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ECO616

Macroeconomic Analysis

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ECO616

Macroeconomic Analysis

Advanced Macroeconomics: Theory and Models — Study Handout

This handout covers ECO616 Macroeconomic Analysis: the workhorse models of modern macro — classical and Keynesian foundations, the IS-LM and AD-AS frameworks, consumption and investment theory, money and inflation, growth theory, and open-economy macroeconomics. Each unit states the model's assumptions, derives its key result, and gives the policy implication.

Notation: Y = output/income, C = consumption, I = investment, G = government spending, T = taxes, r = real interest rate, P = price level, M = money supply, NX = net exports. Master one diagram per model — exams are diagram-driven.

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Unit 1: Foundations: Classical vs Keynesian Macroeconomics

Lectures 1–5

Learning Objectives

- Define macroeconomics and its key variables
- Explain the classical model: Say's law and full employment
- Explain the Keynesian critique: sticky prices and demand deficiency
- Distinguish real vs nominal variables and the classical dichotomy

The Macro Questions

Macroeconomics studies aggregates: **output (GDP)**, **unemployment**, **inflation**, and their movement over the **business cycle**. The central debate: does the economy self-correct to full employment, or can it get stuck below it?

The Classical Model

- **Say's law:** supply creates its own demand — production generates the income that buys the output.
- **Flexible wages and prices** clear all markets; the labor market always reaches full employment.
- **Classical dichotomy:** real variables (output, employment) determined by technology and factor supplies; money only affects nominal variables (price level) — **money is neutral**.
- Policy implication: government intervention is unnecessary and ineffective (crowds out private activity).

The Keynesian Critique

- **Sticky wages/prices:** contracts, minimum wages and menu costs prevent instant market clearing — unemployment can persist.
- **Demand matters:** output is determined by aggregate demand in the short run; the economy can settle below full employment.
- **Liquidity preference:** money demand for transactions, precaution and speculation — the interest rate is monetary.
- Policy implication: **fiscal and monetary policy can stabilize** the economy — the case for active demand management.

Exam framing: every model in this course sits somewhere on the classical–Keynesian spectrum. When asked to 'evaluate', locate the model's assumptions (price flexibility? expectations? market clearing?) and the policy conclusion follows automatically.

Unit Summary

- Classical: flexible prices, Say's law, money neutrality, no role for stabilization policy.

- Keynesian: sticky prices, demand-determined output, persistent unemployment, activist policy works.
- The spectrum between them organizes the entire course.

Exam Pointers

- ★ State Say's law and the classical dichotomy.
- ★ Give three Keynesian reasons markets may not clear.
- ★ Why does price stickiness justify fiscal policy?

Unit 2: National Income Accounting and Measurement

Lectures 6–8

Learning Objectives

- Compute GDP by expenditure, income and value-added approaches
- Distinguish nominal vs real GDP and the GDP deflator
- Explain unemployment and inflation measurement
- Discuss limits of GDP as welfare measure

Three Faces of GDP

Expenditure: $Y = C + I + G + NX$ — the workhorse identity of the course.

Income: wages + rents + interest + profits (+ taxes – subsidies) — every expenditure is someone's income.

Value added: sum of (output – intermediate inputs) across firms — avoids double counting.

- All three give the same GDP — a favorite numerical verification question.

Real vs Nominal; Inflation and Unemployment

Real GDP = nominal GDP / GDP deflator × 100 — removes price changes. GDP deflator = (nominal/real) × 100.

CPI vs deflator: CPI tracks a fixed consumer basket (Laspeyres); deflator covers all goods with changing weights. —

Unemployment rate = unemployed / labor force. Types: frictional (job search), structural (skill mismatch), cyclical (demand-deficient) — the Keynesian concern).

- **Okun's law:** each 1% of cyclical unemployment ≈ 2% output gap (rough rule of thumb).

Limits of GDP

GDP ignores household production, the informal economy (large in Pakistan), environmental depletion, leisure, and distribution — a country can grow GDP while welfare stagnates. Complements: HDI, genuine savings, happiness indices. Use this critique whenever asked to 'evaluate growth performance'.

