WHAT PRODUCT FACTORS ALLOW AIRLINES TO COMMAND A PRICE PREMIUM IN THE SYDNEY-LOS ANGELES MARKET?

Fu-Jui Hsueh[1]

Singapore Airlines Cargo

Ian Douglas[2]

School of Aviation, University of New South Wales

Rodger Robertson[3]

School of Aviation, University of New South Wales

Abstract

Recent changes to the competitive environment in the highly contested Sydney to Los Angeles market have impacted the route profitability of almost 20 carriers. In particular the commencement of non-stop services by Delta Airlines and V Australia has impacted route profitability of almost 20 carriers. This paper investigates the product factors that enable airlines to command a price premium the Sydney to Los Angeles market. A sample of business and economy class net fare quotes, in addition to data collected on seven product factors is used in this study to estimate the relationship between price and product. The regression results show that service quality, space, connectivity and alliance membership all have a positive influence on price in this particular market. In a practical setting, the research outcomes are particularly relevant to the areas of Airline Pricing & Yield Management, Airline Strategy, Airline Marketing and Product Planning.

Keywords: Price, product, airline competition, Sydney to Los Angeles

---

[1] Fu-Jui Hsueh (corresponding author) focused his BA (Hons) thesis on the study of the relationship between price and product factors in the Sydney to Los Angeles market. These research outcomes were presented at the 2010 ATRS Conference in Porto, Portugal. More recently, Fu-Jui has worked as a Resource Analyst in Aircrew Planning and as a Research Analyst in Network Planning for the Virgin Australia Airline Group. His current role is Marketing Manager, Australia & New Zealand for Singapore Airlines Cargo. Contact Details: FuJui_Hsueh@singaporeair.com.sg

[2] Ian Douglas' research interest is focused on ASEAN aviation, and his DBA research addresses the tensions between economic and institutional factors in development of airline strategy. Ian joined UNSW in 2007 after 5 years with the School of Management at UTS, and 25 years at Qantas where his roles ranged through airport operations, fleet and airline planning, pricing, revenue management and alliances. He is currently a Senior Lecturer at UNSW. Contact Details: ian.douglas@unsw.edu.au

[3] Rodger Robertson's employment history spans over 30 years at Qantas as an Airline Analyst, Planner and in Executive Management. He was responsible for matters including corporate planning, international relations, scheduling planning and fleet management. Rodger has spent the last 15 years working as a consultant to the international airline industry and as a Senior Lecturer in the School of Aviation. He is currently a Senior Visiting Fellow. Contact Details: r.robertson@unsw.edu.au

1. INTRODUCTION

Recent changes in the global economic environment have led to weakened air travel demand and consequently, airlines are faced with excess capacity during the downturn in the business cycle (Levenstein and Suslow, 2002). Consumers are becoming increasingly sensitive to airline ticket price and therefore, a study of passenger willingness-to-pay for product attributes is beneficial but also necessary. Pricing is an important part of airline management as airline economics is driven by yield, unit cost and load factor. Price is a key factor that affects a passenger's propensity to use air transportation as a means of travel and plays an important role in the choice of airline itinerary (Garrow et al., 2007). Product planning is also an important part of airline management. The homogeneous nature of the perceived product on offer forces the innovative carriers to product differentiate in order to sustain competitive advantage (Doganis, 2002).

This paper uses the Sydney to Los Angeles (SYD-LAX) market to study the relationship between *price* and *product*. The duopoly between Qantas and United Airlines which existed for several decades has now ended. V Australia and Delta Airlines both entered the market with non-stop services in 2009, bringing the total number of carriers offering net fares in the SYD-LAX market to almost 20. Such a study adds value to airline planning particularly in commercial areas such as network planning, schedules planning, revenue management and strategic alliances.

