

AUTOMOTIVE REPAIR SHOP QUEUEING MODEL

APM 115 Group Project 2
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MODEL MOTIVATION AUTO REPAIR SHOPS

- Long wait time
- Limited number of technicians
- Varying job lengths
- Special offers of free oil changes after 30 min!



SPECIAL OFFERS OF FREE OIL CHANGES

- ...if oil change takes more than 30 min (queue + service)
- putting oil changes at the front of queue : service
- service time being guaranteed : revenue and retention rate
- probing system parameters: varying customer arrival rate, number of technicians, customer tolerance on wait time

BASIC STATISTICS (AVERAGE)

- number of technicians = 2
- 10 repairs and 3 oil changes per day
- cost of a repair = \$400 (40% labor + 60% parts)
- cost of labor = \$100 / hr
- cost of an oil change = \$30 (15 min)

MODEL ASSUMPTIONS

- Poisson customers arrival
- Poisson service time required for repairs (mean = 2.5 hrs)

MODEL SIMPLIFICATION

- Two categories: oil changes, repairs
- Customer tolerance of queue wait time based on length of work
- Time is continuous for consecutive days
- Profit = revenue minus cost of parts and cost of labor

MODEL FEATURES

- features two queueing systems: FIFO and OCF
 - FIFO = first-in-first-out
 - OCF = Oil Changes First
- tracks arrivals, wait times, number of lost customers, profits
- customers arrive, enqueueing them, then dequeueing them if they are at the front of the queue and a technician is available

MODEL FEATURES (CONT'D)

- two gates for customers to be “lost”: at arrival and at queue
- “tolerance multipliers”
- simulation timespan = 30 days
- time increment = 15 min

