Using Shopping and Booking Data to Calibrate QSI Models

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Amadeus
May 2021

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Speaker – Jim Barlow

Bio

- Member of Amadeus Strategy team
- 35 years in the airline industry
- Background in Network Planning, Pricing, and Revenue Management
- Led development of several industry-leading solutions
- Specialty in choice modeling
- M.S. in O.R. from University of Pennsylvania

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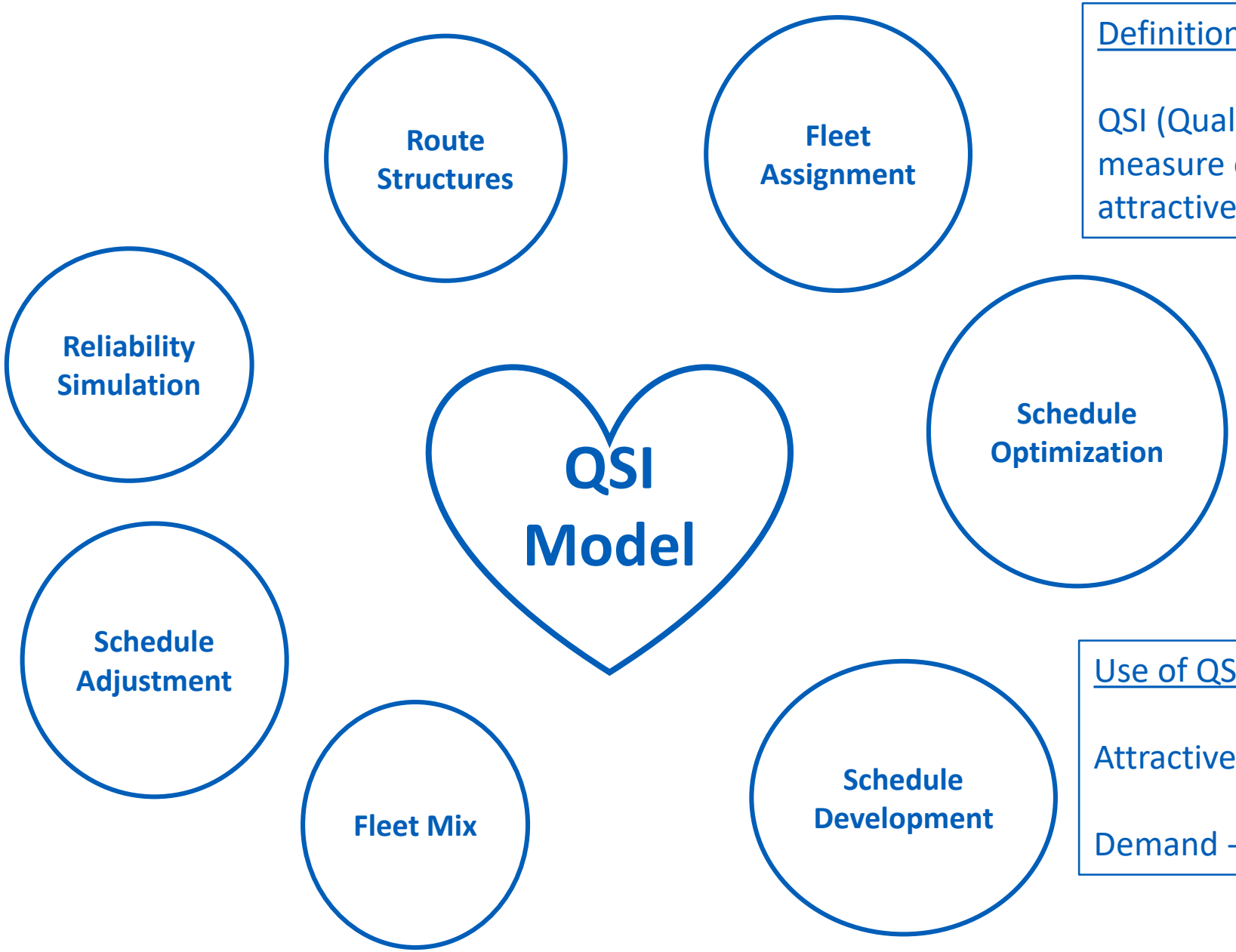
QSI models in schedule planning



