Chapter 16.
Pricing Revenue Management in a Supply Chain (Section One)

2021

Manhattan, Kansas

Kansas State University | Agricultural Economics

Learning Objectives

- Understand *the role of revenue* in a supply chain.
- Identify how *differential pricing* *can help increase profits when serving multiple customer* segments.
- Describe how *dynamic pricing* and *overbooking* can help increase profits from perishable assets.
- Discuss how *peak pricing* and *off-peak discounts* can help increase profits when demand is seasonal.

The Role of Pricing and Revenue Management in a Supply Chain

The Role of Pricing and Revenue Management in the SC

Revenue management is the use of pricing to increase the profit generated from a limited supply of supply chain assets

Supply assets exist in two forms – capacity and inventory

Revenue management may also be defined as the use of differential pricing based on customer segment, time of use, and product or capacity availability to increase supply chain profits

The Role of Pricing and Revenue Management in the SC

Revenue management has a significant impact on supply chain profitability when one or more of the following four conditions exist

1. The value of the product varies in different market segments
2. The product is highly perishable or product waste occurs
3. Demand has seasonal and other peaks
4. The product is sold both in bulk and on the spot market

Differential Pricing for Multiple Customer Segments

Differential Pricing for Multiple Customer Segments

Differential pricing increases total profits for a firm

Two fundamental issues must be handled in practice

- How can the firm differentiate between the two segments and structure its pricing to make one segment pay more than the other?
- How can the firm control demand such that the lower paying segment does not utilize the entire availability of the asset?

Differential Pricing for Multiple Customer Segments

1. Pricing to different segments

2. Allocating capacity to segments under uncertainty

Allocating Capacity to a Segment Under Uncertainty

1. Effective use of revenue management increases firm profits and improves service for the more valuable customer segment.

Airlines (Tickets)

2. Create different versions of a product targeted at different segments

Publishers (Books)

Allocating Capacity to a Segment Under Uncertainty

3. Tactics for multiple customer segments

- Separate segments effectively on service dimension (e.g response time)
- Use different prices for the value assigned to each segment
- Forecast demand at the segment level
- Save appropriate amount of the asset for the last arriving high price segments

Dynamic Pricing and Overbooking for Perishable Assets

Pricing and Revenue Management for Perishable Assets

Any asset that loses value over time is perishable

Two basic approaches

- Vary price dynamically over time to maximize expected revenue
- Overbook sales of the asset to account for cancellations

Dynamic Pricing

Dynamic pricing, the tactic of varying price over time, is suitable for assets such as fashion apparel that have a clear date beyond what they lose much of their value.

The success of dynamic pricing also requires the presence of different customer segments, with some willing to pay a higher price for the product.

Overbooking

- *Overbooking* occurs when a seller with limited capacity sells more units that it has.

- The basic trade-off to consider when overbooking is between having wasted capacity (or inventory) because of excessive cancellations or having a shortage of capacity (or inventory) because of a few cancellations, in which case and expensive backup needs to be arranged to satisfy demand.

Discounting and Peak Pricing for Seasonal Demand

Discounting and Peak Pricing for Seasonal Demand

- Seasonal peaks of demand common in many supply chains
- Off-peak discounting can shift demand from peak to non-peak periods
- Charge higher price during peak periods and a lower price during off-peak periods
- Increases profits for the owner of assets, decreases the price paid by a fraction of customers, and brings in new customers during the off-peak discount period

Contracting a Portfolio of Bulk Contracts and Spot Buying

Contracting a Portfolio of Bulk Contracts and Spot Buying

- Problems constructing a portfolio of long-term bulk contracts and short-term spot market contracts
- Decide what fraction of the asset to sell in bulk and what fraction of the asset to save for the spot market
- The amount reserved for the spot market should be such that the expected marginal revenue from the spot market equals the current revenue from a bulk sale

Some Practical Challenges when Using Revenue Management

Some Practical Challenges when Using Revenue Management

The failure to anticipate customer behavior when using Revenue management and develop an appropriate response can have significant negative consequences.

