

# Empirical Analysis of Mergers and Acquisitions: Evidence from International and Comparative Supply Chain Operations in Russian Market

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**Abstract**— Fifty mergers and acquisitions deals that occurred in the period 2014-2017 in the Russian market were analyzed. Deals were randomly selected. The largest number of selected transactions accounted for 2015. 32% of all transactions occurred in the oil and gas sector of the economy. Within the framework of the study, two hypotheses were put forward: 1) the effectiveness of a merger and acquisition transaction increases with an increase in the capitalization of the company-buyer, 2) the effectiveness of a merger and acquisition transaction increases with an increase in its amount. The effectiveness of the merger and acquisition deal was expressed through the growth of the economic profit of the purchasing companies based on the comparative supply chain. Fifteen variables were selected as independent ones (return on invested capital; weighted average cost of capital; return on equity; return on assets; return on sales; multiplier “share return”; multiplier “price / earnings”; multiplier “price / book value of assets”; multiplier “business value / revenue”; multiplier “Business cost / profit before interest, taxes and amortization”; profitability of the company before interest, taxes and the multiplier “earnings before interest, taxes and depreciation / book value of assets”; the dollar exchange rate, etc.), however, only two of them were included in the final type of the regression model: the price / net profit multiplier and the amount of the merger / acquisition transaction.

**Keywords**— *mergers, acquisitions, company value, empirical analysis, comparative supply chain, M&A.*

## 1. Introduction

Mergers and acquisitions are a reflection of the internal state of the economy. During the crisis period, there is a decline in all economic indicators in the country, including a decrease in the number and volume of mergers and acquisitions.

The Russian market of mergers and acquisitions as a mirror of the entire economy is shrinking more and more. The market is becoming closed to foreign capital, the share of domestic transactions between Russian companies increases every year and the concentration of assets in the hands of large private investors and the state takes place. As in previous years, the vast majority of transactions occur in the oil and gas industry [1-7].

The relevance of the topic of this study is determined by the decrease in the number and especially the volume of transactions involving Russian companies and the reduction in the share of the Russian market of mergers and acquisitions against the background of growth in the global M&A market [8-14].

The purpose of mergers and acquisitions is to increase the value of the combined company by increasing the synergy effect, as well as improving the competitiveness and efficiency of the company. Within the framework of the study, two hypotheses were put forward: 1) the effectiveness of a merger and acquisition transaction increases with an increase in the capitalization of the company-buyer, 2) the effectiveness of a merger and acquisition transaction increases with an increase in its amount. The effectiveness of the merger and acquisition deal was expressed through the growth of the economic profit of the purchasing companies [15-21].

## 2. Method

Indicators used for the construction of economic and mathematical model are given in Table 1.

**Table 1.** The indicators used to study corporate mergers and acquisitions

Variable	Designation	Indicator name
Y	EP	Economic profit, mln. Rur.
X1	ROIC	Return on invested capital, %
X2	WACC	Weighted average cost of capital, %
X3	ROE	Return on equity, %
X4	ROA	Return on assets, %
X5	ROS	Return on sales, %
X6	EPS	earnings per share
X7	P/E	Price / earnings ratio
X8	P/S	Price / Sales ratio
X9	P/B	Price / assets book value
X10	EV/S	Enterprise value / Revenue
X11	EV/EBITDA	Enterprise value / earnings before interest, taxes, depreciation and amortization
X12	EBITDA margin	Profitability before interest, taxes, depreciation and amortization. %
X13	EBITDA/B	Earnings before interest, taxes, depreciation and amortization / book value of assets
X14	USD	Dollar exchange rate, rub..
X15	A	Amount of assets under a merger / acquisition transaction, mln. USD

The time structure of the selected mergers and acquisitions is reflected in table 2.

**Table 2.** Time structure of selected mergers and acquisitions

Year	Number of transactions	Specific gravity, %
2014	11	22
2015	21	42
2016	10	20
2017	8	16
Total	50	100

From the data in Table 2, it can be seen that 50 mergers and acquisitions were in the sample, with the main part (21 transactions or 42%) in 2015.

Table 3 shows the branch structure of selected mergers and acquisitions transactions.

**Table 3.** Branch structure structure of selected mergers and acquisitions

Industry name	Number of transactions	Specific gravity, %
Automobile production	1	2
Health & Pharma	3	6
Real Estate and Construction	4	8
Oil and gas sector	16	32
Consumer sector	1	2
Agriculture	4	8
Telecommunications and media	7	14
Transport and infrastructure	2	4
Chemical industry	3	6
Power industry	9	18
Total	50	100

The construction of an economic-mathematical model is carried out in the form of a regression equation (linear model of multiple regression).

