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FORECASTING THE NUMBER OF POSTAL SERVICES IN THE REGION OF SOUTH EAST EUROPE[1]

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Abstract

A success of the postal companies depends on many factors and is exposed to the influences and changes based on the global level. Postal services are an important element of the infrastructure of each country which provides a fast and secure transfer of all types of shipments, both in the domestic and international traffic. Every postal provider performs forecasting calculations as assistance in network or services planning. Accurate forecasting helps operators to make key investment decisions related to the product development and marketing, advertising, pricing etc. which should lead to the increase in quality of service and profit. By using statistical data collected from the database of the Universal Postal Union, this paper is about forecasting of postal services in the Post of Serbia by using a direct method. The obtained results are compared to the forecasts from the postal sector in the neighbouring countries.

Keywords – forecasting; domestic; traffic; postal; sector

INTRODUCTION

The structure of the postal network and its equipment may vary from state to state, depending on economic capabilities of operators in each country and by volume of traffic, formed by customers. In general, business success in the postal sector depends on the number of customers, and the volume of traffic that those users of postal services create.

The volume of traffic and the number of customers are of a great importance for the postal operators. They represent the basic variables that can be used in the process of forecasting. Forecasting is a more or less

[1] Original scientific paper

successful prediction of the future, on the basis of observed regularities in the past. In the postal sector, these regularities are expected to subsist also into the future. At an early stage of forecasting, it is crucial to declare the main goal of forecast. Also, the time plays the passive part and marks the moving frontier between the past and the future. It means that all collected statistical data has to be arranged or systematized into time series. Time series can represent daily, weekly or annual data, depending on goals. Forecasting methods can establish the time of occurrence, intensity and effects of events that are beyond the immediate control of the companies, but are of importance for the future business.

This paper represents a comparative review of changes in the volume of traffic in the Post of Serbia, with the volume of traffic in the countries from the region – Croatia, Macedonia and Bosnia and Herzegovina. Postal statistics are collected from the database of the Universal Postal Union. Collected data contain the number of: letter-post items, registered items, insured items and express items in domestic service, sorted at the annual level from 2006 - 2014. By using the direct method and linear trend, the volume of traffic is predicted till the end of 2021.Eachservice forecasts are followed by the graphic illustration.

FORECASTING BY DIRECT METHOD AND LINEAR TREND

Direct method is a regression model with the influence of multiple factors. This model simplifies mutual relations of many factors from the real world. It also provides the opportunity to treat observed variable [Y] (in this case the volume of traffic) from the start as the variable that changes depending on effects of many factors [x_1, x_2,..., x_n].

$$Y = a + b_1x_1 + b_2x_2 + \cdots + b_nx_n \qquad (1)$$

The relationship between these factors can be presented in linear form by using the linear trend. This method minimizes the sum of the squared effects in the data series

$$S = \sum_{i=1}^{n}(a + b_1x_1 + \cdots + b_nx_n - Y)^2 \qquad (2)$$

By solving these equations,

$$na_0 + a_1\sum_{i=1}^{n}x_1 + \cdots + a_n\sum_{i=1}^{n}x_n = \sum_{i=1}^{n}Y \qquad (3)$$

$$a_0\sum_{i=1}^{n}x_1 + a_1\sum_{i=1}^{n}x_1^2 + a_2\sum_{i=1}^{n}x_1x_2 + \cdots + a_n\sum_{i=1}^{n}x_1x_n = \sum_{i=1}^{n}x_1Y \qquad (4)$$

$$a_0 \sum_{i=1}^{n} x_n + a_1 \sum_{i=1}^{n} x_1 x_2 + a_2 \sum_{i=1}^{n} x_2 x_n + \cdots + a_n \sum_{i=1}^{n} x_n^2 = \sum_{i=1}^{n} x_n Y \qquad (5)$$

the parameter values [a_0, a_1, a_2, …, a_n] are obtained. This process is followed by forecasting the values of influence factors by using the linear trend.

Figure 1 shows the real statistical data of the number of: letter-post items, registered items, insured items and express items in domestic service of the Post ofSerbia, collected from statistical database of Universal Postal Union, for the period 2006 – 2014.These values present the basic data for forecasting of future values.