It is important for firms to ensure that the revenue management techniques do not diminish customer loyalty and encourage them to game the system.

Using Pricing and Revenue Management in Practice

1. Evaluate your market carefully
2. Quantify the benefits of revenue management
3. Implement a forecasting process
4. Keep it simple
5. Involve both sales and operations
6. Understand and inform the customer
7. Integrate supply planning with revenue management

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Pricing Revenue Management in a Supply Chain (Section Two)

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Overview

- Revenue management
- Price elasticity of demand
- Price discrimination
- Understanding consumer surplus
- 1st degree and 2nd degree price discrimination

Revenue Management (RM)

It is the use of differential pricing (price discrimination) based on

- Customer segment or
- Time of use or
- Product (or capacity) availability or product perishability

Benefits to Seller of Variable Pricing

1. Increase profit by extracting consumer’s surplus from buyers.

2. Increase profits by more fully utilizing supply chain assets, both physical capacity and inventory

- Rations supply chain assets
  - Over time and
  - Over customers.
- Must consider capacities, fixed costs and variable costs

Variable Pricing Examples

- Charge lower price . . .

  to customers making advanced commitment

  - advance purchase airline tickets

  With long term contracts

  - e-procurement contracts, shuttle trains

  During periods of low demand

  - off-peak pricing

  Differently branded items—private label is priced below the national brand even though both may come from the same production.

Pricing Revenue Management Examples

Big Mac Price Index

- https://mc-menu.com/mcdonalds-menu-prices/62-big-mac-meal.html

Great Value (Walmart’s Brand?)

Who Makes Walmart's Great Value Brand Products?

