

ALEKSANDRAS STULGINSKIS UNIVERSITY
BUSINESS AND RURAL DEVELOPMENT MANAGEMENT INSTITUTE

**PROGNOSTICATION AND PLANNING
OF ECONOMIC DEVELOPMENT:
MICROECONOMIC
AND MACROECONOMIC LEVELS**

Volume 2

**Multi-authored monograph
edited by J. Žukovskis, K. Shaposhnykov**

Kaunas, Lithuania
2019

UDC 340.34+338.2
P93

*Recommended for publication
by the Academic Council of Aleksandras Stulginskis University*

*Recommended for publication
by the Academic Council of SSI "Institute for the Education Content Modernization"
of the Ministry of Education and Science of Ukraine (Minutes No. 10 on 18.12.2019)*

Reviewers:

Paweł Dziekański – Doctor of Economic Sciences, Jan Kochanowski University in Kielce, Poland.

Natia Gogolauri – Professor, Dr. of Economics, Head of Quality Assurance, New Higher Education Institute (NEWUNI), Georgia.

Editorial Board of the multi-authored monograph:

Jan Žukovskis – Associate Professor, Dr. of Economics, Head of Business and Rural Development Management Institute, Aleksandras Stulginskis University, Kaunas, Lithuania.

Andrzej Pawlik – Dr. hab., Professor Head of the Institute for Entrepreneurship and Innovation, State University of Jan Kochanowski, Poland.

Olga Chwiej – Associate Professor, Dr. of Economics, freelancer scientist, Poland.

Kostiantyn Shaposhnykov – Professor, Dr. of Economics, Head of Black Sea Research Institute of Economy and Innovation, Ukraine.

Vilma Atkociuniene – Professor, Dr. of Economics, Business and Rural Development Management Institute, Aleksandras Stulginskis University, Kaunas, Lithuania.

Martina Diesener – Professor, Dr. of Economics, Faculty of Economics and Management Science, Leipzig University, Germany.

Hélder Ferreira Vasconcelos – Professor, Dr. of Economics, NOVA School of Business and Economics, Lisbon, Portugal.

Xavier Martinez-Giralt – Professor, Ph.D, Dr of Economy, Dean at Departament d'Economia i d'Història Econòmica at the Universitat Autònoma de Barcelona, Spaine.

Yuriy Safonov – Doctor of Economics, Professor, Deputy Director of the State Scientific Institution "Institute for the Modernization of the Content of Education".

The authors of articles usually express their own opinion, which is not always comply with the editorial Board's opinion. The content of the articles is the responsibility of their authors.

Prognostication and planning of economic development: microeconomic and macroeconomic levels. – Multi-authored monograph. – Vol. 2. – Lithuania: Publishing House "Baltija Publishing", 2019. – 408 p.

Плиашенко Н. С., Нагорний Ye. I., Шипулина Yu. S. PREREQUISITES FOR THE SUCCESS OF THE STRATEGIES OF THE ADVANCING INNOVATION ACCELERATION OF INDUSTRIAL ENTERPRISES OF UKRAINE	636
Нагорний Ye. I. PRACTICAL INSTRUMENT FOR EVALUATION OF COMMERCIAL FAILURES OF COMMODITY INNOVATION IN THE MARKET	651
Omelyanenko V. A. INDUSTRY 4.0 STRATEGIES OF INNOVATION DEVELOPMENT: MAIN IDEAS AND EXPECTED EFFECTS	666
Петренко М. І., Іванюта П. В., Кашпрук Ю. А. СИСТЕМА УПРАВЛІННЯ ІНВЕСТИЦІЙНО-ІННОВАЦІЙНИМ РОЗВИТКОМ ПІДПРИЄМСТВА НА СУЧАСНОМУ ЕТАПІ РИНКОВИХ ВІДНОСИН.....	680
Rohanova H. O. FACTOR ANALYSIS OF NET CASH FLOW MARGIN RATIO	757
Сергієнко О. А., Білоцерківський О. Б., Баранова В. В. ФІНАНСОВІ ТЕХНОЛОГІЇ ПІДТРИМКИ РОЗВИТКУ ПІДПРИЄМНИЦТВА: АНАЛІЗ І МОДЕЛЮВАННЯ ДИНАМІКИ	770
Терліук М. А., Liezina A. V., Voloboieva I. O. VALUE-ORIENTED ENTERPRISE MANAGEMENT FROM THE POSITION OF INTERNAL STAKEHOLDERS	787
Шевчук І. Б., Васьків О. М., Старух А. І. ДОСЛІДЖЕННЯ ТЕХНОЛОГІЙ УПРАВЛІННЯ БІЗНЕС-РИЗИКАМИ ТА ЕКСПЕРТНІ МЕТОДИ ЇХ ОЦІНКИ	802

Rohanova H. O.¹

*Candidate of Economics Sciences,
Senior Lecturer at the Department of Finance
National University of Food Technologies*

FACTOR ANALYSIS OF NET CASH FLOW MARGIN RATIO

Summary

The study object is net cash flow or profit margin ratios within a company. Sometimes it is very difficult to reveal and identify the factors that affect the net cash flow margin.

Cash flow ratio within a company is analyzed. The financial ratios taken into account while analyzing the cash flows are described. First-order net cash flow drivers are identified upon comparison of cash flow calculation methods.

