Midterm Exam Info 10/29

- very much like last year's exam
- type will look the same
- closed book
- basic calculator allowed
- review lecture notes
- scan textbook
- look at past exam
- focus on relationship inter-11
- new vs old planes, tradeoffs, marketshare freq share, load vs market share
  Think in
  non linearly w/ s curve
  load factor diff story
  ↑ will go down likely
- V

Project out monday
- like what did Bos-Mia
- but on market of our choice
- while scheduling + utilization

Team 4

Stuff to talk about on Midterm

10/30

- weird special case
  - point ~~out~~ out
  - say why/help
- consider maintance, crew, cost efficiencies
- pax demand changes from your actions
- say all of the relations
  - more flights → ↑ block hrs
    ↑ ASM
    ↑ cost
    ↓ unit cost
  - ↑ freq = ↑ market share (S-curve)
  - add. personell for short turn times
    - ↑ idle times other times

11/1
- remember fixed cost only thing that matters
  variable moves w/ unit

- important where?
  - fleet planning - which routes aircraft flyes on?
- Why do biz travlers pay more? - explain all the different airline divisions
- make sure go right direction
- Biggest thing is making sure to cover every detail

(2)

Reviewing P-set - this class is graded very harshly - make sure to include every possible impact!

→ reducing # of seats changes demand
- would not have thought of in that case
- where exam was different

- could elasticity be > 1
- do not really in airline industry
- but still mention!

Do not "imply" anything!

Some of its based on rest of industry assumption
- noon checkout
- but bag drop
- never studied particular times

* Explain more *
Consider all factors in each qu - nothing off limits/assumed
- Compensate for possible delays

Do not just don't mention unlikely scenarios
- mention them + say why unlikely

plot interactions + implications

yeah very much like case interview

Sample mid term ~~Exam~~

QUESTION 1 ***(36 points)***: For each of the following questions, provide brief explanations of the terms, concepts and relationships involved, as appropriate. You may use point form and sketch graphs in your explanation. *(6 points each).*

(A) Explain the principal economic advantages to an airline when it operates a hub network rather than a point-to-point network in order to serve a large number of O-D markets?

- Hub/spoke network allows an airline to serve many more O-D markets with fewer departures, fewer ASMs and fewer resources (aircraft, crews, fuel) than a point-to-point network. The biggest economic advantage to an airline is lower total operating costs.
- By consolidating loads from multiple markets on spoke-hub flights, the airline can operate larger aircraft with lower unit costs. Alternatively, a higher frequency of departures can be offered, increasing revenues.
- As long as the cost savings from operating a hub/spoke network exceed the potential revenue loss from passengers not wishing to fly on connecting itineraries, the overall economic impact is positive.
- There are also significant economies of scale possible at the hub airport, as crew bases, catering facilities and maintenance work can all be located in a single location.

(B) In a competitive non-stop market, what will be the expected changes in a carrier's own market share and average load factor when that carrier increases its own frequency of departures, with all else remaining equal?

- As a rule of thumb, airline market share is directly related to its frequency share in a non-stop market, but this relationship is not linear.
- The S-curve model suggests that market share increases disproportionately (more) than increases in frequency, unless the frequency share is already dominated by the airline.
- Thus, any increase in frequency of departures will increase market share.
- The impact on load factors is less clear. If the market is extremely time sensitive, and the increase in frequency generates a greater increase in RPMs than ASMs, load factors could increase.
- More typically (as in Assignments), the increase in capacity will exceed the increase in passengers, leading to a decrease in average load factor.

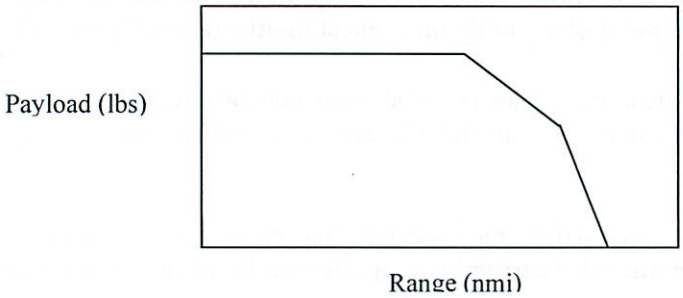
(C) What are the advantages and disadvantages (economic and operational) of reducing the planned ground turn-around times of aircraft in an airline's schedule?

