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Bachelor of Commerce (B2001) | Level 2 • Part B Major | Monash University

Intermediate macroeconomics

Course Code: ECC2010 • Module 4 Notes

Module 4: Open-Economy Macroeconomics, Exchange Rates & Public Debt Dynamics

Chapter 1: Balance of Payments, Saving-Investment & Real Exchange Rates

1.1 Balance of Payments Accounting (ABS BPM6 Framework)

Open-economy macroeconomics examines how international trade in goods and services and cross-border capital flows shape domestic output, interest rates, exchange rates, and sovereign fiscal sustainability. Under the International Monetary Fund's *Balance of Payments Manual (BPM6)* used by the Australian Bureau of Statistics (ABS), all economic transactions between Australian residents and non-residents are recorded across three accounts:

- **Current Account (CA):** Records flows of goods and services exports (X), imports (M), net primary income (NPI, comprising interest, dividends, and reinvested earnings on cross-border assets and liabilities), and net secondary income (foreign aid and remittances). Thus $CA = NX + NFI$, where $NX = X - M$ is the trade balance and NFI is net foreign income.
- **Capital Account (KA):** Records relatively minor capital transfers (debt forgiveness, migrant asset transfers) and acquisitions/disposals of non-produced, non-financial assets.
- **Financial Account (FA):** Records net cross-border acquisitions of financial assets minus net incurrence of financial liabilities across direct investment (FDI), portfolio investment (equities and debt securities), financial derivatives, other investment, and official Reserve Bank of Australia (RBA) reserve assets.

Under double-entry accounting, a current account deficit must be financed by net capital inflows (a financial account surplus), so ignoring statistical errors and omissions:

$$CA + KA + FA = 0 \implies FA \approx -CA$$

Where: CA is the current account balance; KA is the capital account balance; and FA is the financial account balance (in ABS BPM6 sign convention, net capital inflows are recorded as negative net acquisition of financial assets minus positive net incurrence of liabilities, meaning a net borrowing country has $CA < 0$ and net financial inflows of $-CA > 0$).

1.2 The Open-Economy Saving-Investment Identity

Combining the national income identity $Y = C + I + G + NX$ with Net Foreign Income (NFI) defines Gross National Income ($GNI = Y + NFI$) and national saving ($S = GNI - C - G = S_p + S_g$), where private saving is $S_p = Y + NFI - T - C$ and public saving is the fiscal budget balance $S_g = T - G$. Rearranging yields the fundamental **open-economy saving-investment identity**:

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$$CA = NX + NFI = S - I = (S_p - I) + (T - G)$$

Where: CA is the current account balance; S is total national saving; I is domestic private and public capital investment; $S_p - I$ is the private sector saving-investment balance; and $T - G$ is the general government fiscal balance. Historically, Australia operated as a persistent capital importer ($I > S$, hence $CA < 0$) because high domestic investment opportunities in mining, infrastructure, and housing exceeded domestic saving. Since 2019, however, Australia has frequently recorded current account surpluses ($S > I$) driven by strong commodity export revenues (iron ore, LNG, coal) and growing compulsory superannuation saving.

Notice the **twin deficits hypothesis** embedded in the identity: if private saving minus investment ($S_p - I$) remains unchanged, a widening government fiscal deficit ($\Delta(T - G) < 0$) worsens the current account balance ($\Delta CA < 0$), either via higher domestic interest rates appreciating the currency or via import demand leaking abroad.

1.3 Nominal and Real Exchange Rates and Purchasing Power Parity

Following standard Reserve Bank of Australia (RBA) convention, define the **nominal exchange rate** (E) as the number of units of foreign currency per Australian dollar (for example, $E = 0.66$ USD/AUD). Under this convention, a rise in E ($E \uparrow$) represents an **appreciation** of the AUD (one Australian dollar buys more foreign currency), while a fall in E ($E \downarrow$) represents a **depreciation**. Australia's effective exchange rate against its major trading partners is summarised by the RBA's **Trade-Weighted Index (TWI)**.

International competitiveness depends not on E alone, but on the **real exchange rate** (RER), which measures the relative price of the Australian basket of goods in terms of the foreign basket:

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

Where: RER is the real exchange rate; E is the nominal exchange rate (foreign currency per AUD); P is the Australian domestic price level; and P^* is the foreign price level. An increase in RER (a *real appreciation*) makes Australian exports dearer to foreigners and imports cheaper for Australians, lowering net exports ($\partial NX / \partial RER < 0$).