As a result of the factor analysis, the net cash flow margin factor model is offered. It includes 7 ratios: leverage ratio; cash turnover ratio; common profit margin; net cash flow coverage ratio for all liabilities; net operating cash flow ratio for operating activities; turnover ratio for all assets; profitability ratio for average cash balance.

In the course of this study, certain net cash flow margin modeling methods were applied. The net cash flow margin is analyzed on a regression basis, which allowed identifying two of the most influential and statistically significant drivers cash turnover ratio and net operating cash flow ratio for operating activities.

In comparison with similar known factor cash flow models, the offered model makes it possible to identify the net cash flow drivers in order to form an efficient mechanism for proper cash flow evaluation and management.

Introduction

Experience shows that major market events are not simple and almost never occur for one reason; instead, they are usually multifactorial and evolve from well-defined sequences of events [1, p. 270]. The solutions of many tasks of estimating events or phenomena are based on the use of a number of indicators, the choice of which determines the accuracy and ability of the result obtained. A critical factor affecting the efficiency of financial management of enterprises, according to the author [2, p. 160] is the composition of the information indicators used. Most often in the economic literature such indicators as margin and cash flow, as well as the ratio of productive indicators to factor components, the resources that led to the result are considered as indicators of activity efficiency [3].

¹ orcid.org/0000-0003-3758-9675

It is clear that even high-margin enterprises may face problems of paying off their liabilities and lack of money to further finance their activities. As a consequence, there is a need to determine the status and movement of funds using indicators, the analysis of which will determine the level of efficiency of cash flow management of the enterprise. The use of relative indicators of cash flow gives an idea of the quality picture, namely, characterizes the efficiency of use of cash of the enterprise. The advantage of coefficient analysis is the ability to study the dynamics of various indicators, which allows to identify the positive and negative trends, as well as to develop the necessary measures to make appropriate adjustments to optimize management decisions in the field of finance [4, p. 80]. The system of financial indicators of cash flow analysis can be represented by groups: liquidity, cash capacity, efficiency and profitability, manoeuvrability, financing and profitability, generation, quality ratios, analysis of future cash flows, uniformity and synchrony of formation and spending of cash. To evaluate the effectiveness (efficiency) of operating activities in terms of obtaining the required cash resources, the indicators of profitability, efficiency and quality of cash flows are more informative than traditional indicators of profitability.

Cash flow margin ratio should be considered, in our opinion, in the context of 2 groups, i.e. the coefficients of profitability based on the calculation of: 1) net profit or net cash flow is the indicators of profitability of cash flow, net cash flow, cash flow from activities (operating, investment, financial); 2) operating profit is the indicators of return on assets and equity on cash flow and cash return: investment, invested capital, invested capital.

The group of cash flow margin ratios include the following ratios: cash flow from operating activities, cash flow efficiency from operating activities, total cash flow efficiency, cash flow from operating activities to total debt, reinvestment.

The calculation of the cash flow quality group metrics is based on an estimate of net cash flow (hereinafter referred to as NCF) and includes metrics: NCF Quality Ratio and Level, NCF Sales Profitability, Equity and NCF Assets. Because NCF can be considered an indicator of solvency and financial stability, conducting a factor analysis of NCF provides an opportunity to find out the relationship between deficit or excess cash flow and major financial performance [5, p. 125].

This is why the Net Cash Flow Margin (hereinafter – NCFM), which is calculated by the ratio of Net Cash flow from Operations to Net Sales. This coefficient characterizes the value of Cash flow, which is the unit of net sales, and shows how much of the proceeds from the sale remains at the enterprise after making all payments in the course of operating activities [6]. In other words, NCFM demonstrates how effective (or ineffective) an enterprise is at converting cash operations.

Part 1. Systematization of cash flow indicators

The first models for measuring and evaluating the performance of enterprises emerged in the 1920s and subsequently spread to virtually all market economies, and were built solely on the basis of financial performance. The traditional approach to determining performance is based on Dupont's classic model of "Return on Equity", involves assessing performance on the basis of two groups of indicators: the summarizing are the first level indicators that characterize the effectiveness of the enterprise as a whole, comparing the performance indicators with the costs of all resources, and indicators of the second level, which evaluate the efficiency of using certain types of enterprise resources [7, p. 234]. In the work [8, p. 34–40] the analysis of classical methods of assessing the efficiency of cash flow management of enterprises was carried out and it was proposed to improve the quality of assessment by introducing statistical analysis indicators. Author of work [9, p. 57] notes that the use of factor analysis, comparative and other methods based on financial reporting leads to the preparation of financial statements by financial managers to assess the past, measure the existing and forecast the future financial position. Such reports contain indicators that reflect the effectiveness of the management of the entity as a whole and its individual businesses. In the framework of complex analysis of cash flows of the enterprise in work [4, p. 79-80], according to the "Cash Flow Report", a factor analysis was conducted to investigate the effect of 1st and 2nd order factors on the change in the absolute value of NCF. In the work [3] it was proposed to calculate profitability, sustainable growth rate, financing index in parallel with the profitability index to incorporate NCF in order to estimate the degree of financial policy effectiveness and to expand the range of factors affecting enterprise value.

