

Oct 28th, 9:00 AM - Oct 30th, 5:00 PM

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Oltiana Toshkollari

Aleksander Moisiu University, o.toshkollari@gmail.com

Fjoralba Sota

University Ismail Qemali, fjoralba.sota@gmail.com

Viola Shtino

Aleksander Moisiu University, vf.sh@hotmail.com

Kristel Bozhiqi

Aleksander Moisiu University, boziqikristel@yahoo.com

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Recommended Citation

Toshkollari, Oltiana; Sota, Fjoralba; Shtino, Viola; and Bozhiqi, Kristel, "Analysis and prediction of city postal services in Albania. A case study" (2016). *UBT International Conference*. 32.

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Analysis and prediction of city postal services in Albania. A case study

Oltiana Toshkollari¹, Fjoralba Sota², Viola Shtino³, Kristel Bozhiqi⁴

^{1, 3, 4} University "Alexander Moisiu". Faculty of Information Technology,
Durrës, Albania

²University "Ismail Qemali". Faculty of Technical Sciences
Vlora, Albania

o.toshkollari@gmail.com¹, fjoralba.sota@gmail.com²,
vf.sh@hotmail.com³, boziqikristel@yahoo.com

Abstract. Postal service plays an important role in development of an effective and dynamic market. The role of postal services has changed in years. On one side, the demand for the delivery of letters, newspapers and other documents is reducing due to the use of electronic communication. On the other side, the demand for package services is increasing due to e-commerce development. Albanian postal service offers a very wide range of postal and financial services with quality and competitive prices. Postal services include: letters, small packages, telefax, correspondence, typography, telegrams, and subscribers of fixed and mobile telephony. In this article, we have done an analysis of postal services in Albania from 1993 to 2015 and a prediction for the next years. The most important services we have taken in consideration are: simple letters and parcels, registered letters and parcels, and insured parcels. We use statistical models for this prediction.

Keywords: Postal service, Data Analysis, Prediction

1. Introduction

Postal service has been established since 1878 in some post offices in the Ottoman administration. Post Service Communications in Albania marked started working after the declaration of independence in November 1912. In December 5, 1912 Ministry of Mobile Post Telegraph was established and the first Albanian postage stamp was created in May 5, 1913. Postage Stamps proof the payment of postal services. The stamp was produced by metal and in the middle was the emblem of Albanian state, the double-headed eagle. At the edge of the eagle was written in black "MINISTRIA E POST-TELEG E TELEFONEVET". The first stamp was produced in Rome. In 1922 Albania became a member of the Universal Postal Union and the International Telecommunication Union. After that, all the stamps for 14 years had the portrait of Ahmet Zogu posted on it.

Albanian Post is the only public postal operator which offers a wide range of services, over 77 types, such as traditional postal services (mail, parcels and services orders), the fast EMS service, business services and financial services (quick transfer of money, payment of taxes, distribution of old age pension, collection of telephone bills, electricity and other fees). During 1993-2005, it was very difficult for postal service to survive because it had lost user's confidence. It was a long time for sending

a letter, from 6 to 8 days. At the same time private operators were established so the market would be dominated by them. After 2005, Albanian Post conducted a reform process to become a leader of postal services. Nowadays, Albania has 550 post offices. Albanian Post has achieved great quality and speed improvements, approaching EU standards.

In this article, we have done an analysis of postal services about a city of Albania from 1993 to 2015 and a prediction for the next years. We have taken in consideration simple letters and parcels, registered letters and parcels, and insured parcels. Based on graphic appearance of Albanian Post Service in the recent years, especially after 2005, we have seen a significant increase of those numbers. Since the Albanian Postal office is the only postal service in this country, a continuous support comes from the government, it is considered to have an increase of the postal service and at the same time an economic increase for Albanian Postal service and, also, for Albania, too.

2. Data Analysis and Methodology

In this section we have presented a general data analysis of postal services in an Albanian city and a prediction for the next two years.