Taking percentage rates of change yields $\%\Delta RER \approx \%\Delta E + \pi - \pi^*$, where π and π^* are domestic and foreign inflation rates. Under **Relative Purchasing Power Parity (PPP)**, if real factors leave the long-run equilibrium real exchange rate constant ($\%\Delta RER = 0$), nominal exchange rate changes offset inflation differentials:

$$\%\Delta E \approx \pi^* - \pi$$

Where: $\%\Delta E$ is the percentage appreciation of the AUD; π^* is foreign inflation; and π is Australian inflation. In the medium to long run, productivity surges in tradable sectors (such as mining or manufacturing) relative to non-tradable services can generate a trend real appreciation via the **Balassa-Samuelson effect**, raising domestic non-tradable wages and overall price level P relative to P^*.

Worked Example 1: Open-Economy Identities and Real Exchange Rate Dynamics

Suppose in a given year Australia records GDP $Y = 2{,}600$, consumption $C = 1{,}380$, investment $I = 620$, government purchases $G = 560$, net taxes $T = 530$, and net primary income $NFI = -70$ (all in billion AUD).

1. **Net exports and current account balance:**

$$NX = Y - C - I - G = 2{,}600 - 1{,}380 - 620 - 560 = +40 \text{ billion AUD}$$

$$CA = NX + NFI = 40 + (-70) = -30 \text{ billion AUD}$$

Ignoring KA, the financial account records net capital inflows of $FA = +30$ billion AUD (an increase in net foreign liabilities).

2. **Private, public, and national saving verification:**

$$S_p = Y + NFI - T - C = 2{,}600 - 70 - 530 - 1{,}380 = 620 \text{ billion AUD}$$

$$S_g = T - G = 530 - 560 = -30 \text{ billion AUD}$$

National saving is $S = 620 - 30 = 590$ billion AUD, confirming $S - I = 590 - 620 = -30 = CA$.

3. **Real exchange rate calculation:** Suppose the AUD/USD spot rate moves from $E_0 = 0.65$ to $E_1 = 0.68$ USD/AUD (4.62% nominal appreciation), while Australian CPI rises by $\pi = 3.5\%$ and US CPI rises by $\pi^* = 2.5\%$. Using exact ratios from base indices $P_0 = P_0^* = 100$:

$$RER_0 = \frac{0.65 \times 100}{100} = 0.650, \qquad RER_1 = \frac{0.68 \times 103.5}{102.5} = 0.6866$$

Thus the AUD appreciates in real terms by $(0.6866 - 0.650)/0.650 = +5.64\%$ (matching the approximation $4.62\% + 3.5\% - 2.5\% = +5.62\%$), eroding Australian price competitiveness.

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Chapter 2: Interest Parity Conditions & Exchange Rate Determination

2.1 Covered Interest Parity (CIP)

In open capital markets without capital controls, global investors compare returns across currencies. Consider an Australian investor holding 1 AUD for one year. Investing domestically at the Australian nominal interest rate i yields $(1+i)$ AUD risk-free. Alternatively, converting 1 AUD at the spot exchange rate E (USD/AUD) buys E USD, which earns $(1+i^*)$ in US Treasury bills to yield $E(1+i^*)$ USD at maturity. Locking in the forward exchange rate F (USD/AUD) eliminates all currency risk, returning $\frac{E(1+i^*)}{F}$ AUD. Arbitrage eliminates riskless profit opportunities when both strategies yield identical AUD payoffs, giving **Covered Interest Parity (CIP)**:

$$\$1+i = \frac{E}{F}(1+i^*) \quad \Longrightarrow \quad \frac{F-E}{E} = \frac{i^*-i}{1+i} \approx i^* - i\$$$

Where: i is the domestic (Australian) nominal interest rate; i^* is the foreign (US) nominal interest rate; E is the spot exchange rate (foreign currency per AUD); and F is the forward exchange rate of matching maturity. Whenever domestic interest rates exceed foreign rates ($i > i^*$), the domestic currency must trade at a *forward discount* ($F < E$) to prevent risk-free covered arbitrage.

