

HE1002 Macroeconomics I

Final Practice Examination 1 – Solutions

Academic Year 2025/2026, Semester 1

Quantitative Research Society @NTU

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Question 1: Calculations – Complete Solutions (30 marks)

1.1 [Source: T01-Q04] – GDP Calculation (2 marks)

Given: $C = \$20.1$ billion, $I = \$3.5$ billion, $G = \$5.2$ billion, $NX = -\$1$ billion.

Formula:

$$GDP = C + I + G + NX$$

Solution:

$$\begin{aligned} GDP &= 20.1 + 3.5 + 5.2 + (-1) \\ &= 20.1 + 3.5 + 5.2 - 1 \\ &= \boxed{\$27.8 \text{ billion}} \end{aligned}$$

1.2 [Source: T01-Q07] – Expenditure Approach (2 marks)

Given: $C = \$200,000$, $I = \$50,000$, $G = \$75,000$, Exports = \$45,000, Imports = \$20,000.

Formula:

$$GDP = C + I + G + (X - M)$$

Solution:

$$\begin{aligned} NX &= 45,000 - 20,000 = 25,000 \\ GDP &= 200,000 + 50,000 + 75,000 + 25,000 \\ &= \boxed{\$350,000} \end{aligned}$$

1.3 [Source: T02-Q03] – CPI and Inflation (2 marks)**Given:** $\text{Cost}_{2023} = \$20,000$, $\text{Cost}_{2024} = \$21,400$, Base year = 2023 (CPI = 100).**Formulas:**

$$\text{CPI}_t = \frac{\text{Cost}_t}{\text{Cost}_{\text{base}}} \times 100$$

$$\pi = \frac{\text{CPI}_t - \text{CPI}_{t-1}}{\text{CPI}_{t-1}} \times 100\%$$

Solution:

(a) CPI in 2024:

$$\text{CPI}_{2024} = \frac{21,400}{20,000} \times 100 = \boxed{107.0}$$

(b) Inflation rate:

$$\pi = \frac{107.0 - 100}{100} \times 100\% = \boxed{7.0\%}$$

1.4 [Source: T03-Q02] – Unemployment Statistics (2 marks)**Given:** WAP = 130,000, LF = 65,000, Employed = 53,000, Unemployed = 12,000.**Formulas:**

$$u = \frac{\text{Unemployed}}{\text{Labor Force}} \times 100\%$$

$$\text{LFPR} = \frac{\text{Labor Force}}{\text{Working-Age Population}} \times 100\%$$

Solution:

(a) Unemployment rate:

$$u = \frac{12,000}{65,000} \times 100\% = \boxed{18.5\%}$$

(b) Labor force participation rate:

$$\text{LFPR} = \frac{65,000}{130,000} \times 100\% = \boxed{50.0\%}$$

1.5 [Source: T04-Q03] – Rule of 70 (2 marks)**Given:** Real GDP per capita growth = 3.5% per year.**Formula:**

$$\text{Doubling time} \approx \frac{70}{\text{Growth rate (\%)}}$$

Solution:

$$\text{Years to double} = \frac{70}{3.5} = \boxed{20 \text{ years}}$$

1.6 [Source: T04-Q01] – Real GDP Per Capita Growth (2 marks)**Given:** $g_{\text{Nom GDP}} = 8\%$, $\pi = 3\%$, $g_{\text{Pop}} = 1\%$.**Formula:**

$$g_{\text{GDP/cap}} \approx g_{\text{Nominal}} - \pi - g_{\text{Population}}$$

Solution:

$$\begin{aligned} g_{\text{GDP/cap}} &= 8\% - 3\% - 1\% \\ &= \boxed{4\%} \end{aligned}$$

1.7 [Source: T05-Q12] – Equilibrium Output (2 marks)**Given:** $C_0 = \$800$, $\text{MPC} = 0.75$, $I = \$1,000$, $G = \$600$, $NX = \$400$, $T = \$500$.**Formula:**

$$\begin{aligned} C &= C_0 + \text{MPC}(Y - T) \\ Y^* &= C + I + G + NX \end{aligned}$$

Solution:At equilibrium, $Y = PAE$:

$$\begin{aligned} Y &= [C_0 + \text{MPC}(Y - T)] + I + G + NX \\ Y &= 800 + 0.75(Y - 500) + 1,000 + 600 + 400 \\ Y &= 800 + 0.75Y - 375 + 2,000 \\ Y &= 2,425 + 0.75Y \\ 0.25Y &= 2,425 \\ Y^* &= \boxed{\$9,700} \end{aligned}$$

