Optimal Pricing Rule for One-way Airline Tickets

Empirical evidences

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Dynamic pricing in airline industry

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Time based theory	Capacity based theory
• Gale and Holmes (1992, 1993) • Gallego and van Ryzin (1994) • Piga and Bachis (2007) • Möller and Watanabe (2010)	• Dana (1999) • Escobari and Gan (2007) • Deneckere and Peck (2012)
Combination of both theories	
• **Anjos, Cheng and Currie (2004)** • Alderighi, Nicolini and Piga (2014) • Alderighi, Gaggero and Piga (2018)	

Optimal Pricing Rule - the starting point

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Anjos, Cheng and Currie (2004, JORS)

What -> optimal pricing rule for airline tickets under one-way pricing

How -> analytical model + standard analytical method for constrained optimization

Results -> simple pricing rule; relationship between days before departure and distance from expected booking curve

Dataset

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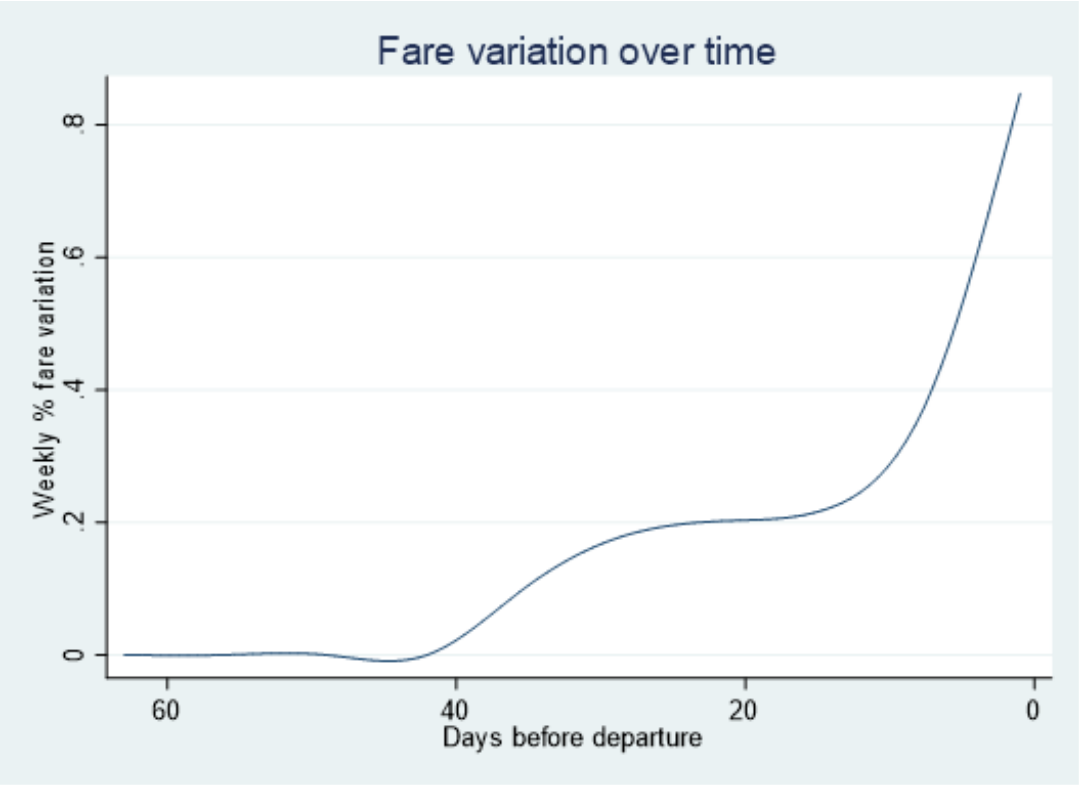
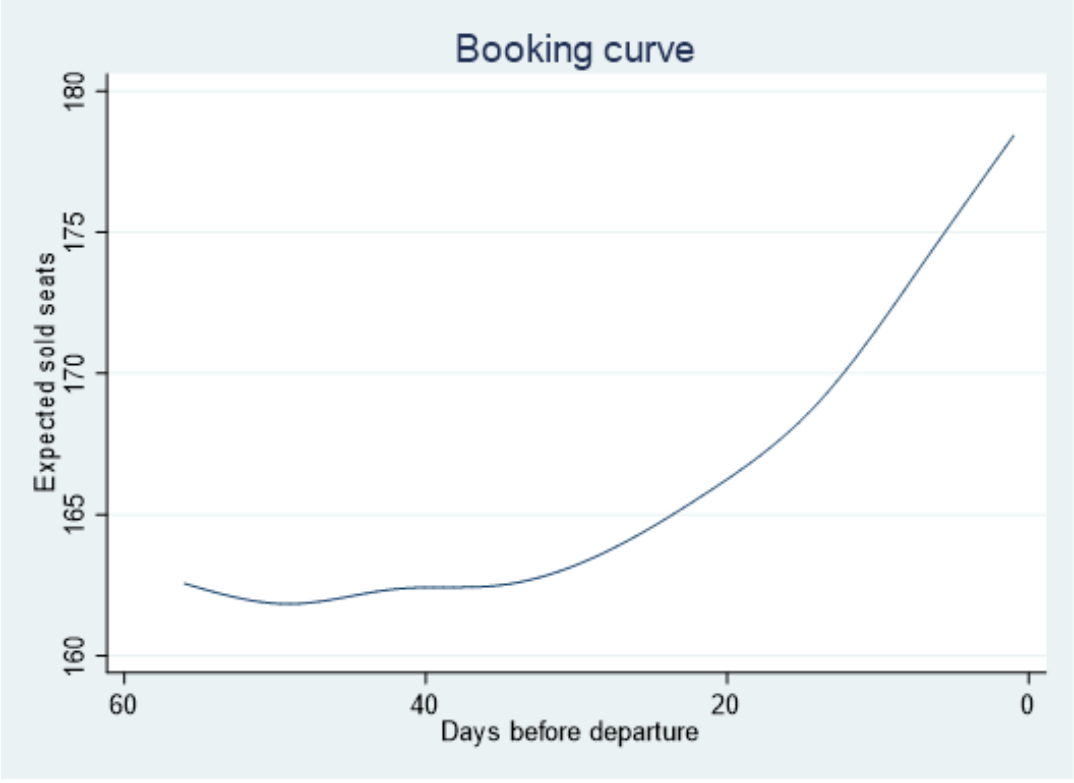
- **Sample routes / period / collection**
  77,221 Ryanair flights, **81 out of 154 routes** from UK over **Jan 2004 - Jun 2005**; data collected with an **electronic spider**
- **Fares**
  11 fares at different days to departure (weekly sampled)
- **Seats**
  Available **seats** detected if **less than 50**