2.2 Uncovered Interest Parity (UIP) and Risk Premia

When investors do not hedge currency exposure in the forward market, they compare domestic returns against expected unhedged foreign returns evaluated at the expected future spot rate E^e_{t+1}. Assuming risk neutrality (or absorbing a currency risk premium ρ_t into the spread), market equilibrium requires **Uncovered Interest Parity (UIP)**:

$$\$1+i_t \approx \frac{E_t}{E^e_{t+1}}(1+i^*_t) \quad \Longrightarrow \quad i_t - i^*_t \approx -\frac{E^e_{t+1}-E_t}{E_t}\$$$

Where: E^e_{t+1} is the expected future spot exchange rate (USD/AUD); and $\frac{E^e_{t+1}-E_t}{E_t}$ is the expected rate of AUD appreciation. Equivalently, solving for the current spot rate in natural logarithms ($s_t = \ln E_t$) gives:

$$s_t = E_t[s_{t+1}] + (i_t - i^*_t)$$

Where: $s_t = \ln E_t$ is the log spot exchange rate (AUD value in foreign currency). UIP conveys an essential mechanism: holding expected future exchange rates $E_t[s_{t+1}]$ constant, an unexpected RBA rate hike ($i_t \uparrow$ above i^*_t) causes an *immediate spot appreciation* ($s_t \uparrow$, $E_t \uparrow$) up to the point where the expected subsequent depreciation back toward $E_t[s_{t+1}]$ exactly offsets the higher Australian interest rate advantage! Empirically, high-interest currencies often fail to depreciate as fast as UIP predicts over short horizons (the "forward premium puzzle"), giving rise to profitable *carry trades* until sharp risk-off reversals occur.

Worked Example 2: Covered Arbitrage and UIP Spot Adjustment

Suppose the 1-year Australian government bond yield is $i = 4.50\%$, the 1-year US Treasury yield is $i^* = 3.00\%$, and the spot exchange rate is $E_t = 0.6500$ USD/AUD.

1. **No-arbitrage 1-year forward rate (CIP):**

$$F = E_t \frac{1+i^*}{1+i} = 0.6500 \times \frac{1.0300}{1.0450} = 0.64067 \text{ USD/AUD}$$

The forward AUD trades at a discount of $(0.64067 - 0.6500)/0.6500 = -1.435\%$ (matching $i^* - i = -1.50\%$ divided by 1.045). If a dealer misquoted a forward rate of $F' = 0.6480$, an arbitrageur could borrow USD at 3.00%, convert spot to AUD at 0.6500, invest in Australian bonds at 4.50%, and buy USD forward at 0.6480, locking in a gross USD payoff of $1.0450 \times (0.6480/0.6500) = 1.0418 > 1.0300$—a risk-free 1.18% arbitrage profit.

2. **UIP expected spot rate:** Under UIP without risk premia, $E^e_{t+1} = F = 0.64067$ USD/AUD: markets expect the AUD to depreciate by 1.435% over the next year to equalise expected returns.
3. **Spot reaction to a surprise RBA hike:** Suppose the RBA unexpectedly lifts i to 5.50% while $i^* = 3.00\%$ and the long-run anchor $E^e_{t+1} = 0.64067$ remain unchanged. By UIP, the spot AUD must immediately jump to:

$$E'_t = E^e_{t+1} \frac{1+i'}{1+i^*} = 0.64067 \times \frac{1.0550}{1.0300} = 0.65622 \text{ USD/AUD}$$

an immediate $+0.96\%$ appreciation.

Chapter 3: Dornbusch Exchange Rate Overshooting Model

3.1 Sticky Goods Prices vs. Fast Asset Markets

Real-world floating exchange rates such as the AUD/USD are dramatically more volatile than underlying price levels, GDP, or money supplies. Rudiger Dornbusch (1976) explained this empirical puzzle by combining **slow price adjustment in goods markets** with **instantaneous clearing in asset markets** (money market and UIP).

Write the log-linear open-economy system with exogenous output $\bar{y}$, foreign price $p^* = 0$, and log nominal exchange rate $s_t = \ln E_t$ (where $s_t \uparrow$ is an AUD appreciation):