- https://www.youtube.com/watch?v=ndAzz9C-9yc

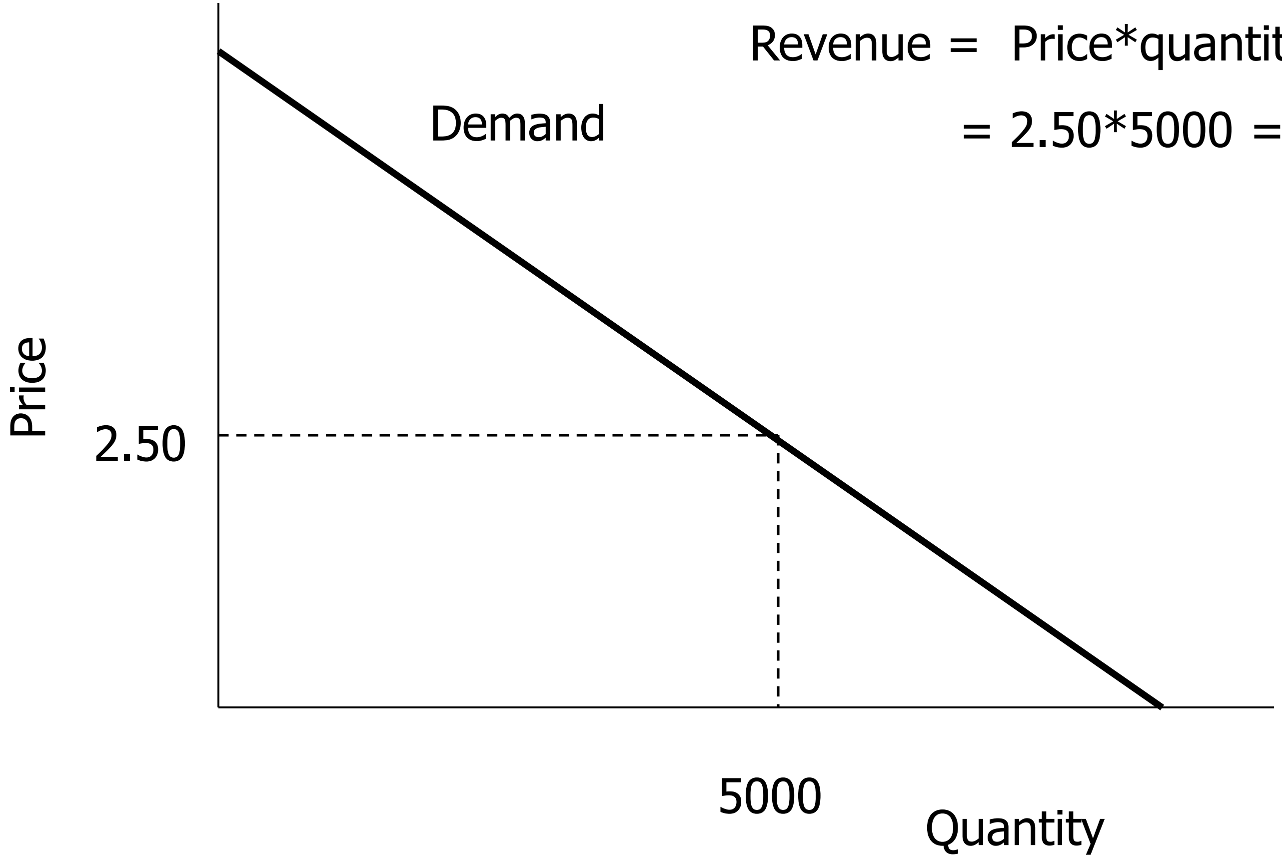
Understanding Consumer Surplus

- To understand the revenue enhancement of price discrimination, we must understand consumer surplus (or more generally buyer surplus).

- Step 1. Recognize that buyers do not value all purchases of the same product has having equal value.

