Managing airline survival in a highly competitive environment

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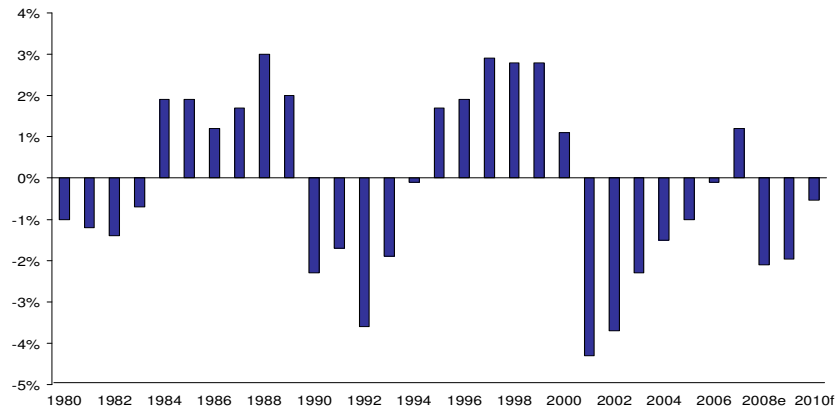
Outline of presentation

- Setting the scene
- Cost drivers in airlines
- Methodology of first stage of analysis
- Methodology of second stage of analysis
- Results
- Conclusions and policy recommendations

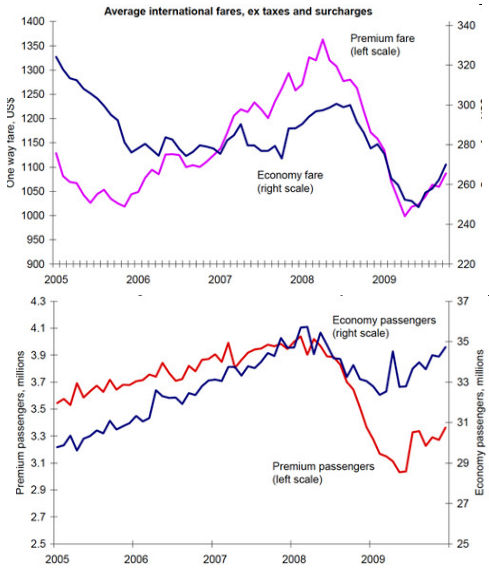
Net Profit or Loss World' Airlines as % of Total revenues
Trend 1: Current crisis severe and it returned too early



Airline failure 2008-10 → Who is next?

USA	Europe	Asia
Maxjet (Dec. 07)	Euromanx (May 08)	Oasis (April 08)
BigSky (Jan 08)	Silverjet (June 08)	Japan Airlines, JAL (Jan 2010)
Aloha (April 08)	XL (Sept. 08)	
ATA Airlines (April 08)	Alitalia (Sept 08, rel-aunched Jan09)	
Skybus (April 08)	Sterling (Oct 08)	
Eos (April 08)	Futura (Sept 08)	
Champion Air (May 08)	Sky Europe (Aug 09)	
Zoom Airlines (Sept 08)	Lithuanian Airlines, LAL (Jan 09)	
Sun Country Airlines (Oct 08, re-launched Nov 09)	Blue Wings (Jan 10)	
Primaris Airlines (March 09)	Denim Air (Feb 10)	
	Highland Airways (March 10)	
	MK Airlines (April 10)	

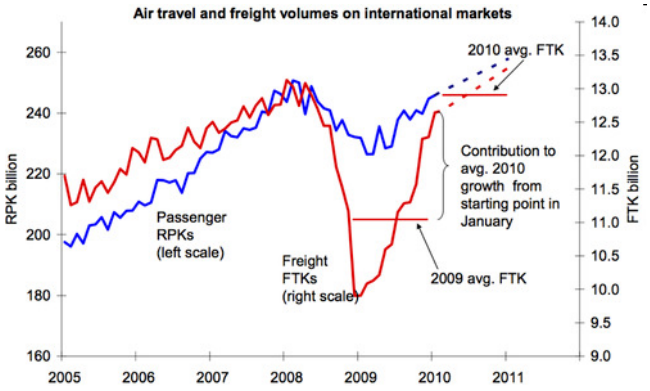
One problem of current crisis was/is drop in premium fares and pax numbers



Source: IATA

Structural shift in premium yields?

