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FACTOR ANALYSIS OF ROA OF THE CONSTRUCTION INDUSTRY OF IRKUTSK REGION

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Abstract

The profitability management of companies is becoming a main task for all management levels: operational, tactical and strategic. The way to control the assets return through the decomposition of the return on assets factor into factors reflecting various aspects of a company is proposed in this article. This article consolidates the information in the sphere of the theory of economic analysis, mastering skills of application of modeling methods of factor systems, the assessment of the impact of quantitative and qualitative factors on the indicators which characterize the final results of economic entities activity. The Filatov model (Return on assets model) allows determining due to what factors the change in profitability occurs or how to perform the analysis of profitability. The transformed methods of factor analysis given in this article compared to the most common traditional methods allow reducing the labor intensity of particular iterations by entering the author's comparative coefficients. The Filatov model analysis (model of return on assets) and the use of the proposed methods of factor analysis for the specialists in the sphere of Economics and management will make the contribution to their base for the development of economic thinking, realization of the essence of economic processes and phenomena which occur within the activities of economic enterprises. However, the most important thing is the development of skills of quantitative assessment as well as economic interpretation along with the search for reserves in order to improve the efficiency of functioning.

Keywords: Factor analysis, competitiveness, ROA, ROE.

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1. Introduction

First of all the economic analysis is necessary in order to foresee and predict the development of economic situation and make rational (on scientific grounds) management decisions. The main tool in the comprehensive analysis of economic enterprises' activity is factor analysis (Ansoff, 2010; Babicheva, 2012; Yakushev, 2014).

The main task of factor analysis is the study of internal causes influencing the investigated phenomenon. (Kogdenko, 2017; Kogdenko, 2019; Lyubushin & Kondrat'ev, 2017).

2. Problem Statement

In the management system of various aspects of the activities of any company in modern conditions, the most difficult and responsible link is to ensure its financial stability. In order to ensure the effective functioning of companies in the long term, the role and importance of quality management decisions is increasing.

An increase in the value of return on assets increases the financial stability of an economic entity. The higher the ratio (ROA), the more profitable and competitive the company is.

The profitability ratios show the company profitability and the increase in its value to shareholders. A necessary tool for managing the company's finances is a clear understanding of the relationship of all factors affecting the overall level of its financial condition. Therefore, the research topic of this scientific work is extremely relevant.

3. Research Questions

The proposed three-factor model allows determining the impact of three factors, respectively (the return on equity, the coefficient of income coverage by equity and asset turnover) on the change in return on assets.

One of the main indicators of financial profitability is return on equity (ROE). Return on equity is, in fact, the main indicator for strategic investors. The indicator determines the efficiency of the use of capital invested by the owners of the enterprise.

The equity Income Coverage Ratio (EICR) introduced by the author is the inverse of the return on equity (Yield On Equity – YOE). The return on equity indicator (YOE) introduced by the author characterizes the **revenue ratio** (net) from all the types of sales to the size of the organization's equity. ROE differs from YOE in that instead of profit, revenue (net) from all types of sales is compared to equity. YOE characterizes the overall profitability of the business for its owners, otherwise how much income (revenue) the company will receive from the monetary unit of equity.

The equity income coverage ratio (EICR) gives an idea of how much sales revenue is provided by equity.

The ratio of asset turnover illustrates the efficiency of a company the resources of which it uses to produce products, showing how much revenue from sales of products falls on one investment monetary unit in the assets of a company.

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The ratio of asset turnover shows the efficiency of the use of all available resources of a company, despite the sources of their attraction (Arbatskaya, 2012; Barinov & Sinel'nikov, 2000; Vojcekhovskaya, 2005). Turnover ratios are indicators of business activity of the company.

4. Purpose of the Study

In the author's model (Filatov's model): return on equity characterizes investment activity; return on equity coverage ratio characterizes financial activity; asset turnover characterizes operating activity.

The research purpose is to study the three-factor model of return on assets using the proposed methods of factor analysis.

5. Research Methods

Table 1 presents the initial data for the analysis of the Filatov model by the proposed methods (Filatov, 2018).

The research object is construction companies (the construction of residential and non-residential buildings) of Irkutsk region of Russia.

The sources of data base on financial indicators of construction companies of Irkutsk region were presented by financial statements in accordance with Russian accounting standards: Balance sheet, December 31, 2017 and December 31, 2018; Financial results report for 2017 and 2018 (IS «BIR-Analyst», 2019).

