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## **EXPRESSION OF THE TRANSPORT SECTOR OPERATIONAL EFFICIENCY EVALUATION METHODOLOGY (TRENDS) AT DIFFERENT STAGES OF THE ECONOMIC CYCLE**

**Summary.** It is important to evaluate the impact of economic fluctuations on the transport sector operational efficiency, since such an analysis is a source of economic information which contributes to the identification of the sector's potential and advantages, the establishment of the risky areas of activity, and the exploration of the opportunities to increase its effectiveness. The aim of the study was to apply mathematical evaluation methods to the exploration of the operational efficiency of the Lithuanian transport sector companies and, based on the outcomes, to validate the opportunity of predicting a potential change of the economic cycle. The operational efficiency of the Lithuanian transport sector was analysed in the context of the cyclical national economy, and not in individual economic boom or recession periods, as that allowed for more detailed evaluation of the specific activities of the sector and its impact on Lithuanian economy. To achieve the aim, three different stages of the economic cycle in Lithuania were identified, and calculations were made during them. Based on the aggregate financial data, four different economic efficiency indicators were developed that reflected the efficiency level of the entire transport sector, and the sensitivity of the transport sector to economic fluctuations was identified. The comparison of the changes in the transport sector and in Lithuanian economy made it obvious that the level of the sector's operational efficiency could be regarded as a leading indicator of the economic cycle.

### **1. INTRODUCTION**

The contemporary economic reality can be identified as a recurrent sequence of economic fluctuations, when economic growth is a sequence of downturns and upturns. The definitions of economic cycles emphasise the importance of prognostication in different stages of the cycle [15]. Economic cycles are periodically occurring fluctuations in economy which can be calculated, predicted, and respectively prepared for by developing a plan or a strategy of action [15]. Observation of economic cycles is very important, as economic fluctuations have an impact on the overall economy of the country, are felt in all sectors, and affect the public social stability. For these reasons, both the government and the business sector are interested in understanding the factors that predetermine the regularities and variations of the economic cycle so as to be able to prepare for potential difficulties or, on the contrary, for the business development on time. "Economic cycles are not twins, however, traits can be identified in them that prove their belonging to one family"[14, p. 142]. This illustrates another important trait of the economic cycle: economic cycles are not similar to each other, but they share a number of common characteristics. A uniform structure of the economic cycles and an analysis of the cycles of different duration allow for the explanation of the relationship of different economic cycles.

Economic fluctuations that affect the entire economy of the country and its individual sectors inevitably influence the operational efficiency of those sectors; therefore, it is necessary to examine the impact of the economic cycles on the efficiency of the transport sector activity. Given the significance of that sector for Lithuanian economy, the sector may become one of the key factors for the economic boom of the country. The importance of evaluation of the impact of economic fluctuations on the transport sector's operational efficiency is also predetermined by the fact that such an analysis is a source of economic information which contributes to the identification of the sector's potential and advantages, the establishment of the risky areas of activity, and the exploration of the opportunities to increase its effectiveness.

The aim of the study is to apply mathematical evaluation methods to the exploration of the operational efficiency of the Lithuanian transport sector companies and, based on the outcomes, to validate the opportunity of predicting a potential change in the economic cycle.

The operational efficiency of the Lithuanian transport sector was analysed in the context of the cyclical national economy, and not in individual economic boom or recession periods, as that allowed for more detailed evaluation of the specific activities of the sector and its impact on Lithuanian economy.

A shortage of statistical data has so far prevented the identification of the precise boundaries of the Lithuanian transport sector development cycles and the shift periods; however, based on the close relationship of the cycle in that sector with the classical economic cycle, one can reveal major Lithuanian transport sector development characteristics and the causes of the succession of its upturns and downturns.

To achieve the aim, three different stages of the economic cycle in Lithuania were identified, and respective calculations were made. The period of 2005 to 2010 was chosen for the study, as the performed analysis of the economic cycle indicators suggested that in Lithuania, the recovery stage of the economic cycle lasted from 2005 to March 2008. Lithuanian economy reached a peak of economic activity in March 2008, when the highest GDP level was recorded. From March 2008 to the last quarter of 2009, a recession stage lasted in Lithuania, and in the last quarter of 2009, when the economy reached its lowest point, the recovery stage began.

