Jury, 2012).

To acquire certain benefits (i.e. additional funding) managers may internally manipulate the information in traditional accrual-based financial statements. The researches show plenty of evidence that accounting professionals within the companies intentionally manipulate the financial records and reports to meet a specific target (Bhasin, 2016). On the other hand, when financial institutions make decisions to grant a loan, it is essential for them to determine the exact numerical value of risk exposure. Having clear credit risk estimations is not only important to improve decision-making and its possible financial consequences, but it is also a legal requirement to the financial institutions set by the controlling institutions (European Bank Authority, 2021). For investors, it is crucial to have a clear analysis of the financial state of their potential investment, especially foreign direct investment. To make investment decisions investors need to know the information regarding the companies' financial position, performance and efficiency as well as the potential future cash flows (Robu *et al.*, 2014). Consequently, the economic society faces the problem of the trustworthiness of such an important method of analysis as credit risk modelling, which is usually done based on traditional financial statements. It is a problem for the business and financial society that currently, relying on the credit risk analysis done through an accrual-based credit risk model,

financial institutions risk providing a loan to companies that are close to insolvency, because the accrual-based approach does not grant as clear and trustworthy information as a cash-based approach (Kiaupaite-Grušniene, 2019). The knowledge gap lies in the area of cash-based methods in credit risk modelling, and the present research and review of one of the methods help contribute to the development of knowledge in this area. To increase the reliability of the data outcome from the credit risk modelling, the authors of this scientific publication suggest applying the credit risk modelling to the cash flow statements, which are more reliable in showing the actual data about the companies' solvency and liquidity (Mills & Yamamura, 1998).

The purpose of this research is to develop the credit risk model based on the cash flow principle, which would be precise in the determination of the credit risk, probability of default and pre-bankruptcy stage and to apply this model to a manufacturing company.

The authors contributed to the present scientific paper both to theory and to practice. The article contributes to the development of the cash flow theory because nowadays, the theory of accrual financial statements prevail over the theory of cash flow statement (Ionaşcu & Ionaşcu, 2012). The same pattern applies to credit risk theory – the theory of accrual-based credit risk models prevails over the theory of cash-based credit risk models. Although, as studies show, credit risk professionals with more experience and tasks that are more complicated prefer cash flow information over accrual information (Seppänen & Teinilä, 2014). The cash-based area requires academic contribution and research on related topics to cover the knowledge gap. Useful research has recently been done by Seppänen and Teinilä (2022) through surveys among credit professionals. The researchers found that the archival accounting research demonstrates the prevalence of accrual accounting information in credit assessment over cash accounting information (Seppänen & Teinilä, 2022).

Thus, in this paper, the authors reviewed the methodology of credit risk, as well as the cash-based analysis template of Timothy Jury, a British financial consultant and chartered accountant (Jury, 2012). The authors modified the template into the cash-based credit risk model and applied it to the manufacturing company to illustrate the operations of the developed system. This created a theoretical precedent of the developed cash-based credit risk model applied to the manufacturing company, which invites researchers to continue research in this field.

The paper contributes to practice as well. The authors applied a newly developed cash-based credit risk model based on Timothy Jury's modified analysis template to the manufacturing company to determine the probability of default. The results showed that the cash-based credit risk model presented in the article provides an indication of the company's ability to cover debt and shows its probability of default.

Further analysis showed that the company paid sufficient dividends despite the negative cash available to satisfy capital providers. Thus, the contribution of the present article to practice is clear. The newly developed cash-based credit risk model is useful for financial managers, company owners and investors to improve decision-making. It is also useful for a financial institution to analyse credit risks properly and diminish the number of bad loans. In addition, the model is useful for auditors as a trustworthy tool for the analysis of companies' financial statements and precise determination of the probability of default.

The following parts of the paper build a solid understanding of the research. The theoretical part underlines the importance of the cash-flow statement, explains its features, such as trustworthiness, introduces the credit risk notion and creates a logical connection between the notions of credit risk and cash flow. The next two parts review Jury's cash flow analysis template and present a version reworked into the cash-based credit risk model according to IFRS standards. Further, the authors apply the cash-based credit risk model to the financial statements of production company Linas Agro Group and analyse with the use of annual, managerial and auditor's reports. In the conclusions part the authors present the outcomes of the research.

2. Literature review

The 1970s and 1980s played an important role in the development of cash flow theory. The predecessors of Timothy Jury have created a certain theoretical background, which is a good starting point for further research and development of the field. American and British professors as well as other authors, including Thomas A. Lee (Lee, 1993) have been researching different aspects of the topic of cash flow, from reporting to the analysis techniques aggregating the literature on these topics and suggesting new approaches.

For the main users of financial statements, particularly creditors, financial management, and shareholders the cash flow statement itself, as well as its analysis, provides a valuable evaluation regarding the company's ability to generate positive net cash flows in the future to meet its liabilities and to pay dividends. All users of the statement of cash flows share the desire to see that cash inflows exceed or at least equal the cash outflows. The viability of the company depends on the fact that more cash should flow in than out (Torfason, 2014). What is more important, the analysis of the cash flows can even provide an early warning of the possible financial ailments of an enterprise (Cernuska & Mates, 2007). "The cash flow statement provides a complete characterization of those aspects of the business which are not exposed in the basic financial statements, namely the cash efficiency of operating, investing and financing activities, liquidity and solvency" (Brycz & Pauka, 2012). Additionally, a

cash flow statement provides beneficial information for management, which plays a key role in an organization's decision-making (Cash flow analysis, 2013).