1.8 [Source: T05-Q15] – Multiplier Effect (2 marks)**Given:** $\text{MPC} = 0.8$, $\Delta A = \$500$ million.**Formula:**

$$\begin{aligned} m &= \frac{1}{1 - \text{MPC}} \\ \Delta Y &= m \times \Delta A \end{aligned}$$

Solution:

(a) Expenditure multiplier:

$$m = \frac{1}{1 - 0.8} = \frac{1}{0.2} = \boxed{5}$$

(b) Change in output:

$$\Delta Y = 5 \times 500 = \boxed{\$2,500 \text{ million}}$$

1.9 [Source: T07-Q10] – Fiscal Multipliers (2 marks)**Given:** $MPC = 0.75$.**Formulas:**

$$m_G = \frac{1}{1 - MPC}$$

$$m_T = -\frac{MPC}{1 - MPC}$$

Solution:

(a) Government spending multiplier:

$$m_G = \frac{1}{1 - 0.75} = \frac{1}{0.25} = \boxed{4}$$

(b) Tax multiplier:

$$m_T = -\frac{0.75}{1 - 0.75} = -\frac{0.75}{0.25} = \boxed{-3}$$

Note: Tax multiplier is negative (tax increases reduce output) and smaller in absolute value than spending multiplier.

1.10 [Source: T07-Q11] – Budget Deficit (2 marks)**Given:** $G = \$300$ billion, $T = \$275$ billion.**Formula:**

$$\text{Budget Balance} = T - G$$

Solution:

$$\begin{aligned} \text{Budget Balance} &= 275 - 300 \\ &= -25 \text{ billion} \end{aligned}$$

Result: Budget deficit of $\boxed{\$25 \text{ billion}}$ (government spending exceeds tax revenue).

1.11 [Source: T08-Q19] – Public and Private Saving (2 marks)**Given:** $Y = \$500\text{B}$, $C = \$380\text{B}$, $G = \$140\text{B}$, $I = \$80\text{B}$, $T = \$120\text{B}$.**Formulas:**

$$S_{\text{public}} = T - G$$

$$S_{\text{private}} = Y - C - T$$

Solution:

(a) Public saving:

$$S_{\text{public}} = 120 - 140 = \boxed{-\$20\text{B}} \text{ (deficit)}$$

(b) Private saving:

$$S_{\text{private}} = 500 - 380 - 120 = \boxed{\$0\text{B}}$$

1.12 [Source: T09-Q07] – Money Multiplier (2 marks)**Given:** Reserve ratio = 0.10, Initial deposit = \$2,000.**Formula:**

$$m_{\text{money}} = \frac{1}{\text{Reserve Ratio}}$$

$$\text{Total Money} = m_{\text{money}} \times \text{Initial Deposit}$$

Solution:

$$m_{\text{money}} = \frac{1}{0.10} = 10$$

$$\text{Total Money} = 10 \times 2,000 = \boxed{\$20,000}$$

1.13 [Source: T10-Q16] – Quantity Theory (2 marks)**Given:** $g_M = 7\%$, $g_V = 0\%$ (constant), $g_Y = 2\%$.**Formula (Quantity Theory of Money):**

$$g_M + g_V = g_P + g_Y$$

Solution:

$$g_P = g_M + g_V - g_Y$$

$$= 7\% + 0\% - 2\%$$

$$= \boxed{5\%}$$

Interpretation: Inflation rate is 5% per year.**1.14 [Source: T12-Q01] – Balance of Trade (2 marks)****Given:** Exports = \$235B, Imports = \$310B.**Formula:**

$$NX = X - M$$

Solution:

$$NX = 235 - 310$$

$$= \boxed{-\$75 \text{ billion}}$$

Result: Trade **deficit** of \$75 billion (imports exceed exports).

1.15 [Source: T12-Q18] – Purchasing Power Parity (2 marks)

Given: Big Mac prices: Canada C\$5.20, U.S. \$4.00, Actual ER = \$0.75/C\$.