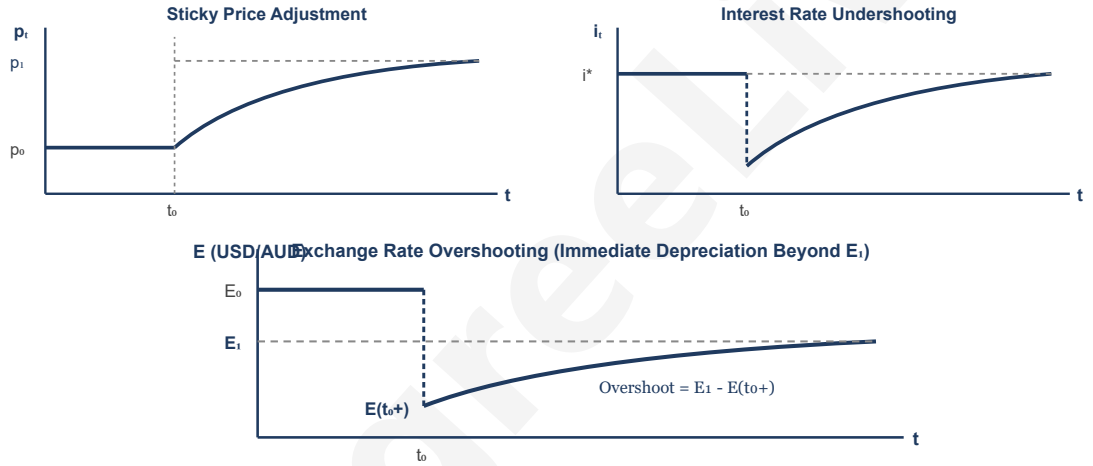
1. **Money market equilibrium:** $m_t - p_t = \phi \bar{y} - \lambda i_t$, where $\lambda > 0$ is the interest semi-elasticity of money demand.
2. **Continuous-time UIP:** $i_t - i^* = -\dot{s}^e_t$, where $\dot{s}^e_t$ is the expected rate of AUD appreciation.
3. **Long-run PPP:** In the long run, prices adjust fully to restore neutral money ($\bar{p}_1 - \bar{p}_0 = \Delta m$), so the long-run equilibrium exchange rate depreciates proportionally: $\bar{s}_1 = \bar{s}_0 - \Delta m$.
4. **Phillips-style sluggish price adjustment:** $\dot{p}_t = \theta(y^d_t - \bar{y}) = \theta\delta(\bar{s} - s_t)$, where $\theta > 0$ is price adjustment speed and $\delta > 0$ captures exchange-rate competitiveness effects on demand.

3.2 Mechanics of Monetary Expansion and Overshooting

Suppose the economy begins at long-run steady state $(\bar{p}_0, \bar{s}_0, i_0 = i^*)$ and the central bank announces an unanticipated, permanent increase in the money supply of $\Delta m > 0$:

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- **Step 1 (Short-Run Interest Rate Drop):** Because the goods price level p_t is sticky at $\bar{p}_0$ on impact, real money balances $m - \bar{p}_0$ jump by Δm. To induce households to hold the extra real money balances when $\bar{y}$ is fixed, the domestic nominal interest rate must fall immediately by $\Delta i = -\Delta m/\lambda$, so $i_0^+ < i^*$.
- **Step 2 (UIP Requires Expected Appreciation):** Because $i_0^+ < i^*$, domestic bonds yield less than foreign bonds. Asset market equilibrium under UIP ($-\dot{s}_t^e = i_t - i^* < 0 \implies \dot{s}_t^e > 0$) requires investors to expect the AUD to *appreciate* over time during the transition!
- **Step 3 (Immediate Overshooting Depreciation):** How can the AUD be expected to *appreciate* toward its new, lower long-run PPP level $\bar{s}_1 = \bar{s}_0 - \Delta m$? Only if the spot AUD *depreciates immediately beyond* $\bar{s}_1$ ($s_0^+ < \bar{s}_1 < \bar{s}_0$)! That initial jump below its long-run value is **exchange rate overshooting**.
- **Step 4 (Transition to Long Run):** The undervalued AUD boosts net exports and aggregate demand above $\bar{y}$, gradually pushing prices p_t upward. Rising p_t shrinks real money balances $m - p_t$, lifting i_t back toward i^* while the exchange rate appreciates steadily along the saddle path from s_0^+ up to $\bar{s}_1$.



Worked Example 3: Quantifying Dornbusch Exchange Rate Overshooting

Suppose prices adjust sluggishly toward long-run equilibrium according to $\dot{p}_t = \theta(\bar{p} - p_t)$, while money market equilibrium $m - p_t = \phi\bar{y} - \lambda i_t$ and continuous-time UIP $i_t - i^* = -\dot{s}_t^e$ imply the Dornbusch saddle-path relationship $s_t - \bar{s} = \frac{1}{\lambda\theta}(p_t - \bar{p})$. Verify consistency: differentiating with respect to time gives $\dot{s}_t = \frac{1}{\lambda\theta}\dot{p}_t = -\frac{1}{\lambda}(p_t - \bar{p}) = i^* - i_t$, satisfying UIP identically. Calibrate the model with money demand semi-elasticity $\lambda = 2.0$, price adjustment speed $\theta = 0.25$ per year, and a permanent monetary expansion of $\Delta m = +0.06$ (6.0%).

