A Certain Manufacturing Concern Has Total Cost Function C = 15+9x−6x+x? Find X, When The Total

A Certain Manufacturing Concern Has Total Cost Function C = 15+9x−6x+x? Find X, When The Total

Understanding the Total Cost Function in Manufacturing

In the realm of manufacturing and production, understanding the total cost function is crucial for optimizing operations, controlling expenses, and maximizing profits. The total cost function typically represents the sum of fixed costs and variable costs associated with production. It helps managers and decision-makers determine the optimal level of production, set appropriate pricing strategies, and forecast future expenses.

The problem statement here involves a specific total cost function:

$$ C = 15 + 9x - 6x + x $$

The goal is to find the value of x when the total cost C reaches a certain condition, such as when it exceeds or equals a specific value. For this discussion, we will analyze the function, simplify it, and explore how to determine the value of x under various scenarios.

Breaking Down the Cost Function

Understanding the Components

The given total cost function is:

$$ C = 15 + 9x - 6x + x $$

- Fixed Costs: The constant term, 15, represents fixed costs that do not change with production volume.
- Variable Costs: The terms involving x (which likely represents units produced) account for variable costs that fluctuate with production levels.

Simplifying the Function

Let's combine like terms:

$$ C = 15 + (9x - 6x + x) $$

$$ C = 15 + (9x - 6x + x) $$

$$ C = 15 + (9x - 6x + x) $$

Calculate the combined coefficient for x:

$$ 9x - 6x + x = (9 - 6 + 1) x = 4x $$

Therefore, the simplified total cost function is:

$$ C = 15 + 4x $$

This simpler linear function indicates that the total cost increases by 4 units for each additional unit produced, starting from a fixed cost of 15.

Finding the Value of x for a Given Total Cost

The core question is: When the total cost reaches a certain level, say $C = C_{target}$, what is the corresponding value of x?

General Approach

To find x when C is known, we rearrange the equation:

$$ C = 15 + 4x $$

solving for x:

$$ 4x = C - 15 $$

$$ x = \frac{C - 15}{4} $$

This formula allows us to determine the production volume x for any specified total cost C.

Example Scenarios

Suppose the manufacturing concern wants to know the production level when the total cost is:

- Example 1: $C = 100$
- Example 2: $C = 200$
- Example 3: $C = 150$

Let's compute x for each case.

- **When $C = 100$:**

$$ x = \frac{100 - 15}{4} = \frac{85}{4} = 21.25 $$

Since production units are typically whole numbers, the company might consider approximately 21 or 22 units, depending on operational feasibility.

- **When $C = 200$:**

$$x = \frac{200 - 15}{4} = \frac{185}{4} = 46.25$$

Similarly, the production level is approximately 46 or 47 units.

- **When $C = 150$:**

$$x = \frac{150 - 15}{4} = \frac{135}{4} = 33.75$$

Approximate production levels are 33 or 34 units.

Implications in Manufacturing and Cost Control

Understanding this cost function has significant implications for manufacturing operations:

1. Cost Planning and Budgeting

By knowing how costs increase with production volume, managers can set realistic budgets and identify thresholds where costs become too high or where economies of scale might be achieved.

2. Break-Even Analysis

The break-even point occurs when total revenue equals total cost. Knowing the cost function enables calculation of the minimum production volume needed to cover costs, which is essential for pricing strategies.

3. Pricing Strategies

Accurate cost calculations inform pricing decisions, ensuring that products are priced above the variable and fixed costs to generate profit.

4. Production Optimization

By analyzing how costs behave at different production levels, firms can determine the most cost-effective production volume, balancing fixed and variable costs.

Additional Considerations in Cost Function Analysis

While the simplified function $C = 15 + 4x$ provides clear insights, real-world scenarios often involve more complex cost functions, including:

- **Non-linear Costs:** Costs that increase exponentially or logarithmically with production.
- **Economies of Scale:** Cost reductions per unit at higher production volumes.
- **Diminishing Returns:** Increased costs beyond a certain point due to inefficiencies.

Understanding these factors is crucial for accurate financial planning.

Practical Application in Manufacturing Operations

Example Case Study

Suppose a manufacturing company produces electronic components with the total cost function:

$$C = 15 + 4x$$

and aims to produce enough units to reach a total cost of $300. Using the formula:

$$x = \frac{C - 15}{4}$$

we get:

$$x = \frac{300 - 15}{4} = \frac{285}{4} = 71.25$$

Thus, approximately 71 or 72 units need to be produced to incur a total cost of around $300.

Strategic Decision-Making

- Cost-Benefit Analysis: Determine whether increasing production beyond this point is justified by potential revenue.
- Capacity Planning: Adjust manufacturing capacity to meet the calculated production levels.
- Pricing Decisions: Set prices that cover costs at different production volumes.

