Business Cash Flow Simulation Modelling: Lessons Learned

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Abstract
Cash flow analysis is an important and relevant object of research because companies often do not effectively manage their cash flows. The main goal of managers is only to achieve a maximum profit. This leads to sub-optimal use of resources of humans and inventory, poor financial performance and indicators, distrust of the company. If employees would not trust company, its sustainability and feel ensure they can quit the job. Consequently, the aim of this work is to create a cash flow model to predict the dynamics of flows over time and to identify the company's main errors in managing cash flows. The simulation model will be universal, therefore it will be easy to adapt to any type and size of business. This method could make employees work easier and faster and then human resource management becomes more efficient. Simulation modelling method and "Powersim 10" software will be used to achieve this goal.

Keywords
Simulation modelling; cash flow model; business cash flow management; financial statements; "Powersim 10".

Introduction

This work is based on the information provided in any company's financial statements, so it is important to mention their key characteristics. Financial reporting is regulated by IFRS (International Financial Reporting Standards) in most countries of the world, and GAAP (Generally Accepted Accounting Principles) is still in force in the USA. There are fundamental differences between these standards. For example, Harris (2016) points to a problem related to inventory management methods in an article. GAAP allows the use of the LIFO method, whereas under IFRS rules this method is not permitted and must be used by FIFO (Harris, 2016). For this reason, the information provided in the financial statements of "Gasprom" and "ExxonMobil" cannot be easily compared, as their inventory management methods, cost of sales and even profit may differ. Investors and analysts should not make unadvised decisions and succumb to the bias of functional fixation.

Recent research (for example, Ayers, Call, & Schwab (2018), Anikeyev, Bagriy, & Hablovskyi (2020), Baik, Cho, Choi & Lee (2016), Barbashin (2016), Cumbie & Donnellan (2017), Deo (2016), Hardan, Qabajeh, & Alshanti (2016), Yakovlev, Yarullin, & Shlyannikov (2020), Kent (2018), Korzeniowska (2018), Lightstone, Wilcox, & Beaubien (2014), Markovnina et al. (2019), Myznikova & Zhdanova (2017), Mohsin, Ahmed, & Streimikiene (2020), Motlagh (2013), Muzira (2020), Nicula & Spânu (2019), Ofori (2020), Rowland & Stanek (2021), Stice, Stice, Cottrell, & Stice (2017), Sun, Xu, & Zhao (2018), Volkova, Kozlov, Mager, & Chernenkaya (2017), etc.) highlights the importance of appropriate cash flow management and represents wide variety of angles to address this topic.

The information based on company's cash flows is important not only for managers, but also for investors, suppliers, customers, creditors and so on. They show not only the sources and extent of money, but also determine the value of the company. There are plenty of different methods, which could predict the value from future cash flows. For example, Dong (2018) points to the possibility of discounting the free cash flow (FCFF), Fernandez (2020) suggests the method of discounting the free cash flow to equity (FCFE) (Dong, 2018; Fernandez, 2020). Other method could be Gordon's growth model (Maranjory & Keykha, 2016), etc. Overall, cash flow management is a complex process in corporate control. Company during the different stages faces various problems and challenges. Employees must always pay attention to examples of improper cash flow management provided below. Therefore, these examples will be taken into account in this work.

Firstly, managers must pay particular attention to the difference in timing between when cash is collected from customers from the sale of inventory and when cash must be paid to suppliers for the purchase of that inventory. Significant discrepancy between those numbers indicates a potential cash flow problem (Stice et al., 2017). Cash pays loans, suppliers, employees, taxes and more. Thus, if even profitable company gets imbalance in its cash flows, it can go bankrupt. According to the authors, the most important part is operating activities, so suggestion is to analyses the length of operating cycles and find the most optimal size for the firm (Stice et al., 2017).

Secondly, Ishak et al. (2020) identified main problem for construction industry in Malaysia – delays in payment to subcontractors. Late or delayed in payment is one of the most serious crisis, which can cause the dispute between parties, bankruptcy, abandon projects and others (Ishak et al., 2020). Thirdly, Klimek (2021) mentions the resource-constrained project scheduling problems and client's payments after the end of the contract and works. When planning long-term projects, it is very important to include not only the time component (how long each stage will last) but also to estimate how the size of each cash flow will change over time (Klimek, 2021). A similar case was analyzed by Roieva (2020). According to the author, in general, it is very important to ensure effective inventory management in the company's business process: inventory acquisition and maintenance. The results of such management efficiency or inefficiency will affect the overall liquidity, solvency, financial stability, etc. of the company (Roieva, 2020).