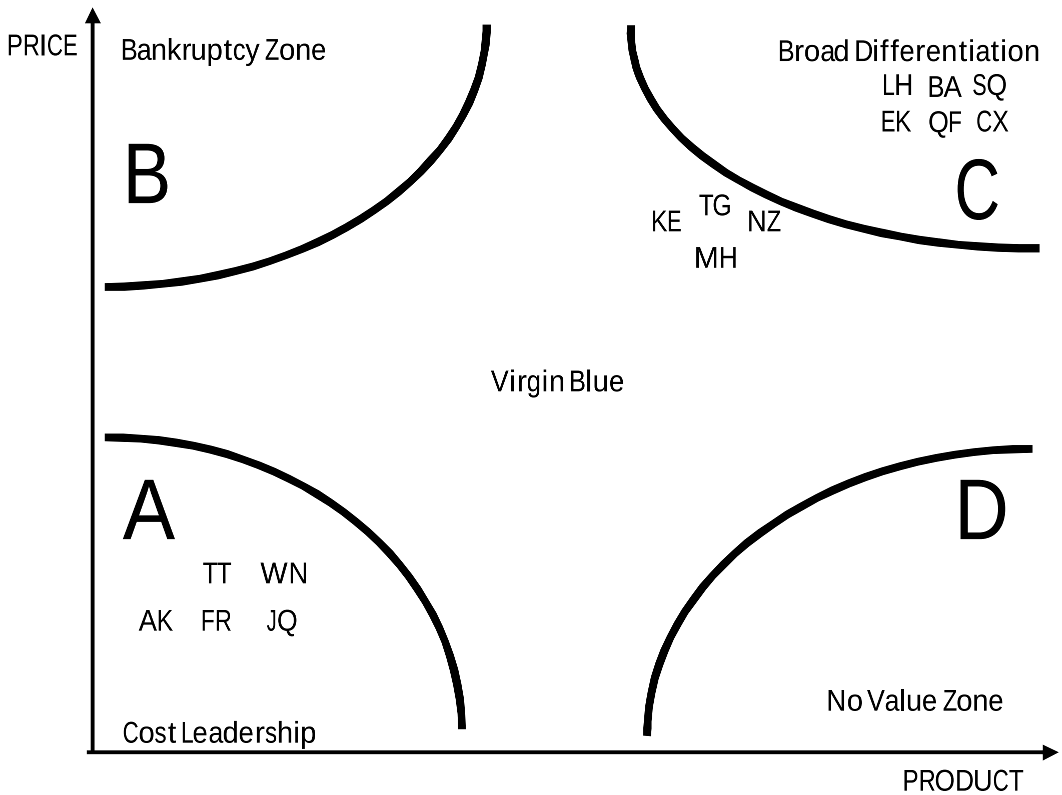
2. THEORETICAL CONTEXT

Few studies have explored the area of passenger willingness to pay for airline product attributes (Garrow et al., 2007). Indeed, the factors affecting consumer willingness to pay have become more complex and dynamic over time (Allsopp, 2005). According to Martin et al. (2008) many airlines are asking themselves the question: Which attributes really do matter to specific classes of passengers? Also, what price premium are passengers willing to pay for different products? Table 1 provides a summary of previous studies that have analysed airline product attributes. Attributes have been grouped under four categories for easier reference. Passengers exhibit different degrees of willingness to pay, reflecting different price sensitivities. Passengers also have different expectations and preferences for product. Exploiting the heterogeneous nature of price elasticity and service level sensitivity, there is value in understanding the positioning of carriers on the *Price vs. Product* map (Fig. 1). The revenue management product differentiation theorem states that each airline's product can be mapped on a graph which has price on one axis and service on the other (Pinchuk, 2002).

Table 1: Previous Studies incorporating Aspects of Airline Product Attributes

Literature	Service Quality	Comfort	Convenience	Image
Balcombe et al. (2009)	Meal Provision Entertainment	Seat Pitch		Punctuality Airport Lounges
Garrow et al. (2007)		Legroom Aircraft Type	Flight Time Stop Penalty	
Lee and Luengo-Prado (2004)			Frequency Non-Stop Dummy	OTP
Borenstein (1989; 1991)		Equipment	Frequency No. of Stops	
Harris and Emrich (2007)		Flight Capacity	Schedule Frequency	
Suzuki et al. (2001)	Service Quality		Trip Length Frequency of Service	Airline Network Size Safety Record
Morash and Ozment (1996)			Frequency of Service	OTP
Coldren et al. (2003)	Food Quality Crew Friendliness		Non-stop/Single Connect Time-of-Day Dummy	Code-share Dummy OTP
Proussaloglou and Koppelman (1995; 1999)	On-Board Amenities		Service Frequency Flight Schedule	FFP On-Time Reliability
Gimeno and Woo (1996)			Frequency	
Evans and Kessides (1994)			Direct Flight Dummy	No. of Routes Served
Abramowitz and Brown (1993)				Code-share Dummy On-Time Rating Safety Record
Toh and Hu (1990)	Service by Attendants Food & Beverage		Convenient Schedule	OTP FFP
Park (2007)	Meal Service IFE	Seat Space Legroom	Convenient Schedule Non-Stop Flight	OTP Safety Record
Mason (2008)	IFE Food	No. & Size of Cabins Seat Configuration		FFP Airport Lounges
Jou et al. (2008)	Entertainment Quality of Food/Drink	Seat Comfort	Number of Flights Convenient Schedule	Flight Safety FFP
Park et al. (2005)	Meal Service IFE	Seating Comfort Seat Space Legroom	Non-Stop Flight Convenient Schedule	Safety Record OTP FFP
Douglas (2005)		Seat Pitch Seat-Bed	Number of Stops Elapsed Journey Time	Alliance Membership Nationality
Doganis (2002)	On-Board Service IFE	Aircraft Type Individual Space Seat Pitch	Frequency Timings Connections	Punctuality Airline Lounges Safety Reputation
Shaw (2004)	In-Flight Service	Seat Pitch Seat Width	Frequency Timings	Punctuality FFP

Figure 1: Framework for Mapping Airline Price and Product Positioning



Note: The placement of airlines on the continuum in Fig. 1 is estimated and may not be accurate.

The aim of this paper is twofold:

1. To determine the product factors that enable airlines to command a price premium in business and economy class in the Sydney to Los Angeles market.
2. To gain an understanding of price and product positioning by mapping carriers on the graph outlined in Fig. 1.

3. DATA

3.1 PRICING DATA

Fare information was obtained from a leading Australian on-line travel distribution agency, travel.com.au. 12 pricing snapshots of business and economy class fares were collected between May and September 2009. Within each pricing snapshot, fare quotes for each individual carrier were noted; providing sufficient variability in the '*y*' dataset. As such, average or representative fares are not used in this study as much valuable information pertaining to sample variation is lost under this approach. Fares were searched 2-3 weeks prior to departure for a travel period of 2-3 weeks. The following was observed during the data collection process:

- All-inclusive (fees, taxes and surcharges) return net fares.
- Lowest-restricted fares available.

3.2 PRODUCT DATA

This paper analyses the effect of seven product attributes on price. Table 2 outlines the product factors used in this study in addition to some relevant key features of the data.