Formula:

$$\text{PPP Exchange Rate} = \frac{P_{\text{US}}}{P_{\text{Canada}}}$$

Solution:

(a) PPP-implied exchange rate:

$$\text{ER}_{\text{PPP}} = \frac{4.00}{5.20} = \boxed{0.769 \text{ US\$/C\$}}$$

(b) Currency valuation:

Since actual rate (\$0.75) < PPP rate (\$0.769), the Canadian dollar is undervalued by:

$$\frac{0.75 - 0.769}{0.769} \times 100\% = -2.5\%$$

Question 2: Short Answer – Complete Solutions (30 marks)

2.1 [Source: T01-Q03] – Transfer Payments (3 marks)

Answer:

No, transfer payments do **not** count as part of GDP. Transfer payments (such as Social Security or unemployment benefits) are not payments for currently produced goods or services; they are simply redistributions of income from taxpayers to recipients. GDP measures only new production of goods and services. However, when recipients spend transfer payments on consumption, that spending *does* count as part of GDP under the consumption category (*C*).

2.2 [Source: T02-Q05] – Hedonic Adjustment (3 marks)

Answer:

Laptop computers require hedonic quality adjustment because their features and capabilities change dramatically over time. Modern laptops are thinner, lighter, faster, have longer battery life, and more powerful processors compared to older models. When measuring inflation, statisticians must distinguish between price increases due to inflation versus price increases due to quality improvements. Hedonic adjustment removes the price differential attributed to quality changes, ensuring the CPI reflects true inflation rather than improvement in product quality.

2.3 [Source: T03-Q07] – Types of Unemployment (3 marks)

Answer:

Frictional unemployment is short-term unemployment arising from the normal process of workers changing jobs, locations, or careers due to imperfect information and search time. Example: A recent graduate searching for their first job.

Structural unemployment is long-term unemployment caused by a fundamental mismatch between workers' skills and job requirements, often due to technological change or industry decline. Example: A factory worker displaced by automation who lacks skills for available jobs.

2.4 [Source: T04-Q04] – Productivity Component (3 marks)

Answer:

The efficient irrigation system improves **technological knowledge (A)**. This promotes economic growth because technology allows the same inputs (land, labor, water) to produce more output. Technological improvements are non-rival (one person's use doesn't reduce another's) and are a key driver of sustained long-run growth. Better irrigation increases

agricultural productivity, raising total factor productivity (TFP) and enabling the economy to produce more with the same resources.

2.5 [Source: T05-Q03] – Transfer Payment Multipliers (3 marks)

Answer:

Transfer payments have a smaller multiplier effect because they are not direct purchases of goods and services. When the government makes a transfer payment, recipients may *save* some of the money rather than spend it all ($MPC < 1$). In contrast, government purchases directly inject money into the economy as immediate spending on goods and services. The initial spending is larger with government purchases (ΔG) compared to transfer-induced consumption ($MPC \times \Delta \text{Transfers}$), resulting in a larger multiplied effect on GDP.

2.6 [Source: T06-Q08] – SRAS vs LRAS (3 marks)

Answer:

The **short-run aggregate supply (SRAS)** curve is upward sloping because prices and wages are sticky in the short run. Firms can temporarily produce more output in response to higher prices. The **long-run aggregate supply (LRAS)** curve is vertical at potential output (Y_p) because in the long run, prices and wages fully adjust to market conditions. Output returns to the natural level determined by resources, technology, and institutions, independent of the price level.

2.7 [Source: T07-Q08] – Automatic Stabilizers (3 marks)

Answer:

Automatic stabilizers are fiscal policy mechanisms that automatically counteract economic fluctuations without explicit government action. They reduce recession severity by automatically increasing government spending or reducing taxes during downturns, and vice versa during booms. Example: Progressive income taxes—when incomes fall during recession, people move to lower tax brackets, automatically reducing their tax burden and leaving more disposable income for consumption, which helps support aggregate demand without requiring new legislation.

2.8 [Source: T08-Q04] – Saving vs Investment (3 marks)

Answer:

In macroeconomics, **saving** refers to income not spent on consumption—the portion of income households retain. **Investment** refers to purchases of capital goods (machinery, equipment, structures) and inventory that businesses use to produce future output. Saving

provides the funds (supply in loanable funds market), while investment uses those funds (demand). A household buying stocks is "saving" (not consuming), but only business purchases of physical capital count as macroeconomic "investment."

