Journal of Air Transport Management 72 (2018) 39–46

Contents lists available at ScienceDirect

Journal of Air Transport Management

journal homepage: www.elsevier.com/locate/jairtraman

How to manage seasonality in service industries – The case of price and seat factor management in airlines

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ARTICLE INFO

Keywords:
Seasonality
Revenue management
Pricing
Capacity utilisation
Service industry

ABSTRACT

Seasonality and its impact on forecasting have been long established for service industries, including airlines. Less researched is whether the response to seasonality through price and/or capacity management is beneficial in industries with rigid capacity and high demand volatility. This paper proposes and develops a theoretical model of rational airline seasonal behaviour to guide airline strategic management with pricing and/or capacity management decisions during periods of high seasonality. We develop, calibrate and test our model using a large sample of international airlines across the Asia Pacific, Europe as well as North and South America. Our results suggest that there is strong seasonal variation in both the fares and seat factor of the average airline. However, in most cases there is stronger seasonal variation in the average airfare than in the seat factor, which is diametrically opposite to the findings of the rational model. As a result airlines should allow both the seat factor and average airfares to be higher during seasonal highs than seasonal lows, but the ratio of the high to low seat factor should exceed the ratio of the high to low average airfare. In other words, in practice airlines should aim for more seasonality in the seat factor than the average airfare. This is an important finding for airline management practice and adds to the literature on revenue management and competitive strategy which has so far mainly focused on pricing.

1. Introduction

Similar to other service industries, air travel is a highly seasonal business. It tends to be stronger during the summer months compared to the winter months, as leisure and holiday travellers take advantage of school holiday periods and better weather conditions for travelling and holidaying (e.g. Pegg et al., 2012). Passengers that travel to visit friends and relatives do so extensively during festive seasons, such as Christmas, Lunar New Year, Easter, and the Mecca pilgrimage (e.g. Hakim and Merkert, 2016). They also travel on weekends[1] for sporting and other entertainment events, or to take advantage of long weekends (e.g. Merkert and Beck, 2017). And when booking flights or other service products such as hotels, consumers will experience differential fares; in many cases a result of dynamic pricing or in other words a response of the service provider/firm to seasonality (e.g. Viglia et al., 2016). Airlines, like other businesses that have seasonally high demand periods, must decide whether the strength of demand is manifested in high sales volumes, higher prices or both. This decision is particularly important when the capacity of the business is fixed, invariant to the seasons, which is despite many of them now scheduling heavy maintenance in low periods still often the case for airlines. In this case, the variable costs of the business are invariant to the seasons despite the fact that revenue does vary.

In a world in which most of the airlines' capacity is invariant to the seasons, profit maximising airline management must decide on the extent to which it will allow strong demand to grow into high seat factors.[2] and/or average airfares during the high seasons and the extent to which it will try and stimulate demand with lower fares during the low seasons. This is a particularly important consideration for a very competitive industry such as aviation (i.e. since liberalisation and the advent of low cost carriers), but also often other sectors of the economy characterised by seasonal demand, since a strong earnings or profit outcome often relies on optimal decisions on load and price during the seasonal peaks, where much of the annual profit is often made.

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[1] Please note that weekly and daily cyclicality caused by business travellers are outside the scope of this paper.

[2] Please note that seat and load are often interchangeable. In this paper we define Passenger seat factor = RPK/ASK (as opposed to PAX/SEATS) which is different to Passenger load factor = RPTK/APTK = APW x RPK/(APW x ASK) where APW = average passenger weight.

https://doi.org/10.1016/j.jairtraman.2018.07.005
Received 15 June 2017; Received in revised form 19 July 2018; Accepted 31 July 2018

A key objective of this paper is to provide insightful observations about the relative seasonality of seat factors and average airfares, using as evidence the operating and financial statistics of large a number of Asia Pacific, European and American airlines and their flying segments. A profit-maximisation model is constructed based on seat load factors and average airfares set by these airlines. Using this model for guidance, the aim of this paper is to establish whether airlines in the regions described above are likely to be able to add to their profitability by making better decisions about the relative seat factor and average airfares during the seasonal highs and lows.

This paper is set out as follows. Section 2 presents an overview of the literature that conducts research into the seasonality of airline seat factors and average airfares. Section 3 briefly discusses the methodology and sample. This is followed by section 4 which shows some observations about the seasonality of seat factors in the Asia Pacific, Europe and Americas regions, and the seasonality of average airfares of select airlines that are domiciled in those regions. Section 5 then develops a simple analytical model to try and explain the behaviours observed in section 4. Section 6 then presents evidence associated with the seasonal premium in seat factors compared to average airfares for different flying segments and what this implies about airline profit maximising behaviour. Section 7 concludes the paper including management recommendations as well as limitations of our study.