In addition, there are other problems faced by companies like disorganization, spending too much on not common fields, lack of cash and so on. Likewise, there are companies, which do not forecast their future cash flows or even do not make bookkeeping. External factors (crisis, seasonal demand, competitors, etc.) also contribute to a company's cash flow imbalance. All examples conclude the same problems (imbalance in cash flows and varied payment terms) regardless the age of the company and are obvious for both start-ups and corporation with significant experience. So, it's important for businesses to understand their fundamental mistakes and avoid them or at least always keep a close eye on those areas, because bad financial performance can cause deterioration of employee wellbeing.

Methodology of the study

In general, there are not many similar studies related to cash flow analysis in research. Flows are usually analyzed using relative or absolute indicators, estimating a company's share price, or similar models. These methods are traditional and do not provide new insights, which could help to improve humans' well-beings. There is a significant lack of scientific articles investigating the movement of money using simulation models. One example is a study conducted by Sokolovska (2018), during which she sought to create opportunities to forecast the dynamics of the company's cash flows, but focused on the effect of Wednesday. The author used "Ithink" software (Sokolovska, 2018). Therefore, similar types of research are new and relevant, as they provide more opportunities for companies to optimize their operations, to see new perspectives that they would not normally see with traditional financial management tools.

Research problem and goal: Companies often do not manage their cash flows efficiently, which results in distrust of external users in the company, poor financial performance, sub-optimal use of human and inventory resources and non-maximum profits. The goal is to create a universal cash flow model that could be used to predict the dynamics of flows over time and to identify the company's mistakes in managing cash flows and facilitate the work of employees.

Object and data of the research: the data was taken from APB "Apranga", 2015 – 2020 quarterly financial statements: balance sheet, profit and loss account, cash flow statement.

"Apranga group" is a chain of clothing retail stores. It consists of APB "Apranga" and 25 subsidiaries. In all, 175 stores in three countries: Lithuania, Latvia and Estonia. (Apranga Group, 2021). APB "Apranga" was chosen, because it has been operating for more than 20 years and is the market leader in Lithuania. Its operations are developed and relatively stable, the store chain is wide, so there should be no sudden and large growth spikes that would severely distort the results of the model. This choice is especially important, as the long-term perspective of the company's results will be analyzed.

Research method: simulation modelling, calculation of financial ratios.

The simulation modelling method is widely used in practically all economic activities and industries. It is a great tool used in the decision-making process. The method can be applied in various ways, depending on the software chosen, modelling schemes, purpose, evaluation criteria, assumptions, production processes, and so on. t. (Morozova & Lomkova, 2018). Specifically, financial models are characterized by dynamism, complexity, and general unpredictability, which make their analysis difficult to implement without simulation. For example, Novik (2019) studied the outflow of labor force in Ukraine, Sagitov and Kirpikov (2019) performed an analysis of financial stability of firms using cash flow simulation modelling, Morozova and Lomkova (2018) performed simulation modelling in the process of textile production (Novik, 2019; Sagitov & Kirpikov, 2019; Morozova & Lomkova, 2018). Different research objects show the convenience and versatility of this method.

Hypotheses

1) The forecasted profit of APB "Apranga" for the reporting period will increase;
2) Inventories will be managed inefficiently;
3) Short-term payables and receivables will be strongly correlated.

The first hypothesis is raised in the hope that the company is profitable, does not face significant problems, so its profit should grow. The second hypothesis is based on the problem mentioned in scientific articles inefficient inventory management and planning. The correlation between short-term receivables and payables is examined in the light of the cash flow imbalances mentioned.

Universal simulation model

This study develops model of cash flow movement. A model has been developed that is suitable for companies of all sizes. This scheme is universal for Lithuanian companies, because the variables were selected on the basis of the regulations of the Republic of Lithuania and the established forms of AVNT financial statements effective from 2016-

01-01 (Finansinių ataskaitų formos, 2016). In addition, it can be easily adapted to different countries firms.

