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Price Discrimination Strategy of Low-Cost Airlines

Abstract: The main objective of this research was to determine whether the prices of airline tickets increase monotonically over time. The authors analyzed the market share of low-cost airlines during the period after the Serbian air transport deregulation of the lines connecting Belgrade to other worldwide destinations. In the observed period, Wizz Air achieved the highest increase in market share. This airline held a monopoly over all lines except the Belgrade-Rome line in the observed period. Based on the theorem on monotonic function, Spearman`s coefficient, and data on Wizz Air's airfare changes for the Belgrade-Rome line, the results indicate a correlation between the time of ticket purchase and its price, but the prices of low-cost airline tickets do not monotonically increase over time.

Keywords: low-cost airlines, price, price discrimination, monotonicity.

Strategija diskriminacije cenama low-cost avio-kompanija

Apstrakt: Glavni cilj rada je da se utvrdi da li cene avio-karte monotono rastu tokom vremena. Autori analiziraju tržišno učešće low-cost avio-kompanija tokom perioda nakon deregulacije avio-saobraćaja u Srbiji na linijama koje povezuju Beograd sa drugim destinacijama u svetu. U posmatranom periodu, avio-kompanija Wizz Air je ostvarila najveće povećanje tržišnog učešća. Ova avio-kompanija je imala monopolistički položaj na svim linijama izuzev na liniji koja povezuje Beograd sa Rimom u posmatranom periodu. Na osnovu podataka o kretanju cena avio-karata avio-kompanije Wizz Air na liniji koja povezuje Beograd sa Rimom, teoreme o monotonosti funkcije i Spermanovog koeficijenta, rezultati istraživanja ukazuju da postoji korelaciona veza između

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vremena kupovine karte i njene cene, ali da cene avio-karata ne rastu monotono tokom vremena.

Ključne reči*: low-cost avio-kompanije, cena, diskriminacija cenama, monotonost.*

1. Introduction

The airline industry is vital to the world`s transportation infrastructure and has been in the throes of a life-and-death struggle between the so-called network of original, older companies and relatively new low-cost airlines (Biedman et. al., 2008). The emergence of low-cost air-companies is a consequence of air-traffic deregulation, globalization, as well as information technology development and application (Petrovic, 2011).

Deregulation of the U.S. aviation market in 1978 paved the way for a new era of airline services. Airlines were able to reorganize the management structure vital for their survival and development. South-West Airlines was the first company to introduce a new form of service by offering cheaper prices to its travellers. As a successful competitor in the U.S. air transportation market, South-West Airlines created the foundations for what is nowadays called a low-cost airline.

The South-West Airlines model was copied by Europe airlines that achieved deregulation in 1993. This "Southwest's business model" has significantly contributed to the development of low-cost airlines during the last few years. Low-cost airlines became very important participants in European air traffic, with its market share constantly growing. "EasyJet" and "Ryanair" were among the first to organize such a low-cost service structure. These two companies have been Europe's leading low-cost airlines. However, the competition in low-cost services has rapidly increased in Europe.

In Serbia, there are two international airports - "Nikola Tesla" in Belgrade and "Great Constantine" in Nis. Due to marginalized position of the airport in Nis, the paper will focus on the lines that connect Belgrade to other worldwide destinations.

Serbia is at the intersection of the aviation lines between the Eastern, Southern and Western Europe. Consequently, the increase of passenger traffic in air travel can be one factor in economic development. Although the worldwide low-cost airlines have been functioning successfully for more than thirty years, introduction of low-cost airlines in Serbia and Belgrade was delayed for many years, due to lower passenger traffic in Serbia compared to

other world-known airports, Air Serbia's monopoly, and airline market regulations. Low-cost airlines should encourage changes in air transport and increase traffic in a way that would enable people from Serbia, who otherwise would not travel or would use different transportation mode, to travel with them. Air Serbia and other national airline companies offer transporting services on the lines connecting Belgrade to other destinations in the world, except "Wizz Air", "German Wings'', "Norwegian Air", "Easy Jet" and "Vueling".