Preliminary evidences



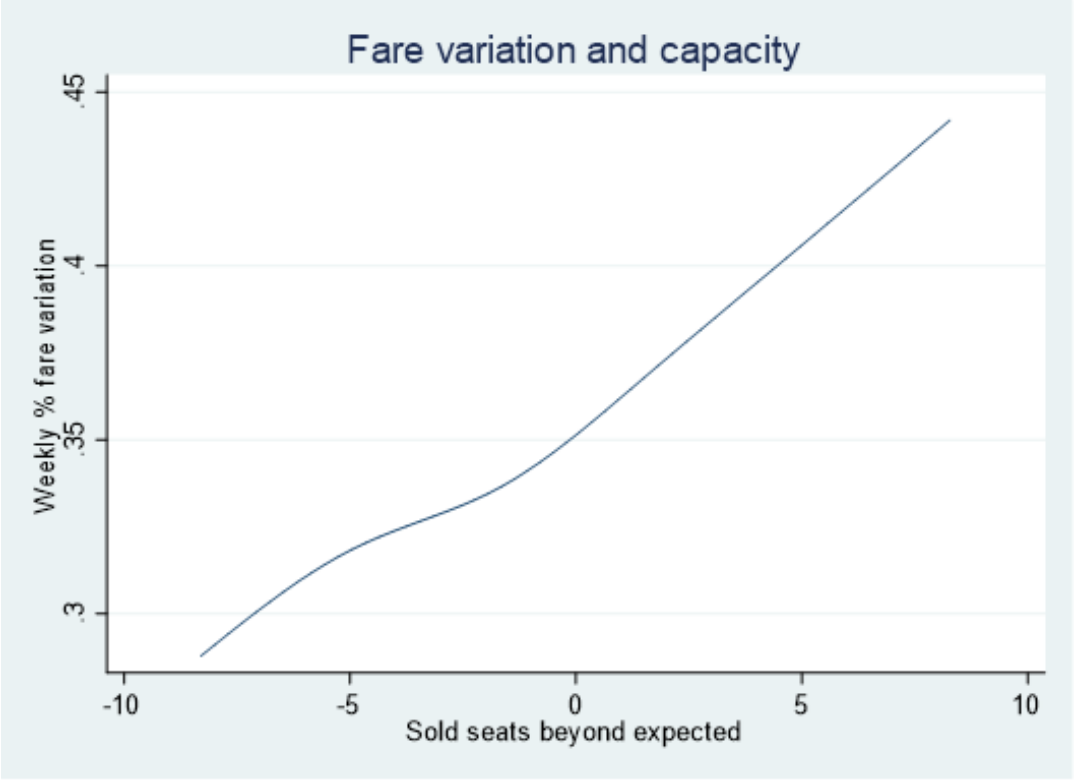
- Fare hikes over time
- From day 42 to day 21 fares grow at a decreasing rate
- Inflection point at day 21
- Growth at increasing rates during the 2 weeks before departure

Preliminary evidences



- Increasing number of seats sold when approaching the departure date
- Booking curve: mean calculated on available seats