Scientists pay enough attention to the analysis of cash flows in the framework of the investment activity of the enterprise. Thus, in the work "Systems Evaluation: Methods, Models, and Applications" the authors carried out a factor analysis of cash flows using 4 indices – net present value (NPV), internal rate of return (IRR), financial benefits and costs ratio (FBCR), payback period (P) [10, p. 86–89]. Formalization of the relationship between the sizes of cash flows sent to the compensation fund, the rate of economic depreciation and the rate of return on capital was addressed by the authors of the work [11] using direct capitalization and cash flow discounting methods. The method of factor analysis of cash flows was used by scientists to estimate the yield of bonds in work [12, p. 136–137].

In studying any indicator, it is important not only to study the indicator itself, its essence and dynamics, but also the factors under the influence of which it changes. This is necessary to identify positive and negative effects on the studied indicator, which will further enhance the impact of positive processes and minimize the negative impact on the object [2, p. 121]. That is why we consider it necessary to carry out a factor analysis, in our opinion, of

such an important indicator of cash flow efficiency as NCFM, i.e. an indicator of the quality of cash flows and the level of self-financing of the enterprise.

The purpose of the work is study of the impact of financial performance of business entities on NCFM using factor analysis. In addition, general and special methods of research were used during the study: analysis and synthesis for preliminary analysis on problem statement, definition of goals, hypotheses and shortcomings; planning the implementation of NCFM in the overall methodology for cash flow analysis; to investigate the peculiarities of analysis of methods of calculating net cash flow from operations in order to identify first-order impact factors; analogies and comparative comparisons to determine the characteristics of factor models of cash flow analysis; decomposition method to decompose NCFM into other cash flow ratios; detailing the NCFM factor model.

Modern practice allows to determine *NCF* from operating activities by two methods – direct and indirect. The list of factors of influence of the first order depending on a method of calculation of PPE is given in Tab. 1.

Table 1

Comparison of cash flow calculation methods

The direct method	
<i>Positive Impact (positive cash flow) – revenue from:</i>	<i>Negative Impact (spendable cash flow) – spending on payments for:</i>
sale of products (goods, works, services)	goods (works, services)
return of taxes and duties	labour
target financing	deductions for social events
buyers and customers of advance payments	other fees and duties
return of advance payments	advance payments
income from interest on balances in current accounts	return of advance payments
penalties (fees, charges) due by debtors	target payments
operating lease	other transactions
receiving royalties	
other operations	
The indirect method	
<i>Positive impact – revenue</i>	<i>Negative impact – expense</i>
profit from ordinary activities before tax	loss from ordinary activities before tax
increase in amortization of fixed assets	reduction in collateral
increase in security	income from unrealized exchange differences
loss on unrealized exchange differences	income from non-operating activities and other non-monetary operations
loss from non-operating activities and other non-monetary operations	increase in current assets
decrease in current assets	decrease in current liabilities
increase in current liabilities	income tax paid

Source: cash flow report [13]

In addition to the above mentioned Cash Flow Profitability Margin (NCFM), in our opinion, cash flow margin ratio should be considered in terms of two groups, depending on the type of profit (cash flow) that was included in the calculation. Consider the algorithm of calculation (where f. is the form of financial statements, and l. and gr. are line and graph of the form of financial statements, respectively):

1 Group 1: cash flows margin ratios, the calculation of which is based on the net profit or net cash flow of the enterprise from the respective activity:

1) profitability ratio of positive cash flow (R_{PCF}):

$$R_{PCF} = \frac{NP}{CF_{CP}} = \frac{f.2 \text{ l.2350(or 2355)}}{f.3 \Sigma l.(3000..3055,3200..3235,3300..3340)} \quad (1)$$

NP – Net profit;

CF_{CP} – aggregate positive cash flow.

2) net cash flow rate of return (R_{NCF}):

$$R_{NCF} = \frac{NP}{NCF} = \frac{f.2 \text{ l.2350(or 2355)}}{f.2 \text{ l.3400}} \quad (2)$$

NCF – aggregate Net Cash Flow of the enterprise.

3) the profitability ratio of the average cash balance (R_C):

$$R_C = \frac{NP}{C_M} = \frac{f.2 \text{ l.2350(or 2355)}}{0,5 \times f.1 (l.1160 \text{ gr.3} + 1165 \text{ gr.3} + l.1160 \text{ gr.4} + l.1165 \text{ gr.4})} \quad (3)$$

C_M – average cash balance.

4) cash flow margin ratio from operations of the enterprise (R_{CFO}):

$$R_{CFO} = \frac{NCF_0}{PCF_0} = \frac{f.3 \text{ l.3195}}{f.3 \Sigma l.(3000..3055)} \quad (4)$$

NCF_0 – net cash flow from operations;

PCF_0 – positive cash flow from operations.

5) cash flow margin ratio from investment activities (R_{CFI}):

$$R_{CFI} = \frac{NCF_I}{PCF_I} = \frac{f.3 \text{ l.3295}}{f.3 \Sigma l.(3200..3235)} \quad (5)$$

NCF_I – net cash flow from operations;

PCF_I – positive cash flow from investments.

6) cash flow margin ratio from financial activities (R_{CFF}):

$$R_{CFF} = \frac{NCF_F}{PCF_F} = \frac{f.3 \text{ l.3395}}{f.3 \Sigma l.(3300..3340)} \quad (6)$$

NCF_F – net cash flow from financial activities;

PCF_F – positive cash flow from financial activities.