2.1. Data Analysis

The role of postal services has changed in years. On one side, the demand for the delivery of letters, newspapers and other documents is reducing due to the use of electronic communication. On the other side, the demand for package services is increasing due to e-commerce development.

There are three main groups of data: simple letters and parcels, registered letters and parcels and insured parcels. Simple letters and parcels are letters and objects that weigh up to 2kg, the paper dimensions should be no smaller than 90 * 40mm with a tolerance + 2mm. Registered letters and parcels are those letters and objects weighing up to 2kg and they change from simple letters and parcels because a special treatment is requested by the sender. Insured parcels (packets) called those objects that contain items which weigh up to 20kg. These objects should be packaged in accordance with the weight and content, there are not allowed to be sent, hazardous items, pets, explosives, narcotics, as well as to import prohibited substances. Inside the packages are not allowed banknotes or other valuable items.

The period we have taken in consideration is 1993 – 2015. Our study consists of quantity of postal services during these years, but it is worth mentioning that the Albanian Post is empowered economically over the years. Albanian Post has a high performance and is a leader in the market of services, as a result of well-organized policy of the Albanian post and given priority by the government. The following figures represent the pieces quantity of postal services in a city of Albania.

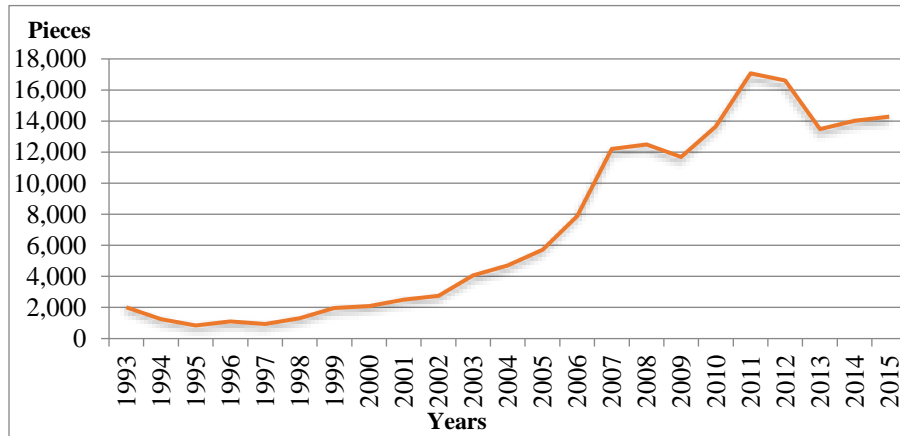


Fig. 1. Simple letters and parcels; real values 1993-2015.

Simple letters and parcels are postal services that have the highest number in postal services. This number has increased considerably mainly after 2005. The highest number of simple letters and parcels was in 2011, with an amount of about 17073 pieces / year. The lowest number of simple letters and parcels are made in 1995 with an amount of 844 pieces / year. Until 2005 we have an increase of about 1.8 times more than in 1993. The period from 2005 to 2011, in which we have maximum of postal services, approximately 2 times more. We have a total increase of approximately 600%, or in other words 6 times more services in 2015 than in 1993.

