

Full Length Research Paper

Pricing dynamics in the airline market

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The price policy represents one of the most important segments of overall business policy of every airline. One of the areas where subtle approach as well as, creativity and intuition of airline management come to their full force is price discrimination. Developed airlines are successful in the application of price discrimination. They offer a wide range of air tickets depending on how much time in advance tickets are bought, the estimate of the amount that is to be returned in case of flight change or cancellation, whether the journey includes staying over the weekend or not. Starting from the most frequent lines, the authors have analysed the movement of airfares in relation to a flight date, that is to say, price discrimination application based on the time of a ticket purchase. Based on data on airfare movement on ten most frequent lines, authors have analysed whether airfares monotonically increase or decrease as the date of flight approaches.

Key words: Price discrimination, airlines, market participation, airfares.

INTRODUCTION

Price discrimination represents a practice of charging different fares for identical goods to different consumers or a group of consumers, where price differences are not justified by the differences in production costs and goods sale (Zdravkovic et al., 2008). It enables companies to maximise their profits and consumers to gain benefits since a greater goods amount is offered to a greater number of consumers. Without the application of price discrimination, certain groups of consumers or individuals would not be able to afford themselves to purchase certain goods (Petrovic, 2007a). Having in mind the characteristics of airline market and basic types of price discrimination (Varian, 1998), there are three types of price discrimination applied by airlines:

- i. Versioning,
- ii. Quantitative discounts – price discrimination based on the number of purchased tickets,

- iii. Frequent flyers programme (Steen and Sorgard, 2002).

Versioning implies that the airline offers different versions of its tickets. The high quality version of ticket is a flexible ticket, where the passenger can reschedule and even cancel the flight whenever it wants. The low quality version of ticket is a restricted ticket, respectively ticket with a Saturday night stay-over and/or advance purchase requirement (Steen and Sorgard, 2002).

For numerous services, price is determined depending on the period between the service booking that is, the purchase of a promised service and the use of that service. The price depends on the moment of service booking. This strategy offered the airline the potential of gaining revenue from seats that would otherwise fly empty; however, it presented them with the problem of determining the number of seats that should be protected for late booking, full fare passengers. If too few seats were protected, the airline would spill full fare passengers; if too many were protected, flights would depart with empty seats (McGill and Ryzin, 1999). The

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ratio between sold tickets at a discount price and full price is not fixed during the period of reservation. The observed ratio depends on the expected demand, realized sale in the previous period and special events (Petrovic, 2007b).

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) considered airfares to be increasing during time, that is, to be increasing monotonically. McGill and Ryzin (1999) pointed to 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 in strict fare sequence, generally from lowest to highest, as flight departure approaches (McGill and 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). Dana (1998) maintains that in competitive markets where prices are set before the demand is known, firms find it convenient to implement the "low-before-high-fares" principle in order to cope with uncertain consumer demand. Having in mind the stated positions, the authors have applied analysis in this paper to determine whether airfares increase monotonically as the flight date approaches, that is, whether airlines apply the stated strategy in the conditions of uncertain demand.

Serbia is at the crossroads of airlines from east, south and west Europe. For this reason precisely, the increase of passenger flow in air traffic can be a key point for the economic development of Serbia and the whole region. Although, low-cost airlines have been doing business in the world for more than thirty years, they have come to Serbia many years later; one of the reasons relate to the size of the market, that is, the fact that overall number of transported passengers in Serbia is significantly lower in relation to the flow realised by worldwide known airports. An important reason for such a situation is a long-standing Jat Airways monopoly as well as market regulation.

By signing an Open Skies Agreement (OSA), Serbia obliged itself to allow all airlines to offer services of passenger transport which meets the criteria of standard and quality of service. Airline traffic liberalisation enabled citizens of Serbia to travel at lower airfares to other European destinations. Simultaneously, it influenced the increase of passenger flow and the airport Nikola Tesla has become a "port" of international traffic.

As earlier mentioned in this paper, special attention is paid to the analysis of market structure to establish which airlines has greater market share in lines connecting Belgrade airport with other airports in the world. Market share of each airline is established based on the relation between the number of its flights and overall number of flights of all airlines that are realised on the observed

lines during one week. Using this research, that is the most frequent lines and airlines with the greatest market share, the authors have analysed the movement of airfares in relation to the scheduled time of flight.

