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The effect of the economic crisis on the behaviour of airline ticket prices. A case-study analysis of the New York–Madrid route



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ABSTRACT

The effect of external factors such as the economic situation on airline ticket price behaviour has not been examined in the specialised literature. In this paper, we analyse the effect of the economic crisis on the behaviour of the prices offered via several types of intermediaries over time. We chose to examine the Madrid–New York route because of its high demand which provides us with a sufficient number of flights and it is used for both business and leisure trips. We used round-trip fares posted on-line, from two months prior to departure, in order to replicate real travellers' behaviour when making reservations. We chose flights in 2009 and 2013 departing on 18th June and returning eight days later on 26th June, in order to avoid peak holiday times. The results show that the economic crisis has affected price behaviour both in terms of price level and dispersion, with a clear increase in price level and decrease in price dispersion. Moreover, the economic crisis has reduced the usual marked increase in average price that takes place as the flight departure date approaches.

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1. Introduction

The use of the internet as a channel for sales and finding information has enabled consumers to have more control and consider a wider range of products and prices. Undoubtedly the biggest attraction of an internet search is the possibility of obtaining a lower price, hence in recent years there has been more internet marketing research on the issue of pricing (Ancarani and Shankar, 2009; Sengupta and Wiggins, 2014; Andrés et al., 2014). The internet has led to the emergence of three types of retailers: pure-play internet e-tailers; traditional or offline retailers; and multichannel retailers (Zettelmeyer, 2000).

Probably the sector in which the emergence of the internet has most affected price behaviour is the airline industry. The airline industry uses dynamic pricing and revenue management (RM) systems, and these RM systems often include the practices of inter-temporal price discrimination (Mantin and Koo, 2009). Volatile pricing is typical in these systems in order to mitigate the effect of

consumer behaviour and purchase timing on their revenue. In the literature on airline pricing there are two main focuses: the analysis of the main factors affecting both price dispersion and price behaviour over time. In terms of the former, the main factors affecting price dispersion are considered to be price discrimination, uncertain demand and costly capacity. In terms of the latter, most relevant research is related to revenue management practices; several papers conclude that the proximity of the flight departure date causes an increase in both prices and variability (Gillen and Mantin, 2009).

Moreover, it is necessary to take into account the fact that there are different kinds of retailers and their behaviour is different, reflecting the competition across different channels. In this sense, Zettelmeyer (2000) showed that different price levels between retailers are motivated by the competition between different channels, whereas price dispersion reflects the competition within each channel. Thus, in this paper we have studied both in order to analyse the competition between channels and within each channel.

In terms of the analysis of price levels and dispersion there are several papers that examine the main factors explaining this behaviour. Gaggero and Piga (2010) analysed the relationship between pricing and market structure, while Gaggero and Piga (2011)

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considered the relationship between market structure and price dispersion, concluding that competition and price dispersion are negatively correlated and that fares of flights departing at Christmas and Easter are on average less dispersed. Bergantino y Capozza (2015) found empirical evidence of competitive-type price discrimination. Alderighi (2010) concluded that price dispersion is usually caused by a mixture of elements such as product differentiation, firm and consumer heterogeneity, demand uncertainty, capacity constraints, demand peaks, information asymmetry and search costs.

The economic crisis affects different economic aspects in different countries and accordingly there are a number of papers analysing the effect of the economic crisis on different sectors, products and services. Greenglass et al. (2014) developed a general study that considered the effect of the economic crisis from economic and psychological perspectives; Markovits et al. (2014) the effect of the economic crisis on employees; and Archibugi et al. (2013) on innovation. Clearly, one sector heavily affected by the crisis is tourism and thus there is extensive literature that analyses the effect of the economic crisis on that sector (Smeral, 2009; Song et al., 2011; Alegre et al., 2010; Eugenio-Martin and Campos-Soria, 2014). Nevertheless, none of these papers examine price dispersion or price behaviour in their analysis and only the Cornia et al. (2012) paper analysed the effect of business cycles on price dispersion.

In this paper, we have collected data on fares posted on the websites of different kinds of intermediaries in order to analyse the effect of external factors, such as the economic situation, on price behaviour. We studied round-trip fares for twelve flights on the route between Madrid and New York departing on 18th June and returning eight days later on 26th June, in order to avoid peak holiday times and to obtain a representative sample of the off-peak season. We chose the Madrid–New York route because of its high demand which provides us with a sufficient number of flights. Moreover, this route is used for both business and leisure trips, and the flights on this route considered in this paper did not change much between 2009 and 2013. In the case of New York, we did not specify which airport. We collected this information in 2009 and 2013 in order to construct a database with which to see the effect of the crisis.