Definition of QSI score

QSI (Quality of Service Index) score is a measure of relative schedule attractiveness

Use of QSI models in schedule planning

Attractiveness score -> market share ->

Demand -> Traffic -> Revenue

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Aggregate data often used to calibrate QSI models

Sources of aggregate data

Internal airline data

MIDT bookings

Governmental statistics (e.g., DB1B)

Others

Weaknesses

- Aggregate data affected by capacity constraints, RM effects
- Schedule matching is imprecise
- Difficult to understand influence of price, similar “matching” problem

Calibration process

- Pick historical period
- Match historical schedule for data in that period
- Identify QSI parameters that best fit the aggregate data

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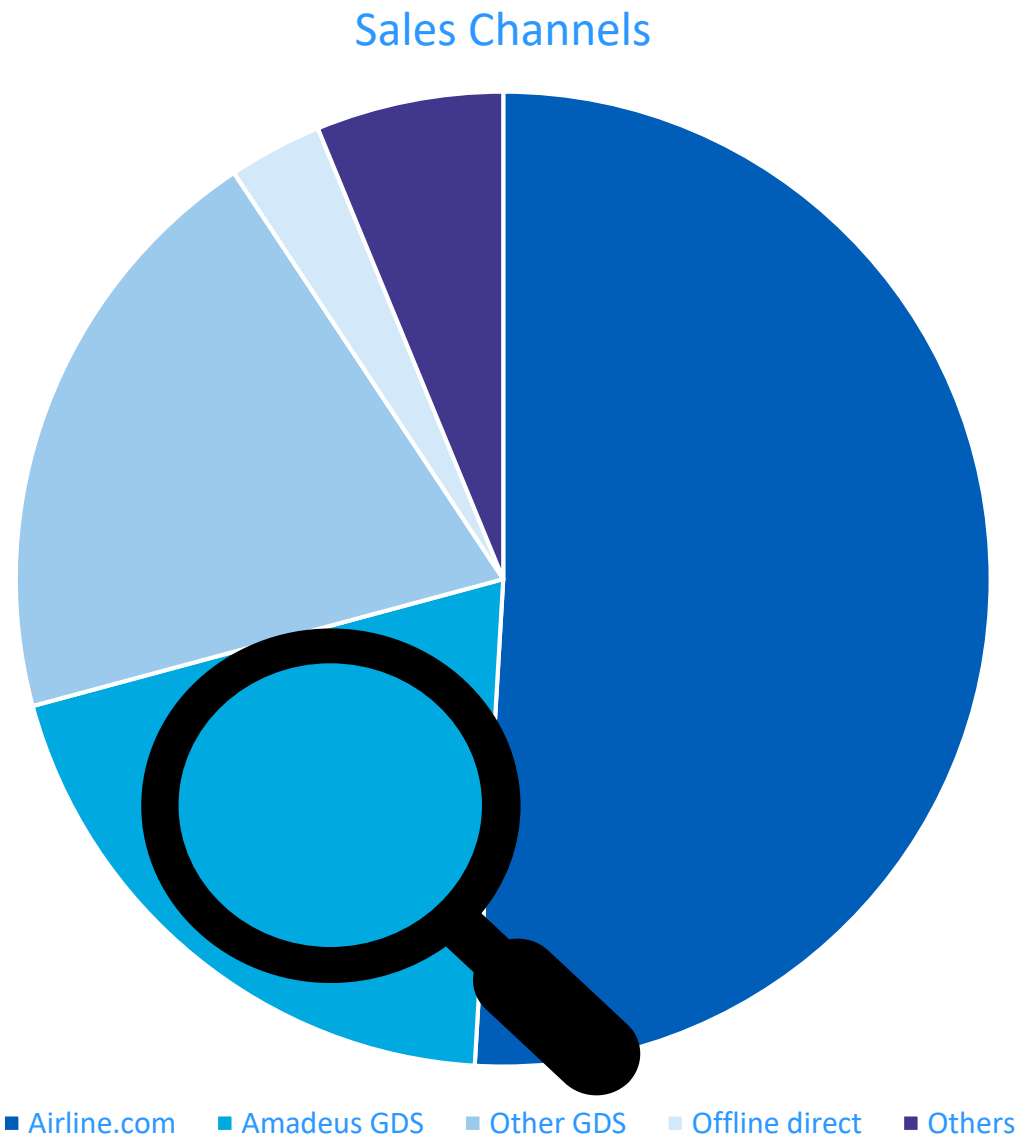
One type of disaggregate data – shopping / booking data from the GDS



