CFA Institute

ECONOMICS

CFA® Program Curriculum
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How to Use the CFA Program Curriculum

The CFA® Program exams measure your mastery of the core knowledge, skills, and abilities required to succeed as an investment professional. These core competencies are the basis for the Candidate Body of Knowledge (CBOK™). The CBOK consists of four components:

- A broad outline that lists the major CFA Program topic areas (www.cfainstitute.org/programs/cfa/curriculum/cbok/cbok)
- Topic area weights that indicate the relative exam weightings of the top-level topic areas (www.cfainstitute.org/en/programs/cfa/curriculum)
- Learning outcome statements (LOS) that tell you the specific knowledge, skills, and abilities you should gain from each curriculum topic area. You will find these statements at the start of each learning module and lesson. We encourage you to review the information about the LOS on our website (www.cfainstitute.org/programs/cfa/curriculum/study-sessions), including the descriptions of LOS "command words" on the candidate resources page at www.cfainstitute.org/-/media/documents/support/programs/cfa-and-cipm-los-command-words.ashx.
- The CFA Program curriculum that candidates receive access to upon exam registration.

Therefore, the key to your success on the CFA exams is studying and understanding the CBOK. You can learn more about the CBOK on our website: www.cfainstitute.org/programs/cfa/curriculum/cbok.

The curriculum, including the practice questions, is the basis for all exam questions. The curriculum is selected/developed specifically to provide candidates with the knowledge, skills, and abilities reflected in the CBOK.

CFA INSTITUTE LEARNING ECOSYSTEM (LES)

Your exam registration fee includes access to the CFA Institute Learning Ecosystem (LES). This digital learning platform provides access to all the curriculum content and practice questions. The LES is organized as a series of learning modules consisting of short online lessons and associated practice questions. This tool is your source for all study materials, including practice questions and mock exams. The LES is the primary method by which CFA Institute delivers your curriculum experience. Here, you will find additional practice questions to test your knowledge, including some interactive questions.

DESIGNING YOUR PERSONAL STUDY PROGRAM

An orderly, systematic approach to exam preparation is critical. You should dedicate a consistent block of time every week to reading and studying. Review the LOS both before and after you study curriculum content to ensure you can demonstrate

the knowledge, skills, and abilities described by the LOS and the assigned learning module. Use the LOS as a self-check to track your progress and highlight areas of weakness for later review.

Successful candidates report an average of more than 300 hours preparing for each exam. Your preparation time will vary based on your prior education and experience, and you will likely spend more time on some topics than on others.

ERRATA

The curriculum development process is rigorous and involves multiple rounds of reviews by content experts. Despite our efforts to produce a curriculum that is free of errors, we must make corrections in some instances. Curriculum errata are periodically updated and posted by exam level and test date on the Curriculum Errata webpage (www.cfainstitute.org/en/programs/submit-errata). If you believe you have found an error in the curriculum, you can submit your concerns through our curriculum errata reporting process found at the bottom of the Curriculum Errata webpage.

OTHER FEEDBACK

Please send any comments or suggestions to info@cfainstitute.org, and we will review your feedback thoughtfully.

Economics

LEARNING MODULE

1

The Firm and Market Structures

by Gary L. Arbogast, PhD, CFA, Richard V. Eastin, PhD, Richard Fritz, PhD, and Michele Gambera, PhD, CFA.

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LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	determine and interpret breakeven and shutdown points of production, as well as how economies and diseconomies of scale affect costs under perfect and imperfect competition
☐	describe characteristics of perfect competition, monopolistic competition, oligopoly, and pure monopoly
☐	explain supply and demand relationships under monopolistic competition, including the optimal price and output for firms as well as pricing strategy
☐	explain supply and demand relationships under oligopoly, including the optimal price and output for firms as well as pricing strategy
☐	identify the type of market structure within which a firm operates and describe the use and limitations of concentration measures

INTRODUCTION

This learning module addresses several important concepts that extend the basic market model of demand and supply to the assessment of a firm's breakeven and shutdown points of production. Demand concepts covered include own-price elasticity of demand, cross-price elasticity of demand, and income elasticity of demand. Supply concepts covered include total, average, and marginal product of labor; total, variable, and marginal cost of labor; and total and marginal revenue. These concepts are used to calculate the breakeven and shutdown points of production.

