Price discrimination in an airline market with uncertain demand

"Welcome to easyJet.com, the best place to book your cheap flights online. With low cost flights across many top European destinations you're bound to pick up a deal that fits your budget."

(www.easyjet.com, 2008-02-12)

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Abstract

This project examines how a monopoly can utilise differences in the uncertainty of individual demand to discriminate between consumers. The starting point is the varying prices seen when purchasing tickets with easyJet on route they operate between Kastrup and Stansted. Two theories, advance-purchase discounts and vertical product differentiation, are presented and discussed from the airline's position.

The empirical study analyses easyJet's pricing and willingness to pay of consumers based upon raw data. We found statistical evidence that the airline discriminates between consumers based on geographical origin and time of travel whilst utilising advance purchase discounts. In addition the willingness to pay for a ticket is lower far in advance of departure and consumers are willing to pay a larger mark-up for flexibility far in advance.

Key Words: easyJet, monopoly, price discrimination, uncertainty of individual demand, advance purchase discounts, regression analysis

Contents

1.0.   Introduction

Being regular low-fare airline customers we have often wondered why it is cheaper to purchase our tickets far in advance of departure. We have also wondered if customers associate flying with low-fare airlines as 'cheap' in that they may have been prepared to pay more for their tickets. The philosophy of 'selling one seat rather than having one seat unoccupied' is obviously the goal of any actor within the airline industry. One can see price differences within the same type of airline (those offering equal quality of service[1]).

One of the types of airline markets is that of the low-fare segment. These low fare airlines are characterised as offering neither business class travel nor any free extravagancies[2] other than a seat. Also characterising the low-fare segment is that the majority of destination airports, within Europe, are physically smaller, geographically further from cities and that one often assumes that they are cheaper. The low-fare airlines consist of companies such as easyJet, Ryanair and Norwegian.

Price discrepancies are noticeable throughout the low-fare airline market and who market themselves by equalling the price of tickets to travellers' budgets. easyJet one of these low-fare airlines market their cheap flights by 'providing our customers with safe, good value, point-to-point air services... to offer a consistent and reliable product and fares appealing to leisure and business markets on a range of European routes.'[3] But how does a low-fare airline provide 'fares appealing to leisure and business markets' and provide 'a deal that fits your budget.' One method of meeting consumers' demand and budget could be through a pricing method such as price discrimination which includes offering tickets purchased in the advance at a lower price.

Our first impressions and rough observations of the low-fare airlines' prices have left many questions unanswered as to how they decide what price to charge. The purpose is therefore to highlight some of the characteristics of one low-fare airline market in order to see if they can explain price discrepancies.

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[1] When equal quality of service is given it does not exclude the availability of a luxury for an extra cost. The quality between these airlines may differ from day to day but fundamentally their quality is the same.

[2] This includes free food, in flight entertainment relatively large amounts of leg room.

[3] http://www.easyjet.com/EN/About/index.html 2008-02-12

2.0   Aim

> easyJet (easyJet Airline Company Limited), the organisation at the basis of this study, is based at London Luton Airport and is classed as a low-fare airline. easyJet, founded in 1995, is the second largest low-fare airline of the two major low-fare airlines in Europe, the largest being Ryanair. Ryanair is larger in terms of the amount of destinations, flights and airplanes. easyJet holds the licence of United Kingdom Aviation Authority type A which gives them the right to carry passengers, cargo and mail. easyJet runs domestic and international flights on 387 routes between 104 European and North African airports with planes of more than 20 or more seats.

Through this project we hope to examine if and how it is possible for an airline to actively discriminate across different consumer groups based on individual uncertainty of demand. We will consider an airline operating as a monopoly, such that we will be able to describe how differences in consumer uncertainty and consumer valuation interact and counteract to determine prices.

We have recognised that tickets can include flexibility (an insurance) whereby the consumer is entitled to a refund or half a refund. Therefore we will analyse price discrimination for cases including tickets with flexibility as well as tickets without flexibility.

As a framework for this study we have set out the following four questions:

1. **How does price change with time?**

2. **Why does price change with time?**

3. **How does an individual's willingness to pay differ across time?**

4. **Under what conditions does there exist a possibility to charge different prices?**

By obtaining data for the 4 aforementioned points we hope to analyse the differing consumer behaviour when purchasing tickets for a low-fare journey. In understanding consumer behaviour we hope to define the supplier's reaction to the consumer's demand characteristics. Therefore we wish to recognise the supplier's behaviour given consumers' willingness to pay,

time of purchase prior to take-off and flexibility. Through highlighting consumers' willingness to pay we would like to analyse demand uncertainty as a part of price discrimination by the supplier. We also hope to derive assumptions necessary for there to exist separate markets (in terms of different purchasing periods and types of tickets) for consumers and the supplier.

3.0.   Method

We set out a framework of four questions in the previous section. This section deals with the process by which we hope to answer the four questions.

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On the basis of existing theories regarding second degree price discrimination and third degree price discrimination, we will derive the price setting problem facing our monopoly and examine which tendencies one can expect in the prices that are finally set. The analysis will examine the implications of these theories for price discrimination; price paid by consumers and their willingness to pay (in different time periods for tickets of differing quality). An empirical study will then be performed to investigate if the derived tendencies are evident in a real market place.

This section will undoubtedly cover many different equations with varying symbols and so for the purpose of clarifying for the reader we have attached an appendix of the symbols used. (See attachment 1; Symbols)

The quantitative analysis will be built upon raw data that will be collected through a consumer survey/questionnaire of passengers flying with easyJet from Copenhagen Airport to London Stansted Airport. The largest reason for choosing easyJet as a source for our data was due to the geographical proximity to Copenhagen and the costs involved. Secondly, easyJet suited the purpose of our thesis since they do not offer different standards of travel i.e. they do not offer customers a choice between business class travel and economy class travel. Furthermore easyJet is the only low-fare airline flying between the aforementioned airports.

Data will be collected from random passengers on pre-given flights from Copenhagen Airport (Kastrup), Denmark using a questionnaire. The amount of questionnaires answered will entirely be based on how many passengers are willing to answer and/or how many we are able to collect during the check-in for the pre given flights (usually 2 hours). The questionnaire will consist of a small number of questions covering information relevant to our aim[4]

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[4] Patel, R. and Davidsson, B. (1994)

The results from our questionnaire will enable us to investigate price differences across time and other price discrimination methods. We will also be able to examine the behaviour of a consumer/individual's willingness to pay. Econometrical regressions completed on the data will be based on the method of Least Squares. Several different specifications will be tested and in order to test the stability of our models we will perform a Ramsey RESET Test. Further diagnostic tests will consist of the White Test to check for heteroscedasticity and the Breusch-Godfrey Test to check for autocorrelation. If any of our specifications fail the aforementioned diagnostic tests appropriate action will be taken.

The regression results will then be discussed on the basis of the theories that have been presented.

4.0.   Theory

The purpose of this thesis is to examine ways in which an airline is able to discriminate between consumers using differences in demand uncertainties. Browsing economic literature we have found several ways in which this may be done. In this section we aim to introduce two theories called "advance-purchase discounts" and "vertical product differentiation," both explaining how differences in individual demand uncertainties can be used to separate a market. However, the existence of other forms of price discrimination available to an airline[5] will be discussed briefly due to the fact that these will have to be accounted for in the subsequent regression analysis[6].

4.1. Second Degree Price discrimination:

A monopoly usually faces a trade of between selling a large quantity and selling its product at a high price. However, when consumers are heterogeneous in their preferences there often exists a possibility to price discriminate between different types of consumers.

In the case of second degree price discrimination the monopoly is faced with an identification problem, whilst they know the demand of different consumer types/groups they cannot tell which consumers belong to which types. Since they cannot tell which group a specific consumer belongs to they are not able to make use of individual pricing, but instead they have to offer the same price to all consumers. However by slightly differentiating[7] the product in some way the monopoly may be able to extract a higher consumer surplus.

If we assume that a market consists of two consumer groups; one group that has a low valuation (lower marginal utility) for every quantity consumed and one group with a high

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[5] See e.g. Stavins, J. (2001)

[6] Even though easyJet can be argued to operate in a market characterised of monopolistic competition (it is the only airline trafficking the route Kastrup-Stansted, however, other airline operate similar routes e.g. Kastrup-Heathrow) we will only discuss the case of a monopoly. The reason for this is simplification; assuming a monopoly market instead of a monopolistic-competition market allows us to disregard any strategic interaction that might otherwise take place.

[7] Here differentiation is used quite loosely, it may include changing the physical character of a product, or amount (e.g. "buy three, pay for two").

valuation. If this is the case then the monopoly will be able to separate the market by offering different products at different prices. In order for this separation to work the monopoly must first of all make sure that the consumers derive a non-negative utility from consuming their respective products, and secondly that each consumer group chooses the product designed for its type.

We denote the utility function (u) of a low valuation consumer by "1" and let the product (x) designed for this consumer type and its price (p) carry the same subscript (subsequently we use the subscript "2" for the high valuation consumers), then the first conditions (those of non-negative utility) can be formalised as follows:

$$u_1(x_1) - p_1 \geq 0 \qquad (4.1)$$

$$u_2(x_2) - p_2 \geq 0 \qquad (4.2)$$

As mentioned, the second requirement for a market separation is that each consumer type will self-select the product designed for them. In order for this to happen a consumer must derive a higher utility from consuming their respective product at the prices set by the monopoly. These so-called "self-selection constraints" require that the following relationships hold:

$$u_1(x_1) - p_1 \geq u_1(x_2) - p_2 \qquad (4.3)$$

$$u_2(x_2) - p_2 \geq u_2(x_1) - p_1 \qquad (4.4)$$

If the relationships in 4.1 - 4.4 are fulfilled simultaneously the market will separate itself. Furthermore, it can be shown that profit maximum for the monopoly occurs when 4.1 and 4.4 are binding. That is, the monopoly will extract the entire consumer surplus from the low-valuation consumers by setting the price equal to their willingness to pay, while it will not be able to charge the high-valuation consumers their complete willingness to pay for x_2 since they can receive a positive net utility from consuming x_1 at the price p_1. Lastly we note that if x_1 and x_2 are given (i.e. the monopoly cannot differentiate x_1 and x_2); the above constraints are constraints on price setting[8].