Based on the aggregate financial data, four different economic efficiency indicators were developed that reflected the efficiency level of the entire transport sector, and the sensitivity of the transport sector to economic fluctuations was identified.

## 2. LITERATURE REVIEW

Economic cycles mean a type of fluctuations of all the economic activity in the country which is organised mainly on the basis of private entrepreneurship. The cycle consists of an expansion period, simultaneously experienced in a number of types of economic activities, which is replaced by a recession period, also common for all the economy, and the contraction of production with a subsequently developing recovery, which extends into the expansion period of the next cycle. The succession of the cycle stages is repetitive, but not necessarily periodic.

The theory of economic cycles emphasises the existence of a consistent and predictable structure of the economic cycle by means of which changes in economy can be explained. Economic cycles are defined as unpredictable and irregular; however, different economic research and governmental agencies use some indicators of economic cycles that allow to predict the process of the economic cycle and to identify its turning points, i.e. the highest expansion and the lowest recession points. Economic cycle indicators are sequences of economic data which are grouped based on their relationships with the shifts in the economic cycles.

Depending on the direction of the movement of the macroeconomic variable compared with the directions of the overall economic activity, procyclical, counter-cyclical, and acyclical indicators are identified. Procyclical variables move in the same direction as the overall economic activity, counter-cyclical variables move in the opposite direction than the overall economic activity, while the acyclical variables do not have a clear direction during the economic cycle [13, 18].

The second trait of the indicators is the time of the turning point (peaks and troughs) as compared with the economic cycle turning points. Depending on the coincidence with the stage of the economic cycle, lagging indicators, which lag behind the economic cycle; coincident, whose changes coincide with the current stage of the economic cycle; and leading ones, whose changes lead to the shift of the economic cycle stage, are identified [12, p. 7].

Cyclical fluctuations are typical not only of the entire economic system but also of the transport sector. Consequently, the transport sector has its own development cycle whose process is closely related to the changes taking place in the entire national economy, as proved by an analysis of the transport services index developments. As one of the potential aspects of the interaction of the transport sector and economic cycles, direct participation of the transport sector in the Kitchin inventory cycles and direct interaction of the sector with the production processes and trade are named [9]. Moreover, an obvious relationship exists between other economic cycles and the transport sector.

The inclusion of the transport sector in economic cycles is obvious due to three principal factors predetermined by the reasons of emergence of the Kitchin, Kuznets, and Kondratieff cycles. The Kitchin cycles manifest themselves by commercial enterprises' stock fluctuations. The transport sector plays one of the key roles in such cycles, since it is the sector responsible for the stock storage and transportation. Demographic processes, the primary cause of the emergence of the Kuznets cycles, promote the increase in the demand for passenger transport companies. Another cause of the Kuznets cycles is the intensity of the construction development due to the ongoing demographic processes. Goods vehicles are the main mode of construction material transportation; therefore, in case of a new construction boom, the demand for cargo transportation service providers significantly increases. In the Kuznets cycle recession stage, cargo transportation companies lose most of their orders, while with no migration process taking place, the demand for the services provided by passenger transport companies decreases. The principal cause of the emergence of the Kondratieff long wave cycle was technological changes and innovations. One of the technological changes that promoted the emergence of the wave in 1840 was the development of the railway and the invention of a steam engine; in 1895, the development of the auto industry; in 1940, of the aerospace; and in 2000, the development of the new generation biocars [16, p. 78]. These technological changes affected both the production of new vehicles and the development of transport services.