This learning module surveys how economists classify market structures. We analyze distinctions between the different structures that are important for understanding demand and supply relations, optimal price and output, and the factors affecting long-run profitability. We also provide guidelines for identifying market structure in practice.

LEARNING MODULE OVERVIEW

- Firms under conditions of perfect competition have no pricing power and, therefore, face a perfectly horizontal demand curve at the market price. For firms under conditions of perfect competition, price is identical to marginal revenue (MR).
- Firms under conditions of imperfect competition face a negatively sloped demand curve and have pricing power. For firms under conditions of imperfect competition, MR is less than price.
- Economic profit equals total revenue (TR) minus total economic cost, whereas accounting profit equals TR minus total accounting cost.
- Economic cost considers the total opportunity cost of all factors of production.
- Opportunity cost is the next best alternative use of a resource forgone in making a decision.
- Maximum economic profit requires that (1) MR equals marginal cost (MC) and (2) MC not be falling with output.
- The breakeven point occurs when TR equals total cost (TC), otherwise stated as the output quantity at which average total cost (ATC) equals price.
- Shutdown occurs when a firm is better off not operating than continuing to operate.
- If all fixed costs are sunk costs, then shutdown occurs when the market price falls below the minimum average variable cost. After shutdown, the firm incurs only fixed costs and loses less money than it would operating at a price that does not cover variable costs.
- In the short run, it may be rational for a firm to continue to operate while earning negative economic profit if some unavoidable fixed costs are covered.
- Economies of scale is defined as decreasing long-run cost per unit as output increases. Diseconomies of scale is defined as increasing long-run cost per unit as output increases.
- Long-run ATC is the cost of production per unit of output under conditions in which all inputs are variable.
- Specialization efficiencies and bargaining power in input price can lead to economies of scale.
- Bureaucratic and communication breakdowns and bottlenecks that raise input prices can lead to diseconomies of scale.
- The minimum point on the long-run ATC curve defines the minimum efficient scale for the firm.
- Economic market structures can be grouped into four categories: perfect competition, monopolistic competition, oligopoly, and monopoly.

- The categories of economic market structures differ because of the following characteristics: The number of producers is many in perfect and monopolistic competition, few in oligopoly, and one in monopoly. The degree of product differentiation, the pricing power of the producer, the barriers to entry of new producers, and the level of non-price competition (e.g., advertising) are all low in perfect competition, moderate in monopolistic competition, high in oligopoly, and generally highest in monopoly.
- A financial analyst must understand the characteristics of market structures to better forecast a firm's future profit stream.
- The optimal MR equals MC. Only in perfect competition, however, does the MR equal price. In the remaining structures, price generally exceeds MR because a firm can sell more units only by reducing the per unit price.
- The quantity sold is highest in perfect competition. The price in perfect competition is usually lowest, but this depends on factors such as demand elasticity and increasing returns to scale (which may reduce the producer's MC). Monopolists, oligopolists, and producers in monopolistic competition attempt to differentiate their products so that they can charge higher prices.
- Typically, monopolists sell a smaller quantity at a higher price. Investors may benefit from being shareholders of monopolistic firms that have large margins and substantial positive cash flows.
- In perfect competition, firms do not earn economic profit. The market will compensate for the rental of capital and of management services, but the lack of pricing power implies that there will be no extra margins.
- In the short run, firms in any market structure can have economic profits, the more competitive a market is and the lower the barriers to entry, the faster the extra profits will fade. In the long run, new entrants shrink margins and push the least efficient firms out of the market.
- Oligopoly is characterized by the importance of strategic behavior. Firms can change the price, quantity, quality, and advertisement of the product to gain an advantage over their competitors. Several types of equilibrium (e.g., Nash, Cournot, kinked demand curve) may occur that affect the likelihood of each of the incumbents (and potential entrants in the long run) having economic profits. Price wars may be started to force weaker competitors to abandon the market.
- Measuring market power is complicated. Ideally, econometric estimates of the elasticity of demand and supply should be computed. However, because of the lack of reliable data and the fact that elasticity changes over time (so that past data may not apply to the current situation), regulators and economists often use simpler measures. The concentration ratio is simple, but the Herfindahl-Hirschman index (HHI), with a little more computation required, often produces a better figure for decision making.