The model (Figure 1) is suitable for any type and size of company, as all firms prepare a balance sheet and a profit (loss) account. This scheme has the adaptability characteristics, so it is easy to change elements and add new ones. The model consists of seven main elements: equity, liabilities, financing, assets, current assets, fixed assets, profit (loss) for the period.

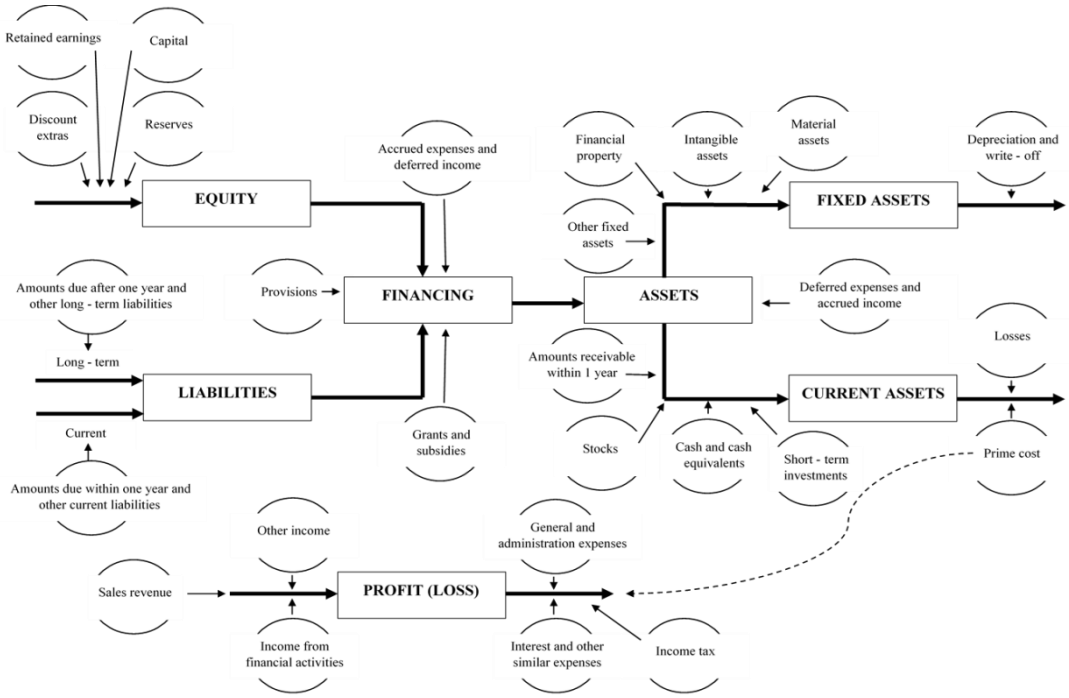

Figure 2. Model universal scheme

(Own study based on research results)

The company's activities in the initial stage begin with the search for sources of financing. It consists of equity and liabilities from which assets are acquired for operating activities. Equity consists of retained earnings, capital, reserves and discount extras. Current and long-term liabilities are determined by almost the same factors; only their maturity differs, such as loans, advances received, debts to suppliers, various amounts payable, and so on. In addition, current liabilities include income tax and employment liabilities. Grants and subsidies, provisions, accrued expenses and deferred income contribute to the financing.

After receiving financing, the company buys various assets for production or services. Fixed assets include material and intangible, financial and other fixed assets. Outflows consist of depreciation and write-off. The amount of current assets is determined by inventories, receivables within 1 year, short-term investments and cash and cash equivalents. Most of it is consumed through prime cost and various losses. It can include theft, disappearance, damage and so on.

When a company starts operations, it receives income. The largest part of them consists of sales, financial activities and other income. Expenses consist of prime cost, general and administrative expenses, interest and other similar expenses and income tax. The aggregation of income with expenses results in the net profit for the reporting period.

General information and models' parameters of models

The simulation model developed and presented in this paper is stochastic, dynamic, complex and continuous. It reflects the dynamics of cash flows in the company over a set period of time. Complexity is revealed through the number of variables and most of them are random and vary within a set range. The model was developed using "Powersim 10" and the universal scheme (Figure 1), which was adapted according to the financial statements of APB "Apranga".

