MANAGEMENT AND FUNDING OF THE HEALTHCARE SYSTEM

Štefko R., Jenčová S., Litavcová E., Vašaničová P.*

Abstract: Healthcare is currently undergoing a challenging and dynamic period. In the field of financial-economic analyzes, modern methods of evaluating decision-making units are quite often used as a necessary tool for assessing the financial stability and performance of decision-making units. The aim of this paper is to analyse the financial situation and financing in the healthcare sector, to implement the DuPont model in the healthcare sector of Slovak Republic. Mentioned sector is divided by SK NACE 86 - Human Health Activities in Slovakia. Authors quantify the impact of changes in analytical factors of the return on sales, the total assets turnover ratio, the debt ratio on the return on equity of the whole industry is assessed by using the logarithmic, index, incremental, and functional method, which represent methods of quantification of the impact of determining factors. Data on the mean values of the financial metrics are obtained through the Cribis information portal. The following sources are used for quantification of healthcare status parameters of the Slovak Republic: OECD Health Data, European Community health indicators (ECHI), WHO Global Health Observatory, National Health Information Center, and Statistical Office of the Slovak Republic. The results show that the use of functional method is the most effective for the management of business entities within the healthcare sector. It was found that the return on assets has the greatest impact on the equity.

Keywords: sector, healthcare, decision-making unit, financial metrics, funding, effectiveness

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Introduction

Management and funding of the healthcare system is largely determined by history, cultural habits, experience of each country, economic situation, and therefore it is not a single mechanism that would represent the only adequate system suitable for all countries. Based on this argument, funding for healthcare is exclusively the responsibility of national governments (Panfiluk, Szymańska, 2017; Baronienė and Žirgutis, 2016; Niño-Amézquita et al., 2017; Kawiorska, 2016). Financing healthcare is built on accessibility, solidarity, equity, quality of healthcare provision. Healthcare sector within its SK NACE class 86 - Human Health Activities includes these subclasses: 86.1. Hospital Activities, 86.2 Medical and Dental Practice Activities, 86.9 Other Human Health Activities. The growing dynamics and complexity of the marketing environment that surrounds any

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organization and hence healthcare facilities, rising competition, and many other factors and impacts increase the requirements for a management concept that effectively supports the management of the healthcare facility (Morvay et. al., 2013; Gadowska and Różycka, 2016). As part of the quantification of priority areas and parameter analysis, the Strategic Health Care Framework for 2013 - 2030 sets key health and health status parameters across European countries.
Health sector area of concern:

- Public Health-Health status - Healthy life years, Life expectancy, Potential years of life lost, Causes of mortality.
- Public Health-Health promotion - Non-medical determinants of health, Prevention.
- Primary, Outpatient Care - General practitioners, GPs acting as gatekeepers, Consultations, Standardized clinical processes, Excessive pharmaceuticals expenditure, Pharmaceutical consumption, Access to healthcare.
- Inpatient care - Discharges, Hospital beds, Inpatient utilization, Obsolescent hospital infrastructure, Average length of stay, Standardized clinical processes, Research and development, Health system financial stability, Operational profit of hospitals.
- eHealth - Electronic health documentation, Electronic medication, Health promotion.

The activity of the health facility should be supported by marketing management. Management and marketing in the healthcare sector was studied in Ondruš and Ondrušová (2017). The implementation of multivariate methods, using which it is possible to compare the healthcare establishments in healthcare sector of Slovak Republic reported Jenčová et al. (2017). Holmerova et al. used a generalized linear model to determine differences for selected cost variables concern healthcare of Czech Republic, respectively. DEA method was used to analyze health performance, development of inefficiencies in health care in OECD countries (OECD, 2015; Jourmard, 2010; Luigi, 2014) and in some specific countries too (Oikonomou et al., 2016; Deidda et al., 2014). Effective management in healthcare facilities, healthcare funding, and its international comparison is presented in works of Ondruš and Ondrušová (2017), Rudawska and Fedorowski (2016). In the field of financial-economic analyzes, the issue of the implementation of financial models in the sectors of the economy or individual decision-making units within the selected sector is detailed described in a lot of papers (see Zmeškal et al., 2013; Vartiak, 2016). Koijen et al. (2016) provide a theoretical and empirical analysis of the link between financial and real health care markets. They conclude, by using econometric analysis, that policies that had removed government risk would have led to more than a doubling of medical research and development and would have increased the current share of health care spending by more than 3% of GDP.

