
Part A. Multiple Choice Questions

Question 1: Infinite Horizon Model - Transversality Condition

Correct Answer: (c)

Explanation:

The current account in this economy, at a given time t , is equal to the national income minus domestic absorption (defined as the sum of private consumption, government consumption, and investment).

Why (c) is correct:

- This is the fundamental national income accounting identity: $CA_t = Y_t - A_t$
- Where $A_t = C_t + I_t + G_t$ (domestic absorption)
- This identity always holds by definition

Why other options are incorrect:

- **(a) FALSE**: A country with negative NFA (debt) CAN run perpetual CA deficits if the growth rate of debt is less than the interest rate (transversality condition)
- **(b) FALSE**: Perpetual TB deficits are not sustainable even with positive NFA, as they would violate the transversality condition
- **(d) FALSE**: The no-Ponzi condition states that the PRESENT DISCOUNTED VALUE of debt must go to zero, NOT the level of assets. The condition is: $\lim_{t \rightarrow \infty} B_t / (1+r)^t = 0$
- **(e) FALSE**: Trade balance can be positive (country exports more than imports)

Question 2: Pancraziland Pizza Discovery

Correct Answer: (a)

Explanation:

The current account in period 1 deteriorates.

Why (a) is correct:

This is a classic example of consumption smoothing with anticipated future income:

1. **Future Income Effect**: Discovery of new pizza sauce increases expected Q_2 (period 2 income)
2. **Permanent Income Hypothesis**: Agents want to smooth consumption across periods
3. **Period 1 Response**: With concave utility and higher expected future income, agents increase C_1 above Q_1
4. **Borrowing**: To finance higher C_1 , the country borrows internationally ($CA_1 < 0$)
5. **Current Account**: $CA_1 = Q_1 - C_1 < 0$ (deteriorates)

Intuition: Knowing you'll be richer tomorrow, you borrow today to enjoy higher consumption now.

Question 3: Two-Large Country Model - Saving Increase

Correct Answer: (d)

****Explanation:****

The current account in the domestic economy improves, but by less than if the domestic economy were a small-open economy.

****Why (d) is correct:****

****Small Open Economy Case:****

- World interest rate r^* is exogenous (taken as given)
- Increased saving → full improvement in CA at constant r^*

****Large Open Economy Case:****

1. Domestic saving increase shifts CA curve right
2. This increases world saving supply
3. World interest rate r^* FALLS (general equilibrium effect)
4. Lower r^* reduces the incentive to save
5. Some of the saving increase is offset by the interest rate decline
6. CA improves, but **less** than in small economy case

Key Insight: In large economies, your actions affect world prices, creating feedback effects that dampen the initial change.

Question 4: No-Ponzi Condition

****Correct Answer: (b)****

****Explanation:****

The No-Ponzi condition rules out the possibility that debt grows too much and that it is never repaid.

****Why (b) is correct:****

- The transversality/no-Ponzi condition: $\lim_{t \rightarrow \infty} B_t / (1+r)^t = 0$
- This prevents "Ponzi schemes" where you borrow forever to pay off previous debts
- It ensures debt growth rate < interest rate
- Debt can grow, but not faster than the rate at which it's being discounted

****Why other options are incorrect:****

- **(a) FALSE**: It's an EXOGENOUS constraint, not derived from optimization
- **(c) FALSE**: It depends on interest rate r as well as debt level
- **(d) FALSE**: It applies regardless of utility function shape
- **(e) FALSE**: CA deficits are sustainable if transversality holds

Question 5: Two-Large Countries - Investment Surge in B

****Correct Answer: (a)****

****Explanation:****

The current account in country A improves because of a movement along its CA schedule.