To measure the time of the simulation process was selected a banking calendar consisting of 12 months and 30 days each. The time interval is a quarter; the simulation period lasts from 1st January, 2021 to 1st of January, 2031 for a total of 10 years. These timing settings were chosen not randomly, but for convenience using APB "Apranga's" historical quarterly data to determine the long-term financial perspective without changing the company's cash flow management policy. In the figures from 1 to 4 "saus." mean January.

Simulation modelling is performed only by simulating the movement of cash flows. There are no other units of measurement in the model. In addition, all amounts and flows presented in the simulation are in thousands of euros. These figures were used for convenience and better presentation and visualization capabilities. Some extreme values were also removed from the data for greater model stability.

Results of analysis

After creating and adapting imitation model, a cash flow simulation was started. Adaptation was done based on the elements mentioned on companys financial statements: balance sheet and profit (loss) account, cash flow statement. Main view of model is performed in Figure 2. The obtained results shows the forecast financial results of APB "Apranga" for 2021 – 2031. The model simulation starts from equity and liabilities as financing sources. Equity consists of authorized capital, retained earnings, reserve requirements. Liabilities consists of current and long-term loans, lease obligations, long-term liabilities to employees, deferred income tax liabilities, income tax liabilities, trade and other payables. Completely achieved financing is used for fixed and current assets acquirement. Fixed assets consists of trade and others receivables, assets under management, intangible assets, material assets, financial property, prepayments, investments in subsidiaries and it is used by depreciations and write-off. Current assets consists of inventory, trade and other receivables, cash and cash equivalents, financial property, prepayments and it is used by losses and prime cost. The part of profit (loss) is related with other parts through fixed assets for sale and prime costs elements. Income consists of net foreign exchange gains, other income,

income from contracts with customers and income from financial activities. Expenses consists of income tax, general and administrative expenses and financial operating expenses.

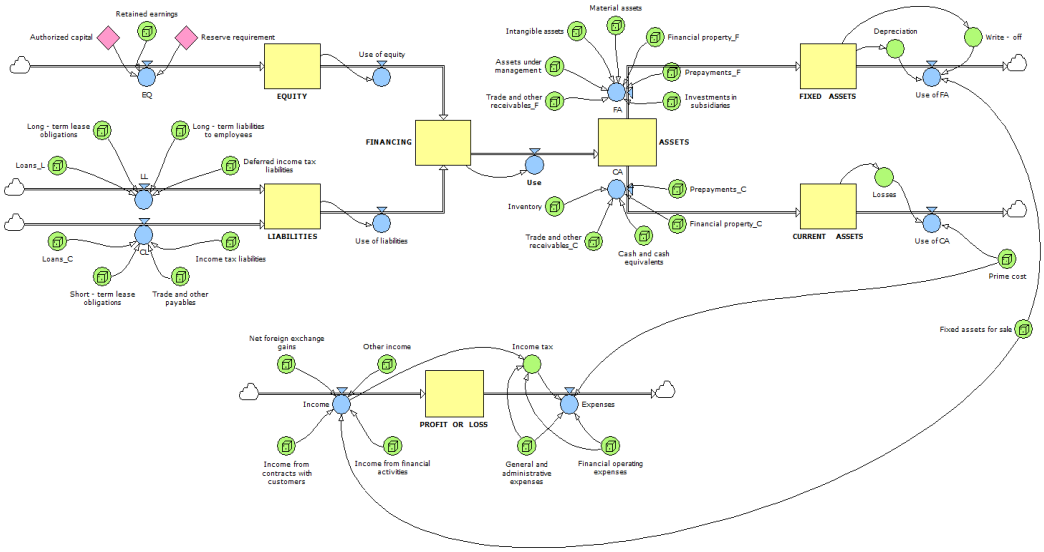

Figure 3. General view of simulation model
(Own study based on research results)

One of mistakes in companies is inefficient inventory management. Figure 3 shows the projected relationship between inventories and prime cost. Inventories accounted for an average of 31% of total assets over 6 years (approximately 54% of current assets) and prime cost 64% of sales revenue. The stocks curve reflects their receipt and and the prime cost – use. The first positive aspect is that stocks do not grow to infinity, i. y. the company does not stockpile stocks. Secondly, the graph shows that as inventories increase, so does their prime cost. This means that once a company has purchased inventories (goods), it uses (sells) them quickly. Delays occur at certain times, but they are not significant and do not have a significant impact.

