Given The Demand Function D(P) = 350 - 2p, Find The Elasticity Of Demand At A Price Of $32 At This Price,

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Understanding how consumers respond to changes in price is vital for businesses, economists, and marketers. The concept of price elasticity of demand quantifies this responsiveness, indicating whether demand for a product is elastic (high sensitivity), inelastic (low sensitivity), or unit elastic (proportional response). In this comprehensive guide, we will explore how to determine the price elasticity of demand given the demand function D(P) = 350 - 2p, specifically at a price point of $32. We will walk through the underlying theory, step-by-step calculations, and interpret the results to provide a clear understanding of demand elasticity.

Understanding Demand Function and Price Elasticity of Demand

What Is a Demand Function?

A demand function expresses the relationship between the price of a good or service and the quantity demanded by consumers. It typically shows how demand varies as price changes, assuming other factors remain constant (ceteris paribus).

In our case, the demand function is:

$$D(P) = 350 - 2p$$

where:

- $D(P)$ is the quantity demanded at price p,
- p is the price per unit.

This linear demand function suggests that as price increases, demand decreases at a consistent rate.

What Is Price Elasticity of Demand?

Price elasticity of demand (Ed) measures the percentage change in quantity demanded resulting from a one percent change in price. It provides insight into how sensitive consumers are to price changes.

Mathematically, it is defined as:

$$Ed = \frac{\%\ \text{change in quantity demanded}}{\%\ \text{change in price}}$$

For practical calculations, the elasticity at a specific point can be expressed as:

$$Ed = \frac{dQ}{dP} \times \frac{P}{Q}$$

where:

- $\frac{dQ}{dP}$ is the derivative of the demand function with respect to price,
- P is the price at which we want to evaluate elasticity,
- Q is the quantity demanded at that price.

Step-by-Step Calculation of Elasticity at $P = \$32$

1. Find the Quantity Demanded at $P = \$32$

Using the demand function:

$$D(32) = 350 - 2 \times 32 = 350 - 64 = 286$$

So, at a price of $32, the quantity demanded is 286 units.

2. Calculate the Derivative of the Demand Function $\frac{dQ}{dP}$

Since the demand function is linear:

$$D(P) = 350 - 2p$$

the derivative with respect to price is:

$$\frac{dQ}{dP} = -2$$

This negative value indicates that demand decreases as price increases, which aligns with economic intuition.

3. Apply the Elasticity Formula

Using the point elasticity formula:

$$Ed = \frac{dQ}{dP} \times \frac{P}{Q}$$

Substitute the known values:

$$Ed = -2 \times \frac{32}{286}$$

Calculating:

$$Ed = -2 \times 0.1119 \approx -0.2238$$

The magnitude of elasticity is approximately 0.224.

Interpreting the Elasticity Result

What Does an Elasticity of About 0.224 Mean?

An elasticity of approximately 0.224 (ignoring the negative sign, which indicates the inverse relationship between price and demand) indicates that demand at the $32 price point is inelastic.

Inelastic demand suggests that:
- Consumers are relatively insensitive to price changes in this range.
- A 1% increase in price would lead to roughly a 0.224% decrease in quantity demanded.
- Revenue might increase if the price is raised because the decrease in quantity demanded is proportionally less than the increase in price.

Implications for Businesses and Policymakers

- Pricing Strategies: Since demand is inelastic at this point, firms might consider raising prices to boost revenue without significantly losing sales.
- Tax Policies: Governments can impose taxes knowing that demand won't decrease drastically, ensuring stable revenue collection.
- Market Analysis: Understanding the elasticity helps predict how market dynamics will change with pricing adjustments.

Additional Concepts Related to Demand Elasticity

Types of Demand Elasticity

- Elastic Demand (Ed > 1): Consumers are highly responsive; demand drops significantly with price increases.
- Inelastic Demand (Ed < 1): Consumers are less responsive; demand decreases slightly with price increases.
- Unit Elastic Demand (Ed = 1): Percentage change in demand equals percentage change in price.

Factors Influencing Demand Elasticity

- Availability of substitutes
- Necessity vs. luxury nature of the good
- Proportion of income spent on the good
- Time horizon (demand tends to be more elastic over longer periods)

Calculating Elasticity at Different Price Points

The elasticity varies along the demand curve. For linear demand functions like ours, elasticity is not constant. It can be calculated at any point to understand consumer responsiveness specific to that price.

Practical Applications of Demand Elasticity Calculations

Pricing Optimization

Businesses use elasticity to determine optimal pricing that maximizes revenue and profit. Knowing that demand is inelastic at $32 suggests raising prices could be beneficial.