Factors of ticket price formation applied by airlines

Formation and policy of transport service prices for passengers represent very important aspects and instruments of not only traffic policy, but also business policy of traffic companies. The height of passenger transport price is an important element of market competition of certain forms of traffic and individual traffic companies. Consequently, those prices represent an element which significantly determines the position and market participation of certain forms of transport and particular companies.

From the historic point of view, the approaches to passenger transport price formation have been changed in accordance with the changes on the level of traffic system development, level of development and structure of transport market, traffic treatment in economic policy, transport market treatment and degree of its regulation as well as theoretical understanding and concepts which preceded the practice or which generalised previous empirical experiences. The approaches to price formation of passenger transport service vary with different forms of transport based on the difference in their characteristics and market positions. By analysing theoretical and practical economical-political approaches to price policy in air traffic, which were developed and used in the previous period, from the present already historically important time distance, it can be concluded that their basic and preferable concept stemmed from the degree of airline market development and competition conditions on that market.

Monopoly and oligopoly position of the market or certain segments of the market leads to domination of monopoly approach and criteria when forming airfares. The basic principle of price policy, in the conditions of monopoly on the airline market, is directed to enabling the maximisation of revenue generated from the sale of air tickets through the application of price discrimination. That is to say, taking into consideration the paying abilities of passengers in this approach is a starting point when deciding on the height of airfares and possibility of applying price discrimination.

Oligopoly positions on the market leads to cartel formation of passenger transport prices, which are being realised via different forms of cartel agreements. The basic philosophy of the stated approach is enabling the survival of even the most unsound airlines, partakers in the cartel agreement. Sound and efficient airlines, based on such formed prices, are in

the position of realising extra profit. Characteristic examples are forming cartel prices in the regular international air traffic.

The approaches to transport price formation based on the price of unit transport service cost have to take structure and dynamics of airline business expenses into consideration. The structure of price costs depends on the prices of certain factors in the process of producing passenger transport services and is changeable in the conditions of price fluctuation of these factors. The structure of costs mostly consists of labour costs and then, fuel depending on the oil price. In 2005, the share of labour expenses in the overall expenses amounted up to 37.7%, whereas, fuel and lubricant expenses amounted up to 21.9%. Operational costs (labour expenses, expenses of fuel and lubricant) are 50% higher traditionally in relation to low-cost airlines which is a consequence of lower crew income, greater productivity and lower fuel and lubricant expenses due to the use of smaller types of airplanes (Balboa et al., 2009).

The characteristic for airlines is the predominant share of fixed expenses in the overall expenditures of their business. Fixed expenses per unit of airline ticket are determined by the degree of capacity utilisation. At the time of airfare formation which precedes the beginning of providing services to passengers, the real number of passengers is not known so airlines cannot know the real amount of average fixed expenses. This amount is connected to the presupposed number of passengers which ensures an average degree of plane capacity utilisation. For example, in the international air traffic, it is presumed that the use of seat capacity in the plane is around 55%. Certain services such as; passenger transport as well as phone, hotel, restaurant and theatre services have a demand which fluctuates during time and limited offer. Companies, which provide the stated services, are faced with the problem of forming prices which would enable them to do business with profit during time. Price discrimination application can have an important role in levelling demand and synchronising supply and demand. Gale and Holmes (1992, 1993) and Dana (1998) for a related analysis of competitive market, considered a model in which a monopolist does not know which of the two demand periods will be the peak demand period and which will be the off-peak demand period. They showed that the firm uses advance purchase discounts to allocate its scarce capacity more efficiently and to increase its expected profits (Gale and Holmes, 1992).

Airlines try to sell tickets for higher prices on the market segments with smaller demand elasticity and for lower prices on the market segment with greater demand elasticity. It is a way of forming airfares based on the use of price to manage ticket demand by considering price sensitivity of passengers. The airfares for first class are a lot higher than for the economy class not because passengers would reach the destination more quickly, but

because of the higher level of quality service and more simplified procedure of flight checking. Airlines which offer services on the lines connecting Belgrade with other destination in the world offer a range of combinations of airfares and level of service quality so as to satisfy the needs of different market segments. The passengers of one market segment would want to travel in a short period, usually on business. Businesspersons consider it expensive if they do not manage to have a short journey; thus, this group is ready to pay a relatively high airfare. For passengers who do not travel due to business reasons, one segment is ready to accept a low airfare in exchange for purchasing the ticket two months before the due date, whereas others take the risk of buying a ticket for a lower price at the last moment by being in a standby regime (Palmer, 1998).