2 PROFIT MAXIMIZATION: PRODUCTION BREAKEVEN, SHUTDOWN AND ECONOMIES OF SCALE

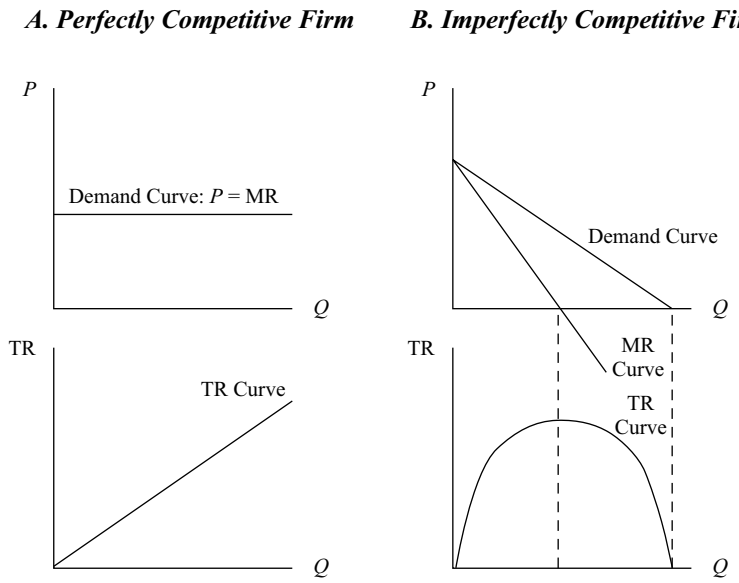
☐ determine and interpret breakeven and shutdown points of production, as well as how economies and diseconomies of scale affect costs under perfect and imperfect competition

Firms generally can be classified as operating in either a perfectly competitive or an imperfectly competitive environment. The difference between the two manifests in the slope of the demand curve facing the firm. If the environment of the firm is perfectly competitive, it must take the market price of its output as given, so it faces a perfectly elastic, horizontal demand curve. In this case, the firm's marginal revenue (MR) and the price of its product are identical. Additionally, the firm's **average revenue** (AR), or revenue per unit, is also equal to price per unit. A firm that faces a negatively sloped demand curve, however, must lower its price to sell an additional unit, so its MR is less than price (P).

These characteristics of MR are also applicable to the total revenue (TR) functions. Under conditions of perfect competition, TR (as always) is equal to price times quantity: TR = $(P)(Q)$. But under conditions of perfect competition, price is dictated by the market; the firm has no control over price. As the firm sells one more unit, its TR rises by the exact amount of price per unit.

Under conditions of imperfect competition, price is a variable under the firm's control, and therefore price is a function of quantity: $P = f(Q)$, and TR = $f(Q) \times Q$. For simplicity, suppose the firm is monopolistic and faces the market demand curve, which we will assume is linear and negatively sloped. Because the monopolist is the only seller, its TR is identical to the total expenditure of all buyers in the market. When price is reduced and quantity sold increases in this environment, a decrease in price initially increases total expenditure by buyers and TR to the firm because the decrease in price is outweighed by the increase in units sold. But as price continues to fall, the decrease in price overshadows the increase in quantity, and total expenditure (revenue) falls. We can now depict the demand and TR functions for firms under conditions of perfect and imperfect competition, as shown in Exhibit 1.