Group 2: cash flow margin ratios, the calculation of which is based on cash flow from operations [14]:

7) cash flow ratio of assets (ROA_{CF} , monetary return on assets):

$$ROA_{CF} = \frac{NCF_0}{A_M} = \frac{f.3 \text{ l.3195}}{0,5 \times f.1 (l.1300 \text{ gr.3} + l.1300 \text{ gr.4})} \quad (7)$$

A_M – annual average assets ratio.

8) ratio of return on equity on cash flow (ROE_{CF}):

$$ROE_{CF} = \frac{NCF_0}{E_M} = \frac{f.3 \text{ l.3195}}{0,5 \times f.1 (l.1495 \text{ gr.3} + l.1495 \text{ gr.4})} \quad (8)$$

E_M – annual average equity ratio.

9) ratio of monetary return on investment (ROI_{CF}):

$$ROI_{CF} = \frac{PCF_0}{A_O - C_{IF}} = \frac{f.3 \Sigma l.(3000..3055)}{f.1 (l.1300 - \Sigma l.(1020..1090) - \Sigma l.(1120..1190)) - f.1 \text{ l.4010}} \quad (9)$$

A_O – operating assets;

C_{IF} – interest – free capital.

9) ratio of monetary return on investment (CROCI):

$$CROCI = \frac{EBITDA}{C_I} = \frac{f.2 \text{ l.2290} - f.2 \text{ l.2250} - f.2 \text{ l.2515}}{0,5 \times f.1 (l.1495 \text{ gr.3} + l.1595 \text{ gr.3} + l.1495 \text{ gr.4} + l.1595 \text{ gr.4})} \quad (10)$$

$EBITDA$ – Earnings before interest, taxes, depreciation and amortization;

C_I – invested capital.

10) cash return from gross investment (CROGI):

$$CROGI = \frac{NOPAT + Amor}{C_I + Amor_c} = \frac{(f.2 \text{ l.2190} (or \text{ 2195}) - f.2 \text{ l.2300}) + f.2 \text{ l.2515}}{0,5 \times f.1 (l.1495 \text{ gr.3} + l.1595 \text{ gr.3} + l.1495 \text{ gr.4} + l.1595 \text{ gr.4}) + f.1 \text{ l.1002 gr.4}} \quad (11)$$

$NOPAT$ – Net Operating Profit After Tax;

$Amor$ – amortization;

$Amor_c$ – accumulated amortization.

The defined list of cash flow margin ratios will allow financial analysts to carry out a comprehensive and qualitative analysis of cash flow management efficiency, which can be supplemented by factor analysis of any indicator.

Before embarking on a factor analysis of NCFM, let us examine the behavior of cash flow from operations. The confectionary factories of “Roshen” Corporation (located in Kyiv (hereinafter referred to as KKF), Vinnytsia (hereinafter referred to as VKF), and Kremenchuk (hereinafter referred to as KrKF) were selected as objects of research. The statistical characteristics of the positive and negative cash flows of the surveyed enterprises for 2012-2017 [8] are presented in Tab. 2, the dynamics of changes in their volumes is shown in Fig. 1.

Graphical representation of the dynamics of cash flows from operations (Fig. 1) indicates their imbalance in volume and the lack of synchronization of their formation over time for VKF. For other entities, the amount of cash flow variation is much smaller, but if for 2017 KrKF is characterized by the formation of a positive net cash flow from operations, then for KKF it is a negative net operating cash flow.

Table 2

Statistical characteristics of cash flows from operating activities

Indicator	KKF		VKF		KrKF	
	PCF_0	N_{ECF_0}	PCF_0	BN_{ECF_0}	PCF_0	N_{ECF_0}
Arithmetic mean, thousand UAH	488981	485705	903559	751412	219313	191343
RMS, thousand UAH	223882	147778	382901	95911	47917	23269
Coefficient of variation, %	45.8	30.4	42.4	12.8	21.8	12.2
The coefficient of uniformity, %	54.2	69.6	57.6	87.2	78.2	87.8
Range of variation, thousand UAH	607159	410648	1268064	268854	136370	71728
Risk factor	0.23	0.26	1.08	0.61	0.53	0.26
Pair correlation coefficient	0.972		0.003		0.938	

Source: Prepared by the author on the basis of the financial statements of enterprises [13], where N_{ECF_0} – negative (initial) cash flow of the enterprise from operations.