Thus, we analyse the effect of the economic crisis on airline pricing behaviour, taking into account the difference between the three typical kinds of retailers that operate in this industry. We graphically illustrate the fares' behaviour showing that the prices increase, there is lower dispersion and in 2013 there was no a clear tendency to increase the price as the flight departure approached, as a consequence of lower competition and demand. In addition, we developed several analyses of variance (ANOVAs) to evaluate differences in the average prices with regards to two factors: kind of intermediary and the economic situation. We find that the economic crisis resulted in a clear increase in airline ticket prices and also led to a clear reduction in price dispersion.

The rest of the paper is structured as follows. In Section 2, we describe the data used in this paper. In Section 3 we analyse the main results obtained with the data collected and finally, in Section 4, we outline the main conclusions and limitations of this paper.

2. Methodology and data

The main objective of this paper is to analyse the effect of economic situation and the kind of intermediary over the price behaviour. In order to compare the average price for each kind of intermediary and economic situation we could use different statistical techniques such as: t-test, analyses of variance (ANOVA) or regression models. The use of t-test is possible when the factor has only two categories, as happens to the economic situation, although

the result obtained with this test is the same as the ANOVA. The ANOVA is a parametric statistical technique that it is used to compare means between datasets obtained for each category of the factor. This method has significant advantages regarding multiple t-tests although the most important is that doing multiple two-sample t-tests would result in an increased chance of committing a statistical type I error. Finally, regression models are usually used when there are several variables to explain the behaviour of other variable and in this case we have only two factors.

Therefore, the characteristics of the information obtained and the research objective of this work led us to use several univariate analyses of variance (ANOVAs) to evaluate differences in the average prices with regards to two factors: kind of intermediary and the economic situation. The main limitations of ANOVA are related with the assumptions about the data, concretely: normality, homoscedasticity and independence. Normality is not particularly important when large amounts of data are handled, as in our case, although there are several nonparametric tests such as the Kruskal–Wallis test and the median test. The homoscedasticity is tested using the Levene statistic; if the assumption of homogeneity of variance is accepted we must use the F-statistic to develop the ANOVA, however if the assumption is rejected we must apply other alternative such as the Welch test. Finally, the samples were obtained independently, although there is little you can do in order to offer a good solution to this problem. Moreover, ANOVA only indicate a difference between groups, not which groups are different. For the latter we would need to use a multiple comparison test.

Thus, in order to analyse the effect of the economic crisis on price behaviour, the first step is to gather data on flight prices. In the specialised literature there are two main sources of information used in the analyses of flight fares: on the one hand, empirical works such as Berry and Jia (2008), Gerardi and Shapiro (2009), Hernandez and Wiggins (2009) and Sengupta and Wiggins (2014) among others, have used data collected by the U.S. Department of Transportation in the “Airline Origin and Destination Survey”; on the other hand, studies by Pels and Rietveld (2004), Giaume and Guillou (2004), Carlsson (2004), Escobari and Gan (2007), are based on data collected from reservation systems. The difference between these two methods is that prices in the databank are realised prices, whereas reservation systems provide only posted prices. In this paper, we use posted prices because they are the most appropriate way to understand how flight fares change on the internet.

We have considered price data for twelve flights on the route between Madrid and New York, in order to study a sufficient number of flights on an in-demand route. Airlines included Air Europa, Iberia, Delta Airlines, U.S. Airways, KLM, TAP Air Portugal and Air Canada.

The time period studied included flights departing on 18th June and returning eight days later on 26th June, in order to avoid peak holiday times and to obtain a representative sample of the off-peak season. The timeframe for the airfares in our database ranges from two months prior to departure, up to the day before the departure date. In order to examine two points of the economic crisis, we have focused on flights with the characteristics and database ranges described previously, in 2009 and 2013; that is, at the point of the first reaction of the companies to the crisis, and at a point during the economic crisis.

The selected airlines offer direct flights and flights with a stopover for the specific route analysed in this paper. We included 50% of each kind of flight. We did not consider a greater number of flights with a stopover because in this case more consumers believed that the cheaper price did not offset the increased flight time. We focused on three intermediaries representing three

Table 1
Flight price descriptive statistics.

	Company		Multichannel retailer		E-tailer	
	2009	2013	2009	2013	2009	2013
Average	462.395	656.999	463.279	681.897	445.735	676.418
Standard Deviation	51.975	40.553	47.921	33.654	43.217	43.212
Median	446.990	648.240	449.260	664.860	436.580	665.360
Minimum	390.220	536.240	397.050	628.610	384.380	626.610
Maximum	572.960	760.290	540.840	795.960	528.170	858.900
Kurtosis	-1.083	1.146	-1.155	1.429	-0.747	4.626
Asymmetry	0.443	0.305	0.440	1.217	0.555	1.818

Source: Own elaboration.

