Chapter 12
Pricing and Revenue Management

Learning Objectives
After reading this chapter, you will be able to answer the following questions:

- What is revenue management?
- Why do firms offer differential prices to different market segments?
- What are the conditions under which revenue management can be practised in an effective way?
- How do firms make optimal pricing decision in the context of revenue management?
- Why does the fashion industry offer markdown pricing during the end of the season?

Teaching Note: Initiate the discussion using the opening vignette on the airline industry scenario involving differential pricing and instance of overbooking by airlines resulting in denial of seats to customer who had reserved seats in advance. Ask the provocative question: Why do we see so many instances of end of season markdowns in garment and other fashion industry products?

Pricing (Slides 3–4)
Teaching Note: Most students would have gone through the basic concepts of demand curve in a microeconomics course, so just reinforce concepts like demand elasticity, etc.

Revenue Management for Multiple Customer Segments (Slides 5–7)
Teaching Note: See if students can come up with another set of examples (beyond the airline and the hotel industry cases) that involve multiple customer segments having different price elasticity. Bring in the example of Aravind Eye Hospital to demonstrate the innovative use of fencing by firms to charge different prices to different sets of customers.

Pricing under Capacity Constraint for Multiple Segments (Slide 8)
Revenue Management under Uncertain Demand and Limited-capacity Situations (Slide 9–16)

*Teaching Note:* Highlight the issues discussed in the interview with Mr. Ratmakar about the experience of Kingfisher Airlines which shows that demand is difficult to predict. This discussion would help to bring out the nature of the trade-offs involved in fixing booking limits. You may revisit the basic one-period inventory model discussed in Chapter 4. Raise the issues of implementation in India where one may not have demand data for reasonably long period of time. Use the caselet on the Marriott hotel to show the need for experimentation to understand all the relevant issue before full-fledged implementation of revenue management.

Capacity Allocation among Multiple Segments (19–11)
Forward versus Spot Market (Slides 12–13)
Overbooking (Slides 14–15)

Revenue Management for Inventory Assets: Markdown Management (Slides 17–20)

*Teaching Note:* Instructor may like to relate discussion in this section to issues discussed in Chapter 11.

Innovative Pricing (Slide 21)

*Teaching Note:* Encourage students to bring in examples of dynamic pricing seen in practice and see if concepts of revenue management help students in analysing the underlying logic behind dynamic pricing cases seen in practice.

Summary (Slides 22–23)

- In a situation where capacity is perishable, the bulk of the capacity and supply-related costs have already been incurred, revenue management attempts to make optimal pricing decision so that a firm can maximize both the revenue, and by extension, the profit.
Revenue management can be practiced where the same unit of capacity can be used to deliver product or service to different submarkets having their own demand curves with differing price elasticity.

A firm should be able to come up with an innovative way of separating different submarkets so that it can offer differential pricing schemes. Using different booking conditions, the firm should be able to create a fence between various submarkets.

As different submarkets book capacity at different points in time, the firm has to allocate capacity to various submarkets a priori. In uncertain demand situations, the firm faces a delicate decision regarding how much capacity to reserve for high-fare paying customers who usually book capacity at later point in time. Given the uncertainty in demand, while reserving capacity for high-fare paying customers, the firm has to balance cost of over-reserving versus cost under-reserving.

Firms can use ideas of revenue management in any industry (not restricted to the case of perishable capacity context) by applying innovative pricing schemes like customized pricing so as to increase revenues and profits.

**Discussion Questions**

1. **Why do firms offer different prices to different customers for the same unit of capacity?**

   **Solution:** Single pricing assumes that the firm is dealing with a homogenous group of customers and, hence, assumes that it has one demand curve (and associated price elasticity). Most situations involve multiple segments of customers, each segment having different price elasticity with a different demand curve for each submarket. In the case of airlines and the hotel industry, we usually have two clear segments: business travellers and leisure travellers. Both have different price elasticity and, hence, provide an opportunity of revenue management. By charging different prices for different segments (with effective fencing rules), the firm can increase revenue and profitability.