- Shorter turn times mean more departures per day, given a limited window of desirable schedule times during the day. Increased departures lead to higher daily aircraft utilization (block hours) and aircraft productivity (ASMs), both of which will reduce unit operating costs.
- If the aircraft is being used in a shuttle operation on the same route, increased departures mean greater frequency and market share. In all cases, increased departures per aircraft per day should lead to higher total revenues.
- On the other hand, shorter turn times leave less buffer for operational irregularities and increase the risk (and cost) of delays to both the airline and passengers. At a hub, reduced turn times can increase the risk of passengers and baggage misconnections.

- From an operational perspective, shorter turn times put more pressure on ground and gate personnel, and could require additional personnel to make shorter turns possible, increasing costs.

(D) Describe a typical "payload-range curve" for an aircraft type, using a sketch diagram. Discuss the relevance and importance to airline fleet planning of an aircraft's "payload-range curve".

- The shape of a payload-range curve shows the maximum distance that a given aircraft type can carry a maximum load of passengers, cargo, baggage (maximum structural payload).
- Beyond this distance, a trade-off between more fuel and less payload is required, up to a maximum distance that the aircraft can fly non-stop.



- In fleet planning, the payload and range technical characteristics are important for the airline in determining the routes on which the aircraft can feasibly be operated, and the revenue potential from passengers and cargo.

(E) Explain why it occurs that an airline charges $600 for an unrestricted one-way ticket from Boston to Minneapolis (1200 miles), while charging only $300 for a similar unrestricted one-way ticket from Boston to Las Vegas (2300 miles), even though the Las Vegas bound passengers must fly via Minneapolis?

- This is an example of distinct and separate O-D markets that happen to share a joint supply of seats on the BOS-MSP flight leg.
- The two markets can have very different characteristics in terms of the volume of demand, passenger elasticities, and/or competition.
- In this example, BOS-MSP demand might involve business travelers with a higher WTP and lower price sensitivity, allowing the airline to charge a higher fare for its non-stop services.
- BOS-LAS might involve mostly leisure travelers with low WTP, and they are willing to take a connecting flight in order to secure a lower fare.
- If there is low-fare competition in the BOS-LAS market, then this airline might be matching the BOS-LAS fare in order to protect its market share, irrespective of the difference in distances.

(F) Using the "Airline Operating Profit Equation" presented in this course, discuss the likely impacts on each of the affected variables in this equation of an airline's strategy to shift more of its ticket distribution to internet (web) channels, and away from GDSs and travel agencies.

- UNIT COSTS will decrease as the airline avoids paying travel agency commissions and GDS segment booking fees. Total distribution and sales costs decrease, while ASMs stay constant, leading to lower unit costs.
- YIELDS will most likely decrease as more passengers use internet search engines to find itineraries with the lowest possible fares.
- RPMs might then increase due to the greater price transparency and increased access to low fare availability, even if the airline does not change its own fare levels.
- Load factors will then increase assuming ASMs do not change.

QUESTION 2 ***(16 points)***

You are provided with the following 8 metrics for a small airline that operates a fleet of 20 aircraft on a US domestic network.

(1)	Average Number of Seats per Aircraft	120
(2)	Average block speed (miles per block hour)	500
(3)	Average stage length (miles)	1500
(4)	Average departures per aircraft per day	4
(5)	Aircraft Operating Costs per Block Hour:	$3000
(6)	Total System Unit Costs ($/ASM)	$0.10
(7)	Yield ($/RPM)	$0.12
(8)	Average Load Factor	80%

(A) Calculate the following additional measures (show your work):

(i) Aircraft Operating Unit Cost per ASM *(3 points)*

Given AOC per block hour = $3000
In one block hour, aircraft flies 500 miles, with 120 seats, generating 60,000 ASM
Unit AOC per ASM = $3000/60,000 = $0.05 per ASM

(ii) Daily Aircraft Utilization *(3 points)*

Each flight leg (departure) takes 1500/500 = 3 block hours
Given 4 departures per aircraft per day, daily aircraft utilization = 4 X 3 = 12 block hours/day

(B) Based on the information provided by metrics (1-8), can you determine whether this airline is making an operating profit? If yes, explain how and whether the airline is profitable. If no, explain what additional information is needed. *(3 points)*

Yes, we have enough information.
Unit revenue = Yield X Load Factor = $0.12 X 80% = $0.096 per ASM
Given total Unit cost = $0.10 per ASM
Therefore, Unit Revenue is less than Unit Cost, and the airline is NOT making a profit.