Table 2
Analysis of variance for two factors.

	Sum of squares kind III	df	Mean square	F	Sig.
Adjusted model	4028848.448 ^a	5	805769.690	424.343	0.000
Intersection	1.106E8	1	1.106E8	58234.269	0.000
Kind of intermediary	11592.535	2	5796.267	3.052	0.049
Economic Situation	3997218.518	1	3997218.518	2105.058	0.000
Kind * Situation	19512.988	2	9756.494	5.138	0.006
Error	649411.371	342	1898.864		
Total	1.177E8	348			
Adjusted total	4678259.819	347			

^a R squared = 0.861 (Adjusted R squared = 0.859).

Source: Own elaboration.

Table 3
Levene statistic test for variance homogeneity.

Factor	Levene statistic	df1	df2	Sig.
Kind of intermediary	4.814	2	345	0.009
Economic Situation	10.977	1	346	0.001

Source: Own elaboration.

resulted in the highest concentration of values around the mean and, therefore, reconfirms the lowest price dispersion.

These general characteristics can be explained because the economic crisis has, largely in the case of tourist flights, resulted in a reduction in flights on offer and in the demand for flights. This situation can give rise to: a price increase; lower dispersion; and no clear tendency to increase the prices as the flight departure approaches, as a result of lower competition and demand.

3. Results

Based on the information obtained through the different types of intermediaries, the results of the ANOVA for two factors show that average flight prices differ significantly taking into account the two factors separately and also when considering the interactions (see Table 2).

The results in Table 2 show that there are differences in all the cases considered, although the differences relating to kind of intermediary are less significant. These results require the development of two single-factor ANOVAs that separately examine the kind of intermediary and the economic situation, but with a comparison of the price behaviour relating to the two factors. This is due to the fact that as the economic situation factor only has two values it is not possible to develop a post-hoc analysis. First, we check the statistic that can be used to carry out the analysis of variance for one factor by checking for variance homogeneity. In order to do so, we have used the Levene statistic, the results of which can be observed in Table 3.

The results in Table 3 verify that the variances are not homogeneous and, therefore, that we can use the Welch statistic to

perform the analysis of variance (Table 4).

Comparing the results shown in Tables 2 and 4 we can see how to examine the factors separately. The difference in the average price according to the kind of intermediary is not significant because, as shown in Table 5, the prices offered by the different intermediaries are similar. However, there are significant differences between the average price in relation to the economic situation in 2009 and 2013. We analysed, therefore, the average prices in these two situations via the different kind of intermediaries. The results are shown in Table 5.

As can be seen in Table 5, the results show that there are significant differences between the prices in 2009 and 2013. The difference in the minimum price available for the Madrid–New York flight is €214.635, that is, 46.95%. These results verify the conclusions in Table 4. However, when only examining the kind of intermediary, the difference between the minimum prices offered is €13.513, that is, only 2.4%. Moreover, it can be clearly seen that the prices in 2013 are higher for all the intermediaries and that the highest prices in 2009 and 2013 are offered by the multichannel retailer. On the other hand, the economic crisis has prompted the airlines to reduce prices in relation to the other intermediaries with the lowest price increase between 2009 and 2013; the intermediary offering the lowest prices in 2013 is the airline website whereas in 2009 it was the e-tailer. Therefore, we can conclude that the economic situation has caused the company to reduce prices in order to better compete with the other kinds of intermediaries.

Another important aspect in the analysis of price behaviour is price dispersion: several papers in the literature show a higher dispersion in e-commerce. In this sense, Table 6 shows the price dispersion considering the different kinds of intermediaries and the

Table 4
Analysis of variance for one factor: kind of intermediary.

Factor	df1	df2	Welch	Sig.
Kind of intermediary	2	229.288	0.458	0.633
Economic Situation	1	321.933	1995.003	0.000

Source: Own elaboration.

Table 5
Average flight price.

		Company	Multichannel retailer	E-tailer	Total
All flights	2009	462.395	463.279	445.735	457.136
	2013	656.990	681.897	676.418	671.771
	Total	564.729	578.242	567.042	570.005

Source: Own elaboration.

Table 6
Flight price dispersion.

		Company	Multichannel retailer	E-tailer	Total
Variation Coefficient	2009	0.112	0.103	0.097	0.106
	2013	0.062	0.049	0.064	0.060
	Total	0.191	0.202	0.218	
Gini Coefficient	2009	0.063	0.059	0.054	0.059
	2013	0.033	0.026	0.033	0.032
	Total	0.108	0.114	0.122	

Source: Own elaboration.

Table 7
Flight price average and dispersion (only direct flights).