METHODOLOGY

Market structure represents one of the most sensitive issues. It is defined by identifying market participation of an observed partaker in relation to other competitors on the relevant market, by comparing the participation (which helps to gain an insight into the degree of market concentration) and by identifying potential competitors and measuring the size of certain partakers. Changes in market share are a valuable clue to a company's future prospects. For example, if the management of a company sees that their market share is decreasing, this can be an indicator that their competitors are using more effective strategies to attract new consumers. While the basic concept of market share is simple, it can get complicated when you want to define market share in a particular situation.

In measuring market participation in Serbia, there are significant problems in terms of gathering data and their reliability. This has nothing to do with any particularity of Serbia, because many other countries in transition have faced similar problems. Namely, national institutions for statistics do not have an adjusted methodology during the first years of transition to follow data in a way that regulatory bodies need them.

With the aim of undertaking basic research and proving the basic hypothesis, the authors have paid special attention to the structure of air traffic in Serbia, that is, establishment of market participation of airlines that provide services for passengers transport on the lines connecting the airport in Belgrade with other airports in the world. Market participation of airlines have been established on the basis of relation between a number of its flights and the overall number of realised flights of all airlines during one week on the observed lines (Table 1). The analysis has provided information of the established and most frequent lines.

Based on line frequencies, that is, number of flights on the observed lines, it has been established that the greatest market share was realised by the company JAT (41.01%), that is to say, the observed company has realised a dominant position on the airline market of Serbia. In the second place, from the point of view of market share, there is Montenegro Airline with 11.61%, and in the third place, there is Lufthansa with 5.17% (Figure 1). At the beginning of this research, market share of low-cost airlines providing services of passenger transport on the lines connecting Belgrade with other destinations in the world amounted up to 4.39%. When compared to September, low-cost airlines have increased their market share in March up to 5.98%. The increase of their market share is the consequence of the increased market share of the low-cost company Wizzair which has increased the number of flights in the observed period by more than 100% and

Table 1. Market share of airline (in %).

Airline	JAT	YM	LH	SK	OS	AZ	UA	SU	AF	OK	KL	JA	Other
Market share	41.01	11.61	5.17	4.96	4.46	2.69	1.98	1.98	1.98	1.98	1.91	1.84	18.43

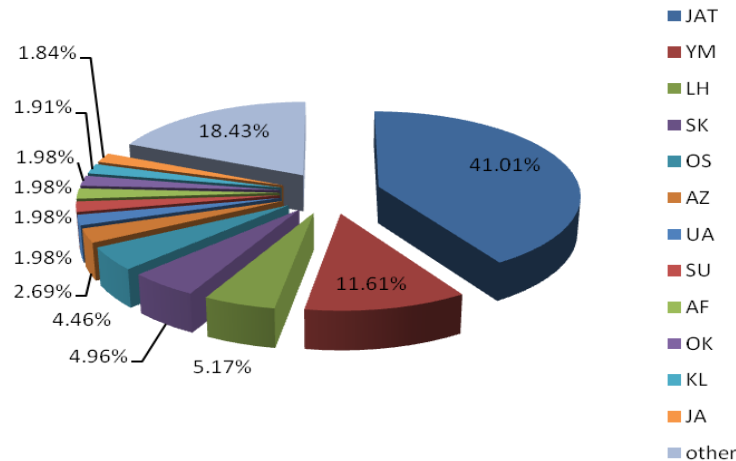


Figure 1. Market share of airline.

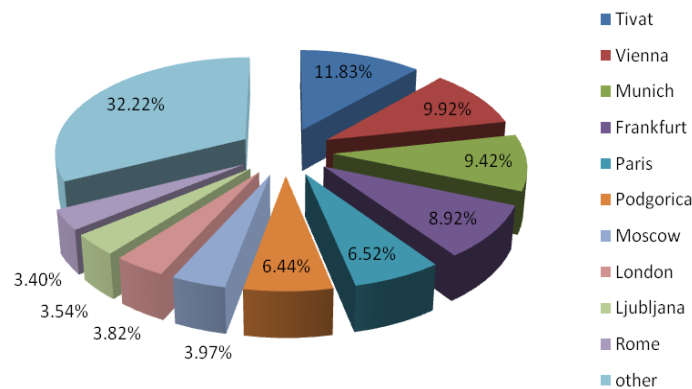


Figure 2. The share of the most frequent lines.

thus increased its market share from 0.99 to 2.68%. Figure 2 shows the share of the most frequent lines in the overall number of flights. The most frequent lines are the ones connecting Belgrade with Tivat, Vienna, Munich, Frankfurt, Paris, Podgorica, Moscow, London, Ljubljana and Rome. The passenger flow realised on the line Belgrade – Vienna participated in the overall flow with 11.83% (Table 2).