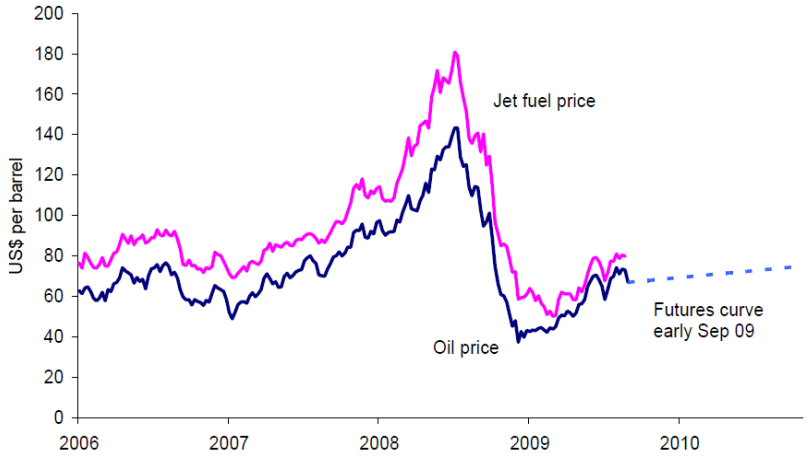
There are however strong signs of recovery



- As of March 2010 IATA halved its airline industry loss forecast for 2010 to USD2.8 billion (compared to the USD5.6 billion loss forecast in Dec-2009)
- Upgrade largely driven by strong recovery in demand, but revenues remain USD42 billion below the 2008 peak

Source: IATA

Fuel price level and volatility force airlines to cut cost (other than fuel) even more



Source: IATA, Platts, Bloomberg.

In addition to volatility, underutilisation risk

- Oil price lower now, but still high volatility

→ most big players paid high prices for a long period of time as a result of hedging

- High volatility of exchange rates
- IATA's key concerns: increase in fuel price in 2010 and increased capacity
- Emirates have just ordered 32 new A380s making a fleet total of 90 A380s by 2017

→ Underutilisation, Sustainability?

→ Combined impact is estimated to add USD132 billion in 2010 to airline industry bill (IATA, 2010)

Second Trend: LCC revolution

LCC now top of the league

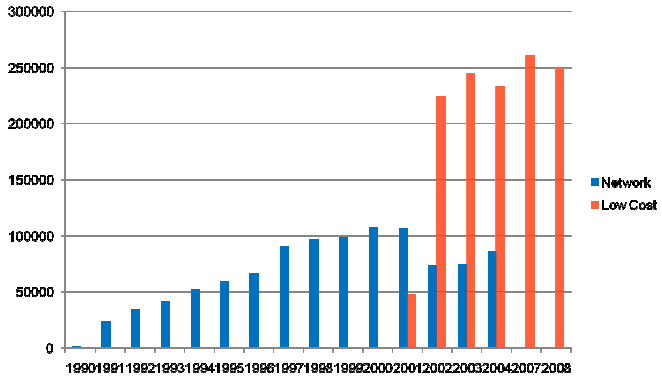
IATA 2009 ranking: Top 5 airlines in terms of scheduled passenger traffic

International		Domestic		Total	
	000s pax		000s pax		000s pax
Ryanair	57647	Southwest	101921	Southwest	101921
Lufthansa	42151	American	71618	American	92772
easyJet	35417	Delta	59499	Delta	71843
Air France	32508	China Southern	54154	United	63070
British Airways	29054	United	53307	China Southern	57961

Source: IATA, 2009.

Second Trend: LCC revolution

Example: Air passenger traffic Bristol – Edinburgh



Source: UK CAA.