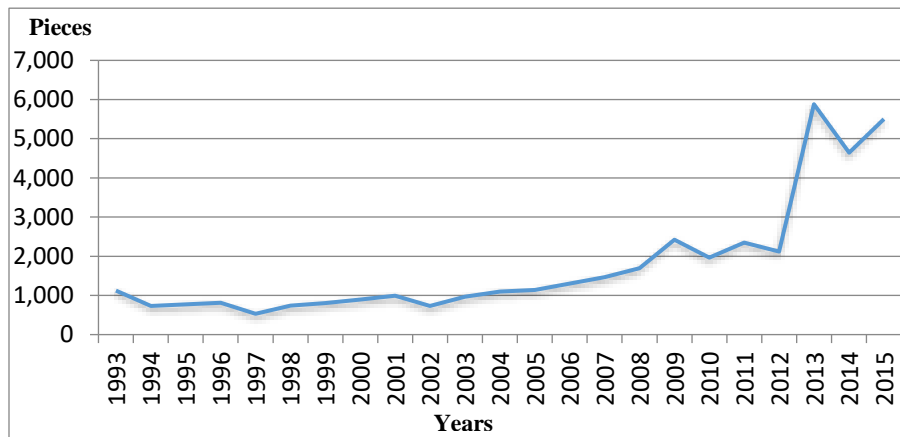
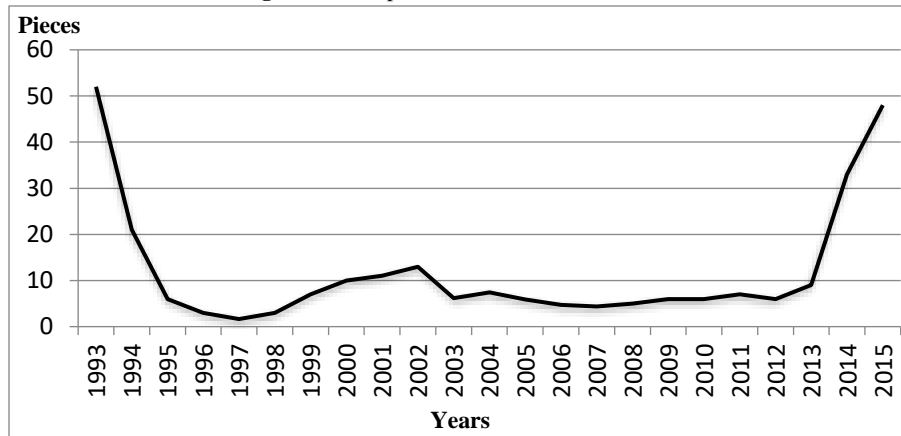


Fig. 2. Registered letters and parcels, real values 1993-2015.

Registered letter and parcels are postal services which constitute a significant number of the postal services. This number increased after 2005. The highest number of registered letters and parcels was in 2015, with an amount of about 5881 pieces / year. Lower number of registered letters and parcels was in 1997, with an amount of about 531 pieces / year. In 1993 the number of services is 1122 and after a year this number has been reduced to 733. So, we have a declining trend until 1997. After this

year we have a gradual increase of approximately 6% for year, until 2005. By 2005 and until 2013 we have the maximum of postal services that is about 4 times higher. From 2013 to 2015 we have a decrease of approximately 6%. We have a total increase of approximately 580%, or in other words 5.8 times more services in 2015 than in 1993.

Fig. 3. Insured parcels, real values 1993-2015.



Insured parcels, as seen in the figure above, have been increased in three periods, in 1993-1994, 1999-2002, 2013-2015. Between the years these values have been relatively low. Insured parcels in postal services constitute the smallest number. Their maximum is in 1993 and minimum in 1997. From 2002 to 2013 the number of services was approximately 6 pieces / year, while in the first period this number was approximately 3 pieces / year.

The figure below shows the impact in percentage of the three postal services taken into consideration. In postal services on average 80% is occupied by simple letters and parcels, on average 19% are registered letters and parcels and an impact of approximately 1% are insured parcels. This means that the insured parcels in postal services have a very small impact; therefore the Albanian Post has to work more in this direction although the last 3 years show a considerable increase.