The nature of the economic cycles and the transport sector development cycle coincides: the cycle consists of 4 stages (recession, its lowest point, or depression, recovery, and boom), which cyclically follow one after the other [9, p. 85]. One major difference exists that is revealed by an analysis of the transport services index and the economic cycles: the transport sector life cycle and the economic cycle are asymmetrical, i.e. the cycle curves do not coincide in terms of time [5, p. 57]. The transport sector market reaches its peak earlier than the peak of economic activity recorded in the country. For that reason, the processes in the transport sector are to be considered as leading indicators of the economic situation [8, p. 22]. When the first signs of decline are observed in the transport sector, after a certain period of time, decline is to be expected throughout the economy. The period of time that separates the shifts taking place in the transport sector and in the entire economy covers six months; therefore, the decline in the economic cycle can be predicted.

### **3. METHODOLOGY**

#### **3.1. Economic cycle identification in Lithuania**

The definition of the economic cycle change periods and the identification of the exact date when the economy passes from one stage of the cycle to another is a complex process primarily due to a shortage of statistical data in Lithuania. The criteria in the world-recognised economic cycle identification methodology are valid for an analysis of monthly indicators; however, the Lithuanian Department of Statistics does not publish those indicators by month. Second, to identify the economic cycle turning points and the deviation from the long-term trend, it is necessary to do calculations that allow one to determine the long-term trend and to eliminate seasonal fluctuations.

Given the fact, in order to identify the economic cycle in Lithuania, the Business Cycle Clock provided by the European Statistical Office has been used. It is a graphical interface that shows the monthly and quarterly changes in the basic economic indicators of all Europe and individual European countries, depending on their deviation from the long-term trend. The graphical data are based on the recalculated statistical data time series and estimated by eliminating the seasonal impact, except for the prices, which are usually calculated without seasonal adjustment.

Of the eleven potential economic cycle indicators, nine major ones were selected that are best suited to identify the economic cycle in Lithuania:

1. one leading indicator (monthly changes in new orders of industrial companies);
2. five coincident indicators (quarterly changes in the GDP volumes, employment rates, and consumer spending, and monthly changes in the industrial production level and the retail trade turnover);
3. three lagging indicators (monthly changes in the unemployment rate and the inflation level and quarterly changes in labour costs).

Based on the quarterly changes in the GDP, consumption, and employment, the peak of economic activity in Lithuania was identified in the first quarter of 2008. More precise monthly indicators of the industrial production and the retail trade revealed that the highest level of industrial production and the largest volume of retail trade were recorded in March 2008. Consequently, before the first quarter of 2008, Lithuanian economy was in the late recovery stage, and all the above-named economic cycle indicators were higher than indicated by the long-term trends.

The unemployment rate was assigned to the lagging indicators; however, by January 2008 in Lithuania, the unemployment rate indicator had already reached its peak. In January 2008, the unemployment rate in the country was the lowest, and from February, it started to rapidly increase, although the level of production and the volume of retail trade had not yet reached their peaks.

The same trend was revealed by the study of the economic cycles carried out in Lithuania in the period of 1993 to 2003, which established that the unemployment indicator was to be assigned to the coincident indicators, although that was in contradiction to theoretical considerations and global practices [17, p. 195].

As a leading indicator, whose change led to the shift of the economic cycle stage, new orders of industrial companies were chosen which revealed the prospective level of industrial production. The peak of that economic cycle indicator was the highest in February 2008 and the lowest in September 2009. The time difference between the new orders of industrial companies and the highest level of industrial production accounted for only one month.

During those processes, the inflation and the labor costs in the country continued to increase and reached their peaks in November and June, respectively. Thus, the peak of economic activity in Lithuania was reached in March, in the first quarter of 2008, when the highest levels of industrial production and retail trade were recorded in the country.

After the peak of economic activity reached in the early 2008, a recession stage started, accompanied by the decreasing employment, consumption, and a low level of production, as well as by still increasing inflation. The first quarter GDP and consumption and the second quarter employment in the same year were lower than the long-term trend and kept moving towards the trough.

It is rather difficult to establish when the depression stage (the turning point) was reached in Lithuania, as all the coinciding indicators reached their trough at different times. The GDP reached the lowest point as early as in the last quarter of 2009, while the employment and consumption at the time kept decreasing. The lowest values of those indicators were recorded in the first quarter of 2010. Deep recession was witnessed by a high unemployment rate which reached its peak in March 2010. Consequently, the values of the selected coincident indicators moved from the lowest point and started to increase, although they still remained lower than their long-term trend. It is interesting to note that both the level of industrial production and the new orders of industrial companies reached their lowest values at the same time, i.e. in September 2009: they overtook the GDP turning point by three, and of consumption and employment, by six months.

