

MONITORING OF COSTS IN INTERNATIONAL ROAD FREIGHT TRANSPORTATION

Zdeněk ŘÍHA, Jan TICHÝ, Václav BAROCH

Czech Technical University, Faculty of transportation Sciences, Czech Republic, EU,
rihazden@fd.cvut.cz, jtichyja3@fd.cvut.cz, barocvac@fd.cvut.cz

Abstract

The Cost Index CESMAD BOHEMIA is a monitoring system of cost development for Czech freight carriers. This Index is based on the methodology of the Dutch company NEA and the methodology of transport experts from the Czech Technical University. Cost Index CESMAD BOHEMIA has a goal to give information about costs per kilometre for different relations in Europe and to describe general trends across freight transport market. The paper is focused on web application for monitoring of costs of international road freight transportation and on the development of basic macroeconomic indicators, which have main influence on the cost index (interest rate, inflation, wage developments, toll rates, exchange rate) in the period 2016 - 2018.

Keywords: Costs, indexation, freight transportation, web application, wage rate, toll

1. INTRODUCTION

The goal of creating the cost index is to capture changes in the cost of road freight carriers based on statistical observation of indicators of the economic system. The result is the percentage change of the costs in calculation units. Cost unit, i.e. the unit, by which the model calculated the internal costs of carriers, is 1 kilometre (1 km). [1] The actual index expresses the change in costs compared to the previous period and is therefore expressed (both for individual types of costs and for a total cost of 1 km) in percentage (%). In terms of traditional classification of expenses (costing) of carriers, the cost index contains these following items [2], [3]:

1. Fuel
2. Direct material and tires
3. Depreciation and leasing
4. Repairs and maintenance
5. Wages of the drivers and compulsory payments
6. Per diem and travel allowances
7. Tolls
8. Other direct costs (incl. insurance)
9. Indirect costs

For the creation of the index it is necessary to choose the model vehicle that has the following parameters:

- model set: tractor unit with trailer
- weight: 40 tons (of which 24t is payload)
- number of axles: 5 (tractor unit with 2 axles and trailer with 3 axles)
- emission category of trailer truck: Euro V and Euro VI (the combination in relation to the transportation performance which are registered in toll system of the Czech republic)
- type of trailer: tilt, low-deck
- annual mileage: 120,000 km (10,000 km per month)
- average fuel consumption: 30 litres per 100 km (Euro V), 28 litres per 100 km (Euro VI)
- leasing: type - financial leasing, payback period - 5 years (60 months)
- lifetime of vehicles: tractor unit - 5 years, trailer - 8 years

- acquisition price of tractor unit (excluding VAT): € 83 000 (V) and € 90,000 (VI)
- acquisition price of trailers (excluding VAT): € 27,000

The index is further calculated for routes to Spain, Italy, Germany, Slovakia and the United Kingdom. One route is internal.

2. THE WEB APP DESCRIPTION

The ČESMAD BOHEMIA Index is presented to the public via the web application at www.indexcesmad.cz. On the home page (see **Figure 1**), the user finds the individual index options described in the previous first chapter. Here is the option to choose route, emission standard, fuel costs, and toll costs. The user also chooses the range of periods for which the index is to be set. Based on the user-specified option, the appropriate values of the given index variation in the implementation of iQ (Quarterly index) and iB (Base index) are immediately displayed. For selected index variants, it is possible to display a chart of development of index trend, which is compiled in cooperation with the website of traffic data: www.ioda.cz.