2.9 [Source: T09-Q01] – Functions of Money (3 marks)

Answer:

Money serves three essential functions: (1) **Medium of exchange**—eliminates need for barter by being universally accepted for transactions; (2) **Unit of account**—provides common measure for valuing goods, services, and recording debts; (3) **Store of value**—allows purchasing power to be transferred from present to future, though inflation erodes this function. These functions make economic transactions vastly more efficient than barter systems.

2.10 [Source: T10-Q12] – Money Neutrality (3 marks)

Answer:

The neutrality of money means that changes in the money supply affect only **nominal variables** (prices, wages, exchange rates) in the long run, not **real variables** (output, employment, real wages). In the short run, money is non-neutral due to sticky prices—monetary expansion can temporarily boost real output. However, once prices fully adjust in the long run, the real economy returns to its natural level determined by resources and technology, with only the price level permanently changed.

Question 3: True or False – Complete Solutions (30 marks)

3.1 [Source: T01-Q17] – Home Production (3 marks)

Statement: A parent who quits a paid job to stay home and care for their child causes GDP to fall, even though the same childcare service is being provided.

Answer: TRUE

Explanation: GDP measures only *market transactions*—goods and services produced and sold in markets. Previously, both the parent’s wage (\$20,000) and babysitter’s payment (\$10,000) counted toward GDP. When the parent provides childcare at home, this becomes non-market production not captured in GDP, causing GDP to fall by \$30,000 total. This illustrates a limitation of GDP—it excludes valuable home production and may understate true economic welfare.

3.2 [Source: T03-Q01c] – Discouraged Workers (3 marks)

Statement: A worker who becomes discouraged and stops looking for work is classified as unemployed by the Bureau of Labor Statistics.

Answer: FALSE

Explanation: To be classified as unemployed, a person must be actively seeking employment (job applications, interviews within past 4 weeks). Discouraged workers have stopped searching for work and are therefore classified as *not in the labor force*, not unemployed. This classification can understate true labor market slack, as discouraged workers would work if they believed jobs were available. This is why economists also track broader unemployment measures that include discouraged workers.

3.3 [Source: T04-Q08a] – Labor Share and Growth (3 marks)

Statement: Country A’s labor share is 60%, Country B’s labor share is 70%, and labor is growing at 3% in both countries. All else equal, Country B has a higher growth rate of output.

Answer: TRUE

Explanation: Using the growth accounting equation: $g_Y = g_A + \alpha g_K + (1 - \alpha)g_L$, where $(1 - \alpha)$ is labor’s share. Country B has higher labor share (0.70 vs. 0.60), so labor growth contributes more to output: Country B gets $0.70 \times 3\% = 2.1\%$ from labor growth, while Country A gets only $0.60 \times 3\% = 1.8\%$. With all else equal (same g_A and g_K), Country B has 0.3 percentage points higher output growth.

3.4 [Source: T05-Q02] – Investment Volatility (3 marks)

Statement: Investment spending is more volatile than consumption spending over the business cycle.

Answer: TRUE

Explanation: Investment spending fluctuates much more than consumption over business cycles. During recessions, firms dramatically cut investment in new equipment and structures as expected returns fall and uncertainty rises. Consumers, however, smooth consumption over time using savings and credit, maintaining more stable spending patterns. Additionally, investment is forward-looking and sensitive to expectations, while consumption depends largely on current income. Data show investment can swing from large positive to negative growth, while consumption remains relatively stable.

3.5 [Source: T06-Q02] – Tax Cuts and AD (3 marks)

Statement: A tax cut that increases disposable income will shift the aggregate demand curve to the right.

Answer: TRUE

Explanation: A tax cut increases disposable income ($Y - T$), which increases consumption spending through $C = C_0 + \text{MPC}(Y - T)$. Higher consumption is a component of aggregate demand ($AD = C + I + G + NX$), so AD increases and shifts right. This rightward shift raises both output and price level in the short run. The magnitude of the shift depends on the tax multiplier: $\Delta Y = m_T \times \Delta T = -\frac{\text{MPC}}{1 - \text{MPC}} \times \Delta T$.

3.6 [Source: T07-Q09] – Ricardian Equivalence (3 marks)

Statement: According to Ricardian equivalence, a tax cut financed by government borrowing will increase consumption because consumers have more disposable income.