In the economic cycles identification methodology of the Organisation for Economic Co-operation and Development (OECD), priority is given to the industrial production index; however, for Lithuania, the GDP analysis is more appropriate due to Lithuania's economic openness and the weight of the service sector which respectively affects the GDP and the labour market structure. Given that, it can be

concluded that Lithuania entered depression in the last quarter of 2009, when the lowest GDP level was recorded.

Thus, the recession stage in Lithuania lasted for six quarters or 18 months. After Lithuanian economy reached the lowest point, a recovery stage began. All over the year 2010, the GDP, employment, and consumption kept gradually increasing, although they were still below the long-term trend. As early as in September 2010, the industrial production volumes exceeded the long-term trend and were gradually moving towards the peak. In the second half of 2010, along with the decrease in the number of the unemployed, the inflation level and the labour costs decreased, i.e. all the traits typical of the recovery stage were manifested.

The years 2004 to 2007 for Lithuania were the period of rapid economic growth, when the GPP volumes kept increasing, as well as the level of production, consumption, and employment, and the unemployment rates were decreasing. In the first quarter, or to be more specific, in March 2008, the highest point of economic activity was achieved, further followed by recession.

After 18 months of economic recession, the lowest point, or depression, was reached in the last quarter of 2009, after which Lithuanian economy passed into another stage of the economic cycle, i.e. recovery; that is why the period of 2005 to 2010 was chosen for the study, as it revealed all the stages of the economic cycle.

### 3.2. An operational activity evaluation model for the transport sector

After the analysis of theoretical sources, nine key financial indicators were established that revealed the efficiency of the transport companies' activity [1 - 4, 6, 7, 10, 11, 16]. The abundance of financial indicators that characterise the company's operational efficiency accounted for the complexity of providing unambiguous conclusions. Therefore, we employed the operational efficiency evaluation methodology designed for a specific economic branch or the operational efficiency of all the entities in a specific economic branch [1, 6]. The analysis is consistent with the theory developed by F. E. Kydland and E. C. Prescott to the effect that the transfer of microeconomic regularities to macroeconomics contributes to the disclosure of new regularities.

Efficiency evaluation is based on the aggregation of financial indicators in accordance with a created mathematical algorithm and the calculation of four economic efficiency indicators. Four different efficiency evaluation methods, adapted for the operational efficiency evaluation of the transport sector enterprises, are presented in Table 1.

The weighted "rapid" economic efficiency indicator was calculated on the basis of a weighted arithmetic mean. For its calculation, two key indicators were chosen: the ratios of operating profitability and financial dependency as reflecting the current performance of economic entities and their opportunities to operate on a long-term basis.

The calculation of the economic efficiency ratio neglected the gross sales profitability ratios, as the latter could acquire negative values. Negative indebtedness and financial dependency ratios were chosen, so that a lower value of indebtedness or financial dependency would be evaluated better than a higher one. In that way, the principle was maintained of a higher value of the operational efficiency indicator characterising a better situation. The gross sales profitability ratios were also neglected in the calculation of the economic efficiency indicator by the weighted geometric mean method.

When calculating the economic efficiency indicator on the basis of an arithmetic mean, all the selected ratios were used, as that financial data aggregation method covered the largest amount of information about the activities of economic entities.

The financial indicators selected for aggregation were measured in different units; therefore, the weights were selected in such a way as to provide each financial indicator with equal opportunities of affecting the aggregated size. In order to present as clear and vivid results as possible, the calculated values of the indicator were multiplied by 100 or 10, i.e. indexed. Therefore, the efficiency ratio was measured by points.

The efficiency indicators calculated by four different methods were processed by eliminating seasonal occurrences. For the seasonal leveling of indicators, the *Demetra* software was used (a parametric TRAMO/SEATS method). The data selected for the analysis reflected quarterly changes in the efficiency level, which allowed to identify more precise boundaries of the increasing or decreasing

efficiency level in the transport sector and to compare them with the changes taking place in Lithuanian economy.