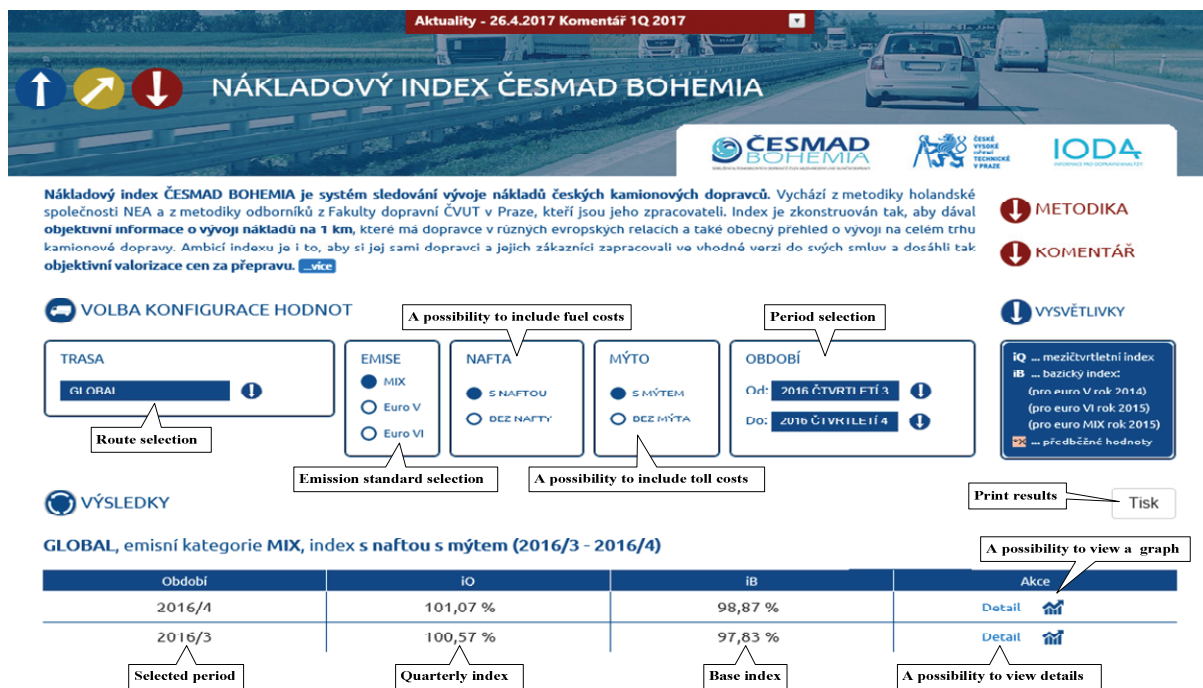


Figure 1 The home web app page offers sufficient possibilities for index calculation

If the user is interested in more detailed values for each index folder, they can be displayed for each period by clicking on the Detail button. (see **Figure 2**).

Detailní složky indexu podle druhu nákladů v období 2016/4 Zavřít detail

Detail	1.Pohřmo	2.Materiál	3.PořVoz	4.Opravy	5a.Mzdy	5b.Diety	6.Mýto	7.Ostatní	8.Režie	Celkem
A share of different items in the index Podíl	27,88 %	2,97 %	17,98 %	1,75 %	12,11 %	10,69 %	16,74 %	3,98 %	5,90 %	100,00 %
Quarterly index iQ	103,38 %	100,00 %	100,19 %	101,19 %	100,53 %	99,98 %	99,75 %	100,00 %	101,19 %	101,07 %
Base index iB	93,40 %	100,00 %	99,95 %	105,15 %	107,95 %	95,40 %	99,25 %	107,41 %	104,00 %	98,87 %
	Fuel	Material	Vehicle acquisition	Repairs	Wages	Per diem costs	Toll	Other	Overheads	Total

Figure 2 Index components divided by the types of the costs



Index components divided by the types of the costs display 9 basic index components: fuel (1), material (2), vehicle acquisition (3), repairs (4), wages (5a), per diem costs (5b), toll (6), other (7), and overheads (8). Index component values are set for iQ and iB. Additionally, it also shows a share of different items in the index in the percentage. If the user does not enter an optional component (e.g. Fuel) in the index variant selection, there is displayed and proportionally calculated only the limited selected set of index components (see **Figure 3**), where the Fuel (1) and Toll (6) components are missing and the index is calculated without them.

Detailní složky indexu podle druhu nákladů v období 2016/4

Zavřít detail

Detail	2.Materiál	3.PořVoz	4.Opravy	5a.Mzdy	5b.Diety	7.Ostatní	8.Režie	Celkem
Podíl	5,36 %	32,47 %	3,16 %	21,87 %	19,30 %	7,19 %	10,66 %	100,00 %
iQ	100,00 %	100,19 %	101,19 %	100,53 %	99,98 %	100,00 %	101,19 %	100,34 %
iB	100,00 %	99,95 %	105,15 %	107,95 %	95,40 %	107,41 %	104,00 %	101,75 %

Figure 3 Selected view of a limited set of index components

For a continuous index determination in the current period, for example, for the last quarter, some components of the index may only be preliminary since some components of the index are already known as final, but others are only to be estimated by the time of publication of the final data. This applies, for example, to the Wages component (5a) in which the data base for its final determination are known with a certain time delay compared to the data base of the other components. If the index values are only preliminary, the user is notified by the red coloration of the given value (see **Figure 4**).