Quantification of Financial Metrics in Healthcare Sector

The healthcare sector is labor-intensive and wage-intensive, despite lower wage levels, low intermediate consumption and high value added. From the point of view of the number of workers, the health sector can be classified as a medium-sized sector. Within the tertiary sector, it belongs to the human development sector (Morvay et. al., 2013). Financing healthcare is modified and defined by legal standards. The cardinal source of health care financing in Slovakia is public health insurance. The structure of available resources in the healthcare sector is shown in Table 1. The healthcare sector is so called strongly feminized industry. The number of employees in the healthcare sector was 181 thous. people in the year 2015 (27.4 thous. men, 153.6 thous. women). In 2016, it was an increase of 500 people (30.5 thous. men, 151 thous. women). In the mentioned industry in 2015, the average nominal monthly salary of employee was 858 EUR, and in compare with the year 2000 it increased by 23 pp. The real wage index grew most in 2007 (1.13), from 2012 the index is around 1.26. For the period 2016, the revenues of health facilities were approved for 1344.375 mln. EUR, expenditures of medical facilities were 1273.551 mln. EUR. The total surplus is 70.824 mln. EUR, but after accounting for the year-on-year change in liabilities, the deficit of health facilities is (-50.16) EUR. Employees in the health sector (107.9 thous. in 2011) to account for about 4.6% of the total number of employees in the Slovak economy. The total current healthcare spending were in 2015 5.418 mln. EUR, in 2014 5.25 mln. EUR, in 2013 5.7 mln. EUR, and compared to 2004, they increased by index 1.65. The development of total healthcare expenditure in the Slovak Republic compared to the Czech Republic is illustrated in Figure 1. In 2014 were created in health facilities 19.685 thous. work places (doctor, dentist), (42.3 thous. bed places), in general hospitals there were 7785 work places (24.351 thous. bed places), in specialized hospitals there were 1157 work places (5.754 thous. bed places). In 2015 the number of jobs increased by 115, the number mlnliabilities over maturity reached more than 442 mln. EUR. At the end of 2016, maturity liabilities at faculty and university hospitals reached 527 mln. EUR despite the fact that they got rid of debts at the end of 2011. No matter how much money goes into the healthcare sector, hospitals raise debt on average by 100 mln. EUR per year. The consequence is inefficiency in purchases, in work organizations, in management, in the number of people. The development of the average number of employed persons in healthcare sector and the share of the average number of employed persons in the healthcare sector on the total number of employed persons in the economy of Slovakia and the Czech Republic in pp. is expressed in Figure 2.

The average growth rate of the share of healthcare sector nominal monthly wage on the monthly wage in the economy is given by geometric mean G=1.056 (Fig. 3). Geometric mean for the period from 2008 to 2015 for cost is G=0.935, and for revenues is G=0.951. Costs grew year-on-year across the whole industry up to 2015. In mentioned year, there were a decrease in cost from 2741.85 mln. EUR

(year 2014) to 1205.15 mln. EUR. In 2014, the basic index reached value of 1.42 in relation to base year 2008. Index of income change were 1.07 in 2014, and 0.48 in 2015. Liabilities of the whole sector were 1136.53 mln. EUR in 2014, and 276.83 EUR in 2015. State of inventory has risen from 31.94 mln. EUR to 56.66 mln. EUR from 2008 to 2014. Then there is a decrease to 21.56 mln EUR. From the point of view of financial ratios, the sector reached value of overall liquidity ratio 2.16. The median of the average the creditors payment period was 65.89 days, and the median of the debt ratio was 38.68 pp. Within the subclass 86.1 – Hospital Activities, on 1 EUR of short-term liabilities accounted in average 0.93 EUR of current assets. Based on trend analysis, financial metric of overall liquidity reached low values. The average collection period was 66.5 days, and the creditors payment period was 78.15 days. On 1 EUR of total capital accounted 0.88 EUR of current liabilities, in 2014 it was even 0.93 EUR. The new created value to sales ratio was nearly 63% and, EBITDA to sales ratio was 4.09%.