Costs always mattered in aviation, but recently it got down to surviving

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- Trend 1: Long downturn (and atypical cycle) creating structural instability
- Trend 2: Low-cost revolution undermining short haul markets

Further challenges:

- Accelerating liberalisation of international air services
- High and volatile fuel prices
- Overcapacity
- Economic pressures to consolidate through mergers and alliances
- Declining yields (particularly premium) require new pricing and cost strategies
- Continued cost reduction a long-term necessity as fuel prices rise
- Need for effective IT strategy
- Growing environmental pressures
- Inadequate infrastructure

Key cost drivers

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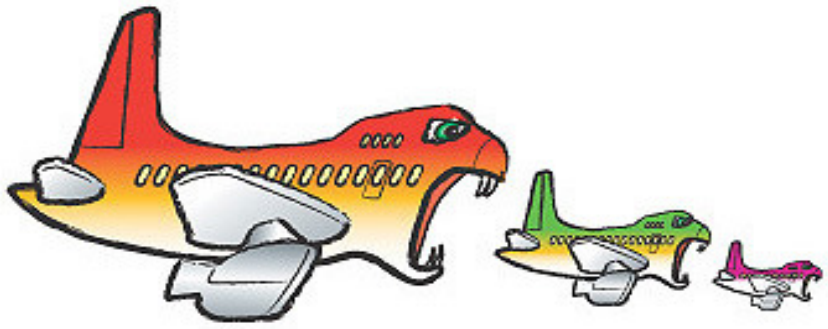
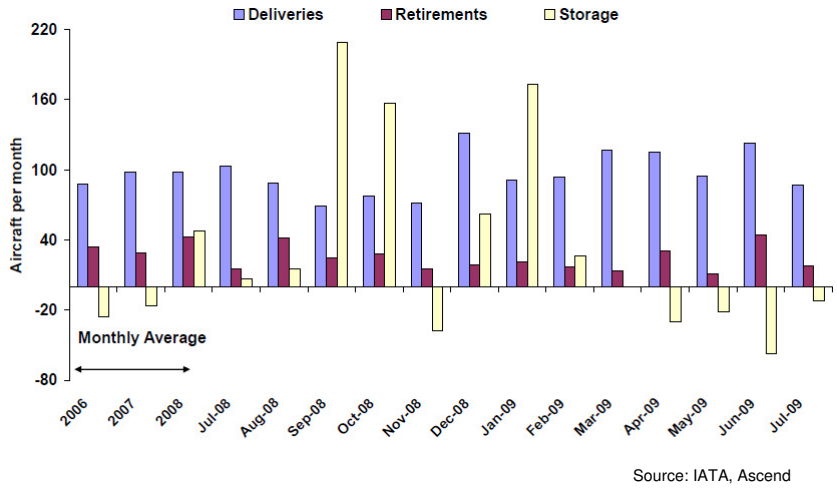
- Flying Expenses (40% of total opcost)
  - Flight Crew Salaries & Expenses (recent strike activities do not make this asset cheaper)
  - Fuel & Oil
  - Airport & En-Route Charges
  - Aircraft Insurance
  - Rental of Flight Equipment and Crews
- Maintenance and Overhaul (10% of opcost)
  - Labour costs
  - Spares stored and used
  - Maintenance Overheads
- Aircraft Depreciation (6% of opcost)
- Station and Ground Costs (16% of opcost)
- Passenger services (8% of opcost)
- Ticketing, Sales and Promotion (8% of opcost)
- General Administration (6% of opcost)

Source: Own analysis, IATA.

Survival Strategies ?



Capacity has been cut by grounding (drop in utilisation) but not by reducing fleet size → Fixed costs are still there



Source: IATA, Ascend

Survival strategies

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- Adapting the LCC model
  - Own subsidies, e.g. Jetstar/Qantas
  - General trend to de-frill
- Outsourcing (e.g. easyJet)
- Cutting capacity, or renewing fleet at low prices
- Sophisticated revenue management
- Non-aeronautical revenues !!!!!!!!!!
- Diversification
- Alliances (avoiding duplications, IT efficiency, marketing etc.)