1. **Long-run PPP depreciation:** Because $\Delta\bar{p} = +\Delta m = +0.06$, the long-run AUD exchange rate depreciates by $\Delta\bar{s} = -0.06$ (-6.0%).
2. **Impact interest rate drop:** With p_0 fixed on impact, $i_0^+ - i^* = -\frac{\Delta m}{\lambda} = -\frac{0.06}{2.0} = -0.03$ (-3.0 percentage points).
3. **Impact exchange rate jump and overshooting:** Because $p_0 - \bar{p}_1 = -\Delta m = -0.06$, substituting into the saddle-path condition yields:

$$s_0^+ - \bar{s}_1 = \frac{1}{\lambda\theta}(p_0 - \bar{p}_1) = \frac{1}{2.0 \times 0.25}(-0.06) = 2.0 \times (-0.06) = -0.12 \text{ (or } -12.0\%)$$

Combining the long-run depreciation (-6.0%) with the overshoot (-12.0%) produces an immediate total AUD depreciation of:

$$s_0^+ - \bar{s}_0 = -0.06 - 0.12 = -0.18 \text{ (or } -18.0\%)$$

Hence, a 6.0% permanent monetary expansion triggers an immediate 18.0% spot depreciation—overshooting its 6.0% long-run depreciation by 12.0 percentage points—followed by gradual AUD appreciation at initial rate $\dot{s}_0^+ = i^* - i_0^+ = +3.0\%$ per year as goods prices adjust upward.

Chapter 4: The Mundell-Fleming (IS^*-LM^*) Model & Trilemma

4.1 Small Open Economy Under Perfect Capital Mobility

The Mundell-Fleming model extends IS-LM to a small open economy with fixed short-run prices ($\bar{P}$) and perfect capital mobility. Because domestic and foreign bonds are perfect substitutes and static exchange-rate expectations are assumed in the baseline short-run model ($\dot{E}^e = 0$), UIP pins the domestic interest rate to the world interest rate:

$$r = r^*$$

Where: r is the domestic real interest rate; and r^* is the exogenous world interest rate. Substituting $r = r^*$ into goods market and money market equilibrium defines the IS^* and LM^* schedules in (E, Y) space (where E is USD/AUD on the vertical axis):

$$IS^*: \quad Y = C(Y - T) + I(r^*) + G + NX(E), \qquad \frac{\partial NX}{\partial E} < 0$$

$$LM^*: \quad \frac{M}{\bar{P}} = L(Y, r^*)$$

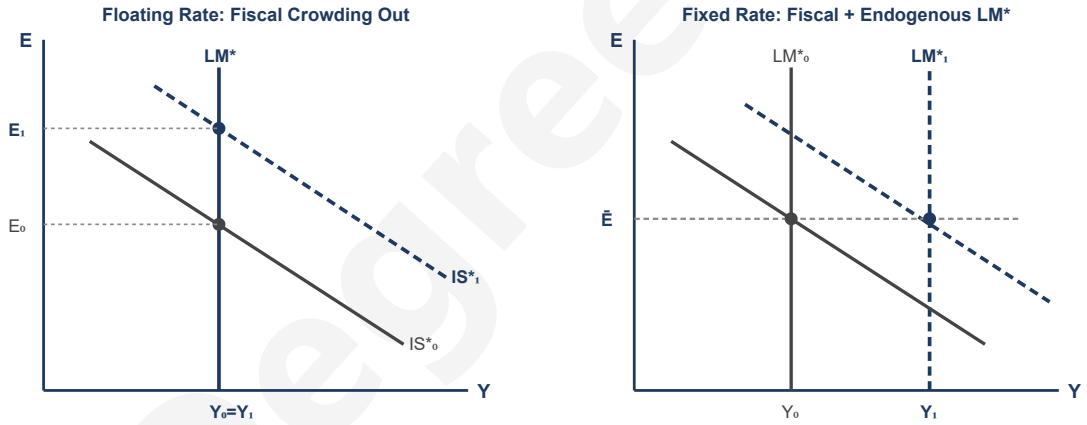
Where: IS^* slopes downward in (E, Y) space because a higher exchange rate E (AUD appreciation) reduces net exports $NX(E)$ and lowers equilibrium output via the multiplier; and LM^* is vertical in (E, Y) space because with $r = r^*$ fixed by global markets and $M/\bar{P}$ set by the central bank, money market equilibrium uniquely pins down income Y independently of E.

