slides session 18

Advanced Open Economy Macroeconomics: Theoretical Foundations, Policy Transmission, and Global Integration

1. Introduction: The Open Economy Paradigm

The study of macroeconomics undergoes a fundamental transformation when the assumption of autarky is relaxed. The transition from a closed system to an open economy introduces a triad of critical variables—exchange rates, the balance of payments, and international interest rate differentials—that redefine the transmission mechanisms of stabilization policy. The lecture material from "Session 18" serves as a foundational text for this transition, moving beyond the domestic IS-LM framework to incorporate the external sector through the Mundell-Fleming model, the logic of parity conditions, and the strategic constraints of the global financial system.

In a closed economy, the aggregate demand identity is simply the sum of consumption, investment, and government spending ($Y = C + I + G$). The inclusion of the external sector expands this identity to $Y = C + I + G + NX$, where Net Exports (NX) serves as the bridge between domestic production and global demand. This seemingly simple addition complicates the equilibrium conditions significantly. Policymakers can no longer focus solely on "internal balance" (full employment and price stability); they must simultaneously achieve "external balance" (a sustainable current account position).[1]

The analysis presented in this report provides an exhaustive examination of these dynamics. It is structured to guide the reader from the long-run fundamental determinants of exchange rates, such as Purchasing Power Parity (PPP) and the Balassa-Samuelson effect, through the volatile short-run dynamics characterized by Uncovered Interest Parity (UIP) and the Dornbusch Overshooting model. Central to this exposition is the Mundell-Fleming framework, which rigorously delineates the effectiveness of fiscal and monetary policy under varying exchange rate regimes and capital mobility assumptions. Furthermore, this report critically evaluates the "Impossible Trinity" (Trilemma) in the context of the 21st-century "Global Financial Cycle," integrating modern academic debates on whether floating exchange rates truly insulate emerging markets from global financial shocks.[2]

1.1 The Balance of Payments Constraint

The fundamental constraint in open economy macroeconomics is the Balance of Payments (BoP) identity. The BoP records all economic transactions between the residents of a country and the rest of the world. It is composed of two primary accounts:

1. **The Current Account (CA):** Records trade in goods and services, net income from abroad, and net unilateral transfers. Mathematically, it is often approximated by Net Exports (NX).
2. **The Capital and Financial Account (KA):** Records net flows of financial capital (assets, bonds, equities, FDI).

The lecture slides emphasize the equilibrium condition where the sum of these accounts is zero (excluding official reserve transactions):

$$BP = CA + KA = 0$$

This identity implies that a current account deficit ($CA < 0$) must be financed by a capital account surplus ($KA > 0$), meaning the country must borrow from abroad or sell assets to foreigners. Conversely, a current account surplus implies the accumulation of foreign assets.[1]

The behavior of these accounts is determined by different economic variables. The Current Account is primarily a function of domestic income (Y), foreign income (Y^*), and the real exchange rate (R). The Capital Account is driven by the differential between domestic interest rates (i) and foreign interest rates (i^*), adjusted for expected exchange rate movements and risk premia. The interaction between these two accounts forms the basis of the **BP Curve** in the Mundell-Fleming model, the slope of which dictates the degree of integration with global financial markets.[4]

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2. Long-Run Exchange Rate Determination: Fundamentals and Structural Deviations

Before analyzing short-run volatility and policy effectiveness, it is essential to establish the long-run anchors of the exchange rate. Economic theory suggests that over extended horizons, exchange rates should adjust to reflect the relative purchasing power of currencies and the structural characteristics of economies.

2.1 Purchasing Power Parity (PPP) and the Law of One Price

The most enduring theory of long-run exchange rate determination is **Purchasing Power Parity (PPP)**. It is derived from the **Law of One Price (LOOP)**, which asserts that in an efficient market with no transportation costs or trade barriers, identical goods must sell for the same price when expressed in a common currency.[6]

If P_i is the price of good i in the domestic economy and P_i^* is the price in the

foreign economy, arbitrage ensures that:

$$P_i = E \times P_i^*$$

where E is the nominal exchange rate (defined as units of domestic currency per unit of foreign currency).
Absolute PPP aggregates this relationship across the entire basket of goods in the economy:

$$E = \frac{P}{P^*}$$

This equation implies that the nominal exchange rate is simply the ratio of the two countries' price levels. If the domestic price level (P) doubles due to inflation while the foreign price level (P^*) remains constant, the currency must depreciate (E must double) to maintain parity.1
However, the lecture slides and supplementary research indicate that Absolute PPP rarely holds in practice due to significant frictions:

- **Transaction Costs:** Shipping, insurance, and tariffs create natural price wedges.
- **Non-Tradable Goods:** Services like housing, healthcare, and haircuts cannot be arbitraged across borders.
- **Pricing to Market:** Imperfect competition allows firms to charge different prices in different markets.