GLOBAL, emisní kategorie **MIX**, index **bez nafty bez mýta** (2017/1 - 2017/1)

Období	iQ	iB	Akce
2017/1	*100,52 %	*102,28 %	Detail

Detailní složky indexu podle druhu nákladů v období 2017/1

Zavřít detail

Detail	2.Materiál	3.PořVoz	4.Opravy	5a.Mzdy	5b.Diety	7.Ostatní	8.Režie	Celkem
Podíl	*5,33 %	*32,26 %	*3,20 %	*21,97 %	*19,34 %	*7,15 %	*10,75 %	100,00 %
iQ	100,00 %	99,86 %	101,90 %	*100,99 %	100,73 %	100,00 %	101,35 %	*100,52 %
iB	100,00 %	99,81 %	107,14 %	*109,02 %	96,09 %	107,41 %	105,40 %	*102,28 %

Figure 4 The display of preliminary index values due to the absence of final data of the component „Wages“ (5a)

3. DEVELOPMENT OF COSTS IN 2018

What the results of the cost index show in the last period. After the phase, when the costs had fallen (ca. until mid-2017), this year there was a significant turnover and increased international freight transport costs faster than in the past. [4] In particular, in the third quarter of 2018, four basic trends met:

- rise in prices of fuel, their growth started in 2016, then slowed down in 2017 by strengthening the Czech crown (see **Figure 5**), [5]

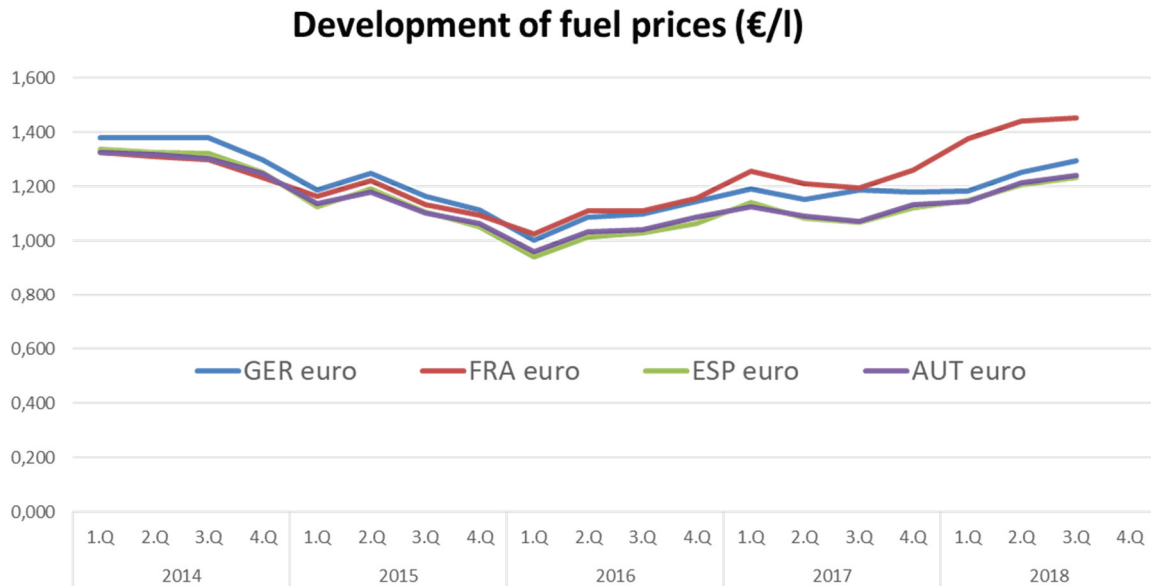


Figure 5 Development of fuel prices (source: Eurostat)

- growth in interest rates, if we follow the 3M PRIBOR indicator, which is used to determine the interest rates of various financial products, has risen approximately fivefold since mid-2017 (**Figure 6**), [6]