- Step 2. Consumer surplus

Revenue with a Single Price



Revenue = Price*quantity

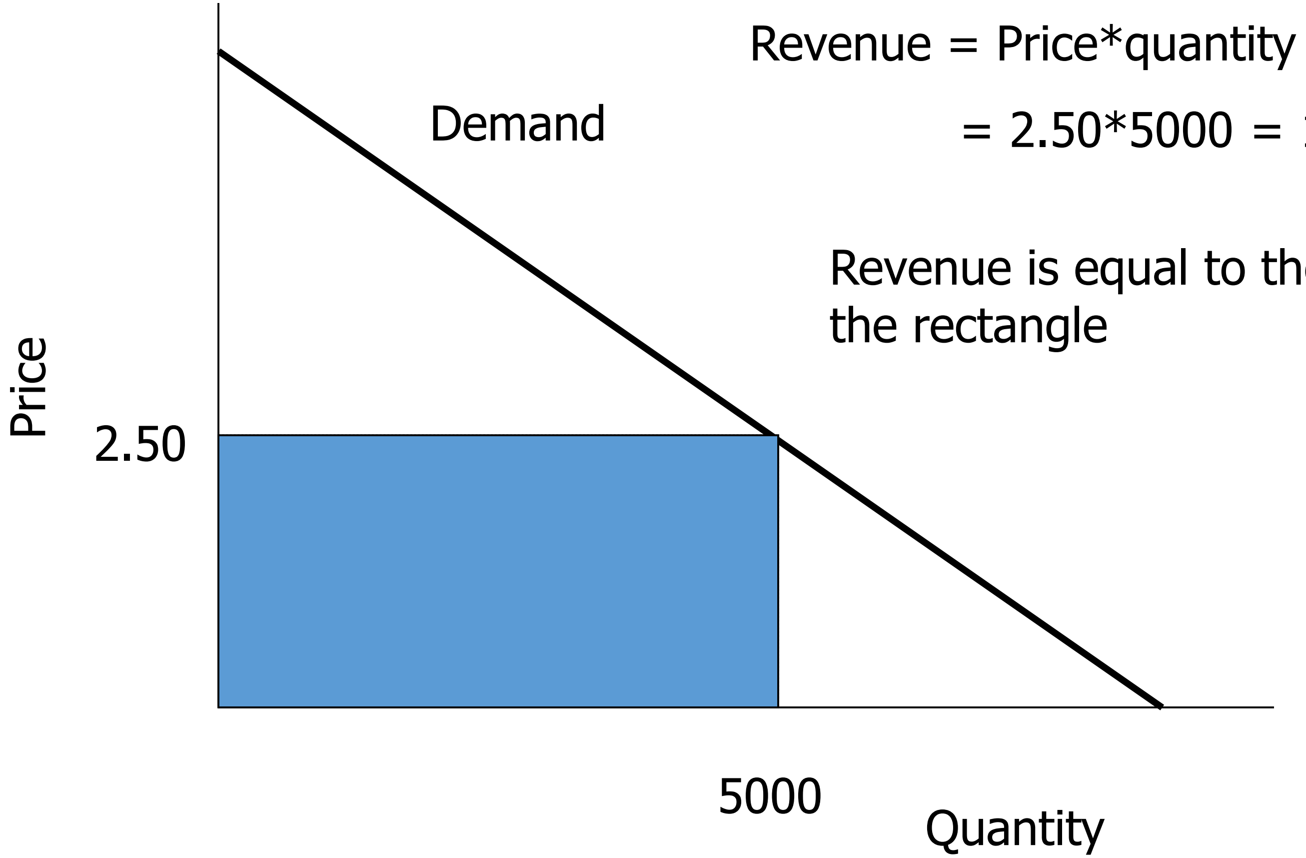
= 2.50*5000 = 12,500

Revenue with a single price