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4.2 Policy Effectiveness Under Floating vs. Fixed Exchange Rates

Exchange-rate regimes fundamentally reverse the relative potency of fiscal and monetary policy:

- **Floating Exchange Rate (Australia since December 1983):**
  - *Fiscal Expansion ($\Delta G > 0$):* Shifts IS^* rightward. Upward pressure on r attracts capital inflows, appreciating E ($E \uparrow$). Appreciation crowds out net exports $NX(E)$ until IS^* returns to the unchanged vertical LM^* curve. Under static expectations and fixed prices, **fiscal policy has zero effect on** Y (100% exchange-rate crowding out).
  - *Monetary Expansion ($\Delta M > 0$):* Shifts LM^* rightward. Downward pressure on r triggers capital outflows, depreciating E ($E \downarrow$), which boosts net exports NX and expands output Y powerfully along IS^*.
- **Fixed Exchange Rate (Pegged $E = \bar{E}$):**
  - *Monetary Expansion ($\Delta M > 0$):* Attempts to lower r below r^*, causing depreciation pressure. To defend $\bar{E}$, the central bank must buy domestic currency and sell foreign reserves, shrinking M back to its original level. **Monetary policy is completely impotent.**
  - *Fiscal Expansion ($\Delta G > 0$):* Shifts IS^* rightward, putting upward pressure on r and E. To prevent E from appreciating above $\bar{E}$, the central bank intervenes by buying foreign exchange and expanding M, shifting LM^* rightward until equilibrium is restored at higher Y with zero crowding out!



4.3 The Impossible Trinity (Macroeconomic Trilemma)

Mundell-Fleming implies a binding institutional constraint known as the **Impossible Trinity (Trilemma)**: an economy cannot simultaneously maintain (1) free international capital mobility, (2) a fixed exchange rate, and (3) independent domestic monetary policy. Policymakers can select at most two corners of the triangle: Australia (since 1983), the United States, and New Zealand choose free capital mobility and independent inflation-targeting monetary policy, accepting a floating exchange rate; Hong Kong and Denmark choose free capital mobility and a fixed exchange rate, surrendering monetary autonomy; and China historically maintained a managed peg and independent monetary policy by imposing capital controls.

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Worked Example 4: Solving IS^*-LM^* Under Floating and Fixed Regimes

Consider a small open economy with $C = 100 + 0.75(Y - T)$, $T = 200$, $I = 250 - 20r^*$, $G = 300$, $NX = 350 - 0.15Y - 200E$, world rate $r^* = 5$ (percent), price level $\bar{P} = 1$, nominal money supply $M = 350$, and money demand $L(Y, r^*) = 0.25Y - 10r^*$.

1. **Derive IS^* and LM^*:**

$$IS^*: \quad Y = 100 + 0.75(Y - 200) + 250 - 20(5) + 300 + 350 - 0.15Y - 200E$$

$$Y = 750 + 0.60Y - 200E \implies 0.40Y = 750 - 200E \implies Y = 1{,}875 - 500E$$

$$LM^*: \quad 350 = 0.25Y - 10(5) \implies 0.25Y = 400 \implies Y_0^* = 1{,}600$$

2. **Initial equilibrium exchange rate (E_0^*):** Substituting $Y_0^* = 1{,}600$ into IS^* gives $500E_0^* = 1{,}875 - 1{,}600 = 275$, so $E_0^* = 0.55$ USD/AUD.
3. **Fiscal expansion ($\Delta G = +40$ so $G = 340$):** IS^* shifts up to $0.40Y = 790 - 200E \implies Y = 1{,}975 - 500E$.
   - *Under floating E:* LM^* remains at $Y_1^* = 1{,}600$. Exchange rate appreciates to $E_1^* = (1{,}975 - 1{,}600)/500 = 0.75$ USD/AUD, reducing net exports by $200(0.75 - 0.55) = 40$—crowding out ΔG dollar-for-dollar!
   - *Under fixed $\bar{E} = 0.55$:* Output expands to $Y_1^{\text{fixed}} = 1{,}975 - 500(0.55) = 1{,}700$ ($\Delta Y = +100$, multiplier $1/0.40 = 2.5$), requiring RBA reserve accumulation expanding M to $0.25(1{,}700) - 50 = 375$.