****Why (a) is correct:****

****Mechanism:****

1. Investment surge in country B \rightarrow B's CA curve shifts LEFT (more investment = lower CA)
2. World interest rate r^* must RISE to clear the global CA market ($CA_A + CA_B = 0$)
3. Higher r^* causes movement ALONG country A's CA curve
4. Country A moves up along its CA schedule \rightarrow CA improves

****Key Distinction**:**

- Country B: SHIFT in CA curve (fundamental change)
- Country A: MOVEMENT along CA curve (price adjustment)

****Intuition**:** B wants to invest more (borrow), so world interest rate rises, making A want to save more (lend).

Question 6: Pancraziland Current Account Components

Correct Answer: (e) None of the above*

****Explanation:****

****Given Information:****

- Imports large quantity of pizzas ($TB < 0$)
- No other imports
- Has foreign assets, no liabilities (positive NII)
- No domestic assets, zero compensation, zero transfers

****Current Account Components:****

$$CA = TB + NII + NCE + NUT$$

Where:

- $TB < 0$ (trade deficit from pizza imports)
- $NII > 0$ (earns returns on foreign assets)
- $NCE = 0$
- $NUT = 0$

Therefore: ****CA = (negative TB) + (positive NII)****

****The sign of CA is AMBIGUOUS**** - depends on whether $NII > |TB|$ or $NII < |TB|$

****Why each option is wrong:****

- **(a)**: CA sign is unknown
- **(b)**: CA could be negative if $|TB| > NII$
- **(c)**: In absolute value, this depends on which component is larger
- **(d)**: CA unlikely to be exactly zero

Question 7: Definition of "Small" Open Economy

Correct Answer: (e) None of the above*

****Explanation:****

****Correct Definition**:** A "small" open economy is one that ****cannot affect the world interest rate**** through its saving/investment decisions.

****Why (e) is correct:****

None of the options (a-d) capture the economic definition:

- NOT about population size (e.g., Netherlands is "small" economically)
- NOT about geographical area
- NOT about political influence
- NOT about absolute NIIIP size

****What matters**:** The economy's saving/investment decisions are too small relative to world capital markets to move r^*

****Example**:** Singapore is geographically tiny but economically might be "large" in certain markets.

Question 8: Firm's Optimal Investment Decision

****Correct Answer: (c)****

****Explanation:****

The firm will consider the marginal productivity of investment in the second period and the interest rate on the loan to determine the optimal investment level so that profits are maximized.

****Why (c) is correct:****

****Firm's Problem:****

- Period 1: Borrow to invest I_1
- Period 2: Produce $F(I_1)$, repay $(1+r)I_1$

****Optimal Condition:****

Invest until: **$F'(I_1) = 1 + r$**

Where:

- $F'(I_1)$ = marginal product of investment
- $(1+r)$ = marginal cost of borrowing

****Intuition**:** Invest until the marginal benefit (extra output from one more unit of investment) equals marginal cost (interest on borrowing).

****Why other options are incorrect:****

- **(a)**: Ignores profit maximization
- **(b)**: Ignores intertemporal nature
- **(d)**: Would mean zero investment - not optimal if $F'(0) > 1+r$
- **(e)**: Ignores the cost-benefit tradeoff

Question 9: Log Utility with Zero Interest Rate

****Correct Answer: (a) $C_1 = C_2 = 10$**

****Explanation:****

****Given:****

- $U(C_1, C_2) = \log(C_1) + \log(C_2)$
- $\beta = 1$ (implied by no discounting)
- $r = 0$
- $Q_1 = Q_2 = 10$
- $B_0 = 0$

Euler Equation:

$$u'(C_1) = \beta(1+r)u'(C_2)$$

With log utility: $u'(C) = 1/C$

Therefore: $1/C_1 = (1)(1+0)(1/C_2)$

$$\rightarrow C_1 = C_2$$

Budget Constraint:

$$C_1 + C_2/(1+r) = Q_1 + Q_2/(1+r) + B_0$$

$$C_1 + C_2 = 10 + 10 + 0 = 20$$

Solution:

$C_1 = C_2$ and $C_1 + C_2 = 20$

$$\rightarrow \mathbf{C_1 = C_2 = 10}$$

Intuition: With $r = 0$ and no discounting, perfect consumption smoothing. Since income is already smooth (10 in each period), no need to borrow or lend.

Part B. Essay Questions

Question 1: Perpetual Current Account Deficit Sustainability

ANSWER:

A perpetual current account deficit is sustainable in an infinite-horizon small open economy if and only if the **transversality condition (no-Ponzi condition)** is satisfied.

The Transversality Condition

The key condition is:

$$\lim_{t \rightarrow \infty} B_t / (1+r)^t = 0$$

Where:

- B_t = net foreign debt at time t
- r = world interest rate

What This Means

1. **NOT**: Debt must eventually reach zero ($\lim B_t = 0$) X
2. **YES**: Present discounted value of debt must approach zero ✓

Implication: Debt can grow forever, but cannot grow faster than the interest rate.