Another category of users that highly benefit from cash flow statement analysis is the auditors, to whom the proper liquidity analysis can help to avoid gross mistakes in the assessment and approval of a company's financial situation (Mills & Yamamura, 1998). The primary usage of cash flow statements to investors, creditors, auditors, and others suggests assessing (Carslaw & Mills, 1991):

- companies' ability to generate future positive net cash flows;
- companies' ability to meet their obligations and pay dividends, as well as the need for external financing;
- the effects of the companies' financial position of both its cash and noncash investing and financial transactions during the period;
- the reasons for differences between net income and associated cash receipts and payments.

Since the cash flow statement has a feature of higher trustworthiness compared to the rest of the financial statements, the ratios produced based on the cash flow statement are used in detecting red flags in the fraud examination activities, which is essential both for internal and external audit (Urbancic, 2017).

The auditors and investors developed a set of warning signs to detect financial reporting fraud. One of the strongest is the difference between cash flow and income. The companies report exaggerated earnings compared to their actual cash flow from operations because the overdrawn revenues cannot be collected and underdrawn expenses still must be paid (Bhasin, 2016). There is evidence from the capital market research on the usefulness of the cash flow statement content and its relationships with security returns. Hadri Kusuma concluded in the research that the cash flow could be used for the prediction of future cash flows (Kusuma, 1999).

It is also important to mention on the structure of the cash flow statement that it reconciles the beginning and ending balances of cash and cash equivalents, where cash equivalents are short-term, highly liquid investments that can easily be converted to cash, such as financial instruments with a maturity date less than 3 months (Nobes & Parker, 2008). Cash flows from operating activities represent the amount of cash received from the main operating activities and spent for the main operating activities of the company during the whole year (IAS 7, 2016). To be more precise, cash flows from operating activities are primarily derived from the key revenue-producing activities of the company (Kusuma, 1999).

The role of this section is to express the daily activities of the company in terms of cash generated from the company's operations and its cash outflows. It clearly shows the sources and application of cash and indicates whether the generated cash is

sufficient for internal financing (Faurescu, 2010). They include the transactions and events that are involved in the determination of net income. An important point that analysts must consider is that cash flow from operations can include a diverse mix of transactions representing a variety of unusual events, which could make the analysis too difficult and less accurate, as Alver demonstrated well (2005). Therefore, the authors suggest including cash provided by normal operating activities only (Carslaw & Mills, 1991). For these reasons, the authors consider the operating cash section of the statement of cash flows the most important for the creation of a cash-flow based credit risk model.

Given the nature of this scientific paper, it is important to uncover the notion of credit risk. Since credit risk is associated with every active trade, it represents a major risk (SpuchlÁková *et al.*, 2015). One of the definitions of financial risk states that credit risk is a risk of loss with default when the company does not meet its obligations under the conditions of the contract and thus causes the holders of debt loss. These obligations arise from various sources such as lending activities, trade and investment activities, payment, and settlement of securities trading on its own and foreign accounts (Jilek, 2000; SpuchlÁková *et al.*, 2015). Kyriazopoulos (2019) defines credit risk as a probability of loss incurred due to the failure of a borrower to meet financial obligations. Altman and Hochkiss (2011) associate credit risk with the financial institutions' capability to get their money back from the corporations financed, and the corporations' capability to repay the debt.

The goal of credit risk management is to maximize a bank's risk-adjusted rate of return by maintaining credit risk exposure within acceptable parameters. The key topic of the new Basel II is to strengthen and improve the financial reliability of credit institutions through risk management, which is a significant step to harmonize international banking regulations (Khemakhem & Boujelbene, 2015). Banks need to manage the credit risk inherent in the entire portfolio as well as the risk in individual credits or transactions. Despite the fact that there is a variety of risks affecting the banks, the counterparty, or credit risk, is the main, the most common and the most dangerous risk that every financial institution faces (*Ibid.*: 61).

According to the Basel Committee on Banking Supervision, credit risk is the inability of the borrower to pay the interest payments or repay the principal at maturity, however, it is an inevitable function of banking activity (Abdelmoula, 2015). Banks should consider the relationships between credit risk and other risks. The effective management of credit risk is a critical component of a comprehensive approach to risk management and essential to the long-term success of any banking organization." Torfason (2014) in his doctoral thesis conducted numerous interviews with bank management and confirmed that credit risk alongside liquidity risk are the vital factors to be managed by banks to ensure that the banking business goes smoothly. However, as per Berger *et al.* (2012), the banks are not anymore the major holders of credit risk thanks to securitization, as government expensively supports the banks when necessary.

The analysis of the definitions of credit risk provides us with an understanding of the connection of credit risk to cash flow. Credit risk occurs when one party fails to conduct the cash outflow directed towards another party due to the lack of cash. Thus, it is evident, that for credit risk estimation the analysis of cash flows plays an important role. In the trade relationships between buyers and suppliers, credit risk analysis helps to segregate trustworthy customers from customers with a high probability of default, otherwise incorrect credit decisions can result in economic damage for the company. For example, “the refusal of a good credit can cause the loss of future profit margins, and the approval of a bad credit can cause the loss of the interest and the principal money” (Kyriazopoulos, 2019). One of the popular areas of cash flow research is its ability to predict financial distress. Gombola and Ketz (1983) developed one of the most important pieces of research. Researchers found that operating cash flow variables in ratios could be useful in the predictive and descriptive analysis of the companies. Further, the research was developed and formed in a more explicit study of cash flow in bankruptcy prediction (Gombola *et.al.*, 1987). Both studies attempted to estimate the predictive ability of cash-flow based ratios and were an important step in the development of the cash flow theory. Another research paper by Largay and Stickney (1980) underlines the importance of cash flow analysis through a comparison with accrual indicators.