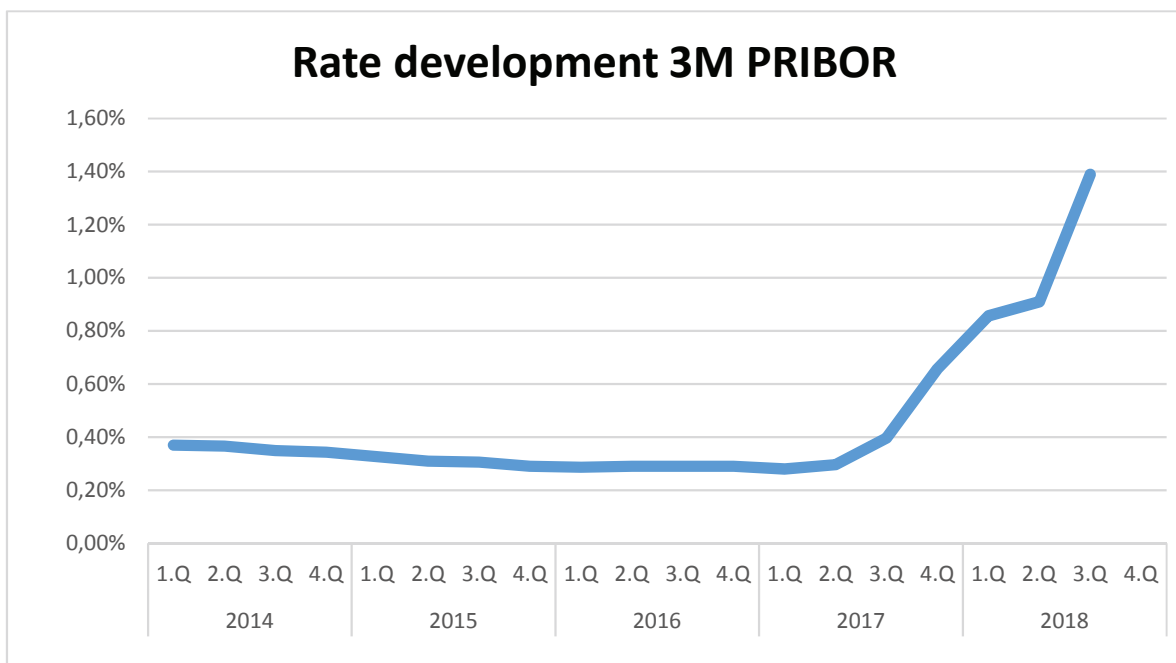


Figure 6 Rate development 3M PRIBOR (source: Czech National Bank)

- Intensive drivers' wage growth, increase on average by about 3 % per quarter, the basic wage growth index of truck drivers compared to Q1 2015 is 1.45, i.e. a 45 % increase. [7] The growth of truck drivers' wages is captured in **Figure 7**. [8]

