Aggregate Demand in an Open Economy

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Demand in the Open Economy

- To analyze macroeconomic fluctuations, study how short-run shocks affect three markets.
  - Goods market (output)
  - Money market (money and interest rates)
  - Forex market (exchange rates)

Preliminaries and Assumptions

- 2 countries: home & “rest of the world” (ROW).
  - Home and foreign price levels are fixed.
  - Assume sticky prices in the short run.
  - Government spending G and taxes T are fixed.
  - Foreign (ROW) goods market and money market conditions are fixed and taken as given.
  - GDP is taken to be the equivalent to GNDI.
  - NFIA = NUT = 0, so TB = CA.
Consumption
- Consumption is a function of disposable income:
  \[ C = C(y - T) \]
- Keynesian consumption function.
  - As disposable income rises, consumption increases. Ignores consumption smoothing, but more consistent with actual consumption behavior (credit constraints, uncertainty).
  
Consumption
- Marginal effects
  - Slope of the consumption function is the marginal propensity to consume (MPC), \( 0 < \text{MPC} < 1 \).

Investment
- Firms engage in investment projects only if real return on the project (less depreciation) > cost of borrowing.
  - Firm’s borrowing cost is expected real interest rate:
    \[ r^e = i - \pi^e \]
  - Fixed prices means \( \pi^e = 0 \), so \( r^e = i \).
  - As nominal interest rate rises, expected real interest rate rises, so the volume of projects that are profitable declines and investment declines.
Investment

- Investment demand is therefore:

\[ I = I(i) \]

The Government

- The government budget (federal, state, local):
  - Government collects net taxes, \( T \), and spends government consumption, \( G \), on goods and services.
  - \( G \) does not include government transfer programs, which are deducted from net taxes, and we ignore any difference between government investment and consumption.
  - Government’s tax revenue may not exactly equal its government consumption spending.
  - \( G > T \): Budget deficit; \( G < T \): Budget surplus.
  - \( G \) and \( T \) are assumed to be exogenous.

The Trade Balance

- Higher foreign income \((Y^*)\) increases exports, CA rises.
- Higher domestic income \((Y)\) increases imports, CA falls.
- Expenditure switching:
  - The real exchange rate, \( q \) (or RE) = \((E P^*) / P\).
  - Fixed price levels in home and ROW.
  - \( CA = TB = P Q_x(q) - (E P^*) Q_m(q) \)
  - \( = P \left[ Q_x(q) - q Q_m(1/q) \right] \)
  - (Changes in \( q \) lead to expenditure switching between home and foreign goods and services:
    - \( q↑ \) \( \rightarrow \) foreign goods relatively more expensive
      \( \rightarrow \) home exports and \( \downarrow \) home imports, TB ↑
  - Marshall-Lerner condition assumed, so increased price of imports does not outweigh the change in export and import quantities. We are ignoring short-run J-curve effects.
The Trade Balance

Combining the three factors above (expenditure switching, home disposable income and foreign disposable income):

\[ TB = TB(\frac{E}{P}, Y, Y^e - T^e). \]

Effect of Income on the Trade Balance

Effect of a change in output on trade balance.

- Changes in income affect consumption:
  - \( MPC \) = marginal propensity to consume (all goods).
  - \( MPC_H \) = marginal propensity to consume home goods.
  - \( MPC_F \) = marginal propensity to consume foreign goods.

\[ MPC = MPC_F + MPC_H \]

The terms above divide consumption expenditures into two parts.

- Consumption of home goods.
- Consumption of foreign goods.
The Trade Balance and Real Exchange Rates

- Examine U.S. prices relative to ROW
  - Use real effective exchange rate

\[ \Delta q_{\text{effective}} = \frac{\text{Trade}_1 \Delta q_1}{\text{Trade}_1} + \frac{\text{Trade}_2 \Delta q_2}{\text{Trade}_2} + \ldots + \frac{\text{Trade}_N \Delta q_N}{\text{Trade}_N} \]

- Measures prices in the U.S. relative to a basket of other countries (weighted by U.S. trade with each country).

Trade Balance and Real Exchange Rates

- Real effective exchange rate \( q \) has a positive relationship with the trade balance, as expected.
  - Correlation is not perfect. Why? Other variables, lags, etc.

Supply and Demand

- The total aggregate supply of final goods and services is equal to total output, and (as we have assumed) GDP = Y:
  - Supply = GDP = Y

- The total aggregate demand for goods and services is given by the components defined above:
  - Demand = D = C + I + G + TB

- In a normal supply and demand model, prices (P) adjust to move to equilibrium. In this model, production (and employment) responds to inventory signals, and Supply creates its own Demand (Say’s Law in reverse).
**Keynesian Cross Model**

The economy will end up at point 1 via an adjustment in quantities.
- Point 2: \( Y_2 < Y_1 \rightarrow D > Y \rightarrow \text{inventories decline} \rightarrow \text{firms expand production until} \ D = Y. \)
- Point 3: \( Y_3 > Y_1 \rightarrow D < Y \rightarrow \text{inventories rise} \rightarrow \text{firms decrease production until} \ D = Y. \)

This is a Keynesian short-run model.
- Note: fixed-price assumption is crucial here.
- Employment and production will change according to the demand for goods and services.
- Prices are assumed sticky and cannot adjust to achieve equilibrium.