Worked: $C=60, I=20, G=15, X=25, M=30$ (billion Rs). $Y = 60+20+15+(25-30) = 90$. If the deflator is 120, real GDP = $90/1.2 = 75$ (in base-year prices). Trade deficit ($M>X$) drags GDP — the NX term.

Unit Summary

- $Y = C + I + G + NX$; income and value-added approaches must agree.
- Real GDP strips inflation via the deflator; CPI measures consumer prices.
- Unemployment: frictional/structural/cyclical; Okun's law links cycles to output gaps; GDP ≠ welfare.

Exam Pointers

- ★ Compute GDP three ways from given data and reconcile.
- ★ Nominal GDP 120, deflator 125 — find real GDP.
- ★ Give four limitations of GDP as a welfare measure.

Unit 3: Consumption and Saving Theories

Lectures 9–12

Learning Objectives

- Explain the Keynesian consumption function and MPC
- Describe the life-cycle hypothesis
- Describe the permanent income hypothesis
- Discuss implications for fiscal policy effectiveness

Keynesian Consumption Function

$C = a + bY_d$, where Y_d = disposable income, b = MPC (marginal propensity to consume), a = autonomous consumption. —

- $0 < MPC < 1$; **APC falls** as income rises (Keynes's conjecture — contradicted by long-run data, motivating later theories).
- The **multiplier**: $k = 1/(1-MPC)$ — an initial spending rise cascades through consumption rounds. $MPC = 0.8 \rightarrow k = 5$.

Life-Cycle Hypothesis (Modigliani)

People **smooth consumption** over their lifetime: borrow young, save in middle age, dissave in retirement. Consumption depends on **lifetime resources** (wealth + expected earnings), not current income. Implication: a temporary tax rebate is mostly saved (small MPC out of transitory income) — only **permanent** income changes move consumption much.

Permanent Income Hypothesis (Friedman)

C depends on **permanent income** (long-run average), not transitory windfalls. Consumers save windfalls and borrow against temporary shortfalls. Testable prediction: consumption is smoother than income — broadly confirmed.

- **Ricardian equivalence (Barro)**: forward-looking consumers see deficit-financed tax cuts as future taxes and save the cut — fiscal policy neutralized (extreme, but the logical endpoint of permanent-income thinking).

Policy case: government mails every household Rs. 10,000 to 'stimulate demand'. Keynesian: spending jumps by $MPC \times 10,000 \times \text{population}$, multiplied. Life-cycle/permanent-income: households treat it as transitory, save most of it — stimulus fizzles. Exams love asking you to predict the outcome under each theory.

Unit Summary

- Keynes: $C = a + bY_d$; multiplier $k = 1/(1-MPC)$.
- Life-cycle: consume from lifetime wealth; smooth across ages. Permanent income: consume from long-run average.
- Modern theories predict weak effects of temporary fiscal stimulus — know the contrast.

Exam Pointers

- ★ $MPC = 0.75$. Compute the multiplier; government raises G by 100 — total Y effect?
- ★ Contrast Keynesian and permanent-income predictions for a one-time tax rebate.
- ★ State Ricardian equivalence and its assumption.

Unit 4: Investment Theory

Lectures 13–15

Learning Objectives

- Explain the neoclassical investment model
- Describe Tobin's q
- Explain the accelerator principle
- Discuss why investment is the volatile component

Neoclassical Model (Jorgenson)

Firms invest until the **marginal product of capital equals the user cost of capital**: $MPK = uc$, where $uc = (r + \delta - \pi) \times P$ — real interest plus depreciation minus expected capital gains, times the price of capital goods. Higher r or faster depreciation $\rightarrow$ less desired capital $\rightarrow$ less investment. Tax credits that cut P stimulate investment — the theory behind investment incentives.

Tobin's q

q = market value of installed capital / replacement cost. $q > 1 \rightarrow$ install more capital (invest); $q < 1 \rightarrow$ let it depreciate. —

- q links the **stock market to real investment** — a booming market should drive an investment boom (with lags and frictions).

