



Car Rental

Outline

- ◆ **Car Rental Business and RM at Hertz**
- ◆ **Revenue Management Saves National Car Rental**
- ◆ **Game: Universal Car Rental game**

**Based on Carroll and Grimes Interfaces 1995,
Geraghty and Johnson Interfaces 1997.**



Hertz

- ◆ Hertz Global Holdings (NYSE: HTZ).
- ◆ Hertz Investors, Inc established in 2005 is a subsidiary of Hertz Global Holdings.
- ◆ The Hertz Cooperation (Hertz) is a subsidiary of Hertz Investors, Inc.
- ◆ Hertz engages in the car and equipment rental businesses worldwide. It operates in two segments, Car Rental since 1918 and Equipment Rental since 1965. The Car Rental segment engages in the ownership and lease of cars. It also sells used cars.
- ◆ Hertz headquartered in Park Ridge, New Jersey.
- ◆ Total Hertz revenue is 7,322 M and Earning (EBITDA) is 853 M in 2009.
- ◆ Ownership,
 - Before 1985, by RCA corporation
 - 1985-1987, UAL corporation
 - 1987-2005, Ford Motor Company; FMC divested from Hertz as its restructuring plan in 2005.
 - 2005-2010, by the following investment funds:
 - » Clayton, Dubilier & Rice Inc.
 - » The Carlyle Group
 - » Merrill Lynch Global Private Equity, which was bought by Bank of America in 2008.
- ◆ Hertz has 8100 rental locations in 145 countries; for more read annual reports www.hertz.com/rentacar/abouthertz/index.jsp?targetPage=investorrelations.jsp



Hertz Car Rental by the Day and Segments

- ◆ Hertz rents cars by-the-day with the exception of a small rent by-the-hour business
 - Rent by the hour to preapproved members is called “Connect by Hertz”, see www.connectbyhertz.com. This is popular among university students.
- ◆ Segments for car rental,
 - US Business Revenues 43%; remaining is leisure
 - US Business Transactions 48%, remaining is leisure
 - International Business Revenues 50%; remaining is leisure
 - International Business Transactions 52%; remaining is leisure
 - US Airport Revenues 73%; remaining is off-airport
 - US Airport Transactions 75%, remaining is off-airport
 - International Airport Revenues 54%; remaining is off-airport
 - International Airport Transactions 57%; remaining is off-airport
- ◆ More business transactions but less revenue: Business rentals are shorter.
- ◆ Business vs. Leisure segments similar in US and abroad.
- ◆ More airport pickups in US than abroad. How are train station pickups are accounted for in international cities?



Pools

- ◆ Pool: This is a geographical location that can contain multiple rental locations (in airports, train stations, downtown, etc.) The Dallas pool contains DFW Airport, Love Field Airport locations, and locations at downtown Dallas, Ritz Carlton Hotel, Hyatt Regency at DFW Airport, Amtrak Dallas Station, Galleria Mall, etc.
- ◆ In smaller cities, a pool can contain only 1 or 2 locations.
- ◆ Pools are defined such that
 - intrapool car transfers are quick and cheap,
 - interpool transfers take more than several hours and have significant costs.
- ◆ Pools are managed by region managers.
- ◆ In the Universal Car Rental game, Orlando, Miami, Tampa are all pools with multiple rental car locations.



Car Rental as a Product and Associated Decisions

- ◆ Car rental product: By car type (compact, ..., luxury; sedan, jeep, van), by insurance (liability, collision), pickup-return location, rental duration (several days, weekly, containing Saturday night rental).
- ◆ How many cars to own, say in US?
- ◆ How to deploy those cars? How many cars are deployed in Dallas pool versus Orlando pool versus Miami pool?
- ◆ What products to offer?
- ◆ What products to sell?



How many cars to own?

- ◆ Purchase cars from manufacturers (Ford) ; Sell them at auction markets or through web: www.hertzrent2buy.com.
- ◆ Challenge: Desirable cars for retailer sales are also desirable for rental. Mix of the cars Hertz wants to buy is not the least costly mix.
 - How many times have you ended up with a purple rental car and wanted to change it? Speculation, purple is not a desired car color.
- ◆ Base decisions on
 - Contribution: A car's expected revenue generation – transaction cost – holding cost
 - Fleet utilization, average percent of the fleet on rent. 78.4% in 2009 annual report.
 - Turndowns (stock-outs, shortages), expected number of customers turned away. No statistics found in the annual report.
 - Market share target; customer loyalty; dependable service
- ◆ Fleet planning horizon 12-18 months
 - Commit to purchases 12 months in advance
 - Accelerate/decelerate deliveries from manufacturers



How to deploy cars?

- ◆ Determine how many cars to keep at each location, based on contribution, utilization, turned downs, etc. at the location level.
- ◆ Demand patterns at the locations of the same pool are not necessarily the same.
 - DFW downtown demand is higher during weekends
 - DFW airport demand is higher during weekdays
- ◆ Intrapool transfer of cars to avoid short term (weekly) demand-supply mismatches
 - Drive airport cars to downtown on Thursday and return them to airport on Sunday
- ◆ Interpool transfer for long term (monthly, seasonal) demand supply mismatch
 - Drive Tampa cars to Orlando before the holiday season and return afterwards
 - Sport events (super bowl), natural disasters (hurricane Katrina) can cause interpool transfers.
- ◆ Since we can handle demand mismatches for very long term (more than a year) by accelerating/decelerating deliveries, no need for transfers.