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[8] [8] See e.g. Varian, H. R. (1992): p. 244-248

Vertical Product Differentiation:

Vertical product differentiation is a sub-case of second degree price discrimination. Vertical product differentiation refers to differentiating a product by offering different levels of "quality". The model assumes that all consumers agree upon the preferred product (the product which contains the highest quality), i.e. everyone ranks the products in the same order, but they differ in their willingness to pay for quality.
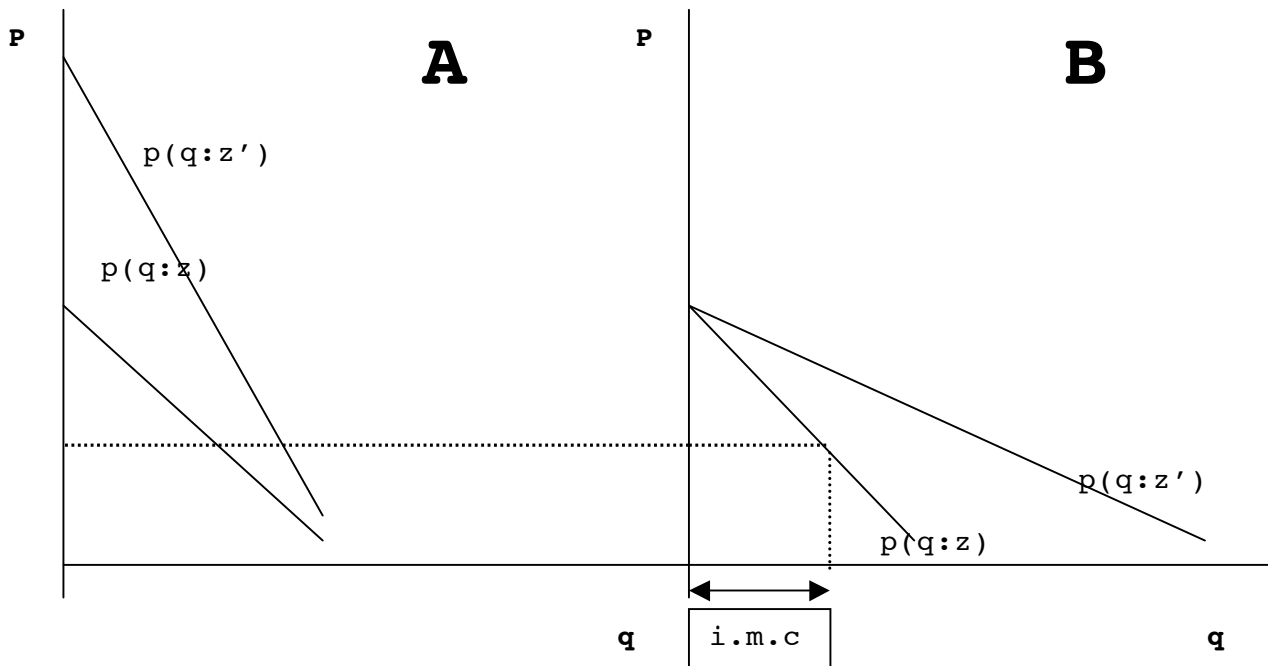
In the vertical product differentiation model the monopoly faces the same identification problem as in the case of general second degree price discrimination. The monopoly's challenge is thus to find levels of quality and prices, in order to maximise profit, subject to constraints that are in essence the same as those given in 4.1.-4.4.[9]

Changes in quality can affect demand in two ways. The first such case occurs when a rise in quality (z) increases the reservation price of consumers, but does not affect the maximum size of the market, i.e. the demand rotates clockwise around its intercept on the x-axis. In addition, as can be seen below in Figure 4A, the willingness to pay of infra-marginal consumers rises more than that of the marginal consumer. The alternative case is when an increase in z expands the market and raises the reservation price of the consumer (the demand rotates anti-clockwise around its intercept on the y-axis), here the increase in willingness to pay is larger for the marginal consumer than for the infra-marginal consumers as seen in the figure below (Figure 4A). In both cases the increase in z allows the monopolist to charge a higher price for any given quantity[10].

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[9]The monopoly always has the option to only offer one quality, i.e. to not separate the market. However, for the purpose of this paper we will always assume that the monopoly will separate the market.

[10] See e.g. Pepall et al (2005): p. 149-159

Figure 4A: Product differentiation diagrams[11]

In the figure above panel A shows two ways in which an increase in quality from z to z' affects market dema

In the case of an airline market with uncertain individual demand an obvious form of vertical product differentiation is that of offering tickets containing some degree of flexibility. If an individual has less than certain demand he will consider (ceteris paribus) tickets with flexibility as strictly preferable to tickets without. Moreover, since the need of flexibility is inversely related to the probability of actually wanting a ticket, it seems reasonable to predict that flexibility can be used to separate markets when consumer groups differ in their certainty of demand. (This question will be more fully explored in section *4.2 Price constraints for Tickets with Flexibility*).

Advance Purchase Discounts:

Tickets for air travel are often available for purchase far in advance of departure. The advance purchase discount model is built upon the assumption that consumers differ in their probability of actually wanting a ticket when the date of departure finally arrives. This implies that in advance of take-off consumers' willingness to pay for tickets depend not only on what

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[11] Depending on the price level the number of infra-marginal consumers can be seen by the horizontal distance from the intercept of p(q:z) to p.

value they place on actually flying, but also the probability of flying, that is, there expected utility[12] of purchasing a ticket.

Generally it is assumed that people are more certain in their individual demand closer to departure rather than far in advance. This implies that their expected utility, and hence willingness to pay must be higher at this date (the utility derived from actually consuming a ticket is assumed constant and given). Differences in initial probabilities may allow the airline to separate the market by setting different prices in different time periods. However, due to the assumption that certainty of individual demand is weakly increasing in time the price must always be higher closer to departure otherwise no one would choose to buy at an earlier date. It is important to note that easyJet do not offer a 'last minute market' for the sale of their tickets. Consequently, people with a high certainty of individual demand will tend to have an incentive to buy in advance[13]. Advance purchase discounts can also be used to allocate capacity to different time periods.[14]

4.2. Third Degree Price Discrimination:

Third degree price discrimination is one method of "charging different prices for the same product in different segments of a market."[15] Different segments of a market could include time or location whereby the supplier supplies goods at different prices depending on the time of purchase or by the location of a consumer.

The standard case occurs when markets are completely separable. In this case the monopoly applies standard monopoly pricing in each of its markets. That is to say that if the monopoly has a constant marginal cost its profit maximisation problem will be:

$$\max \pi = \sum_{i=1}^{n} p_i \, q_i - \sum_{i=1}^{n} q_i \, c_i \qquad (4.5.)$$

Which implies that the prices charged in the different markets will be:

[12] See Varian, H. (1992): p. 173-175

[13] Dana, J. (1998)

[14] Gale, I. L. and Holmes, T. J. (1993)

[15] www.tutor2u.com 2008-01-18

$$p_i = c_i/(1 - \frac{1}{\varepsilon_i})$$

Where ε_i is the elasticity of demand for market i. From this it is clear that markets with higher elasticity of demand will have a lower price than markets with a lower elasticity of demand. If the markets are not completely separable then the monopoly faces the same price constraints as in second degree price discrimination (see 4.1 and 4.4)[16].

Figure 4B:
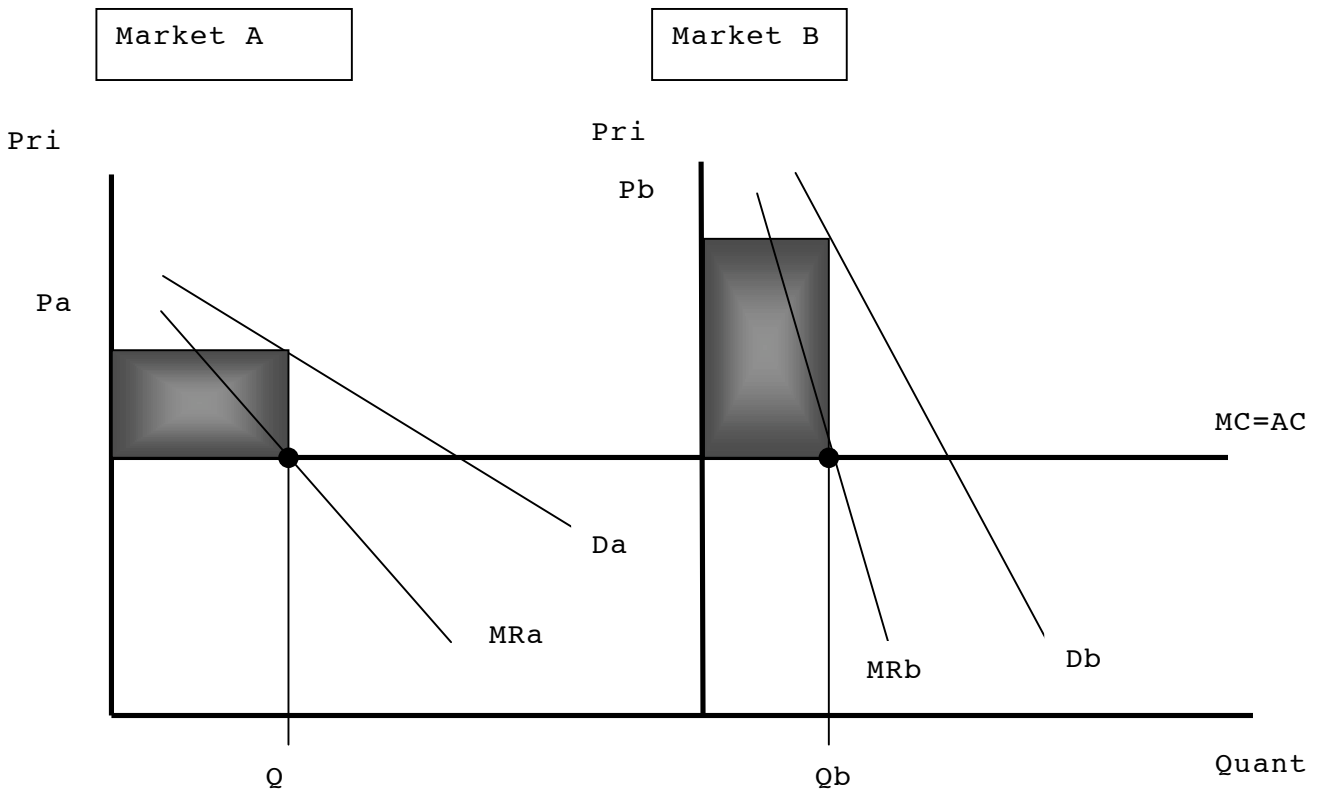
Market A is a market with a high elasticity of demand, while Market B has a low elasticity of demand. It is optimal for the monopoly to charge a higher price in the market with lower elasticity/higher inelasticity (Market B). Assuming that both markets are the same size then the producer surplus (the shaded area) will be bigger in Market B.