Sustainability Conditions

A perpetual CA deficit is sustainable if:

**** $g_B < r$ ****

Where g_B is the growth rate of debt.

****Intuitive Explanation:****

- Country can run CA deficits every period
- Debt accumulates: $B_t = B_{t-1} + CA_t$ (with $CA_t < 0$)
- But if debt grows slower than r , its present value $\rightarrow 0$
- Country is able to service debt from economic growth

Example with Trade Balance

Suppose:

- Perpetual trade deficit: $TB_t = -10$ for all t
- But growing economy with surplus from capital income
- Net investment income = $r \times$ Foreign Assets $> |TB|$
- If NII grows fast enough, transversality can be satisfied

What Violates Sustainability

X **Ponzi scheme:** Borrowing each period to pay interest on previous debt

- Debt grows at rate $g_B = r$
- Violates transversality condition
- Present value explodes

Conclusion

****Perpetual CA deficits ARE sustainable** if:**

1. Supported by growth in productive capacity
2. Debt grows slower than interest rate
3. Country can generate sufficient future surpluses (in present value terms)
4. Transversality condition is satisfied

****Real-world examples**:** Australia, New Zealand have run persistent CA deficits for decades, financing productive investment that enables future repayment.

Question 2: Uncertainty and Precautionary Savings

****ANSWER:****

Effect on Period 1 Current Account

An increase in uncertainty about period 2 output will ****improve the current account in period 1**** (CA_1 becomes less negative or more positive).

What Are Precautionary Savings?

Definition: Precautionary savings are additional savings made by agents to self-insure against uncertain future income.

Mechanism:

1. Higher uncertainty about $C_2 \rightarrow$ higher variance of future income
2. Risk-averse agents want to protect against bad outcomes
3. Increase savings in period 1 as a buffer
4. Reduce $C_1 \rightarrow$ higher CA₁

The Role of the Utility Function

The strength of precautionary savings depends critically on the **third derivative of the utility function**.

Key Concept: Prudence

An agent is **prudent** if: $u''''(C) > 0$

Why u'''' matters:

1. **Risk Aversion** ($u'' < 0$): Makes you dislike risk
2. **Prudence** ($u'''' > 0$): Makes you save MORE when facing risk

Mathematical Intuition:

- With uncertainty, $E[u'(C_2)] > u'(E[C_2])$ if $u'''' > 0$ (by Jensen's inequality)
- Higher expected marginal utility \rightarrow save more today
- This is precautionary motive

Different Utility Functions

**1. Log Utility: $u(C) = \log(C)$ **

- $u' = 1/C$
- $u'' = -1/C^2$
- $u'''' = 2/C^3 > 0 \checkmark$

Result: **STRONG precautionary motive**

**2. Quadratic Utility: $u(C) = C - (b/2)C^2$ **

- $u' = 1 - bC$
- $u'' = -b$
- $u'''' = 0$

Result: **NO precautionary motive**

**3. CRRA Utility: $u(C) = C^{(1-\sigma)/(1-\sigma)}$ **

- $u'''' > 0$ if $\sigma > 0$
- Stronger precautionary motive with higher σ

Complete Analysis

Period 1 Current Account:

$CA_1 = Q_1 - C_1$

Optimal C_1 with uncertainty:

From Euler equation: $u'(C_1) = \beta(1+r)E[u'(C_2)]$

Effect of increased uncertainty:

1. Higher $\text{var}(Q_2) \rightarrow$ higher $\text{var}(C_2)$
2. If $u''' > 0$: $E[u'(C_2)]$ increases
3. Right side of Euler equation \uparrow
4. Therefore $u'(C_1)$ must $\uparrow \rightarrow C_1 \downarrow$
5. Lower $C_1 \rightarrow CA_1$ improves

Graphical Intuition

With convex marginal utility ($u''' > 0$):

- Losing £100 hurts more than gaining £100 helps
- Agents over-weight bad outcomes
- Save more to avoid severe consumption drops

Conclusion

**Effect on CA_1 **: Improves (CA_1 increases)

Precautionary Savings: Additional savings motivated by uncertainty about future income, serving as self-insurance

Role of Utility:

- Requires $u''' > 0$ (prudence)
- Strength increases with degree of prudence
- Absent with quadratic utility

Question 3: Global Saving Glut

ANSWER:

What is the Global Saving Glut?