Revenue and Elasticity Relationship

- When demand is inelastic, increasing prices tends to increase total revenue.
- When demand is elastic, decreasing prices might boost total revenue.

Market Segmentation

Understanding elasticity helps identify customer segments with different sensitivities, enabling targeted marketing and pricing strategies.

Summary and Key Takeaways

- The demand function \(D(P) = 350 - 2p \) shows a linear relationship where demand decreases as price increases.
- At a price of $32, the quantity demanded is 286 units.
- The derivative of the demand function is \(-2\), representing the rate at which demand changes with price.
- The calculated price elasticity of demand at $32 is approximately -0.224, indicating demand is inelastic at this price point.
- Inelastic demand suggests that price increases could lead to higher total revenue, beneficial for suppliers.
- Elasticity varies along the demand curve, and understanding its value at different prices informs better business and policy decisions.

Conclusion

Understanding and calculating price elasticity of demand is fundamental for making informed pricing, production, and marketing decisions. By analyzing the demand function $D(P) = 350 - 2p$, we determined that at a price of $32, demand is relatively inelastic. This insight empowers businesses to strategize effectively, maximizing revenue while considering consumer responsiveness. Whether adjusting prices, launching promotions, or designing policies, elasticity analysis remains a vital tool in economic decision-making.

Keywords for SEO:

- Demand function
- Price elasticity of demand
- Elasticity calculation
- Inelastic demand
- Demand at specific price
- Economic analysis
- Pricing strategy
- Revenue optimization
- Consumer responsiveness
- Linear demand curve

Frequently Asked Questions

What is the demand function provided in the problem?

The demand function given is D(p) = 350 - 2p.

How do you calculate the price elasticity of demand at a specific price?

The price elasticity of demand is calculated using the formula: $E = (dD/dp) (p / D)$, where dD/dp is the derivative of the demand function with respect to price.

What is the derivative of the demand function $D(p) = 350 - 2p$?

The derivative dD/dp is -2.

How do you find the quantity demanded at a price of $32?

Substitute $p = 32$ into the demand function: $D(32) = 350 - 2(32) = 350 - 64 = 286$ units.

What is the elasticity of demand at the price of $32?

Using $E = (dD/dp) (p / D)$, we get $E = -2 (32 / 286)$ □ -0.224.

What does the calculated elasticity imply about demand at $32?

An elasticity of approximately -0.224 indicates that demand is inelastic at this price, meaning a 1% change in price results in less than a 1% change in quantity demanded.

Additional Resources

Demand Elasticity

Understanding how consumers respond to price changes is a cornerstone of economic analysis, particularly for businesses aiming to optimize pricing strategies. One of the most essential concepts in this realm is price elasticity of demand, which measures the sensitivity of quantity demanded to a change in price. In this article, we delve into the specifics of calculating the elasticity of demand at a given price point, using the demand function \(D(p) = 350 - 2p \), with a focus on the price of $32.

This exploration will equip you with a comprehensive understanding not only of the calculation process but also of its implications in real-world scenarios.

Understanding the Demand Function $D(p) = 350 - 2p$

Before diving into elasticity calculations, it's vital to interpret the demand function itself. The function:

$$D(p) = 350 - 2p$$

represents the relationship between the price p (in dollars) and the quantity demanded $D(p)$. Here are key points to understand:

- Intercept: When $p = 0$, the demand is $D(0) = 350$. This indicates that at a zero price, the quantity demanded would be 350 units.
- Slope: The coefficient -2 indicates that for each dollar increase in price, the quantity demanded decreases by 2 units.
- Linear Demand: The function is linear, implying a constant rate of change in demand relative to price.

This straightforward demand function allows us to analyze consumer responsiveness at different price points with clarity.

Defining Price Elasticity of Demand

Price elasticity of demand (often denoted as E_d) quantifies how much the quantity demanded responds to a change in price. Formally, it is defined as:

$$
E_d = \frac{\%\ \text{change in quantity demanded}}{\%\ \text{change in price}}
$$

Expressed mathematically, for small changes:

$$
E_d = \frac{dQ}{dP} \times \frac{P}{Q}
$$

where:
- $\frac{dQ}{dP}$ is the derivative of the demand function with respect to price,
- P is the current price,
- Q is the quantity demanded at that price.

Key characteristics of demand elasticity:
- Elastic demand: $|E_d| > 1$ (quantity demanded is highly responsive)
- Inelastic demand: $|E_d| < 1$ (quantity demanded is less responsive)
- Unit elastic: $|E_d| = 1$

Understanding whether demand is elastic or inelastic at a particular price helps businesses decide on pricing strategies, promotional efforts, and revenue expectations.