		Company	Multichannel retailer	E-tailer	Total
Average	2009	542.741	497.469	538.311	526.174
	2013	692.555	724.088	827.586	748.076
	Total	621.523	616.639	690.429	
Variation Coefficient	2009	0.109	0.115	0.129	0.123
	2013	0.073	0.077	0.133	0.128
	Total	0.149	0.206	0.249	
Gini Coefficient	2009	0.055	0.064	0.069	0.067
	2013	0.040	0.041	0.074	0.071
	Total	0.083	0.117	0.142	

Source: Own elaboration.

economic situation. In order to measure the price dispersion we have used the coefficient¹ variation and the Gini coefficient (I_G) as they allow a better comparison.

The results in Table 6 show that, although the values are different, the behaviour of the price dispersion is similar when using either the variation coefficient or the Gini coefficient as dispersion measurement. Thus, we see that the price dispersion is markedly lower in 2013 and that, when we do not differentiate according to the economic situation, the dispersion is lowest on the airline website. Moreover, the e-tailer has the lowest price dispersion at the time of the first reaction to the crisis, although the difference compared to the other intermediaries is not significant. However, the multichannel retailer also shows a lower dispersion in 2013 with similar values in the other two kinds of intermediaries. It is very surprising that the economic crisis has resulted in a clear reduction in price dispersion. Possibly this situation can be explained by a marked reduction in demand and number of flights on offer, which caused a lower price variability.

In this paper we have considered information about direct flights and flights with stopover, so other interesting issue to take into account in the analysis is the possible influence of the demand for the intermediate city in the prices behaviour. Thus, we analyse the average and dispersion behaviour when the analysis is conducted only on the subsample direct flights. Table 7 shows the average and the variation and gini coefficients when only direct flights are considered.

Although, in general terms, the behaviour is similar there are

¹ In formula: Variation coefficient = $S_x/|\bar{x}|$ where S_x is the standard deviation and \bar{x} is the average.

several changes in the value in relation to the different intermediaries that we want highlight. Like when we consider all flights, the prices in 2013 are highest for all the intermediaries. When all flights are considered the highest prices in 2009 and 2013 are offered by the multichannel retailer, while with only direct flights the highest price in 2009 is offered by the company and in 2013 by the e-tailer. As happened when all flights are considered, the lowest price increase between 2009 and 2013 appears in the company with an increase of 42.08%. This price increase is higher than when considering all flights while in the other intermediaries the price increase is similar in percent.

When only direct flights are considered, the price dispersion is similar for company and multichannel retailer where the dispersion is markedly lower in 2013, however, this situation is different in the e-tailers. The lowest price dispersion in 2009 and 2013 appears in the company with a small difference with the multichannel retailer but highest with the e-tailer. Therefore, when we consider all the flights the multichannel retailer shows the lowest dispersion

while considering only direct flights the lowest dispersion appears in the company. Moreover, the price dispersion decreases between 2009 and 2013 in the company and multichannel retailer but it increases in the e-tailer.

In summary, although demand at the intermediate city does not cause large changes in the general price behaviour, we have highlighted some changes that need to be considered.

4. Conclusions and future lines of research

The literature on internet price behaviour includes flights as a key product for analysis. The main reason for this is that a high percentage of flight tickets are purchased via the internet. However, to the best of our knowledge, although there are several papers that analyse aspects related to price behaviour and the principal elements affecting the fares, there are no analyses on the effect of external factors, such as the economic crisis, on price behaviour. In this regard, this paper contributes to the specialised literature by analysing the effect of the economic crisis on price behaviour.

The main conclusions are that the economic crisis has resulted in a clear increase in airline ticket prices and has also entailed a clear reduction in price dispersion. However, the economic crisis has limited the usual marked increase in average price that takes place as the flight departure date approaches. These results assume that prices have increased possibly as a result of the smaller number of flights on offer, which is a consequence of the economic situation. Moreover, the lower demand for flights – particularly tourist flights – has meant that intermediaries do not change their prices so much in reaction to competitor prices, and has thus led to a reduction in price dispersion. Therefore, the crisis has motivated

changes in the market with a lower demand for flights and a clear reduction in the number of flights on offer. This situation has meant that airlines have changed their pricing behaviour.

The main limitations of this paper, which at the same time open new lines of research, are related to the flight considered as we have only studied one route from Madrid to New York. In this regard, it would be interesting to include several routes. In this case, however, it has not been possible because the authors did not have the relevant pre-economic crisis information. Additionally, it would be interesting to analyse price behaviour in countries other than Spain to see if this situation is unique to Spain. Moreover, with regards to available data, because the economic crisis is not finished, we were not able to study the entire period of the economic crisis. However, using the year 2009 and 2013 gives us a good idea of the effect of the crisis, since the first reactions to the crisis were in 2009 and the crisis was still ongoing in 2013.

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