Republic of	Years:	2006	2007	2008	2009	2010	2011	2012	2013	2014
SERBIA	Domestic service, number of:									
Letter-post items:		206411309	214661257	239592293	222831835	237092614	243130583	255001419	248331091	208072215
Registered items:		44455469	45411989	46206085	46285872	44901734	49560584	48425796	48684018	34227621
Insured items:		3364618	4290194	4293427	3567229	2759734	2625056	2331494	2099648	1210571
Express items:		1262334	1950128	2632730	2717231	3233102	4020254	4799189	5467375	5664297

Fig.1. Volume of traffic in domestic service, Post of Serbia.

Influential factors figuring in this model are *population*(millions) and *net salary* (€). The real statistical data of population of Serbia and forecasts of future population are shown in figure 2. The population of Serbia continuously decreases over years.

Years	Population [milions]	Years	Population [milions]
2006	9.851	2015	9.594
2007	9.833	2016	9.558
2008	9.841	2017	9.521
2009	9.851	2018	9.485
2010	9.856	2019	9.448
2011	9.854	2020	9.412
2012	9.847	2021	9.375
2013	9.511	....	....
2014	9.542	....	....

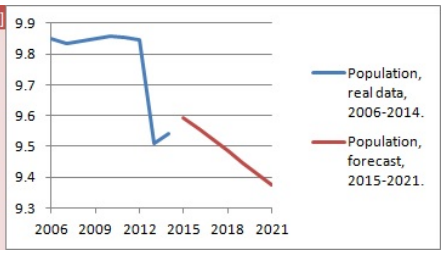

Fig.2. Population by years in millions, Serbia.

Second influential factor is net salary. Figure 3 shows the real data and predictions made till the end of 2021. The expectations are that the net salary will increase in future.

Years	Net salary [€]	Years	Net salary [€]
2006	250	2015	399
2007	348	2016	409
2008	402	2017	418
2009	338	2018	428
2010	330	2019	437
2011	372	2020	447
2012	370	2021	456
2013	381	....	....
2014	375	....	....

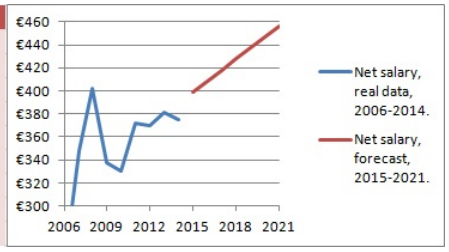

Fig.3.Average Net salary by years in €, Serbia.

The future values of influential factors were determined by a linear trend. Influential factors are expressed linear and as they have an effects on the determination of values of future traffic volume, these volume of traffic will also be expressed linear.

Figure 4showscomparison between the real data and forecasted data of letter-post items, in domestic service of the Post of Serbia.

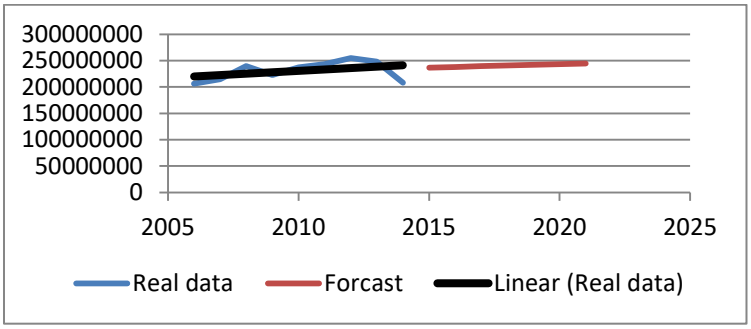

Fig.4. Comparison of real and expected volume of traffic, for letter-post items, in domestic service of the Post of Serbia.

The blue line shows the number of letter-post items, starting with January of 2006 and ending with December of 2014. These data present the maximum volume of traffic made by customers of the Post of Serbia. Black line describes a trend. The trend shows that the volume of traffic grows through the years. The red line presents expected values of volume of traffic in future period, till the end of 2021. Forecasts by direct method cannot describe the true future values precisely, because those values are unpredictable, but can present themeslinear. These values show potential grow of expected volume of traffic.