Calculating Elasticity at $p = \$32$

Let's now proceed step-by-step to calculate the elasticity of demand at a price of $32.

Step 1: Determine the Quantity Demanded at \(p = \$32 \)

Using the demand function:

\[

Q = D(p) = 350 - 2p

\]

Plug in \(p = 32 \):

\[

Q = 350 - 2 \times 32 = 350 - 64 = 286

\]

So, at a price of $32, the quantity demanded is 286 units.

Step 2: Find the Derivative \(\frac{dQ}{dP} \)

Since the demand function is linear:

\[

D(p) = 350 - 2p

\]

the derivative with respect to \(p \) is:

\[

\frac{dQ}{dP} = -2

\]

This indicates that for each 1-dollar increase in price, the quantity demanded decreases by 2 units—a constant rate due to the linear nature of the demand curve.

Step 3: Apply the Elasticity Formula

Using the elasticity formula:

$$
E_d = \frac{dQ}{dP} \times \frac{P}{Q}
$$

Substitute the known values:

$$
E_d = -2 \times \frac{32}{286}
$$

Calculating:

$$
E_d = -2 \times 0.1119 \approx -0.2238
$$

Interpretation:

The elasticity of demand at a price of $32 is approximately -0.22.

Interpreting the Result

The magnitude of the elasticity, approximately 0.22, reveals a few critical insights:

- Inelastic Demand: Since $|E_d| < 1$, demand at this price point is inelastic. Consumers are relatively unresponsive to price changes here.
- Implication for Pricing: Raising prices slightly might not significantly decrease demand, potentially increasing total revenue.
- Consumer Sensitivity: The low elasticity suggests that consumers view this product as a necessity or have limited substitutes at this price point, leading to less sensitivity.

Furthermore, the negative sign reflects the typical inverse relationship between price and demand, but in practical applications, the absolute value is often considered when discussing elasticity.

Broader Context and Practical Implications

Understanding the elasticity at a specific point allows businesses and policymakers to make informed decisions. Here's how:

1. Pricing Strategies

- If demand is inelastic ($|E_d|<1$):
Increasing prices can lead to higher total revenue because the percentage decrease in demand is less than the percentage increase in price.

- If demand is elastic ($|E_d|>1$):
Price increases could significantly reduce demand, potentially lowering revenue. Conversely, lowering

prices might boost sales substantially.

2. Revenue Optimization

Given the elasticity at $p = \$32$, a business might consider a slight price increase to maximize revenue, as demand is inelastic here. However, caution is warranted to avoid crossing into elastic territory at higher prices.

3. Product Positioning

The low elasticity suggests limited substitutes or that the product is viewed as essential. Marketing efforts can focus on maintaining this inelastic demand or differentiating the product further.

4. Policy Considerations

For policymakers, knowing the elasticity helps predict how taxes or subsidies might influence consumption.

Exploring Elasticity at Other Price Points

While our focus is on $p = \$32$, it's instructive to consider how elasticity varies at different prices:

- At lower prices (closer to $p = \$0$), the demand is higher, and elasticity may differ.
- At higher prices, demand might become more elastic as consumers seek alternatives.

Using the demand function:

\[

E_d(p) = -2 \times \frac{p}{350 - 2p}

\]

- At \(p = 10 \):

\[

Q = 350 - 20 = 330

\]

\[

E_d = -2 \times \frac{10}{330} \approx -0.0606

\]

- At \(p = 50 \):

\[

Q = 350 - 100 = 250

\]

\[

E_d = -2 \times \frac{50}{250} = -2 \times 0.2 = -0.4

\]

This demonstrates that elasticity tends to increase with price, but remains inelastic in these ranges.

Conclusion: The Significance of Elasticity Analysis

In the dynamic landscape of economics and business strategy, calculating and understanding price elasticity of demand is invaluable. Our detailed analysis of the demand function \(D(p) = 350 - 2p \) at a price of $32 reveals a low elasticity magnitude (~0.22), indicating that demand is relatively insensitive to price changes at this point.

Key takeaways include:

- Inelastic demand at \(p= \$32 \) suggests that price increases could be beneficial for revenue.
- Constant slope in the demand function simplifies elasticity calculations and predictions.
- Strategic decisions should consider elasticity across different price ranges, not just a single point.

By mastering these concepts, businesses can optimize pricing, forecast revenue, and better understand consumer behavior, ultimately leading to more informed and effective decision-making. Whether managing product pricing or crafting policy, elasticity remains a fundamental tool in the economist’s toolkit.

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