The other part of this research included the movement of one-way airfares for economic class on direct most frequent lines. It incorporated only the process of gathering 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 movement of the low-cost airline company Wizzair.

In this paper, the authors assumed that airfares monotonically increase with time. With the aim to prove the stated assumptions,

the following theorems have been highlighted:

- 1) 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.
- 2) 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.

RESULTS AND DISCUSSION

If we mark time to flight shown in days with t , airfare which would be purchased on the t day before the flight with $c(t)$, then $c(t)$ function is growing if for every $t_1 < t_2$ we

Table 2. The share of the most frequent lines (in %).

Destination	Tivat	Vienna	Munich	Frankfurt	Paris	Podgorica	Moscow	London	Ljubljana	Rome	Other
Market share	11.83	9.92	9.42	8.92	6.52	6.44	3.97	3.82	3.54	3.40	32.22

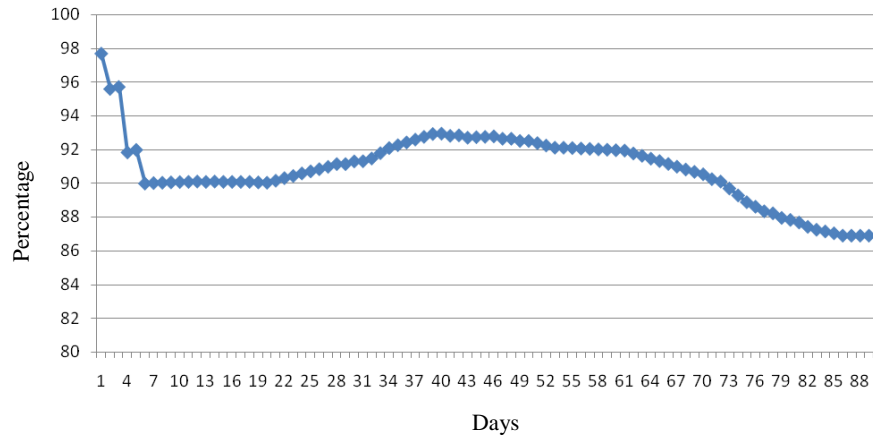


Figure 3. Average airfare movement on the line Belgrade-Rome formed by JAT.

Table 3. Average airfare (in £) movement on the line Belgrade-Rome formed by JAT.

Days before departure	1	2	3	4	5	7	10	13	16	19	22
Mean fare	97.66	95.57	95.69	91.82	91.97	90.01	90.07	90.08	90.08	90.05	90.30
Days before departure	25	27	31	34	37	40	43	45	49	52	55
Mean fare	90.70	90.97	91.30	92.08	92.58	92.93	92.69	92.74	92.50	92.230	92.08
Days before departure	58	61	64	67	70	73	76	79	82	85	88
Mean fare	92.00	91.93	91.45	90.98	90.53	89.69	88.61	87.95	87.42	87.04	86.90

have, $c(t_1) < c(t_2)$.

In case

$t_1 = 5$ days $t_2 = 10$ days; $c(5) = 91.97£$, $c(10) = 90.07£$ then $t_1 < t_2$, $c(t_1) > c(t_2)$, so function is not increasing for every t_1, t_2 . We can conclude that the price function in relation to the time of the flight is not monotonically increasing nor monotonically decreasing (see Figure 3).

Function is decreasing if for every $t_1 < t_2$, we have $c(t_1) > c(t_2)$, so that by changing data on airfare movement, we get:

$t_1 = 27$ days $t_2 = 45$ days; $c(27) = 90.97£$, $c(45) = 92.74£$ then if $t_1 < t_2$, we have $c(t_1) < c(t_2)$, so that function is not decreasing for every t_1, t_2 .