Table 2: Key Features of the Data

Variable	Units	Key Features	Expected Sign
Price (Net Fare)	$AUD	Log or level form	Dep. variable
Service Quality	Skytrax rating	Score between 1-5	Positive
Individual Space	Square inches	Seat Pitch × Seat Width	Positive
Elapsed Journey Time	Minutes	SYD-LAX + LAX-SYD	Negative
Frequency	Flights/week	Weekly frequency	Positive
Connectivity	No. of Connections	No. of connections within 4 hours (MCT = 2 hour)	Positive
Alliance Membership	Yes/No	Dummy (discrete) variable	Positive
Code-sharing	Yes/No	Dummy (discrete) variable	Positive

4. METHODOLOGY

A hedonic regression technique was employed to determine the important product attributes in business and economy class, and their estimated impact on price. Although hedonic methods have been used in a range of industries including automobile, housing, information technology, medicine and university education, the application of hedonic approaches to the study of airfares is new to the airline industry (Good et al., 2008). Very few studies have employed the hedonic approach to estimate passenger valuations of different air travel characteristics (BTCE Report 80, 1992). However, some research employing hedonic models has been undertaken in the hotel industry to better understand the relationship between room rates and hotel amenities (Kuminoff et al., 2010), and such a study would yield similarly beneficial outcomes for airlines searching for information on the determinants of price with respect to product-related attributes. The hedonic pricing framework is valuable to the aims of this study because:

(a) It assists in addressing changing dynamics in quality when new products enter the market (Good et al., 2008).
(b) The model identifies attributes that have a significant effect on price (Good et al., 2008).
(c) Passengers' marginal willingness-to-pay for a change in product attribute can be derived (Bajari et al., 2010).
(d) This method is particularly powerful as it helps an analyst understand the relationship between price and product under a highly competitive, product differentiated environment (Bajari et al., 2010).

4.1 DEPENDENT AND INDEPENDENT VARIABLE

The dependent variable is *Net Fare*. This has been chosen because the aim of this paper is to answer the key question: What product factors (independent variables) allow airlines to command a price premium (dependent variable) in the Sydney to Los Angeles market? The explanatory variables included in this study are: service quality rating, overall individual space, elapsed journey time, frequency, connectivity, alliance membership and code-share.

4.2 FUNCTIONAL FORM SPECIFICATION

Table 3 outlines different functional form specifications that were considered in this study. The *Log-Level* specification was chosen for this study. Specifying the dependent variable in *Log Form* results in interpreting percentage changes in *y* (it is more meaningful to interpret a percentage change in price as opposed to a fixed change). Specifying the independent variables in *Level Form* facilitates the interpretation of parameter estimates. This specification for *x* (unit changes) is easier to interpret than a log specification (interpreting percentage changes in *x*).

Table 3: Functional Form Specification

Options	Dependent	Independent	Interpretation
Level-level	y	x	$\Delta y = \beta_k \Delta x$
Level-log	y	$\log(x)$	$\Delta y = (\beta_k / 100)\% \Delta x$
Log-level	$\log(y)$	x	$\% \Delta y = (100 \beta_k) \Delta x$
Log-log	$\log(y)$	$\log(x)$	$\% \Delta y = \beta_k \% \Delta x$

4.3 MODEL FORMULATION

Table 4 outlines the variables in the regression model, their notations and corresponding coefficient estimates. The formulated model is shown below.

$$\log(NF) = \alpha_0 + \alpha_1 SQR + \beta_1 OIS + \gamma_1 EJT + \gamma_2 ASF + \gamma_3 CON + \delta_1 AAM + \delta_2 ACS + \varepsilon \qquad (1)$$

Table 4: Variables in regression model

Variable Name	Notation	Coefficient
Net Fare	NF	-
Constant Term	-	α_0
Service Quality Rating	SQR	α_1
Overall Individual Space	OIS	β_1
Elapsed Journey Time	EJT	γ_1
Airline Schedule Frequency	ASF	γ_2
Connectivity	CON	γ_3
Airline Alliance Membership	AAM	δ_1
Airline Code-Sharing	ACS	δ_2
Error Term	-	ε

4.4 KEY ASSUMPTIONS

1. The error term captures all other stochastic and unobserved factors (apart from the independent variables) affecting the determination of net fare.
2. Interpretations are assumed ‘ceteris paribus’.

5. RESULTS & DISCUSSION

5.1 BUSINESS CLASS

An econometric RESET test on the model indicated presence of functional form misspecification. Scatter-plots were constructed (Figures 2-4) to better visualise patterns of non-linearity in the underlying data. Non-linear relationships are evident between *Price* and three independent variables (frequency, space and journey time). Quadratic functions were fitted to these independent variables to improve model fit.