Survival strategies relevant to this talk

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- Fleet optimisation
- Route optimisation
- Growth through mergers and acquisitions (cost cutting, market power, complement routes, less competition)
  - e.g. BA/Iberia in Europe and United/Continental in the US, note: Continental Airlines first quarter 2010 net loss of USD146 million
  - Economies of scale, sometimes also scope and density

Economies of airlines

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Economies of scale

- Firms that are operating with decreasing ATC (highly capital intensive=high fixed cost such as railways or airlines) are associated with economies of scale
- Usually cubic cost function; hence some level of production economies of scale and after turning point diseconomies of scale (they are getting too big to produce efficiently)

Economies of scope

- Reducing unit costs by leveraging efficiency through sharing resources for multiple projects or product lines (synergies, freight & passenger)

Economies of density

- Hub-and-spoke networks more efficient than point to point connections

→ depending on own case either grow or shrink, concentrate or diversify and either operate more or less hubs

Major operational factors affecting airline direct operating costs

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Aircraft Characteristics

- Speed and capacity (including configuration) determine aircraft productivity

Fleet mix

- The more types of aircraft, the higher the need for different pilots, maintenance etc., also purchase and maintenance logistics more costly

Route Structure and Type of Network

- Stage length affects aircraft and crew utilization (and crew accommodation costs), fuel used per block hour, relative station costs and some maintenance expenses
- Service frequency directly influences aircraft and crew utilization rates
- Average length of passenger haul affects sales and passenger handling costs

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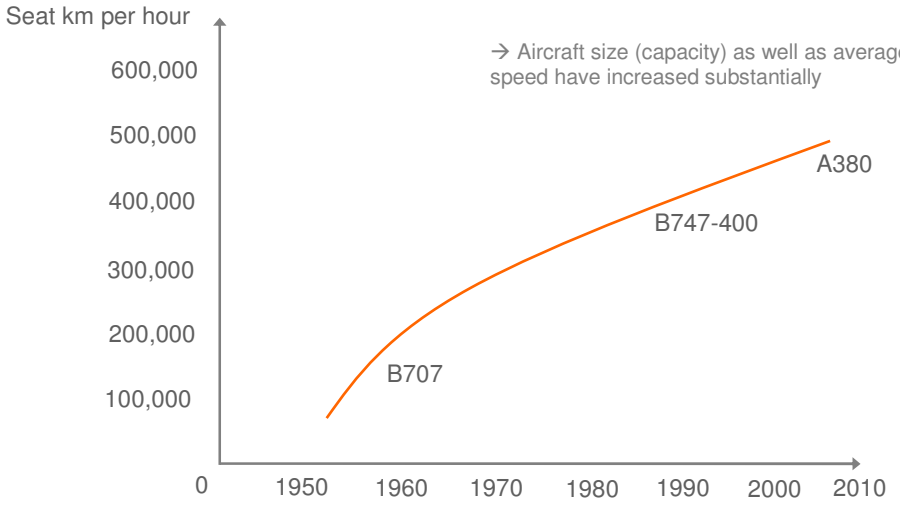
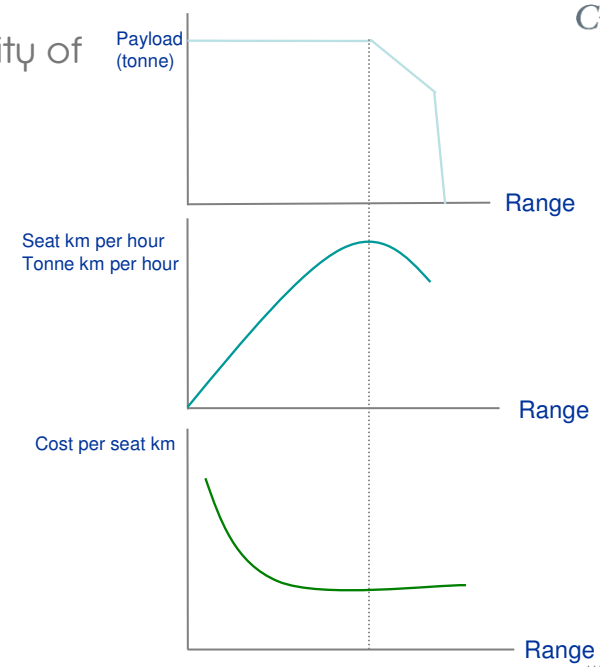
Aircraft Productivity