Table 01. Source data for factor analysis of the construction industry of Irkutsk region

No.	Indicators	№ factor's	2017 Plan (0) *	2018 Fact (I) **	Deviation (Δ) ***
1	**V** – Net revenue, thous. Rubles		50 891 143	56 016 982	5 125 839
	V – The net revenue, thousand $		883 524	806 341	-77 183
2	**P** – Net profit, thousand rubles		933 022	1 703 684	770 662
	P – Net profit, thousand $		16 198	24 524	8 326
3	**A** – Value of assets, thous. Rubles		63 921 861	73 257 449	9 335 588
	A – Value of assets, thous. Dollars		1 109 751	1 054 510	-55 241
4	**SK** – The average cost of equity, thous. Rubles		2 839 630	7 836 037	4 996 407
	SK – The average cost of equity, thous. Dollars		49 299	112 796	63 497
5	**ROE** (Return On Equity) (2/4)	F_1	0.328572	0.217417	-0.111155
6	**EICR –** (Ratio of Equity Income Coverage) (4/1)	F_2	0.055798	0.139887	0.084089
7	**AT** – (Asset Turnover) (1/3)	F_3	0.796146	0.764659	-0.031487
8	**ROA** (Assets return) 2/3 = (5 * 6 * 7)		0.014596	0.023256	**0.008660**

where: * 0 – the planned 2017; ** I – actual year 2018; *** Δ – difference between actual and planned years (I – 0).

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Next, we derive the initial formula of factor analysis, which has the following form (formula 1):

$$\text{ROA} = \frac{P}{SK} * \frac{SK}{V} * \frac{V}{A} = ROE * EICR * AT = F_1 * F_2 * F_3 \quad (1)$$

The balance of deviation is presented below (formula 2):

$$\Delta\text{ROA} = \Delta\text{ROA}\,(F_1) + \Delta\text{ROA}\,(F_2) + \Delta\text{ROA}\,(F_3) \quad (2)$$

Next, we study 10 methods of deterministic factor analysis proposed by the author.

Tables 2, 3 show the auxiliary data on the proposed comparative coefficients for factor analysis.

Table 02. Multiple comparative factors by 1 factor

Comparison	Comparative coefficient designation	Value	Coefficients (value) product
$F_{1(I)} / F_{1(0)}$	A_1	0.661702	1.00
$F_{1(0)} / F_{1(I)}$	A_2	1.511254	
$F_{2(I)} / F_{2(0)}$	A_3	2.507017	1.00
$F_{2(0)} / F_{2(I)}$	A_4	0.398880	
$F_{3(I)} / F_{3(0)}$	A_5	0.960451	1.00
$F_{3(0)} / F_{3(I)}$	A_6	1.041178	

Table 03. Multiplicative comparative coefficients on 2 factors

Comparison	Comparative coefficient designation	Factor factors	Value
$(F_{1(I)} * F_{2(I)}) / (F_{1(0)} * F_{2(0)})$	B_1	$A_1 * A_3$	1.658898
$(F_{2(0)} * F_{3(0)}) / (F_{2(I)} * F_{3(I)})$	B_2	$A_4 * A_6$	0.415305

The table 4 presents the proposed methods of factor analysis, in which the result is equal to the product of the key element of the formula and the corresponding coefficients of correction.

Table 04. Alternative factor analysis methods with comparative coefficients

№ formula	Formulas / calculations	
	Main part of formula	Factors of adjustment
1.1	Δ ROA $(F_1) = ROA_0 * (A_1) - ROA_0$	–
1.2	Δ ROA $(F_2) = (ROA_0 * (A_3) - ROA_0) *$	A_1
1.3	Δ ROA $(F_3) = (ROA_0 * (A_5) - ROA_0) *$	$(A_1 * A_3)$ or B_1
2.1	Δ ROA $(F_1) = (ROA_I - ROA_I * (A_2)) *$	$(A_6 * A_4)$ or B_2
2.2	Δ ROA $(F_2) = (ROA_I - ROA_I * (A_4)) *$	A_6
2.3	Δ ROA $(F_3) = ROA_I - ROA_I * (A_6)$	–
3.1	Δ ROA $(F_1) = (\Delta F_1 / F_{1(0)}) * ROA_0$	–