The authors illustrated the example of Grant's company, which generated no cash and went bankrupt despite moderate accrual indicators (Largay & Stickney, 1980). In this case, accrual indicators showed warning signs too late (United States Court of Appeals, 1983), and the example demonstrated that careful analysis of the company's cash flows would have revealed the upcoming financial distress at an earlier stage (Largay & Stickney, 1980). The research of Thomas Lee states that investors are not only concerned about realised profits, which can be manipulated by the financial management, but also about the operating cash flows that can be consumed by debtors and stock (Lee, 1992). Operating cash flows, as the product of the actions of financial management possesses crucial information about a company's viability and the decision-making of the company's financial management. These and many other theories have formed the theoretical basis not only for future research but also for investors and management to focus additional attention on the cash flow analysis. Timothy Jury has subsequently applied these theoretical concepts to business practice through the development of his methodology of analysis and template.

3. Review of Timothy Jury's template

First, it is important to clarify the background of Timothy Jury to understand the reason for his creation of the credit risk template, in which he approaches the analysis of cash flows in a new way through the credit risk perspective. Timothy Jury is a financial training consultant and chartered accountant, qualified by KPMG. He has

over twenty years of experience in senior financial roles, specializing in corporate credit training for major UK and Irish banks. During his career, he dealt with hostile takeovers, acquisitions and various turnaround situations, ultimately leading him to create the credit risk template that is analysed in this paper. He has chosen certain cash flow data indicators to serve the credit risk analysis through his template, comparing these across several years.

Indicators taken from the statement are listed in Table 1: cash generated from operations as a starting line, deducting generated from the net working assets, and deducting net CAPEX, deducting taxation paid in the period. These lines result in the line “cash available to satisfy capital providers”. Further, the net interest and net dividends are deducted resulting in the line “Cash available for debt service”. The next line in the template is “Total net debt in cash”, and the last line is “Number of years to repay” which is finalising the template. (Jury, 2012: 208)

Table 1. Indicators of Jury’s template

Action	Line
Starting line	Cash generated from operations
(Deduct)	(invested in) / generated from Net Working (current) Assets
(Deduct)	Net Capital Expenditures
(Deduct)	Taxes paid in the period
Equals to	Cash available to satisfy capital providers
(Deduct)	Net interest
(Deduct)	Net dividends
Equals to	Cash available for debt service
Starting line, divide by line above	Total net (debt)/cash
Equals to	Number of years to repay

Note: This table shows indicators of Jury’s template. Source: Jury, 2012, 208

The classification criteria state that if the number of years to repay the debt is from 0 up to 6 years, it shows that the company is healthy and mature. When the number of years to repay ranges from 6 to 10 years, the leverage of the company is high and cash flow is fully utilized. Finally, if the number of years to repay is more than 10 years, there is too much debt.

Timothy Jury states that restructuring and business disposals might be required to reduce debt, which speaks of the high credit risk. (Jury, 2012: 205). Timothy Jury has created a template that compares values for five years, and after several mathematical calculations presents the number of years to repay the debt. The higher the number of years to repay the debt, the closer the company is to credit default. The healthy number of years to repay is from 0 to 6 years. (Jury, 2012: 205).

Table 2. Summary of outputs of the Jury's credit risk template

Characteristics	Jury's Template
High credit risk. Marked as a red category.	More than 10 years to repay the debt.
Ordinary credit risk. Marked as a grey category.	From 6 to 10 years to repay the debt.
Low credit risk. Marked as a green category.	From 0 to 6 years to repay the debt.
Note: table shows summary of outputs of the Jury's credit risk template. Source: Jury, 2012, 205.	

Thus according to Jury's classification, zero to six years to repay the debt describes a strong, mature company without solvency or liquidity problems, and strong profitability from its major business activities. Jury's six to ten years to repay the debt means the company is acting normally, and has the ability to cover its debt, but has some issues with its solvency, liquidity, and profitability. However, such a company still accumulates positive cash from operating activities.

Jury's "more than 10 years to repay the debt", especially dangerous if classified as "never", means the company has a negative value of net cash flows from operations. Such companies have serious problems with solvency, liquidity, and especially with profitability, having a high chance of bankruptcy and a high probability of credit default, and the inability to repay the debt provided by the financial institutions. There are several advantages, specified by Jury regarding the use of his template (*Ibid.*: 209):

- The analysis using the template shows the actual cash available for the interest and debt service.
- The template indicates the cause of the problems with cash if any.
- The cash flow values summarized based on several years show the historic effects of the industrial and economic cycles.

The template is a valuable invention for both the company and financial professionals because companies do not show the cash available for the service of debt in the financial statements, though it contributes a lot to the credit risk analysis of the company.

4. Reworking the credit risk template

However, the current version of Jury's template possesses disadvantages as well; one of these disadvantages is the lack of comprehensiveness, which leads to some difficulties in the application of the template to practical cases and the checking of the results' correctness. It is important to mention that Jury's template was created based on the Law of the United Kingdom and accounting standards which later changed to UK GAAP in the year 2015 (ICAEW, 2021).

The present paper reworks the template for European users to comply with the IFRSs. Due to the difference between the financial reporting standards, some lines in Jury's template were composed of different subcomponents compared to IFRSs,

which creates confusion for the users and inability to apply the system to their relevant company cases.

For example, Jury's template contains the line "Change in net working assets (NWA)". Clarity is crucial, "more information is defined in terms of "fineness". One information set is said to be finer than another if one contains all the information contained in the other." (Hendriksen & van Breda, 1992). Therefore, the present paper suggests a reworked version of the template according to the IFRSs (see Appendix 1), which breaks down net working assets into the following components:

- Decrease (increase) in biological assets;
- Decrease (increase) in inventories, including the right of return assets;
- Decrease (increase) in prepayments;
- Decrease (increase) in trade and other accounts receivable;
- Decrease (increase) in restricted cash;
- Decrease (increase) in trade and other accounts payable.