More on Productivity of aircrafts



Source: Doganis 2007

Unit cost against stage length 2006/07

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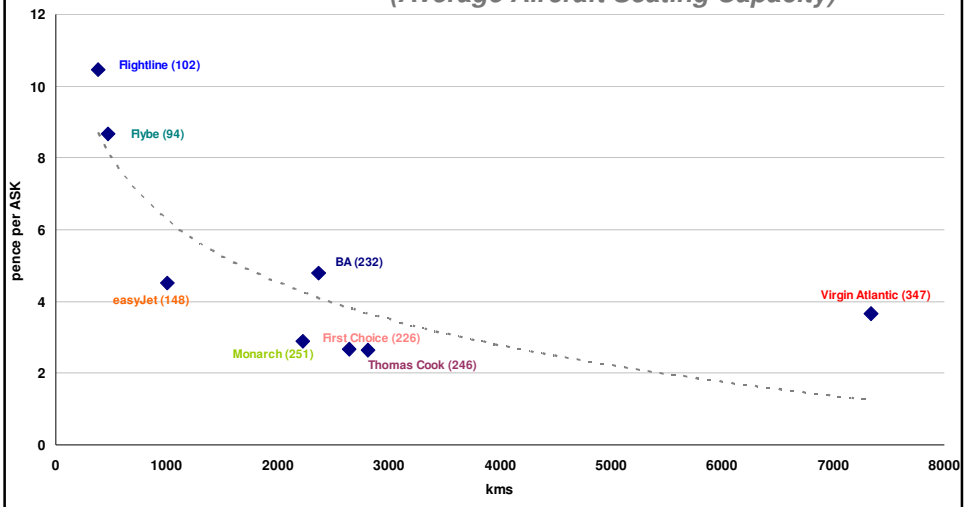
(Average Aircraft Seating Capacity)



Source: UK CAA.

Will efficiency improvements and hedging beat future fuel price increases?