Definition: The "Global Saving Glut" refers to the substantial increase in global savings (particularly from emerging markets) relative to investment in the 2000s, which led to:

- Large current account surpluses in emerging Asia and oil exporters
- Large current account deficits in the US
- Declining world interest rates
- Capital flows from poor to rich countries

Historical Phenomenon

Timeline: 2000-2008**

****Key Features:****

1. **Emerging markets** (China, Asian Tigers, oil exporters) ran massive CA surpluses
2. **United States** ran massive CA deficits (6% of GDP by 2006)
3. **World interest rates** declined despite high US borrowing
4. **Capital flows "uphill"** - from developing to developed countries

The Puzzle

Traditional theory: Capital should flow from rich (high capital) to poor (low capital) countries

Reality: Capital flowed FROM emerging markets TO the United States

Two Competing Hypotheses

****HYPOTHESIS 1: Saving Glut (Bernanke, 2005)****

Explanation: Emerging markets experienced exogenous increase in desired saving

Causes:

1. Asian Financial Crisis (1997-98):

- Countries wanted to self-insure with foreign reserves
- Built up war chests of US Treasury bonds

2. Demographic factors:

- Aging populations in Asia → higher saving rates

3. Oil price boom:

- Oil exporters accumulated petrodollars
- Saved rather than invested domestically

4. Export-led growth model:

- China's strategy of currency undervaluation
- Accumulated reserves to keep renminbi cheap

Mechanism:

- CA curve of emerging markets shifts RIGHT
- World interest rate falls
- US responds with CA deficit (movement along curve)

Graphical Analysis (Metzler Diagram):

Emerging Markets CA curve → Shifts RIGHT

US CA curve → No shift

Result: $r^* \downarrow$, CA_EM ↑, CA_US ↓

****HYPOTHESIS 2: Investment Drought (Summers, Rajan)****

Explanation: Decline in global investment demand, particularly in emerging markets

****Causes:****

1. **Financial underdevelopment:**

- Poor institutions in emerging markets
- Lack of safe investment opportunities
- Capital flowed to US seeking safety

2. **Technological change:**

- Shift from capital-intensive manufacturing to services
- Lower investment needs globally

3. **Post-crisis caution:**

- Firms reluctant to invest after Asian Crisis
- Risk aversion increased

****Mechanism:****

- Investment falls in emerging markets
- CA curve shifts RIGHT (same observable outcome!)
- But driven by lower I, not higher S

How to Test the Two Hypotheses

****Key Insight**:** Both hypotheses predict:

- EM current accounts improve ✓
- US current account worsens ✓
- Interest rates fall ✓

****The Discriminating Variable: INVESTMENT****

****Test**:** Look at what happened to investment rates in emerging markets

Hypothesis	Prediction for I/GDP
----- -----	
Saving Glut	Investment should be UNCHANGED or increase (if r^* falls enough)
Investment Drought	Investment should DECLINE

****Additional Tests:****

1. **Saving Rates:**

- Saving Glut \rightarrow S/GDP should rise significantly
- Investment Drought \rightarrow S/GDP might be unchanged

2. **Decomposition of CA:**

- $CA = S - I$
- Which component moved more?

3. **Regional Analysis:**

- Did all EM regions behave similarly?
- Or different patterns in Asia vs. Latin America?

What Do the Data Support?

Evidence SUPPORTS the Saving Glut Hypothesis:

1. **Saving rates in China**:

- Rose from 35% (2000) to 50% (2008) of GDP
- Massive increase

2. **Investment rates in EM**:

- Remained relatively stable or even increased
- Did NOT decline as investment drought predicts

3. **Reserve accumulation**:

- EM foreign reserves: \$1 trillion (2000) → \$6 trillion (2008)
- Clear evidence of saving surge

4. **Asian post-crisis behavior**:

- Massive self-insurance through reserve buildup
- Consistent with saving glut story

Conclusion: The data strongly support Bernanke's **Saving Glut hypothesis**. The global imbalances of the 2000s were primarily driven by increased saving in emerging markets, not decreased investment.