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3.2	Δ ROA (F_2) = (ΔF_2/ $F_{2(0)}$) * ROA $_0$)*	A_1
3.3	Δ ROA (F_3) = ((ΔF_3/ $F_{3(0)}$) * ROA $_0$)*	(A_1*A_3) or B_1
4.1	Δ ROA (F_1) = ((ΔF_1/ $F_{1(I)}$) * ROA $_I$)*	(A_6*A_4) or B_2
4.2	Δ ROA (F_2) = ((ΔF_2/ $F_{2(I)}$) * ROA $_I$)*	A_6
4.3	Δ ROA (F_3) = ((ΔF_3/ $F_{3(I)}$) * ROA $_I$	–
5.1	Δ ROA (F_1) = (ROA $_I$*A_4*A_6) – ROA $_0$	–
5.2	Δ ROA (F_2) = ((ROA $_I$*A_2*A_6) – ROA $_0$)*	A_1
5.3	Δ ROA (F_3) = ((ROA $_I$*A_2*A_4) – ROA $_0$)*	(A_1*A_3) or B_1
6.1	Δ ROA (F_1) = (ROA $_I$ – (ROA $_0$*A_3*A_5))*	(A_6*A_4) or B_2
6.2	Δ ROA (F_2) = (ROA $_I$ – (ROA $_0$*A_1*A_5))*	A_6
6.3	Δ ROA (F_3) = ROA $_I$ – (ROA $_0$*A_1*A_3)	–
7.1	Δ ROA (F_1) = Δ ROA – (ROA $_I$ – (ROA $_0$*A_1)	–
7.2	Δ ROA (F_2) = Δ ROA – (ROA $_I$ – (ROA $_0$*A_3))*	A_1
7.3	Δ ROA (F_3) = Δ ROA – (ROA $_I$ – (ROA $_0$*A_5))*	(A_1*A_3) or B_1
8.1	Δ ROA (F_1) = Δ ROA – ((ROA $_I$ *A_2) – ROA $_0$)*	(A_6*A_4) or B_2
8.2	Δ ROA (F_2) = Δ ROA – ((ROA $_I$ *A_4) – ROA $_0$)*	A_6
8.3	Δ ROA (F_3) = Δ ROA – ((ROA $_I$ *A_6) – ROA $_0$)	–
9.1	Δ ROA (F_1) = Δ ROA – (ROA $_I$ – (ROA $_I$*A_4*A_6))	–
9.2	Δ ROA (F_2) = Δ ROA – (ROA $_I$ – (ROA $_I$*A_2*A_6))	A_1
9.3	Δ ROA (F_3) = Δ ROA – (ROA $_I$ – (ROA $_I$*A_2*A_4))*	(A_1*A_3) or B_1
10.1	Δ ROA (F_1) = Δ ROA – (ROA $_0$*A_5*A_3) – ROA $_0$)*	(A_6*A_4) or B_2
10.2	Δ ROA (F_2) = Δ ROA – ((ROA $_0$*A_5*A_1) – ROA$_0$)*	A_6
10.3	Δ ROA (F_3) = Δ ROA – ((ROA $_0$*A_3*A_1) – ROA $_0$)	–

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6. Findings

Tables 5 and 6 show the results of the methods of factor analysis proposed by the author.

Table 05. Methods' results 1.1, 2.1, 3.1, 4.1, 5.1

No.	Main part of formula	Factors of adjustment		Result
1	Δ **ROA (F_1) =** -0.004938	–		-0.004938
2	Δ **ROA (F_2) =** 0.021997	0.661702	A_1	0.014555
3	Δ **ROA (F_3) =** 0.000577	1.658898	A_1*A_3	-0.000958
	0.016482			**0.008660**

Table 06. Methods' results 1.2, 2.2, 3.2, 4.2, 5.2

No.	Main part of formula	Factors of adjustment		Result
1	Δ **ROA (F_1) =** -0.011890	0.415305	A_6*A_4	-0.004938
2	Δ **ROA (F_2) =** 0.013980	1.041178	A_6	0.014555
3	Δ **ROA (F_3) =** -0.000958	–		-0.000958
	0.001132			**0.008660**

The assets return of the construction industry of Irkutsk region in 2018 compared to 2017 increased by almost 1 % (0.87 %) from 1.46 to 2.33 %.

At that:

Factor # 1 – the return on equity in the construction industry of Irkutsk region decreased from

32.86 % in 2017 to 21.74 % in 2018 or by –11.12 %, which resulted in the decrease in the assets return of the construction industry of Irkutsk region by –0.49 %.

Factor # 2 – equity income coverage ratio of the construction industry of Irkutsk region in 2018 increased by 8.41 from 5.58 % in 2017 to 13.99 % in 2018, which resulted in the decrease in the return on assets of the construction industry of Irkutsk region by 1.46 %.

Factor # 3 – the assets turnover in the construction industry of Irkutsk region in 2018 decreased by 3.15 % from 79.61 to 76.46 %, which resulted in the decrease in the return on assets of the construction industry of Irkutsk region by 0.1 %.

7. Conclusion

The Filatov three-factor model shows the impact on the return on assets of investment of a company and business activity (financial and operating activities). Thus, the return on total capital (assets) of a company directly determines both the general profitability and attractiveness of investment.

The return on assets according to the Filatov model depends on 3 factors: the level of equity return, income coverage with owns funds and asset turnover speed. Therefore, the directions of the increase in the return on assets are determined.

Deterministic modeling of the systems of factor is the basis to quantify the role of each factor in changing the performance indicator (Meredith & Mantel, 2003; Sydsæter & Hammond, 2002; Thompson, William, & Strickland, 1990). This analysis is extremely relevant for practical application in market relations due to the fact that factor deterministic analysis is aimed at the identification of the impact of factors on the value of the effective indicator of the excluding error of interest (Biglova, 2017; Certo, 2003; Heizer, 2004). The author presented in this study the transformed methods of factor analysis compared to the most common traditional methods which can reduce the complexity of several particular iterations by entering the comparative coefficients proposed by the author.

The Filatov model is the essential indicator of the investment and business activities of a company and the assessment of its overall competitiveness.

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