Figure 2: Scatterplot of Price vs. Frequency

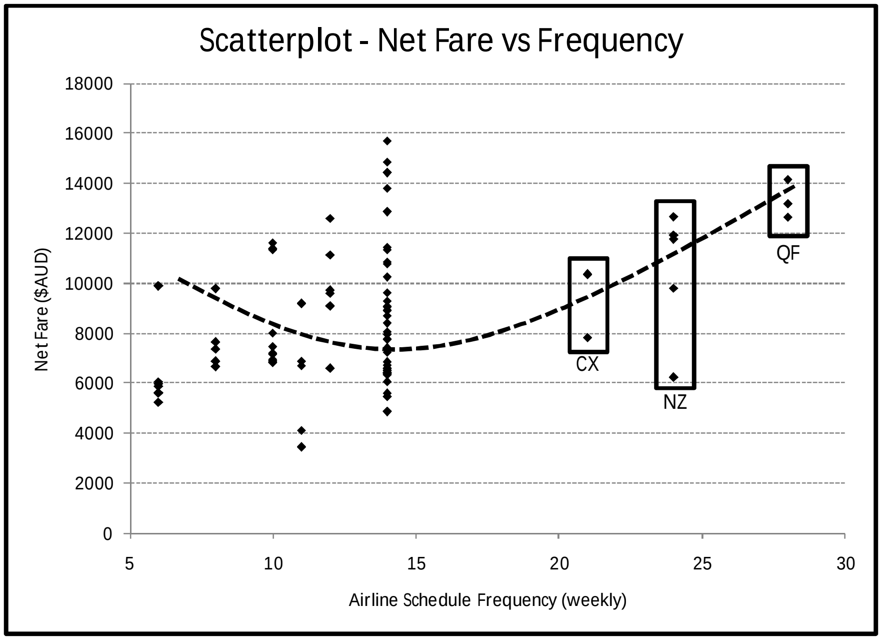


Figure 3: Scatterplot of Price vs. Space

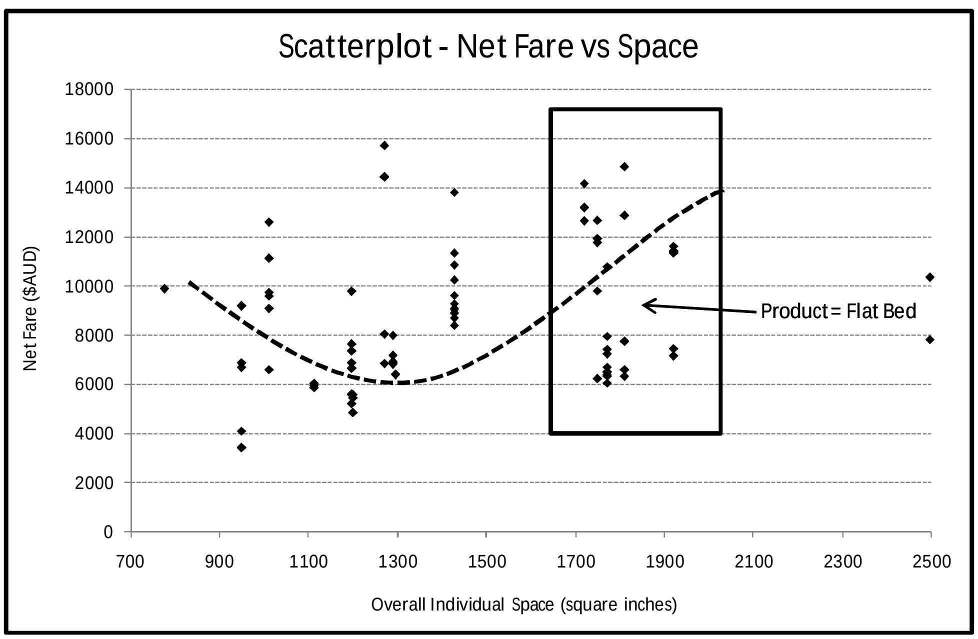
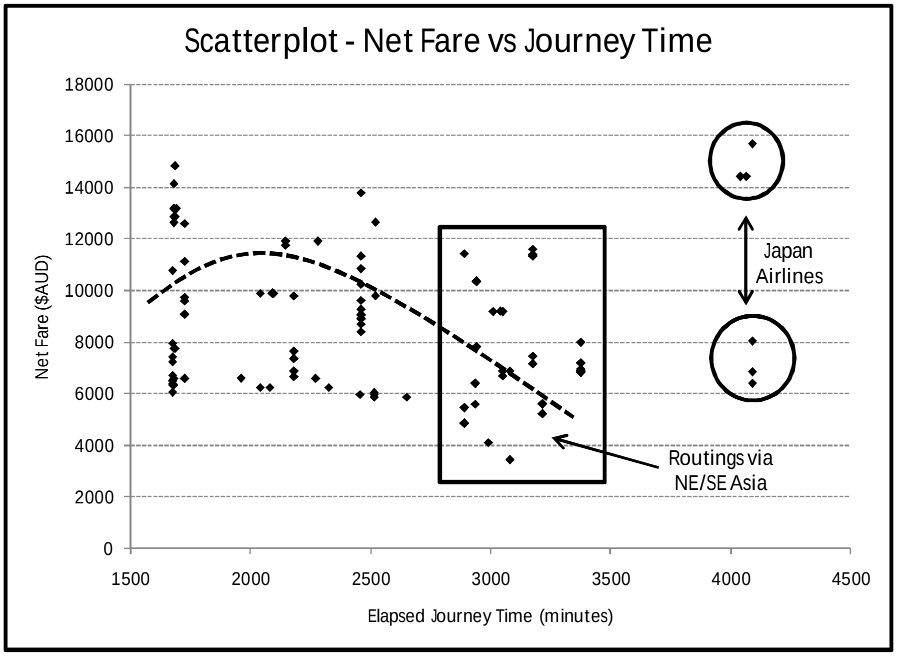


Figure 4: Scatterplot of Price vs. Journey time[4]



A revised model shown below contains the three adjustments in functional form for frequency, space and journey time. Results of the regression estimation for business class are presented in Table 5.

$$\log(NF)_{Business} = \alpha_0 + \alpha_1 SQR + \beta_1 OIS + \beta_2 OIS^2 + \gamma_1 EJT + \gamma_2 EJT^2 + \gamma_3 ASF + \gamma_4 ASF^2 + \gamma_5 CON + \delta_1 AAM + \delta_2 ACS + \varepsilon \quad (2)$$

Table 5: Business Class Regression Results

Variable	Coefficient	P-Value
SQR	0.6086***	0.000
OIS	-0.0005**	0.018
OIS^2	0.196E-06***	0.003
EJT	0.0015***	0.000
EJT^2	-0.369E-06***	0.000
ASF	-0.1069***	0.000
ASF^2	0.0025***	0.000
CON	0.0427***	0.000
AAM	0.1213**	0.011
ACS	-0.1372***	0.001
Constant	6.1933***	0.000

*** significant at 1%, ** significant at 5%.
Adjusted R^2 = 0.63, F-statistic = 29.7. Log (NF) is the dependent variable; sample size = 171.