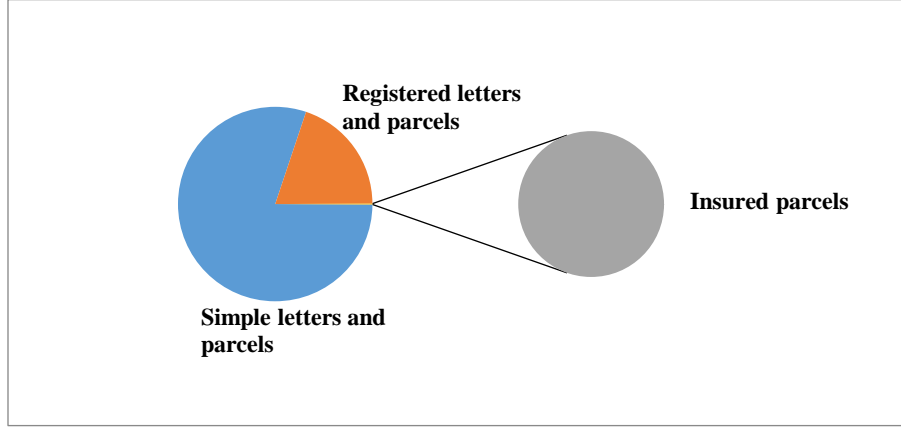


Fig. 4. Here is the average of three postal services, for the years taken into consideration. The blue color shows Simple letters and parcels, the red color shows registered letters and parcels and the green color shows Insured parcels.

2.2. Methodology

In this section it is presented the methodology used to forecast post services for two next years. There is used Holt's Exponential Smoothing.

2.2.1. Holt's Exponential Smoothing

Holt's Exponential Smoothing is used in time series that have trend and not seasonality. Holt's exponential smoothing estimates the level and slope at the current time point. To control smoothing there are used two parameters, α and β , α estimate the level at the current time point and β estimate the slope b of the trend component at the current time point. The value of α and β are between 0 and 1, when these values are close to 0 it means that the small weight is set to the latest observations, when these values are close to 1 it means that the latest value has more weight.

To measure the forecast accuracy in all methods used the Mean Square Error (MSE), Mean Absolute Error (MAE), Root Mean Square Error (RMSE) and Mean Percentage Error (MPE).

$$MSE = \frac{1}{n} \sum_{t=1}^n (\hat{Y}_t - Y_t)^2 \quad MAE = \frac{1}{n} \sum_{t=1}^n |\hat{Y}_t - Y_t|$$

$$RMSE = \sqrt{\frac{1}{n} \sum_{t=1}^n (\hat{Y}_t - Y_t)^2} \quad MPE = \frac{1}{n} \sum_{t=1}^n \frac{(\hat{Y}_t - Y_t)}{\hat{Y}_t} \times 100$$

The model is best when the above values are smallest.

3. Results

Albanian Post is a trading company and occupies a very important role in Albanian economy. The period 1993-2015 is taken into consideration and prediction is carried out for the next 20 years in a city in Albania. The following table presents Holt's Exponential Smoothing method, forecasting parameters and predicted values for 2016-2017, for simple letters and parcels, registered letters and parcels and insured parcels. By using this method three of postal services have increased their values.

Table 1. Holt's Exponential Smoothing method, smoothing parameters, coefficients, the value to measure forecast accuracy and predicted values for 2016-2017, for Simple letters and parcels, Registered letters and parcels and Insured parcels.

Holt's Exponential Smoothing, Simple letters and parcels			
Smoothing parameters		Coefficients	
alfa=1		a	14288.0
beta= 0.2306009		b	265.2
The measure of forecast accuracy			
MAE= 1174.11	RMSE= 1616.50	MPE= 15.76	MASE=1.08
Forecast value			
Year 2016	ES – value=14553	Year 2017	ES–value=14818
Holt's Exponential Smoothing, Registered letters and parcels			
Smoothing parameters		Coefficients	
alfa=0.25		a	5502.2
beta= 1		b	998.2
The measure of forecast accuracy			
MAE= 419.64	RMSE= 779.64	MPE= 14.39	MASE=0.91
Forecast value			
Year 2016	ES – value=6500	Year 2017	ES – value=7498
Holt's Exponential Smoothing, Insured parcels			
Smoothing parameters		Coefficients	
alfa=0.999		a	48.0
beta= 1		b	15.0
The measure of forecast accuracy			
MAE=4.60	RMSE= 7.30	MPE= 41.96	MASE=0.86
Forecast value			
Year 2016	ES – value=55	Year 2017	ES–value=63

The following figure presents the graph of the initial data (black color), the graph of calculated values according to the method ES (the red) and predicted values for the next two years (blue points). In figure we have a good approach between observed values and fitted values.