Figure 4. The interaction between inventory and prime cost relationship
(Own study based on research results)

In order to assess the turnover of the company's inventories more broadly, relative indicators were used (Table 1). The results were obtained by calculating the indicator with minimum, maximum and average values over 6 years. The obtained values contradict the prediction, and the indicator looks poor even on average. Stocks are not being used so quickly. However, it must be acknowledged that these indicators need to be assessed very critically and individually. "Apranga" sells clothes, so their stocks make up the bulk of the total. With clothes in stock for 1.5 years, nothing happens (assuming there is no fire, etc.), but fashion trends need to be taken into account as well. Every season, clothing models, colors, designs, styles, etc. change. Therefore, stocks of clothing and accessories held 548 days, may remain unused or will have to be sold at a discount. Another important aspect to consider is what constitutes inventory in addition to goods. Goods for customers are packed in plastic (paper) bags, other packaging with a very long shelf life. A great example of this is McDonald's operating cycle. According to the data of the 2016, the indicator is 7 days. As for a fast food cafe, this seems a little big number (especially knowing that customers pay for them immediately), but packaging is also included in this indicator (Stice et al., 2017). This condition changes the assessment of the indicator from slow to a quite normal turnover. Returning to the assessment of APB "Apranga's" inventory turnover, it should be emphasized that this long storage and warehousing significantly increases the company's expenses, therefore the company's employees should review the use and storage of inventories.

Table 3. The stock turnover ratio is calculated with minimum, maximum and average values

Indicator	MIN[1]	MAX[2]	Average[3]
Inventory turnover	0,46	1,72	0,66
Inventory turnover (days)	798	212	548

Own study based on research results

In Figure 4 is presented the volatility of short-term receivables and payables over time. Trade and other receivables accounted for an average of 18% of total assets over 6 years (approximately 32% of current assets) and trade and other payables for 29% of total liabilities (approximately 46% of current liabilities). It is clear from the graph that as receivables increase, so do the amounts payable. The company cannot settle accounts with suppliers and other entities until they are settled by customers. This is very important because it can affect the company's creditworthiness and, in general, its image. It is also important to mention that receivables are projected to be higher than payables. "Apranga" should assess whether the deadlines set for customers are not too long, during which they can settle with the company without additional consequences. This situation is not bad in the "boom" stage, but the company may face major difficulties during the downturn.

[1] Ratio calculated on minimum values of the period (2015 – 2020)
[2] Ratio calculated on maximum values of the period (2015 – 2020)
[3] Ratio calculated on average values of the period (2015 – 2020)

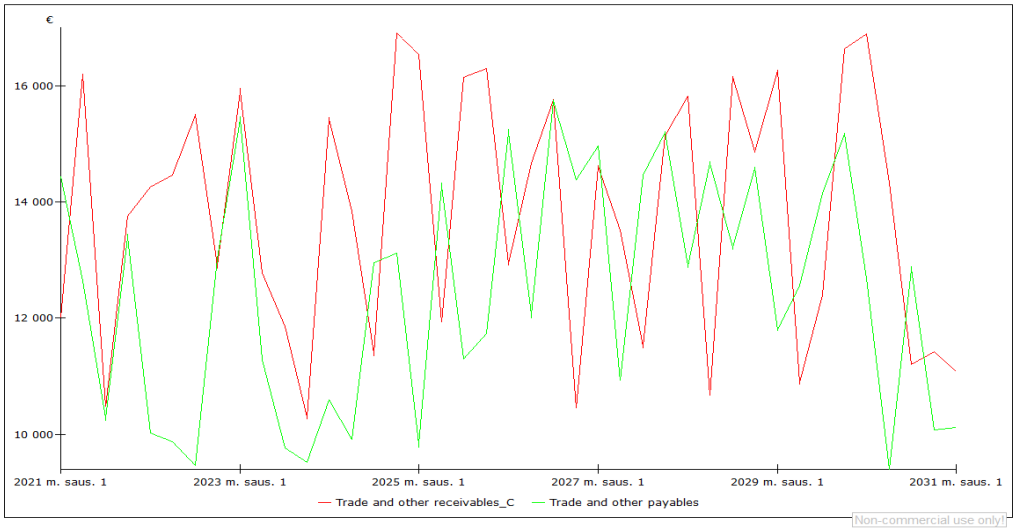

Figure 5. The interaction between short-term receivables and payables
(Own study based on research results)