For any given airline route two instances of third degree price discrimination are readily identifiable. The first of these instances is the direction of a flight (or starting location of a round-trip travel). Consumers at *different geographical locations* may very well differ in their willingness to pay for tickets, and an airline can thus benefit from charging different prices in different markets. In the case of the geographical origin of a travel the markets can be

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[16]   See e.g. Varian, H. R. (1992): p. 248-250

considered completely separated. The second type of third degree price discrimination is the *time of travel*. If individuals differ in their preferences for the time of departure airlines may utilise this to charge a higher price in markets with low elasticity. In this case the markets are often not completely separable.

4.3. Price Constraints

This section, price constraints, will outline the constraints our monopoly faces when setting prices. We start by presenting the price-setting problem, which the monopoly is faced with, when they use advance purchase discounts. From this incurred situation we derive expressions for the resulting prices and discuss their underlying rationale. We will then proceed to investigate the case of tickets sold with flexibility under the same form.

Price Constraints for Advance purchase discounts:

When consumers are heterogeneous whilst the monopoly cannot tell which group an individual belongs to, the monopoly can still separate a market by differentiating their product and thereafter charge different prices. In the case of advance purchase discounts this differentiation is manifested in the time of purchase.

In describing these price constraints we assume that the market only consists of two time periods separated by a lottery where individual demand is determined. This means that in the first period (**the advance purchase market)** individual demand is uncertain, whereas in the second time period (**the spot market**) an individual know for sure whether they want a ticket or not. Furthermore, we assume that the market consists of two consumer groups where the consumers within each group are identical in terms of their valuation (v_i) of a ticket (i.e. the utility they derive from actually using a ticket), the probability (π_i) of wanting a ticket and that all consumers are risk neutral whilst harbouring rational expectations[17].

For the monopoly to be able to separate the market it must fulfil a row of constraints similar to those given in section *4.1 Second degree price discrimination.* Using the subscript *"adv"* for the consumer group that is to be allocated to the advance-purchase market and the subscript *"spot"* for the group allocated to the spot market, the nonnegative utility constraint facing the monopoly will be as follows

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[17]   See e.g. Varian, H. (1992): p. 177-181, 265

$$\pi_{adv} v_{adv} - p_{adv} \geq 0 \qquad\qquad (4.7)$$

$$v_{spot} - p_{spot} \geq 0 \qquad\qquad (4.8)$$

Following the same procedure the self-selection constraints become:

$$\pi_{adv} v_{adv} - p_{adv} \geq \pi_{adv}(v_{adv} - p_{spot}) \qquad\qquad (4.9)$$

$$\pi_{spot}(v_{spot} - p_{spot}) \geq \pi_{spot} v_{spot} - p_{adv} \qquad\qquad (4.10)$$

If we, for simplicity and illustrative purposes, assume that one group has no individual uncertainty of demand (that is $\pi_i=1$). This group will then be allocated to the advance market because the price must always be weakly lower there for there to be any separation. But what does this imply for the prices set in the two markets?

We begin by investigating the spot market price. According to the self-selection constraint, regarding consumers that will be allocated to the spot market, this price must be no larger than a mark-up equal to the inverse of π_{spot} multiplied by the price found in the advance market. However this relationship implies that the spot market price can reach infinity as the individual probability of a consumer belonging to this group goes to zero, which would violate the non-negative utility constraint. Thus, whenever this probability is low the spot market price will be bound above by the valuation of the concerned individuals. It turns out that the breaking point (at which the price goes from being bounded by the nonnegative utility constraint to being bounded by the self-selection constraint), occurs when the expected utility (and thus willingness to pay) of a ticket in the advance market equals the price that prevails there, and the function for the price of a ticket in the spot market thus becomes

$$p_{spot} = \min\left\{ v_{spot}, \frac{1}{\pi_{spot}} p_{adv} \right\} \qquad\qquad (4.11)$$

That the breaking point occurs at this specific point is reasonable. Whenever the willingness to pay for a ticket in the advance-purchase market is lower than p_{adv} the spot-market price is not restrained by this price since the individuals that are to be allocated to the spot market do not wish to buy in advance at the going price.

Figure 4C.
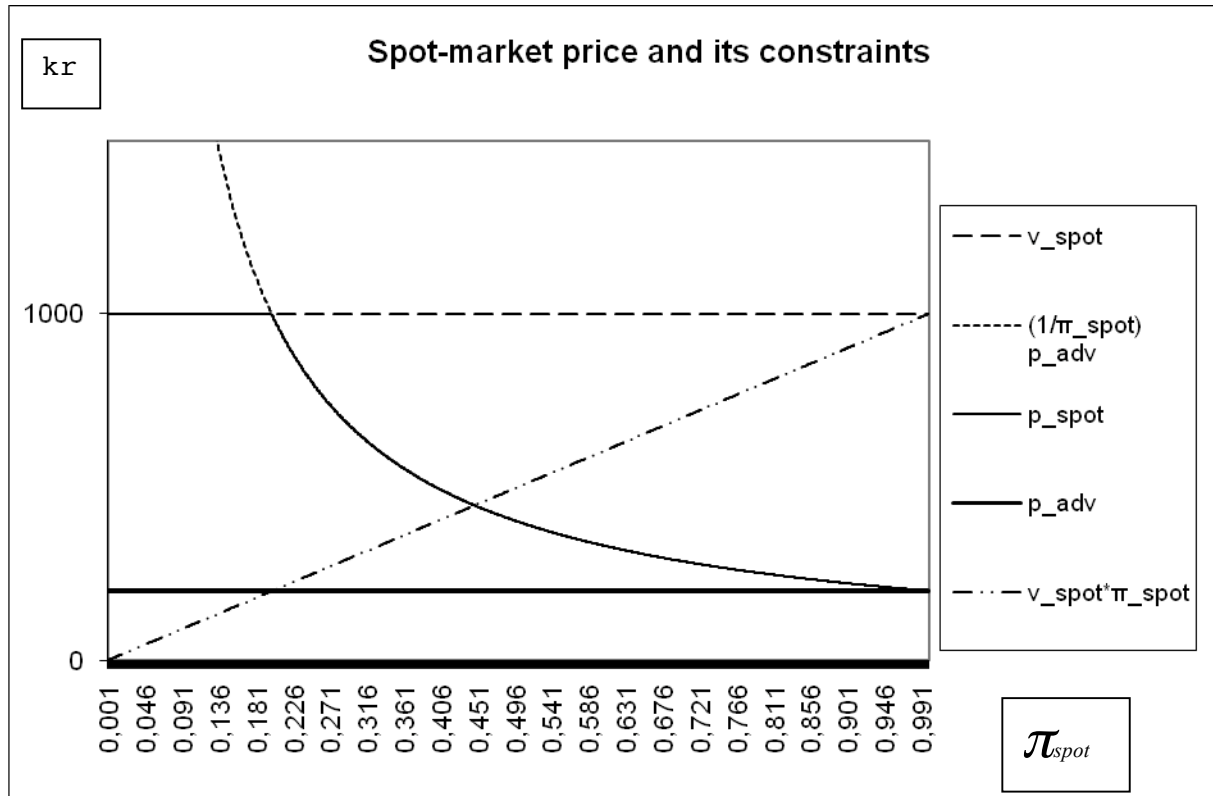
The above figure shows the non-negative utility constraint and the self-selection constraint as well as the price as functions of π_{spot}. The other parameters have been chosen arbitrarily and v_{spot} equals 1000 and p_{adv} equals 200.

What is obvious in *4.9* is that p_{spot} is weakly increasing in p_{adv}. This implies that it must be optimal for the monopoly to set the price in the advance market as high as possible. In our case (with $\pi_{adv}=1$) this would imply that p_{adv} is set to equal the full valuation of the consumers that are supposed to buy at this point in time, that is, it will be set to v_{adv}.[18] Nevertheless, this implies that v_{adv} must be lower than v_{spot} in order for these consumers to self-select the advance market.[19]

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[18] If $\pi_{adv}<1$ the maximum price that can be set in the advance market is $\pi_{adv}v_{adv}$ according to the nonnegative utility constraint. Also, the case the self-selection constraint may be binding for some levels of probability, forcing the advance market price to be no higher than $\pi_{adv}p_{spot}$ (if this is the case, however, it will not be optimal to separate the market (see next footnote).

[19] In our case: if v_{adv} is not lower than v_{spot} it will not be any point for the monopoly to separate the market since the best they could do is to charge v_{spot} in both markets, which in this case would give the same profit as only offering tickets with that price in the spot market only. (Although it is still possible to separate the market by setting the advance-purchase price low enough).