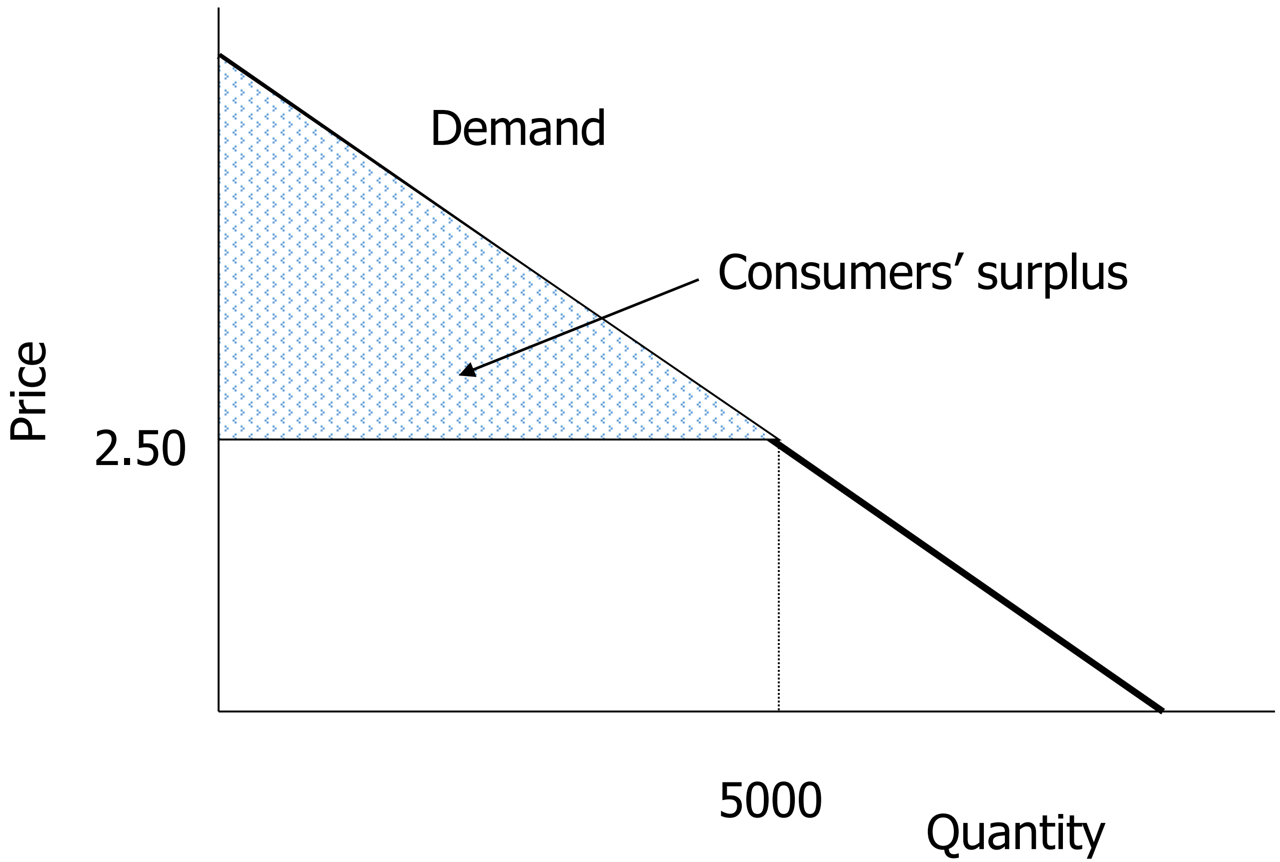
Revenue = Price*quantity

= 2.50*5000 = 12,500

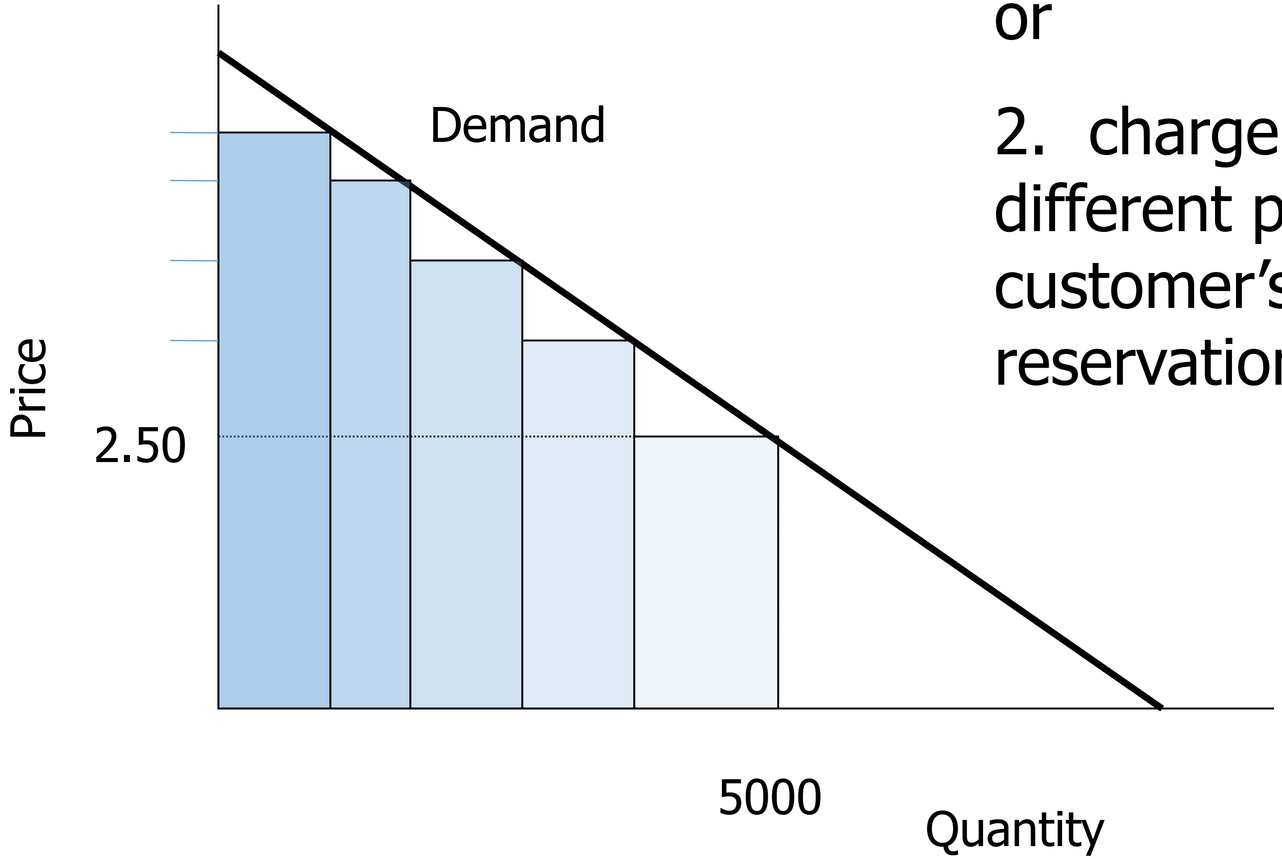
Revenue is equal to the area of the rectangle