2. Literature review

Price discrimination involves selling different units of output at different prices (Varian, 1996). It occurs when a company charges some customers higher prices than others for the same product. The price difference cannot be explained by a difference in the supply cost. Price discrimination can be categorized into three types:

 - First-degree price discrimination: Different units of goods are sold at different prices. The prices of the same good may differ from company to company. This is also sometimes known as the case of perfect price discrimination (Varian, 2010). The different prices are equal to the consumer's exact willingness to pay. In practice, there are few examples of the application of modern discriminatory prices. One example would be a doctor who charges different prices for his services to patients in a small town, depending on how much they are willing to pay for them.

- Second-degree price discrimination: A company sells goods at different prices, depending on the quantity of the offered goods. In this case, every individual who buys the same amount of goods, or the same quality of goods, pays the same price. Thus, the price differs across the units of goods, but not across people (Varian, 2010).

- Third-degree price discrimination: This type of discrimination occurs when a monopolist sells output to different people at different prices, but every unit of output sold to specific person is sold at the same price. This is the most common form of price discrimination. Examples include: student discounts, senior citizens' discount and so on (Varian, 2010). The question arises as to how these types of price discrimination applied by the airlines can fit into the main types of price discrimination.

Pricing in the airline industry is known to be very complex, resulting in substantial and well-documented price dispersion (Gerardi & Shapiro, 2009). Deneckere and Peck (2012) point out that airline industry belongs to a rather wide class of markets, in which good is offered for sale for a limited length of

time, capacity is set in advance, and aggregate demand is uncertain. The phenomenon of the world growth in low-cost airlines has resulted in putting their focus on pricing strategies, issues of cost recovery and their impact on the traffic and market shares of legacy carriers or other low-cost carriers when they are competing, either directly or at adjacent airports (Pitfield, 2008).

Contemporary economic issues indicate that the business of successful companies is focused more and more on their customers (Krstic, 2002). In order to ensure survival and development, low-cost airlines apply different pricing strategies. One of these strategies is charging different passengers or groups of passengers, differently for the same ticket, thus applying price discrimination.

Based on characteristics of airline market and basic types of price discrimination, there are three types of price discrimination applied by airlines:

1) Quantity discounts - price discrimination based on the quantity of tickets purchased,

2) Frequent flyers programs,

3) Versioning, respectively, price discrimination based on the quality of transport services (Steen & Sorgard, 2002).

Quantity discounts granted to a group of passengers is a clear example of the second-degree price discrimination. Wizz Air offers specific conditions for a group of passengers comprising 25 or more passengers.

Passengers who buy large amounts of tickets in a specific period are rewarded by being provided with a special kind of volume discount, and this program for increasing customers' loyalty is an example of the second–degree price discrimination. All of the observed low-cost airlines apply this method to increase passengers' loyalty. Wizz Air offers its passengers a frequent flyer program called ''Wizz Xclusive Club''. This program provides a passenger with an exclusive access to promotional tickets that can be cheaper up to 10 euros per one way ticket in comparison to their regular prices.

Versioning means that airline offers different versions of its tickets. The application of price discrimination based on the characteristics of the goods ("versioning") implies that all passengers are provided with the same pricing scheme, where they can buy an expensive, high quality or a cheaper, low-quality ticket. Technically speaking, this is an example of the second-degree price discrimination, because passengers pay different prices for different quality of a service purchased.

The high quality version of a ticket is a flexible ticket, which allows passengers to change the date of their flight at any time and even to cancel a flight without paying additional fees. The low quality version of a ticket or "damaged" service is a restricted ticket, for example, a ticket for a Saturday night stay-over and/or advanced purchase requirement (Steen & Sorgard, 2002). The main reason for creating a "damaged" service by an airline company is to make a service less attractive for the passengers who are willing to pay. These limits are important for passengers who are travelling for leisure in comparison to business travellers.

Another way in which traditional but also low-cost airlines apply price discrimination, based on the level of service quality, refers to the introduction of travelling in a first and tourism class. Passengers travelling in the first class pay a more expensive ticket for the same journey in comparison to passengers travelling with the economy or tourist class, but receive a higher quality of service: more space, higher quantity and quality of food, and more attention. Economy class passengers receive a lower quality of service from each aspect.