Answer: FALSE

Explanation: Ricardian equivalence argues that debt-financed tax cuts do *not* increase consumption. Forward-looking consumers realize that government borrowing today requires higher taxes in the future to repay the debt. Rational consumers save the tax cut to pay future taxes, leaving consumption unchanged. The theory assumes perfect foresight, no liquidity constraints, and intergenerational concern. In reality, Ricardian equivalence only partially holds—many consumers do increase spending when taxes are cut, making fiscal policy effective.

3.7 [Source: T08-Q17] – Efficient Markets (3 marks)

Statement: If financial markets are efficient, it is impossible to consistently earn above-average returns by trading based on publicly available information.

Answer: TRUE

Explanation: The Efficient Market Hypothesis (EMH) states that asset prices reflect all available information. In an efficient market, publicly available information is already incorporated into prices through arbitrage and trading activity. Since everyone has access to public information, no one can systematically exploit it for above-average returns. To beat the market consistently, you would need non-public (inside) information or superior

analytical ability. This implies that passive index investing should perform as well as active management.

3.8 [Source: T09-Q06] – M1 vs M2 (3 marks)

Statement: M1 and M2 both measure money supply, with M2 being a broader definition that includes less liquid assets.

Answer: TRUE

Explanation: M1 includes the most liquid forms of money: currency (cash and coins) and checking deposits (demand deposits). M2 is a broader measure that includes all of M1 plus less liquid assets: savings deposits, money market accounts, and small-denomination time deposits. M2 assets are "near-money"—they can be converted to cash relatively easily but not as immediately as M1 components. M2 better captures total purchasing power, while M1 focuses on immediate transaction capability.

3.9 [Source: T10-Q22] – Phillips Curve Slopes (3 marks)

Statement: The Phillips curve is downward sloping in both the short run and the long run.

Answer: FALSE

Explanation: The Phillips curve is downward sloping only in the *short run*, showing a trade-off between inflation and unemployment: $\pi = \pi^e - \beta(u - u_n)$. Lower unemployment creates wage pressure and higher inflation. However, the *long-run* Phillips curve is **vertical** at the natural rate of unemployment (NAIRU). In the long run, expectations adjust and there is no permanent inflation-unemployment trade-off. Any attempt to keep unemployment below u_n simply accelerates inflation without lasting employment gains.

3.10 [Source: T12-Q17] – Monetary Policy Effectiveness (3 marks)

Statement: Monetary policy is more effective under a fixed exchange rate regime than under a floating exchange rate regime.

Answer: FALSE

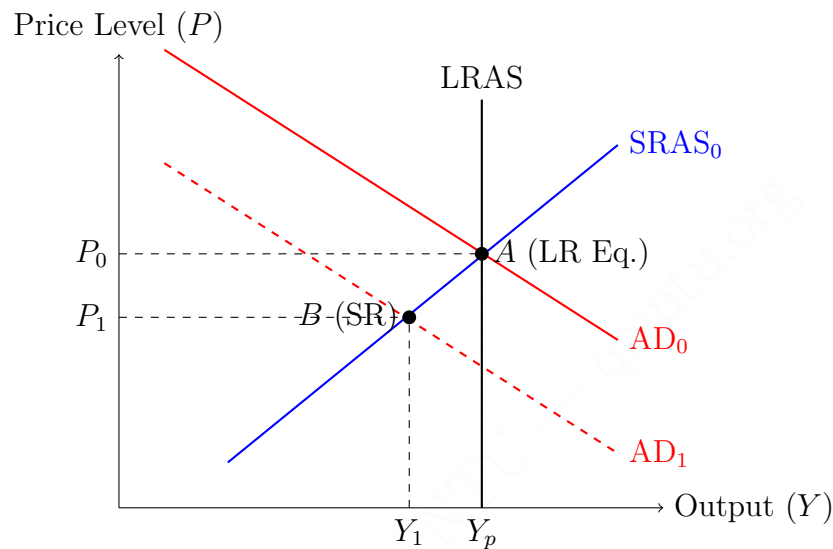
Explanation: Monetary policy is *ineffective* under fixed exchange rates but *effective* under floating rates. With a fixed rate, the central bank must intervene to maintain the peg—any attempt to expand money supply causes capital outflows and currency depreciation pressure, forcing the bank to contract money supply to defend the peg, neutralizing the policy. Under floating rates, the exchange rate adjusts naturally, allowing the central bank to control money supply and interest rates independently, making monetary policy effective through both investment and net export channels.