2. **Identify key characteristics of industries where revenue management can be applied.**

   **Solution:** A firm can apply ideas of revenue management under any of the following conditions:
   - Capacity is perishable (One can not store unused airline seat).
   - The same unit of capacity can be used to deliver product or service to different submarkets having their own demand curves with differing price elasticity.
   - Using appropriate booking rules firm can create a fence among the relevant submarkets.
3. For airline/hotel industry, how would the magnitude of benefit from revenue management change with the following?
   a) Reduction in demand uncertainty of business travellers.
   b) Increase in price elasticity of business travellers
   c) Increase in capacity of planes/hotels.

Solution: a) Reduction in demand uncertainty of business travellers: The magnitude of benefit from revenue management would increase as the expected number of idle sets would decline so the overall capacity utilization would go up and revenue would increase for the firm.

b) Increase in price elasticity of business travellers: The difference between the slopes of demand curve for two segments would come down and with a result benefit from revenue movement would decline.

c) Increase in the capacity of planes/hotels: If a firm can identify more segments for enhanced capacity, revenue management benefit from revenue management would remain at the same level. But if numbers of segments remain the same and demand curve faced by firm does not change, the benefit of revenue management would decline.

4. Explain why dynamic pricing provides higher profits compared to fixed price strategy.

Solution: Fixed-price strategy is valid if firm can estimate demand accurately in advance. But in most markets, the firm is not able to estimate the demand accurately; consequently, the firm will with end up with a situation of either unfulfilled demand (the firm is losing an opportunity of hiking prices) or unsold stocks or lower utilization of capacity. Dynamic pricing allows firms to change prices based on updated demand forecast.

5. How important is IT for implementing ideas of Revenue Management?

Solution: All the four roles discussed in Chapter 8 are relevant /important for revenue management:

- Processing basic business transactions: Revenue management needs real-time information about seat/room booking so as to ensure that one does not exceed booking limit for the relevant segments. As booking is done in a decentralized manner in the absence of IT, it would be impossible to implement RM.
- Enhancing collaboration and coordination in the chain: In the airline and the hotel industry, booking is done by agents/partners in chain. In the absence of real-time information, one would not be able to manage and control differential pricing.
- Support SCM DSS: Pricing and booking limits are dynamic in nature as market (demand structure and nature of competition) keeps changing with time. So IT-based decision support systems (DSS) are required to keep revising rules based on recent demand data. Refer to the examples of American Airlines and Kingfisher airlines.

- Measure and Report SCM performance: Revenue management should improve utilization rate and revenue per assets. SCM performance measurement on real-time basis is important to check the overall performance of the revenue management initiative.

6. Why does the fashion industry offer price discounts close to the end of the season?
Solution: Given the nature of demand uncertainty in the fashion industry and the fact that life cycle is quite short in the fashion industry; it is quite likely that the firm would end up with surplus stock at the end of season. Markdown during the season is likely to fetch much higher value than the salvage value available at the end of the season. Given the fact that the firm already has paid for the inventory, higher the revenue obtained on inventory, higher the profitability of the firm.

7. In what ways the Indian Railways can apply idea of revenue management in its operations?
Solution: Indian Railway has started using revenue management in certain services. For example, tatkal tickets are priced at higher value and some amount of capacity is kept reserved for the tatkal category. Indian railway has also started applying ideas of revenue management for freight also. In general, by segmenting customers and pricing their services based on demand–supply situations (rather than using prices which are not function of demand and supply situation) would improve performance of railway.

8. Some hotels have found that application of revenue management resulted in increase in capacity utilisation but resulted in reduction in total profits. What could be the reason for the same?
Solution: In most revenue management policies, where the firm is allowing customers to do a self-segmentation, the firm will not be able to create water-tight compartments and some amount of spillover would happen (For example, in the student discount scheme in the airline case, one would have no spillover because the airline is able to neatly segment the customers using student identity cards) where customers who would have bought capacity at a high price end up paying lower prices. As long as this fraction is low, revenue management schemes would increase revenue and profitability for a firm. If the firm is not able to keep this fraction at a low level, it
might find that revenue and profits might decline. For example, if all the customers at Aravind Eye Hospital take advantage of free services, the hospital would not be able to sustain operations. Similarly, if in the airline case, if cancellation penalty is low, business class customers might start booking early at low prices.