Consequently, economists often rely on Relative PPP, which posits that the rate of change in the exchange rate equals the differential in inflation rates:

$$\frac{\Delta E}{E} \approx \pi - \pi^*$$

This formulation allows for a constant structural divergence in price levels while asserting that changes in competitiveness will be offset by exchange rate movements over time.6

2.2 The Balassa-Samuelson Effect: A Structural Critique of PPP

One of the most robust empirical findings in international macroeconomics is that price levels are systematically higher in rich countries than in poor countries when converted at market exchange rates. This violation of Absolute PPP is rigorously explained by the **Balassa-Samuelson Effect**.[7]

The mechanism rests on the distinction between the **tradable sector** (manufacturing, agriculture) and the **non-tradable sector** (services).

1. **Productivity Differential:** Technological progress tends to be concentrated in the tradable sector. Developed economies exhibit much higher productivity in tradables than

developing economies ($A_T^{Rich} \gg A_T^{Poor}$). However, productivity in the non-tradable sector (e.g., a barber shop or restaurant) is relatively similar across countries ($A_{NT}^{Rich} \approx A_{NT}^{Poor}$).
2. **Wage Equalization:** In the rich country, high productivity in the tradable sector justifies high wages. Since labor is mobile within the country, workers in the non-tradable sector demand comparable wages to those in the tradable sector, despite not having realized comparable productivity gains.
3. **Price Transmission:** To pay these higher wages, firms in the non-tradable sector must raise prices. In the poor country, low productivity in tradables keeps wages low across the board, resulting in low prices for non-tradables.
4. **Aggregate Price Level:** Since the Consumer Price Index (CPI) is a weighted average of tradable and non-tradable prices, the rich country will have a higher overall price level.

Implication for the Real Exchange Rate:
The Real Exchange Rate (R) is defined as $R = \frac{E P^*}{P}$. The Balassa-Samuelson effect implies that for fast-growing emerging economies (where productivity in tradables is converging to developed levels), the domestic price level (P) will rise faster than the foreign price level (P^*). This leads to a secular real appreciation of the currency. This is a fundamental equilibrium phenomenon, not a misalignment, and explains why the currencies of high-growth economies (like Japan in the 1960s or China in the 2000s) tend to strengthen in real terms over the long run.9

2.3 The Real Effective Exchange Rate (REER)

Policy analysis, particularly in the context of the "Session 18" slides regarding India, focuses on the **Real Effective Exchange Rate (REER)**. The REER is a multilateral, trade-weighted measure of the real exchange rate against a basket of trading partners.

$$REER = \prod_{i=1}^{N} \left(\frac{E_{i} P_{i}^*}{P} \right)^{w_i}$$
where w_i represents the trade weight of partner country i.

- **REER > 100 (or rising):** Indicates real appreciation. Domestic goods are becoming more expensive relative to competitors, potentially hurting export competitiveness ($NX \downarrow$).
- **REER < 100 (or falling):** Indicates real depreciation. Competitiveness improves ($NX \uparrow$).

Central banks in emerging markets often intervene to prevent excessive volatility in the REER, effectively managing the nominal rate (E) to offset inflation differentials ($\pi - \pi^*$) and maintain trade competitiveness.[1]

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3. Short-Run Asset Markets: Arbitrage, Expectations,

and Volatility

While PPP anchors exchange rates over horizons of several years, short-term currency movements are dominated by asset market conditions. In the short run, the exchange rate behaves like an asset price—highly volatile and forward-looking—adjusting to equate the expected returns on domestic and foreign assets.

3.1 Uncovered Interest Parity (UIP)

The theoretical cornerstone of short-run exchange rate determination is the **Uncovered Interest Parity (UIP)** condition. It asserts that in an environment of perfect capital mobility and risk neutrality, the interest rate differential between two countries must be exactly offset by the expected change in the exchange rate.[12]

$$(1 + i_t) = (1 + i_t^*) \frac{E_{t+1}^e}{E_t}$$
Taking natural logarithms, this approximates to:

$$i_t - i_t^* = E_t(\Delta s_{t+1})$$

where $s = \ln(E)$ and $E_t(\Delta s_{t+1})$ is the expected rate of depreciation of the domestic currency.
The Arbitrage Logic:
If the domestic interest rate (i) is 5% and the US interest rate (i^*) is 2%, investors would theoretically flock to domestic bonds. This capital inflow would instantaneously bid up the value of the domestic currency (E_t appreciates) until the expected future depreciation exactly equals the 3% interest differential. Thus, a high-interest-rate currency should be associated with an expectation of depreciation.