Car inventory (availability)

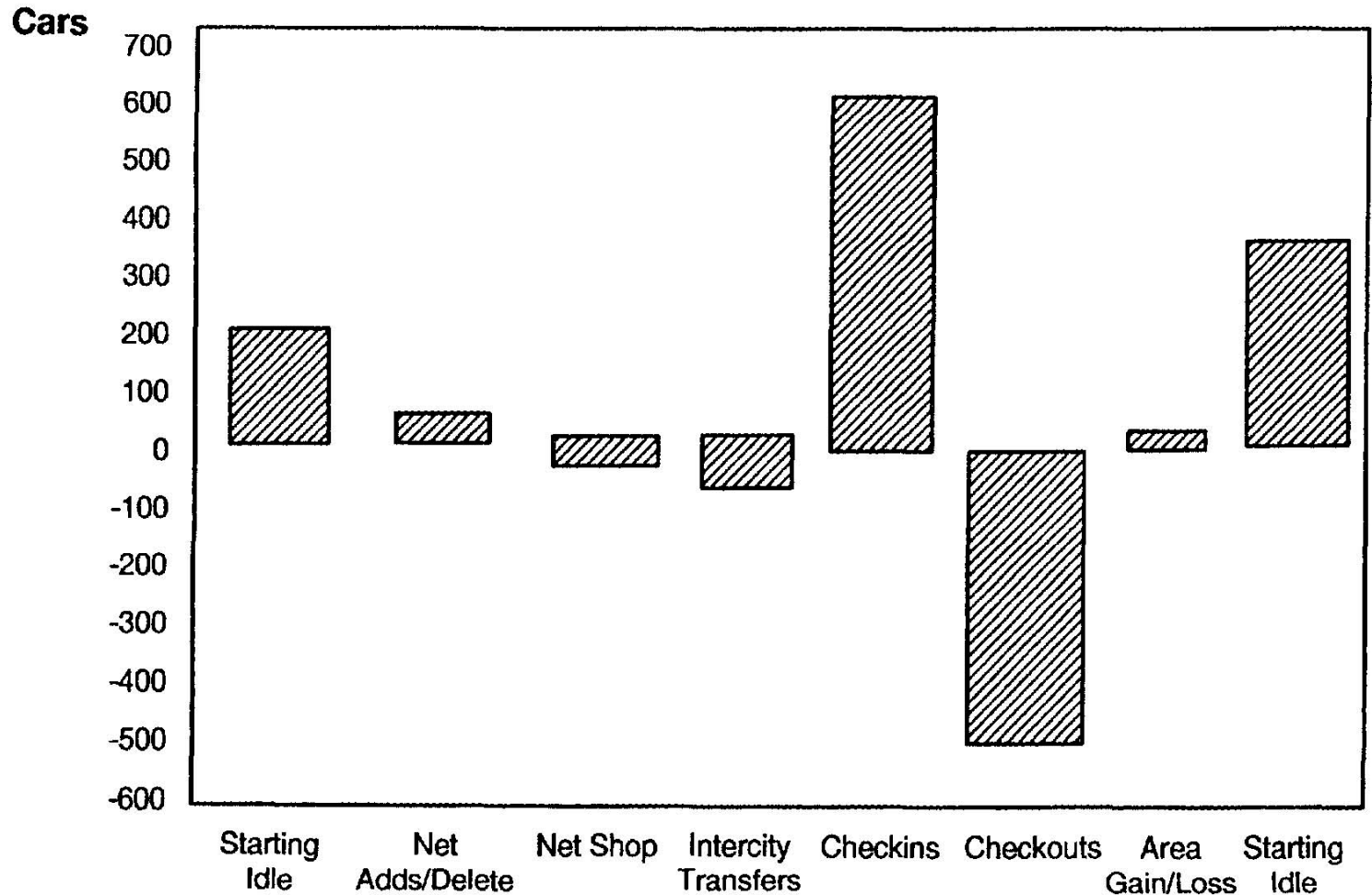


Figure 3: The fleet distribution model uses this underlying logic to calculate car availability for each location in a pool whenever forecasts change.



What products to offer?

- ◆ To commercial customers
 - 24-hour road service
 - Liability protection
 - Corporate rate if requested car is available
- ◆ To leisure customers
 - 24-hour road service
 - Liability protection
 - Collision / full-coverage protection
 - Competitive rate
 - Driving directions / Navigation system
 - Gas option to fill the tank on return
 - Extra driver
 - Bike / Roof Racks
- ◆ Competitive prices by collecting data on competitor prices and advance reservation requirement
- ◆ Adjust price if the competitor's price moves out of a price band



What products to sell?