Question 4: CA Deficit and NIIP Deterioration

ANSWER:

My Position: I DO NOT fully agree with the statement.

The Claim

"Our CA this year has been negative. Although the official numbers are not yet been released, we should be certain that our NIIP has therefore deteriorated."

Why This is NOT Necessarily True

The relationship between CA and NIIP is:

NIIP_t = NIIP_{t-1} + CA_t + Valuation Changes

Key Point: Valuation Changes

Valuation changes can arise from:

1. **Exchange rate movements**
2. **Asset price changes** (stocks, bonds)
3. **Default/write-offs**
4. **Capital gains/losses** on foreign holdings

Scenario Where Statement is FALSE

Example: Positive Valuation Changes Offset CA Deficit

Suppose:

- NIIP_{t-1} = \$100 billion (positive)
- CA_t = -\$10 billion (deficit)
- Stock market boom → foreign assets appreciate +\$15 billion

Result:

$$\text{NIIP}_t = \$100 - \$10 + \$15 = \text{**\$105 billion**}$$

NIIP IMPROVED despite CA deficit!

Real-World Example: United States (2003-2007)

Actual data:

- US ran massive CA deficits (\$500-800 billion/year)
- Yet NIIP did not deteriorate as much as expected
- Why? US foreign assets (stocks) outperformed US foreign liabilities (bonds)

Mechanism:

- US owns foreign equities (high returns)
- Foreigners own US Treasury bonds (low returns)
- Equity gains > bond gains → positive valuation effect
- Partially offset CA deficits

When the Statement IS True

The minister would be correct if:

1. **No valuation changes**: All assets/liabilities in same currency, no price changes
2. **Negative valuation changes**: Asset prices fall, making NIIP deterioration worse
3. **Small open economy with simple asset structure**

Complete Analysis for Pancraziland

To accurately assess NIIP, we need:

1. **Current Account**: CA_t = -X (given as negative)

2. **Composition of foreign assets/liabilities**:

- What currency are they denominated in?
- Equity vs. debt?
- Maturity structure?

3. **Market movements this year**:

- Did Pancraziland's currency appreciate/depreciate?
- Did global stock markets boom/crash?
- Did asset prices change?

4. ****Calculation**:**

$\Delta\text{NIIP} = \text{CA} + \text{Valuation Changes}$

****Cannot determine ΔNIIP from CA alone****

Conclusion

****I disagree with the certainty of the statement.****

****Argument to Present in Cabinet:****

"Minister, while it's true our current account was negative this year, we cannot be **certain** the NIIP deteriorated without examining valuation effects.

If our foreign assets appreciated faster than our foreign liabilities, positive valuation changes could offset or even exceed the CA deficit. For example, if our sovereign wealth fund's foreign equity holdings performed well, or if our currency depreciated (making our foreign-currency assets more valuable in domestic terms), our NIIP could actually improve despite the CA deficit.

We need to wait for the complete NIIP data, which includes both the current account AND valuation changes, before making definitive statements about our net foreign asset position."

****Bottom Line**:** CA deficit is a **flow** that affects NIIP, but valuation changes can dominate, making the relationship non-mechanical.

Summary of Key Concepts Tested

1. ****Transversality Condition**:** Present value of debt $\rightarrow 0$, not level
2. ****Consumption Smoothing**:** Agents borrow against future income
3. ****Small vs Large Economy**:** Large economies affect world prices
4. ****No-Ponzi Condition**:** Prevents infinite rollover of debt
5. ****General Equilibrium**:** Distinguish shifts from movements along curves
6. ****Current Account Components**:** $\text{CA} = \text{TB} + \text{NII} + \text{NCE} + \text{NUT}$
7. ****Economic "Smallness"**:** Inability to affect world interest rate
8. ****Optimal Investment**:** Equate marginal product to interest rate
9. ****Euler Equation**:** Links consumption across periods
10. ****Precautionary Savings**:** $u'' > 0$ drives saving under uncertainty
11. ****Global Saving Glut**:** Saving surge in EM \rightarrow capital flows to US
12. ****NIIP Evolution**:** Flow (CA) + valuation changes

****End of Answer Guide****