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CFA LEVEL I

Detailed Formula Sheet



Economics

Topic 2 of 10 • Fully Explained

💡 Plain-English explanations 📊 Worked examples 🧠 Memory hooks ⚠️ Exam traps

Demand, Supply & Elasticity

Cost, Revenue & Profit

Market Structures

GDP & National Accounts

Multipliers

Economic Growth

Business Cycles & Inflation

Monetary & Fiscal Policy

Currency Exchange Rates

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👋 **Welcome back, future charterholder!** Economics has fewer formulas than Quants but the **logic and direction of effects** matter just as much. Each card gives the formula, a **plain-English meaning**, a worked example, and **memory hooks** for the tricky sign rules. 🌐

💡 **In Plain English**

📊 **Worked Example**

🧠 **Memory Hook**

⚠️ **Watch Out**

📌 **Key Fact**

1 🛒 Demand, Supply & Elasticity

📐 The Three Elasticities

$$\text{Price } E_d = \frac{\% \Delta Q_d}{\% \Delta P} \quad | \quad \text{Income } E = \frac{\% \Delta Q_d}{\% \Delta \text{Income}} \quad | \quad \text{Cross } E = \frac{\% \Delta Q_d^A}{\% \Delta P_B}$$

💡 In Plain English

Elasticity = **how sensitive** quantity demanded is to a 1% change in something (its own price, your income, or another good's price). It's always a ratio of percentage changes.

📊 Worked Example

Price rises 10%, quantity demanded falls 5%: Price elasticity = $-5\%/10\% = -0.5$ ($|E| < 1$, so **inelastic**).

📌 Sign Rules (memorize!)

Cross > 0 → **substitutes** (tea & coffee); **Cross < 0** → **complements** (cars & petrol). **Income > 0** → **normal good**; Income < 0 → inferior good; Income > 1 → luxury.

💰 Elasticity & Total Revenue

Elastic ($|E| > 1$): price ↓ → TR ↑ • Inelastic ($|E| < 1$): price ↑ → TR ↑ • Unit ($|E| = 1$): TR is maxed

💡 In Plain English

When demand is **elastic**, customers are price-sensitive, so cutting price wins enough extra volume to raise revenue. When **inelastic**, you can raise price and revenue still climbs.

🧠 Memory Hook

"**Elastic** → cut to grow; **Inelastic** → hike to grow." Total revenue peaks exactly where demand is unit-elastic. 🎯

2 🏢 The Firm: Cost, Revenue & Profit

🧱 Revenue & Cost Building Blocks

$$TR = P \times Q \quad | \quad MR = \frac{\Delta TR}{\Delta Q} \quad | \quad AR = \frac{TR}{Q} = P$$

$$TC = TFC + TVC \quad | \quad ATC = \frac{TC}{Q} \quad | \quad AVC = \frac{TVC}{Q} \quad | \quad MC = \frac{\Delta TC}{\Delta Q}$$

💡 In Plain English

"Total" = the whole amount, "Average" = per unit ($\div Q$), "Marginal" = the cost/revenue of one *more* unit. Fixed costs don't change with output; variable costs do.

Profit Maximization & Profit Types

Maximize profit where **MR = MC** (perfect competition: $P = MR = MC$)

Economic profit = $TR - (\text{explicit} + \text{implicit costs})$ • Accounting profit = $TR - \text{explicit costs}$

In Plain English

Keep producing while each extra unit adds more revenue than cost ($MR > MC$); stop when they're equal. **Economic** profit also subtracts *opportunity cost* (implicit costs), so it's stricter than accounting profit.

Worked Example

TR = \$500k, explicit costs \$300k, implicit (opportunity) costs \$150k:
Accounting profit = **\$200k**; Economic profit = $500 - 300 - 150 = \text{\$50k}$.

Breakeven, Shutdown & Exit

Breakeven: $P = ATC$ • Short-run shutdown: $P < AVC$ • Long-run exit: $P < ATC$

In Plain English

In the **short run** a firm keeps operating as long as price covers *variable* cost (AVC) — it's still chipping away at fixed costs. If price can't even cover AVC, shut down now. Long run: leave if price $< ATC$.

Memory Hook

"Short run cares about Variable; Long run cares about Total." AVC = stay-open line; ATC = stay-in-business line. 

3 Market Structures & Concentration

The Four Market Structures

Perfect Competition → Monopolistic Competition → Oligopoly → Monopoly (most → least competitive)

In Plain English

Moving right: **fewer firms, more pricing power, harder entry**. Perfect competition = many firms, identical products, price-takers. Monopoly = one firm, no substitutes, price-maker.

