The Impact of an Old Fleet on the Demand for Air Transportation: The Case of VASP Brazilian Airlines.

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Abstract

In 05/25/1982, the VASP aircraft broke in two after a hard landing killing 2 people. The pilot's misuse of rain repellant, caused an optical illusion leading to the hard landing. Since that day, VASP started to have constant problems. A brief history about VASP is discussed. After so many problems, VASP lost its market share and became the 4th airline of Brazil, VASP used to be second place. With financial problems, VASP could not buy new airplanes and its fleet was from the 70-80s. This paper aims to study if an old fleet could affect the demand for air transportation.

Introduction

The *Viação Aérea São Paulo*, known by the great public as VASP Brazilian Airlines, was created in November of 1933, in São Paulo. The company at first was investor owned and its first planes were two Monospar, bought from an English airline.

Even though it had a good beginning, the company had constant losses and the only solution to solve the crisis was asking for government help. On March of 1935, the São Paulo government agreed to help the company, not lending money but making it a public company owned half by the state and half by the city of São Paulo. The VASP owners agreed with that decision, because it was the only way to avoid bankruptcy.

After decades under government control, in 1988, the São Paulo state told the press that it wished to privatize the company because it still had monthly losses. On October of 1990, on a public auction, the VOE/CANHEDO group, represented by the Canhedo Group and the VASP employers, bought the company for US$44 million dollars. Until today, the company is owned by the VOE/CANHEDO group.

After the reelection of Fernando Henrique Cardoso as President of Brazil, the brazilian central bank decided to devaluate its currency and the airlines suffered a lot because its debts were in US dollars. One of the biggest problems that VASP faced was that it had earnings on brazilian currency and had costs in US dollars.

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While VASP was facing all this trouble, in 2001, the "low fare airlines boom" arrived in Brazil. The GOL Linhas Aéreas was a mimic of Jet Blue[1]. Its prices were at least 40% less than the airlines operating in Brazil and it did attract costumers. The meal served inside the plane is quite simple, just cold sandwiches and cereal bars.

VASP that could not compete with the brazilian biggest airlines, VARIG and TAM, now had a competitor: GOL. At the end of 2002, GOL passed VASP on the brazilian airline market, making VASP the 4th brazilian airline, after VARIG, TAM and GOL.

Recently, one of VASP airplanes had problems while flying to Fortaleza airport, Pinto Martins. A week later, another airplane flying from São Paulo to Curitiba had problems after landing. The land crew tried to fix the problem and after it took off to continue the flight, the planes remained and the plane had to go back to Curitiba[2]. One of the biggest brazilian newspapers said that the VASP fleet was from the 1970s. The VASP frequent flyers were shocked. Nowadays, VASP and GOL compete for the third place of the brazilian airline market.

Methodology

According to the microeconomics theory, the demand for a certain object depends on the price, the price of other similar object and the budget constraint. To help the study, the quality of services offered by the airlines besides the ones discussed above, we can include the *frequency delay*[3] and flight time[Young(1972) and Anderson & Kraus(1981)].

Our aim will be to analyze how the quality of services can affect the demand for air transportation[Douglas & Miller(1974), Anderson & Kraus(1981) and Trapani & Olson(1982)].

A possible doubt that can come one your mind is how a passenger could measure the age of the airline that he is fixing to board. The answer it is simple. An older airplane looks are not good. It looks like it had received a complete patchwork. Indeed, an old airplane with those kinds of looks could worry some of the passengers.

The data analyzed will be about the Rio de Janeiro – São Paulo flight, because it's a major airline route. Three hundred thousand people use this route monthly. As discussed earlier, VASP tries to get back the third place of the brazilian airline market, so our data will just include GOL and VASP passengers. For the Rio de Janeiro – São Paulo route, time is very important because the major part is businessmen. We will assume that t is the complete flight time, including flight time, time needed to get to the airport and the schedule delay[4]. Assuming that t is a function of F, the number of flights offered by the airlines composes it.

$$t = t(F); \frac{\partial t}{\partial F} < 0 \quad (1)$$

[1] Chris Isidore(2002)
[2] Folha de São Paulo newspaper, may 2004.
[3] The absolute difference between the most desired time to fly and the flight time.
[4] Same as frequency delay; see Douglas & Miller(1974)

The demand for flights of the Rio de Janeiro – São Paulo route will be a function of the place ticket price *p*, the complete flight time *t* and an X variable that measures the quality of services offered.