Table 1. Disposable Resources of the Health Care Sector (EUR mln.)

	2011	2012	2013	2014	2015	Change 15-14	Index of change (%)	Growth rate (%)
Public insurance	3581.1	3786.0	3849.8	3981.5	4228.9	247.4	106.2	6.2
State contributions	1207.5	1358.2	1276.8	1211.5	1348.9	137.4	111.3	11.3
Other public resources	-20.0	204.8	154.0	50.0	30.0	-20.0	60.0	-40.0
Private resources	1235.4	1289.4	1301.2	1319.9	1345.5	25.6	101.9	1.9
Total	5021.3	5229.4	5242.3	5351.4	5604.4	253.0	104.7	4.7

(The Healthcare Surveillance Authority)

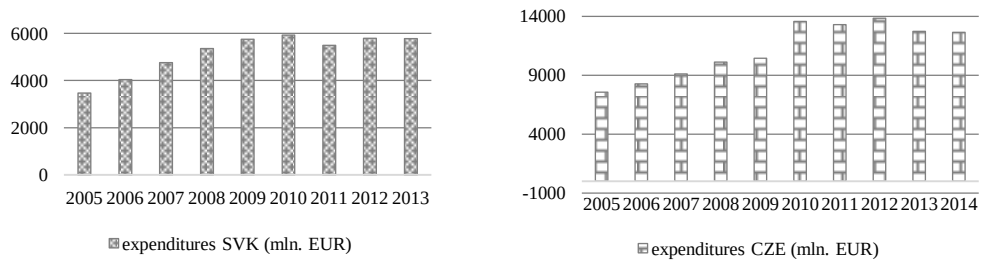

Figure 1. Development of healthcare expenditure (mln. EUR) in Slovakia and in Czech Republic (own processing based on the data of the Statistical Office of the Slovak Republic, and Czech Statistical Office)

Health expenditure in the OECD countries in 2013 is illustrated in Figure 4. The development of financial resources in the healthcare sector in the OECD countries

is shown in Figure 5. For Slovakia, the total resources as a percentage of GDP accounted for 7.6%, in the year 2000 they were 5.3%, in 2009 they were 8.5%. Ozorovský and Vojteková (2016) in their publication divide countries according to the type of financing of health services. Countries with health insurance where the general taxes through the state budget are the source of finance account for 7.84% (Albania, Cyprus, Denmark, Finland, Ireland, Iceland, Luxembourg, Malta, Norway, Portugal, Spain, Sweden, Italy, United Kingdom). Countries with health insurance, where the source of funding for health services is the Monopoly Fund with regional branches represent 32.43% (Bosnia and Herzegovina, Bulgaria, Estonia, Croatia, Lithuania, Latvia, Hungary, Macedonia, Poland, Romania, Slovenia, Serbia).