Full-cost airlines use price discrimination techniques based on different fare classes, complex systems of discounts with limited access, customer loyalty schemes and overbooking techniques. On the other hand, low-cost airlines apply "dynamic pricing" or price discrimination based on on-time purchasing of airline tickets. Due to the dynamic pricing, it is now common for people to buy tickets to European destinations for less than 10 euros (airport taxes excluded) (Malighetti et al., 2009).

Airlines form different prices for the same air ticket depending on the time of a ticket purchase. McGill and Ryzin (1999), as well as Klein and Loebbecke (2003) consider that airfares have been increasing over a time, that is, they have been increasing monotonically. McGill and Ryzin (1999) point out the fact that airlines form low-before-high fares or monotonic fares. The sequential booking class assumption is often augmented by the additional assumption that booking requests arrive at the strict fare sequence, generally from the lowest to the highest as flight departure approaches (McGill & Ryzin, 1999). The conventional wisdom on the temporal profile of airlines' prices holds that carriers facing uncertain demand can enhance their profits by assigning a monotonically increasing price to different batches of seats (Dana, 2001).

Alderighi et al. (2011) stated that passengers who booked tickets in advance were more concerned about paying lower prices than those who bought their airline tickets closer to the departure date. Therefore, a high-low pricing mechanism based on this inter-temporal segmentation is employed by airlines, especially by low-cost companies.

This practice of inter-temporal price discrimination variation has been detailed in several papers (see for instance Gallego & van Ryzin, 1994; Su, 2007). In general, there is compelling evidence that fares rise in the last 20-30 days before the departure date (Alderighi, 2010; Alderighi et al., 2011; Gaggero & Piga, 2010; Giaume & Guillou, 2004; Mantin & Koo, 2009). Bachis and Piga (2011) analyzed a daily change in airfares for routes operated by low-cost carriers which depart from several European airports. For each route, they collected a sample of daily airfare data for several days prior to a departure and showed that each airline's distribution of the lowest fares tended to increase as the departure date approached.

3. Research Hypothesis

In the paper, the authors first determined the market share of low-cost airlines for the lines connecting Belgrade to other worldwide destinations. The authors paid special attention to the analysis of price discrimination which was based on the time of purchasing airline tickets. The basic goals of this research are to determine: 1) whether the price of air tickets formed by low-cost airlines monotonically increases over time; 2) the exponential model for forecasting the average price of an airline ticket in relation to the time of its purchase.

The research is based on the assumption that the day when the plane takes off is the last day when a traveller buys a ticket and when the price of air tickets should be the highest. Based on the purpose and primary objective of the research, the authors of the paper will test the following hypotheses:

H1: The market share of low-cost airlines changed in the observed lines in the period from 2010 until 2014;

H2: Airfares monotonically increase as the date of departure approaches;

H3: There is a strong correlation between airline ticket price and the time of its purchase.

4. Research methodology

In order to determine the main goals of the research it is necessary to start with determining market morphology based on the market share of low-cost airline that connects Belgrade to other destinations around the world. The market share of low-cost airlines will be determined when flights offered by low-cost airlines are compared to total flights provided by all airlines on the lines which connect Belgrade to other destinations in the world and vice versa. The number of flights on the line is determined using the data from the

seasonal flight schedule which can be found on the website of the airport "Nikola Tesla" in Belgrade.

In this paper, the authors assumed that airfares monotonically increase in time. With the aim to prove the stated assumptions, we started from the theorem of monotonic function (or monotone function):

If for every x_1 and x_2 where $x_1 < x_2$ we have $f(x_1) < f(x_2)$, then the function $f(x)$ is said to be monotonically increasing, but if we have $f(x_1) \leq f(x_2)$, then the function is monotonically non-decreasing.

If for every x_1 and x_2 where $x_1 < x_2$ we have $f(x_1) > f(x_2)$, then the function $f(x)$ is said to be monotonically decreasing, but if we have $f(x_1) \geq f(x_2)$, then the function is monotonically non-increasing.

The data of airline ticket prices and the time of ticket purchase are imported into the Statistical Package for Social Science data base and all the following analyses were conducted by Statistical Package for Social Science. The statistical methods used for the analysis of the collected data are Spearman`s coefficient and the exponential function. The exponential function belongs to a group of curvilinear functions that are used in cases where the data set shows the characteristics of a geometric progression, or when the phenomenon shows relatively stable changes (Grdic et. al., 1974).,The exponential function is obtained based on data regarding the fluctuation of airline ticket prices in order to predict airline ticket prices (Y) based on the time of a flight (X).