3.2 The Forward Premium Puzzle and the Carry Trade

Despite the theoretical elegance of UIP, empirical evidence overwhelmingly rejects it. This rejection is famously known as the **"Forward Premium Puzzle"** or **"Fama Puzzle"** (Fama, 1984).

In regression analyses of the form:

$$\Delta s_{t+1} = \alpha + \beta (i_t - i_t^*) + \epsilon_{t+1}$$

the theoretical prediction is $\beta = 1$. However, empirical studies consistently find $\beta < 1$, and frequently $\beta < 0$.14 A negative beta implies that currencies with high interest rates tend to appreciate (or depreciate less than the interest differential) rather than depreciate.

The Carry Trade Strategy:
This empirical failure enables the "carry trade," a strategy where investors borrow in low-interest currencies (funding currencies like the Japanese Yen or Swiss Franc) and invest in high-interest currencies (investment currencies like the Australian Dollar or Indian Rupee). Because the high-yield currency does not depreciate as predicted by UIP (and often appreciates), the investor profits from both the interest differential and the currency movement.16
Explaining the Failure:

1. **Risk Premia:** Investors are not risk-neutral. High-interest currencies are often those of economies with higher inflation volatility or sovereign risk. The excess return (deviation from UIP) is a compensation for holding risky assets. Models like Verdelhan (2010) link this risk premium to the covariance between currency returns and consumption growth: investors require a premium to hold currencies that depreciate during "bad times" (high marginal utility of consumption).[18]
2. **Crash Risk (Skewness):** Carry trade returns exhibit negative skewness. They yield steady small profits (picking up nickels) but are subject to sudden, massive losses (in front of a steamroller) during global liquidity crises. The "unwinding" of carry trades during panic episodes causes high-yield currencies to crash violently, as seen in 2008 and 1998.[20]
3. **Forward Rate Bias:** Behavioral explanations suggest that expectations are not fully rational, or that "peso problems" (a small probability of a catastrophic devaluation that does not occur in the sample) skew the ex-post data.[22]

3.3 The Dornbusch Overshooting Model

To reconcile the high volatility of exchange rates with the relative sluggishness of macroeconomic fundamentals (like prices and output), Rudiger Dornbusch (1976) developed the **Overshooting Model**. This model is a hybrid that combines sticky prices in the goods market with flexible prices (rational expectations) in the asset market.[23]

The Mechanism of Overshooting:
Consider an unanticipated, permanent monetary expansion ($M \uparrow$).

1. **Long Run:** We know from the monetary approach (and PPP) that a 10% increase in money supply will eventually lead to a 10% increase in the price level (P) and a 10% depreciation of the nominal exchange rate (E).
2. **Short Run (Sticky Prices):** Prices (P) are rigid. The increase in nominal money (M) leads to an increase in real money balances (M/P). To clear the money market, the domestic interest rate (i) must fall ($i < i^*$).
3. **UIP Condition:** With the domestic interest rate below the foreign rate, investors will only hold domestic assets if they expect the currency to **appreciate** in the future.
4. **The Overshoot:** For the currency to be expected to appreciate toward its new long-run equilibrium, it must instantaneously depreciate **beyond** (overshoot) that long-run level.
5. **Adjustment Path:** Over time, as prices slowly rise, real money balances fall, and interest

rates rise back to world levels. The exchange rate appreciates from its overshot position to the long-run equilibrium.

This model explains why exchange rates are "jump variables" that react violently to monetary news, exhibiting far greater volatility than the underlying economic fundamentals.[25]

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4. The Mundell-Fleming Model (IS-LM-BP)

The Mundell-Fleming model serves as the operational framework for analyzing macroeconomic policy in an open economy. It extends the IS-LM model by adding the Balance of Payments (BP) curve, allowing for the analysis of policy effectiveness under fixed versus flexible exchange rates and varying degrees of capital mobility.[1]