Exhibit 1: Demand and Total Revenue Functions for Firms under Conditions of Perfect and Imperfect Competition

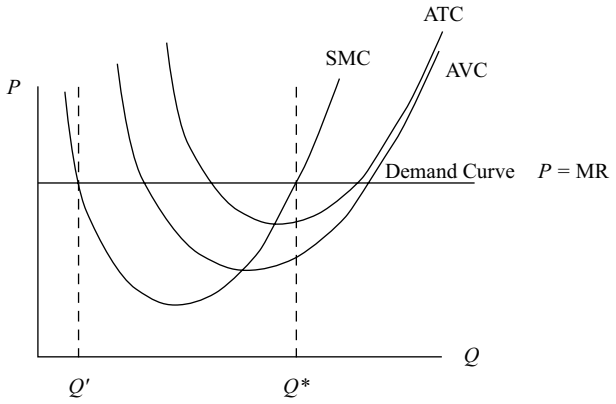


Panel A of Exhibit 1 depicts the demand curve (upper graph) and total revenue curve (lower graph) for the firm under conditions of perfect competition. Notice that the vertical axis in the upper graph is price per unit (e.g., GBP/bushel), whereas TR is measured on the vertical axis in the lower graph (e.g., GBP/week). The same is true for the respective axes in Panel B, which depicts the demand and total revenue curves for the monopolist. The TR curve for the firm under conditions of perfect competition is linear, with a slope equal to price per unit. The TR curve for the monopolist first rises (in the range where MR is positive and demand is elastic) and then falls (in the range where MR is negative and demand is inelastic) with output.

Profit-Maximization, Breakeven, and Shutdown Points of Production

We can now combine the firm's short-run TC curves with its TR curves to represent profit maximization in the cases of perfect competition and imperfect competition. Exhibit 2 shows both the AR and average cost curves in one graph for the firm under conditions of perfect competition.

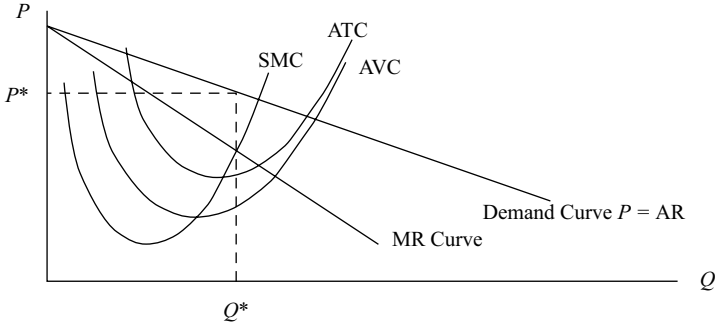
Exhibit 2: Demand and Average and Marginal Cost Curves for the Firm under Conditions of Perfect Competition



The firm is maximizing profit by producing Q^*, where price is equal to short-run marginal cost (SMC) and SMC is rising. Note at another output level, Q', where P = SMC, SMC is still falling, so this cannot be a profit-maximizing solution. If market price were to rise, the firm's demand and MR curve would simply shift upward, and the firm would reach a new profit-maximizing output level to the right of Q^*. If, however, market price were to fall, the firm's demand and MR curve would shift downward, resulting in a new and lower level of profit-maximizing output. As depicted, this firm is currently earning a positive economic profit because market price exceeds average total cost (ATC), at output level Q^*. This profit is possible in the short run, but in the long run, competitors would enter the market to capture some of those profits and would drive the market price down to a level equal to each firm's ATC.

Exhibit 3 depicts the cost and revenue curves for the monopolist that is facing a negatively sloped market demand curve. The MR and demand curves are not identical for this firm. But the profit-maximizing rule is still the same: Find the level of Q that equates SMC, to MR—in this case, Q^*. Once that level of output is determined, the optimal price to charge is given by the firm's demand curve at P^*. This monopolist is earning positive economic profit because its price exceeds its ATC. The barriers to entry that give this firm its monopolistic power mean that outside competitors would not be able to compete away this firm's profits.