(2) $$Q = Q(p + t(F), X)$$

Where *Q* is the number of plane seats demanded.

Following Gronau[5], the full price is $\theta = p + t(F)$ and it follows:

(3) $$\frac{\partial Q}{\partial p} = \frac{\partial Q}{\partial q}\frac{\partial q}{\partial p} = \frac{\partial Q}{\partial q} < 0$$

(4) $$\frac{\partial Q}{\partial F} = \frac{\partial Q}{\partial q}\frac{\partial q}{\partial F} = \frac{\partial Q}{\partial q}\frac{\partial t}{\partial F} > 0$$

As can be seen, the impact of the price on the demand for air transportation is negative and the impact of the number of flights offered is positive as we expected.

The flight time between Rio de Janeiro domestic airport and São Paulo domestic airport is about 45 minutes. The difference between the speed of the airplanes used on this route is minimal, so we assume as zero. The difference in time of the flights of GOL and VASP are also minimal, so we assume it to be zero as well. Both airlines have the same schedule delay. After that we eliminate the variable *t* of our demand function and the new demand is:

(5) $$Q = Q(p, X)$$

The new demand of the VASP and GOL passengers is function of the price and the quality of services. The offered prices of both airlines are also alike. It does not have mileage programs and it just operate domestic flights.

The services provided by these airlines are quite alike, so we now assume that the demand will be just function of the price.

(6) $$Q = Q(p)$$

[5] Gronau(1980)

We cannot forget that the "age" of the fleet could affect the demand for air transportation of these airlines. GOL uses on this route Boeings 737-700[6] and it's from the 90s while VASP uses 737-200/300 from the 70s. We will assume on this model that as old the plane is more hours it had flight. The budget constraint of the passenger will not be considered because we are going to use the Taaffe ´s passenger definition[Taaffe(1962)] this reference may be old, but it had not changed much since now. The demand for GOL passengers could include others aspects because it can compete with VARIG and TAM, however VASP can just compete with GOL and its demand would be:

(7) $$Q_{VASP} = Q(p_{VASP,} p_{GOL,} J)$$

The variable J represents the airplane "age".

We expect in our model that the airplane "age" affects negatively the demand function:

(8) $$\frac{\partial Q_{VASP}}{\partial J} < 0$$

The econometric model needed to solve this puzzle is called *linear probability model(LPM[7])*. We want to see the impact(d_j) on the probability of success when the dependent variable(x_j) suffers some variation:

(9) $$\Delta P(y = 1|x) = d_j x_j$$

Mutatis mutandes, the variation on the probability of failure:

(10) $$\Delta P(y = 0|x) = 1 - \Delta P(y = 1|x)$$

After knowing what to use to solve this puzzle, we now can come up with a regression equation to measure the effects of the "age" of the plane on the demand for air transportation.

(11) $$flyvasp = y_0 + y_1 price + y_2 planeage + y_3 planeage^2 + e$$

[6] For further information visit Boeing website.
[7] Wooldridge(2002)

Where *flyvasp* is a *dummy* variable that assumes 1 if the passenger flew VASP and 0 if the passenger flew GOL. The dependent variable *price* represents the price paid by the passenger to fly(R$). The variable *planeage* represents the "age" of the airplane that the passenger used.(years). y_0 is the intercept of the equation while the y_i are the slopes of the dependent variables. The quadratic variable $planeage^2$ was included because we want to study also the positives or negatives marginal effects of the variable *planeage*. The marginal effect would be:

(12) $$\frac{\partial flyvasp}{\partial planeage} = y_2 + 2y_3 planeage$$

After these problems that VASP faced with its airplanes, I think it would be important to analyze if the "age" of the airplane does affect the demand for air transportation. In order to do this I would use cross sectional data. The econometric model used, as discussed above, would be the *linear probability model(LPM).* The estimation method used would be *generalized least squares(GLS).*[8] The need of this method is why we have the risk of facing heteroskedasticy. The Wald test is needed for the variables and the Shapiro-Wilk searching for outliers.

Conclusions

Unfortunately this research could not be finished because VASP went bankrupt and lost its permission to fly in March of 2005. However the model discussed above could be used to study the relationship between the demand of two airlines, just some modifications needed to be done. But indeed I know that this model would be helpful for further works.

[8] Wooldridge(2002)

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