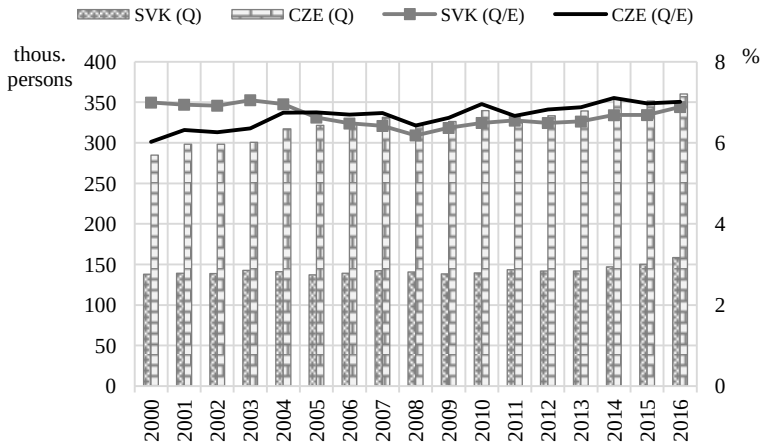

Figure 2. The development of the average number of employed persons in healthcare sector (Q, in thous.) and the share of the average number of employed persons in the healthcare sector on the total number of employed persons in the economy (E, %) of Slovakia and the Czech Republic (own processing based on the data of the Statistical Office of the Slovak Republic, and Czech Statistical Office)

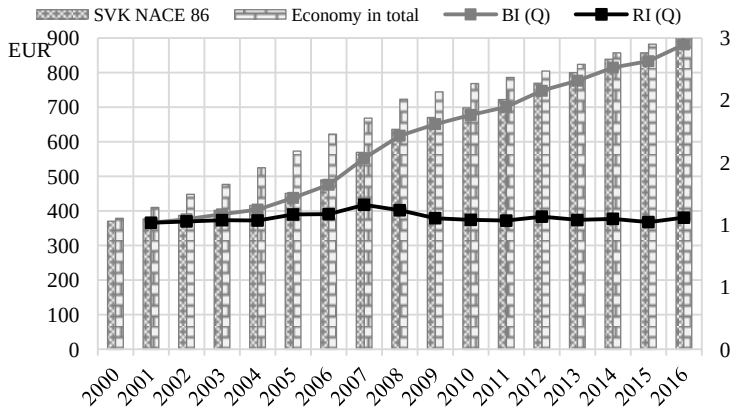

Figure 3. The development of the average nominal monthly wage of an employee in the healthcare sector, and of an employee in whole economy in the period from 2000 to 2016, where BI denotes base index of the sector, and RI denotes chain index of the sector (own processing)

Health insurance or health insurance combined with general taxes can be found in 11 countries and it is 29.73%., of these the choice of a health insurance company is possible in 7 countries (63.64%) (Belgium, Czech Republic, Slovakia, the Netherlands, Germany, Russia, Switzerland), and membership by socio-economic groups and family health insurance can be found in 4 countries (36.36%) (France, Greece, Austria, Turkey).

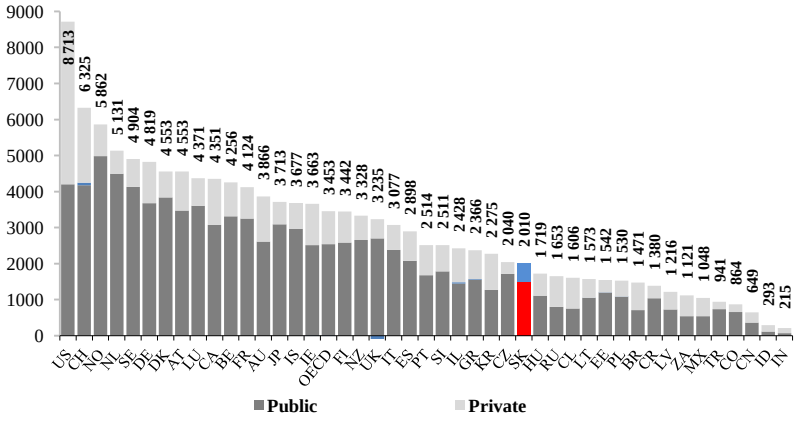

Figure 4. Health expenditure per capita (in USD) in OECD countries in 2013 (or nearest year) (OECD Health Statistics, 2015)