Consumers' Surplus:
Customer value above price



Revenue When Charging Different Prices



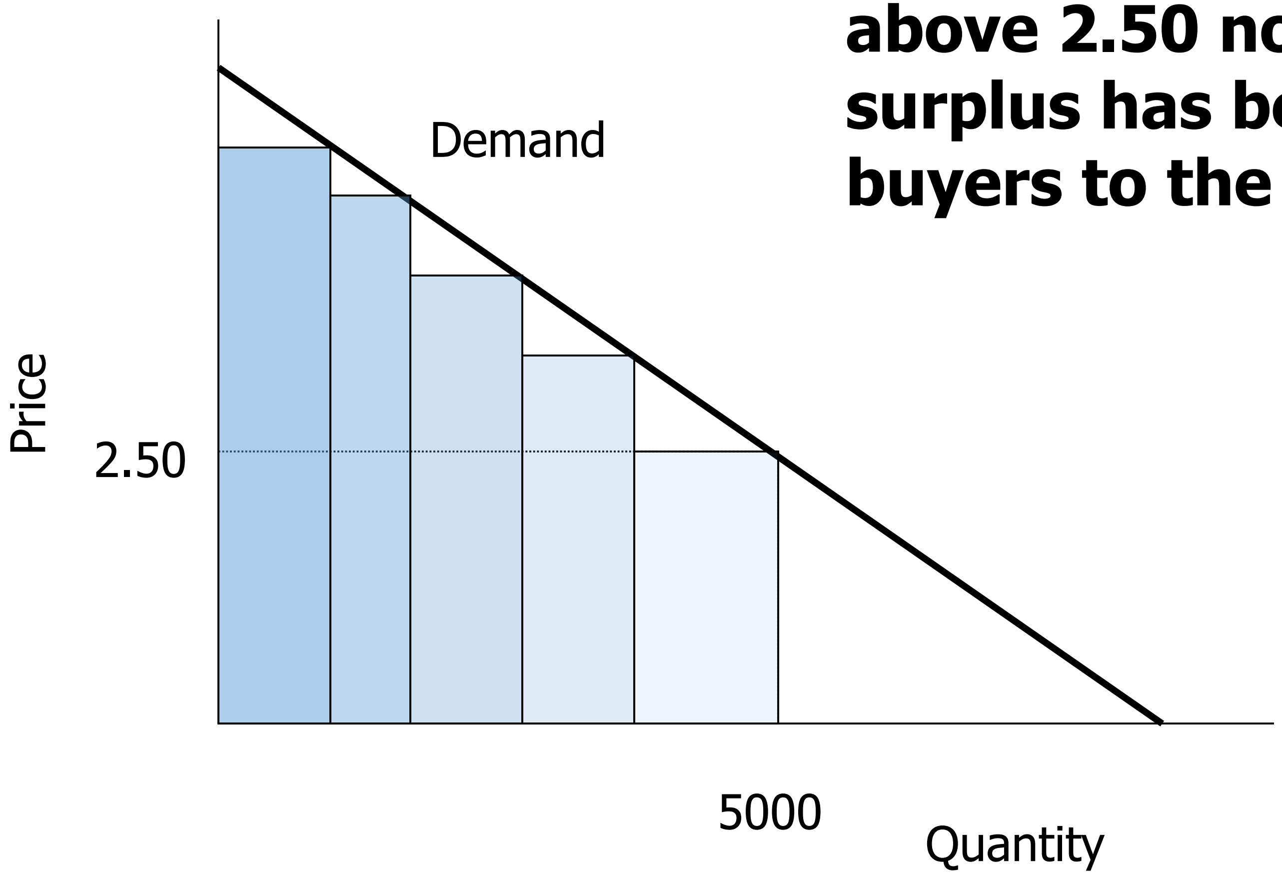
Possibilities:

1. charge same customer different prices as customer buys more units or

2. charge different customers different prices based on each customer's willingness to pay—reservation price.

Result: Some consumer's surplus transferred to seller

Notice that with variable pricing some of the area in the triangle above 2.50 now goes to the seller, surplus has been transferred from buyers to the seller.



First Degree Price Discrimination

We just saw how a seller can increase revenue by exploiting the whole demand curve.

1st degree Price Discrimination examples

- Typical new car sales—each sale involves price negotiation.
- BN's COT program as discussed in transportation.

Seller's objective is to find highest price each customer is willing to pay (Customer's reservation price).

Reservation price depends on

- Value customer perceives
- Alternatives available to potential customer

Second Degree Price Discrimination

- In many instances customer will buy additional product if sellers will offer a quantity discount.

- Total amount customer will buy depends on the price paid for the last unit purchased.

- Use quantity discounts to increase volume sold and revenue received

- Declining block pricing is another form of volume discounting.

Chapter 16.
Pricing Revenue Management in a Supply Chain (Section Three)

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Elasticity of Demand

Price elasticity of demand—percentage change in quantity demanded associated with a percent change in price.

$$\varepsilon_D = \%\Delta Q / \%\Delta P$$

Because demand is an inverse relationship between Price and Quantity, $\varepsilon_D < 0$ (negative)

Marginal Revenue and Elasticity of Demand

- It can be shown that

$$MR = P[1 + 1/\varepsilon_D]$$

Price Responsiveness

When pricing a product, one wants to know how buyers will respond to different prices.

- Does changing the price—up or down—have much affect on the quantity demanded?
- How much is much?
- Depends on percentage change
  - in quantity demanded
  - in price
- Why?
  - See next slide.

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Measure Elasticity of Demand

ε_d = $\%\Delta Q/\%\Delta P$

= $[\Delta Q/Q]/[\Delta P/P]$

=$[\Delta Q/\Delta P]*[P/Q]$, now as ΔP gets small,

$\Delta Q/\Delta P$ approaches dQ/dP so that

ε_d = $dQ/dP*[P/Q]$

=$\{1/slope]*[p/Q]$

That is how one can measure ε_d .

Practical use of $\boldsymbol{\varepsilon_d}$

When ε_d is -1 or less (-10), the % change in quantity is greater than the percent change in price. (demand is elastic)

- That means that raising price will reduce total revenue, but lowering price will increase total revenue.

When ε_d greater than minus one, say -.9 the % change in quantity is less than the percent change in price. (demand Inelastic)

- That means that raising price will increase total revenue, but lowering price will decrease total revenue.

Practical Considerations

- Evaluate your market and customers carefully.
- Quantify the benefits of revenue mgt.
- Use price forecasting & demand analysis.
- Optimize, choose prices and arrangements that maximize objective (profit or asset utilization).
- Involve both sales and operations personnel so that each understands and can work with the customers in the best interest of the firm.
- Understand and inform the customers.
- Integrate supply planning with revenue mgt.

Key Points

- Role of revenue management in supply chain mgt.
- Conditions under which revenue management can be effective?
- Forms of price discrimination and how each operates.
- Trade-offs that must be considered with revenue management.

Next Monday (Oct 11)
Chapter 7. Demand Forecasting

AGEC 632: Agribusiness Logistics

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