Figure 5 shows forecasted values of expected volume of letter-post items, in domestic service for the posts of: Serbia, Croatia, Macedonia and Bosnia and Herzegovina.

	NUMBER OF LETTER-POST ITEMS			
	SERBIA (SRB)	CROATIA (CRO)	MACEDONIA (MK)	BOSNIA and HERZEGOVINA (BH)
2015	236830078	258145534	49564528	62099279
2016	238082210	252556367	51582073	65811231
2017	239334342	246967201	53599618	69523182
2018	240586473	241378035	55617162	73235133
2019	241838605	235788869	57634707	76947084
2020	243090737	230199703	59652252	80659035
2021	244342869	224610536	61669797	84370986

Fig.5. Forecasts: volume of letter-post items in domestic service for the posts of: Serbia, Croatia, Macedonia and Bosnia and Herzegovina.

An illustration of the combined volume of letter-post items is shown on figure 6. It is obvious that Croatia has the highest volume of letter-post items today, but it seems that this volume will decrease over time. By the end of 2018 this volume will primarily be equated with the volume of letter-post items of Post of Serbia. Secondly, this volume decrease will provide a leadership of Post of Serbia in this postal service, in the region.

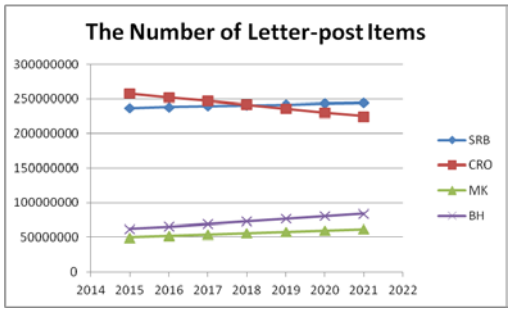

Fig.6. Comparison between the expected volumes of letter post items, till the end of 2021.

Drastically lower volume of letter-post items is expected in Macedonia and Bosnia and Herzegovina, but for both countries these volumes of traffic will increase over time. Compared with Macedonia, the highest volume of traffic is expected in Bosnia and Herzegovina.

Figure 7 shows forecasts of number of registered items in domestic service.

NUMBER OF REGISTERED ITEMS				
	SERBIA (SRB)	CROATIA (CRO)	MACEDONIA (MK)	BOSNIA and HERZEGOVINA (BH)
2015	43482389	28443836	5622097	15626117
2016	43108660	27789669	5801279	15988130
2017	42734932	27135502	5980462	16350143
2018	42361203	26481335	6159645	16712156
2019	41987475	25827168	6338827	17074169
2020	41613746	25173002	6518010	17436182
2021	41240018	24518835	6697193	17798195

Fig.7. Forecasts: volume of registered items in domestic service for the posts of: Serbia, Croatia, Macedonia and Bosnia and Herzegovina.

Those values can be presented graphically, as shown on the figure 8.

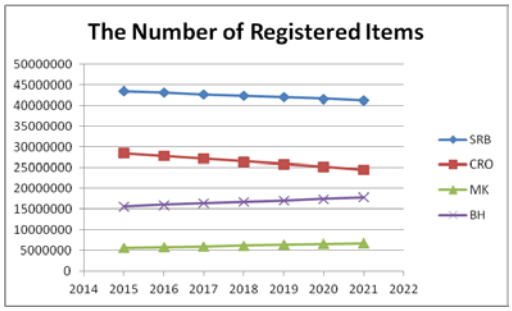

Fig.8. Comparison between the expected volumes of registered items, till the end of 2021.

For Serbia and Croatia, the volume of registered items in domestic service is expected to decrease over time, with greater intensity in Croatia. In Bosnia and Herzegovina and Macedonia is expected that the volume of registered items will increase. With this continuous loss of traffic, Serbia will last as the leader in service of registered items in domestic service.

Figure 9 shows the expected number of insured items, in domestic service of these countries.