Question 4: Diagrams – Complete Solutions (10 marks)

4.1 [Source: T06-Q17] – Demand Shock Analysis (5 marks)

Scenario: Economy initially in long-run equilibrium. Consumer confidence falls, reducing consumption.

Solution:



Analysis:

(a-b) **Initial equilibrium at point A:** Economy at potential output Y_p with price level P_0 . Loss of consumer confidence shifts AD left from AD_0 to AD_1 .

(c) **Short-run effects (point B):**

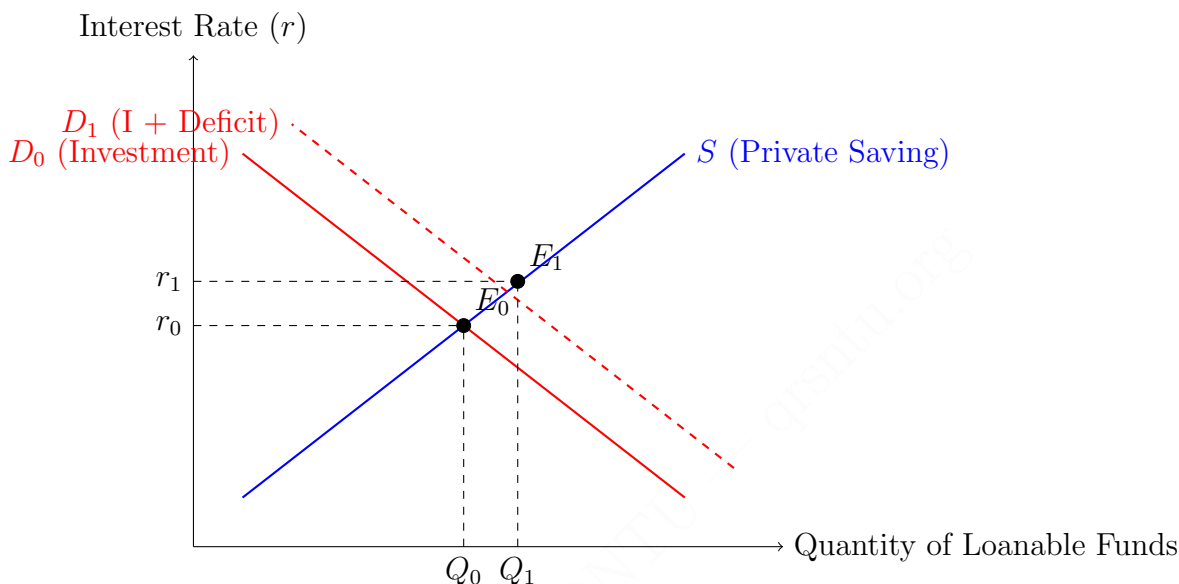
- Output falls from Y_p to Y_1 (recessionary gap)
- Price level falls from P_0 to P_1 (deflation pressure)
- Unemployment rises above natural rate (cyclical unemployment)

(d) **Long-run self-correction:** With output below potential, unemployment is high and wage demands fall. Lower wages reduce production costs, shifting SRAS right. Process continues until economy returns to point A at Y_p , with even lower price level. No government intervention needed but adjustment may be slow and painful.

4.2 [Source: T08-Q06, T08-Q21] – Loanable Funds and Crowding Out (5 marks)

Scenario: Government increases spending while keeping taxes constant, creating budget deficit.

Solution:



Analysis:

(a) **Initial equilibrium at E_0 :** Supply of loanable funds (private saving) intersects demand (business investment) at interest rate r_0 and quantity Q_0 .

(b) **Budget deficit effect:** Government deficit represents negative public saving. Total demand for loanable funds increases: firms demand funds for investment *plus* government needs funds to finance deficit. Demand curve shifts right from D_0 to D_1 .

(c) **New equilibrium at E_1 :**

- Interest rate rises from r_0 to r_1
- Quantity of loanable funds increases from Q_0 to Q_1
- Higher interest rate increases private saving and reduces some private investment

(d) **Crowding out:** Government borrowing "crowds out" some private investment by raising interest rates. Higher interest rates make some investment projects unprofitable. The increase in loanable funds ($Q_1 - Q_0$) is less than the full deficit because higher rates reduce private investment demand. This is **partial crowding out**—some but not all private investment is displaced by government borrowing.

END OF SOLUTIONS

All solutions reference original tutorial questions
Complete working shown for all calculations

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