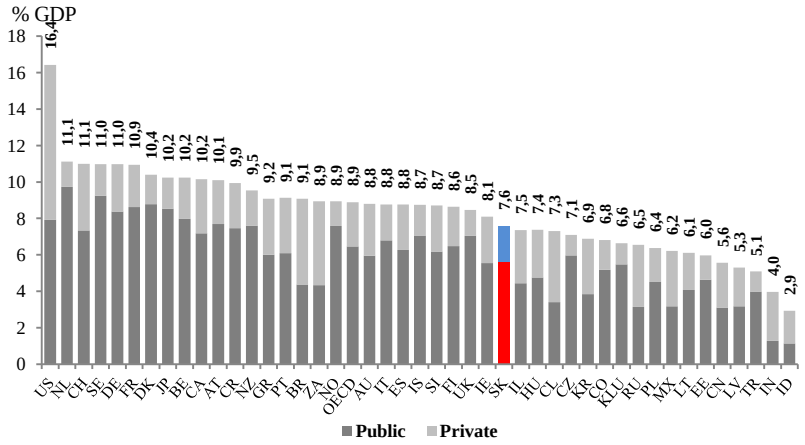

Figure 5. Health expenditure as a share of GDP in 2013 (or nearest year)
(OECD Health Statistics, 2015)

Implementation of the Dupont Model in the Slovak Healthcare Sector

Within the Slovak Republic, on the basis of the set of decision-making units within the group of decision-making units (Table 2) of the SK NACE 86 class and SK NACE 86.1 subclass, the average values of the financial indicators are calculated. In this paper we applied DuPont model. Into model were entered values of financial metrics from period 2014-2015, median of return on sales (ROS), total assets turnover ratio (TA), financial leverage (FL). DuPont equation represented the multiplicative product of the median of the individual factors. Based on the set of decision-making units were obtained lower quartile (LQ), upper quartile (UQ), median (M) for sector SK NACE 86, and SK NACE 86.1 (Table 3, without year 2007 due to range). The development of a mean value for total assets turnover ratio (coefficient), financial leverage (coefficient), and ROS (%) is shown in Table 4.

Table 2. Number of decision-making units

Sector	2007	2008	2009	2010	2011	2012	2013	2014	2015
SK NACE 86	2356	2625	2829	3552	3420	4002	4081	4385	4855
SK NACE 86.1	32	36	30	37	29	35	38	36	37

Table 3. Lower quartile, upper quartile of financial metrics within the SK NACE 86 class, and SK NACE 86.1 subclass

Quartile	2008	2009	2010	2011	2012	2013	2014	2015
$LQ_{TA(86)}$	1.13	1.09	1.11	1.13	1.14	1.04	1.02	0.93
$LQ_{TA(86.1)}$	0.78	0.59	0.78	0.92	1.09	1.02	1.80	1.47
$UQ_{TA(86)}$	2.22	2.18	2.29	2.38	2.43	2.30	2.19	2.16
$UQ_{TA(86.1)}$	3.38	3.29	3.26	3.48	3.59	3.27	4.04	4.31
$LQ_{FL(86)}$	1.27	1.27	1.27	1.27	1.27	1.28	1.28	1.27

$LQ_{FL(86.1)}$	1.23	1.34	3.17	2.70	1.79	-	-	-
$UQ_{FL(86)}$	3.21	3.21	3.45	3.57	3.71	-	-	-
$LQ_{ROS(86)}$	4.73	3.51	2.98	2.80	3.07	3.58	4.70	4.99
$LQ_{ROS(86.1)}$	-10.10	-7.42	-6.21	-6.72	-0.72	0.59	0.29	-0.28
$UQ_{ROS(86)}$	27.94	27.58	26.19	25.56	24.97	26.05	26.88	28.23
$UQ_{ROS(86.1)}$	4.63	4.25	2.26	3.64	5.64	6.75	3.78	3.60

Table 4. Median of financial metrics within the SK NACE 86 class, and SK NACE 86.1 subclass in the period 2007-2015