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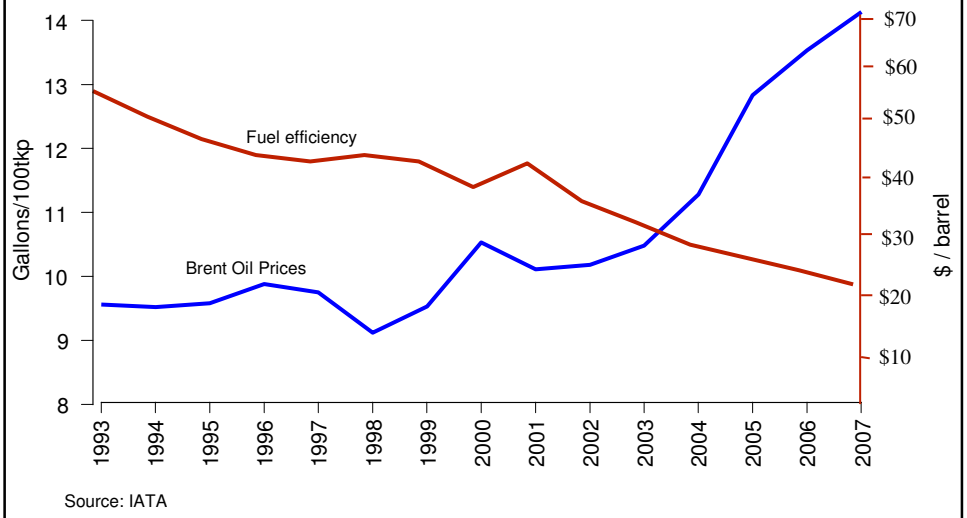
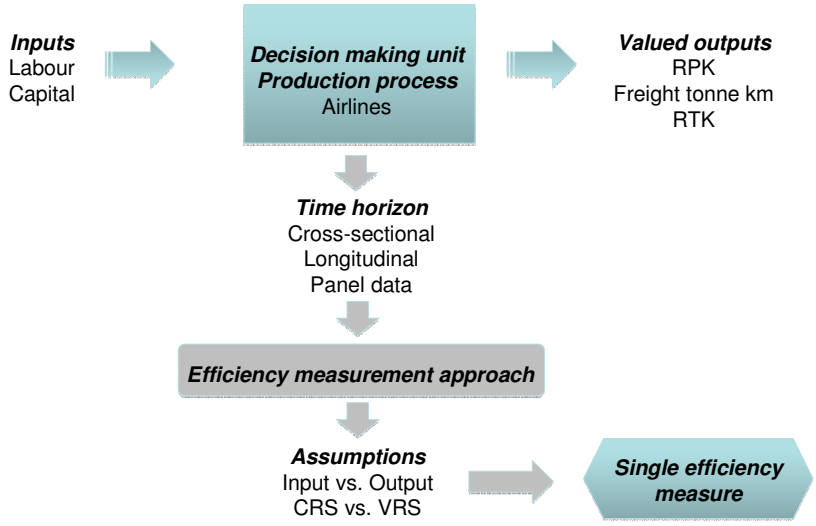


Source: IATA

Own research project

- Two stage DEA approach
  - First stage: DEA models to determine technical (including scale), allocative and cost efficiency
  - Second stage: Panel data analysis to determine impacts of fleet mix and stage length on efficiency of airlines
- Data collection mostly done in UK but finalised at ITLS
- Results will be published in two papers

Measuring productivity/efficiency is complex



Data envelopment analysis (DEA) in theory

Terminology
DMU – Decision Making Unit (e.g. a single airline)
Peers – comparison group of DMUs (e.g. a number of airlines)
Linear programming – used to solve DEA formulations

Efficiency is ratio of sum of outputs over sum of inputs → but outputs and inputs cannot be added together just like that →

$$TE = \frac{Weight_1 \cdot Output_1 + Weight_2 \cdot Output_2 + Weight_3 \cdot Output_3}{Weight_1 \cdot Input_1 + Weight_2 \cdot Input_2 + Weight_3 \cdot Input_3}$$

→ Technical efficiency is the sum of weighted outputs over sum of weighted inputs
→ Problem: weights are unknown

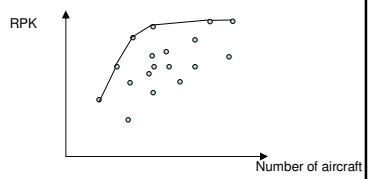
$$\max : TE = 0 \le \frac{\sum_{i=1}^{s} u_i \cdot y_i}{\sum_{j=1}^{t} v_j \cdot y_j} \le 1 \qquad , u_i, v_j \ge 1$$

- DEA uses linear programming to assign the weights to each DMU to put them in the best possible light
- Linear programming technique (deterministic)

$$\begin{aligned} &\min_{\lambda,\, xi^*} \; w_i' x_i^*, \\ &st \quad -q_i + Q\lambda \ge 0 \\ &\quad x_i^* - X\lambda \ge 0 \\ &\quad \Pi' \lambda = 1 \\ &\quad \lambda \ge 0, \end{aligned}$$

see for example Merkert et al. (2010)

Data envelopment analysis (DEA) in theory



Features of DEA

- Evaluates relative performance of DMUs
- Constructs a piecewise linear frontier which envelops the other inefficient DMUs
  →TE achieved by producing at production frontier
  → Distance function: DEA measures inefficiency as the radial distance from the inefficient unit to the frontier