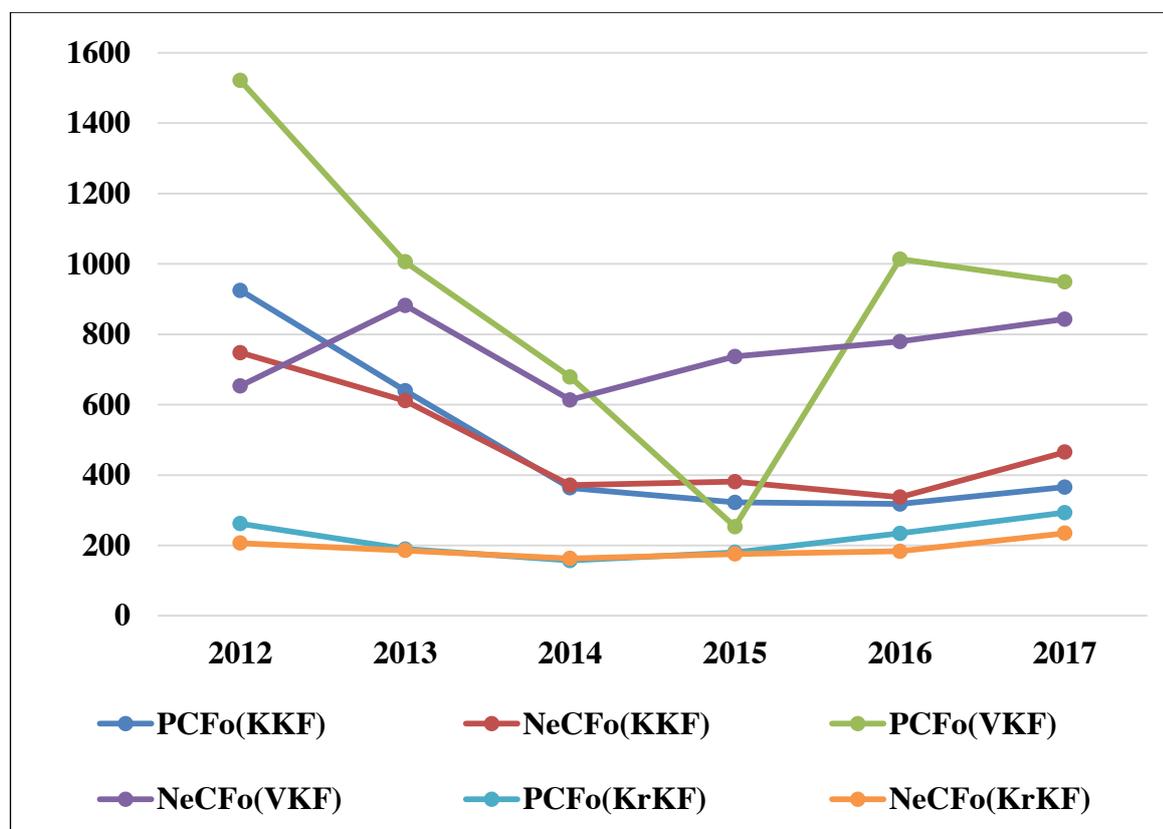


Fig. 1. Dynamics of cash flows of the studied enterprises for 2012-2017, million UAH

Part 2. Factor analysis of Net Cash Flow Margin ratio

Factor analysis is to identify the reasons for the change in absolute and relative financial indicators, as well as to determine the impact of causes (factors) on the change in the financial indicator, which they analyze [15, p. 12]. The sources of information for modeling the NCFM indicator are the forms of financial statements of the enterprises as “Balance” (Statement of Financial Condition, f. 1), the “Statement of Financial Results” (Statement of comprehensive income, f.2) and “Statement of cash flow” (by the direct method, f.3). The multifactor model of the studied NCFM indicator can be formed as follows (12):

$$Y(\text{NCFM}) = \frac{NCF_0}{NS} = \frac{NCF_0}{NS} \cdot \frac{CL+FL}{CL+FL} \cdot \frac{A_M}{A_M} \cdot \frac{NE}{NE} \cdot \frac{NCF_0}{NCF_0} \cdot \frac{NCF}{NCF} \cdot \frac{NS}{NS} \cdot \frac{C_M}{C_M} \quad (12)$$

де $Y(\text{NCFM})$ – **Net Cash Flow Margin** (monetary return on sales); NCF_0 – net cash flow from operations (f.3 l.3195); NS – net income of the enterprise from the sale of products, goods, works, services (f.2 l.2000); $CL + FL$ – long-term and current obligations and security (f.1 l.1595 + f. 1 l.1695 + f.1 l.1700); A_M – average annual value of the assets of the enterprise ($0,5 \times (\text{f.1 l.1300 gr.3} + \text{f.1 l.1300 gr.4})$); NE – net profit (loss) of the enterprise (f.2 l.2350(or 2355)); NCF – aggregated net cash flow of the enterprise (f.3 l.3400); C_M – average cash balance ($0,5 \times (\text{f.1 l.1165 gr.3} + \text{f.1 l.1165 gr.4})$).

By transformations we obtain the following multiplicative model (13):

$$Y = \frac{CL+FL}{A_M} \cdot \frac{NS}{C_M} \cdot \frac{NE}{NS} \cdot \frac{NCF}{CL+FL} \cdot \frac{NCF_0}{NCF} \cdot \frac{A_M}{NS} \cdot \frac{C_M}{NE} \quad (13)$$

Or a model consisting of 7 factors influencing the NCFM:

$$Y = \frac{X_1 \cdot X_2 \cdot X_3 \cdot X_4 \cdot X_5}{X_6 \cdot X_7} \quad (14)$$

де X_1 – coefficient of financial dependence; X_2 – ratio of cash flow of the enterprise; X_3 – the overall profitability of the enterprise; X_4 – coverage ratio NCF of the total liabilities; X_5 – part NCF_0 in NCF ; X_6 – ratio of return of all assets; X_7 – profitability ratio of the average cash balance.