Key Fact

Only in **perfect competition** is the firm a price-taker with $P = MR$. In all others the demand curve slopes down, so **$MR < P$** .



Measuring Concentration

$$N\text{-Firm Concentration Ratio} = \sum (\text{market shares of top } N \text{ firms})$$

$$\text{Herfindahl-Hirschman Index (HHI)} = \sum (\text{market share}_i)^2$$

In Plain English

Both gauge how concentrated an industry is. The **HHI squares** each share, so it punishes dominance by big players — making it better than the simple ratio (which ignores a merger between large firms).

Worked Example

Four firms with shares 40%, 30%, 20%, 10%:

3-firm ratio = 40 + 30 + 20 = **90%**; HHI = 40² + 30² + 20² + 10² = 1,600 + 900 + 400 + 100 = **3,000**.

Watch Out

The concentration ratio can **miss the impact of a merger** among the largest firms; the HHI captures it because squaring magnifies large shares.

4

GDP & National Accounts



GDP — Expenditure Approach

$$\text{GDP} = C + I + G + (X - M)$$

In Plain English

Add up all spending in the economy: **Consumption** + **Investment** + **Government** + **net exports** (eXports – iMports). The expenditure total always equals the income total.

Worked Example

C = 700, I = 200, G = 250, X = 120, M = 170:

GDP = 700 + 200 + 250 + (120 – 170) = **1,100**.



Real vs Nominal GDP & the Deflator

$$\text{GDP Deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}} \times 100$$

In Plain English

Nominal GDP uses current prices (inflated); **Real** GDP uses base-year prices (inflation stripped out). The deflator is the price-level index that links them — a broad inflation gauge.

Worked Example

Nominal GDP = 1,200, Real GDP = 1,000: Deflator = (1,200/1,000) × 100 = **120** → prices are 20% above the base year.

Watch Out

Only **Real GDP growth** reflects true output gains. Rising Nominal GDP can be pure inflation. 

5 The Multipliers

Spending & Fiscal Multipliers

$$MPC + MPS = 1 \quad | \quad \text{Spending multiplier} = \frac{1}{1 - MPC} = \frac{1}{MPS}$$

$$\text{Fiscal multiplier (with taxes)} = \frac{1}{1 - MPC(1 - t)}$$

In Plain English

One dollar of new spending circulates again and again as income → spending → income. The fraction re-spent is the MPC, so a higher MPC means a bigger ripple. Taxes (t) leak money out each round, shrinking the multiplier.

Worked Example

MPC = 0.8, no taxes → multiplier = $1/(1 - 0.8) = 5$ (\$10B spending → \$50B output).

MPC = 0.9, t = 0.20 → $1/[1 - 0.9(0.80)] = 1/0.28 = 3.57$.

Key Fact

The **balanced-budget multiplier = 1**: raising spending and taxes by equal amounts still lifts output (taxes cut spending by only MPC × the amount).

6 Economic Growth

Production Function & Growth Accounting

$$\text{Cobb-Douglas: } Y = A \cdot K^{\alpha} \cdot L^{(1-\alpha)}$$

$$\% \Delta Y = \% \Delta A + \alpha(\% \Delta K) + (1 - \alpha)(\% \Delta L)$$

In Plain English

Output (Y) comes from **technology/total factor productivity (A)**, **capital (K)**, and **labor (L)**. α is capital's share (output elasticity). Growth in Y = growth in each input, weighted by its share, plus TFP.

Worked Example

TFP +1.5%, capital +4% (α = 0.3), labor +1%:

$\% \Delta Y = 1.5 + 0.3(4) + 0.7(1) = 1.5 + 1.2 + 0.7 = 3.4\%$.

Potential GDP Growth

$$\text{Potential GDP growth} = \text{Growth in labor force} + \text{Growth in labor productivity}$$

In Plain English

The economy's **sustainable speed limit**: more workers, plus each worker producing more per hour.

Worked Example

Labor force grows 1%, labor productivity grows 2% → potential GDP growth ≈ 3%.

Memory Hook

"More hands + smarter hands." Long-run growth = more workers × more output per worker. 💪

7 Business Cycles & Inflation

CPI & the Inflation Rate

$$\text{CPI} = \frac{\text{Cost of basket at current prices}}{\text{Cost of basket at base prices}} \times 100$$

$$\text{Inflation rate} = \frac{\text{CPI}_{\text{end}} - \text{CPI}_{\text{begin}}}{\text{CPI}_{\text{begin}}}$$

In Plain English

The CPI tracks the price of a fixed shopping basket versus a base year. Inflation is just its percentage change.