Preliminary evidences

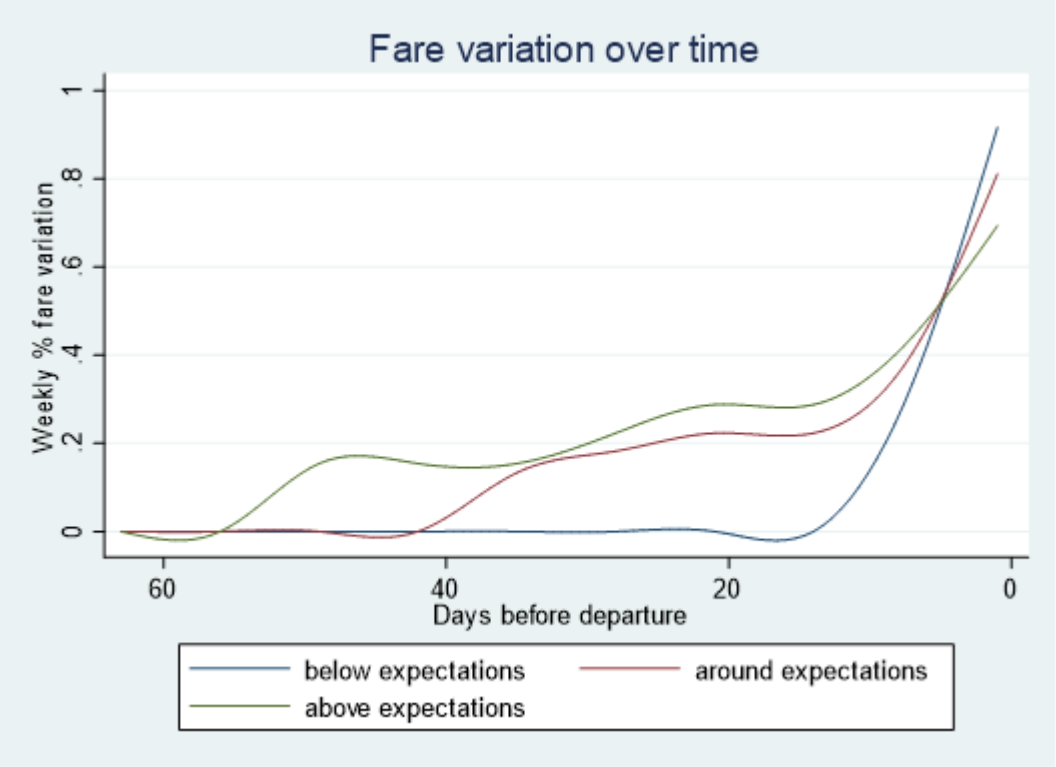


- Anjos, Cheng and Currie (2004) conjecture satisfied
- Fares follow a simple rule:
  - increase more when **above** the booking curve
  - increase less when **below** the booking curve

Preliminary evidences

- Simple pricing rule continues to hold over different booking periods
- Relationship between sold seats beyond expected and fare variation evolves in time

Preliminary evidences



- On average, fares are rised more and earlier when above the booking curve
- On average, no evidences for price drops (Biloktach, Gaggero &Piga, 2015, TM)

Methodology

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- **Sample selection**

  Aircraft capacity: 0 - 189

  Available seats detected: **if less than 50**

  Bias corrected with: **Tobit regression** (Alderighi et al., 2014)

- **Panel data approach**

  Log-lin random effect panel estimator with selection coefficient

- $\Delta \ln(\textbf{Fare}) = \textbf{sold seats}$ beyond expected + D(**days to departure**) + selection coefficient

Results

$\Delta \ln(\text{Fare})$	(1)	(2)	(3)
$\Delta E(Seats)$	0.020***	0.008***	
$\Delta E(Seats)^{+}$			0.015***
$\Delta E(Seats)^{-}$			-0.002
1 day to dep.		0.884***	0.860***
7 days to dep.		0.520***	0.496***
14 days to dep.		0.234***	0.214***
21 days to dep.		0.192***	0.177***
28 days to dep.		0.153***	0.144***
35 days to dep.		0.145***	0.139***
42 days to dep.		0.123***	0.119**
49 days to dep.		0.123**	0.123**
56 days to dep.		0.112**	0.114**
Λ	0.019***	0.007***	0.008***
Constant	0.864***	0.256***	0.217***
R-squared	.00475	.0364	.0372
Observations	107043	107043	107043

Standard Errors clustered by route. Significant at *10%, ** 5%, and ***1%.

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Conclusions

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- Optimal simple pricing rule confirmed
- Both capacity and time theories prove to be relevant, especially if considered together
- Fares hike over time, mainly during the 2 weeks before departure
- Symmetric fare variation when sold seats are above or under expectations

Future steps

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- Instrumental variable approach (endogeneity fare &available seats)
- Bayesian approach for estimating expected booking curve
- Test the same model for other companies (e.g. full service)