Efficiency measurement is not limited to the above-named methods and can be supplemented by the methods of parametric and non-parametric statistical analysis. At present, priority is given to the non-parametric data envelopment analysis (DEA) [18, 39]. The method allows to reveal the efficiency of different economic entities and can be applied both at the macro- and micro-levels, i.e. it is adapted to the analysis of efficiency both in a specific branch and in the entire country. In the field of transport, the DEA method is used for the efficiency analysis of airports and seaports, public transport, and the railway and air transport. However, the method is quite sophisticated by its mathematical content, and a large number of road transport companies so far prevents the application of the method to the entire transport sector.

### 3.3. Lithuanian transport sector efficiency evaluation results at different economic cycle stages

The Lithuanian transport sector efficiency indicators calculated by means of the developed mathematical model are presented in Table 2.

The weighted "rapid" economic efficiency indicator, after the seasonal component elimination, obtained the maximum value in the third quarter of 2007 (1,03), and the minimum, in the first quarter of 2008 (-10,46), i.e. the operational efficiency decreased by 10.2 times (see Fig. 10). From 2005 to the third quarter of 2007, the "rapid" economic efficiency indicator was rather unstable and was characterised by sudden changes; however, the efficiency level of the third quarter of 2007 exceeded the level of the early 2005 by 51.5 percent points. A rapid decline started from the third quarter of 2007 and lasted for a year. In 2010, the transport sector failed to reach the efficiency level of either the first quarter of 2005 or the third quarter of 2007. The decline in the efficiency level in accordance with that method was predetermined by both of its components (the operating profitability and the financial dependency ratios), and especially the poorer values from the early 2008. It should also be noted that, during all the reference period, the transport sector failed to reach the efficiency level of 2005.

On the basis of the economic efficiency indicator calculated by the financial rating method, one can conclude that the level of efficiency was rather stable and characterised by not such large changes as compared with the indicator calculated by the previously analysed method. The maximum value of the indicator was recorded in the third quarter of 2007 (3,39), and the lowest, in the first quarter of 2009 (1,93), i.e. the change amounted to 41.93%. From 2005 to the third quarter of 2007, the indicator kept increasing, however, at a different rate: the total increase accounted for 24.7 percent points.

The level of economic efficiency reached in 2010 exceeded the level of 2005, however, remained lower than the value of the indicator of the third quarter of 2007. Such trends led to the conclusion that the business profitability and financial dependency ratios were very important for Lithuanian transport companies, as they reflected high fluctuations of the efficiency level. Therefore, attention should be paid to the huge impact on the transport sector operational efficiency made by the permanent cost increase and the dependency on external funding sources.

The transport sector efficiency indicator calculated by the weighted arithmetic mean method, just like the "rapid" efficiency indicator, was characterised by large fluctuations. The highest transport sector efficiency level was reached in the third quarter of 2007 (3,04), and the lowest, in the second quarter of 2009 (-0,03); the decline amounted to -107,5 percent points. From the early 2005 to the third quarter of 2007, the efficiency level increased by 24.3 percent points. However, the efficiency level reached in 2010 did not exceed either that of the first quarter of 2005 or of the third quarter of 2007.

Table 1

Mathematic algorithm of financial indicators for the transport sector efficiency evaluation