→ Efficiency score= distance function of observations relative to envelope surface
→ DEA data driven approach

Key strengths

- Estimating robust results of efficiency requiring neither assumptions (cost minimisation, production or cost frontier) nor info on prices for inputs/outputs (for CE & AE cost min. + prices)

Key weaknesses

- Deterministic → no accommodation for statistical noise
  → bootstrapping, but just for TE
- Results sensitive to outlier observations

First stage - DEA model specification

Input oriented
- Choice depends on analyst's view over which parameters it is believed managers can exercise control

VRS, CRS and NIRS
- Constant returns to scale (CRS)
  - CCR model (Charnes et al. 1978)
  - Requires to assume that all firms/DMU's operate at their optimal size →because of regulations, imperfect competition, constraints on finance, political decisions around entry/exit, etc., that appears to be unrealistic!

  → Analyst must understand market constraints of relevant sector
- Variable returns to scale (VRS)
  - BCC model (Banker et al., 1984)

- CRS/VRS= Scale efficiency (0 to 1, if below 1 then inefficient)
- NIRS-VRS → Direction of inefficiency

DEA model specification - variables

Inputs
- Labour (FTE)
- Capital (ATK)

Outputs
- Passenger (RPK)
- Total transport (RTK)
  which is how many tonne of pax, freight and mail are flown how far

- Initially we tried FTE and ATK as inputs and RPK and freight TK as outputs, but meaningless since results suggested that airlines could on average improve efficiency by some 75% → likely result of many LCC not carrying any freight

Second stage regressions/panel data analysis

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- Random effects Tobit regression models because we do not know whether time or firm error term is dominant
- Efficiency scores depend on:
  - Stage length
  - Aircraft size
    - Average seats per aircraft
    - In each year roughly 8500 aircraft assessed
    - Aircraft model but also seat configuration matters
    - BA has the 777 at on average 238 seats and Etihad at 378
  - Number of different manufacturers of aircraft in fleet
  - Number of different types of aircraft in fleet
    - Ryanair and Southwest just a lot of Boing 737, while others have a range of different types and models
  - Time error term
  - Airline error term

Sample and data sources

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- 55 international airlines (company, not group)
- 2 financial years, 2007/08 and 2008/09
- Data sources: ICAO, IATA (WATS 52&53), Annual accounts, Airlines directly, Flightglobal

Plus operational data of Etihad, Qatar and Saudi Arabian

Descriptive statistics of key variables

	N	*Mean*	*St.D.*	*Min*	*Max*
First stage DEA models					
Output 2007/08					
RPK (000s)	55	55261002.46	48615140.16	1302807.00	222763439.50
RTK (000s)	55	6762635.45	6017986.59	120163.00	23321412.30
Input 2007/08					
LABOUR (FTE)	55	19904.32	16319.30	1079	71818
ATK (000s)	55	10583588.07	9416318.47	220155	38978784
FTE_Price (USD/FTE)	55	52443.30	26180.73	1890.66	115836.30
ATK_Price (opcost-staffcost and then divded by ATK) (USD/ATK)	55	0.5491	0.1909	0.2552	1.1848
Output 2008/09					
RPK (000s)	55	56436697.36	47635729.84	1371653.00	211993968.00
RTK (000s)	55	6814895.03	5915474.26	126361.00	22176042.60
Input 2008/09					
LABOUR (FTE)	55	19572.34	15935.46	1132	70926
ATK (000s)	55	10831322.93	9233882.47	232285	37416956
FTE_Price (USD/FTE)	55	63263.29	44111.82	1998.78	315903.60
ATK_Price (opcost-staffcost and then divded by ATK) (USD/ATK)	55	0.5899	0.2193	0.2219	1.4342
Second stage explanatory variables					
STAGE_LENGTH (km)	110	1865.99	1168.03	633.03	7281.02
AIRCRAFT_SIZE (seats)	110	191.12	60.41	50.67	340.21
AIRCRAFT_TYPES	110	5.38	2.76	1	13
MANUFACTURERS	110	2.33	1.12	1	7

Source: Own analysis.