9. How important is markdown management for firms in short life-cycle products?
Solution: Given the nature of demand uncertainty in short life-cycle products, it is quite likely that firm would end with surplus stock at the end of season. Markdown during the season is likely to fetch much higher value than the salvage value available at the end of the season. Given the fact that firm already has paid for the inventory, higher the revenue obtained on inventory, higher the profitability of the firm.

10. What are the key characteristics of effective markdown management policies?
Solution: Optimal markdowns are based on demand elasticity and estimate of the excess stock. Firm should be able to collect data on observed demand (actual demand) on real-time basis (This would allow firm to estimate “excess stock”) and it should have good estimates of demand elasticity for the relevant market segment in which the firm is operating.

11. A retailer operates with a standard markdown policy as follows: In case we are likely to have surplus stocks offer 50% discount in the last month of the season. How effective is the above markdown policy?
Solution: Effective markdown policy should offer discount based on observed demand and inventory available towards the end of the season. Further, one might start discounting much earlier rather than waiting till the last month. Refer to the worked out example in the chapter.

Exercises

1. A Bangalore-based retail company owns two outlets—one in an upmarket mall and the other a discount store in Chennai. It has procured 2000 quantities of a new toy at a unit cost of 300 from China for the Christmas season. Retailer plans to sell the toy at Rs 500 at the discount store and at Rs 800 in the upmarket mall during the Christmas season. It knows that at the discount store there is unlimited demand for this new toy but the demand at the upmarket mall is likely to be normally distributed with mean of 600 with a standard deviation of 200. As per
company policy, all the leftover toys at the end of Christmas season would be donated to charity. How many toys should the retailer reserve for upmarket mall retail outlet?

**Solution:** Cost of under-stocking at the upmarket mall = 800 − 500 = Rs 300  
Cost of overstocking at upmarket mall = 500 − 0 = Rs 500  
Optimal service level = \( \frac{300}{300 + 500} \times 100 = 37.5\% \)  
From Table 4.3, a service level of 37.5% means \( k = -0.3 \)  
Toys to be reserved for the upmarket mall = 600 − 0.3*200 = 540

2. A trucking company owns 50 oil tankers. A large oil company is willing to book the entire fleet in advance at Rs 15,000 per tanker per month. The owner of the trucking company has found that, on the spot market, customers are willing to pay price of Rs 25,000 per tanker per month. Demand however is uncertain in spot market. From the past data owner has estimated that demand in spot markets is likely to follow normal distribution with mean of 25 tankers with standard deviation of 5. How many tankers should be reserved for spot market?

**Solution:** Cost of under-stocking for spot market = 25000 − 15000=10000  
Cost of overstocking for spot market = 15000  
Optimal service level = \[ \frac{10000}{10000 + 15000} \times 100 = 40\% \]  
From Table 4.3, service level of 37.5% means \( k = -0.25 \)  
Toys to be reserved for spot market = 25 − 0.25*5 = 23.74 ≈ 24

3. Super Airlines is working out its overbooking policy during Diwali holidays. It knows that during the Diwali season flight always gets fully booked but several passengers seem to cancel the tickets at the last minute. Revenue from flight is 2500 per seat. If the flight is overbooked, airline incurs average cost of 5000 per passenger in making alternate arrangements for the passengers who could not be give seat because of overbooking. From past data airlines knows that number of cancellations is likely to follow normal distribution with mean of 10 with a standard deviation of 5. By how many seats should Super Airlines overbook the flight?

**Solution:** Cost of under-stocking = 2500  
Cost of overstocking = 5000 − 2500 =2500  
Optimum service level = \( \frac{2500}{2500 + 2500} \times 100 = 50 \)  
Optimal overbooking = 10

4. Refer to the example of designer garment case discussed in the chapter. Firm has 694 shirts left at the end of month-1 and knows that demand is going to be 150 shirts per month for remaining
three months of the season. Let us take a scenario where demand elasticity of price is on lower side. Firm estimates that 20% and 40% reduction in prices would result in demand increases by about 20% and 50% of base price demand respectively. Under this scenario work out optimal markdown strategy for the garment firm.

Solution: Instructor may like to use the excel sheet and just changed the corresponding demand at 20% and 40% discount level.

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So it would be optimal for firm not to offer any markdowns. Lower price elasticity makes markdown management less attractive.