Financial indicators selected for aggregation	Selected weights	Formula
Weighted calculation of the "rapid" economic efficiency indicator		
Operating profitability (profit before tax/total costs)	$\alpha_1 = -\frac{1}{5}$	$E(x) = \sum_{i=1}^n x_i \alpha_i$ where $\alpha_i$ is weights, $\sum_{i=1}^n \alpha_i = 1$
Financial dependency ratio (liabilities/equity)	$\alpha_2 = \frac{6}{5}$	
Calculation of the economic efficiency indicator by the financial rating method		
Current ratio (current assets/current liability)	$\alpha_1 = \frac{1}{72}$	$FR(x) = \sqrt{x_1^2 \alpha_1^2 + x_2^2 \alpha_2^2 \dots x_n^2 \alpha_n^2}$ where $\alpha_i$ is weights, $\sum_{i=1}^n \alpha_i = 1$
Indebtedness ratio (total liabilities/assets)	$\alpha_2 = -\frac{1}{24}$	
Return on assets (net profit/total assets)	$\alpha_3 = \frac{20}{24}$	
Financial dependency ratio (liabilities/ equity)	$\alpha_4 = -\frac{1}{48}$	
Fixed assets turnover (revenues/ fixed assets)	$\alpha_5 = \frac{1}{24}$	
Receivables turnover (revenues/one year receivables)	$\alpha_6 = \frac{1}{114}$	
Operating profitability (profit before tax/ all costs)	$\alpha_7 = \frac{3}{24}$	
Equity turnover (revenues/equity)	$\alpha_8 = \frac{1}{24}$	
Calculation of the economic efficiency indicator by the weighted geometric mean method		
Operating profitability (profit before tax/all costs)	$\alpha_1 = -\frac{1}{5}$	$EG(x) = x_1^{\alpha_1} x_2^{\alpha_2} x_3^{\alpha_3} \dots x_n^{\alpha_n}$ where $\alpha_i$ is weights, $\sum_{i=1}^n \alpha_i = 1$ .
Financial dependency ratio (liabilities/ equity)	$\alpha_2 = \frac{6}{5}$	
Calculation of the economic efficiency indicator by the arithmetic mean method		
Gross profit margin (gross profit/revenues)	$\alpha_1 = \frac{1}{25}$	$\sum_{i=1}^n \alpha_i = 1$ $E(x) = \sum_{i=1}^n x_i \alpha_i$
Current ratio	$\alpha_2 = \frac{1}{75}$	
Indebtedness ratio	$\alpha_3 = -\frac{1}{25}$	
Return on assets	$\alpha_4 = \frac{20}{25}$	
Financial dependency ratio	$\alpha_5 = -\frac{1}{50}$	
Fixed assets turnover	$\alpha_6 = \frac{1}{25}$	
Receivables turnover	$\alpha_7 = \frac{1}{150}$	
Operating profitability rate	$\alpha_8 = \frac{3}{25}$	
Equity turnover	$\alpha_9 = \frac{1}{25}$	

Table 2

## Indicators of the transport sector operational efficiency

	Gross profitability	Current ratio	Indebtedness ratio in %	Return on assets in%	Financial dependency ratio	Fixed assets turnover	Receivables turnover	Operating profitability	Return on equity
2005K1	26,7	1,41	34	1,48	55,74	0,218	1,701	9,244	27,33
2005K2	22,8	1,46	35	1,72	58,16	0,243	1,777	9,662	30,91
2005K3	22,9	1,49	36	1,91	59,56	0,265	1,798	9,899	34,04
2005K4	20,1	1,2	37	1,44	62,64	0,261	1,726	7,124	35,13
2006K1	21,7	1,28	37	1,60	64,68	0,244	1,749	8,602	32,79
2006K2	24	1,39	38	2,47	65,58	0,290	1,889	12,028	38,79
2006K3	22,3	1,53	37	2,04	64,13	0,309	1,944	9,097	41,15
2006K4	22,2	1,4	36	1,77	61,75	0,301	1,863	7,990	39,78
2007K1	23	1,38	37	1,85	64,12	0,261	1,584	9,815	34,40
2007K2	23,8	1,48	38	2,21	65,97	0,297	1,759	10,552	38,94
2007K3	22,7	1,69	38	2,80	66,12	0,306	1,718	13,250	39,84
2007K4	19	1,47	38	1,28	66,53	0,296	1,728	5,796	38,84
2008K1	20	1,31	41	1,71	78,08	0,285	1,501	8,391	39,72
2008K2	20,2	1,29	43	1,80	83,32	0,296	1,566	8,265	42,49
2008K3	16	1,36	43	1,18	84,30	0,300	1,573	5,328	43,50
2008K4	14,2	1,17	42	1,05	83,55	0,259	1,551	5,107	39,15
2009K1	16,5	1,06	41	0,70	81,63	0,195	1,241	4,409	30,33
2009K2	17,1	1,14	40	0,88	76,63	0,207	1,303	5,358	31,14
2009K3	18,1	1,24	38	1,24	72,88	0,215	1,366	7,430	31,92
2009K4	15,4	1,22	37	0,88	68,94	0,219	1,418	4,950	32,18
2010K1	19,1	1,22	38	1,10	71,83	0,217	1,245	6,615	31,87
2010K2	19,3	1,28	38	1,33	68,71	0,253	1,397	7,113	35,10
2010K3	21,5	1,39	36	2,18	65,29	0,264	1,363	11,668	35,69
2010K4	17,7	1,33	34	1,46	60,56	0,271	1,504	7,171	36,51