4.1 Deriving the Open Economy Curves

1. The IS Curve (Goods Market):*
$$Y = C(Y-T) + I(i) + G + NX(Y, Y^*, R)

$$The open economy IS curve is steeper than the closed economy version because the multiplier is reduced by the marginal propensity to import (m).$$
Multiplier_{Open} = \frac{1}{1 - c(1-t) + m} < \frac{1}{1 - c(1-t)} $$
A depreciation of the real exchange rate ($R \uparrow$) increases competitiveness, boosting Net Exports (NX) and shifting the IS curve to the right. However, this is conditional on the Marshall-Lerner Condition, which states that the sum of the absolute price elasticities of exports and imports must exceed unity ($|\eta_x| + |\eta_m| > 1$). If demand is inelastic in the short run, a depreciation may initially worsen the trade balance (the J-Curve Effect) before improving it.27
2. The LM Curve (Money Market):*

$$\frac{M}{P} = L(i, Y)$$

This curve remains largely unchanged from the closed economy model, representing the combinations of income and interest rates where money demand equals money supply.
3. The BP Curve (External Balance):
The BP curve represents the locus of points where the Balance of Payments is in equilibrium ($BP = CA + KA = 0$).

$$CA(Y, R) + KA(i - i^*) = 0$$

- **Slope:** The slope is determined by the degree of capital mobility.
    - **Perfect Capital Mobility:** Investors move funds instantly to arbitrage interest

differentials. The BP curve is **horizontal** at $i = i^*$. The slightest deviation of domestic rates from world rates triggers infinite capital flows.[1]

- **Imperfect Capital Mobility:** Capital flows respond to interest rates, but not infinitely. Higher income (Y) leads to higher imports (CA deficit), which requires a higher interest rate (i) to attract sufficient capital inflows (KA surplus) to restore balance. The BP curve is **upward sloping**.
- **No Capital Mobility:** The BP curve is **vertical**. Capital flows are unresponsive to rates; external balance is determined solely by income and the trade balance.[30]

4.2 Policy Effectiveness Under Perfect Capital Mobility

The standard textbook results (and those highlighted in Session 18) assume perfect capital mobility (Horizontal BP curve).

Scenario A: Flexible Exchange Rates

Under a flexible regime, the central bank allows the exchange rate to adjust to clear the external balance.

- Fiscal Policy (Ineffective):
  An expansionary fiscal policy ($G \uparrow$) shifts the IS curve to the right. This puts upward pressure on domestic interest rates ($i > i^*$). Foreign capital rushes in to capture the higher yield, causing the domestic currency to appreciate. The appreciation makes exports expensive and imports cheap, reducing Net Exports ($NX \downarrow$). The IS curve shifts back to the left until interest rates return to parity. The net result is that the rise in government spending is completely "crowded out" by the fall in net exports. Output (Y) remains unchanged.29
- Monetary Policy (Highly Effective):
  A monetary expansion ($M \uparrow$) shifts the LM curve to the right, putting downward pressure on interest rates ($i < i^*$). Capital flees the country, causing the currency to depreciate. The depreciation stimulates Net Exports ($NX \uparrow$), shifting the IS curve to the right. Equilibrium is restored at a higher level of output. Monetary policy works powerfully through the exchange rate channel.26

Scenario B: Fixed Exchange Rates

Under a fixed regime, the central bank is committed to maintaining a specific exchange rate peg ($E = \bar{E}$). This forces the money supply to become endogenous.

- Fiscal Policy (Highly Effective):
  A fiscal expansion ($G \uparrow$) shifts the IS curve right, pushing interest rates up ($i > i^*$). Capital flows in, creating pressure for the currency to appreciate. To defend the peg, the central bank must buy foreign currency and sell domestic currency. This intervention increases the domestic money supply ($M \uparrow$), shifting the LM curve to the right. The expansion continues until $i = i^*$. The fiscal stimulus is reinforced by the monetary accommodation, leading to a large increase in output.32

- Monetary Policy (Ineffective):
  A monetary expansion ($M \uparrow$) shifts the LM curve right, pushing interest rates down ($i < i^*$). Capital flows out, creating pressure for depreciation. To defend the peg, the central bank must sell foreign reserves and buy domestic currency. This intervention reduces the money supply ($M \downarrow$), shifting the LM curve back to its original position. The central bank loses reserves but fails to affect output or interest rates.32

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5. The Impossible Trinity and the Global Financial Cycle

The Mundell-Fleming model gives rise to the famous **Impossible Trinity** (or Policy Trilemma), which states that a country can maintain only two of the following three policies simultaneously [35]:

1. **A Fixed Exchange Rate.**
2. **Free Capital Mobility (Open Capital Account).**
3. **Independent Monetary Policy.**

5.1 The Logic of the Trilemma

- **The Eurozone Option:** Fixed Rate + Free Capital $\rightarrow$ No Monetary Independence. Member states cannot set their own interest rates; they must accept the ECB's policy.
- **The US/Japan Option:** Independent Monetary Policy + Free Capital $\rightarrow$ Flexible Exchange Rate. The currency fluctuates to maintain equilibrium.
- **The Bretton Woods/China Option:** Fixed Rate + Independent Monetary Policy $\rightarrow$ Capital Controls. Restrictions on flows are necessary to break the arbitrage link.