Factor analysis (forward and reverse, deterministic and stochastic) is advisable to carry out using various methods of modeling factor systems (enlargement, extension, contraction, optimization, etc.), as well as traditional economic and logical techniques (elimination) and economic and mathematical techniques (integral, differential, logarithmic calculation), which will significantly increase the informativeness of the obtained results [4, p. 83]. To determine the impact of each factor on the resulting Y , we apply the most universal method of factor analysis: the method of chain substitutions [16]. The input data for factor analysis in the form of the financial statements of the three surveyed enterprises, adapted to model (13), are given in Tab. 3, the estimated coefficients of model (14) are in Tab. 4, the results of determining the influence of factors are in Tab. 5-6.

Table 3

Input data for factor analysis

Indicator (notation)	KKF		VKF		KrKF	
	2016	2017	2016	2017	2016	2017
NCFM (Y)	-0.08	-0.38	0.31	0.12	0.276	0.270
NCF_0 , thousand UAH	-19719	-99665	234226	105534	50717	58726
NS, thousand UAH	232312	259205	750998	913705	183734	217451
CL+FL, thousand UAH	149244	189901	252461	88705	330204	158061
A_M , thousand UAH	682049	726466	4240601	4261803	370391	416484
NE, thousand UAH	3919	2768	2971.00	3595.00	-700.00	11.00
NCF , thousand UAH	-90	6593	-244	-167	-20	-2
C_M , thousand UAH	175	3426.5	310	104	24	13
$X_1 = (CL + FL) / A_M$	0.219	0.261	0.060	0.021	0.891	0.380
$X_2 = NS / C_M$	1327.5	75.6	2422.6	8785.6	7655.6	16727.0
$X_3 = NE / NS$	0.017	0.011	0.004	0.004	-0.004	0.000
$X_4 = NCF / (CL + FL)$	-0.001	0.035	-0.001	-0.002	-0.00006	-0.00001
$X_5 = NCF_0 / NCF$	219.100	-15.117	-0.001	-0.002	-2535.85	-29363.0
$X_6 = NS / A_M$	2.936	2.803	5.647	4.664	2.016	1.915
$X_7 = NE / C_M$	0.045	1.238	0.104	0.029	-0.034	1.182

Source: calculated by the author on the basis of the financial statements of enterprises [13]

Table 4

Determining the impact of factors on the net cash-flow margin indicator

Indicator	Calculation of the influence of factors
ΔY_{X1}	$\Delta Y_{2016} - \frac{X_1(2017) \cdot X_2(2016) \cdot X_3(2016) \cdot X_4(2016) \cdot X_5(2016)}{X_6(2016) \cdot X_7(2016)}$
ΔY_{X2}	$\frac{X_1(2017) \cdot X_2(2016) \cdot X_3(2016) \cdot X_4(2016) \cdot X_5(2016)}{X_6(2016) \cdot X_7(2016)} - \frac{X_1(2017) \cdot X_2(2017) \cdot X_3(2016) \cdot X_4(2016) \cdot X_5(2016)}{X_6(2016) \cdot X_7(2016)}$

Table 4 (continued)

ΔY_{X3}	$\frac{X_1(2017) \cdot X_2(2017) \cdot X_3(2016) \cdot X_4(2016) \cdot X_5(2016)}{X_6(2016) \cdot X_7(2016)} - \frac{X_1(2017) \cdot X_2(2017) \cdot X_3(2017) \cdot X_4(2016) \cdot X_5(2016)}{X_6(2016) \cdot X_7(2016)}$
ΔY_{X4}	$\frac{X_1(2017) \cdot X_2(2017) \cdot X_3(2017) \cdot X_4(2016) \cdot X_5(2016)}{X_6(2016) \cdot X_7(2016)} - \frac{X_1(2017) \cdot X_2(2017) \cdot X_3(2017) \cdot X_4(2017) \cdot X_5(2016)}{X_6(2016) \cdot X_7(2016)}$
ΔY_{X5}	$\frac{X_1(2017) \cdot X_2(2017) \cdot X_3(2017) \cdot X_4(2017) \cdot X_5(2016)}{X_6(2016) \cdot X_7(2016)} - \frac{X_1(2017) \cdot X_2(2017) \cdot X_3(2017) \cdot X_4(2017) \cdot X_5(2017)}{X_6(2016) \cdot X_7(2016)}$
ΔY_{X6}	$\frac{X_1(2017) \cdot X_2(2017) \cdot X_3(2017) \cdot X_4(2017) \cdot X_5(2017)}{X_6(2016) \cdot X_7(2016)} - \frac{X_1(2017) \cdot X_2(2017) \cdot X_3(2017) \cdot X_4(2017) \cdot X_5(2017)}{X_6(2017) \cdot X_7(2016)}$
ΔY_{X7}	$\frac{X_1(2017) \cdot X_2(2017) \cdot X_3(2017) \cdot X_4(2017) \cdot X_5(2017)}{X_6(2017) \cdot X_7(2016)} - \frac{X_1(2017) \cdot X_2(2017) \cdot X_3(2017) \cdot X_4(2017) \cdot X_5(2017)}{X_6(2017) \cdot X_7(2017)}$
$\Delta Y_{3\Gamma}$	$Y_{2017} - Y_{2016} \text{ а\delta\omicron } \Sigma \Delta Y_{Xi}$

Source: based by the author on the basis of the model (14)

The results of the implementation of model (14) made it possible to determine the studied enterprises as ineffective by the criterion of quality of cash flow management according to the results of the study of the influence of factors on the NCFM. The generalized results of the negative impact on the studied indicator (Y) are summarized in Tab. 5. In general, all three enterprises have negative dynamics of the studied indicator during 2016-2017.