Median	2007	2008	2009	2010	2011	2012	2013	2014	2015
$M_{TA(86)}$	1.59	1.63	1.63	1.67	1.72	1.73	1.57	1.52	1.46
$M_{TA(86.1)}$	2.07	2.10	2.16	2.16	2.61	2.16	1.90	2.64	2.59
$M_{FL(86)}$	1.82	1.77	1.75	1.81	1.83	1.79	1.36	1.32	1.23
$M_{FL(86.1)}$	3.12	3.69	3.33	15.77	12.39	5.44	4.55	2.09	3.27
$M_{ROS(86)}$	14.25	15.00	1352	12.47	11.86	11.59	12.19	12.95	13.89
$M_{ROS(86.1)}$	1.72	0.62	0.48	-1.14	-0,30	0.96	3.09	2.02	2.02

To compare the influence of financial metrics within the methods of quantification of the impact of determining factors, there is used elementary realization of the quantification of the impact of the individual components of the DuPont equation by using incremental, logarithmic, index, and functional method.

Analytical components are presented via Return on sales (ROS), Total Assets Turnover Ratio (TA), and Financial Leverage (FL). These components are linked by a multiplicative product interaction representing the first degree of pyramidal decomposition where the economic criterion of effectiveness is the Return on Equity (ROE). The synthetic indicator dropped by 0.96 pp. year-on-year in SK NACE 86 class, and the increase by 5 pp. was recorded in SK NACE 86.1 subclass. Individual analytical indicators in absolute terms contribute to the overall change in return on equity of the group of healthcare sector decision-making units. The impacts are calculated according to the equations Zmeškal et al. (2013). The values for the factors affecting ROE change within the class 86 - Human Health Activities are shown in Table 5, and within the class 86.1 - Hospital Activities are shown in Table 6.

Table 5. Methods of quantification of the impact of determining factors within the SK NACE 86 class

Financial metrics - Factors	Logarithmic method	Index method	Incremental method	Functional method
Δ ROE	-0.0096	-0.0096	-0.0096	-0.0096
ROS	0.01794	0.01893	0.01893	-0.00001
TA	-0.01031	-0.01104	-0.011029	0.00044
FL	-0.01723	-0.01749	-0.01698	-0.01003
Combined effect	-	-	0.00126	-

In this section, it is performed the quantification of the impact of determining factors by using the logarithmic, incremental, index, and functional method according to Zmeškal et al. (2013) within the comparison of impacts.

Table 6. Methods of quantification of the impact of determining factors within the SK NACE 86.1 subclass

Financial metrics – Factors	Logarithmic method	Index method	Incremental method	Functional method
Δ ROE	-0.05930	-0.05930	-0.05930	-0.05930
ROS	0.00007	0.00006	0.00006	0.00007
TA	-0.00267	-0.00212	-0.00212	-0.00271
FL	0.06189	0.06136	0.06252	0.06195
Combined effect	-	-	0.00115	-

Conclusion

The issues of efficiency and performance are examined and analyzed in all areas of management, for example in Šnapka and Kašík (2013), Rajnoha et al. (2016), Rajnoha and Lesníková (2016), Oláh et al., (2017). The aim of the authors was to provide an analytical view of the healthcare sector, and to compare selected economic and financial indicators with selected countries. According to economist analyzes, Slovakia lags behind Czech Republic, Poland, and Hungary due to the low efficiency of healthcare. Increasing efficiency can only be achieved by system changes, particularly in hospitals, health insurance companies, drug policies. On the other hand, it is necessary to perceive the specifics of the health system, its cardinal role, which is the promotion, protection and restoration of health, the value of which is very high in terms of individual as well as social aspect. This contribution quantifies the impact of three main factors on the return on equity in two groups of decision-making units within the entire healthcare sector and sub-sector of the Slovak Republic. By implementing several mathematical methods, there are assessed and compared the impacts of individual areas of financial management on the overall return on equity of the healthcare decision-making units. When monitoring individual impacts, importance is not attributed to each factor. Therefore, it is appropriate for financial managers of decision-making units to include factor weights when analysing the additive, multiplicative, and combined interactions between financial metrics. Then, a multi-criteria assessment of the financial level of business entities could be possible according to the established preferences. There are many ways to grasp the area of funding and efficiency in the healthcare system. Authors Wiysonge et al. (2016) provide an overview of the evidence from up-to-date systematic reviews about the effects of financial arrangements for health systems in low-income countries. They note that systematic reviews should include all outcomes that are relevant to decision-makers and to people affected by changes in financial arrangements. In this paper,