[4] JL journey time excessive as overnight in Tokyo is required on outbound journey. After conducting a sensitivity analysis these outliers were removed.

The results show that service quality has a positive association with price. The managerial impacts that flow from this outcome are relevant to both commercial and operational divisions of an airline. Carriers who are recipients of global airline service quality awards should develop marketing initiatives in order to promote awareness. This can increase the proportion of higher yielding traffic (prepared to pay higher premiums for better service) carried by an airline. The results are relevant to operational areas such as cabin crew service delivery training.

The return on investment is positive when the product transitions from a reclining seat into a flat-bed, highlighting the importance of space in business class in a long-haul market. However, cost-benefit analysis is also necessary when evaluating seating plan reconfigurations, weighing up the predicted revenue gain against the costs of carrying out such projects. The results point to a negative association between price and journey time. This shows that carrier pricing ability suffers significantly as elapsed travel time increases in a long-haul market. A positively increasing function is observed between price and frequency. More specifically, pricing ability improves significantly with a double-daily frequency, indicating that convenience is an important factor in long-haul business class air travel. Especially in dense long-haul markets such as Sydney to Los Angeles and Hong Kong to London, the competition is such that daily frequencies are required to appeal to business class traffic.

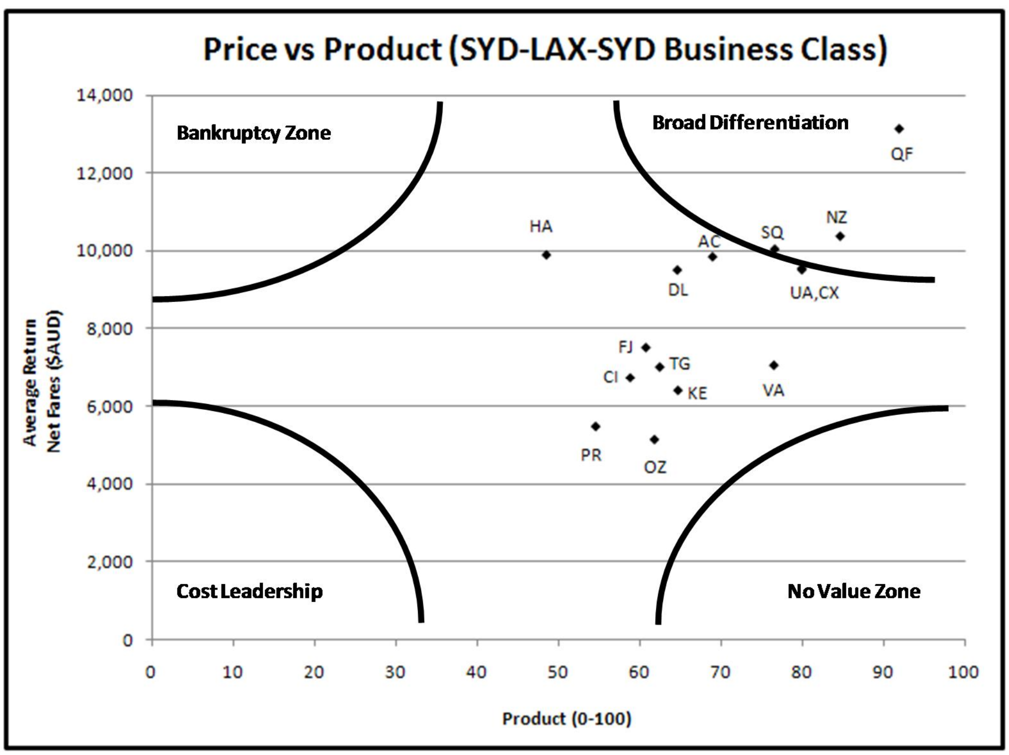
Connectivity has a positive influence on price. These results are particularly relevant to airline network planning, as morning arrivals into Los Angeles are the most attractive because connections to all parts of the US are maximised. Afternoon arrivals into Los Angeles are less attractive due to inconvenient connections (approx. five hours transit) to east coast destinations. Alliance membership has a positive effect on price. This makes sense, as interline connections (e.g. Qantas and American Airlines) between alliance carriers increase network coverage, thereby increasing passenger willingness-to-pay for a more extensive network offering. This finding is relevant to alliance carriers serving markets in which connectivity is important at both hub airports. Examples include the Hong Kong-London market (Cathay Pacific and British Airways of Oneworld) and the Bangkok-Frankfurt market (Thai Airways and Lufthansa of Star).

To gain understanding into the positioning of carriers on the *Price vs. Product* graph (Fig. 1), the following was carried out:

- Weightings: service quality (25%), comfort (35%), and convenience (40%).
- Product incorporates: service quality, space, journey time, frequency, connectivity.
- Each carrier's product specifications were converted into an index (base carrier = 100).
- The final score for *Product* was calculated by adding the service quality score, comfort score, and convenience score together.
- An average net fare was calculated for each carrier based on all pricing snapshot periods. *Price* is based on the result of this calculation.