The lecture slides note that emerging markets often face this constraint acutely. India, for example, manages a "middle ground" solution: it allows capital mobility but intervenes in the forex market (Managed Float) to dampen volatility, effectively trading off some monetary independence or accepting "imperfect" integration to maintain stability.[1]

5.2 The "Dilemma" vs. "Trilemma": A Modern Critique

In the post-2008 financial landscape, the sufficiency of the Trilemma has been challenged, most notably by Hélène Rey (2013). Rey argues that the **"Global Financial Cycle"**—characterized by the co-movement of asset prices, gross capital flows, and leverage—renders the exchange rate regime irrelevant for monetary independence.[2]

The Argument:
Global capital flows are driven principally by conditions in the "center" country (the US),

specifically Federal Reserve monetary policy and global risk appetite (measured by the VIX). When the US tightens policy, global banks deleverage, asset prices fall, and credit spreads widen worldwide. This transmission occurs regardless of whether a periphery country has a fixed or floating exchange rate. Even with a floating rate, a large capital outflow can be so destabilizing that the domestic central bank is forced to raise interest rates (pro-cyclically) to defend financial stability, effectively losing monetary independence.
The "Dilemma":
Rey concludes that the Trilemma has collapsed into a Dilemma: Independent monetary policy is possible if and only if the capital account is managed (via Capital Controls or Macroprudential Regulation). A floating exchange rate alone is insufficient insulation against the Global Financial Cycle.37
Quadrilemma:
Some scholars extend this to a "Quadrilemma," adding Financial Stability as a fourth goal. Countries accumulate massive foreign exchange reserves (as seen in India and China) not just to manage the exchange rate, but to insure against the liquidity risks posed by these global financial cycles.38

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6. Comprehensive Assessment

6.1 Advanced Multiple Choice Questions (MCQs)

Q1. In the Dornbusch Overshooting Model, following an unanticipated permanent expansion of the money supply, which of the following describes the immediate (impact) effect on the nominal exchange rate (E) and the domestic interest rate (i)?
A. E depreciates to its new long-run level; i equals the foreign rate.
B. E depreciates beyond its new long-run level; i falls below the foreign rate.
C. E appreciates; i rises above the foreign rate.
D. E remains unchanged due to sticky prices; i falls significantly.
Answer: B. Reasoning: Sticky prices mean real money balances rise, lowering i (liquidity effect). For UIP to hold ($i < i^$), investors must expect appreciation. Thus, E must instantly depreciate beyond the long-run equilibrium so it can appreciate back to it.*
Q2. According to the Balassa-Samuelson effect, why might the Purchasing Power Parity (PPP) theory fail to hold between a developed and a developing country?
A. Developed countries have higher tariffs on tradable goods.
B. Developing countries have faster productivity growth in the non-tradable sector.
C. Productivity differentials are larger in the tradable sector than in the non-tradable sector.
D. High inflation in developing countries distorts the nominal exchange rate.
Answer: C. Reasoning: High productivity in tradables in rich countries drives up economy-wide wages. This raises prices in the low-productivity non-tradable sector, leading to a structurally higher price level (and real exchange rate appreciation) in rich countries.
Q3. Under the Mundell-Fleming model with perfect capital mobility and a flexible exchange rate, an expansionary fiscal policy is ineffective because:

A. It leads to a rise in the money supply which causes inflation.
B. The resulting increase in interest rates attracts capital inflows, causing currency appreciation that crowds out net exports.
C. The central bank must sell foreign reserves to maintain the peg, contracting the money supply.
D. Consumers anticipate future taxes and reduce consumption (Ricardian Equivalence).
Answer: B. Reasoning: The fiscal stimulus puts upward pressure on rates. Capital inflows appreciate the currency. The loss in competitiveness ($NX \downarrow$) exactly offsets the $G \uparrow$.
Q4. If the "Forward Premium Puzzle" holds true empirically, what implies the profitability of the "Carry Trade"?
A. High-interest currencies tend to depreciate exactly as predicted by UIP.
B. High-interest currencies tend to appreciate or depreciate less than the interest differential.
C. Forward rates are unbiased predictors of future spot rates.
D. Risk premia in foreign exchange markets are constant and zero.
Answer: B. Reasoning: UIP predicts high-rate currencies depreciate. The puzzle is that they often don't, or even appreciate. This allows carry traders to pocket the interest differential plus potential FX gains.
Q5. In the context of the "Impossible Trinity," a country that chooses to maintain a fixed exchange rate and independent monetary policy must:
A. Allow free capital mobility.
B. Impose capital controls.
C. Run a fiscal surplus.
D. Adopt a currency board.
Answer: B. Reasoning: To break the arbitrage link between domestic and foreign interest rates while fixing the exchange rate, the country must restrict the flow of capital.
Q6. Which of the following conditions would result in a J-curve effect following a currency devaluation?
A. Import and export quantities adjust instantaneously to price changes.
B. The Marshall-Lerner condition is violated in the long run but holds in the short run.
C. Short-run price elasticities of demand for imports and exports are low (inelastic).
D. The demand for domestic currency is perfectly elastic.
Answer: C. Reasoning: If demand is inelastic in the short run, the price effect (paying more for imports) dominates the volume effect, worsening the trade balance initially.
Q7. Helene Rey's argument for a "Dilemma" rather than a "Trilemma" suggests that:
A. Floating exchange rates effectively insulate economies from external shocks.
B. The Global Financial Cycle transmits US monetary policy shocks regardless of the exchange rate regime.
C. Capital controls are ineffective in the modern financial system.
D. Fixed exchange rates are superior to floating rates for monetary independence.
Answer: B. Reasoning: Rey argues that global credit and risk flows (the Global Financial Cycle) are so potent that floating rates cannot stop the transmission of financial conditions from the center (US) to the periphery.

Q8. Consider the BP curve under imperfect capital mobility. An increase in domestic income (Y) will:
A. Shift the BP curve to the right.
B. Have no effect on the Balance of Payments.
C. Create a Balance of Payments deficit, requiring a higher interest rate to restore equilibrium.
D. Create a Balance of Payments surplus due to higher savings.
Answer: C. Reasoning: Higher Y leads to higher imports (M), worsening the Current Account. To return to $BP=0$, the Capital Account must improve via higher capital inflows, which requires a higher interest rate (i). Thus, we move up along the positively sloped BP curve.
Q9. Sterilized intervention by a Central Bank under a managed float involves:
A. Buying foreign currency and increasing the monetary base.
B. Selling foreign currency and allowing interest rates to rise.
C. Buying foreign currency and simultaneously selling government bonds to offset the impact on the monetary base.
D. Pegging the exchange rate and surrendering monetary independence.
Answer: C. Reasoning: Sterilization aims to influence the exchange rate (by buying/selling forex) without changing the domestic money supply. The Open Market Operation (selling bonds) mops up the liquidity created by the forex purchase.
Q10. In a "Liquidity Trap" (IS intersects LM in the flat portion), what is the effect of monetary expansion under a flexible exchange rate in the standard Mundell-Fleming model?
A. Highly effective due to the exchange rate channel.
B. Ineffective because interest rates cannot fall further to stimulate investment or depreciation.
C. Effective because it raises inflation expectations immediately.
D. Causes hyperinflation.
Answer: B. Reasoning: Typically monetary policy works in open economies via $i \downarrow \to E \uparrow$. In a liquidity trap, i cannot fall. If i doesn't change, the exchange rate doesn't depreciate via the interest parity channel, rendering standard monetary policy ineffective.

6.2 Long Answer Questions with Solutions

Q1. Analytical Derivation of the BP Curve Slope:
Question: Derive the condition for the slope of the BP curve (i as a function of Y) starting from the Balance of Payments identity: $BP = CA(Y, R) + KA(i - i^*)$. Explain how the slope changes as the degree of capital mobility (κ, sensitivity of capital flows to interest differentials) varies from zero to infinity.
Solution:
We start with the equilibrium condition $BP = NX(Y, R) + KA(i - i^*) = 0$.
Assuming linear functions for simplicity:

$$NX = \bar{NX} - mY + nR$$

$$KA = \bar{KA} + \kappa(i - i^*)$$

Where m is the marginal propensity to import ($0 < m < 1$) and κ is the degree of capital mobility ($\kappa > 0$).
Substituting into the equilibrium condition:

$$\bar{NX} - mY + nR + \bar{KA} + \kappa(i - i^*) = 0$$

To find the slope of the BP curve in (Y, i) space, we solve for i:

$$\kappa i = mY - (\bar{NX} + nR + \bar{KA} - \kappa i^*)$$

$$i = \frac{m}{\kappa} Y - \frac{Intercept}{\kappa}$$

Differentiation gives the slope:

$$\frac{di}{dY} = \frac{m}{\kappa}$$

Interpretation:

- The slope depends on the ratio of the marginal propensity to import (m) to the degree of capital mobility (κ).
- Since $m > 0$ and $\kappa > 0$, the slope is positive. Higher income leads to a trade deficit, requiring higher interest rates to attract capital inflows.
- **Case 1: Perfect Capital Mobility ($\kappa \to \infty$).** The term m/κ approaches 0. The BP curve becomes **horizontal**.
- **Case 2: No Capital Mobility ($\kappa \to 0$).** The term m/κ approaches ∞. The BP curve becomes **vertical**. Income is constrained solely by the trade balance.
- **Case 3: Imperfect Mobility.** The curve is upward sloping.

Q2. Policy Scenario: Import Tariffs under Fixed Exchange Rates:
Question: Country X is a small open economy with a fixed exchange rate and perfect capital mobility. It is currently facing a recession ($Y < Y_{full}$). The government proposes a tariff on imports to boost domestic output. Using the Mundell-Fleming framework, analyze the short-run effect of this policy on Output (Y), Net Exports (NX), and Foreign Reserves.
Solution:

1. **Initial Shock:** A tariff makes imports more expensive, reducing import volume ($M \downarrow$). This increases Net Exports ($NX = X - M$) at any given level of income.
2. **IS Curve Shift:** The rise in autonomous NX shifts the IS curve to the right (from IS_0

to IS_1).

3. **Pressure on Interest Rates:** The increase in aggregate demand raises the transaction demand for money, putting upward pressure on the domestic interest rate ($i > i^*$).
4. **Capital Flows:** Since capital mobility is perfect, the slight rise in i attracts massive capital inflows.
5. **Exchange Rate Pressure:** The demand for domestic currency rises, creating pressure for the currency to appreciate.
6. **Central Bank Intervention:** Under a fixed exchange rate regime, the central bank cannot allow appreciation. It must intervene by **buying foreign currency** (adding to Reserves) and **selling domestic currency**.
7. **Monetary Accommodation:** The sale of domestic currency increases the money supply ($M \uparrow$). This shifts the LM curve to the right (from LM_0 to LM_1).
8. **New Equilibrium:** The intervention continues until the interest rate returns to the world level ($i = i^*$). The economy settles at a higher level of output ($Y_1 > Y_0$).
9. **Conclusion:**
    - **Output (Y):** Increases.
    - **Net Exports (NX):** Increases (due to the tariff).
    - **Foreign Reserves:** Increase (due to the intervention to prevent appreciation).
    - *Note:* While effective for Country X, this is a "beggar-thy-neighbor" policy that reduces the exports of trading partners, potentially inviting retaliation.

Q3. Theoretical Critique: Risk Premia and UIP Failure:
Question: The empirical failure of Uncovered Interest Parity (UIP) suggests that the Mundell-Fleming model's assumption of perfect asset substitutability is flawed. Discuss how introducing a time-varying risk premium (ρ_t) into the parity condition ($i = i^* + \Delta e^e + \rho_t$) alters the transmission of monetary policy and explains the "Carry Trade."
Solution:

- **Modified Parity:** The standard UIP condition assumes investors are risk-neutral. If we introduce a risk premium ρ_t, the domestic interest rate must compensate for foreign rates, expected depreciation, *and* the risk of holding domestic assets: $i = i^* + E(\Delta e) + \rho$.
- **Impact on Monetary Policy:** In the standard model, a monetary expansion lowers i, leading to immediate depreciation. However, if the expansion also increases the risk premium ($\rho \uparrow$)—perhaps due to fears of inflation or instability—the currency may depreciate *more* than predicted by the interest differential alone. Conversely, if a central bank raises rates to defend a currency ($i \uparrow$), but the risk premium rises simultaneously ($\rho \uparrow \uparrow$) due to fears of default, the currency might still depreciate (a failure of the interest rate defense).
- **The Carry Trade:** The "Carry Trade" exploits the failure of standard UIP. Investors borrow in low-i currencies and invest in high-i currencies. If UIP held, the high-i currency would depreciate to wipe out the gain. The existence of ρ implies that the high interest rate is partly a compensation for "Crash Risk" (negative skewness). Investors earn the differential as long as the crash (the realization of the risk) does not occur. This

creates periods of steady appreciation for high-yield currencies (capital inflows) followed by sudden collapses when risk appetite (global ρ) spikes.