The calculation of short-term solvency ratios was also used for a broader assessment (Table 2). They are calculated on the basis of maximum, minimum and average values of variation. The indicators obtained are good. Current assets cover current liabilities by 2,47 times on average. Evaluating the indicator without stocks, it is optimal. In addition, an enterprise can cover on average only 20% of its current liabilities in only cash.

Table 4. Solvency ratios are calculated with minimum, maximum and average values

Indicator	MIN	MAX	Average
Overall short - term solvency ratio	1,99	3,33	2,47
Rapid short - term solvency ratio	1,15	1,55	1,14
Absolute short - term solvency ratio	0,82	0,01	0,20

Own study based on research results

The turnover of short-term payables and receivables was also estimated (Table 3). Short-term trade and other payables are paid faster than receivables as expected from the forecast in figure 2. In general, a company settles with suppliers and other entities on average faster than customers settle with them. This confirms all the above remarks and "Apranga" should reduce its receivables turnover by at least 189 on average in order to eliminate the exclusion.

Table 5. Short-term payables and receivables are calculated with minimum, maximum and average values

Indicator	MIN	MAX	Average
Turnover of accounts payable	1,56	2,72	1,93
Turnover of accounts payable (days)	234	134	189
Turnover of receivable	1,45	3,97	1,77
Turnover of receivable (days)	252	92	206

Own study based on research results

The volatility of receivables is not as intense as that of payables. In summary, the company's solvency ratios are very good, but receivables from customers should be overestimated based on forecasts, as they are highly correlated with payables. In this case, the turnover figures provide the same picture as the forecast.

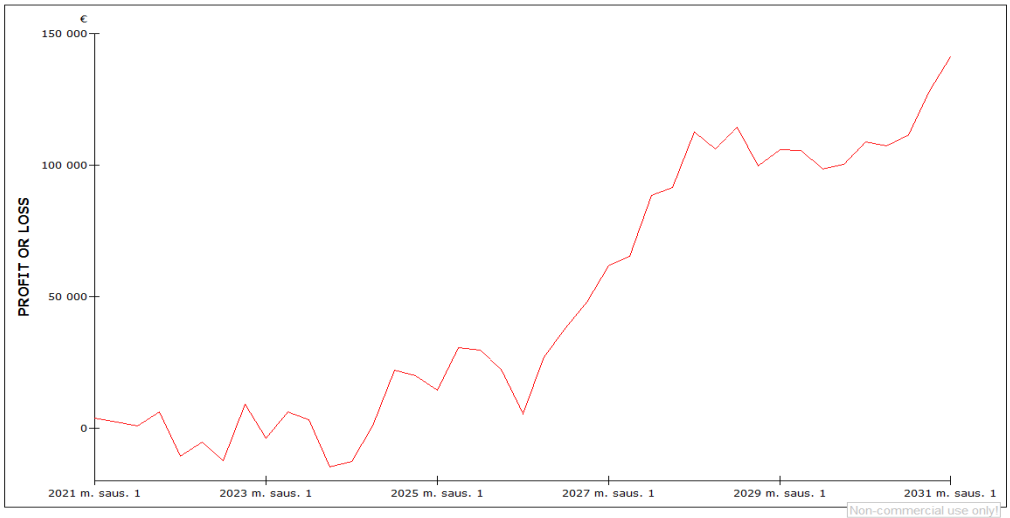

Figure 6. Profit (loss) forecast for 2021-2031
(Own study based on research results)

Figure 5 presents the forecast of net profit (loss) for 2021 – 2031. The graph shows that by 2024 loss is expected to reach the bottom and further is projected to rise. The whole forecast shows, that profit may vary to negative side on the consequences of the pandemic. From then, the trend will tend to grow with small deviations.