(C) What changes (increase or decrease) in the metrics provided to you above should this airline expect to see (in theory) if it decides to move some of its fleet away from its existing long-haul transcontinental domestic routes and shift them to short-haul routes? For each metric that changes, explain why. *(7 points)*

- Average Block Speed will decrease, because a greater proportion of block time will be spent on the ground, taxiing out and into the gate.
- Average Stage Length will decrease, with more short haul flights.
- Average Departures per Aircraft per Day will increase, given that each shorter-haul flight takes less time to complete, allowing more departures to be performed.
- Aircraft Operating Costs per Block Hour will increase, that each aircraft will generate fewer block hours per day over which fixed costs can be distributed.
- Total System Unit Costs will increase, as we expect shorter haul operations to have higher total unit costs. Fewer ASMs over which fixed costs can be distributed.
- Yield will increase, as shorter-haul routes will have higher fares per mile, given that fares increase less than proportionately with distance.

QUESTION 3 ***(18 points)***

Casino Airlines operates a 150-seat Boeing 737-800 aircraft once daily at 7 p.m. from Boston to Las Vegas, a distance of 2000 miles. Provided below is a summary table of fare products, prices, and average passengers carried, both under CURRENT FARES and AFTER A CHANGE in fares:

RESTRICTIONS			CURRENT FARES (ONE-WAY)		AFTER CHANGE (ONE-WAY)	
FARE CLASS	ADVANCE PURCHASE	MIN. STAY	PRICE	LOAD	PRICE	LOAD
Y	0	0	$500	20	$600	15
M	7	0	$300	30	$300	35
Q	14	SAT NIGHT	$200	50	$150	70
AVERAGE/TOTAL			$290	100	$250	120
TOTAL REVENUE			$29,000		$30,000	
YIELD			$0.145		$0.125	
LOAD FACTOR			66.7%		80.0%	

(A) Using the example above, define the terms below and identify the specific changes (CURRENT vs. AFTER CHANGE) in the fare class composition of passenger load that are attributable to *(4 points each):*

(i) Stimulation

- Stimulation refers to an increase in total demand that results from a change in the fare structure, either a reduction in restrictions of lower fares, or the reduction in the actual fare value of one or more fare products.
- In this case, the reduction in the Q-class fare from $200 to $150 results in an increase in total demand of 20 passengers. That is, 20 passengers who did not fly before are now able to purchase tickets.

(ii) Diversion

- Diversion refers to a shift in passenger loads from one fare class to another, again due to a change in the fare restrictions or in the actual fare level of one or more classes that represent substitutes.
- In this case, the increase in the Y-class fare from $500 to $600 causes 5 previous Y-class passengers to shift down to the lower M-class fare at $300, causing revenue loss.

(B) Explain the major advantages and disadvantages to Casino Airlines of such a three-tier pricing strategy, as compared to a single-price strategy. *(4 points)*

- Primary advantage is higher total revenues without a commensurate increase in operating costs, higher load factors, and higher total profits.
- Extra revenue is generated with discount fares, from passengers who otherwise could not afford the fare under a single-price strategy.
- Extra revenue is generated from those passengers with high WTP, as the airline captures more of their consumer surplus.

- For the airline, the disadvantages are minimal – there might be additional costs of complexity associated with the management and distribution of multiple price levels to consumers.
- Some consumers might also perceive the multiple-price structure to be "unfair", leading to consumer resistance and/or loss of market share to airlines with simpler fare structures.

(C) If the airline decides to use a 100-seat capacity aircraft for this flight after reducing its Q-class fare, explain the objectives of applying *yield management booking limits* (capacity controls) to the $150 and $300 discount fares. Using only the information provided to you in this example, what nested booking limits should the airline apply to the three fare classes in order to maximize revenues? Explain why. *(6 points)*

- YM booking limits are used to protect seats for later-booking high fare passengers, in cases where total demand might exceed the number of available seats. Booking limits on lower fare classes prevent early-booking leisure passengers from displacing higher-fare passengers willing to pay more.
- YM booking limits can also be used to reverse potential diversion by encouraging "sell-up". By closing down lower fare classes, those with higher WTP cannot divert to lower fare classes and must instead purchase higher fares.