- ◆ Offsell status: Nonavailability of a product at a certain rate
 - DFW Hertz has 20 Ford Focuses that can be rented to leisure customers at \$60/day or to business customers at \$80/day
 - On a particular Tuesday, 16 of these cars are reserved/rented. Shall we rent the remaining 4 to leisure customers at \$60/day?
 - No, protect 4 cars for the business customers. Ford Focus at \$60 becomes unavailable while it is available at \$80.
 - Expectation is that there are enough business customers to rent all 4 cars.
 - More revenue can be generated by saving a car from current leisure customers and renting it to a forthcoming business customer.

Comparing Car Rental to Airline and Hotel Businesses


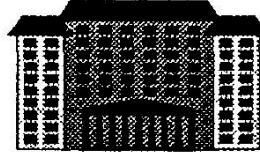

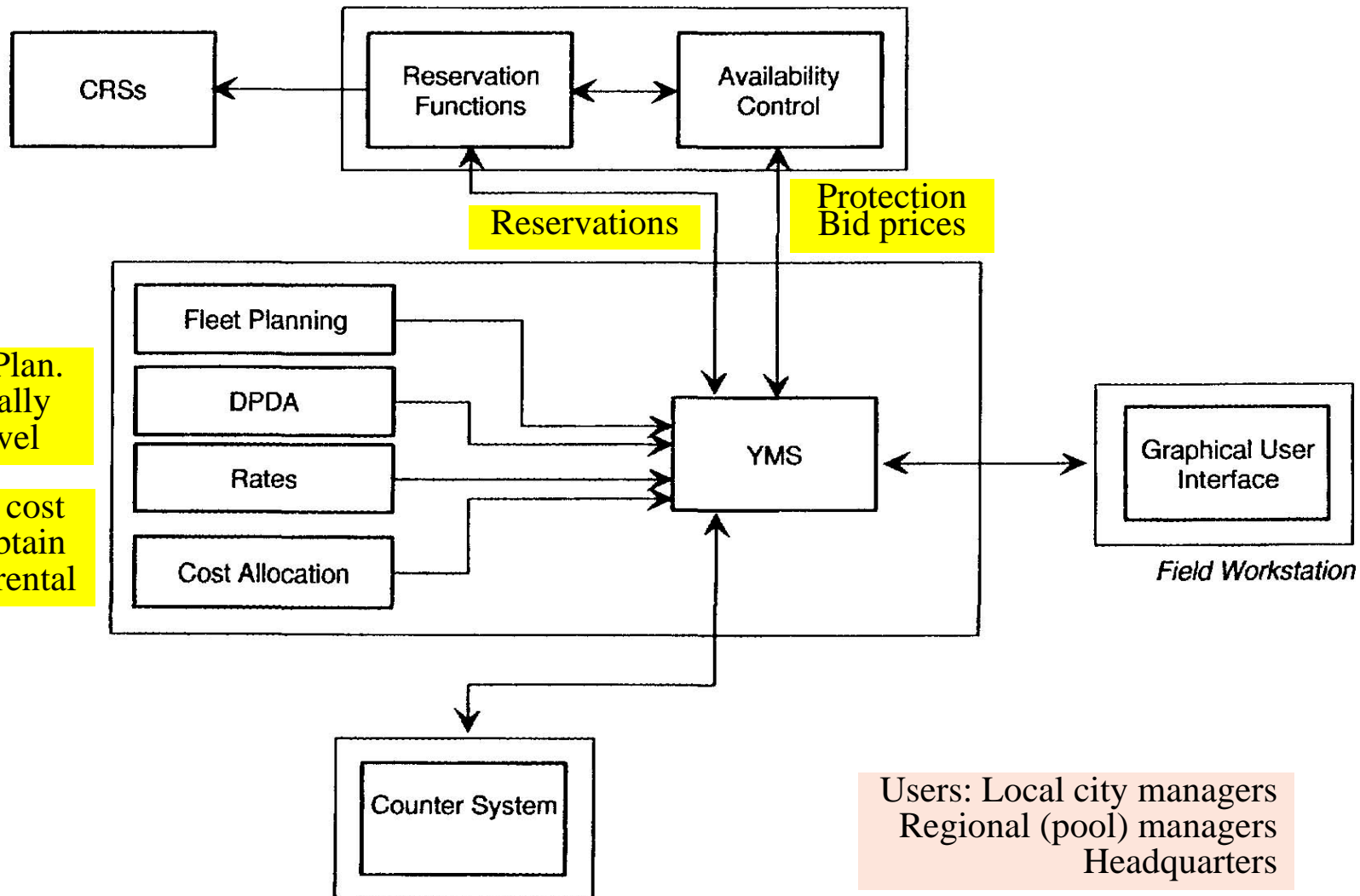
Varying Complexities among Airlines, Hotels and Rental Cars				
		Seat	Room	Car
More Options	Number of Unit Types	1-3	1-10+	5-20+
	Total Units By Location	Fixed	Fixed	Variable
Migratory Inventory	Mobility of Inventory	Small	None	Considerable
	Rates Per Unit	Many (3-7+)	Few (2-3+)	Many (4-20+)
	Duration of Use	Fixed	Variable	Variable
	Corporate Discounts	No	Yes	Yes
Decentralized	Inventory Managed	Central	Central/Local	Central/Regional/Local

Table 2: This comparison of yield management applications highlights some of the reasons why Hertz chose not to adapt existing airline methodologies for its yield management system.