<u>Price Constraints for Tickets with flexibility:</u>

Perhaps a more obvious case of product differentiation that utilises differences in the certainty of individual demand is the case of offering tickets that contain a degree of flexibility. Differentiating tickets by offering the option of flexibility is clearly an instance of vertical product differentiation; high levels of flexibility are always preferred to low levels of flexibility.[20]

Obviously, the separation of a market is only possible if at least one of the involved consumer groups harbour some degree of individual demand uncertainty. Keeping the same framework that was used in the section *Price Constraints for Advance Purchase Discounts*, letting *z* denote a fraction between one and zero that is repaid to the consumer if it chooses not to fly (i.e. after individual demand is determined), and using the subscripts *"flex"* and *"adv"* (since the purchases take place in the advance-purchase market) respectively, the nonnegative utility constraints becomes

$$\pi_{adv} v_{adv} - p_{adv} \geq 0 \tag{4.12}$$

$$\pi_{flex}(v_{flex} - p_{flex}) - (1 - \pi_{flex})\big((1-z)p_{flex}\big) \geq 0 \text{ [21]} \tag{4.13}$$

From these non-negative utility constraints the self-selection constraints are obvious. The inequality 4.12 is the same as in the case of advance purchase discounts, the reason for this is that the type of ticket and the circumstances are the same. It is worth noting that in inequality 4.13 the second term indicates the expected loss from buying a ticket with flexibility when individual demand is not certain.

If we, again, make the assumption that one of the consumer groups harbour no individual demand uncertainty (and, thus, automatically is allocated to the advance market), it is easier to examine the price of a ticket with flexibility. By manipulating the constraints concerning the group that is to purchase tickets with flexibility and applying the same reasoning as before we get the following function for p_{flex}

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[20] If an individual has certain demand (π_i=1) then, naturally, this individual has no use of flexibility. Nevertheless, the individual will not value a ticket without flexibility more than one that contains flexibility (they will be valued as equally good).

[21] Note that if z=1 this constraint is the same as for the people buying in the spot market in the case of advance-purchase discounts. This is due to the fact that the two situations correspond to each other; when z is set to 1 there is no possibility to incur a loss.

$$p_{flex} = \min\left\{\frac{1}{1-(1-\pi_{flex})z}\pi_{flex}v_{flex}, \frac{1}{1-(1-\pi_{flex})z}p_{adv}\right\} \qquad (4.14)$$

In 4.14, the first term within the min-function applies whenever the non-negative utility constraint is binding and the second term applies when the price is bounded by the self-selection constraint. Again we see that the breaking point occurs when the consumers in the market for flexibility might consider purchasing a non-flexible ticket, i.e. when $\pi_{spot}v_{spot}=p_{adv}$.[22]

We note in 4.14 that whenever the non-negative utility constraint is binding (and z is not equal to one) the price of a ticket with flexibility is increasing in π_{spot}. This effect is due to the expected utility of the individual is an increasing function of the certainty of demand, this resulting from the increased expected utility of a ticket ($\pi_{spot}v_{spot}$) as well as the decrease of the expected loss.

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[22] If $\pi_{spot}v_{spot}<p_{adv}$ then offering flexibility increases the market size as well as the willingness to pay of the consumer. If, however, $\pi_{spot}v_{spot}>p_{adv}$ (or equality holds), offering tickets with flexibility only increases the willingness to pay of consumers (compare Figure 4A).
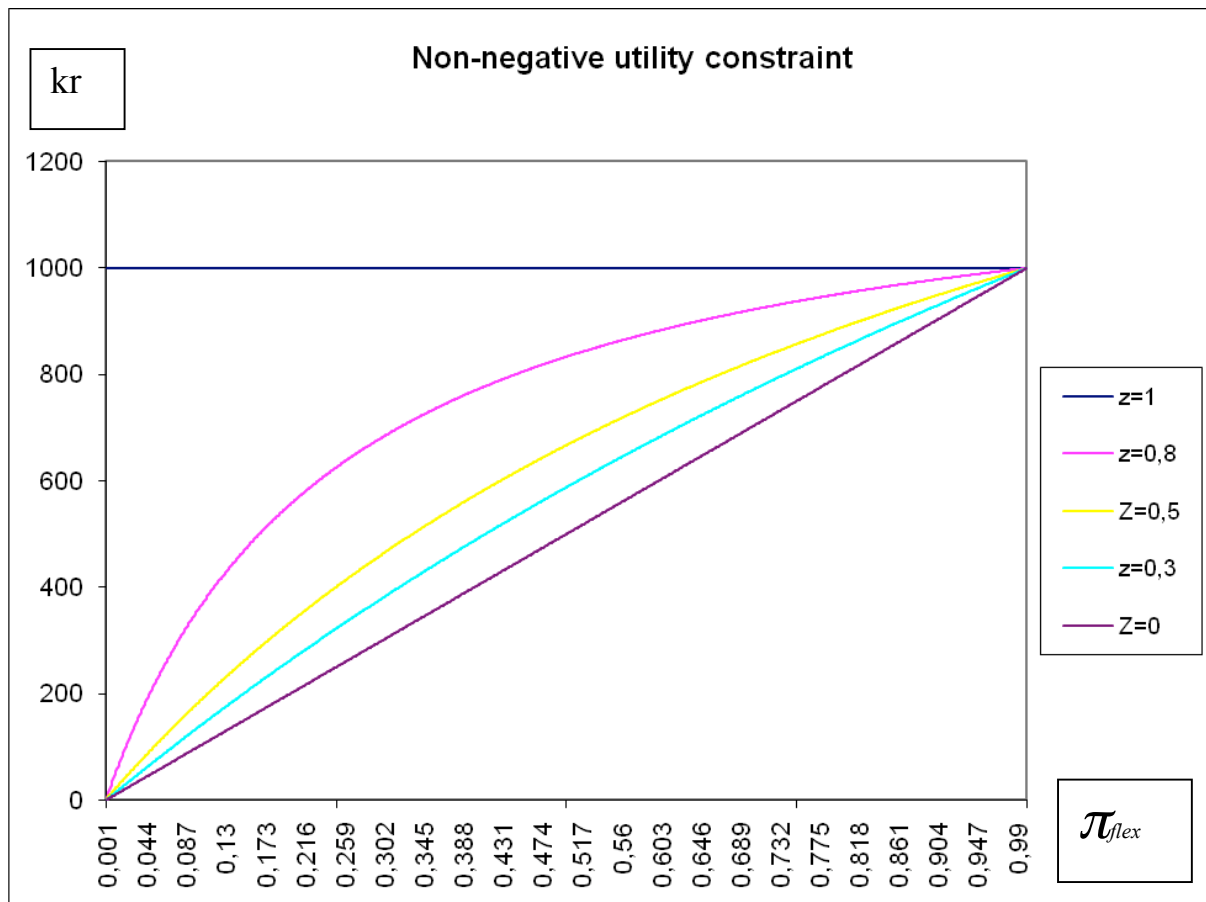
Figure 4D.

Figure 8B shows the non-negative utility constraint for the price of a ticket with flexibility (the y-axis) as a function of certainty (the x-axis). The valuation of the consumer has been chosen arbitrarily and is equal to 1000. The figure contains 5 functions each depicting a specific level of flexibility (z-values). For all z-values, except z =1, the function takes the value 0 when certainty of demand equals 0. This follows that a consumer incurs a certain loss for all positive prices when z is less than 1 and certainty of demand is 0. The greater the money returned from not flying (the greater the level of flexibility) the higher the price that the airline is able to charge for a ticket with flexibility and still comply with the nonnegative utility constraint for every level of certainty. It can also been seen that the functions converge when the probability of demanding a ticket becomes one. This follows from the fact that the consumer has no need for flexibility when demand is certain.

When the self-selection constraint is binding, p_{spot} the price of a flexible ticket is a mark-up of p_{adv}. This mark-up is clearly decreasing in the certainty of demand belonging to the consumers of tickets with flexibility. This decrease in the mark-up is caused by a decrease in the expected loss of purchasing a ticket without flexibility. As a result the willingness to pay for insurance (i.e. flexibility) decreases.

Figure 4E.
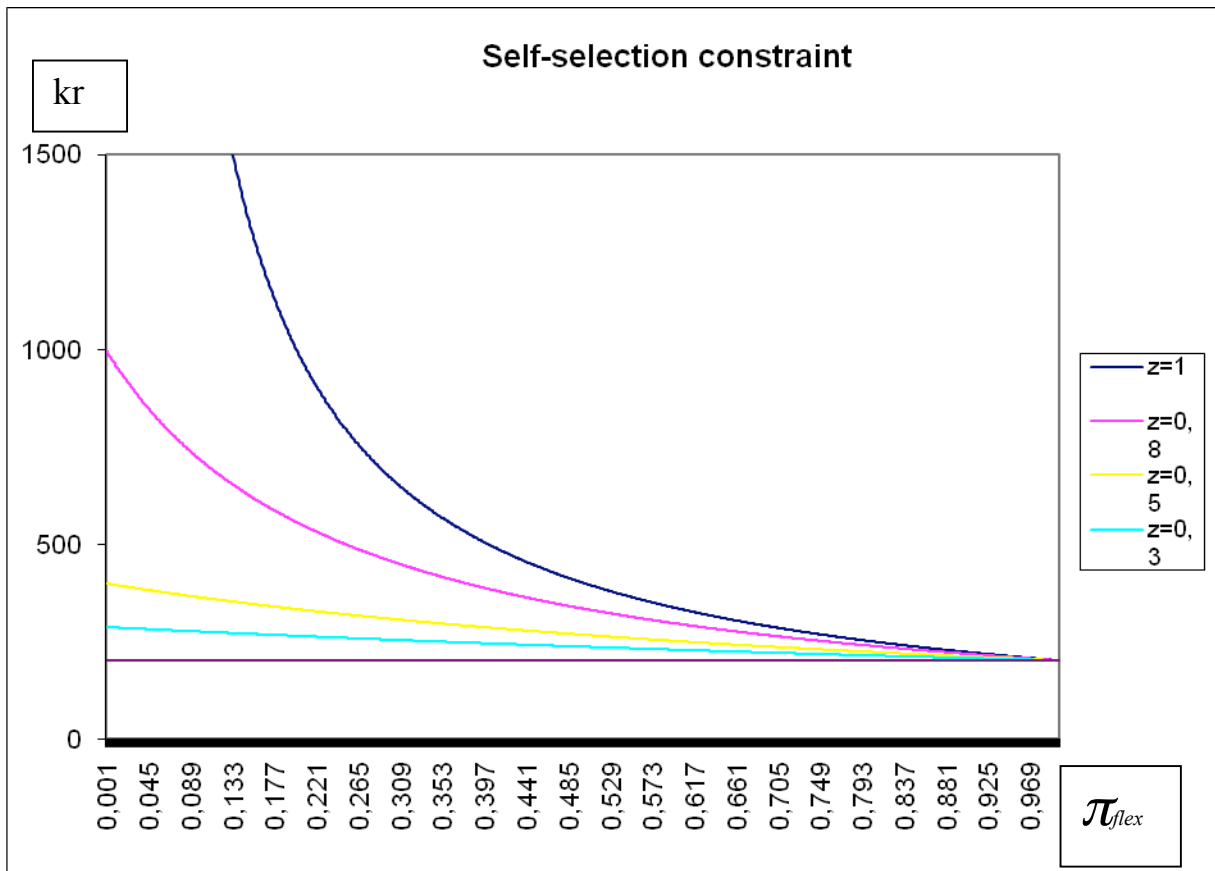
Figure 8C shows the self-selection constraint for the price of a ticket with flexibility (the y-axis) as a function of certainty (the x-axis). The chosen values are the same as figure 8B.