Results of first stage DEA approach TE, AE, CE region rankings

Technical efficiency (total av. 0.8211, 0.7652corr.)	**Allocative efficiency** (total av. 0.6393)	**Cost efficiency** (total av. 0.5478)
Middle East	Middle East	Middle East
North America	North America	North America
Europe	Europe	Europe
Asia/Pacific	Asia/Pacific	Asia/Pacific
South America	Africa	Africa
Africa	South America	South America

Source: Own analysis based on averages of the 2007/08 and 2008/09 individual results.

- Relatively poor cost efficiency mainly due to allocative efficiency (not to much but inefficient mix of inputs)
- Technical efficiency scores likely to be most reliable, since no FX distortions (physical inputs only) as well as bias corrected
- Middle East leading the field, but just one observation (although 2 years), and this observation is with 120bn ASK actually too big too be efficient (TE=0.89)
- North America better than expected, substantial staff cuts in recent past

Size does matter

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In terms of optimal size of airline in case of technical inefficiency (if measured in ASK)

- Qantas 08/09, Catay 07/08, Air New Zealand 07/08 and for both years Ryanair and easyJet (all in region between 35bn and 100bn ASK)

- Worst ten performers apart from Air France 07/08 are all US American legacy carriers (anything above 160bn and certainly above 200bn ASK is too big to operate technical efficient)

→ Although airlines relatively TE, AE & CE efficient, this is not a result of their optimal size → M&A (e.g. Delta/Conti would not improve TE)

- But most airlines that are not efficient and not at optimal scale are too small → individual results suggest that airlines that are TE inefficient and operating below 5bn ASK are too small (diseconomies of scale)

Results of second stage random effects Tobit regression model

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- Best model is efficiency as dependent variable of ASK (indicator of size of airline), average number of seats of operated aircraft, average stage length and average number of different type (A380 vs. A320 etc.) in fleet (plus time error and airline error)
- Business model (9 LCCs in sample) had no significant impact on efficiency
- Year dummy no impact, probably 2 years to close to each other
- Number of different manufacturers had to be dropped because of correlation with number of different types of aircraft in fleet

- Positive (at 1% level), but relatively small impact of *ASK* on technical, allocative and cost efficiency
- Small positive impact of *Aircraft size* on technical, allocative and cost efficiency
- Small negative impact of *Stage length* on technical efficiency
- Negative impact of *Number of different types of aircraft in fleet* on technical, allocative and cost efficiency (on average 1% per type), separate test revealed similar impact of number of manufacturers

- M&A does not help your efficiency if you are already larger then 100bn ASK and even below that, impact on efficiency relatively small

Strategy recommendation based on own research results

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- M&A does not help your efficiency if you are already larger then 100bnASK
- Longer flights do not improve overall efficiency but most likely yields
- Larger Aircraft sensible in terms of efficiency
- Keep the fleet as homogenous as possible (good examples are Southwest and Ryanair), both with regard to number of different types and manufacturers in fleet

General strategies for success? Is there one for all?

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- Have a clear strategy (network, firm size, cost approach etc.)
- Don't focus just on costs (if your product/service does not work…..)
- Improve fuel efficiency (also CO_2) and get the hedging for fuel right
- Get the financing for your aircrafts and spare parts right (get cheap cash (→ capital costs) but also sell assets and lease back)
- Improve productivity of your assets (fleet, crew etc.) → see previous slide
- Get the forecasts right
  - Demand (avoid overcapacities)
  - Level of competition
  - Exchange rates
  - Prices for resources other than fuel
- Cut overhead costs
  - Staff numbers as well as staff costs (including pensions)
  - Bases and headquarters
  - IT-systems
  - Distribution systems
  - Outsourcing
- Negotiate good deals with suppliers (including airports, maintenance etc.)

The end

Thank you very much for your attention!

Any questions and comments are much appreciated.

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