NUMBER OF INSURED ITEMS				
	SERBIA (SRB)	CROATIA (CRO)	MACEDONIA (MK)	BOSNIA and HERZEGOVINA (BH)
2015	2095594	690658	279373	591679
2016	1924890	651900	270369	604935
2017	1754185	613141	261365	618192
2018	1583481	574383	252362	631448
2019	1412777	535625	243358	644705
2020	1242072	496866	234355	657961
2021	1071368	458108	225351	671218

Fig.9. Forecasts: volume of insured items in domestic service for the posts of: Serbia, Croatia, Macedonia and Bosnia and Herzegovina.

These data can be presented graphically, as shown at figure 10.

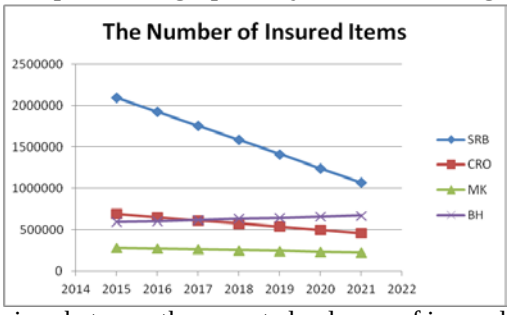

Fig.10. Comparison between the expected volumes of insured items, till the end of 2021.

Currently, Serbia is a leader by the number of insured items, but forecast shows a rapid decrease of the traffic volume. Croatia currently has a higher volume of traffic, but till the end of next year it is expected that this volume of insured items will be lower than the volume of insured items in Bosnia and Herzegovina, which grows. Forecasted values of the number of insured items in Macedonia will slowly decrease.

Figure 11 shows the expected number of express items in domestic service of these countries.

NUMBER OF EXPRESS ITEMS				
	SERBIA (SRB)	CROATIA (CRO)	MACEDONIA (MK)	BOSNIA and HERZEGOVINA (BH)
2015	5396836	2909375	62758	111132
2016	5770729	3006254	53480	122379
2017	6144621	3103134	44202	133627
2018	6518514	3200013	34925	144874
2019	6892407	3296893	25647	156121
2020	7266300	3393772	16369	167369
2021	7640193	3490651	7091	178616

Fig.11. Forecasts: volume of express items in domestic service for the posts of: Serbia, Croatia, Macedonia and Bosnia and Herzegovina.

These data can also be presented by graphic as shown on figure 12.

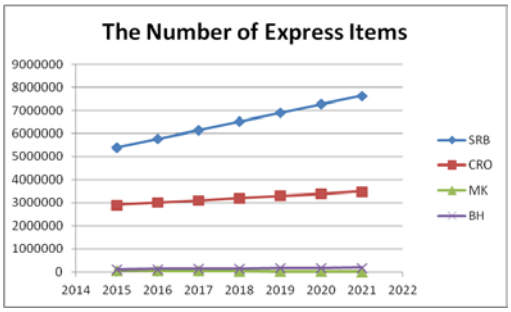

Fig.12. Comparison between the expected volumes of express items, till the end of 2021.

According to the forecasts, the number of express items in the Post of Serbia is expected to rapidly increase, which guarantees the status of the leader in this type of postal service. Compared to the volume of the express items in Croatia, these values are doubled. The number of express items in the Post of Croatia is also expected to increase, but slowly. Forecast shows that the number of express items in the post of Bosnia and Herzegovina will also increase, while the same values in the Post of Macedonia are drastically decreasing.

CONCLUSION

The success of forecasting improves with quality of collected statistical data and with selection of accurate methods. Direct method, used in this paper, cannot predict the true values of the future demand for thepostal service, but can produce the trend which follows the future demand for theservices. Obtained results of the number of letter-post items estimate that demand for this type of service will decrease through the years. The reason might be the growth of the internet communications. Also, the number of registered and insured items will decrease for both posts of Serbia and Croatia, while for the Post of Bosnia and Herzegovina is expected to increase. The number of express items is expected to increase for all countries except for Macedonia, where predictions show that the volume of express items will drastically decrease till the end of 2021. The obtained results could be useful for the observed postal operators, first of all in policy making, marketing strategy, human resource optimization, etc.

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