For KKF and VKF, the most influential negative factor is the decrease in the margin ratio of the average cash balance: 123% and 153.5% in the structure; for KrKF significant reductions in the values of the coefficients of overall profitability and financial dependence (the latter indicates the feasibility of studying the effect of financial leverage).

However, some coefficients showed a positive effect on the NCFM (Tab. 6). For KKF the most influential is the reduction of the cash flow ratio, for the VKF the reduction of the coefficient of coverage *NCF* the total amount of liabilities in 2 times and the increase in the cash flow ratio almost in

2 times; for KrKF, the increase in the margin ratios of the average cash balance and the cash flow.

Table 5

Determination of coefficients that adversely affect the NCFM
(notation: Δ – absolute influence; W – fraction, %)

Indicator	Determination of the influence of factors					
	KKF		VKF		KrKF	
	Δ	W, %	Δ	W, %	Δ	W, %
ΔY_{X1}	-0.017	5.7	-0.203	103.6	-0.159	2650.0
ΔY_{X3}	–	–	-0.002	1.0	-0,260	3433.3
ΔY_{X5}	-0.225	0.75	-0.262	133.7	-0.008	133.3
ΔY_{X6}	–	–	-0.088	44.9	–	–
ΔY_{X7}	-0.371	123.7	-0.301	153.6	–	–
$\Delta Y_{3\Delta\Gamma}$	-0.300		-0.196		-0.006	

Source: calculated by the author based on the model (14)

Table 6

Determination of coefficients that positively affect the NCFM
(designation: Δ – absolute influence; W – fraction, %)

Indicator	Determination of the influence of factors					
	KKF		VKF		KrKF	
	Δ	W, %	Δ	W, %	Δ	W, %
ΔY_{X2}	0,096	-320	0,286	-145,9	0,139	-2316,7
ΔY_{X3}	0,002	-0,7	–	–	–	–
ΔY_{X4}	0,214	-71,3	0,373	-190,3	0,003	-50
ΔY_{X6}	0,001	-0,3	X	-	0,000	0
ΔY_{X7}	–	–	–	–	0,278	-4633,3
$\Delta Y_{3\Delta\Gamma}$	-0,300		-0,196		-0,006	

Source: calculated by the author based on the model (14)

In all the surveyed enterprises, the change in indicators always had a positive effect on the value of the NCFM indicator X_2 (κ cash flow ratio) and X_4 (κ coverage ratio NCF of total liabilities), negative effect: change X_1 (κ financial dependency ratio) and X_5 (fraction NCF_0 in NCF); the influence of other factors is multidirectional.

The correlation-regression analysis of the determination of the effect on the NCFM of these coefficients (the model multiple correlation coefficient is greater than 0.9) carried out in Excel using the Data Analysis package, for all the studied indicators allows to obtain the following three models:

$$Y_{KKF} = -0,0023342 \cdot Z_1 + 0,0137549 \cdot Z_2 \quad (15)$$

$$Y_{VKF} = -0,0000125 \cdot Z_1 + 0,0003564 \cdot Z_2 \quad (16)$$

$$Y_{KTKF} = -0,0000407 \cdot Z_1 + 0,0000140 \cdot Z_2 \quad (17)$$

where Z_1 (X_2) – ratio of cash flow of the enterprise; Z_2 (X_5) – fraction NCF_0 in NCF of the enterprise, has a negative dynamic.

It should be noted that two factors are statistically significant and influential in all three enterprises. Indicator Z_1 (X_2) has a positive effect on the growth of the studied NCFM, but in equations (15)–(17) has the sign “-” precisely because the overall dynamics of the NCFM is negative. On the contrary, a change in the indicator Z_2 (X_5) has a negative effect on NCFM (therefore, in models (14) – (17) it has the sign “+” decrease of fraction PPE_0 in PPE_{CYK} of the company contributes to the reduction of the NCFM.

Conclusions

To achieve this goal was made possible by solving such tasks as: research of modern variations of application of factor analysis to cash flows; development of a multiplicative model for assessing the impact of factors on the NCFM; analysis of the impact of such financial ratios on the resultant indicator NCFM. The built-in NCFM model allows to identify the factors influencing the studied indicator, which helps to further optimize cash flow management. The factor analysis conducted on the example of 3 companies allows to divide the indicators included in the NCFM model into three groups of influence: negative, positive, multidirectional. Factors of negative impact include: the ratio of the financial dependence of the enterprise, the proportion of operating net cash flow in the total net cash flow. The following factors have a positive impact on NCFM: the cash flow ratio of the enterprise and the ratio of the total net cash flow of the enterprise's total liabilities. A set of indicators such as overall profitability, asset turnover ratio and average cash flow ratio of enterprises has a divergent effect on NCFM. It is clear that, depending on the stage of the life cycle and scale of the enterprise, the field of operation, profit (loss) activity of the enterprise, the composition of the groups of indicators will change. On the whole, on the example of the surveyed enterprises, the calculations made allow us to confirm the ineffective transformation of the operations of the investigated enterprises into cash.