Q4. Dynamics of Overshooting:
Question: Explain why exchange rates are more volatile than the price level. Using the Dornbusch model, trace the path of the real exchange rate (R) following a monetary contraction. Does Purchasing Power Parity (PPP) hold in the short run in this model?
Solution:

- **Volatility Puzzle:** Asset markets (exchange rates) adjust instantaneously to news, while goods markets (prices) adjust slowly due to contracts and menu costs. This speed differential necessitates over-adjustment in the asset market.
- **Scenario:** A monetary contraction ($M \downarrow$).
- **Step 1:** In the long run, P will fall and E will appreciate (value of currency rises) proportionally.
- **Step 2:** In the short run, P is sticky. Real money supply (M/P) falls.
- **Step 3:** To clear the money market, the interest rate must rise ($i \uparrow$).
- **Step 4 (UIP):** Since $i > i^*$, investors require an expectation of *depreciation* to hold domestic assets.
- **Step 5 (The Overshoot):** For the currency to depreciate in the future while approaching its new long-run equilibrium, it must effectively be "too strong" today. The spot rate (E) instantaneously appreciates **beyond** (overshoots) the new long-run level.
- **Path of Real Exchange Rate ($R = EP^*/P$):** Since E falls (appreciates) sharply and P is fixed, the Real Exchange Rate (R) appreciates sharply in the short run. It effectively mimics the volatility of the nominal rate.
- **PPP in Short Run:** PPP fails completely in the short run. The real exchange rate deviates significantly from its equilibrium level. It only returns to equilibrium in the long run as P falls and E depreciates back to the steady state.

Q5. Emerging Market Dilemma and Managed Floats:
Question: India follows a "Managed Float" exchange rate regime. Explain the rationale for RBI's intervention in the foreign exchange market in the context of the "Impossible Trinity." Specifically, how does the accumulation of foreign exchange reserves allow a country to pursue a "middle path" in the Trilemma?
Solution:

- **The Corner Solution Problem:** The strict Trilemma suggests a binary choice. A pure float (Option B) allows independent monetary policy but exposes the economy to extreme volatility from global capital flows (The Global Financial Cycle). A pure peg (Option A) provides stability but surrenders monetary autonomy (importing Fed policy).
- **The Middle Path:** India (and many EMs) rejects the corner solutions. The RBI intervenes to "smooth volatility" without targeting a specific level.
- **Role of Reserves:** By accumulating massive reserves (buying forex during inflows), the central bank prevents excessive appreciation that would hurt exports (Dutch Disease). By

selling reserves during outflows, it prevents destabilizing crashes.

- **Relaxing the Trilemma:** This activity effectively creates a hybrid system.
  - *Partial Capital Control:* The reserves act as a buffer, neutralizing the "transfer problem" of capital flows.
  - *Partial Monetary Independence:* The RBI can set interest rates that differ from the Fed (to target domestic inflation) because it uses reserves to absorb the resulting pressure on the exchange rate, preventing the extreme dislocation that would otherwise occur under a pure float.
- **Conclusion:** The accumulation of reserves turns the Trilemma into a spectrum. It allows for *some* exchange rate stability and *some* monetary independence, at the cost of holding lower-yield foreign assets (reserves). This validates the "Quadrilemma" view where Financial Stability is the fourth dimension.

7. Conclusion

The transition from closed to open economy macroeconomics, as outlined in the "Session 18" material and expanded upon in this report, reveals a landscape of complex trade-offs. The **Mundell-Fleming model** remains the essential heuristic for understanding these trade-offs, demonstrating that the power of fiscal and monetary policy is inextricably linked to the exchange rate regime and the fluidity of capital. However, the theoretical neatness of the model is challenged by empirical realities: **PPP** is distorted by structural productivity differentials (Balassa-Samuelson), **UIP** is violated by risk premia and behavioral anomalies (Forward Premium Puzzle), and the **Trilemma** is increasingly viewed through the lens of a **Dilemma**, where global financial cycles constrain policy autonomy regardless of the exchange rate regime. For students and policymakers alike, mastering these concepts requires navigating between the elegance of the long-run equilibrium and the volatile, friction-filled reality of the short-run adjustment.

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