Brackets indicate the negative direction or the decrease in component value. These subcomponents sum up to the "invested in or generated from the net working assets". The components might vary depending on the company's activity, but the general logic of this breakdown of the components complies with the IFRSs to allow users of the reworked credit risk template to apply it correctly.

Another element reworked from Jury's credit risk template is "Total net (debt) in cash". The authors explicitly described its calculations in Appendix 2. This paper breaks down the total net debt in cash to the list of components taken from the cash flow statements and balance sheet of the analysed company. The list of components is represented in Appendix 2. These improvements contributed to better comprehensiveness of the technique.

5. Practical application of the reworked template

To illustrate the application of the reworked template for credit risk analysis, the data were taken from the financial statements of Linas Agro Group. Linas Agro Group is a limited liability company registered in Lithuania acting in the agricultural sector (Linas Agro Annual Report, 2016/2017). The company produces milk, poultry, grain and oilseeds for export in the Baltics and Scandinavia, as well as supplying certified seeds, fertilizers, machinery, and plant protection products to the farmers. Linas Agro Group is a publicly listed company with its shares traded on the Nasdaq Baltic (Nasdaq Baltic, 2021).

Since the analysis is based on the cash-flow principle, the relevant data are taken from cash-flow statements for the years 2016–2022. The total debt data are taken from the balance sheets. Table 3 shows the template of Jury (2012), which was reworked and improved by the authors of this paper. It contains the analysis for the 7 years. Calculation details are available in Appendix 1.

Table 3. Cash-based analysis based on Jury's template

Elements, in thousands of EUR	2016	2017	2018	2019	2020	2021	2022
Cash generated from operations	17,372	20,603	20,606	4,985	19,770	25,601	122,710
Changes in working capital	-	-	-	-	-	-	-
(Increase) decrease in biological assets	3,096	1,061	2,894	-968	3,508	1,032	-2,181
Decrease (increase) in inventories, incl. right of return asset	-15,098	1,511	-22,191	4,180	8,224	-2,657	-53,074
Decrease (increase) in prepayments	2,147	-553	-1,598	5,281	1,555	-1,805	1,316
Decrease in trade and other accounts receivable	4,057	-13,366	-15,790	3,201	5,614	2,708	-49,552
(Increase) in restricted cash	-449	199	-710	600	211	-374	343
Increase in trade and other accounts payable	13,020	-2,444	-1,401	3,500	164	20,070	-18,311
(Invested in)/ Generated from Net Working Assets	6,773	-13,592	-38,796	15,794	19,276	18,974	-121,459
Net Capex	-11,911	-15,707	-18,356	-11,440	-5,118	-6,249	-6,985
Cash Taxes	-1,251	-1,037	-1,824	-471	-165	-1,329	-7,128
Cash available to satisfy capital providers	-6,389	-9,733	-58,976	8,868	33,763	55,971	-134,321
Net interest	-1,896	-2,004	-2,074	-2,309	-2,337	-2,795	-12,778
Net dividends	-1,217	-1,228	-1,216	-2,939	-7	-12	-94
Cash available for debt service	-9,502	-12,965	-62,266	3,620	31,419	53,164	-147,193
Total net (debt)/cash	-98,492	-112,497	-153,968	-150,165	-149,895	127,020	-298,085
Number of years to repay the debt	Never	Never	Never	41.48	4.77	2.37	Never
Note: table shows calculations based on a reworked version of Timothy Jury's template and Appendix 1.							

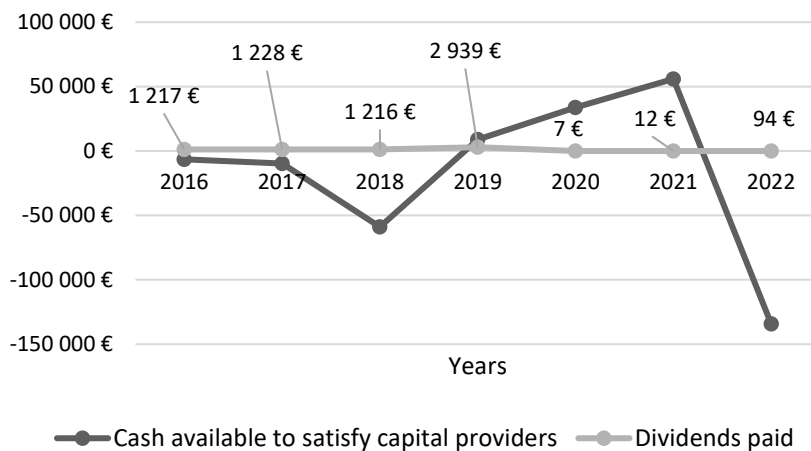
The main element, which allows drawing a conclusion on the company's ability to repay the debt, is the number of years to repay debt, which the last line of Table 3 shows. Table 2 provides the description and categorization of the outputs gained from Jury's template. The authors note that according to the cash-based credit risk model calculations in Table 3, the number of years to repay the debt for the years 2016–2018 is calculated as “never”.

In the year 2019, the number of years to repay the debt was 41.48 and in 2020, it finally dropped to the score of 4.77. In the year 2021, the number of years to repay the debt continued to fall, reaching the score 2.37. However, as is visible from Table 3 above, in the year 2022 the number of years to repay the debt dramatically reached the level of “never”. The authors interpret the results in depth further.

6. Analysis of the results

Several cash flow-based indicators from the reworked credit risk template help to analyse and audit the company's internal financial processes. Figure 1 shows how much cash from operating activities the company accumulates to satisfy capital providers. Figure 1 demonstrates that the company had negative cash available to satisfy capital providers, beginning in 2016 and when reaching the lowest level in the year 2022. In the years 2019 the company reached slightly positive cash available to satisfy capital providers, while in the years 2020 and 2021 being the pick, the company had positive cash available to satisfy capital providers.