YMS: Yield (Revenue) Management System





Segmenting Customers to Price Differently

- Car rental industry is less successful than airlines / some hotels in segmenting
 - Leisure rental customers reserve a couple of days in advance of rental so do business customers.
 - Leisure airline customers reserve at least 14 days in advance.
 - Advance reservation is a segment fence for airlines not for car rental industry.

- ◆ Appropriate fences for car rental companies
 - **Type of car:** Mid- and full-size vehicles for business customers; Special vehicles (van, jeep) and equipment (racks, baby seat) for leisure customers
 - **Insurance:** More extensive for business customers
 - **Payment channel:** Company credit card or direct bill to company for business customers
 - **Time of rental:** Weekdays for business customers
 - **Length of rental:** Shorter for business customers



Demand Forecasting

- History-based demand with user supplied expected changes in the business environment
- Bayesian update of forecasts based on recent observations
 - Bookings increase forecasts unless forward buy
 - Cancellations decrease forecasts unless forward buy
 - » Forward buy less likely among business customers
- ◆ Forecasts at the levels of
 - Future (date) bookings at a city (location)
 - Day of the week
 - Bucket: Time period such as hourly or daily
 - Length of rental
 - Time prior to pickup: A week in advance forecast
 - Willingness to buy-up: Economy car is not available rent mid-size car.



Overbooking

- Reserving more cars than fleet size with the expectation that some reservations will be cancelled
 - Cheaper to cancel a rental reservation than airline reservation

- ◆ To maintain a quality service level, do not overbook much
 - $P(\text{waiting time} > 0)$ = Probability of a customer with a confirmed reservation waiting for car
 - Service level requirement is satisfied $P(\text{waiting time} > 0) < \text{prespecified small value}$
 - Day of the week
 - Bucket: Time period such as hourly or daily
 - Length of rental
 - Time prior to pickup: A week in advance forecast
 - Willingness to buy-up: Economy car is not available rent mid-size car.



Car Rental

◆ **From**

Car Rental Business and RM at Hertz

◆ **To**

Revenue Management Saves National Car Rental



National Car Rental

- ◆ National Car Rental owned by GM before the middle of 1990s (mid 90s) was not making profit. It improved revenues in 1994 and sold at \$1.3 B in 1995.

- ◆ Before the middle of 1990s,
 - Emotion is a variable in the pricing equation
 - Setting price is a shared responsibility of city managers, marketing, regional VPs, ...

 - Price-sensitive leisure customers make multiple bookings as no prepayment is required
 - Rare penalties for cancellations / no-shows

 - National focusses on business customers and ignore leisure customers
 - No significant advertising campaign in late 1980s

 - Infrequent (annual) fleet planning
 - Few changes in fleet deployment to meet demand

 - No demand forecast at either city or corporate level



RM at National Car Rental

- ◆ Issues
 - National Car Rental turning down a lot of customers when cars were available
 - Competitors increase leisure prices as the date of rental approaches
- ◆ Attempt: Revenue-based turnaround of the company
- ◆ Major question: During periods of high demand, could National raise its prices in the seven booking days before rental.
- ◆ In other words, is dynamic pricing useful and implementable?
- ◆ Resistance by National employees
 - **“We can't do this; we'll confuse our customers”**,
 - **“If we do this, we'll confuse ourselves”**
- ◆ Challenge: Rate cuts designed to stimulate demand on low utilization days may increase demand a few days later when capacity is constrained.
- ◆ Cure: Control the length of rentals (LOR) when stimulating the demand

Revenue Management Organization

◆ Decentralization:

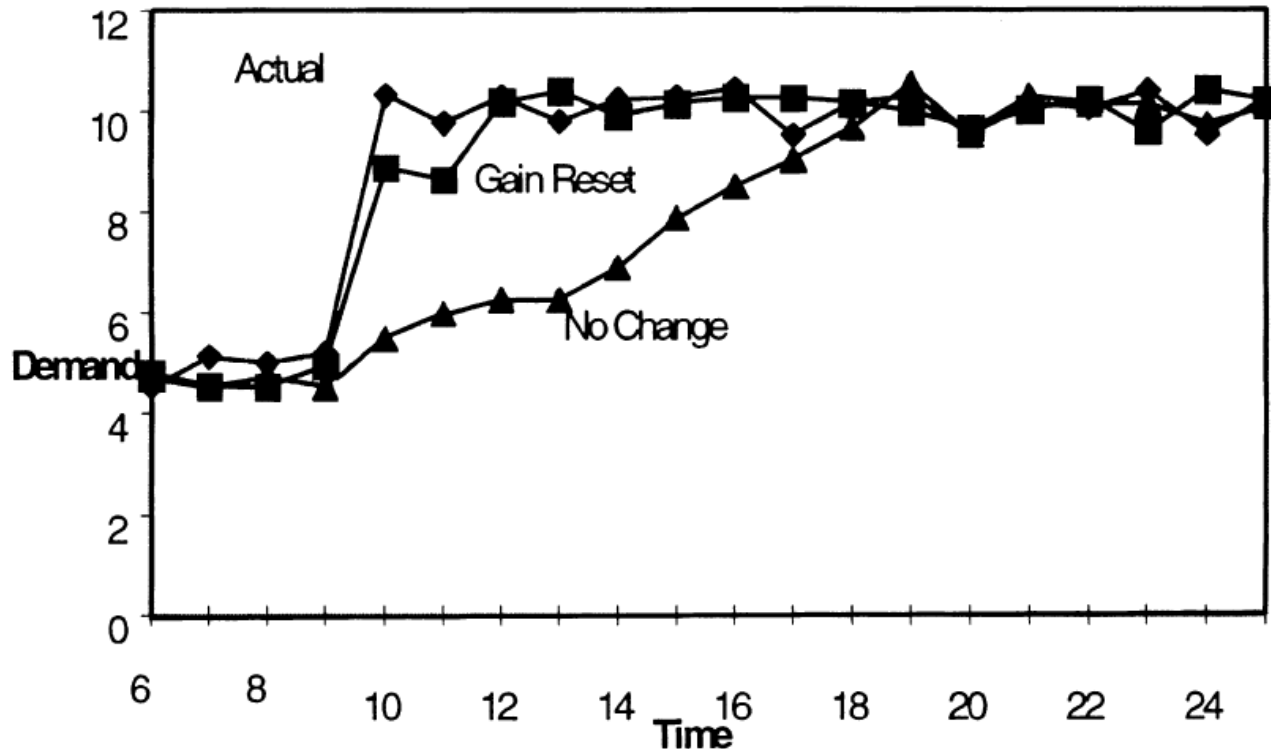
- Least painful solution culturally;
- City manager would not make revenue generation the highest priority;
- Recruiting and training personnel and equipping city offices would be expensive with a long lead time;
- The revenue manager would be a generalist;
- Pricing is inconsistent;
- Managers parochial concerning fleet disbursement;
- Revenue managers would vary in levels of skills.

◆ Centralization:

- The decision to create a centrally located team addressed all of these issues and allowed for the rapid change needed for immediate impact.

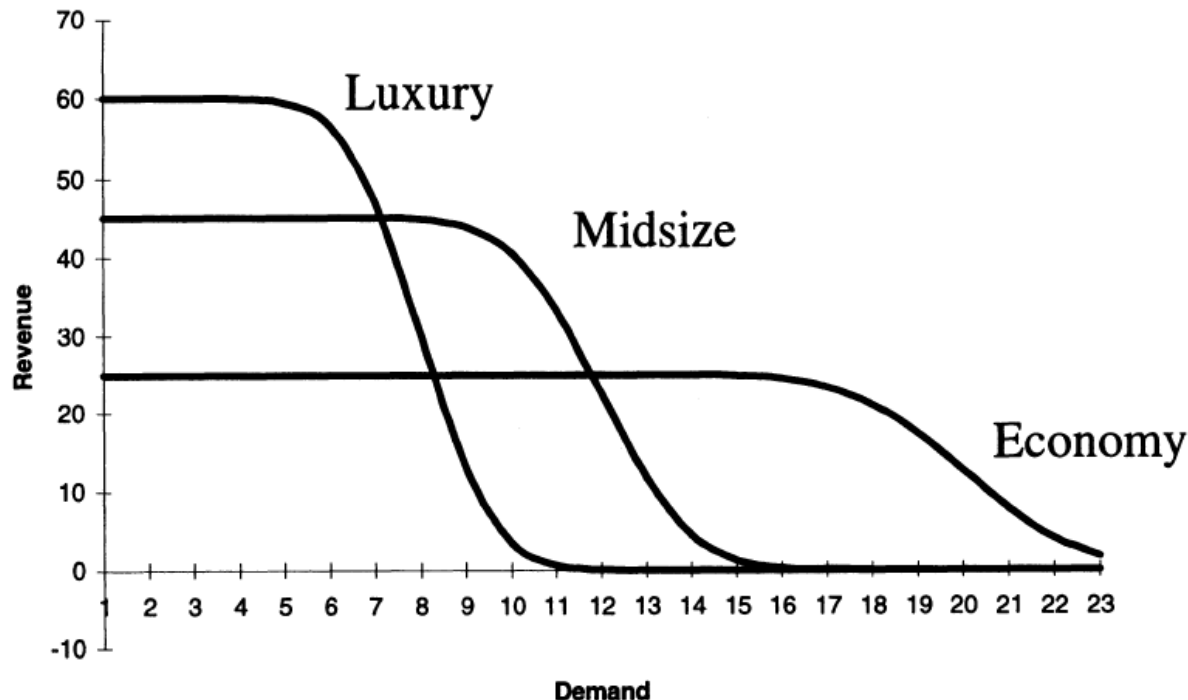
Forecasting

- ◆ Long-term: time-series model with seasonality factors; variable gain approach.
- ◆ Short-term: the expected change in the number of booking.
- ◆ Complications: No-shows and walk-ups.