we focus on only of the financial situation and way of financing in the healthcare sector, and on the implementation the DuPont model in the healthcare sector of Slovak Republic. The use of pyramid systems is not applied in practice a lot because it is a complex and logical tool perceiving causality. Authors of financial models (see Kislingerová 2014) believe that low usage rate is determined by higher difficulty and the unwillingness of corporate practice to accept more difficult solutions and models requiring inventions.

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ZARZĄDZANIE I FINANSOWANIE SYSTEMU OPIEKI ZDROWOTNEJ

Streszczenie: Opieka zdrowotna przechodzi obecnie trudny i dynamiczny okres. W dziedzinie analiz finansowo-ekonomicznych współczesne metody oceny jednostek decyzyjnych są często wykorzystywane jako niezbędne narzędzie oceny stabilności finansowej i wydajności jednostek decyzyjnych. Celem tego artykułu jest analiza sytuacji finansowej i finansowania w sektorze opieki zdrowotnej, w celu wdrożenia modelu DuPont w sektorze ochrony zdrowia w Republice Słowackiej. Wymieniony sektor według SK NACE 86 został przydzielony do kategorii Działania w Zakresie Zdrowia Ludzkiego w Słowacji. Autorzy określają ilościowo wpływ zmian w analitycznych współczynnikach zwrotu ze sprzedaży, wskaźnik obrotu aktywów ogółem, wskaźnik zadłużenia na stopie zwrotu z kapitału własnego całego przemysłu oceniany za pomocą metody logarytmicznej, wskaźnikowej, przyrostowej i funkcjonalnej, które reprezentują metody kwantyfikacji wpływu czynników determinujących. Dane dotyczące średnich wartości wskaźników finansowych uzyskuje się za pośrednictwem portalu informacyjnego Cribis. Do kwantyfikacji parametrów zdrowotnych Republiki Słowackiej wykorzystano następujące źródła: dane zdrowotne OECD, wskaźniki zdrowotne Wspólnoty Europejskiej (ECHI),

Światowe Obserwatorium Zdrowia WHO, Krajowe Centrum Informacji o Zdrowiu i Urząd Statystyczny Republiki Słowackiej. Wyniki pokazują, że zastosowanie metody funkcjonalnej jest najbardziej skuteczne w zarządzaniu podmiotami gospodarczymi w sektorze opieki zdrowotnej. Stwierdzono, że największy wpływ na kapitał własny ma zwrot z aktywów.
Słowa kluczowe: sektor, opieka zdrowotna, jednostka decyzyjna, wskaźniki finansowe, finansowanie, skuteczność

医疗卫生体系的管理和筹资

摘要:医疗保健目前正处于充满挑战和动态的时期。在金融经济分析领域，评估决策单位的现代方法常常被用作评估决策单位财务稳定性和绩效的必要工具。本文旨在分析医疗行业的财务状况和融资情况，在斯洛伐克共和国医疗行业实施杜邦模式。被提及的部门被划分了斯洛伐克的SKNACE86人类健康活动。作者通过对数，指数，增量和功能方法来评估整个行业的销售收益率，总资产周转率，负债率对股本回报率的分析因素变化的影响，量化决定因素的影响的方法。有关财务指标平均值的数据通过Cribis信息门户获得。以下来源用于量化斯洛伐克共和国的医疗保健状况参数:经合组织健康数据，欧洲共同体健康指标(ECHI)，世界卫生组织全球卫生观察站，国家卫生信息中心和斯洛伐克共和国统计局。结果显示，使用功能性方法对于医疗行业内的商业实体的管理是最有效的。发现资产收益率对股权影响最大。
关键词:部门，医疗保健，决策单位，财务指标，资金，有效性