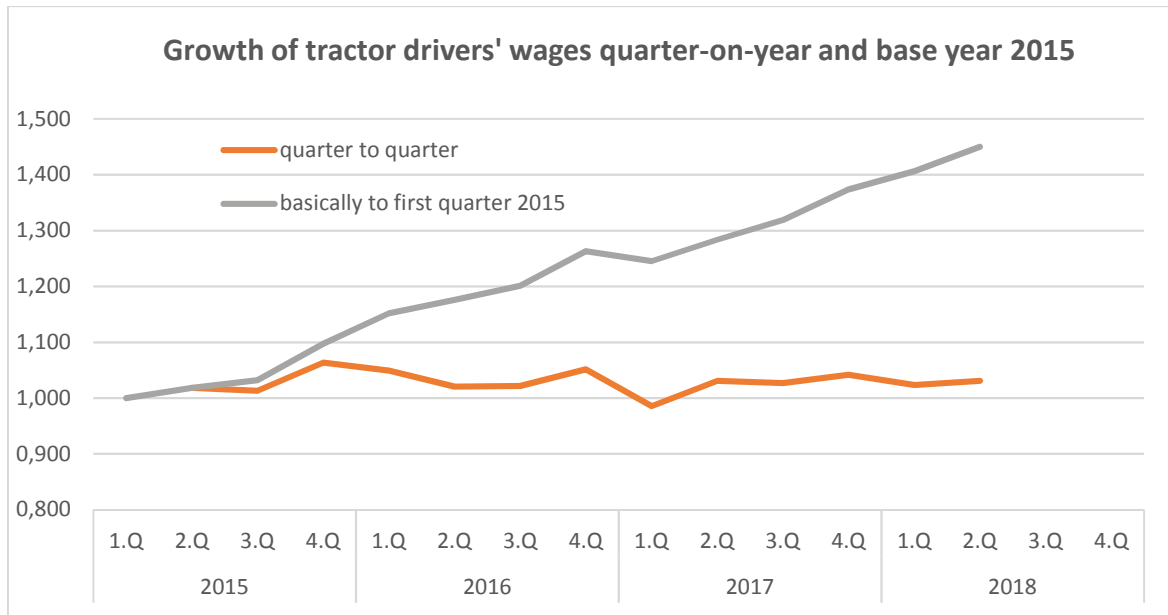


Figure 7 Drivers' wage growth (source: ISPV, Index ČESMAD)

- weakening of the Czech currency (CZK), which is not significant, but the assumption that the CZK should steadily strengthen after the end of CNB interventions is not fulfilled in the last two quarters. There is no reduction in the cost of purchases made abroad (in particular tolls). [9]

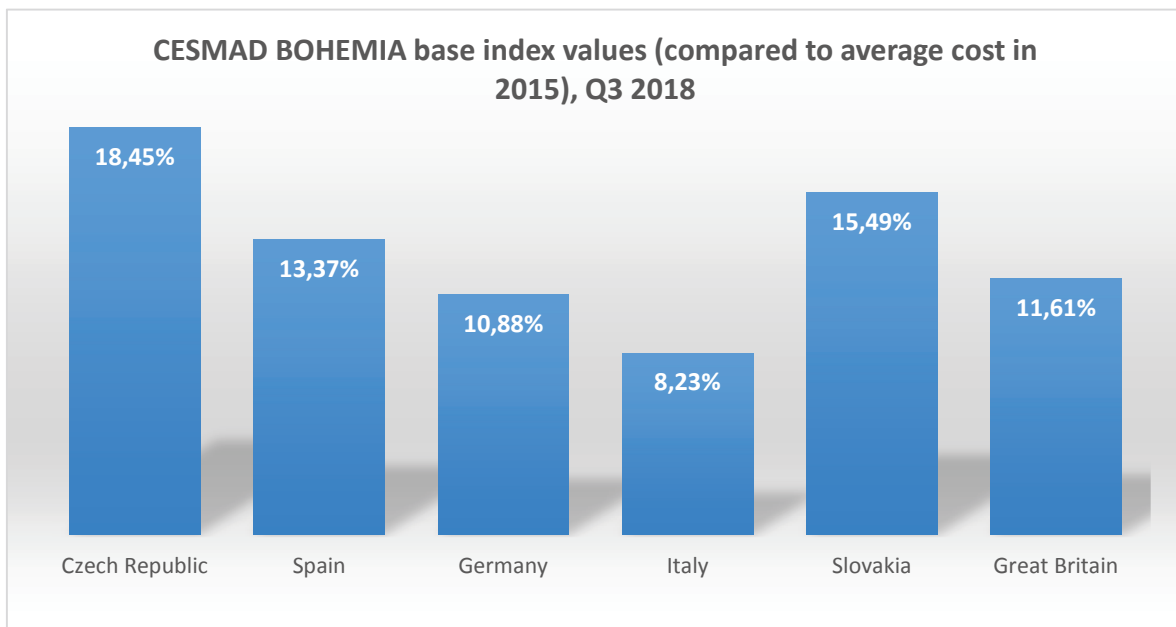


Figure 8 Drivers' wage growth (source: ISPV, Index ČESMAD)

The value of the base index (**Figure 8**) is higher for the domestic route and for the route to Slovakia, as there is no effect of strengthening the Czech currency between Q2 2017 and Q2 2018 for purchases abroad (e.g. toll payments). In the third quarter of 2018, the high values (around 5 %) reached a quarter-on-quarter index, in sharp contrast to the month-on-month inflation, which was around zero. Specific values for individual routes are shown in **Figure 9**. Year-on-year (i.e. when comparing costs in Q3 2018 and Q3 2017, the index reaches 10 %, which is also the anticipated increase in prices for Czech carriers in 2019.