Figure 1. Cash available to satisfy capital providers



Note: figure shows cash available to satisfy capital providers based on calculations in Appendix 1.

However, in 2022 there has been a dramatic fall in cash available to satisfy capital providers. This shows that the company had negative accumulated cash from operating activities for four years, meaning that the main activities of the company did not result in positive cash flow. Nevertheless, the company was paying dividends during this period. Note 20 on the operating lease from the annual report states that in the year 2018 Linas Agro Group concluded several lease contracts in which terms did not restrict the dividends (Linas Agro Annual Report, 2017/2018). According to Thomas Copeland, Fred Weston and Kuldeep Shastri, “debt contracts, particularly, when long-term debt is involved, frequently restrict a firm’s ability to pay cash dividends. Such restrictions usually state that (1) future dividends can be paid only out of earnings generated after the signing of the loan agreement (i.e., future dividends cannot be paid out of past retained earnings) and (2) dividends cannot be paid when net working capital (current assets minus current liabilities) is below a prespecified amount.” (Copeland *et.al*, 2005). The company paid more than a million euros in dividends and over seven million euros in management remuneration in 2018, including 1.2 million euros as bonuses (Linas Agro Annual Report, 2017/2018, 54, 66). These payments were made despite the company demonstrating its second-lowest level of cash available to satisfy capital providers and the second-highest level of total net debt in cash, as shown in Table 3. The annual report of Linas Agro Group provides evidence that in 2017 the company paid the same amount of dividends and 2.6 million euros of remuneration to management including over one million euros in bonuses (Linas Agro Group Annual Report 2016/2017, 52, 53, 64).

In 2020, the company paid only seven thousand euros in dividends and over four million euros in management remuneration, including bonuses of just EUR 156 thousand (Linas Agro Group Annual Report, 2019/2020: 63, 78). In 2021, Linas Agro Group has accumulated the highest positive cash available to satisfy debt service in the amount of EUR 53.164 million. Despite a large amount of cash available, the company has paid only EUR 12 thousand in dividends and EUR 3.531 million in management remuneration, including EUR 161 thousand in bonuses to the boards of directors of subsidiaries (Linas Agro Group Annual Report, 2020/2021; 75).

In 2022, the company paid dividends in the amount of EUR 94 thousand and management remuneration in the amount of EUR 4,718 thousand, including EUR 8 thousand of bonuses to the boards of directors of subsidiaries (Linas Agro Group Annual Report, 2021/2022; 80).

This problem was cumulative, and visible for all seven years of research, meaning that management was consciously performing such financial actions. Researchers have stated that “the use of cash as a predictor of future dividends, therefore, avoids the biases of the reported net income, except to the extent that the timing of certain cash receipts and disbursements can be altered by management” (Hendriksen & van Breda, 1992: 271–272).

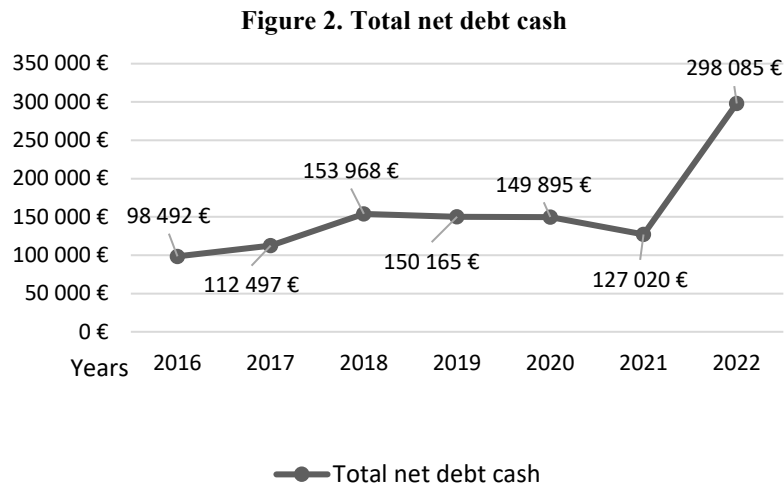
Linas Agro started a transformation in the organisational structure in the year 2019. The transformation included the closure of the dormant company in Latvia, the closure of the Danish company Linas Agro, implementing of other programs increasing the efficiency of internal processes, and reducing operational costs (Linas Agro Interim Report, 2018/2019). In 2020, significant changes took place in the company's strategy and management. The financial director, who was running the company until 2019 was replaced (Linas Agro Annual Report, 2019/2020). In addition, KPMG replaced Ernst & Young as the company's auditors. Moreover, the company has changed its organizational structure and formed a sub-group of companies from new and acquired land management companies (*Ibid.*).

Due to the changes and financial restructuring in Linas Agro, the years 2020 and 2021 showed sufficient cash inflow from operating activities. As is visible from Table 3, the company's main cash outflow is shown in the line "(Invested in)/Generated from Net Working Assets". Thus, the company had a cash outflow in 2017, 2018 and 2022. This tells about the company's active investments or suffered losses, which is impossible to understand from the annual report of the company in the part of consolidated cash flow statements.

Also in the years 2016, 2017, and 2018, the company was investing in non-current assets, which is visible in the statement of cash flows in the section "Cash flows from investment activities", lines "Acquisition, proceeds from intangible assets, property, plant, and equipment". This activity is marked in Table 3 as "Net CAPEX". Only in the year 2018, did the company start to generate a positive value from the networking assets, which led to the positive value of cash available to satisfy capital providers. In 2020 because of the company's financial strategy change, the company managed to increase this even further. In the year 2021, the company accumulated positive cash to satisfy capital providers as well, but in the year 2022, it dropped to the strongest negative value for all research periods. There is evidence from Figure 1 that during all researched periods from the year 2016 until 2020, the company paid dividends in quite a significant amount, especially in the years 2016–2019, although it had a negative result of cash available to satisfy capital providers. In the years 2021 and 2022, the company has decreased the dividend payment to insignificant amounts compared to previous years.