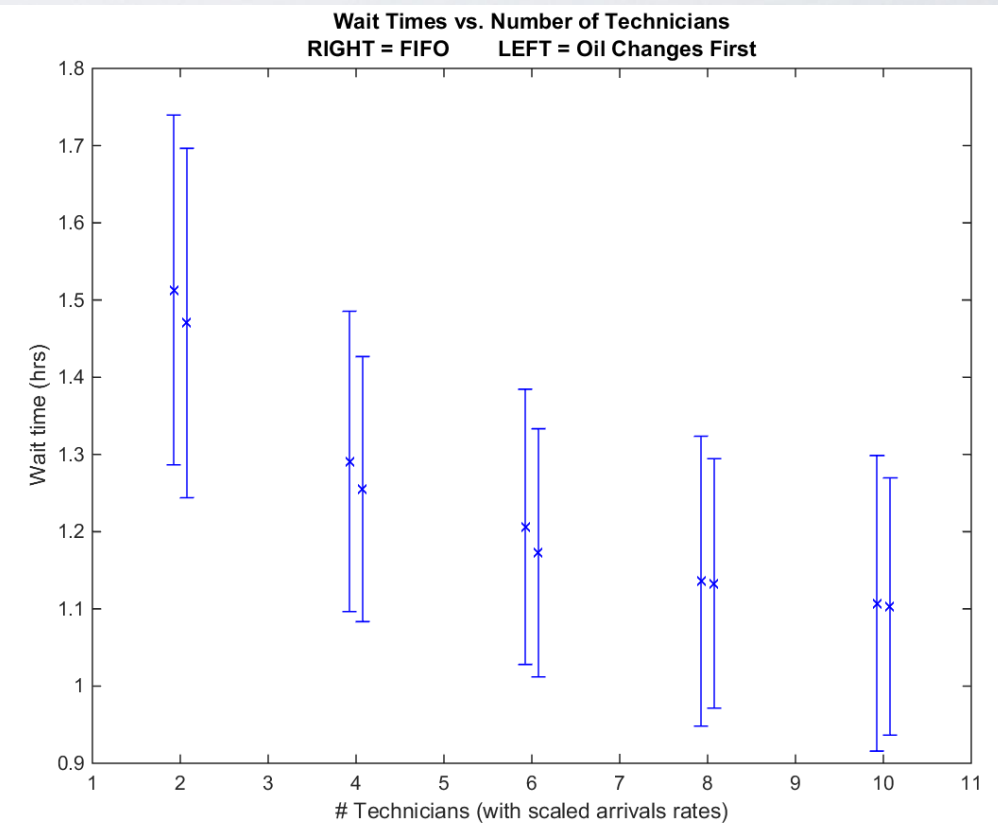
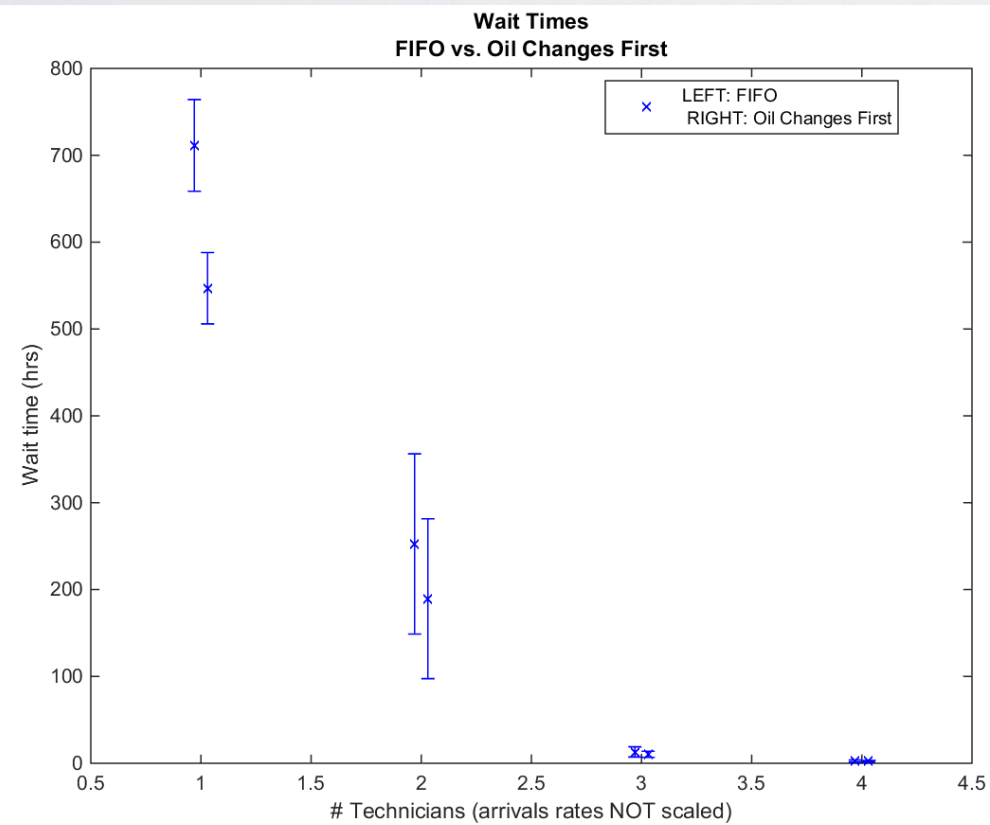
MODEL ANALYSIS