Lastly, from 4.13, it is evident that the price of a ticket with flexibility is weakly increasing in p_{adv}. This implies that the airline wishes to set this price as high as possible, just as in the case of advance purchase discounts.[23]

If the degree of flexibility were to equal one then there would be no incentive for anyone to wait until the spot market if the price of a ticket with flexibility was lower than the price of a ticket in the spot market. Conversely, if the spot-market price is set lower than the price of a ticket with flexibility then consumers would prefer to wait and buy in the spot market. Thus, if z equals one, there will be no separation of the two markets. Following this reasoning, z always has to be less than one and the price of a ticket with flexibility must always be weakly lower than the spot-market price, see Figure 4.F.

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[23] Another similarity with advance-purchase discounts is that the willingness to pay for a ticket with flexibility may be to low for there to be profitable to separate the market. However, if $v_{spot} > v_{adv}$ it is always possible to extract more profit by setting z=1. (However, as already discussed, then it would not be possible to facilitate a separation of the market for flexible tickets and the spot market).

Figure 4.F.
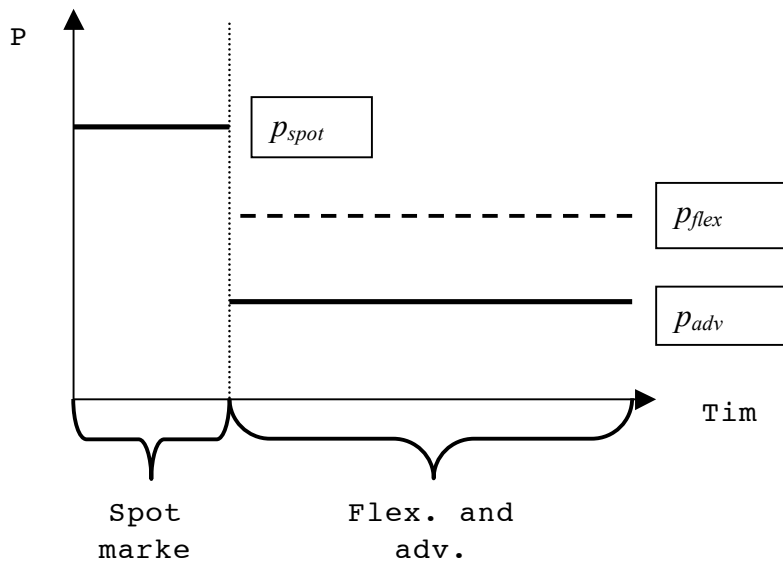
4.4. Summary:

We have in theory shown how easyJet are able to use two forms of price discrimination in order to maximise profit. Within the framework that we have presented (see section 2: Aim), the market can only be separated into three groups (adv, spot, flex) **if** the price of a ticket with flexibility is less than the price charged in the spot market. We have shown that the price should increase closer to departure and that the consumers' willingness to pay should also increase closer to departure. Also that easyJet's profit maximisation is determined by the consumer's valuation of a ticket and his/her certainty of demand for a ticket.

The theory presented above has investigated the restrictions that a monopoly faces when setting the price on different tickets in different time periods. In the presentation of the theory, assumptions were made regarding risk neutrality, rational expectations as well as the structure of the markets. Due to these assumptions, the price expressions derived may not be an actual reflection of real-world methods. For example, that the two theories exclude each other when $z=1$ and tickets with full flexibility are not unusual according to common experience. This incompatibility is most likely due to the assumptions being too restrictive and the validity of these assumptions can thus be questioned. However, we believe that the main insights derived in this section are generally valid.

In order to see if these insights are practiced by our monopoly we have performed an empirical study in which we try to examine the behaviour of price as well as the behaviour of willingness to pay.

5.0.   The Empirical Study:

In this section we will test the aforementioned theories concerning price discrimination in our monopoly framework i.e. how easyJet actively discriminate across different consumer groups based on individual uncertainty of demand. What does the raw data describe and does it describe how differences in consumer uncertainty and consumer valuation interact and counteract to determine prices.

5.1. Questionnaire

We collected raw data from passengers in order to examine if and how the models we have derived describe the model/s of easyJet. The raw data was collected using the following five questions presented in a questionnaire:

1.) *Your reason for Travel?*
2.) *How long-ago did you purchase your ticket?*
3.) *How much did you pay?*
4.) *How much would you have been willing to pay?*
5.) *Does your ticket contain any flexibility?*
6.) *What compensation would you demand if you had to fly six hours later?*

Question 1 and question 6 do not have an effect on the data but were used in this questionnaire. The reason for their inclusion was because we considered the possibility that easyJet may price discriminate between leisure passengers and business passengers and determine their strength of demand. Question 2 is central to this project in highlighting whether there exists an advance purchase discount market. Question 3 is one dependent variable used in analysing price discrimination. Question 4 measures the consumers' willingness to pay whereby these consumers, according to theory, should be willing to pay more the closer to departure. Whether a consumer purchases a ticket with or without flexibility may have an effect on the price and willingness to pay.

The aim of this project was to analyse the possibilities of airlines to discriminate between consumer groups. Considering the theories presented we have derived in the previous section (section 5) we have adapted a questionnaire of the above questions. The data from these questions will hopefully corroborate our models and theories.

The price is an important variable in this project. The amount a consumer pays will be one of the variables in our regression models of price discrimination the others being willingness to pay, flexibility, Monday travel, and the origin where the ticket was purchased. Willingness to pay will play a part of the second-degree price discrimination and advanced purchase discount models. The willingness to pay will be used in sub-analyses of vertical price discrimination and the hypothesis that people with a higher willingness to pay will arrive when the highest price is being paid.

We are not solely interested in collecting price data but foremost which variables have an effect on the price. Considering our models we have chosen to analyse advance purchase discounts and third degree price discrimination, both methods with which an airline can separate markets. Accordingly the variables of interest are time of purchase and origin of flight[24].

Whether a consumer is travelling for business purposes or private purposes is an aspect we will not use in this study. Since the main aim of this study is to examine price discrimination under uncertainty; *when* a ticket is purchased will be a independent variable throughout our models examining price paid as well as those examining how much a consumer would have been willing to pay.

5.2. Data

We could 'only' collect 92 observations at Copenhagen's airport, Kastrup. The entire data collected is provided in the section 10.0. (**attachment 10.2**)

The variables collected are the price of the ticket per consumer (price) and how long before departure the ticket was purchased (prebook). Since people stated the price in their local currencies we have chosen to use the exchange rate at the date of purchase in order to convert all the monetary values into Swedish Krona. Similarly, the willingness to pay has been converted to Swedish Krona and adjusted to the exchange rate of the date of purchase. The two other variables include dummy variables for partial and full flexibility and a dummy variable, equal to 1, if the passenger travelled from Stansted to Copenhagen return. The

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[24] The market for round-tickets from London can be thought of as separate to the market for round-tickets from Copenhagen.

reason for travel also exhibits a dummy variable whereby the dummy 1 is equal to a business traveller.

Figure 5A below shows the distribution of price against time. It is clear from the exponential trend line that price does indeed increase the closer to take-off (zero).