Accelerator

I responds to CHANGES in output: $I = v \cdot \Delta Y$ (v = capital-output ratio). Even steady growth needs heavy investment; a slowdown crashes investment — explaining its volatility.

- Why investment swings most: durable, postponable, expectations-driven, credit-sensitive. This volatility is why investment leads the business cycle.

Worked: $v = 3$, Y rises from 100 to 110 $\rightarrow$ net investment = $3 \times 10 = 30$. Next year Y stays at 110 ($\Delta Y = 0$) $\rightarrow$ net investment collapses to 0 (only replacement). Output merely flattening — not falling — kills net investment. That is the accelerator's punchline.

Unit Summary

- Neoclassical: invest until $MPK = \text{user cost } (r + \delta - \text{expected gains}) \times P$.
- Tobin's $q > 1 \rightarrow$ invest; links stock market to capital formation.
- Accelerator: $I = v \cdot \Delta Y$ — investment volatility comes from responding to output changes.

Exam Pointers

- ★ Compute the user cost of capital from given r , δ , expected gains.
- ★ A firm's q is 1.4. What should it do and why?
- ★ Use the accelerator to explain investment volatility.

Unit 5: The IS-LM Model

Lectures 16–20

Learning Objectives

- Derive the IS curve from goods-market equilibrium
- Derive the LM curve from money-market equilibrium
- Find equilibrium and analyze fiscal/monetary shocks
- Explain the liquidity trap and classical case

IS: Goods Market

IS: $Y = C(Y-T) + I(r) + G$ — combinations of (Y, r) clearing the goods market. **Downward sloping:** lower $r \rightarrow$ more investment $\rightarrow$ higher Y . Fiscal expansion ($\uparrow G$) shifts IS **right**. Steeper IS when investment is interest-insensitive or MPC small.

LM: Money Market

LM: $M/P = L(Y, r)$ — combinations clearing the money market. **Upward sloping:** higher $Y \rightarrow$ more money demand $\rightarrow$ higher r needed to restore equilibrium. Money-supply increase shifts LM **right** (lower r at each Y). Steeper LM when money demand is interest-insensitive.

Equilibrium and Policy

- **Fiscal expansion:** IS right $\rightarrow Y$ up, r up — the r rise **crowds out** some investment (partial offset).
- **Monetary expansion:** LM right $\rightarrow r$ down, Y up — no crowding out; works through investment.
- **Liquidity trap:** LM flat at near-zero rates — monetary policy impotent (r can't fall further); fiscal policy fully effective (no crowding out). The Keynesian extreme.
- **Classical case:** LM vertical (money demand interest-insensitive) — fiscal policy fully crowded out; only money matters. The monetarist extreme.

Diagram drill: draw IS-LM, shift IS right for a deficit-financed G increase, mark new equilibrium with higher Y and higher r , and shade the crowded-out investment as the horizontal distance between the IS shift and the Y increase. Reproduce this mechanically — it's the single most-examined diagram in macro.

Unit Summary

- IS (goods market, downward sloping); LM (money market, upward sloping); intersection = short-run equilibrium.
- Fiscal: $Y \uparrow r \uparrow$ with crowding out. Monetary: $Y \uparrow r \downarrow$.
- Liquidity trap (fiscal wins) vs classical case (money wins) are the two extremes.

Exam Pointers

- ★ Derive IS and LM slopes from their equilibrium conditions.

- ★ Show fiscal expansion in IS-LM and explain crowding out.
- ★ Contrast policy effectiveness in the liquidity trap vs the classical case.

Unit 6: AD-AS and the Phillips Curve

Lectures 21–24

Learning Objectives

- Derive aggregate demand from IS-LM
- Distinguish SRAS from LRAS
- Explain demand-pull vs cost-push inflation
- State the expectations-augmented Phillips curve

Aggregate Demand

AD: combinations of (P, Y) from IS-LM — **downward sloping** because lower P → higher real money supply (M/P) → LM shifts right → Y rises (the Keynes/interest-rate effect). Fiscal/monetary expansions shift AD right.