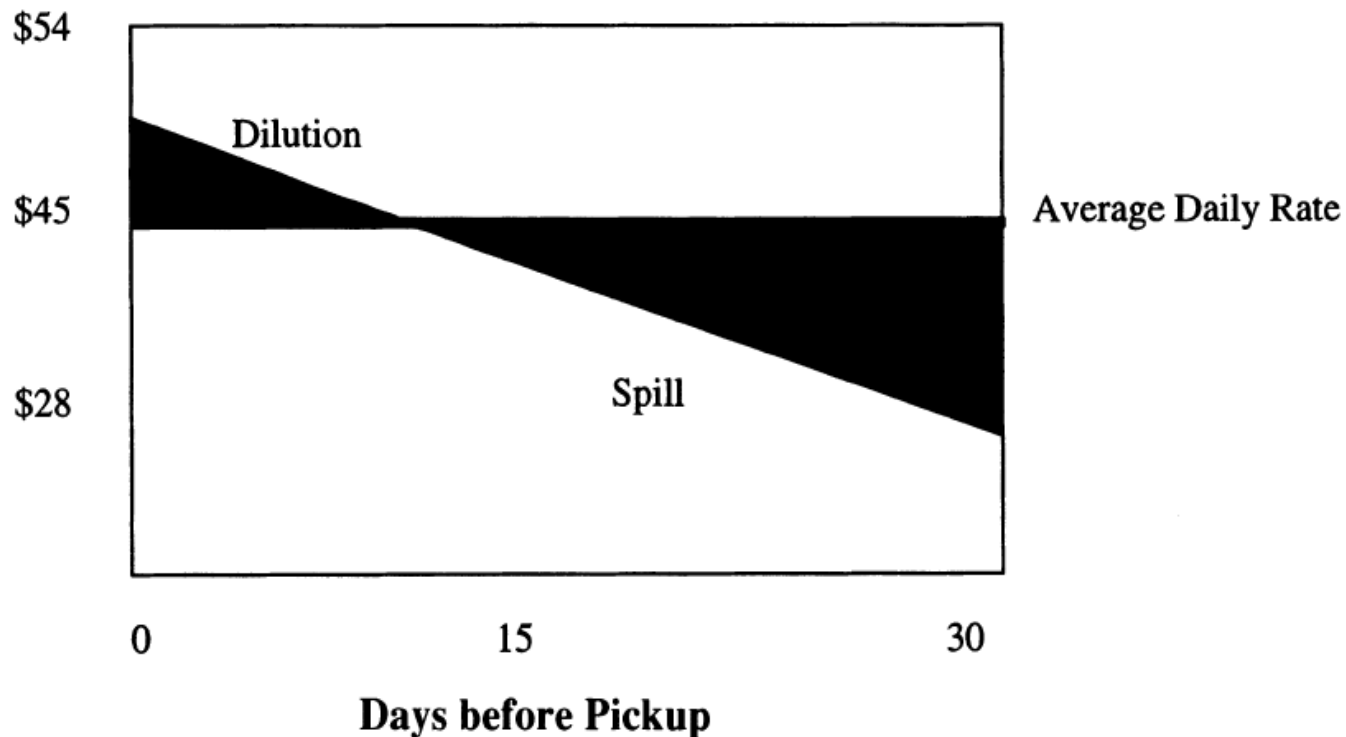
Capacity Management

- ◆ Fleet planning; planned upgrades; overbooking.
- ◆ Differential pricing by instituting fences to capitalize wtp.
- ◆ Typical fleet policy is to acquire more large and midsize cars than expected demand requires and fewer economy level cars.
- ◆ Few economy customers complain for the same rate.



Pricing

- ◆ Two segments: corporate and leisure.
- ◆ Increase or decrease rates based on on-rent demand for a each arrival date.
- ◆ Rely on the revenue analyst's expertise. (e.g. price tolerance of the market segment, the degree of competition at the location)





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Game: Universal Car Rental game