### 3. Results and Discussion

A multiple regression equation was constructed, reflecting the dependence of economic profit (Y) on factors (X). The results are shown in the table 4.

**Table 4.** Results of an economic-mathematical model

Regression statistics		Variance analysis												
Multiple R	0,74	df	SS	MS	F	F-value								
R <sup>2</sup>	0,55	Regression	361943639284,72	24129575952,31	2,77	0,01								
Adj. R <sup>2</sup>	0,35	Residues	296567031082,15	8722559737,71										
St. error	93394,65	Total	658510670366,87											
Observations	50						Coefficient	St. error	t-stat	P-value	Lower 95%	Upper 95%	Lower 95%	Upper 95%
		Y-intersection	75237,5	98535,6	0,8	0,5	-125010,9	275485,9	-125010,9	275485,9				
		X1	-72888,3	214307,6	-0,3	0,7	-508413,5	362636,8	-508413,5	362636,8				
		X2	-9903775,7	4978049,5	-2,0	0,1	20020382,7	212831,4	20020382,7	212831,4				
		X3	-122390,8	72798,1	-1,7	0,1	-270334,2	25552,5	-270334,2	25552,5				
		X4	10149608,7	4838326,1	2,1	0,0	316953,5	19982263,9	316953,5	19982263,9				
		X5	70907,9	26319,9	2,7	0,0	17419,4	124396,4	17419,4	124396,4				
		X6	0,2	0,4	0,4	0,7	-0,6	1,0	-0,6	1,0				
		X7	-1941,4	1991,4	-1,0	0,3	-5988,5	2105,7	-5988,5	2105,7				
		X8	-31946,2	34819,5	-0,9	0,4	-102707,9	38815,6	-102707,9	38815,6				
		X9	-19615,4	10795,4	-1,8	0,1	-41554,2	2323,4	-41554,2	2323,4				
		X10	99627,2	38553,8	2,6	0,0	21276,4	177978,0	21276,4	177978,0				
		X11	-19198,6	9960,3	-1,9	0,1	-39440,4	1043,2	-39440,4	1043,2				
		X12	-404958,8	171612,1	-2,4	0,0	-753716,3	-56201,4	-753716,3	-56201,4				
		X13	128363,8	72392,2	1,8	0,1	-18754,7	275482,3	-18754,7	275482,3				
		X14	474,3	1467,4	0,3	0,7	-2507,7	3456,3	-2507,7	3456,3				

Consequently, the obtained regression economic-mathematical model of dependence of economic profit on the selected factors can be given in the following form:

$$Y = 75237,5 - 72888,3X_1 - 9903775,7X_2 - 122390,8X_3 + 10149608,7X_4 + 70907,9X_5 + 0,2X_6 - 1941,1X_7 - 31946,2X_8 - 19615,4X_9 + 99627,2X_{10} - 19198,6X_{11} - 404958,8X_{12} + 128363,8X_{13} + 474,3X_{14} + 63,7X_{15}, \quad (1)$$

Thus, the resulting model characterizes the following change in economic profit, ceteris paribus: 1) with an increase in the return on invested capital by 1%, economic profit decreases by 728.883 million rubles; 2) with an increase in the weighted average cost of capital by 1%, the economic profit decreases by 99,037.757 million rubles; 3) with an increase in the return on equity by 1%, the economic profit decreases by 1,223.908 million rubles; 4) with an increase in the profitability of assets by 1%, the economic profit increases by 101,496.087 million rubles; 5) with an increase in sales profitability of 1%, the economic profit increases by 709.079 million rubles; 6) with an increase in the earnings per share by 1%, the economic profit increases by 0.2 million rubles; 7) with an increase in the Price / earnings ratio by 1%, the economic profit decreases by 1,941.1 million rubles; 8) with an increase in the Price / Sales ratio by 1%, the economic profit decreases by 31,946.2 million rubles; 9) with an increase in the Price /

assets book value ratio by 1%, the economic profit decreases by 19,615.4 million rubles; 10) with an increase in the Enterprise value / Revenue ratio by 1%, the economic profit increases by 99,627.2 million rubles; 11) with an increase in the Enterprise value / earnings before interest, taxes, depreciation and amortization ratio by 1%, the economic profit decreases by 19,198.6 million rubles; 12) with an increase in the company's Profitability before interest, taxes, depreciation and amortization by 1%, the economic profit decreases by 4,049.588 million rubles; 13) with an increase in the Earnings before interest, taxes, depreciation and amortization / book value of assets ratio by 1%, economic profit increases by 128,363.8 million rubles; 14) with an increase in the dollar exchange rate by 1%, the economic profit increases by 474.3 million rubles; 15) with an increase in the Amount of assets under a merger / acquisition transaction by 1%, the economic profit increases by 63.7 million rubles.