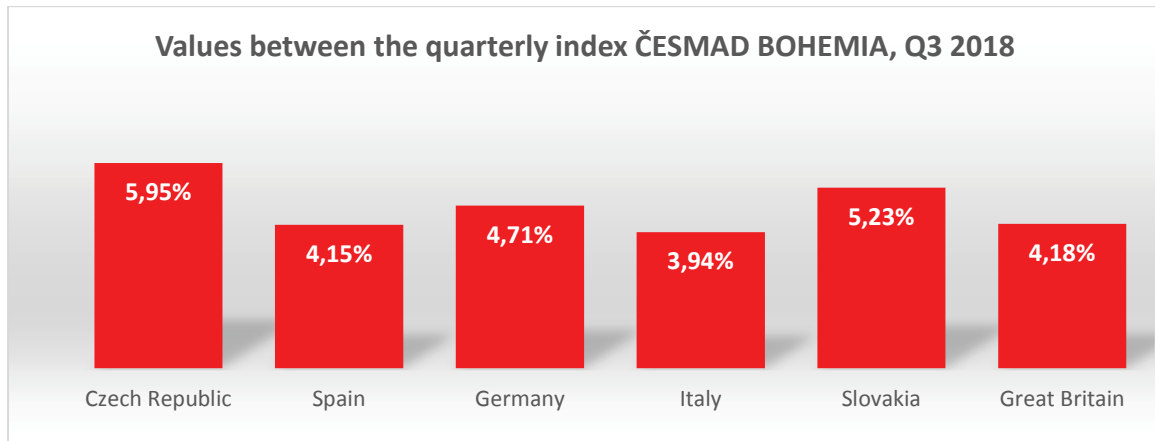


Figure 9 Values between the quarterly index ČESMAD BOHEMIA in Q3 2018 - against Q2 2018
(source: Index ČESMAD)

4. CONCLUSION

Through the cost index, the costs of international and domestic transport are monitored from 2014. In 2016, a web application was launched, which, besides its own index values for particular routes, also includes comments on developments in individual quarters and cost indexing methodology. In 2018, the cost of road haulage has increased significantly, by an average of five percent during the third quarter. The main reasons include the strong growth in drivers' wages, rising fuel prices and, last but not least, the rise in interest rates. Even the exchange rate of the Czech currency, the strengthening of which ended in the second quarter of 2018, has a negative impact on carriers' costs.

REFERENCES

- [1] ŘÍHA, Z. and TICHÝ, J. *The Costs Calculation and Modelling In Transport*; In: Transport Means 2015. Kaunas: Kauno technologijos universitetas, 2015, p. 388-391. ISSN 1822-296X.
- [2] DUCHOŇ, B. *Inženýrská ekonomika*, Prague, Publisher: C.H.Beck, 2007, ISBN: 8071797630
- [3] KUNST, J., Eisler, J. and ORAVA, J. *Ekonomika dopravního systému*, Prague, Publisher: Oekonomica, 2011. ISBN: 978-80-245-1759-9
- [4] GNAP, J, KONEČNÝ, V. and ŠIMKOVÁ, I. *Impact of fiscal decentralization on motor vehicle taxation in the Slovak*. In: Transport and telecommunication. - ISSN 1407-6160. - Vol. 17, no. 1 (2016), s. 28-39, DOI: 10.1515/ttj-2016-0004
- [5] EUROSTAT [online]. *All weekly Oil Bulletines since January 2009*. [citation 30.9.2018]. Available from: <http://ec.europa.eu/energy/observatory/reports/List-of-WOB.pdf>
- [6] CZECH NATIONAL BANK [online]. *PRIBOR Rates*. [citation 10.10.2018]. Available from: https://www.cnb.cz/cs/financni_trhy/penezni_trh/pribor/prumerne_form.jsp
- [7] POLIAK, M. and POLIAKOVÁ, A. *Relation of social legislation in road transport on driver's work quality*. In: Tools of transport telematics: 15th international conference on Transport systems telematics, TST 2015: Wrocław, Poland, April 15-17, 2015: revised selected papers. - Cham: Springer, 2015. - ISBN 978-3-319-24576-8. - S. 300-310. - (Communications in computer and information science, 531. - ISSN 1865-0929).
- [8] MINISTRY OF LABOUR AND SOCIAL AFFAIRS OF CZECH REPUBLIC [online]. *Information system on average wages*. [citation 30.9.2018]. Available from: <https://ispv.cz/>
POLIAK, M., HAMMER, J., REUTER, N. and POLIAKOVA, A. *The impact of the transport route on the cost of the transfer*. 11th International Science and Technical Conference Automotive Safety, AUTOMOTIVE SAFETY 2018, Slovakia