Exhibit 3: Demand and Average and Marginal Cost Curves for the Monopolistic Firm



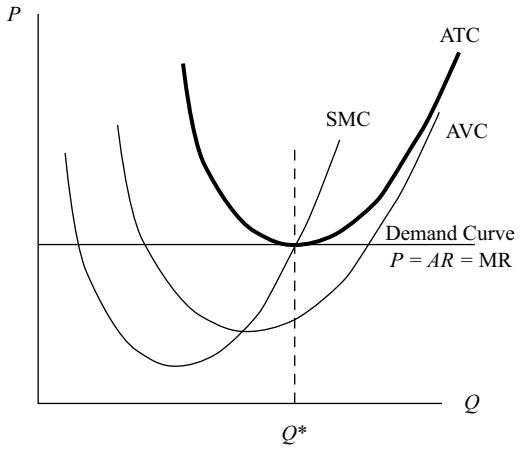
Breakeven Analysis and Shutdown Decision

A firm is said to break even if its TR is equal to its TC. It also can be said that a firm breaks even if its price (AR) is exactly equal to its ATC, which is true under conditions of perfect and imperfect competition. Of course, the goal of management is not just to breakeven but to maximize profit. However, perhaps the best the firm can do is cover all of its economic costs. Economic costs are the sum of total accounting costs and implicit opportunity costs. A firm whose revenue is equal to its economic costs is covering the opportunity cost of all of its factors of production, including capital. Economists would say that such a firm is earning normal profit, but not positive economic profit. It is earning a rate of return on capital just equal to the rate of return that an investor could expect to earn in an equivalently risky alternative investment (opportunity cost). Firms that are operating in a competitive environment with no barriers to entry from other competitors can expect, in the long run, to be unable to earn a positive economic profit; the excess rate of return would attract entrants who would produce more output and ultimately drive the market price down to the level at which each firm is, at best, just earning a normal profit. This situation, of course, does not imply that the firm is earning zero accounting profit.

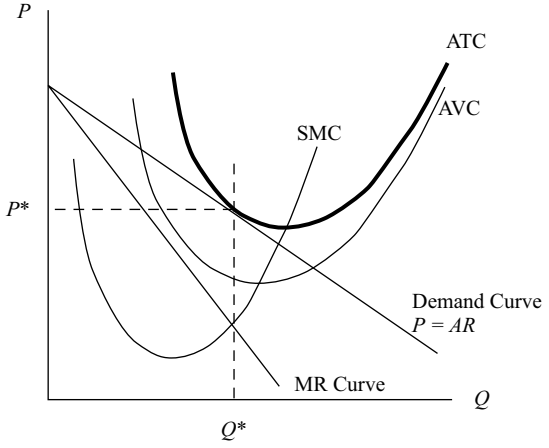
Exhibit 4 depicts the condition for both a firm under conditions of perfect competition (Panel A) and a monopolist (Panel B) in which the best each firm can do is to break even. Note that at the level of output at which SMC is equal to MR, price is equal to ATC. Hence, economic profit is zero, and the firms are breaking even.

Exhibit 4: Examples of Firms under Perfect Competition and Monopolistic Firms That Can, at Best, Break Even

A. Perfect Competition



B. Monopolist



The Shutdown Decision

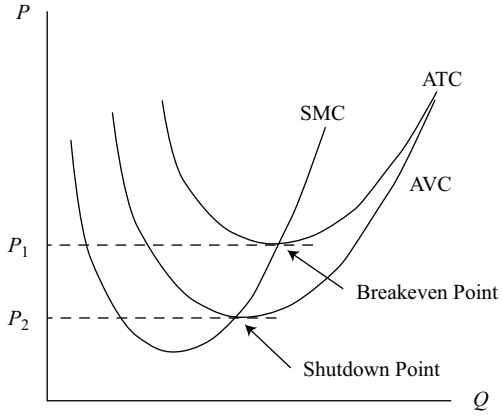
In the long run, if a firm cannot earn at least a zero economic profit, it will not operate because it is not covering the opportunity cost of all of its factors of production, labor, and capital. In the short run, however, a firm might find it advantageous to continue to operate even if it is not earning at least a zero economic profit. The discussion that follows addresses the decision to continue to operate and earn negative profit or shut down operations.