Figure 5 provides an illustration of the relative positioning of carriers in terms of price and product offering in the Sydney to Los Angeles business class market.

Figure 5: Price and Product Positioning in the Sydney-Los Angeles Business Class Market



An understanding of Figure 5 is important from a strategic, competitive and operational perspective. The innovative carriers will shift towards the top right-hand-side, capturing price premiums in return for a superior product; whilst those who fail to deliver on product enhancement will drift down and left as their product enters the 'decline' phase of the product life cycle and their fares reduce in order to re-capture market share lost to competitors. This framework can be used as a benchmarking tool, enabling carriers to visualise where competitors are. It can also assist carriers in leveraging core strengths and competencies. Operationally, shifting towards the 'broad differentiation' zone requires not only commercial input, but is also dependent on airline operations (e.g. crew training, airport lounges, catering).

5.2 ECONOMY CLASS

Multi-collinearity between the *x* variables can lead to higher standard errors and insignificant *t*-ratios. A relatively high correlation coefficient of 0.640 between frequency and alliance membership was found. As a result new variable was added to allow for an interaction effect between *ASF* and *AAM*. In addition, a quadratic function was applied to service quality as a simple scatterplot yielded a positively increasing non-linear relationship between *SQR* and price. A revised model shown below[5] contains the two adjustments outlined above. Results of the regression estimation for economy class are presented in Table 6.

$$\log(NF)_{Economy} = \alpha_0 + \alpha_1 SQR + \alpha_2 SQR^2 + \beta_1 OIS + \gamma_1 EJT + \gamma_2 ASF + \gamma_3 CON + \delta_1 AAM + \theta_1 ASF.AAM + \varepsilon \quad (3)$$

Table 6: Economy class regression results

Variable	Coefficient	P-Value
SQR	6.5182***	0.000
SQR^2	-0.9962***	0.000
OIS	0.00065	0.667
EJT	0.00038***	0.000
CON	-0.0232***	0.008
ASF	-0.0709***	0.000
AAM	-0.2325	0.197
ASFAAM	0.0614***	0.000
Constant	-3.5248	0.202

*** significant at 1%, ** significant at 5%.
Adjusted R^2 = 0.50, F-statistic = 22.5.
Log (NF) is the dependent variable; sample size = 175.

Consistent with the business class findings and with *a priori* expectations, service quality exerts a positive effect on price, suggesting that particularly in long-haul air travel passengers are

[5] *ACS* is not included in the final economy class model. Its inclusion causes several independent variables to be statistically insignificant, and also introduces functional form misspecification issues.

willing to pay a price premium for the expected return in better service. The results show that an increase in individual space is predicted to increase price. From an airline product planning perspective, understanding the effect of 'space' on passenger willingness-to-pay is important before the design or re-design of cabin seating configurations. As passenger preferences continue to change, it would be beneficial to analyse the relationship between price and legroom specifically for premium-economy class in future research.

Longer, more indirect routings are associated with higher price in economy class. This is partly due to the increase in costs (e.g. landing fees, ground-handling, catering) incurred on carriers for multi-stop itineraries. Furthermore, as most carriers have minimum yields, this has been factored into the calculation of fares on longer indirect travel itineraries (e.g. SYD-LAX via Seoul). Although a negative coefficient on connectivity is observed, when the sample size is reduced to the four non-stop carriers (Qantas, United, Delta, V Australia), the effect of connectivity on price becomes positive. Holding all other factors constant, carriers with good connectivity at Los Angeles are also predicted to be able to achieve higher load factors, thus improving the airline economics (both yields and loads) of the operation. The short-run effect of increasing frequency in the SYD-LAX economy class market is a drop in price. Due to the price-elastic nature of the leisure market, carriers who increase frequency also need to develop marketing and other forms of promotional initiatives to stimulate demand. Although its predicted effect on price may not be positive, the result is expected to be different if the model was run on a dense high frequency short-haul market such as Sydney to Melbourne. In line with the business class finding, alliance membership also exerts a positive effect on price in economy class.

Applying the same methodology as previously outlined in the business class section, Figure 6 plots the estimated positions of carriers on the *Price vs. Product* graph in economy class.

5.3 LIMITATIONS & POTENTIAL SHORTCOMINGS

The Sydney to Los Angeles market, with four non-stop carriers and several one-stop operators, can be described as an oligopoly. In such a setting, carriers need to take into account not only the products they and competitors are offering, but also their own and their competitors' ability to influence price. With price being endogenously determined in an oligopolistic framework, competitor pricing should be included as a relevant explanatory variable (i.e. the pricing of one carrier is influenced by the pricing of others). However, there is justification for *not* including competitor pricing as an independent variable in this study. Table 7 illustrates this point further.