CENTRAL QUESTIONS

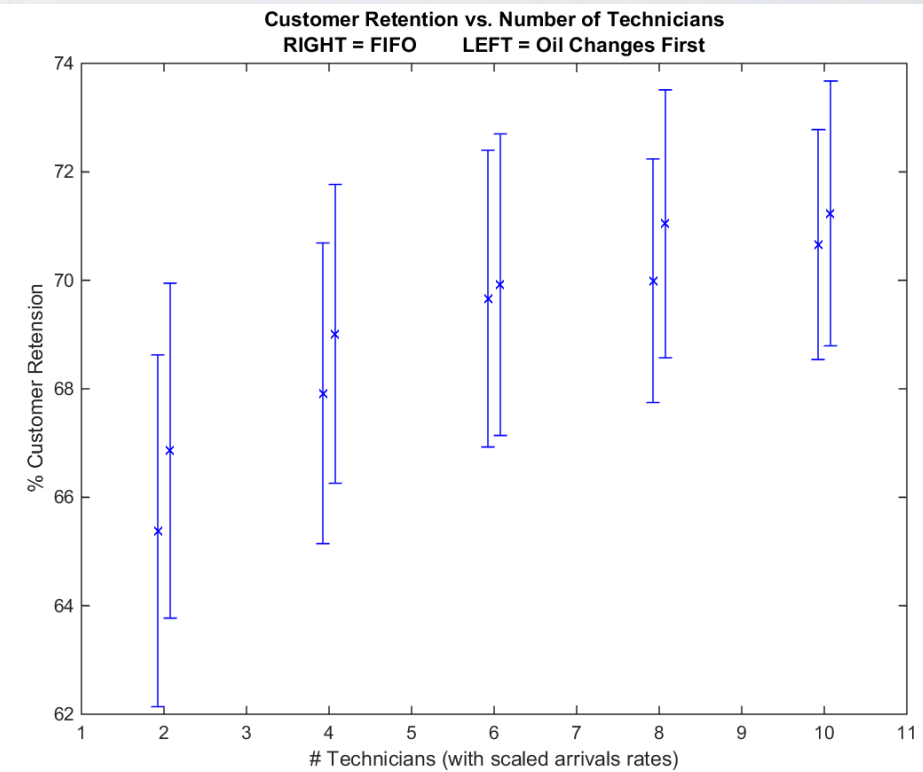
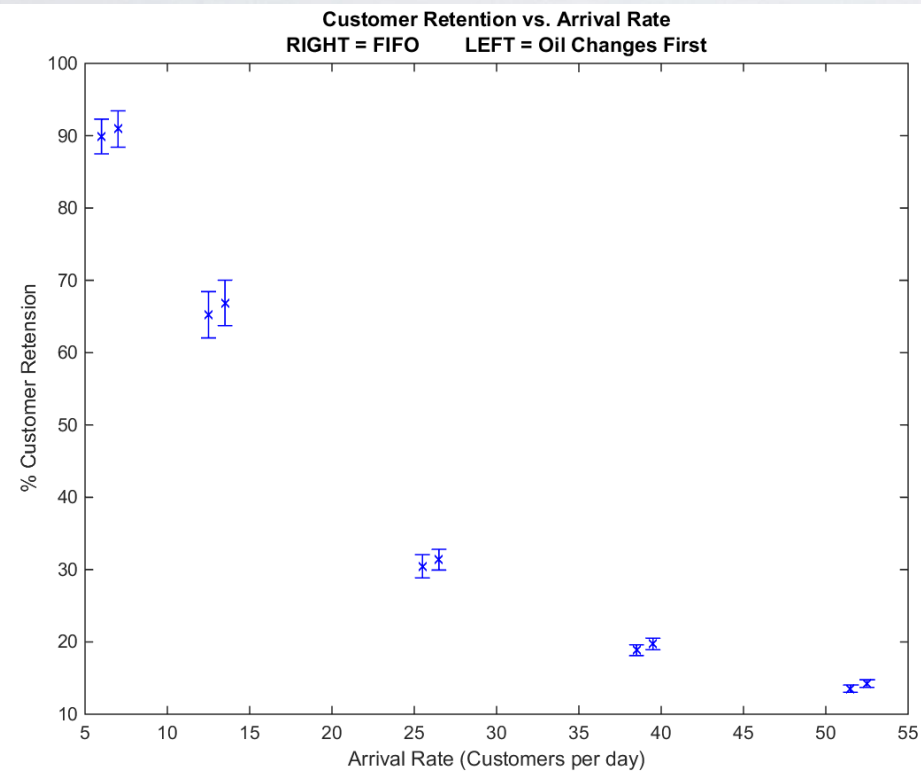
1. How does putting oil changes at the front of the queue affect service?
2. How does profit and customer retention change if service times are guaranteed?
3. Does the success of a the special offer system depend upon system parameters, such as the customer arrival rate, the number of technicians working at the shop, or customer tolerance for wait times?