The indicator change trends calculated by the weighted geometrical mean method were similar to those of the ratio calculated by the financial rating method: the highest efficiency level was recorded in the third quarter of 2007 (2,43), and the lowest, in the second quarter of 2009 (0,87), thus, the decrease accounted for 62,5%. In the second quarter of 2010, the efficiency level exceeded only that of the year 2005, however, the efficiency level of the third quarter of 2007 was not reached.

#### 4. CONCLUSION

Four different mathematical methods for efficiency evaluation were created that can be applied to the analysis of the transport sector companies' operational efficiency: the weighted "rapid" economic efficiency indicator and the calculation of the economic efficiency indicator by means of the financial rating method, the weighted geometric mean method, and the arithmetic mean method.

Based on the efficiency indicator values calculated by all four methods, it becomes obvious that the transport sector efficiency level kept rising from 2005 to the third quarter of 2007, even if at slow pace. The efficiency indicator calculated by the weighted arithmetic and weighted geometric mean methods reached the lowest value in the second quarter of 2009. The "rapid" economic efficiency indicator and the transport sector efficiency level calculated by means of financial rating were the lowest in the first quarter of 2009. As the economic efficiency level calculated by means of the weighted arithmetic mean method covered the greatest amount of information about the activities of economic entities, it could be concluded that the highest level of the national transport sector economic efficiency was reached in the second quarter of 2009. The weighted "rapid" economic



efficiency indicator reached its highest value earlier, as the indicator calculated by that method was directly dependent on the rising level of fuel costs and increasing wages at that time.

The comparison of the changes in the transport sector and in Lithuanian economy made it obvious that the level of operational efficiency of that sector could be seen as the leading indicator of the economic cycle. The period of time that separated the changes related to the increase or decrease in the transport sector efficiency level and to the changes taking place in the economy was equal to two quarters or six months. The same results were obtained by the USA researchers who analysed the economic cycles in the country and the transport sector activity for 24 years. The negative changes that took place in the transport sector, i.e. the decrease in the efficiency level, started as early as in mid-2007, while in Lithuania the economic growth was still continuing. The difficulties were also evidenced by the fact that the largest number of the workers in the sector was recorded in 2007, and afterwards it started decreasing. It is important to note that after the lowest efficiency level reached at the beginning of the third quarter of 2009, the transport sector managed to quite quickly pass into the recovery stage, although Lithuania was still experiencing the period of economic decline. Based on the financial rating, the weighted geometric mean, and the weighted arithmetic mean methods, the level of the Lithuanian transport sector efficiency in the third quarter of 2010 was higher than that of the early 2005, however, still below the level of the third quarter of 2007.

Economic cycles are not the only factor that affects the positive and negative processes taking place in the transport sector, since much depends on the political decisions of both Lithuania and other countries. The decline in the transport sector economic efficiency can also reflect managers' inability to properly use the available resources, to adapt to the ongoing changes in the business, or to take the right investment decisions. When all of the above named factors coincide, the situation in the transport sector becomes especially difficult. In order to objectively evaluate the causes leading to the declining economic efficiency level in the transport sector, it is necessary to analyse the efficiency levels of different economic activities assigned to the transport sector, as each mode of transport has specific characteristics.

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