Worked Example

CPI rises from 200 to 210: Inflation = $(210 - 200)/200 = 5\%$.

Laspeyres, Paasche & Fisher Indexes

Laspeyres = fixed BASE-period basket • Paasche = current-period basket

$$\text{Fisher Index} = \sqrt{(\text{Laspeyres} \times \text{Paasche})}$$

In Plain English

The standard CPI is a **Laspeyres** index (fixed old basket) and tends to *overstate* inflation (ignores substitution to cheaper goods). The **Fisher** index is the geometric average of the two — a balanced middle.

Worked Example

Laspeyres = 1.06, Paasche = 1.04 → Fisher = $\sqrt{(1.06 \times 1.04)} = \sqrt{1.1024} \approx 1.050$ ($\approx 5.0\%$).

Watch Out

Laspeyres has an **upward bias** (substitution + new-product + quality bias); Paasche tends to understate. 🐢

8 Money & Monetary Policy

Money Multiplier & Quantity Theory

$$\text{Money multiplier} = \frac{1}{\text{Reserve requirement}} \quad | \quad M \times V = P \times Y$$

In Plain English

Banks lend out most of every deposit, so new reserves **multiply** through the system. The Quantity Theory says money × velocity = prices × real output: if V and Y are stable, more money → more inflation.

Worked Example

Reserve requirement = 12.5% → money multiplier = $1/0.125 = 8$.

Money supply +6%, velocity flat, real output +2% → inflation $\approx 6\% + 0\% - 2\% = 4\%$.

The Fisher Effect & Neutral Rate

$$R_{\text{nominal}} \approx R_{\text{real}} + E(\text{inflation}) \quad | \quad \text{Neutral rate} = \text{real trend growth} + \text{inflation target}$$

In Plain English

The nominal interest rate is the real return *plus* compensation for expected inflation (plus risk premiums). The **neutral rate** neither speeds up nor slows the economy — the central bank's "no-pressure" setting.

Worked Example

Real rate 3%, expected inflation 2% → nominal rate ≈ **5%**.

9 Currency Exchange Rates

Quotes & Cross Rates

A/B = units of PRICE currency (A) per 1 unit of BASE currency (B)

$$\text{Cross rate: } \frac{A}{C} = \frac{A}{B} \times \frac{B}{C}$$

In Plain English

In "USD/EUR = 1.17", the EUR is the **base** and USD is the **price** — €1 buys \$1.17. A *higher* A/B rate means the base currency (B) has **appreciated**.

Worked Example

USD/GBP = 1.30 and USD/EUR = 1.10 → EUR/GBP = $1.30 \div 1.10 = \mathbf{1.1818}$.

Forward Rates & Covered Interest Rate Parity

$$F_{A/B} = S_{A/B} \times \frac{1 + i_A}{1 + i_B} \quad (i_A = \text{price-currency rate, } i_B = \text{base-currency rate})$$

Forward premium / discount = $F - S$

In Plain English

Covered parity is enforced by arbitrage: the currency with the **higher interest rate trades at a forward discount**, exactly offsetting the rate advantage so no risk-free profit exists.

Worked Example

$S = 1.25 \text{ USD/EUR}$, $i_{\text{USD}} = 4\%$, $i_{\text{EUR}} = 2\%$:

$F = 1.25 \times (1.04 / 1.02) = \mathbf{1.2745 \text{ USD/EUR}}$ → EUR (lower-yield base) is at a forward premium.

Uncovered Parity, PPP & International Fisher

$$\text{Uncovered IRP: } E(\% \Delta S_{A/B}) = i_A - i_B$$

$$\text{Relative PPP: } \% \Delta S_{A/B} = \text{Inflation}_A - \text{Inflation}_B$$

$$\text{International Fisher: } i_A - i_B = E(\text{Inflation}_A) - E(\text{Inflation}_B)$$

In Plain English

Three "parity" ideas about where exchange rates head: high-interest currencies are expected to **depreciate** (UIRP), high-inflation currencies **depreciate** (PPP), and real interest rates are equal across countries (Int'l Fisher).

Memory Hook

"High rates & high inflation → currency falls." Both extra yield and extra inflation get punished by depreciation. 

Watch Out

Mind the quote direction! In A/B notation, a **rise in the rate = the BASE currency (B) strengthening**, not A.