Conclusion: Mastering Cost Function Analysis for Manufacturing Success

Understanding and analyzing the total cost function is vital for the strategic management of manufacturing operations. The simplified linear function $C = 15 + 4x$ offers straightforward calculations to determine production levels corresponding to specific total costs. This knowledge enables managers to make informed decisions about production planning, cost control, pricing, and profitability analysis.

By mastering the principles of cost functions, manufacturing concerns can optimize their operations, improve financial performance, and remain competitive in their respective markets. Remember, while simple models provide clarity, real-world scenarios often require more nuanced analysis, including non-linear costs and external factors affecting production expenses.

In summary:

- The total cost function simplifies to $C = 15 + 4x$.
- To find x when total cost C is known, use $x = \frac{C - 15}{4}$.
- Understanding this relationship helps in effective production and financial planning.
- Incorporate broader cost considerations for comprehensive analysis in practical applications.

Optimizing costs is a continuous process—analyzing cost functions is a fundamental step toward manufacturing excellence.

Frequently Asked Questions

What is the total cost function given for the manufacturing concern?

The total cost function is $C = 15 + 9x - 6x + x$.

How can the total cost function be simplified?

Combine like terms: $9x - 6x + x = (9 - 6 + 1)x = 4x$. So, the simplified function is $C = 15 + 4x$.

What is the value of x when the total cost C is minimized?

Since the total cost function is linear ($C = 15 + 4x$), it either increases or decreases with x. To find the minimum, check the context or constraints; if x can be negative, then the cost decreases as x decreases.

If the total cost C is given, how do you find the

value of x?

Rearrange the simplified cost function C = 15 + 4x to solve for x: x = (C − 15) / 4.

Is the total cost function linear or nonlinear?

The total cost function C = 15 + 4x is linear.

What does the coefficient of x in the cost function represent?

The coefficient 4 represents the marginal cost per unit increase in x.

Can the total cost function be used to find the optimal production level?

Yes, by analyzing the function and any constraints, you can determine the production level x that minimizes or maximizes the cost.

What assumptions are made in deriving the total cost function?

It assumes a linear relationship between cost and production quantity x, with fixed costs and variable costs modeled linearly.

How would you interpret the total cost value when x equals zero?

When x = 0, the total cost C = 15, representing fixed costs with no production.

What is the significance of solving for x when the total cost is known?

It helps determine the production level needed to achieve a specific total cost, useful for budgeting and planning.

Additional Resources

A Certain Manufacturing Concern Has Total Cost Function C = 15 + 9x − 6x + x^2: Find X When The Total

Understanding the cost structure of a manufacturing concern is essential for decision-making, pricing strategies, and optimizing production efficiency. In this comprehensive review, we delve into the analysis of a given total cost function, $C = 15 + 9x - 6x + x^2$, to determine the value of x that influences total costs. By examining the mathematical foundation, solving the relevant equations, and interpreting the results, we aim to provide clarity on how the cost function behaves and how to utilize this information for practical purposes.

Introduction to the Cost Function

The total cost function is a fundamental concept in economics and managerial accounting, representing the aggregate expense incurred in the production process. It typically includes fixed costs (costs that do not vary with output) and variable costs (costs that change with the level of output).

In this case, the function provided is:

$$ C = 15 + 9x - 6x + x^2 $$

which can be simplified for easier analysis.

Breaking Down and Simplifying the Cost Function

Simplification of the Given Function

The original cost function:

$$ C = 15 + 9x - 6x + x^2 $$

contains terms that can be combined:

- The linear terms $9x$ and $-6x$ can be combined:

$$ 9x - 6x = 3x $$

Thus, the simplified cost function becomes:

$$ C = 15 + 3x + x^2 $$

This quadratic function describes the total cost C in terms of the variable x, which likely represents the level of output or units produced.

Features of the Simplified Cost Function

- Fixed Cost: The constant term 15 represents fixed costs irrespective of output.
- Variable Cost Components: The terms $3x$ and x^2 reflect linear and quadratic variable costs, respectively.
- Quadratic Nature: The x^2 term indicates increasing marginal costs as output increases, which is typical in real-world manufacturing.

Finding the Value of x When Total Cost Meets Specific Criteria

The primary goal is to find the value of x based on certain conditions related to total cost C. Since the prompt asks for "Find X, When The Total," it suggests we need to determine x for specific total costs or analyze the behavior of C in relation to x.

Case 1: Find x when $C = 0$

Setting $C = 0$:

$$0 = 15 + 3x + x^2$$

Rearranged as:

$$x^2 + 3x + 15 = 0$$

Using the quadratic formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

where $a = 1$, $b = 3$, $c = 15$.

Calculating the discriminant:

$$\Delta = b^2 - 4ac = 3^2 - 4 \times 1 \times 15 = 9 - 60 = -51$$

Since the discriminant is negative, there are no real solutions. Therefore, the total cost cannot be zero with real x, implying the cost function does not reach zero—costs are always positive for real x.