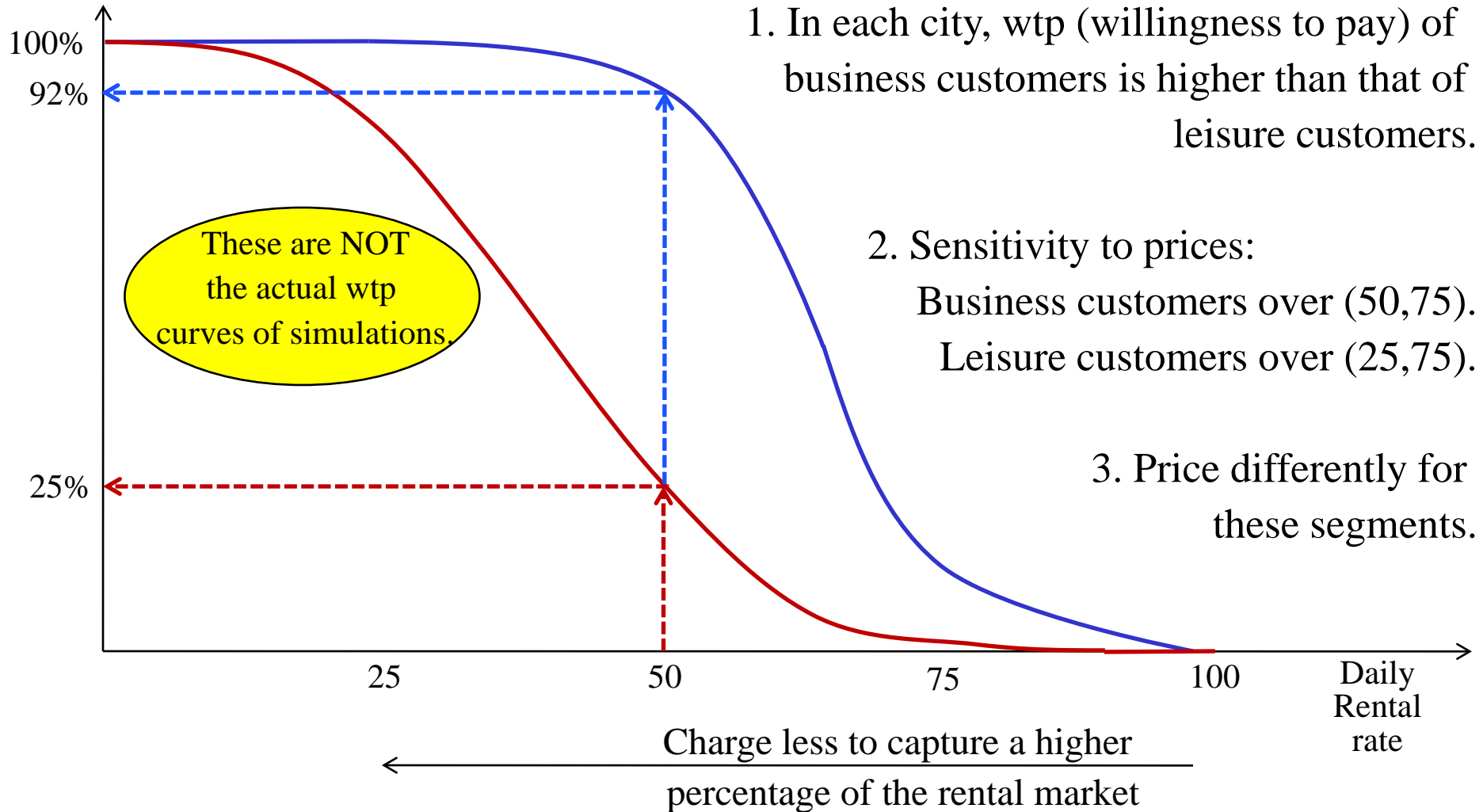


Universal Car Rental

- ◆ Deciding on the weekday and weekend car rental rates in several Florida cities:
 - Orlando, Miami and Tampa.
 - These cities have markets of different sizes and mixes of leisure and business customers.
- ◆ Universal has a competitor in all of these cities.
 - Universal does not know competitor's pricing policy but can infer some of its features from historical data.
- ◆ You are in charge of Universal's pricing for rental cars
 - Prices for each month and for all cities are set at the beginning of that month.
 - For each Florida city
 - For each of 12 months: Oct, Nov, Dec, Jan, ..., Aug, Sep.
 - For each of Weekend and Weekday time periods.
 - For each of two segments: leisure customer and business customer
 - » For 3 cities, 12 months, 2 time periods, 2 segments, you set 144 prices.

Leisure and Business

Customer Purchase Probability via Willingness to Pay





Competition: Splitting the Market

Consider Orlando, Leisure customers, Weekdays in September

- ◆ Suppose:
 - Market is 100K rental days.
 - Universal offers the rate of \$40 and competitor offers \$35.
 - 40% of the market has wtp above \$40 and 50% has wtp above \$35.
- ◆ People with wtp such that $35 \leq wtp < 40$ are captured by the competitor. They are 10% of market, that is 10K rental days.
- ◆ People with wtp $< \$35$ do not rent.
- ◆ People with wtp $\geq \$40$ can rent, say equally likely, from Universal or from the competitor. There are 40K (40% of the market) such people. 20K rent days for Universal; 20K rent days for the competitor.
- ◆ Universal has a demand of 20K; Competitor has a demand of 30K.
- ◆ What happens to demands if the competitor increases his price to \$40?



While Pricing, Beware of

- ◆ Market Segments: Leisure and Business.
 - Business customers tend to rent on weekdays (90% of business demand).
 - Leisure customers tend to rent on weekends (65% of leisure demand).
 - Segments have different price sensitivities.
 - Prices affect not only the split of the demand between Universal and the competitor but also the total demand.
- ◆ Market segments differ from one city to the other.
 - **Orlando:** Largest rental car market in Florida with monthly demand of 1.2 M rental days. 55% of renters are leisure customers. The spread between weekend and weekday demand is limited.
 - **Miami:** Second largest market in Florida with demand of 700 K rental days. 20% of renters are leisure customers. Weekday demand is significantly larger than the weekend demand. What to do with the fleet during the weekend?
 - **Tampa:** Only 200 K rental days per month. 36% of renters are leisure customers.
 - Orlando is a leisure market; Miami is a business market; Tampa is a combination of two.
- ◆ Demand seasonality may or may not be a major factor.
- ◆ Demand growth/contraction may or may not be a major factor.
- ◆ You start with 21617 cars in Orlando and 12807 cars in Miami.