Aggregate Supply

SRAS — upward sloping: sticky wages/prices; higher P (with expected P fixed) lowers real wages → firms hire more → Y rises.

LRAS — vertical at potential output Y^* : wages/prices fully flexible; output set by technology, capital, labor — money neutral in the long run.

- Long-run adjustment: a demand boom pushes Y above Y^* , expectations revise upward, SRAS shifts up until Y returns to Y^* at a higher P — **money is neutral in the long run** even in Keynesian models.

Inflation and the Phillips Curve

- **Demand-pull:** AD shifts right along SRAS — 'too much money chasing too few goods'.
- **Cost-push:** SRAS shifts up (oil shock, wage push) — stagflation: Y down, P up; cruel policy dilemma.

Expectations-augmented Phillips curve: $\pi = \pi^e - \beta(u - u_n) + \text{supply shocks}$.
Short-run trade-off exists; long-run Phillips curve vertical at the natural rate u_n (NAIRU). Attempts to hold $u < u_n$ only accelerate inflation. —

Stagflation case (oil price shock): SRAS up → P up, Y down. Policy dilemma: fight inflation (tighten → deeper recession) or fight recession (stimulate → more inflation). Supply-side answer: raise Y^ (productivity, energy diversification) — demand tools can't fix a supply shock. This is the standard 'evaluate the policy response' question.*

Unit Summary

- AD slopes down (real-balance effect); SRAS slopes up (sticky wages); LRAS vertical at Y^* .
- Demand-pull (AD right) vs cost-push (SRAS up → stagflation).
- Phillips curve: short-run trade-off, long-run vertical at u_n ; expectations decide.

Exam Pointers

- ★ Derive AD's negative slope from IS-LM.
- ★ Show long-run adjustment to a monetary expansion in AD-AS.
- ★ An oil shock hits. Analyze with AD-AS and discuss the policy dilemma.

Unit 7: Money, Inflation and Monetary Policy

Lectures 25–28

Learning Objectives

- Explain money creation and the money multiplier
- State the quantity theory and its predictions
- Describe central bank tools
- Explain inflation costs and the case for rules vs discretion

Money Creation

Money multiplier: $mm = (1 + cr)/(cr + rr)$ — cr = currency-deposit ratio, rr = reserve ratio. $M = mm \times \text{monetary base}$.

- Banks create deposits by lending; the central bank controls the base, influences the multiplier via reserve requirements.

Quantity Theory

MV = PY. With V stable and Y at potential: $\% \Delta M \approx \pi$ — inflation is (in the long run) a monetary phenomenon (Friedman).

- Seigniorage: revenue from money creation — tempting for deficit governments, the classic route to hyperinflation.

Central Bank Tools

- **Policy rate:** raising it tightens financial conditions across the economy.
- **Open-market operations:** buying bonds injects reserves (the everyday tool).
- **Reserve requirements and forward guidance** (managing expectations).
- Transmission: policy rate $\rightarrow$ market rates $\rightarrow$ investment/consumption $\rightarrow$ AD $\rightarrow$ output/inflation (with 'long and variable lags' — Friedman).

Inflation: Costs and Policy Design

- **Costs:** shoe-leather, menu costs, tax distortions, arbitrary redistribution (borrowers gain, lenders lose), uncertainty killing long-term contracts.
- **Rules vs discretion:** discretion tempts surprise inflation (time-inconsistency — Kydland & Prescott); credible rules/targets (inflation targeting) anchor expectations — the modern consensus.

Worked: $cr = 0.2$, $rr = 0.1 \rightarrow mm = 1.2/0.3 = 4$. Base 100 $\rightarrow M = 400$. If the central bank cuts rr to 0.05: $mm = 1.2/0.25 = 4.8 \rightarrow M = 480$ — monetary easing through the multiplier.