2. Literature review

The relationship between pricing and utilisation of assets is not new for service industries and airlines in particular (e.g., Straszheim, 1974). How seasonality impacts on managerial decisions related to that relationship has, however, been so far discussed in relation to other sectors such as the tourism industry (e.g. Higham and Hinch, 2002; Cuccia and Rizzo, 2011), finance (Hong and Yu, 2009), global freight logistics (e.g. Kavussanos and Alizadeh-M, 2001) or energy (e.g. Mitchell et al., 2000). One interesting finding from that literature is that while seasonality can depend on numerous factors (such as weather, school holidays, religious events or economic cycles) and present itself in yearly, monthly or weekly seasonality (Rosselló and Sansó, 2017), it is not only markets that can have an impact on the resulting profitability of the involved players (Turrión-Prats and Duro, 2016) but also the pricing and competitive strategies of the firms involved (Narangajavana et al., 2014; Weatherford, 2018).

Key elements of such competitive strategy in relation to seasonality could be dynamic pricing and predictive inventory management as discussed more generally in the operations research literature (e.g. Gellego and van Ryzin, 1994; van den Berg et al., 2017). There are of course numerous factors that impact on demand for air travel (e.g. Allroggen et al., 2013) sometimes even induced by public support as growth in passenger numbers is positive for regional, cultural and economic development (Baker et al., 2015). Nevertheless it has been established that it is usually the average air fares (revenue/passenger) and yields (revenue/revenue passenger kilometre) generated from a forecasted demand that excite airline management in terms of achieving competitive advantage (Narangajavana et al., 2014). For the airline context much of the relevant extant literature is hence unsurprisingly around demand forecasting (Littlewood, 2005) and price elasticities (e.g. Brons et al., 2002) but also around observations around spatiotemporal trends in air fares (Wei and Grubesic, 2016). The impact of seasonality in the air transport industry has primarily focussed on the profitability of aviation agents such as airports (Zuidberg, 2017). As one of the few papers that have specifically looked at airlines' behaviour and strategic response to seasonality, Garrigos-Simon et al. (2010) examined the Alicante-London market and established that the price setting response does not only depend on seasonality and exchange rates but also on the airline's business model. What is missing in the literature is a more comprehensive analysis that accounts for the yields and load factors. We argue that the combination of both will maximise profits and competitive advantage more effectively. The sole focus on air fares (and thereby neglecting load factors) is in our view a significant gap in the extant literature that this paper aims to close and we aim to present evidence on the interplay between pricing and utilisation that will contribute to the extant literature and management practice.

3. Methodology and sample

With the aim to provide a better understanding of the importance of the interplay between airline pricing and utilisation, we provide in a first step empirical evidence on how airlines face and treat seasonality differently both in terms of seat factors and average fares. Based on the revealed differences that suggest variations in airline behaviour we then develop a theoretical model on airline seasonal pricing and seat factors with the aim to explain how airlines should set their strategies in an ideal world. The extant literature revealed a strong focus on pricing. As economic theory would suggest that profits are a function of pricing (demand) and utilisation (supply), our model will incorporate and reflect both strategies. In a next step we then apply this model to the empirical data collected for our sample to determine to what extent airline management does in practice follow the analytical model that would maximise their profits.

Table 1
Sample of analysed airlines/flying segments.

	Airlines	Flying segments
Asia Pacific	13	21
Europe	15	17
Americas	15	18
Total	43	56

As shown in Table 1, our sample consists of the 43 largest airlines that fly in the Asia Pacific, Europe and Americas (including both North and South America) regions. Importantly, as it is difficult to define what constitutes an airline company, with firm boundaries getting blurred (with full service carriers such as Qantas setting up low cost carrier arms such as Jetstar; see for example, Pearson and Merkert, 2014), and also because pricing will vary (such as between domestic and international sectors or the full service and the low cost arm of an airline) we use what we call flying segments (e.g. Jet Airways Domestic) as the key unit of analysis for our evaluation where data availability allows such distinction. It is worth noting that data availability and reliability is a key concern when evaluation airline pricing strategies and has been a key driver of our sampling strategy.

4. Is there seasonality in seat factors and average airfares?

This section aims to provide some empirical evidence on both seat factors and average airfares of the airlines in our sample. Similar to descriptive statistics sections in other papers, the point of this exercise is to illustrate the problem and also to show potential variations across the sample.

Available seat kilometre (ASK) and revenue passenger kilometre (RPK) data is collected from all 43 airlines in our sample. The data is aggregated over each quarter and used to compute a representative passenger seat factor for the three regions. Our calculation and interpretation of seat factor (RPK/ASK) is as realistic as possible as it reflects the distance travelled or offered to the market (revenues and costs can vary over longer stage lengths). Fig. 1 shows a clear seasonality in the seat factor in the Asia Pacific region, with absolute highs occurring in the September quarter, shoulder highs in the March quarter, and lows in the December and June quarters. The size of the seasonal amplitude, the difference between the seat factor at the peak and at the trough, is also significant. In 2013 for example, the seat factor in September was