5. Data, results and discussion

At the beginning of the research, the market share of low-cost airlines, which provide transport services on the lines connecting Belgrade to other worldwide destinations rose to 4.39%. Compared to September 2010, low-cost airlines increased their market share up to 9.33% in August 2012.The increase in their market share was the result of the increased market share of low-cost airline Wizz Air, which in the observed period, increased the number of flights up to more than 200%, and thus increased its market share from 0.99% to 4.18%.

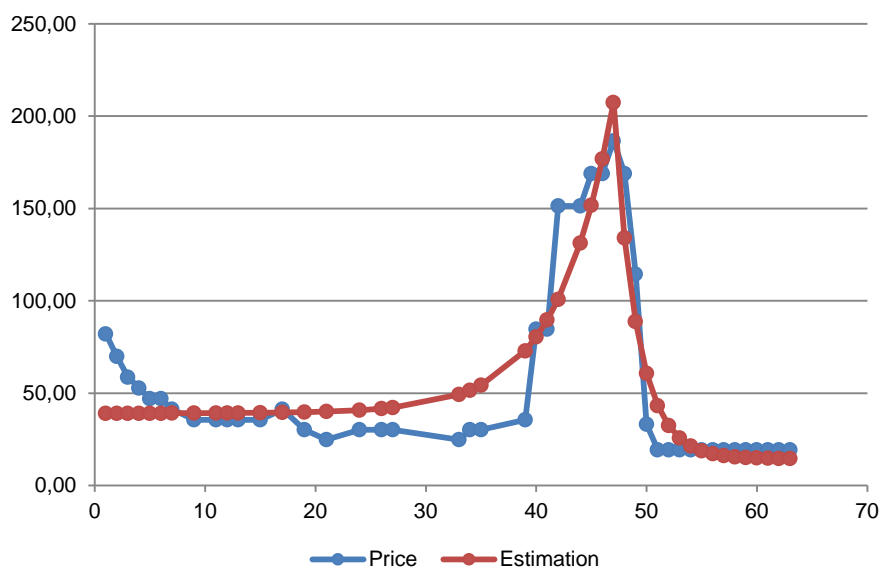*Figure 1. The market share of low-cost airlines (in %) connecting Belgrade with other worldwide destinations*
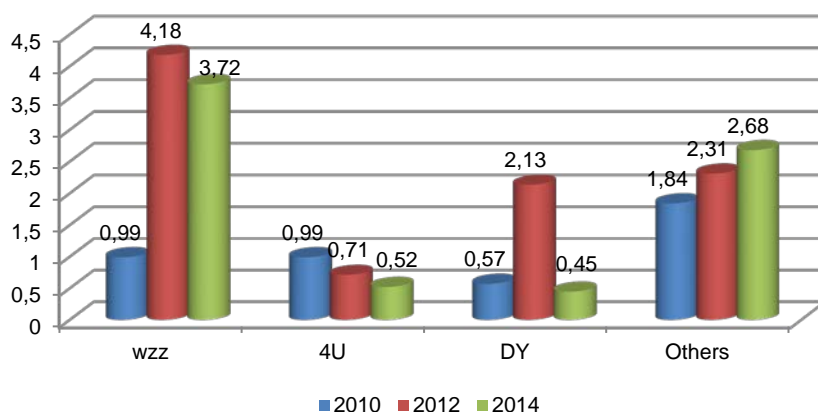
During the period from September 2010 to August 2014, only one low-cost airline increased its market share, while other two airlines ceased providing transportation services on the observed lines and reduced their market share (Fig. 1). Wizz Air increased its market share in this period more than three times. During this period, low-cost airlines increased their market share from 4.39 to 7.36%. However, it is necessary to emphasize that the market share of low-cost airlines in Europe and worldwide are much higher. Their average share (by departures) in the global world market is 23%, and about 38% in European (AirlinePROFILER, 2014).