WAIT TIMES

FIFO VS OCF

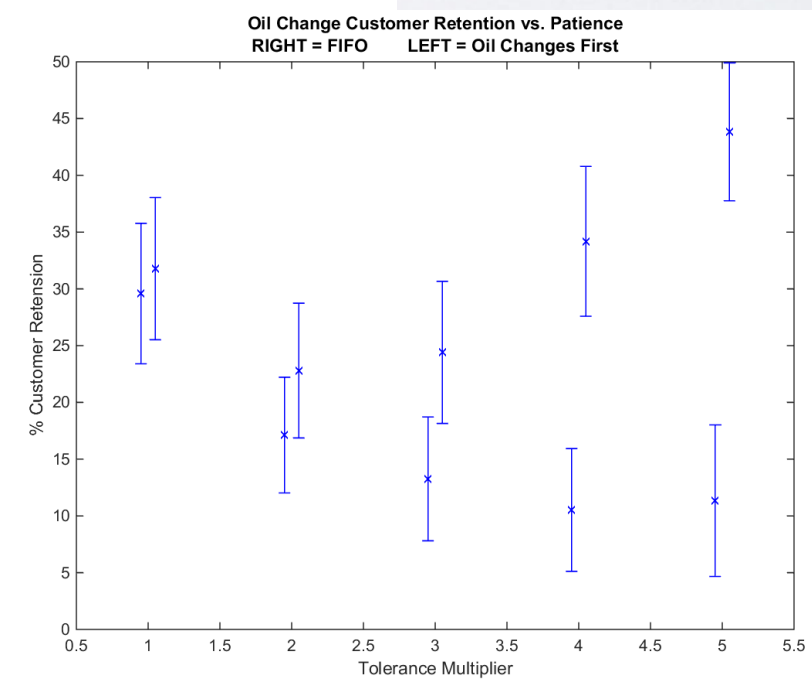
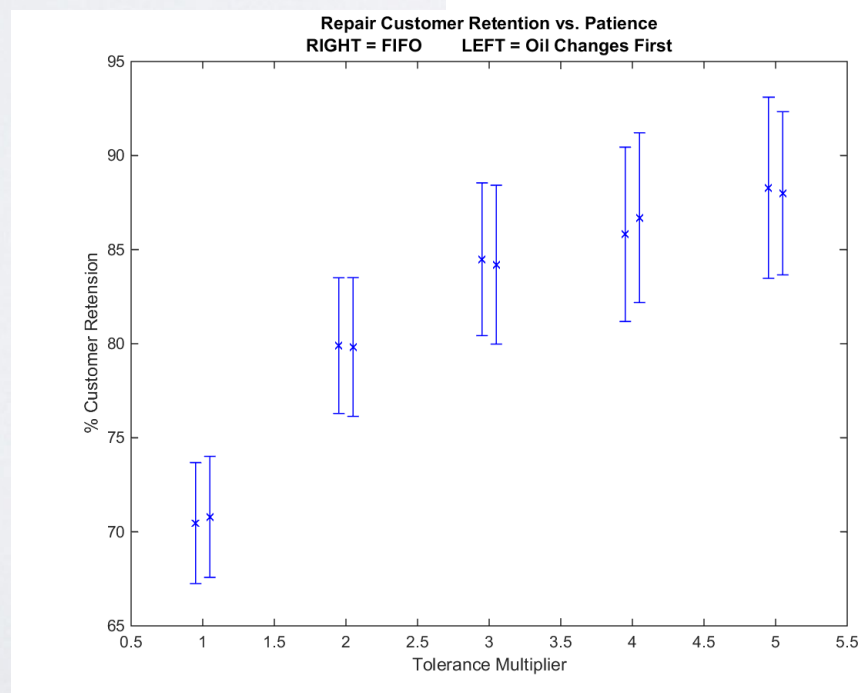
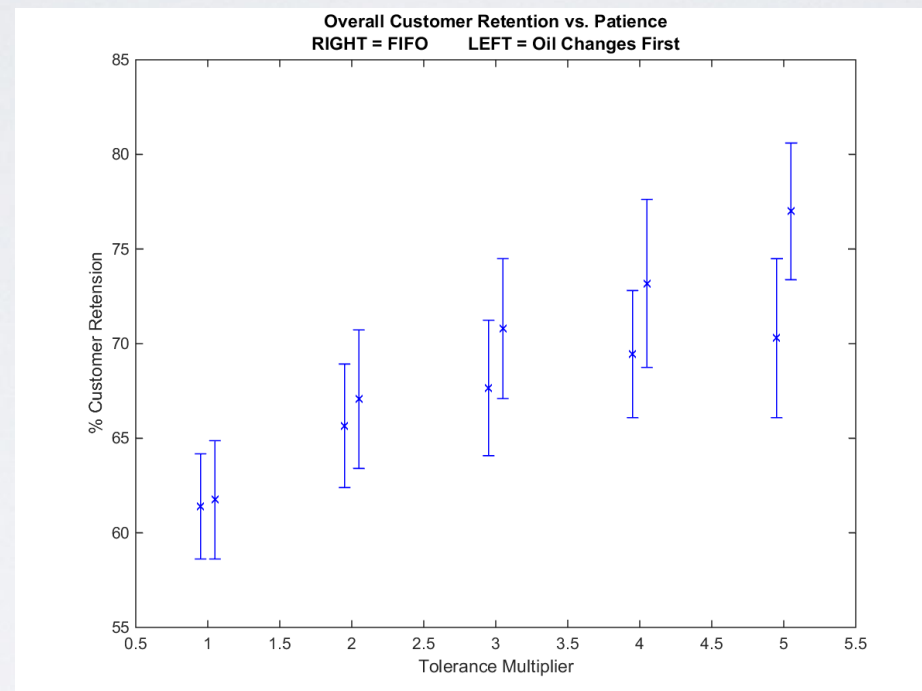