Based on the theorem and data on the airfare movement, it can be concluded that, the price function in relation to the time of the flight is not monotonically increasing nor

monotonically decreasing. Based on the data analysis, it has been proved that airfares do not increase monotonically with time. Research has also shown that a passenger will not always pay the same or lower price for a ticket by buying it three months before the flight.

Table 3 shows that airfares have not grown monotonically within certain period on the line Belgrade-Rome. The highest airfare in the observed period was charged 40 days before the flight (£ 92, 93). Furthermore, there was the reduction in airfare up to the point number six, which shows that airfare amounted to £ 89.98 six days before the flight. Afterwards, airfare increased for the remaining air tickets.

Research based on the airfare movement on ten most frequent lines showed that drastic increase of airfares occurs seven days prior to the flight (Table 4). Simultaneously, gathered data showed that a passenger could purchase a flight ticket for a lower price on the day of the flight, if there is only one air ticket left.

Results also showed that the volatility of fares increase

Table 4. The temporal profile of fares (in £) offered by JAT on a specific route (Belgrade-Vienna).

Days before departure	1	2	3	4	5	6	7	14	21
Max fare	103.30	90.90	104.90	104.90	74.10	74.10	74.10	56.40	56.40
25 th	59.20	59.20	59.20	59.20	54.60	54.60	54.60	54.60	56.40
75 th	90.90	74.10	74.10	74.10	59.60	59.60	59.60	54.80	56.40
Median	74.10	72.60	59.60	59.60	59.60	54.60	54.60	54.60	56.40
Mean	74.29	69.24	68.03	67.37	59.53	58.10	58.81	54.91	56.40
Days before departure	28	35	42	49	56	62	69	76	84
Max fare	56.40	56.30	56.90	56.90	56.50	56.40	56.30	54.70	54.20
25 th	56.20	56.20	56.30	56.50	56.40	56.30	56.30	54.70	53.80
75 th	56.40	56.30	56.90	56.90	56.50	56.40	56.30	54.70	54.20
Median	56.40	56.20	56.30	56.90	56.50	56.40	56.30	54.70	53.80
Mean	56.34	56.24	56.47	56.79	56.47	56.37	56.07	54.70	53.97

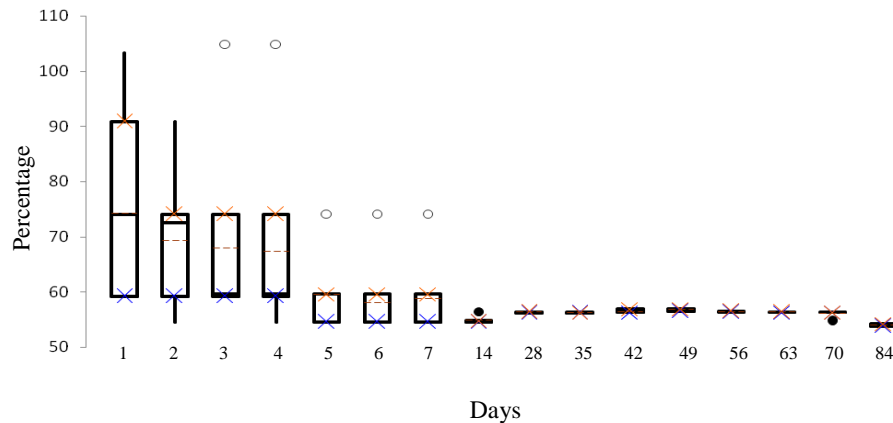


Figure 4. The temporal profile of fares offered by JAT on a specific route (Belgrade-Vienna).

in the last week before departure, which is the period when the airlines can formulate a better prediction for a flight's load factor (Figure 4).

Conclusion

Airlines are successful at applying price discrimination. Having in mind the characteristics of airline market and basic types of price discrimination, we can identify three types of price discrimination: Versioning, quantity discount, frequent flyers programme. In this paper, special attention has been paid to the first type of price discrimination with emphasis being only on one limitation – the time of air ticket purchase.

By considering the stated positions, the authors have analysed whether airfares monotonically grow as the date of flight approaches under the conditions of uncertain demand. Based on the theorem of monotonicity of functions and data on airfare movement on ten most

frequent lines, we have concluded that airfares neither monotonically grow nor do they monotonically decrease during time, that is, the price within the function of time of flight is not monotonic. Based on this, we can deduce that airfares do not increase monotonically as the date of flight approaches.

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