References:

1. Fleisher C. S., Bensoussan B. E. (2015) Business and Competitive Analysis: Effective Application of New and Classic Methods, Second Edition.
2. Kosorukova I., & Prokimnov N. (2013). Pribyil i denezhnyiy potok v stoimostno-orientirovannom analize i finansovom menedzhmente [Using Profit and Cash Flow Factors in in Value Based Analysis and Financial Management]: *Prikladnaya informatika – Applied informatics*, 6(48), 132–137.
3. Kikot I. (2016). Integralnyie i dinamicheskie pokazateli effektivnosti upravleniya [Integral and Dynamic Performance Indicators of Management]. *Ekonomika i pravo v usloviyah razvitiya sovremennogo obschestva – Economics and Law within the Context of the*

Modern Society Development : The Belarusian Trade and Economic University of Consumer Cooperatives, Russian State Social University. Gomel; Moscow II, 160–168. [in Russian].

4. Spilnyk I., & Zahorodna O. (2017). Hroshovi potoky pidpriemstva: kompleksnyi analiz za danymy finansovoi zvitnosti [Enterprise's Cash Flows: Comprehensive Analysis According to the Financial Statements]. *Instytut bukhhalterskoho obliku, kontrol ta analiz v umovakh hlobalizatsii. Mizhnarodnyi naukovyi zhurnal – The Institute of Accounting, Control and Analysis in the Globalization Circumstances. International Scientific Journal*, 1–2, 67–85. [in Ukrainian].

5. Koshelek G. (2016). Faktory, yaki vplyvaiut na formuvannia hroshovykh potokiv promyslovoho pidpriemstva [Factors affecting the formation of cash flows for industrial companies]. *Ekonomika i orhanizatsiia upravlinnia – Economics and organization of management*, 1(21), 119–126. [in Ukrainian].

6. Tereshchenko O., Nevmerzhytskyi Ya., & Kulish A. (2006). Finansova diialnist subiektiv hospodariuvannia [Financial Activities of Undertakings]. Kyiv: KNEU, 312. [in Ukrainian].

7. Otenko V. (2013). Formuvannia analitychnoho instrumentariiu otsinky efektyvnosti diialnosti pidpriemstva [Formation of Analytical Tools of Assessment of Company Effectiveness]: *Biznes Inform – Business Inform*, 5, 232–237 [in Ukrainian].

8. Rohanova H. (2019). Vprovadzhennia statystychnykh pokaznykiv do metodyky analizu efektyvnosti hroshovykh potokiv pidpriemstv [Implementation of statistical indicators to analysis of effectiveness of cash-flows of the enterprise]: *Visnyk Kyivskoho natsionalnogo universytetu imeni Tarasa Shevchenka. Ekonomika – Bulletin of Taras Shevchenko National University of Kyiv. Economics*, 1(202), 34-42 [in Ukrainian]. doi.org/10.17721/1728-2667.2019/202-1/5

9. Xianzhi Zhang (2015). *Standards for Enterprise Management Control*. – Heidelberg: Springer, 160.

10. Sifeng Liu, Naiming Xie, Chaoqing Yuan, & Zhigeng Fang (2011). *Systems Evaluation: Methods, Models, and Applications*. CRS Press. 257.

11. Kosova T., & Roganova H. (2008). Problemy rozpodilu chystoho hroshovoho operatsiinoho potoku pidpriemstva na prybutok i amortyzatsiiu [Problems of the separation of the pure operational Cash-flow of an into income and amortization]. *Ekonomika Ukrainy – Economy of Ukraine*, 7, 57-64.

12. Giulia Di Nunno, & Bernt Oksendal (2011). *Advanced Mathematical Methods for Finance*, 535.

13. Richna finansova zvitnist “Kondyterska korporatsiia “Roshen” [Annual financial statements “Confectionery Corporation “Roshen”] (2018). Retrieved from www.roshen.com [in Ukrainian].

14. Sizykh D. & Sizykh N. (2016). Koeffitsienty denezhnykh potokov kompanii: otsenka, analiz i prakticheskoe primenenie [The company's cash flow ratios: evaluation, analysis and practical application]. – *Upravlenie ekonomicheskimi sistemami: elektronnyi nauchnyi zhurnal*. Retrieved from <https://cyberleninka.ru/article/v/koeffitsienty-denezhnykh-potokov-kompanii-otsenka-analiz-i-prakticheskoe-primenenie> [in Russian].

15. Azarova, A., & Ruzakova, O. (2010). Matematychni modeli ta metody otsiniuvannia finansovoho stanu pidpriemstva [Mathematical Models and Methods for Evaluating the Financial Condition of Companies]: *Monohrafiia – Monograph*, VNTU, Vinnitsa. 172 [in Ukrainian].

16. Rohanova H. & Vovk A. (2019). Analiz finansovoi diialnosti i prohnouzuvannia perspektyv rozvytku strakhovoi kompanii na osnovi bahatofaktornoj modeli rentabelnosti [Financial activity analysis and prospects forecasting of insurance company development on the basis of multifactor profitability models]. *Molodyi vchenyi – Young scientist*, 2 (66), 276–281. [in Ukrainian]. doi.org/10.32839/2304-5809/2019-2-66-60