While Pricing, Beware of the Competitor

- ◆ Competitor's pricing strategy is unknown to you but you can deduce some features of it through analysis of data.
- ◆ What is competitor's pricing strategy?
 - **Price to Utilize:** The competitor might be pricing rental cars to attain and maintain a high percentage of fleet utilization. Fleet utilization is the average percentage of cars on rental.
 - **Price to Match:** The competitor might be exactly matching Universal's prices in the last month.
 - **Price to Match with Adjustment:** The competitor may adjust Universal's latest prices by a little, say 5%, and charges those prices in the current month.
 - **Price to Eliminate:** The competitor might be underpricing, say by 10%, to obtain market share.
 - **Price to Increase Margin:** The competitor consistently increases price over time.
 - Describe **another strategy** that you may find appropriate.
- ◆ Analysis of the historical price/demand data will reveal some aspects of the competitor's pricing strategy. Do this analysis to understand your competitor better.



How to play?

- ◆ As an individual or a group, register at <http://cb.hbsp.harvard.edu/cb/access/6667014>.
- ◆ If you are playing as a group, name your group and let your TA tx1071000@utdallas.edu know of your members.
- ◆ From <http://cb.hbsp.harvard.edu/cb/access/6667014> logon to the game.
- ◆ You will see 3 tabs: Prepare, Analyze and Decide.
- ◆ You should investigate the tabs available to you. Analyze and Decide tabs may not be available to you when you log on.



Prepare Tab for 2010 Fall

- ◆ At the top, you will see the scenario name:
 - Orl-Mia / 2 segments / Wknd Price**
 - Your game is concerned with only two cities: Orlando and Miami. Tampa is excluded so that you can focus on pricing strategies.
 - Your game has leisure and business customers with different willingness to pay.
 - You should set separate weekend and weekday prices.
- ◆ Prepare tab also summarizes the game and explains how to play it.
- ◆ Prepare tab has 4 sections:
 - Simulation summary – Read this
 - Run archive – No archives yet, skip this.
 - How to play - Read this.
 - Intro video – Watch this.
- ◆ If you have done the above, you are ready to analyze prices.



Analyze Tab

- ◆ This tab has Dashboard Overview section where you get an overall depiction of
 - Prices, market share, Sales, Fleet size, Utilization, Monthly income.
 - If you click on Miami or Orlando, these data are reported for each city.
 - If you click on All cities, aggregate data are reported for all cities.
- ◆ You can obtain more detailed information from price history, market share, unit sales, universal fleet size, capacity utilization, monthly net income sections.
- ◆ Investigate these sections. For example click on price history.
 - You will see monthly price data for Universal, competitor and for weekday, weekend.
 - Click on copy to clipboard icon above the data table. Now you have the data on your clipboard. You can go to Excel and paste these data. Similar copy paste operation is possible with the other data tables.
- ◆ Analyze tab has market research section containing data on the competitor.
- ◆ Analyze tab also has breakeven calculator section which reports the percentage of change necessary in the demand to compensate for your price changes. I do not think this information is particularly useful.
- ◆ If you have done the above, you are ready to decide on prices.



Decide Tab

- ◆ This tab has two sections: your decisions and decisions history.
- ◆ You are to set prices for the current month, for each city, for weekend and weekday rentals.
- ◆ After setting prices you can advance the simulation.
- ◆ Before you come to this tab, you must have decided on the prices through your analysis.
- ◆ Decisions history section shows you past prices which are available also through the analyze tab.
- ◆ Unless otherwise stated, we are planning to play for one month in every week. Please do not attempt to play multiple months in advance. Your runs are recorded and monitored.
- ◆ It is better that students/groups are all in the same month in each week.



Performance Evaluation

- ◆ Universal rental car game is mainly to illustrate the relevant factors in a realistic context and in a fun/competitive environment.
- ◆ Only a small portion of your grade, 1% of the overall grade, will be affected by your profit.
- ◆ To make things fairer and stable, the game will be played twice with exactly the same settings over 12 months.
- ◆ **In the first 12 months**, you are to learn the settings and develop an understanding how the “things” work. These 12 months will be played slowly, say in the first 10 weeks of the semester. Results of these runs will be deleted.
- ◆ **In the second 12 months**, you will play faster, say in 1-2 weeks, and finish entire 12 months. Results and your performance will be analyzed for grading.



Car Rental

Summary

- ◆ Evolutionary Change in Product Management: Experiences in the Car Rental Industry
- ◆ Revenue Management Saves National Car Rental
- ◆ Game: Universal Car Rental game