The other part of the research included the fluctuation of one-way airfares for economy classes on direct and most frequent lines. It involved only gathering of data on the prices of airlines with the greatest market share. Apart from airlines with the greatest market share that is, apart from traditional airlines, the research included airfare fluctuations of low-cost airline company Wizz Air. During the period from September 2010 to August 2012, this airline held a monopoly over all the lines except over the Belgrade–Rome line. The market share of Wizz Air on the observed line was about 6.7%. However, Wizz Air was not the only airline that provides transportation services on this line. Taking the HH index, and its value around 0.4268, into consideration, it can be concluded that two airlines have a dominant position or monopoly (Air Serbia and Alitalia) over this route. The high value (more than 0.18) of the index shows a high concentration on the line with the dominant players.

Figure 2. Average airfare movement on the line Belgrade-Rome formed by Wizz Air (€)

If t_{63} shows the number of days before a flight (in this case 63 days before a flight) and the first day when the passenger can buy ticket for the line Belgrade-Rome, then t_{48} shows 48 days before a flight and sixteenth day when a passenger can buy a ticket for the observed line. The $c(t_{63})$ shows airfare which would be purchased 63 days before a flight (Fig. 2). The function is increasing if for every $t_1 < t_2$, we have $c(t_1) < c(t_2)$, so that by changing the data of the airfare fluctuation, we get:

t_{63} = 1 day t_{48}= 16 days; $c(t_{63})$=19.39 € , $c(t_{48})$=168.99 € then if $t_{63} < t_{48}$,

we have $c(t_{63}) < c(t_{48})$, so that the function is increasing for t_{63}, t_{48}, . However, if

t_{41}= 23 days t_6= 58 days; $c(t_{41})$=84.64 € , $c(t_6)$=47.02 € , $t_{41} < t_6$,

we have $c(t_{41}) > c(t_6)$, so that the function is not increasing for every t_1, t_2.

Based on the theorem and the data on airfare fluctuations, it can be concluded that the price function in relation to the time of flight does not increase monotonically.

Table 1. The correlation between the airline ticket price and the time of purchase

Correlations				
			Time	Price
Spearman's rho	Time	Correlation Coefficient	1.000	-.533[**]
		Sig. (2-tailed)	.	.000
		N	45	45
	Price	Correlation Coefficient	-.533[**]	1.000
		Sig. (2-tailed)	.000	.
		N	45	45
**. Correlation is significant at the 0.01 level (2-tailed).				

Source: Calculations by Authors

At the risk of error of 0.01, we can conclude that Spearman's coefficient of correlation indicates that there is a strong correlation between the observed phenomena, or between airline ticket prices charged by low-cost airlines and the time of purchase tickets (Table 1). The minus sign indicates a negative connection between the observed phenomena, i.e. the price of the ticket depends on the time of its purchase.

The exponential function which refers to the prediction of an average price of airline tickets for a period of one to 46 days before the flight, or for a period from 63 to eighteen days when passengers can buy an airline ticket is:

$$Y = 39.143 + e^{0.201x - 4.303} \tag{1}$$

For a period of 46 up to 63 days before the flight is obtained the following exponential function

$$Y = 14.571 + e^{-0.475x + 27.585} \tag{2}$$

6. Conclusions

In this paper, the authors analyzed the market share of low-cost airlines and came to the conclusion that in the period of four years low-cost airlines increased their market share on the lines connecting Belgrade to other

worldwide destinations. Wizz Air is a low-cost airline company that increased its market shares the most.

The paper paid special attention to the first type of price discrimination making only one limitation prominent – the time when air ticket was purchased. The authors analyzed whether the price of airline tickets sold by the observed low-cost airlines monotonically increase in the conditions of an uncertain demand. Based on the monotonic function theorem, Spearman's coefficient of correlation and the data on Wizz Air airfare fluctuation for the line connecting Belgrade to other worldwide destinations, we determined that airfares do not grow monotonically between the first and the last day when airline ticket can be purchased, but there is a strong correlation between airline ticket prices charged by low-cost airlines and the time when ticket is purchased.

Scientific contributions of this research are related to determining the correlation between the price and the time of airline ticket purchase, as well as the analysis of price trends of airline tickets over time. Considering the specific research objectives, a future research may pay special attention to analyses of the effect of price discrimination on the revenue of low-cost airlines.

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