Chapter 5: Sovereign Debt Sustainability & $r - g$ Dynamics

5.1 The Dynamic Debt-to-GDP Law of Motion

Following global fiscal responses to the 2008 financial crisis and the 2020 pandemic, evaluating long-run public debt sustainability became a central policy task for national treasuries and credit analysts. Let B_t denote nominal gross government debt at the end of period t, i_t the effective nominal interest rate on public debt, and $PB_t = T_t - G_t$ the **primary fiscal balance** (tax revenue minus non-interest government spending, where $PB_t > 0$ is a primary surplus). The government's flow budget constraint is:

$$B_t = (1 + i_t)B_{t-1} - PB_t$$

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Where: B_t is end-of-period nominal debt; $(1+i_t)B_{t-1}$ is inherited debt plus debt-service interest; and PB_t is the primary budget surplus. Dividing both sides by nominal GDP ($P_tY_t = (1+\pi_t)(1+g_t)P_{t-1}Y_{t-1}$, where g_t is real GDP growth) converts debt into the **debt-to-GDP ratio** $b_t = B_t/(P_tY_t)$ and primary balance into $pb_t = PB_t/(P_tY_t)$. Using the Fisher relation $1+r_t = \frac{1+i_t}{1+\pi_t}$ yields the exact **debt dynamics equation**:

$$b_t = \frac{1+r_t}{1+g_t}b_{t-1} - pb_t \quad \Longrightarrow \quad \Delta b_t = b_t - b_{t-1} = \left(\frac{r_t - g_t}{1+g_t}\right)b_{t-1} - pb_t$$

Where: Δb_t is the annual change in the debt-to-GDP ratio; r_t is the real interest rate on sovereign debt; g_t is real GDP growth; b_{t-1} is the inherited debt-to-GDP ratio; and pb_t is the primary surplus as a share of GDP. Notice that for small r and g, the snowball term $\frac{r-g}{1+g}b_{t-1}$ is closely approximated by $(r-g)b_{t-1}$.

5.2 The $r - g$ Differential and Debt-Stabilising Primary Balance

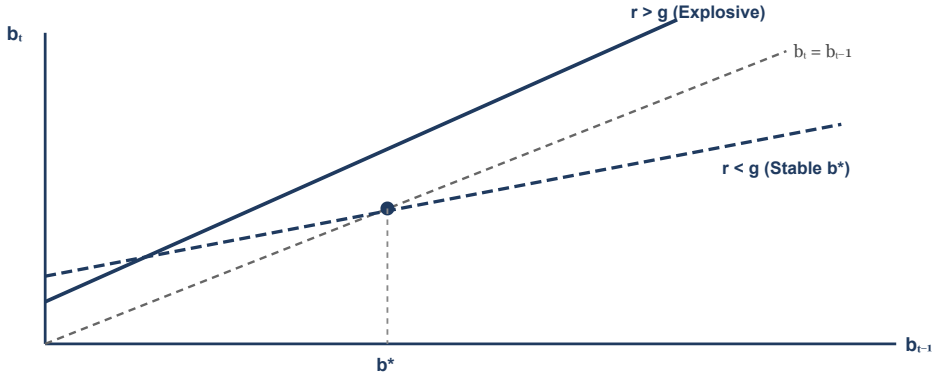
Setting $\Delta b_t = 0$ defines the **debt-stabilising primary balance** (pb^*) required to keep the debt-to-GDP ratio constant:

$$pb^* = \left(\frac{r-g}{1+g}\right)b$$

Where: pb^* is the primary surplus-to-GDP ratio needed to stabilise debt at b. The sign of the **interest-growth differential ($r-g$)** partitions fiscal policy into two sharply different stability regimes:

- **Unfavourable Regime ($r > g$):** Debt compounds faster than the tax base grows (the "snowball effect"). Stabilising debt requires running persistent primary surpluses ($pb^* > 0$); running primary deficits causes b_t to explode exponentially unless fiscal consolidation occurs. Moreover, higher b can raise sovereign default risk premia, pushing r up further in a self-fulfilling fiscal doom loop.
- **Favourable Regime ($r < g$):** Real GDP growth exceeds the real cost of borrowing, so the debt-to-GDP ratio shrinks naturally over time even with balanced primary budgets or modest primary deficits ($pb^* < 0$). However, relying permanently on $r < g$ carries rollover risk: as central banks tighten policy or demographics slow g, $r - g$ can flip back from negative to positive.