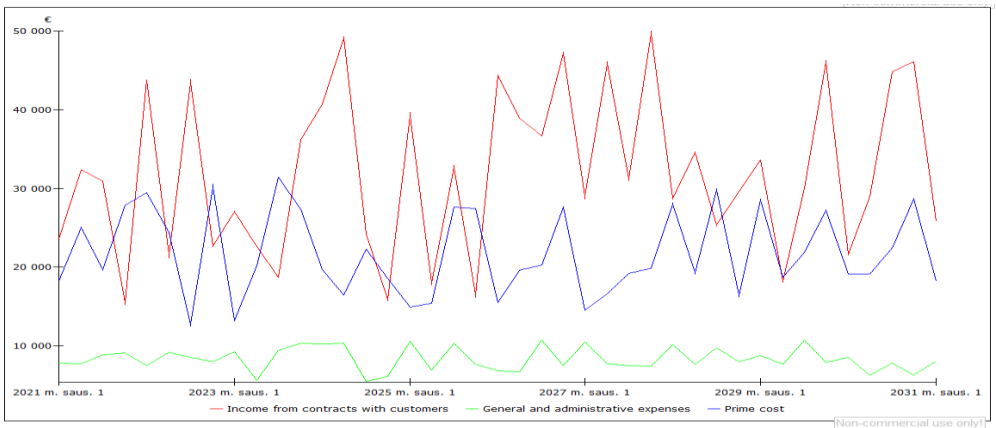

Figure 7. The interaction of key revenue and expense elements
(Own study based on research results)

In 2024 the projected loss may be due to increased general and administrative expenses, prime costs and decreased sales revenue (Figure 6). It is important to emphasize that other expenses and revenues also have an impact on net profit, but their impact is not as pronounced as elements provided in figure 6. In addition, net profit is obtained with minimal delays compared to the values of the elements in certain periods.

To assume, this model shows that profit (loss) of the company will grow, so the first hypothesis is accepted. The main parts of it are earnings, prime cost, general and administrative expenses. Inventory and prime costs have close connection and move in the same directions evenly. From projections the first hypothesis should be confirmed, but based on a deeper analysis it can be rejected. Third hypothesis is confirmed, because forecast shows, that receivables and payable move identically. Additional analysis shows that solvency of "Apranga" is good, but rations of turnover should be reduced.

Advantages and disadvantages of the model

Overall, the advantages and disadvantages of the model can be discussed after the study. The model is complicated and complex. It includes many elements, which can cause model distortions (solution is to filter the data). On the other hand, these elements can be used to make additional analysis identifying main inefficiency problems. Next problem is related to employees' knowledge of the software, but its control is quite simple and easy to learn. In addition, the main advantage is that it can be used by any kind of company, because each firm in Lithuania prepares a balance sheet and a profit (loss) account.

This analysis was done projecting 10 years APB "Apranga" performance, but it can be used to simulate only one week, month or quarter forecast. The results and findings would be more accurate using company's information, which is not showed in public and is confidential. The data analysis, projections and suggestions provided are for guidance only. It also needs to be considered that economic forecasts are often inaccurate, especially in this work, because external factors are not included. In conclusion, the whole work is of a recommendatory nature.

Conclusion

To assume, recent article uses traditional techniques and methods, so it was a quite new idea of how companies can analyses a cash flow movement using simulation modelling. In addition, "Powersim 10" software is a handy tool for this kind of analysis. For bigger view of APB "Apranga" were used relative indicators, which showed a little bit different companies face, but it should be appropriate critically.

Created universal model can be adapted to any kind of firm, which prepare financial statements. The biggest advantage of this work is that it could be repeated as many

times as researchers wants with various companies from different counties. Laws, firm's sizes, kinds and other characteristics can be used to modify the model.

APB "Apranga" 2021 – 2031 forecasts show good results. As expected, the company did not anticipate major difficulties. Inventory is not accumulated, but their turnover is a little bit too low. Receivables are higher than payables, solvency ratios is normal, turnover of payables and receivables might be too long, so it should be one of priority areas of the company. Profit will increase. Therefore, company's forecast is good; if there will be no external factors impact.

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