Figure 5A.
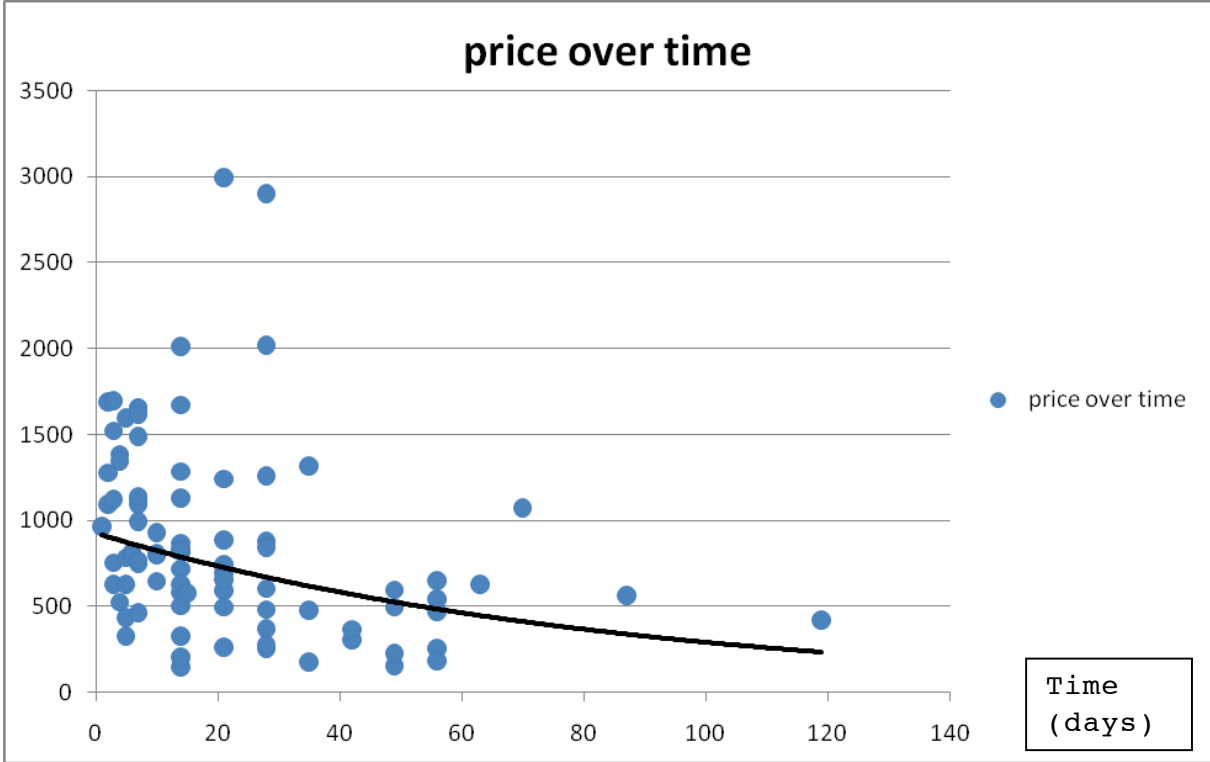
Table 5A, below, includes some of the data's tendencies. Flight 1 and flight 4 departed on Mondays whilst flight 2 and flight 3 were Wednesday departures. Studying the mean prices; flights on Monday were cheaper. Flights on Monday also had the lowest variance of price.

Wednesday passengers were willing to pay more for their tickets than those travelling on Monday. In general over half of the passengers purchased a ticket in England. Their average willingness to pay is more than the average price they paid except on flight 1. This is most likely an irregularity because it is difficult for an individual to determine their willingness to pay.

Table 5A.

		Flight 1	Flight 2	Flight 3	Flight 4	Combined
Price	*Mean*	625.2	937.1	1135	798.1	865.6
	Median	468.5	823	888.5	631	751
	Standard deviavtion	453.9	607.7	680.7	333.1	550.7
Willingness to pay	*Mean*	605.6	1387	1177	1078	1048
	Median	439	1282	1261	632.2	798
	Standard deviavtion	466.5	1093	640.2	1019	901.3
Flexibility	*Nr purchased*	1	7	4	5	17
Origin Eng	*Nr of passengers*	7	14	13	8	47
		n= 26	n = 25	n= 18	n= 23	n= 92

As is seen in figure 5.B.below the exponential trend line increases the closer to departure. Whilst there are many more consumers that enter the market closer to departure (as opposed to far in advance of take-off) their willingness to pay increases.

Figure 5B.
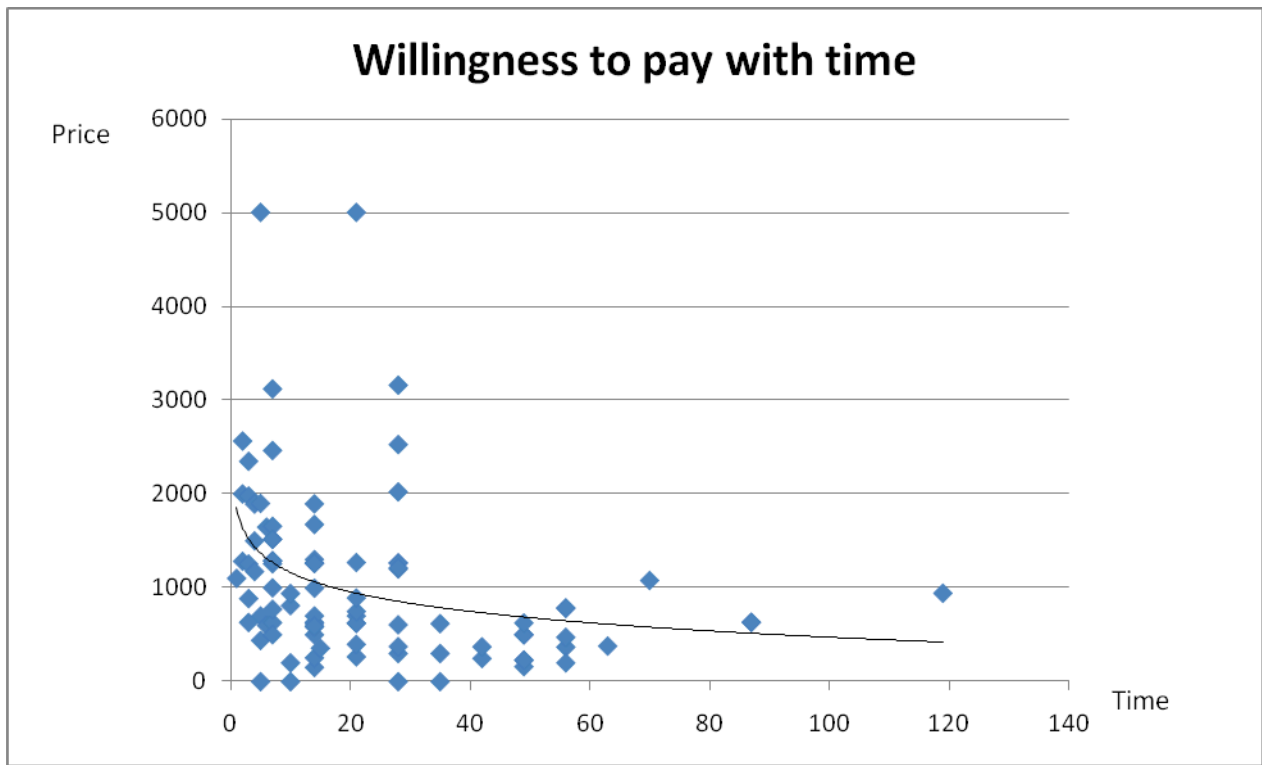
Wednesday passenger purchased more tickets containing flexibility whilst figure 5B below shows us the distribution of tickets purchased with flexibility, leading up to take off, increases gradually. This might have suggested the presence of multicollinearity in our data, however, testing showed no significant presence of this

Figure 5C.

Distribution of tickets with flexibility
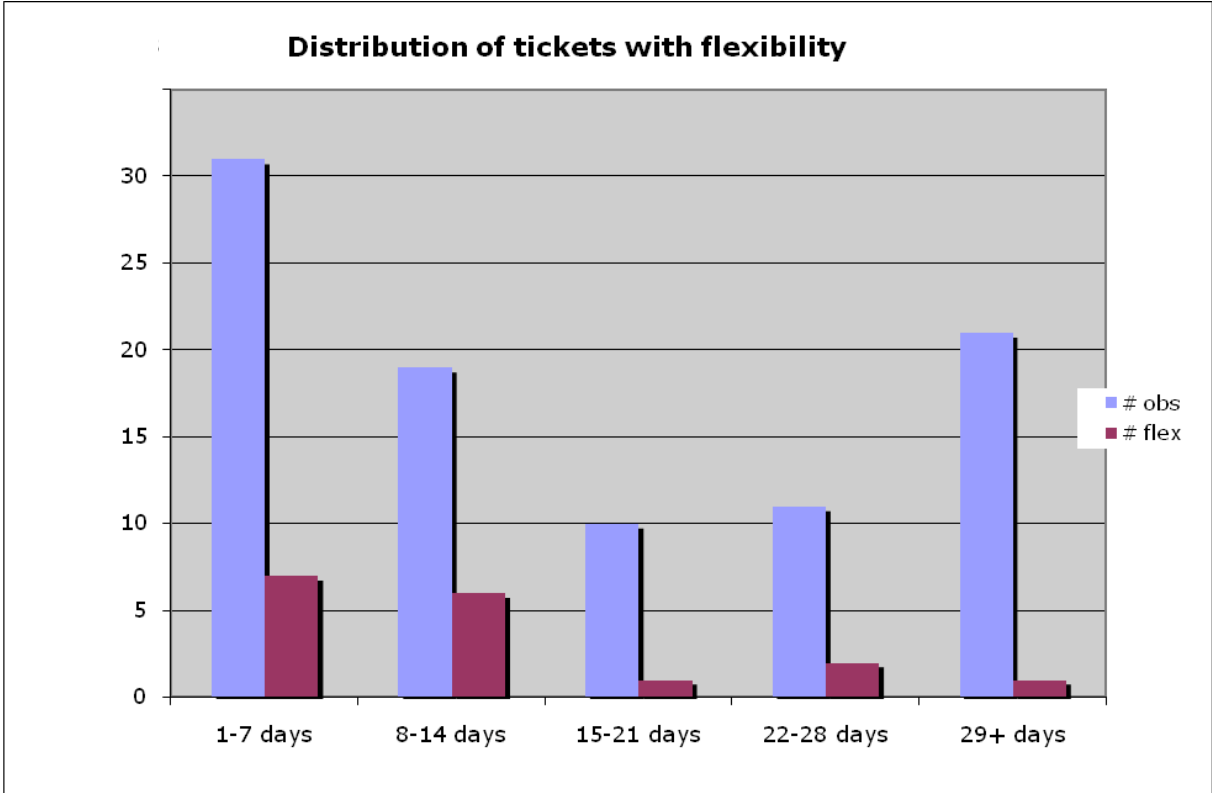
Quantitatively there are discrepancies in the raw data. The number of observations is too few and had we had more, the regressions would have had more power and better size. Whether or not people answered correctly is a big determinant on the results but unearthing if people had misinterpreted or answered falsely is unreasonable if not impossible.