Case 2: Find x for a specific total cost $C = K$

Suppose we want to find the value of x when the total cost C is a specific number K. The general formula becomes:

$$K = 15 + 3x + x^2$$

Rearranged as:

$$x^2 + 3x + (15 - K) = 0$$

Applying the quadratic formula:

$$x = \frac{-3 \pm \sqrt{9 - 4(1)(15 - K)}}{2}$$

$$x = \frac{-3 \pm \sqrt{9 - 60 + 4K}}{2}$$

$$ x = \frac{-3 \pm \sqrt{4K - 51}}{2} $$

For real solutions, the discriminant must be non-negative:

$$ 4K - 51 \geq 0 $$

$$ 4K \geq 51 $$

$$ K \geq \frac{51}{4} = 12.75 $$

This indicates that for total costs less than 12.75, no real x exists.

Example: For $K = 20$:

$$ x = \frac{-3 \pm \sqrt{4 \times 20 - 51}}{2} = \frac{-3 \pm \sqrt{80 - 51}}{2} = \frac{-3 \pm \sqrt{29}}{2} $$

$$ x = \frac{-3 \pm 5.385}{2} $$

- $x = \frac{-3 + 5.385}{2} \approx \frac{2.385}{2} \approx 1.192$
- $x = \frac{-3 - 5.385}{2} \approx \frac{-8.385}{2} \approx -4.192$

Negative x may not be meaningful in a production context (as production levels can't be negative), so the relevant solution is approximately $x = 1.192$.

Interpreting the Cost Function and Its Graph

Shape and Behavior

The quadratic nature of $C = 15 + 3x + x^2$ implies a parabola opening upward, with the minimum cost occurring at the vertex of the parabola.

Finding the Vertex

The vertex of a parabola $y = ax^2 + bx + c$ occurs at:

$$ x_{vertex} = -\frac{b}{2a} $$

For our function:

$$ x_{vertex} = -\frac{3}{2 \times 1} = -\frac{3}{2} = -1.5 $$

Since negative production levels are typically not feasible, the vertex's practical significance may be limited, but mathematically, it indicates the minimum total cost occurs at $x = -1.5$.

Minimum cost:

$$ C_{min} = 15 + 3(-1.5) + (-1.5)^2 = 15 - 4.5 + 2.25 = 12.75 $$

This aligns with the earlier finding that costs can't be below 12.75, emphasizing the lower bound of total costs given this quadratic model.

Practical Applications and Decision-Making

Understanding the cost function's behavior is vital for production planning, cost control, and pricing strategies.

Price and Production Decisions

- Optimal Production Level: Since the minimum total cost is at $x = -1.5$, which is infeasible, the company should focus on production levels where $x \geq 0$.
- Cost Estimation: For any production level x, the total cost can be estimated using the simplified function, aiding budgeting and financial analysis.

Limitations and Considerations

- The model assumes quadratic cost behavior, which may not hold at very high or low production levels.
- Negative x values lack practical meaning in manufacturing contexts; thus, solutions must be interpreted within feasible production ranges.
- External factors such as market demand, capacity constraints, and input costs are not captured in this simplified model.

Pros and Cons of the Cost Model

Pros:

- Simplicity: The quadratic form offers a straightforward way to analyze costs relative to output.
- Predictive Power: The model can forecast costs for different production levels.
- Identification of Minimum Costs: The vertex provides insights into the most cost-efficient production level (though in this case, the minimum occurs at a negative value).

Cons:

- Limited Realism: Negative production levels are not feasible, making the minimum at $x = -1.5$ less meaningful practically.
- Oversimplification: Real-world costs may include fixed, variable, step, and nonlinear costs not captured here.
- Assumption of Quadratic Form: Not all manufacturing cost behaviors follow a quadratic pattern.

Conclusion

Analyzing the total cost function \(C = 15 + 3x + x^2 \) reveals valuable insights into the cost structure of the manufacturing concern. The function indicates that costs increase quadratically with production levels, with a minimum point at \(x = -1.5 \), which is not practically feasible but mathematically significant. When solving for specific total costs, the model provides real solutions only when the total cost exceeds approximately 12.75, guiding managers on feasible production and cost targets.

Ultimately, understanding such cost functions

A Certain Manufacturing Concern Has Total Cost Function C 15 9x 6x X Find X When The Total

A Certain Manufacturing Concern Has Total Cost Function C 15 9x 6x X Find X When The Total

Related Articles

- Determine How Each Key Element Effects Each Other AND Layers Of Meaning With The LittleMermaid.
- On The Largest Scales, The Universe Is Made Of Voids And Filaments. These Filaments Are Made Of:
- Find The Value Of The Expression(v + 33) 2w 5for V = 34 And W = 2. I Need This Within Like 5 Mins.

Back to Home