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Worked Example 5: Sovereign Debt Trajectory Under $r > g$ vs. $r < g$

Suppose an economy begins with gross public debt $b_0 = 40.0\%$ of GDP and runs a constant primary budget deficit of 1.0% of GDP ($pb = -0.010$).

1. **Scenario A (Low-rate post-GFC regime: $r = 1.5\%, g = 3.0\%$):** Here $r - g = -0.015 < 0$. The debt-stabilising primary balance at $b = 0.40$ is:

$$pb^* = \frac{0.015 - 0.030}{1.030} \times 0.40 = -0.00583 \text{ (or } -0.583\% \text{ of GDP)}$$

   With $pb = -0.010$, Year 1 debt rises slightly to $b_1 = \frac{1.015}{1.030}(0.40) + 0.010 = 0.39417 + 0.010 = 40.42\%$, converging asymptotically to a finite steady state $b^* = \frac{-0.010}{-0.01456} = 68.7\%$ of GDP.

2. **Scenario B (Higher-rate regime: $r = 4.5\%, g = 2.5\%$):** Now $r - g = +0.020 > 0$. Stabilising debt at 40% requires a primary *surplus* of:

$$pb^* = \frac{0.045 - 0.025}{1.025} \times 0.40 = +0.00780 \text{ (or } +0.78\% \text{ of GDP)}$$

   If the government continues running a primary deficit of 1.0% ($pb = -0.010$), debt grows to $b_1 = \frac{1.045}{1.025}(0.40) + 0.010 = 41.78\%$ in Year 1, $b_2 = \frac{1.045}{1.025}(0.4178) + 0.010 = 43.60\%$ in Year 2, and $b_3 = 45.45\%$ in Year 3—expanding along an unstable explosive trajectory unless fiscal consolidation closes the 1.78-percentage-point primary gap.

Chapter 6: Australian External Balance & Macroeconomic Resilience

6.1 The Floating AUD as a Terms-of-Trade Shock Absorber

As a commodity-exporting small open economy, Australia experiences large swings in its **Terms of Trade** ($ToT = P_X/P_M$, the ratio of export prices to import prices). When global demand for iron ore, metallurgical coal, lithium, or LNG surges, Australian export income booms, shifting IS^* rightward and

threatening domestic overheating. Under a floating exchange rate, the AUD appreciates automatically, performing two stabilising functions:

1. **Expenditure Switching:** A higher AUD shifts domestic spending toward cheaper imports and moderates non-resource export demand, preventing severe inflationary booms ("Dutch disease" moderation).
2. **Buffer During Global Downturns:** Conversely, during global crises (such as the 2008 GFC and March 2020 COVID-19 shock), the AUD depreciates sharply as global risk appetite falls, immediately improving the competitiveness of Australian tourism, education, agriculture, and manufacturing exports.

6.2 External Vulnerability and Sovereign Balance Sheet Structure

Unlike emerging-market economies afflicted by "original sin" (borrowing abroad in foreign currency while earning taxes and revenues in local currency), Australia's external liabilities are predominantly denominated in AUD or hedged into AUD via derivatives, while foreign equity holdings share risk directly with overseas investors. Consequently, an AUD depreciation actually *improves* Australia's net international investment position (NIIP) in AUD terms via positive valuation effects on foreign-currency assets held by Australian superannuation funds.

Open-Economy Mechanism	Floating Rate (Australia)	Fixed Rate / Currency Peg
Monetary policy autonomy	Full domestic inflation targeting (RBA)	Surrendered to anchor currency central bank
Fiscal policy output impact (short run)	Dampened by AUD appreciation crowding out NX	Amplified by endogenous monetary expansion
Terms-of-trade / external shock absorption	Exchange rate adjusts rapidly, insulating output	Domestic prices/wages & employment must adjust
FX reserve requirement	Minimal intervention reserves needed	Large FX reserves required to defend peg

In Commonwealth fiscal management, the Charter of Budget Honesty requires medium-term fiscal strategies separating *structural* budget balances from *cyclical* automatic stabilisers (such as progressive income tax receipts and JobSeeker payments). Maintaining moderate net debt ratios and AAA-rated Australian Government Securities keeps sovereign risk premia low, preserving fiscal space to respond to major shocks while keeping $r - g$ favourable over the economic cycle.

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