Recall that typically some or all of a firm's fixed costs are incurred regardless of whether the firm operates. The firm might have a lease on its building that it cannot avoid paying until the lease expires. In that case, the lease payment is a sunk cost: It cannot be avoided, no matter what the firm does. Sunk costs must be ignored in the decision to continue to operate in the short run. As long as the firm's revenues cover

at least its variable cost, the firm is better off continuing to operate. If price is greater than average variable cost (AVC), the firm is covering not only all of its variable cost but also a portion of fixed cost.

In the long run, unless market price increases, this firm would exit the industry. But in the short run, it will continue to operate at a loss. Exhibit 5 depicts a firm under conditions of perfect competition facing three alternative market price ranges for its output. At any price above P_1, the firm can earn a positive profit and clearly should continue to operate. At a price below P_2, the minimum AVC, the firm could not even cover its variable cost and should shut down. At prices between P_2 and P_1, the firm should continue to operate in the short run because it is able to cover all of its variable cost and contribute something toward its unavoidable fixed costs. Economists refer to the minimum AVC point as the **shutdown point** and the minimum ATC point as the **breakeven point**.

Exhibit 5: A Firm under Conditions of Perfect Competition Will Choose to Shut Down If Market Price Is Less Than Minimum AVC



EXAMPLE 1

Breakeven Analysis and Profit Maximization When the Firm Faces a Negatively Sloped Demand Curve under Imperfect Competition

Revenue and cost information for a future period including all opportunity costs is presented in Exhibit 6 for WR International, a newly formed corporation that engages in the manufacturing of low-cost, prefabricated dwelling units for urban housing markets in emerging economies. (Note that quantity increments are in blocks of 10 for a 250 change in price.) The firm has few competitors in a market setting of imperfect competition.

Exhibit 6: Revenue and Cost Information for WR International

Quantity (*Q*)	Price (*P*)	Total Revenue (*TR*)	Total Cost (*TC*)[a]	Profit
0	10,000	0	100,000	–100,000
10	9,750	97,500	170,000	–72,500

Quantity (*Q*)	Price (*P*)	Total Revenue (*TR*)	Total Cost (*TC*)[a]	Profit
20	9,500	190,000	240,000	–50,000
30	9,250	277,500	300,000	–22,500
40	9,000	360,000	360,000	0
50	8,750	437,500	420,000	17,500
60	8,500	510,000	480,000	30,000
70	8,250	577,500	550,000	27,500
80	8,000	640,000	640,000	0
90	7,750	697,500	710,000	–12,500
100	7,500	750,000	800,000	–50,000

[a] *Includes all opportunity costs*

1. How many units must WR International sell to initially break even?

   Solution:

   WR International will initially break even at 40 units of production, where TR and TC equal 360,000.

2. Where is the region of profitability?

   Solution:

   The region of profitability will range from greater than 40 units to less than 80 units. Any production quantity of less than 40 units and any quantity greater than 80 units will result in an economic loss.

3. At what point will the firm maximize profit? At what points are there economic losses?

   Solution:

   Maximum profit of 30,000 will occur at 60 units. Lower profit will occur at any output level that is higher or lower than 60 units. From 0 units to less than 40 units and for quantities greater than 80 units, economic losses occur.

Given the relationships between TR, total variable costs (TVC), and total fixed costs (TFC), Exhibit 7 summarizes the decisions to operate, shut down production, or exit the market in both the short run and the long run. The firm must cover its variable cost to remain in business in the short run; if TR cannot cover TVC, the firm shuts down production to minimize loss. The loss would be equal to the amount of fixed cost. If TVC exceeds TR in the long run, the firm will exit the market to avoid the loss associated with fixed cost at zero production. By exiting the market, the firm's investors do not suffer the erosion of their equity capital from economic losses. When TR is enough to cover TVC but not all of TFC, the firm can continue to produce in the short run but will not be able to maintain financial solvency in the long run.