Unit Summary

- Banks multiply base money: $mm = (1+cr)/(cr+rr)$.
- $MV = PY$: sustained inflation is monetary; seigniorage abuse $\rightarrow$ hyperinflation.

- Tools: policy rate, OMOs, reserves, guidance; lags are long — hence rules/credible targets beat discretion.

Exam Pointers

- ★ Compute the money multiplier and M from c_r , r_r and the base.
- ★ Derive the inflation prediction from the quantity theory.
- ★ Explain the time-inconsistency case for central-bank independence.

Unit 8: Economic Growth: Solow and Beyond

Lectures 29–32

Learning Objectives

- Set up the Solow model and find the steady state
- Explain the golden rule of saving
- Discuss convergence predictions
- Introduce endogenous growth ideas

The Solow Model

Production $y = f(k)$ (per-worker, diminishing returns). Capital accumulates: $\Delta k = sf(k) - (n + \delta)k$ — saving builds it; population growth and depreciation dilute it. **Steady state:** $sf(k^*) = (n + \delta)k^*$ — where investment just covers dilution; then y, c constant (aggregate Y grows at rate n).

- **Higher saving** → higher steady-state income level, but NOT permanently faster growth (level vs growth effect — the key exam distinction). 
- **Long-run growth** in output per worker comes only from **technological progress** (add growth rate g : $\Delta k = sf(k) - (n + \delta + g)k$).

Golden Rule and Convergence

Golden rule: the saving rate maximizing steady-state consumption: $MPK = n + \delta$ (+ g with tech progress). —

- **Conditional convergence:** poorer countries grow faster *conditional on* same saving, population growth and technology — roughly observed; absolute convergence fails because conditions differ.

Endogenous Growth

Romer/Lucas: **knowledge spillovers and human capital** make returns to capital non-diminishing at the social level — policy (education, R&D, openness) can raise the **growth rate permanently**, not just the level. Explains why Solow's prediction (all countries converging to the same growth path) needed enriching.

Diagram: plot $sf(k)$ (curving, diminishing) and $(n + \delta)k$ (straight ray); intersection = k^ . Raise $s \rightarrow sf(k)$ shifts up $\rightarrow$ new higher k^* . Show the transition: growth temporarily fast, then settling back to n — the level-vs-growth visual every exam wants.*

Unit Summary

- Solow: $\Delta k = sf(k) - (n + \delta)k$; steady state where saving covers dilution.
- Saving raises the level, not long-run growth; sustained per-capita growth needs technology.
- Golden rule $MPK = n + \delta + g$; conditional convergence; endogenous growth via knowledge spillovers.

Exam Pointers

- ★ Find the steady state k^* from given s , n , δ and $f(k) = \sqrt{k}$.
- ★ Explain the level-vs-growth distinction with the Solow diagram.
- ★ Why might two countries not converge? (conditional convergence)

Unit 9: Open-Economy Macroeconomics

Lectures 33–36

Learning Objectives

- Explain exchange-rate determination
- Apply the Mundell–Fleming model under fixed vs floating rates
- State the impossible trinity
- Discuss policy in Pakistan's context

Exchange Rates

- **Nominal vs real:** real rate = nominal $\times$ (domestic P / foreign P) — competitiveness measure.
- **Purchasing power parity:** long-run anchor (a basket costs the same everywhere); deviations persist for years.
- **Interest parity:** $r \approx r^* + \text{expected depreciation}$ — capital flows equalize returns.

Mundell–Fleming (IS-LM-BP)

Add the **BP curve** (balance-of-payments equilibrium; horizontal under perfect capital mobility at $r = r^*$). **Floating rates:** fiscal policy impotent (expansion $\rightarrow$ currency appreciation $\rightarrow$ NX falls, offsetting G), monetary policy powerful (easing $\rightarrow$ depreciation $\rightarrow$ NX rises). **Fixed rates:** reversed — monetary policy impotent (must defend the peg), fiscal policy powerful.

The Impossible Trinity

A country cannot simultaneously have: 1) fixed exchange rate, 2) free capital movement, 3) independent monetary policy — **pick two**. Pakistan's managed float with capital-flow measures and SBP policy independence is a trinity compromise — and defending the rupee vs preserving reserves is the live tension.