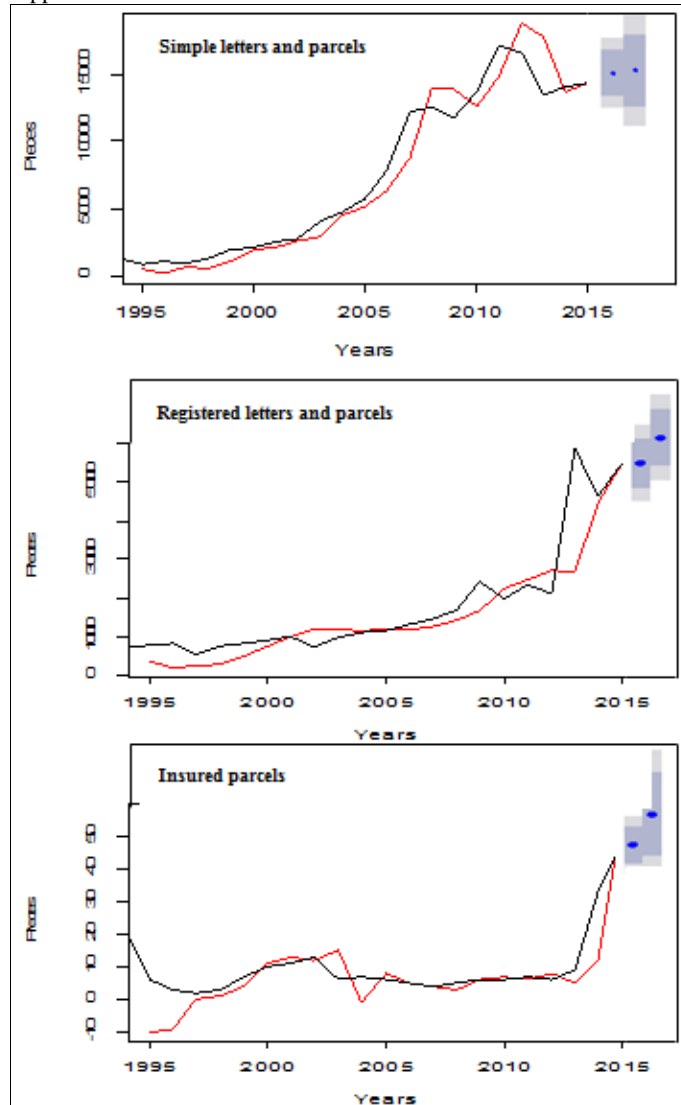


Fig. 5. This figure presents the graph of the initial data (black color), the graph of calculated values according to the method ES (the red) and predicted values for the next two years (blue points) for the three postal services taken into consideration.

Conclusion

Albanian Post has received a special attention by the Albanian government in recent years. It is the only public sector of postal services. Thanks to giving proper importance in recent years by its managers, it has improved significantly in quality and speed of services, recovering what was lost for many years.

In this article are taken into consideration these services: simple letters and parcels, registered letters and parcels and insured parcels. Among these services, simple letters and parcels have greater influence with an average percentage of 80% of the total of all services, over 19% are registered letters and parcels and less than 1% are insured parcels. Until 2005 postal services have had a small number of services and a small percentage of orders were placed by customers, this is because of the quality and slow delivery of the post office. After 2005 we have a considerable increase of postal services in all three sectors. Simple letters and parcels have a total increase of almost 6 more in 2015 than in 1993. Registered letters and parcels have a total increase of approximately 580%, or in other words 5.8 times more services in 2015 than in 1993. However, the insured parcels have been in low levels and have had a slightly increase in the last 5 years. Time series have trend and no seasonality. The time series is non-stationary. The method of prediction is Holt's Exponential Smoothing. We note that for the three postal services taken into consideration we have an increase in their values. To predict Postal offices services are used ARIMA (Auto-regressive Integrated Moving Average) or ANN (Artificial Neural Network), but because the number that was reviewed shows that the data in this case is relatively small, these data are not used.

This study helps Albanian Post Offices services and Albanian government but a continuous support towards Albanian Post Offices services as the only form of service in Albania, which also brings more economic income for the country.

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