CUSTOMER RETENTION FIFO VS OCF

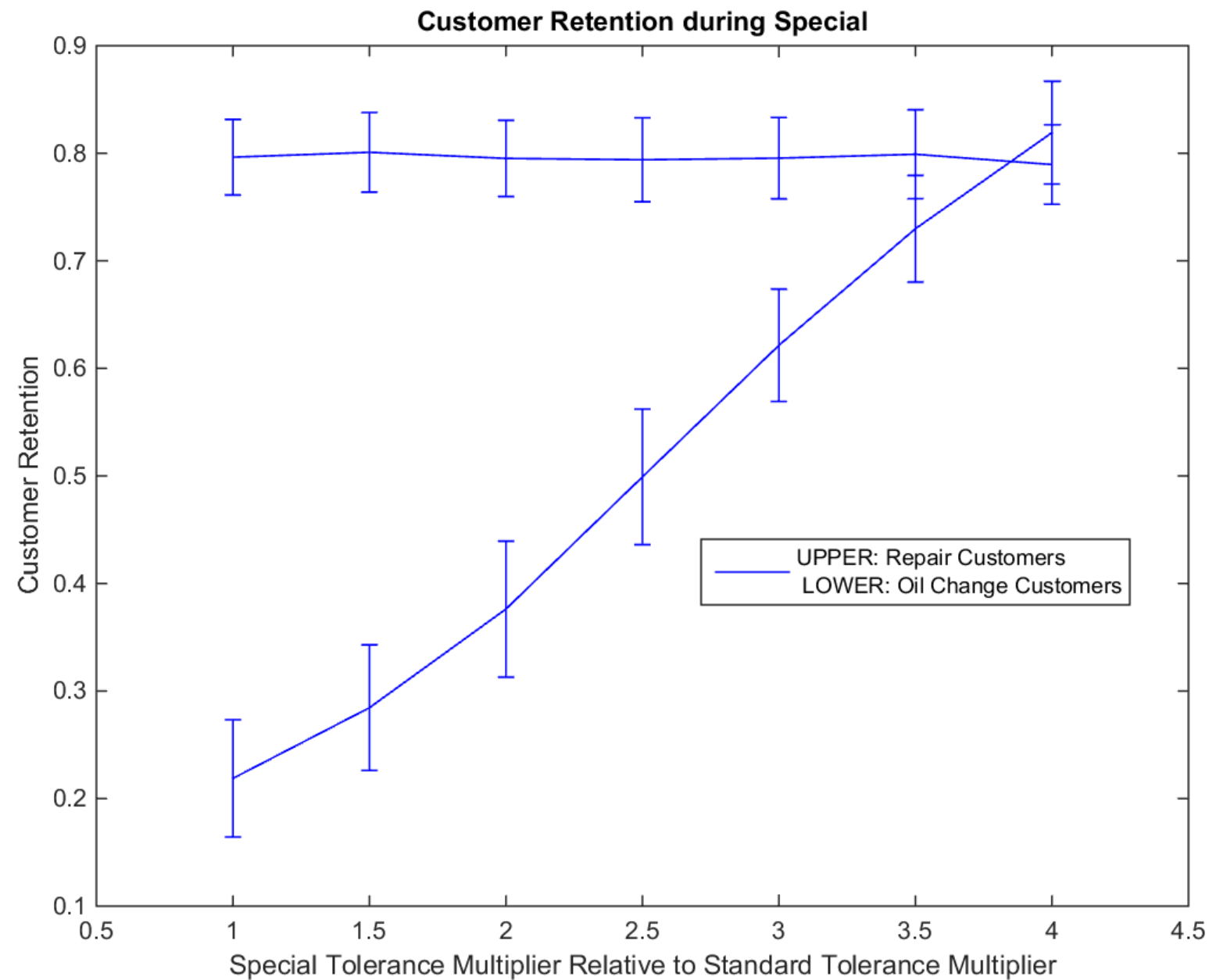


CUSTOMER RETENTION

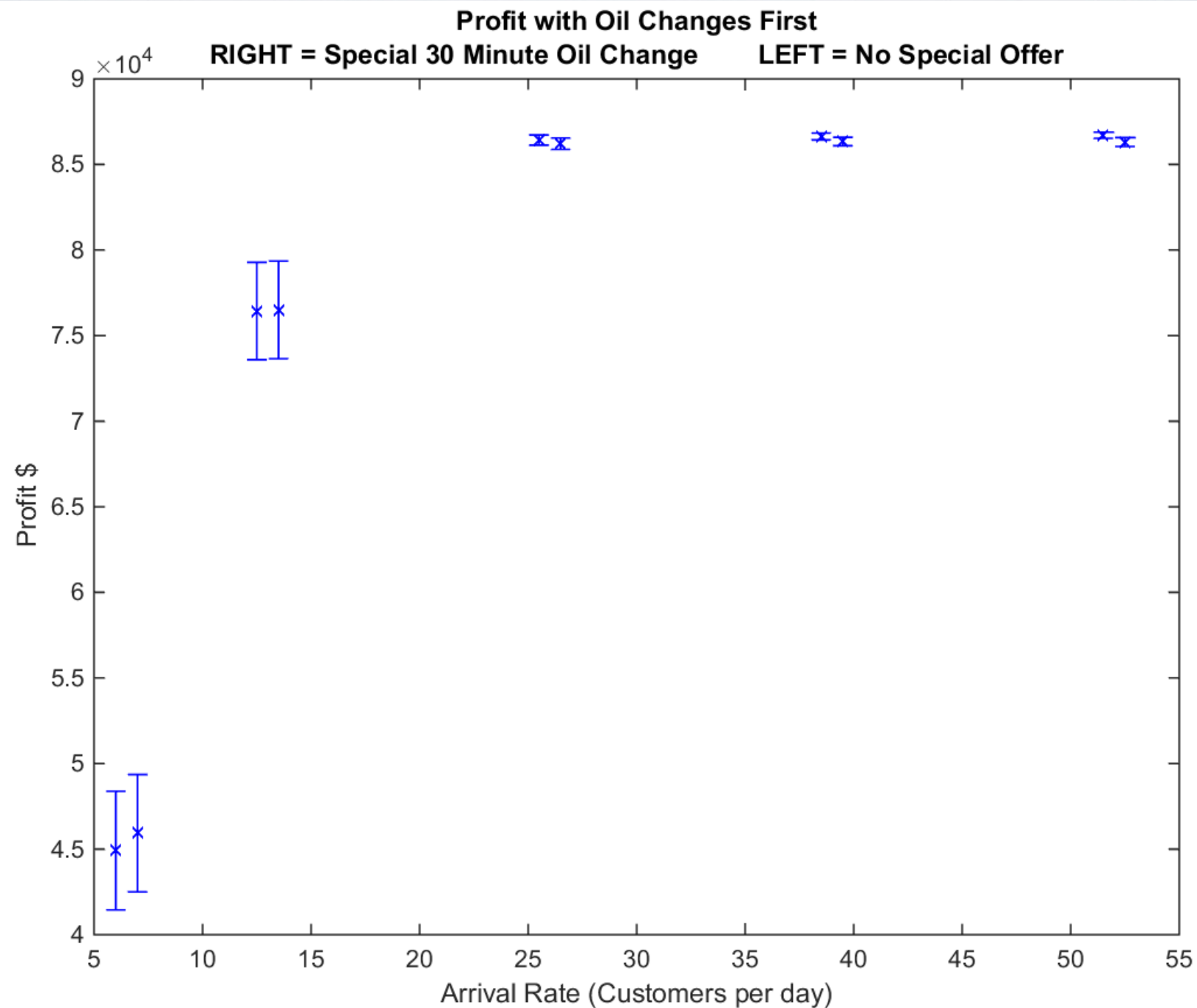
FIFO VS OCF



SPECIAL OFFER! 30 MINUTE OIL CHANGE GUARANTEED



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CONCLUSIONS

- OCF
 - Little effect on overall performance
 - Most of the effect is seen in the oil change customers
- Service Length Guarantee
 - Beneficial if arrival rate is low
 - Drives up oil changes, but slightly reduces repairs