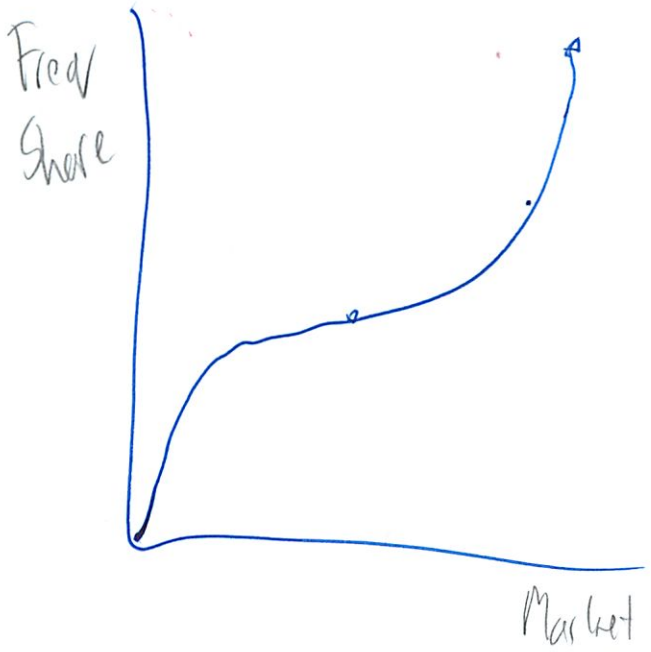
- In this example, assuming deterministic demands equal to the loads of the "after-change" scenario, and given an aircraft with 100 seats, would be as follows:

    - Y-class: All 100 seats are available.
    - M-class: Protect 15 seats for Y class, leaving 85 available to M
    - Q-class: Protect 35 more seats for M class, leaving 50 available to Q

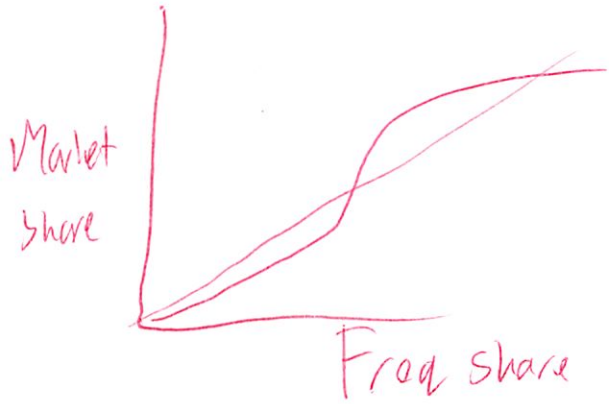
- Nested Booking Limits: Y=100 M=85 Q=50

16.71J Midterm Review

1/1



Slides



Some what I agree I think

Practice Exam #2

1. Operating Cost per ASM

$\frac{\$3000 \text{ cost}}{\text{block hour}} \quad \frac{500 \text{ miles}}{\text{hr}}$

← like doing this with units

$\frac{\text{cost}}{\text{hr}} \cdot \frac{\text{hr}}{\text{miles}} \quad \frac{3000}{500} = \$6 \text{ per mile}$

$\frac{6}{\text{seats}} \quad \frac{6}{120} \quad .05$ ✓

(2)

2. Aircraft utilization
- what is this again? ~~ASMs~~ / ~~day~~

$1500 \cdot 4 \cdot 120 = 720{,}000$
(rate · seats)

← productivity I think
- asms per aircraft per day so ✓

$= \frac{\text{block hrs}}{\text{day}}$

$\frac{1500}{500} \cdot 4 = 12$ block hrs/day ✓

B) Is it making profit?

~~Cost/day =~~
~~$3000 \cdot 12 = 36000$~~

~~Revenue per day~~ ↑ cost in total system costs

$720{,}000 \cdot .10 = 72{,}000$/day cost

Revenue per day

$720{,}000 \cdot .8 \cdot .12 = 69{,}120$/day

$2880 loss/day

- See world ace case interview

they took miles out of it

(3)

Those were all the # questions

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less time in air → lower fuel costs
but less block hrs to spread over!
- does not matter!
Just spreading the fixed cost around

Use words "consumer surplus" etc

I think I know the stuff just scared of not writing enough

Airline divisions

- Network planing/flight scheduling
- ~~Seat inventory~~
- Revenue Management
- Reservations
- Dispatch
- Main
- Crew
- Station
- Pax Processing
- ATC