As is visible from Table 3, for the year 2022 Linas Agro Group has the most negative result for all years in cash available for debt service, namely the negative EUR 147 million. In chapter 5.3. "Cash Flow and Liquidity" of the annual report, Linas Agro Group stipulates its vision of the negative cash and explains the reasons for it. According to Linas Agro Group Annual Report 2021/2022, "cash flow from operating activities after changes in working capital was negative and amounted to EUR 6 million (positive EUR 43 million over the respective period of 2020/2021 financial year), the main reason for that being an increase in inventory (by EUR 155 million) and accounts receivable (by EUR 200 million)".

It is important to consider the total debt to cash calculations for each of the seven years shown in Appendix 2 of this paper. Figure 2 illustrates the calculations from Appendix 2. From the calculations, it is clear that Linas Agro Group was increasing its total debt during the same years (2016–2019 and 2022) as significant dividends were paid in the years 2016–2019 and the cash available to satisfy capital providers was negative. Figure 2 reflects this trend in the direction of the total net debt cash line. The fact that significant amounts of dividends were paid even with the negative cash available to satisfy capital providers represents a warning sign for investors and financial institutions.



Note: figure shows total net debt cash calculations based on Appendix 1

Only because of the shift of financial strategy, replacement of financial director and auditor change (Linas Agro Interim Report, 2019/2020) in the years 2020–2022, Linas Agro Group has paid the least amount of dividends. The managerial report supports the finding in Figure 2. Thus, the managerial report states that in the year 2017, the number of loans increased, and borrowings increased as a short-term loans to finance trade activity (Linas Agro Interim Report, 2016/2017). In the year 2018, the total amount of the financial loans portfolio increased, due to the increase in stocks and debts, as the company was investing in the poultry business, agricultural companies, and grain elevators (Linas Agro Interim Report, 2017/2018). In the year 2019, the amount of debt decreased due to the diminished amount of stocks and accounts receivable (Linas Agro Interim Report, 2018/2019). The years 2020 and 2021 continued a decrease further.

However, in the year 2022, the loan portfolio has significantly increased. According to the Annual Report 2021/2022 of Linas Agro Group, “The Group’s financial loans portfolio at the end of the financial year 2021/2022 was EUR 296 million (EUR 126

million at the end of the financial year 2020/2021) or EUR 266 million if not taking into account leasing obligations related with right of use assets (respectively EUR 98 million at the end of the financial year 2020/2021). Financial debt, out of which 72% is short-term loans used for working capital financing, has mainly increased due to higher demand for working capital financing, as well as due to the acquisition transaction, completed by AB Linas Agro Group on 15th of July, 2021. Respectively over the referenced period financial expenses increased by 324% and amounted to EUR 15.1 million compared to EUR 3.6 million in 12 months of the financial year 2020/2021.” The increase in financial expenses by 324% speaks for itself, as the key internal factors of financial distress are cash flow difficulties and the amount of debt (Karina and Soenarno, 2022).

The last part of the analysis takes a closer look at the last line of Table 3, the “Number of years to repay the debt”, which the authors calculated according to the following simple formula:

$$\text{Number of years to repay} = \frac{\text{Total net (debt)/cash}}{\text{Cash available for debt service}} \quad (1)$$

As is visible from Table 4, only in the years 2020 and 2021 did the company score well with values of 4.77 and 2.39 respectively. This characterises the company’s credibility as a mature company with a decent credit rating, minor solvency and liquidity issues, good cash generation ability and minimal probability of default.

Table 4. Number of years to repay debt

Years	2016	2017	2018	2019	2020	2021	2022
Number of years to repay	never	never	never	41.48	4.77	2.39	never

Note: table shows number of years to repay the debt based on calculations in Appendix 1.

The year 2019 shows that the company had a value of 41.48 years to repay the debt. According to the classification of Jury, the company is located on the verge of red and grey zone, but still has positive cash generation ability and the possibility to cover the debt even though it would take a long period. The probability of default, in this case, is high, according to the cash-based credit risk model. However, as it is evident from Table 4, in the years 2016, 2017, 2018 and especially the year 2022, Linas Agro Group had a negative value of the years to repay the debt indicated by Jury’s classification as “NEVER”, because the company had extremely high negative values of cash available for the debt service. This indicated a high probability of default for Linas Agro Group. Nevertheless, at the same time, the company increased its total debt from 98.492 million euros to 153.968 million euros for the years 2016–2018. In the year 2022, the company has increased the total debt to negative EUR 298.085 million, which is the highest level of debt for all seven years of research, as mentioned in the description of Figure 2. Thus, having the

lowest value of cash available for debt service (negative, EUR 147.193 million), it had the highest amount of total debt. Because of this finding, the authors can state that financial institutions did not take into account the cash flow principle in credit risk calculation.

7. Conclusions

This paper discussed Timothy Jury's credit risk analysis methodology and the underlying template. The aim of the paper was to review and improve the methodology and template of credit risk analysis, Timothy Jury, to elaborate its improved version and apply it to the case of the manufacturing company in order to contribute to the spread of this almost unknown method. The results and conclusions of the work done are as follows:

- Timothy Jury's methodology of credit risk analysis and its underlying template was improved in accordance with the requirements of International Financial Reporting Standards (IFRSs).
- The improved methodology and template provide sufficient visibility of the company's actual financial situation, the ability to cover debt and to specify the actual source used to cover the debt.
- The updated template shows clearly whether a company is close to bankruptcy and specifies the likelihood of default.
- Linas Agro Group paid significant dividends with negative cash available to satisfy capital providers for the years 2016–2018.