5.3. Choice of Variables

In our statistical and regression analysis we have chosen to focus on the determinants of price and willingness to pay. Using standard OLS regression[25] we have tried to estimate the best functional form describing the underlying population behaviour of price and willingness to pay. With reference back to the theory (section 4) we can deduce which variables we need as our regressors. In order to see whether there exist any *advance purchase discount* discrimination we need to unearth whether tickets purchased long in advance are cheaper than tickets purchased close to departure. The natural regressor in this case is *time*.

Secondly, for *flexibility* we will use dummy variables for flexibility and full flexibility. This means that our base case[26] occurs when a ticket does not include flexibility. According to our models however the price that an airline can charge for flexibility changes with the consumer's certainty of demand.[27] In order to view if any such effect occurs we construct a variable where we multiply the time variable with the respective dummy variables for flexibility.

Thirdly, since it is possible that our airline discriminates between consumers flying in different directions we will use a third dummy variable, *origin eng.* The sign of the coefficient of this dummy variable will indicate if passengers flying from Stansted pay more/less/equal than passengers flying from Kastrup. If the price paid by passengers differs then this will specify a form of third degree price discrimination namely a geographical separation of markets.

Finally, since our observations are gathered for flights departing on Mondays and Wednesdays we will us a dummy variable indicating *Monday travel* to see if easyJet charges more depending on which day passengers choose to fly.

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[25] See section 5.2.1. OLS Regression

[26] The base case is defined as the situation in which all dummy variables are equal to zero.

[27]This is due to the fact that the price-constraint changes with uncertainty of demand. Willingness to pay for flexibility (as a mark-up of p_{adv}) will be indirectly related to the certainty of demand (see section 4.3. Price constraints for tickets with flexibility).

The dependant variables in our regressions will be price and willingness to pay. Price will be a dependant variable because it is the main focus of this thesis. However willingness to pay is one of the factors that decides the price of a ticket (with or without flexibility).

5.4. Regression; results and analysis

The regression method used in this analysis is that of least squares. We will also use diagnostic tests in order to check the specification of our models as well as checking for presence of heteroscedasticity and/or autocorrelation. The results for our regressions concerning price and those concerning willingness to pay will be discussed separately.

We have set out below a table showing the estimators effect on price. In the last two columns we have included the adjusted R-squared[28] and the probability from The Ramsey RESET Test[29]. **Prebook** is the number of days before departure. **Flexibility** covers a degree of the cost or the entire cost of the ticket should the passenger not use the ticket. **Origin England** indicates whether a passenger has purchased the ticket in England and in English Sterling Pounds. **Monday travel** indicates that a passenger has chosen to fly on a Monday as opposed to a Wednesday.

Table 5B.

Independent variables	Model 1	Model 2	Model 3	Model 4
C	970.2***	7.037***	977.9***	7.041***
Prebook	-5.529**		-5.823**	
Log (prebook)		-0.2140***		-0.2156***
Incl. flex ticket	125.6	0.1717	103.1	0.1626
Origin England	224.6*	0.3413***	225.0*	0.3422***
Monday travel	-194.7*	-0.1579	-196.2*	-0.1589
Prebook*flex ticket			1.126	0.0004
Adjusted R-squared	0.1805	0.2788	0.1714	0.2705
RESET	0.5268	0.5610	0.5115	0.5613

*** significant to 1%; ** significant to 5%; * significant to 10%

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[28] The R-squared value measures "the goodness of fit" of a model i.e. to what extent the model explains the value of the dependant variable. The R-squared measures from 0 to 1 where 1 implies a perfect fit.

[29] The test was performed with two fitted terms.

In Table 5B we present the regression results for the first four models describing the price of a ticket. Model 1 and Model 3 have price as their dependent variable whereas Model 2 and 4 have the natural logarithm of price as their dependent variable. The Ramsey RESET test gives no reason to reject any of our specifications; we were also not able to detect autocorrelation or heteroscedasticity[30] in any of them.

All four specifications strongly argue that the price is decreasing as time to departure increases. This implies that easyJet utilises advance purchase discounts to separate the market for tickets. Moreover, the regressions support, statistically, a geographical separation of the market; people flying from London tend to pay more for their tickets than those flying from Copenhagen.

Regarding *Monday travel,* Model 1 and Model 3 are the only models whereby the variable has any statistical significance. However, all specifications have in common a negative estimated coefficient, indicating that it is cheaper to travel on a Monday. A reason for cheaper flights on Mondays could be that there are a lot of weekend travellers returning to England on these flights.[31]

The variables that we cannot accept in any of our specifications are those concerning flexibility. Even though they are not statistically significant, the sign of these coefficients are correct according to theory. In all cases the coefficient of the flexibility dummy is positive, suggesting that consumers do indeed pay more for tickets with flexibility. Furthermore, estimates show a small tendency for the mark-up to increase with time to departure, something that we expect if the ability to charge a mark-up is inversely related to individual certainty of demand.

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[30] When using the White Test we included the cross-terms.

[31] Tickets sold with the requirement of weekend stay-over are usually less expensive (see Stavins, J. (2001))

Table 5C.

Independant variables	Model 5	Model 6	Model 7	Model 8
C	1313***	7.299***	1342***	7.381***
Prebook	-8.446**		-9.532***	
Log (prebook)		-0.2388***		-0.268***
Incl. flex ticket	517.0	0.3110	433.7	0.1345
Origin England	162.2	0.3659**	162.6	0.3823**
Monday travel	-349.8	-0.3010*	-355.7	-0.3194*
Prebook*flex ticket			4.113	0.0086**
Adjusted R-squared	0.1746	0.3598	0.1667	0.3365
RESET	0.0107	0.5512	0.0067	0.7241

*** significant to 1%; ** significant to 5%; * significant to 10%

Regressions with willingness to pay as a dependent variable, Model 5 and Model 7, are shown in Table 5C. Model 6 and Model 8 have the natural logarithm of willingness to pay as their dependant variable. Obviously we are forced to reject Model 5 and Model 7 based on the RESET test, i.e. they do not seem to be well specified. However we are not able to reject the specification of models 6 & 8. In both of these cases heteroscedasticity was detected and we thus re-estimated them using White standard errors (it is the result from these re-estimates that are presented in Table 5C.).

Referring to Table 5C we reject the null hypotheses for the variables *Log(Prebook), Origin England* and *Monday travel* in both of our remaining models. Thus, consumers purchasing in advance have a lower willingness to pay, as do those travelling on Mondays and from Copenhagen. In addition, we are able to reject the null for our variable *Prebook*flex ticket* in Model 8. Again this coefficient is positive, thus supporting the hypothesis that people are willing to pay a larger mark-up far in advance.

As is the case in Model 1-4, we are not able to reject the null for the flexibility dummy in any of our regressions (although they have the expected sign). However, this is not unreasonable as the dummy variable shifts the intercept of the price line. If we assume that at the time of departure consumers are certain whether they want a ticket or not then we would not expect

people to be willing to pay a mark-up at this date. Thus it does not contradict the theory that this coefficient is zero as long as the coefficient on *Prebook*flex ticket* is positive (figure 5D).

Figure 5D.

```
Log(willingness
to pay)
```



```
                                        ticket with
                                        flexibility


                                        ticket without
                                        flexibility

                                                    t
```
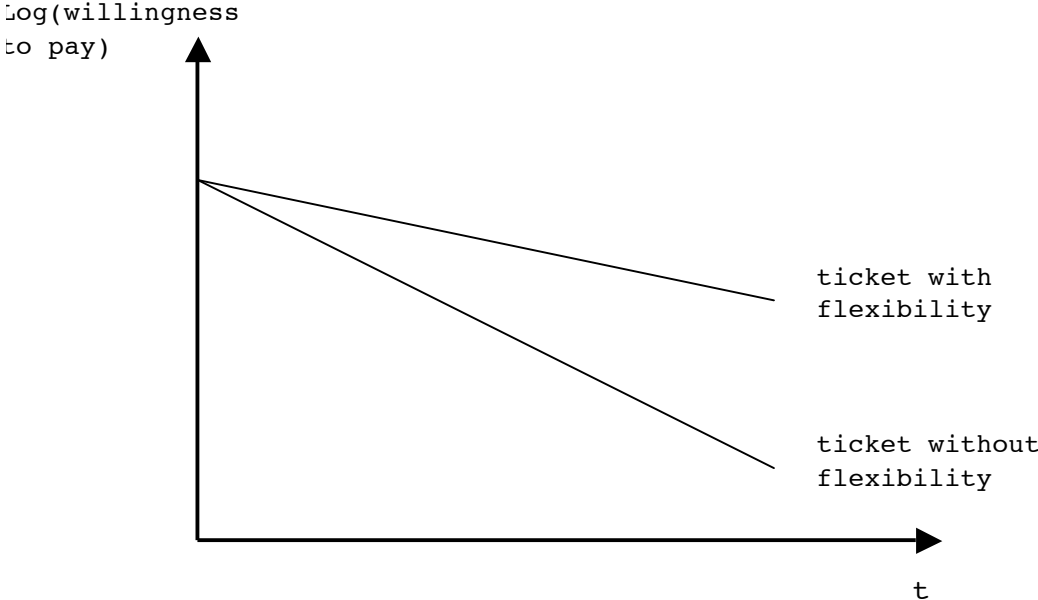
5.5. Summary of the Empirical Study:

The empirical study presented in this section was based on data collected at Kastrup from passengers about to fly to Stansted Airport in London. The data gives statistical support for a separation of the market, for the concerned route, based on geographical origin and time of travel. In addition it appears as though easyJet makes use of advance purchase discounts in their pricing.

That which was disappointing regarding the results was that we were not able to detect price differences between tickets with flexibility and those without (which is contrary to casual observation), but this is most likely due to poor data quality. Moreover, the analysis showed that willingness to pay follows the same pattern as price. If this is the case or because it is the problem of assessing one's willingness to pay is not possible to tell from this study[32].

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[32] Diamond, P. A. and Hausman, J. A. (1994).