- **Devaluation:** under fixed rates, improves NX if the **Marshall–Lerner condition** holds (export + import elasticities > 1); risks imported inflation and balance-sheet damage from foreign-currency debt.

Policy case: Pakistan faces a current-account deficit and falling reserves. Options: tighten monetary policy (raise r — attracts capital, cools imports, but slows growth), allow depreciation (helps exports, fuels inflation, hurts dollar borrowers), seek IMF financing with conditionality. There is no painless option — evaluate each against the trinity and Marshall–Lerner in your answer.

Unit Summary

- Real exchange rate = competitiveness; PPP (long run), interest parity (capital flows).
- Mundell–Fleming: floating $\rightarrow$ monetary works, fiscal doesn't; fixed $\rightarrow$ fiscal works, monetary doesn't.
- Impossible trinity: fixed FX + free capital + monetary independence — choose two.

Exam Pointers

- ★ Show why fiscal policy is impotent under floating rates with perfect mobility.
- ★ State the impossible trinity and locate Pakistan's regime.
- ★ When does devaluation improve the trade balance? (Marshall–Lerner)

Unit 10: Schools of Thought and Policy Debates

Lectures 37–40

Learning Objectives

- Compare Keynesian, monetarist, new classical and new Keynesian views
- Explain rational expectations and the policy ineffectiveness proposition
- Debate rules vs discretion and debt sustainability
- Synthesize a framework for policy evaluation

The Schools

Keynesian — sticky prices, demand drives output, activist stabilization works.

Monetarist (Friedman) — money drives nominal income; markets self-correct; steady money-growth rule, not discretion.

New classical (Lucas) — rational expectations; **policy ineffectiveness proposition:** only *surprise* policy moves output; predictable policy is neutral. Microfoundations, market clearing.

New Keynesian — rational expectations KEPT, but sticky prices/wages (menu costs, efficiency wages) restore a role for stabilization; the modern mainstream synthesis.

Rational Expectations

Agents use all available information and understand the model — they don't repeat predictable errors. Implication: the government cannot **systematically** fool people; disinflation is painless if credible (a contested claim — the Volcker disinflation was painful, a new-Keynesian counterpoint).

Debt and Rules

- **Debt sustainability:** debt/GDP stabilizes if the primary surplus covers $(r - g) \times \text{debt ratio}$; when $r > g$ persistently, debt snowballs — the arithmetic behind debt crises.
- **Rules vs discretion** revisited: inflation targeting with central-bank independence is the synthesis — constrained discretion.

Evaluation Framework

For any policy question: 1) identify the shock (demand or supply?), 2) short-run vs long-run effects, 3) expectations — is the policy credible/anticipated?, 4) which school's assumptions fit the country's institutions?, 5) side effects (debt, distribution, FX). Run every 'should the government...' question through these five.

*Final synthesis: 'Should Pakistan's government borrow to fund development spending now?'
Keynesian: yes if output below potential (multiplier). Monetarist: only if money accommodates; watch inflation. New classical: if anticipated, just raises rates/prices. Debt arithmetic: affordable only if $g > r$ or primary surpluses follow. A complete answer touches all four — that is what earns full marks.*

Unit Summary

- Keynesian → monetarist → new classical → new Keynesian: the debate moves but sticky prices + rational expectations is today's core.
- Rational expectations kill systematic fooling; credibility decides disinflation costs.
- Debt sustainable iff $\text{primary surplus} \geq (r-g) \cdot \text{debt}$; evaluate policy via shock type, horizon, expectations, institutions, side effects.

Exam Pointers

- ★ State the policy ineffectiveness proposition and its assumption.
- ★ Debt/GDP 70%, $r = 8\%$, $g = 5\%$. What primary surplus stabilizes it?
- ★ Apply the five-step framework to deficit-financed stimulus.

Key Terms Glossary

All key terms from this handout in one place — use for quick revision.

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