Despite the fact that the cash-based credit risk model proved itself well, the users of the credit risk models should compare it with accrual-based credit risk models on the example of several companies. The authors of the present research contributed to the development of the cash flow theory from a perspective of credit risk and encouraged the academic society to further research this topic. The cash-based credit risk model presented in this research can now be used by financial managers, company owners, investors, and financial institutions to find out the probability of default of the analyzed companies, as well as by the auditors for the trustworthy estimation of the financial position of the company.

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Appendix 1. Authors’ calculations of cash-based credit risk model

Notes to the cash-based credit risk model calculations in the table below:

1. Cash Generated from Operations 2022 = $-5,877 + 7,128 - 122,710 = -121,459$
2. Cash Generated from Operations 2021 = $43,121 + 1,329 - 25,476 = 18,974$
3. Cash Generated from Operations 2020 = $38,881 + 165 - 19,276 = 19,770$
4. Cash Generated from Operations 2019 = $20,308 + 471 - 15,794 = 4,985$
5. Cash Generated from Operations 2018 = $-20,014 + 1,824 + 38,796 = 20,606$
6. Cash Generated from Operations 2017 = $5,974 + 1,037 + 13,592 = 20,603$
7. Cash Generated from Operations 2016 = $22,894 + 1251 - 6,773 = 17,372$

Cash-based credit risk model based on Timothy Jury's template: review and modification with application to manufacturing company (2016-2022)

In thousands of EUR	2022	2021	2020	2019	2018	2017	2016
Cash generated from operations	122,710	25,601	19,770	4,985	20,606	20,603	17,372
Changes in working capital	-	-	-	-	-	-	-
(Increase) decrease in biological assets	-2,181	1,032	3,308	-968	2,894	1,061	3,096
Decrease (increase) in inventories, and right of return asset	-53,074	-2,657	8,224	4,180	-22,191	1,511	-15,098
Decrease (increase) in prepayments	1,316	-1,805	1,555	5,281	-1,598	-553	2,147
Decrease in trade and other accounts receivable	-49,552	2,708	5,614	3,201	-15,790	-13,366	4,057
(Increase) in restricted cash	343	-374	211	600	-710	199	-449
Increase in trade and other accounts payable (Invested in)/ Generated from Net Working Assets	-18,311	20,070	164	3,500	-1,401	-2,444	13,020
	-121,459	18,974	19,276	15,794	-38,796	-13,592	6,773
Net Capex	-6,985	-6,249	-5,118	-11,440	-18,356	-15,707	-11,911
Cash Taxes	-7,128	-1,339	-165	-471	-1824	-1,037	-1,251
Cash available to satisfy capital providers	-134,321	55,971	33,763	8,868	-58,976	-9,733	-6,389
Net interest	2,293 - 15,071 = -12,778	756 - 3,551 = -2,795	817 - 3,148 = -2,337	635 - 2,944 = -2,309	503 - 2577 = -2074	868 - 2,872 = -2004	273 - 2,169 = -1,896
Net dividends	0 - 94 = -94	0 - 12 = -12	1 - 8 = -7	4 - (17+2,926) = -2,939	14+1,202 = 1,216	26+1,202 = 1,228	15+1,202 = 1,217
Cash available for debt service	-147,193	53,164	31,419	3,620	-62,266	-12,965	-9,502
Total net debt (C) in cash	-298,085	-127,020	-149,895	-150,165	-153,968	-112,497	-98,492
Number of years to repay	NEVER	2.39	4.77	41.48	NEVER	NEVER	NEVER

Source: author's calculations of the cash-based credit risk model based on the Timothy Jury's template.

Appendix 2. Authors' total debt calculations in thousands of EUR

Year 2022. Total Net (Debt) in Cash	2022
Net debt at beginning of the year	127,020
Increase in cash in the year	2,803
Decrease in short-term borrowing	150,435
Current portion of long-term borrowing	3,522
Decrease in long-term borrowing	9,249
Finance lease obligation (non-current)	4,719
Current portion of finance lease obligations	2,106
Deferred income tax liability	1,034
Change in net debt	171,065
Total net (debt)/cash	298,085

Year 2022. Total Net (Debt) in Cash	Beginning	Ending	Difference
Cash	18,007	20,810	2,803
Short-term borrowing	63,115	213,550	150,435
Current portion of long-term borrowing	17,119	20,641	3,522
Long-term borrowing	13,056	22,305	9,249
Finance lease obligation (non-current)	27,148	31,867	4,719
Current portion of finance lease obligations	5,553	7,659	2,106
Deferred income tax liability	1,029	2,063	1,034
Total (debt)/cash	127,020	298,085	171,065
Difference	0	0	0
Total net (debt) / cash	127,020	298,085	171,065
Year 2021. Total Net (Debt) in Cash	Changes		
Net debt at beginning of the year	149,874		
Increase in cash in the year	8,468		
Decrease in short-term borrowing	29,614		
Current portion of long-term borrowing	3,989		
Decrease in long-term borrowing	5,636		
Finance lease obligation (non-current)	7,670		
Current portion of finance lease obligations	561		
Deferred income tax liability	1,760		
Change in net debt	22,854		
Total net (debt)/cash	127,020		

Cash-based credit risk model based on Timothy Jury's template: review and modification with application to manufacturing company (2016-2022)