#### 4. Summary

Despite the fact that the economic-mathematical model gives a clear direction of growth of economic profit (determines the factors leading to growth), however, it is necessary to identify the most significant factors. To do this, it is necessary to conduct a correlation analysis, the results of which will select the factors that have the strongest

relationship with economic profit. For this, a matrix of paired correlation coefficients is constructed. According to the matrix (Table 5), we found that

the relationship is almost absent with all factors except X7 and X15.

**Table 5.** Matrix of paired correlation coefficients

	Y	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15
Y	1															
X1	0,294	1														
X2	0,203	0,875	1													
X3	0,073	0,332	0,420	1												
X4	0,194	0,871	0,999	0,429	1											
X5	0,091	0,225	0,194	0,006	0,183	1										
X6	0,042	0,084	0,085	0,014	0,077	0,029	1									
X7	0,422	0,232	0,179	0,098	0,169	0,081	0,118	1								
X8	0,106	0,384	0,548	0,083	0,536	0,037	0,085	0,100	1							
X9	0,044	0,007	0,059	0,009	0,071	0,046	0,064	0,105	0,190	1						
X10	0,105	0,002	0,119	0,009	0,121	0,830	0,043	0,002	0,511	0,094	1					
X11	0,046	0,188	0,173	0,066	0,175	0,005	0,148	0,284	0,269	0,713	0,147	1				
X12	0,142	0,618	0,802	0,307	0,795	0,026	0,006	0,073	0,882	0,049	0,463	0,011	1			
X13	0,071	0,320	0,401	0,994	0,408	0,011	0,002	0,086	0,093	0,110	0,004	0,143	0,301	1		
X14	0,118	0,130	0,094	0,034	0,081	0,311	0,169	0,007	0,042	0,143	0,238	0,042	0,080	0,051	1	
X15	0,550	0,192	0,120	0,122	0,114	0,002	0,092	0,504	0,015	0,053	0,042	0,059	0,020	0,126	0,169	1

Accordingly, the following factors are included in the economic-mathematical model: 1) Price / earnings ratio (X7); 2) Amount of assets under a merger / acquisition transaction (X15). The resulting regression economic-mathematical model of dependence of economic profit on the selected factors can be given below:

$$Y = 34296,86 + 1587,38 \cdot X7 + 55,30 \cdot X15 \quad (2)$$

The results of a refined economic and mathematical model using the formula (2) are shown in Table 6.

**Table 6.** The results of a refined economic and mathematical model

Regression statistics								
Multiple R	0,575							
R <sup>2</sup>	0,330							
Adj. R <sup>2</sup>	0,302							
St. error	96862,667							
Observations	50							
Variance analysis								
	df	SS	MS	F	F-value			
Regression	2	217538988080,48	108769494040,24	11,59	0,00			
Residues	47	440971682286,39	9382376218,86					
Total	49	658510670366,87						
	Coefficient	St. error	t-stat	P-value	Lower 95%	Upper 95%	Lower 95%	Upper 95%
Y-intersection	34296,86	17149,32	2,00	0,05	-203,08	68796,80	5521,57	63072,16
X7	1587,38	1128,27	1,41	0,17	-682,40	3857,16	-305,77	3480,53
X15	55,30	16,93	3,27	0,00	21,24	89,36	26,89	83,71

The resulting model describes the following change in economic profit, ceteris paribus: 1) with an increase in the Price / earnings ratio by 1%, economic profit increases by 1,587.38 million

rubles; 2) with an increase in the Amount of assets under a merger / acquisition transaction by 1%, the economic profit increases by 55.30 million rubles.

## 5. Conclusions

Within the framework of the study, two hypotheses were tested: 1) the effectiveness of a merger and acquisition transaction increases with an increase in the capitalization of the company-buyer, 2) the effectiveness of a merger and acquisition transaction increases with an increase in its amount. As a result of research both hypotheses were confirmed.

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