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Shopping / booking data example

6:45am - 6:40pm
Dallas (DFW) - Grand ... (GRR)
Frontier Airlines
3 cleaning and safety practices

10h 55m (1 stop)
6h 13m in Denver (DEN)

$259
Roundtrip per traveler

No change fees

3:00pm - 6:27pm
Dallas (DFW) - Grand ... (GRR)
American Airlines • American Airlines 3575 operated by Envoy Air As American Eagle
2 cleaning and safety practices

2h 27m (Nonstop)

$346
Roundtrip per traveler

No change fees

9:35am - 1:03pm
Dallas (DFW) - Grand ... (GRR)
American Airlines • American Airlines 4343 operated by Envoy Air As American Eagle
2 cleaning and safety practices

2h 28m (Nonstop)

$346
Roundtrip per traveler

Unlock trip savings up to $362 when you book a flight + hotel
Add a hotel to your trip and save.

Shop flight + hotel ›

No change fees

7:00pm - 10:28pm
Dallas (DFW) - Grand ... (GRR)

2h 28m (Nonstop)

3 left at
$346
Roundtrip per traveler

Key elements

- Shopping request
- Shopping responses, including price
- Booking

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Matching shopping and booking data

Shopping Data

Search details:

- Search datetime
- Origin, destination, trip dates, pax details, cabin, …
- List of recommendations:
  - List of flights:
    - Flight details (marketing carrier, flight number, flight datetimes, operating carrier, aircraft, …)
    - Fare details (cabin, RBD, fare basis)
  - Price details
  - Elapsed flight time, ground time, n stops…

Booking Data

- Booking datetime
- List of flights:
  - Flight details (marketing carrier, flight number, flight dates)
  - Fare details (cabin, RBD, number in party)

Match

By flight details and time-window

Matched Bookings

Big data set of shopping data enriched with a list of associated bookings

Find best matching search-booking pair, filter and extract features

Modelling Set

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Benefits of using matched shopping – booking data

- “Purer” form of demand
- More information, especially about booking context
- More precise schedule matching
- More precise understanding of impact of price on choice, thus giving an ability to measure price sensitivity in context of schedule

Note – not intended to replace the use of aggregate data, but rather to supplement it

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Recent calibration of QSI coefficients[1]

Effect	QSI Points
Nonstop	1.00
1-Stop Direct	0.17
Single connect	0.09
Double connect	0.01
Interline penalty[2]	17%
Codeshare penalty[2]	54%
Elapsed time (vs. fastest connect)	EXP(-0.65*hrs)
Price[3]	EXP(-1.83*$100s)

Effect	QSI Points
Widebody	1.22
Narrowbody	1.00
Regional Jet[2]	0.84
Turbo[2]	0.74
Legacy airline	1.00
LCC airline[4]	1.75
ULCC airline[4]	0.39

Notes

1. Simple MNL for U.S. domestic one-ways, March 2021. n=430,000. All effects are significant.
2. Special sample required.
3. FYI – equivalent coefficient for AP band (0-6): -1.38; AP band (7-21):-1.89; AP band (21+): -2.20.
4. Requires careful interpretation, coverage issues with 1A GDS, collinear with other effects

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Interpreting the results

- Several coefficients are familiar
- Purer measure of aircraft preference
- Carrier preference coefficients require careful interpretation and further study
- Context of price coefficient allows comparison with other effects, e.g., nonstop premium, value of longer elapsed time / $, etc.

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More uses of the data and QSI model

- Schedule planning integration with Pricing / RM
- Multi-airport cities
- Measuring trends in the coefficients
- B737 MAX preference

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Conclusion and research directions

Conclusion

Calibration of QSI models with disaggregate shopping / booking data is not intended to replace the use of standard calibration methods based on aggregate data, but rather to supplement them

Research directions

- Expand into more types of booking sources
- Dig into carrier preferences
- Model price effects across an extended time period
- Add time-of-day effects to QSI model
- Measure the impact of “screen presence”
- Identify significant differences in market groupings and other ways of clustering the data

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Thank You!!

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