6.0.   Conclusions

The aim of this study was to examine if and how it is possible for an airline to actively discriminate across different consumer groups based on individual uncertainty of demand. Specifically, we wanted to investigate consumer characteristics before and during the consumption of a ticket.

1. **How does price change with time?**

2. **Why does price change with time?**

3. **How does an individual's willingness to pay differ across time?**

4. **Under what conditions does there exist a possibility to charge different prices?**

According to the price constraints (which were derived in section 4.3) the price should be higher closer to departure. The underlying reason for this would be that consumers are more certain of their demand closer to departure. Even though we were not able to quantitatively analyse certainty of demand our data implies that tickets purchased far in advance are cheaper (the negative coefficient on the prebook variable). This would not be possible if the certainty of demand of at least some consumer groups did not increase.

We derived price constraints regarding tickets with and without flexibility. The theory suggested people would choose to fly with flexibility if the expected utility from purchasing such a ticket is greater than the expected utility of purchasing a ticket without flexibility. We could not statistically prove that consumers pay more for flexibility. The results (by examining the positive coefficients of flex) suggested that the price of tickets with flexibility is higher. While the absolute cost of flexibility decreases with time to departure, the percentage mark-up of flexibility relative to a ticket without flexibility tends to increase (according to the signs of prebook*flex in models 3 and 4).

According to both the theory and empirical analysis consumers have a higher willingness to pay closer to departure. Empirically our data shows that consumers are willing to pay relatively less for a ticket including flexibility the closer to departure i.e. the mark-up that consumers are willing to pay as a percentage of the price of a non-flexible ticket decreases. This mark-up tends to zero as the time to departure decreases. This is what one would expect

if consumers become more certain in their demand as time goes by In our theory awe have shown an individual's willingness to pay for a ticket is determined by the valuation and the uncertainty of demand as well as the degree of flexibility of the ticket. In our empirical analysis we cannot separate willingness to pay into uncertainty of demand and the independent valuation.

Throughout this paper the subject of interest has been the price of an airline ticket and its determinants. We have derived price constraints that describe the interaction between different determinants. These derivations are based upon assumptions regarding consumers; risk neutrality, rational expectations, and no correlation in individual demand. These price constraints gave us an indication of how prices for different tickets would develop over time.

To summarise, when aggregate demand is certain, that which is discussed in the theory, the profit maximisation problem of an airline (operating as a monopoly) becomes a conventional monopoly problem. With this the airline's profit maximisation is determined by characteristics belonging to the consumer i.e. the valuation of a ticket and the consumer's certainty of demand for a ticket. These demand uncertainties may be found within all three consumer groups i.e. the flexible market, the advance purchase market and the spot market. But in order for there to exist a separation of the market it is only necessary that demand uncertainties are found within some consumer groups.

7.0.   Evaluation

The evaluation will be divided firstly, into a qualitative evaluation followed by a quantitative evaluation.

Qualitatively there have been very few studies based on the low-fare airline market and their subsequent pricing methods within Europe. Thus we felt it necessary to use James Dana's working paper on <u>Advance-Purchase Discounts and Price Discrimination in Competitive Markets</u> as a basis for many of our models. Yet Dana's working paper is based upon competitive markets whereas we have made the assumption that easyJet operates a monopoly market (Kastrup to London Stansted).

Effectively, what we have derived are models from one market structure (competitive markets) and argued for their existence, based upon reasonable assumptions, in a non-competitive market using economic theory. It could be argued that this was not an optimal method given the different market structures because what may be true for one market structure may not be true for a different market structure.

The results give us indications regarding our models and their usability in this case, yet they are only indications. In some cases the variables are not statistically significant. In these cases we have used the signs of the variables to suggest behaviour. Lastly, the questionnaire did indeed include a question that was not directly related to the aim. Removing question 1, 'Your reason for travel' had no bearing on our results and could have given the consumers who answered a clearer questionnaire.

Recently, there have been discussions of companies using individual customers' IP addresses (Internet Protocol address) to assess consumer behaviour. If easyJet were to be actively analysing customers' IP addresses they would be able to determine their willingness to pay and therefore maximise profit without using different markets.

Currently there exists fewer actors on the low-fare airline market within Europe. This does undoubtedly have an effect on the price of flying with easyJet. Whether or not this effect is beneficial or not to the consumer is a different argument. Secondly, the 'economic slowdown' and its bilateral effects have already caused damage to one low-fare airline. Due to increasing

prices of oil and increased aviation tax, easyJet was forced to increase their revenue to cover their subsequent costs. This in turn would have exaggerated the cost on to the consumers.

8.0. Attachments

Attachment 8.1.

An appendix of mathematical notations:

i   An index for consumer/individual or potential consumer/individual

c   The constant marginal cost

k The constant marginal cost of capacity

n   The number of different consumer groups/individuals.

N   The number of consumers/individuals within one group.

N_i The number of consumers/individuals within group i.

p   The price

p_i The price of a ticket consumed by consumer/individual i.

q   The quantity

q_i The quantity sold to consumers/individuals of type i.

v_i The valuation of consumer/individual i.

x   Often indicates a variable/good in a general model.

z   The quality of a product as a variable.

$\underline{z}_i$ The lower boundary of quality consumer/individual i is prepared to purchase.

$\max_z \prod$ The maximisation of profit with respect to the variable z.

$\sum_{i=1}^{X} x_i$ Indicates the sum of all x_i between i = 1 and i = X

π Probability of a consumer/individual

θ_s The probability of demand state s occurring.

Θ_j The probability that a demand state of order j or lower will occur.

 i   In theoretical work this refers to the elasticity of demand. In econometrics this refers to the error term in a population.

ϕ_{is} The probability that consumer/individual i will want a ticket if state s occurs.

Attachment 8.2.

Time before departure	Price SEK	Partial Flex	Full Flex	Willingness to pay	Origin England	Private/business travel	Monday travel
1	970	0	0	1100	0	1	0
2	1282	1	0	1282	1	1	0
2	1100	0	0	2000	0	0	0
2	1692	0	0	2563,636	1	0	0
3	1127	0	0	1253,615	0	0	1
3	1701	0	0	1977,907	1	0	1
3	1526	1	0	2347,692	1	0	1
3	757	0	0	630,8333	0	0	1
3	632	0	0	884,8	1	0	0
4	1388	0	0	1892,727	1	0	0
4	528	0	0	1173,333	1	1	1
4	1350	0	0	1500	0	0	0
5	630	0	0	700	0	1	0
5	785	0	0	1899,194	1	0	0
5	329	0	0	N/A	0	0	0
5	1600	1	0	5000	0	0	1
5	439	0	0	439	0	1	1
6	823	1	0	1646,127	1	0	0
6	800	0	0	600	0	0	1
7	754	0	0	628,3333	0	1	1
7	1129	0	0	1255,84	0	0	1
7	1099	0	0	1000	0	0	1
7	771	0	0	771	1	0	1
7	1656	0	0	1656	1	0	0
7	1492	0	1	1517,288	1	0	0
7	1492	0	1	1517,288	1	0	0
7	1146	0	0	1287,64	1	1	1
7	1661	0	0	1287,597	1	0	1
7	999	0	0	500	0	0	1
7	468	0	0	2463,158	1	0	0
7	1622	1	0	3119,231	1	0	0
10	800	1	0	200	0	0	0
10	933	1	0	N/A	1	0	0
10	810	0	0	810	0	0	1
10	651	1	0	938,9423	1	1	0
14	821	0	0	1894,615	1	0	0
14	330	1	0	500	0	0	0
14	1675	1	0	1675	1	1	0
14	150	0	0	151	0	1	0
14	209	0	0	253,3333	0	1	0
14	872	0	0	1263,768	1	1	0
14	834	0	0	622,3881	0	0	1
14	584	0	0	584	1	1	1
14	722	0	0	995,8621	0	1	1

Time before departure	Price SEK	Partial Flex	Full Flex	Willingness to pay	Origin England	Private/business travel	Monday travel
14	1288	1	0	1301,01	1	0	1
14	505	0	0	631,25	1	1	0
14	632	0	0	700	0	1	0
14	2018	0	0	1261,25	1	1	0
14	1134	0	0	1260	0	0	1
14	828	0	0	591,4286	1	0	1
15	582	0	0	356,3265	1	1	1
21	700	0	0	700	0	1	0
119	424	1	0	942,2222	0	1	1
21	3000	0	0	5000	0	1	0
21	265	0	0	265	1	1	1
21	596	0	0	397,3333	1	1	1
21	748	0	0	623,3333	0	0	1
21	498	0	0	622,5	0	1	1
21	661	1	0	748,3019	1	1	0
21	892	0	0	892	0	1	0
21	1244	0	0	1269,388	1	1	0
28	486	0	0	1200	0	1	0
28	260	0	0	300	0	1	1
28	374	0	0	374	0	1	1
28	280	0	0	N/A	0	1	1
28	2906	0	0	3158,696	1	0	0
28	885	0	0	1264,286	1	1	0
28	847	0	0	1264,179	1	0	0
28	2022	0	0	2022	1	1	0
28	1263	0	1	2526	0	0	1
28	606	1	0	1212	1	0	1
28	606	0	0	606	1	1	1
35	1322	0	0	N/A	1	0	0
35	180	0	0	300	0	1	1
35	482	0	0	617,9487	1	1	1
42	308	0	0	246,4	0	1	1
42	371	0	0	371	0	1	1
49	160	0	0	160	0	1	1
49	229	0	0	229	0	1	1
49	229	0	0	229	0	1	1
49	599	0	0	500	0	1	1
49	599	0	0	500	0	1	1
49	500	0	0	625	0	0	1
56	547	0	0	781,4286	1	1	0
56	258	0	0	368,5714	0	1	1
56	189	0	0	200	0	1	1
56	655	0	0	786	1	1	0
56	473	0	0	473	0	1	0
63	631	0	0	379,3587	0	1	1
70	1078	0	0	1078	0	1	0
87	569	0	0	632,2222	0	1	1
87	569	0	0	632,2222	0	1	1

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