Figure 6: Price and product positioning in the Sydney-Los Angeles Economy Class Market

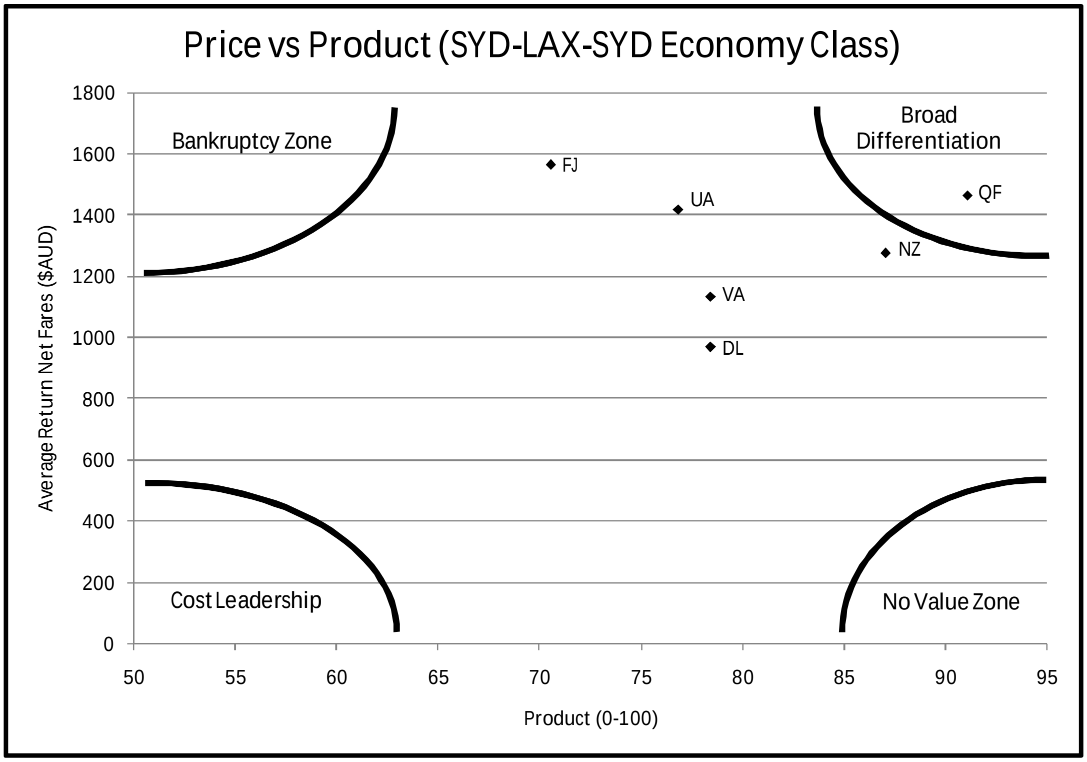


Table 7: The Sensitivity of a Carrier's Pricing to Competitor Pricing

		2. *Reaction* [effect on price]		
1. *Action* [price change]	Carrier Group	Non-Stop	One-Stop	One-Stop
	Non-Stop	Moderate	Moderate/Weak	Minimal
	One-Stop (via Pacific)	Moderate	Moderate	Minimal
	One-Stop (via Asia)	Minimal	Minimal	Minimal

Due to minimum yields (factored into the calculation of net fares for more indirect routings), a change in price by Airline X *does not* necessarily affect the price-setting of Airline Y in the SYD-LAX market. In other words, 'competitor pricing' as an explanatory variable (in some cases), has minimal or nil impact on the dependent variable, justifying its exclusion in this study. Some limitations that arise as a result of this include:

(1) The model cannot be used to predict changes in an individual carrier's price resulting from a change in competitor pricing structure.
(2) The error term, *u*, which captures stochastic and unobserved effects affecting price, now contains minor deterministic element (as the direction of carrier reactions to competitor pricing activity are sometimes predictable).
(3) The hedonic regression models need adjusting (to include competitor pricing as an explanatory variable) if the study is repeated in an oligopolistic airline market such as SYD-AKL [all carriers operate non-stop] or SYD-LHR [all carriers operate min. 1-stop].

Some would argue that the omission of 'competitor pricing' as an explanatory variable would have a significant impact on the empirical results. However a practical example illustrates that in fact, in this study the impact does not change conclusions drawn. Following the entrance of Delta Airlines in the market in July 2009 which forced most non-stop rivals to reduce price (note that 3 and 9 pricing snapshots were obtained before and after DL entry respectively), two separate regressions were run to test the effect of an external shock on the model. Although the magnitude of some coefficients changed (journey time), the economic and statistical significance of the explanatory variables (individual and joint) remained relatively stable, reinforcing the model's ability to produce valid and reliable estimations of the relationship between product and price.

6. CONCLUSION

This study was conducted during a period of volatility and change in the airline industry. In 2009, the Sydney to Los Angeles market saw the arrival of two new non-stop carriers, challenging the two incumbents on the route. Most competing carriers were forced to evaluate pricing tactics and product strategies in the face of decreased demand and excess capacity.

This paper employed hedonic regression analysis to highlight the most important product factors in the Sydney to Los Angeles market and their estimated effect on price. In *business* class, service quality, space, shorter journey time, frequency, connectivity and alliance membership, allow carriers to command higher pricing ability. In *economy* class, four product factors, service quality, space, connectivity and alliance membership, have a positive influence on price. The methodology developed is beneficial to the airline industry in two respects. Firstly, the modelling framework can be applied in future research, which is valuable following product innovation and change in competitive structure. Secondly, the regression models are valuable to airline management as they can be used to conduct 'what-if' analysis, formulating predictions of fares by adjusting aspects of the product offer. The examination of the *Price vs. Product* plot can be used as a benchmarking tool to understand the positioning of competitors and partners. It can also be used to assist airline strategic planning in the development business objectives, whilst encouraging revenue management to work more collaboratively with product planning.