Year 2021. Total Net (Debt) in Cash	Beginning	Ending	Difference
Cash	9,539	18,007	8,468
Short-term borrowing	92,729	63,115	29,614
Current portion of long-term borrowing	13,130	17,119	3,989
Long-term borrowing	18,692	13,056	5,636
Finance lease obligation (non-current)	19,478	27,148	7,670
Current portion of finance lease obligations	4,992	5,553	561
Deferred income tax liability	853	1,029	176
Total (debt)/cash	111,421	76,171	35,250
Difference	38,453	50,849	12,396
Total net (debt) / cash	149,874	127,020	22,854

Year 2020: Total Net Debt (-) in Cash. Changes	Changes
Net debt at beginning of the year	150,165
Increase in cash in the year	1,902
Decrease in short-term borrowing	20,810
Current portion of long-term borrowing	281
Decrease in long-term borrowing	1,101
Finance lease obligation (non-current)	-17,040
Current portion of finance lease obligations	-4,117
Deferred income tax liability	-761
Change in net debt	270
Total net (debt)/cash	149,895

Year 2020. Total Net Debt (-) in Cash	Beginning	Ending	Difference
Cash	7,637	9,539	1,902
Short-term borrowing	113,539	92,729	20,810
Current portion of long-term borrowing	13,411	13,130	281
Long-term borrowing	19,793	18,692	1,101
Finance lease obligation (non-current)	2,455	19,495	17,040
Current portion of finance lease obligations	875	4,992	4,117
Deferred income tax liability	92	853	761
Total (debt)/cash	146,743	124,551	22,192
Difference	3,422	25,344	21,922
Total net (debt) / cash	150,165	149,895	270

Year 2019: Total Net Debt (-) in Cash. Changes	Changes
Net debt at beginning of the year	153,965
Increase in cash in the year	-2,858
Decrease in short-term borrowing	4,570
Current portion of long-term borrowing	-6,576
Decrease in long-term borrowing	7,387
Finance lease obligation (non-current)	-1,283
Current portion of finance lease obligations	-316
Deferred income tax liability	18
Change in net debt	3,800
Total net (debt)/cash	150,165

Year 2019: Total Net Debt (-) in Cash	Beginning	Ending	Difference
Cash	10,495	7,637	2,858
Short-term borrowing	118,109	113,539	4,570
Current portion of long-term borrowing	6,835	13,411	6,576
Long-term borrowing	27,180	19,793	7,387
Finance lease obligation (non-current)	1,172	2,455	1,283
Current portion of finance lease obligations	559	875	316
Deferred income tax liability	110	92	18
Total (debt)/cash	145,399	146,743	1344
Difference	8,566	3,422	5,144
Total net (debt) / cash	153,965	150,165	3,800

Year 2018. Total Net Debt (-) in Cash. Changes	Changes
Net debt at beginning of the year	112,497
Increase in cash in the year	1,598
Decrease in short-term borrowing	-40,615
Current portion of long-term borrowing	4,226
Decrease in long-term borrowing	-6,779
Finance lease obligation (non-current)	-96
Current portion of finance lease obligations	0
Deferred income tax liability	-739
Change in net debt	-41,468
Total net (debt)/cash	153,968

Cash-based credit risk model based on Timothy Jury's template: review and modification with application to manufacturing company (2016-2022)

Year 2018: Total Net Debt (-) in Cash	Beginning	Ending	Difference
Cash	8,897	10,495	1,598
Short-term borrowing	77,494	118,109	40,615
Current portion of long-term borrowing	11,061	6,835	4,226
Long-term borrowing	20,401	27,180	6,779
Finance lease obligation (non-current)	1,076	1,172	96
Current portion of finance lease obligations	559	559	0
Deferred income tax liability	1,906	110	1,796
Total (debt)/cash	98,971	145,399	22,192
Difference	13,256	8,566	21,922
Total net (debt) / cash	112,497	153,965	41,468

Year 2017: Total Net Debt (-) in Cash. Changes	Changes
Net debt at beginning of the year	98,492
Increase in cash in the year	1,996
Decrease in short-term borrowing	-19,402
Current portion of long-term borrowing	8,882
Decrease in long-term borrowing	-3,660
Finance lease obligation (non-current)	152
Current portion of finance lease obligations	374
Deferred income tax liability	-351
Change in net debt	-14,005
Total net (debt)/cash	112,497

Year 2017: Total Net Debt (-) in Cash	Beginning	Ending	Difference
Cash	6,901	8,897	1,996
Short-term borrowing	58,092	77,494	19,402
Current portion of long-term borrowing	19,943	11,061	8,882
Long-term borrowing	16,741	20,401	3,660
Finance lease obligation (non-current)	1,228	1,076	152
Current portion of finance lease obligations	933	559	374
Deferred income tax liability	1,555	1,906	351
Total (debt)/cash	76,388	98,971	22,583
Difference	22,104	13,256	8,848
Total net (debt) / cash	98,492	112,497	14,005

Year 2016: Total Net Debt (-) in Cash. Changes	Changes
Net debt at beginning of the year	104,047
Increase in cash in the year	221
Decrease in short-term borrowing	6,164
Current portion of long-term borrowing	-6,630
Decrease in long-term borrowing	5,988
Finance lease obligation (non-current)	561
Current portion of finance lease obligations	-130
Deferred income tax liability	-398
Change in net debt	5,555
Total net (debt)/cash	98,492

2016 Year: Total Net Debt (-) in Cash	Beginning	Ending	Difference
Cash	6,680	6,901	221
Short-term borrowing	64,256	58,092	6,164
Current portion of long-term borrowing	13,313	19,943	6,630
Long-term borrowing	22,729	16,741	5,988
Finance lease obligation (non-current)	1,789	1,228	561
Current portion of finance lease obligations	803	933	-130
Deferred income tax liability	1,157	1,555	-398
Total (debt)/cash	88,774	76,388	12,386
Difference	15,273	22,014	6,741
Total net (debt) / cash	104,047	98,492	5,555