REFERENCES

- Abramowitz, A.D., Brown, S.M. (1993), Market share and price determination in the contemporary airline industry, *Review of Industrial Organisation*, 8, 419-433.
- Allsopp, J. (2005), Premium pricing: Understanding the value of premium, *Journal of Revenue and Pricing Management*,4, 185-194.
- Balcombe, K., Fraser, I., Harris, L. (2009), Consumer willingness to pay for in-flight service and comfort levels: A choice experiment, *Journal of Air Transport Management*, doi:10.1016/j.jairtraman.2008.12.005.
- Bajari, P., Cooley, J., Kim, K.I., Timmins, C. (2010), A Theory-Based Approach to Hedonic Price Regressions with Time-Varying Unobserved Product Attributes: The Price of Pollution, *NBER Working Paper*, No. 15724.
- Borenstein, S. (1989), Hubs and high fares: Dominance and market power in the U.S. airline industry, *RAND Journal of Economics*, 20, 344-365.
- Borenstein, S. (1991), The dominant-firm advantage in multiproduct industries: Evidence from the U.S. airlines, *The Quarterly Journal of Economics*, 106, 1237-1266.
- Bureau of Transport and Communication Economics – Report 80 (1992), *Quality of Service in Australian Passenger Aviation*, Canberra: BTCE.
- Coldren, G.M., Koppelman, F.S., Kasturirangan, K., Mukherjee, A. (2003), Modelling aggregate air-travel itinerary shares: logit model developments at a major US airline, *Journal of Air Transport Management*, 9, 361-369.
- Doganis, R. (2003), *Flying Off Course – The Economics of International Airlines* (3rd Edition), London: Routledge Taylor & Francis Group.
- Douglas, I. (2005), Do business class air fares capture added value for airline alliance membership? *Journal of Revenue and Pricing Management*, 4, 219-227.
- Evans, W.N., Kessides, I.N. (1994), Living by the "golden rule": Multimarket contact in the U.S. airline industry, *The Quarterly Journal of Economics*, 109, 341-366.

- Garrow, L.A., Jones, S.P., Parker, R.A. (2007), How much airline customers are willing to pay: An analysis of price sensitivity in online distribution channels, *Journal of Revenue and Pricing Management*, 5, 271-290.
- Gimeno, J., Woo, C.Y. (1996), Hypercompetition in a multimarket environment: The role of strategic similarity and multimarket contact in competitive de-escalation, *Organisation Science*, 7, 322-341.
- Good, D.H., Sickles, R.C., Weiher, J.C. (2008), A Hedonic Price Index for Airline Travel, *Review of Income and Wealth*, 54, 438-465.
- Harris, F.H., Emrich, R.M. (2007), Optimal price-cost margin, service quality, and capacity choice in city-pair airline markets: Theory and empirical tests, *Journal of Revenue and Pricing Management*, 6, 100-117.
- Jou, R.C., Lam, S.H., Hensher, D.A., Chen, C.C., Kuo, C.W. (2008), The effect of service quality and price on international airline competition, *Transportation Research E*, 44, 580-592.
- Kuminoff, N.V., Zhang, C., Rudi, J. (2010), Are Travelers Willing to Pay a Premium to Stay at a “Green” Hotel? Evidence from an Internal Meta-Analysis of Hedonic Price Premia, *Agricultural and Resource Economics Review*, 39, 468-484.
- Lee, D., Luengo-Prado, M.J. (2004), Are passengers willing to pay more for additional legroom? *Journal of Air Transport Management*, 10, 377-383.
- Levenstein, M., Suslow, V. (2002), What determines cartel success? *University of Michigan Business School Working Paper*, No. 02-001.
- Martin, J.C., Roman, C., Espino, R. (2008), Willingness to pay for airline service quality, *Transport Reviews*, 28, 199-217.
- Mason, K. (2008), Airline marketing: an overview, in: *Air Transport Management Seminar*, Lisbon, Portugal.
- Morash, E.A., Ozment, J. (1994), Toward management of transportation service quality, *Logistics and Transportation Review*, 30, 115-140.
- Park, J.W. (2007), Passenger perceptions of service quality: Korean and Australian case studies, *Journal of Air Transport Management*, 13, 238-242.
- Park, J.W., Robertson, R., Wu, C.L. (2005), Investigating the effects of airline service quality on airline image and passengers’ future behavioural intentions: Findings from Australian international air passengers, *The Journal of Tourism Studies*, 16, 2-11.
- Pinchuk, S. (2002), Revenue management’s ability to control marketing, pricing and product development, *Journal of Revenue and Pricing Management*, 1, 76-86.
- Proussaloglou, K., Koppelman, F.S. (1995), Air carrier demand: an analysis of market share determinants, *Transportation*, 22, 371-388.
- Proussaloglou, K., Koppelman, F.S. (1999), The choice of air carrier, flight, and fare class, *Journal of Air Transport Management*, 5, 193-201.
- Shaw, S. (2004), *Airline Marketing and Management*, Aldershot: Ashgate.
- Suzuki, Y., Tyworth, J.E., Novack, R.A. (2001), Airline market share and customer service quality: A reference-dependent model, *Transportation Research A*, 35, 773-788.
- Toh, R.S., Hu, M.Y. (1990), A multiple discriminant approach to identifying frequent fliers in airline travel: Some implications for market segmentation, target marketing, and product differentiation, *Logistics and Transportation Review*, 26, 179-197.

Appendix 1: IATA airline codes

Airline	Code
Qantas	QF
United Airlines	UA
Delta Airlines	DL
V Australia	VA
Air New Zealand	NZ
Air Pacific	FJ
Air Tahiti Nui	TN
Hawaiian Airlines	HA
Air Canada	AC
Cathay Pacific	CX
China Airlines	CI
Japan Airlines	JL
Korean Air	KE
Asiana Airlines	OZ
Singapore Airlines	SQ
Thai Airways	TG
Philippine Airlines	PR