**Factors that Shift Demand**

Demand shifts up/down when other variables (except \( Y \)) change:

\[
D = C(Y - \bar{Y}) + I(\bar{Y}) + G + TB\left(EP^*/\bar{Y} + \bar{Y} - \bar{Y}^* - \bar{P}^*\right)
\]

Factors that Shift the Demand Curve:

- Fall in taxes \( \bar{Y} \)
- Rise in government spending \( G \)
- Fall in the home interest rate \( i \)
- Rise in the nominal exchange rate \( E \)
- Any shift up in the consumption function \( C \)
- Any shift up in the investment function \( I \)
- Any shift up in the trade balance function \( TB \)

Demand curve \( D \) shifts up:
- Increase in demand \( D \) at a given level of output \( Y \)
Increases in Demand

Equilibrium in Two Markets

- The IS curve shows combinations of output Y and interest rate i such that the goods and forex markets are in equilibrium.
- Bring together what we know of goods market equilibrium (this chapter) and forex market equilibrium.
- The IS curve is plotted with interest rate i on the vertical axis and output Y on the horizontal axis.
  - The goods market shares the same horizontal axis.
  - The forex market shares the interest rate i as its vertical axis.

Forex Market Recap

- Forex equilibrium depends on uncovered interest parity condition.

\[
\frac{i - i^*}{E - E^*} = \frac{E}{E^*} - 1
\]

- Arbitrage
  - Return on domestic deposits equals expected return on foreign deposits (in home currency terms).
  - Forex market equilibrium determines the nominal exchange rate, E given all the other variables.
Deriving the IS Curve

- Initial equilibrium
  - Equilibrium output and interest rate are given from the goods market and forex market.
  - Goods market: the level of output (Y) is where demand and supply are equal in the Keynesian Cross, where D = Y.
  - Forex market: the equilibrium interest rate (i) and exchange rate (E) insure the UIP condition is met, where DR = FR.
- This combination of i and Y must be a point on the IS curve. Call this point 1.

A fall in the interest rate (i) increases both Y (through I and C) and E.

Two distinct effects on goods and forex markets

- Channel 1: ↓i → ↑i(i) → ↑D → ↑Y
- Channel 2: ↓i → ↓DR → ↑E → ↑TB → ↑D → ↑Y
- Negative relationship between i and Y in goods and forex markets implies a downward sloping IS curve

Two channels: investment demand and external demand

- Decrease in interest rate reduces the cost of borrowing, so more investment projects are profitable.
- Expenditure switching: a decrease in the interest rate leads to a depreciation in the home currency, and a real depreciation, increasing the trade balance.
Factors that Shift the IS Curve

- **Position of IS curve depends on many factors**

\[ IS = IS(G, T, r^*, E^*, P^*, P) \]

Factors that Shift the IS Curve

- **Exogenous increase in demand.**

Summing Up the IS Curve

- **IS curve is downward sloping**
  - A decrease in the interest rate leads to an increase in investment demand and the trade balance.
  - This increases the demand for goods and therefore output, in the short run.
- **Shifts in the IS curve are driven by shifts in demand for a given level of the home interest rate.**
  - Many potential sources of demand shifts.
The LM curve

- This shows combinations of output and the nominal interest rate such that the money market is in equilibrium.

\[ \frac{M}{P} = L(Y) \]

- Real money demand (MD) varies inversely with the nominal interest rate, so the demand for real money balances is downward sloping.
- Real money supply (MS) is fixed, with the price level fixed and the supply of money chosen by the central bank.

Deriving the LM Curve

- The money market and the LM diagram share a vertical axis (the interest rate).

- Example: Increase in output.
  - When output increases, money demand increases.
  - MD shifts to the right, MS fixed.
  - The interest rate rises.
  - Hence, we observe a positive relationship between the interest rate and output in the money market.
  - This implies the LM curve is upward sloping.

Increased Output in the LM

- Diagram showing the money market and the LM diagram with increased output.
Increase in Money Supply

Factors that Shift the LM Curve

- LM curve can be expressed as:

\[ LM = LM(M/P) \]

Factors That Shift the LM Curve

- Increase in supply of money
- Any shift left in the money demand function
- Decrease in equilibrium home interest rate
- At a given level of output

Short-Run IS-LM-FX Model of an Open Economy

- Combine the IS-LM diagram with the forex market diagram:
Macroeconomic Policies in the Short Run

- Two policy actions
  - **Monetary policy**: central bank changes in the money supply.
  - **Fiscal policy**: government changes in taxes and government spending.
- The effects of these policies depend critically on the nation’s exchange rate regime.

Macroeconomic Policies in the Short Run

- Assumptions
  - Economy begins at long-run equilibrium.
  - Sticky prices at home and abroad.
  - Either a floating or fixed exchange rate regime.
- Temporary Policies, Unchanged Expectations
  - To examine temporary shocks to the economy, we assume investors do not change exchange rate expectations (a nominal anchor).
  - Simplifies the study how temporary policies (designed to affect output in the short run) affect the economy.

Short-Run IS-LM-FX Model of Open Economy

- Monetary Policy under Floating Rates
  - Monetary expansion: ↑M/P → LM shifts down → ↓i
    - Direct effects
      - ↓i → ↑Y
      - ↓i → ↑E → ↑TB → ↑Y
    - Indirect effects
      - ↑Y → ↑C
      - ↑Y → ↑M → ↑TB
    - We typically expect net ↑TB if MPC, small
  - A monetary expansion leads to an exchange rate depreciation and a decrease in the interest rate – both of these imply an increase in output.
Monetary Expansion, Floating Rates

- Money market adjusts instantaneously. Goods and services market responds with a long lag.
- A shift in the LM curve is up or down: interest rates are determined by the LM for any given Y, and so i can overshoot.
- A shift in the IS curve is left or right: Y will slowly adjust, and the economy slides along the LM curve until it reaches the new ISLM equilibrium.
- Forex market also adjust instantaneously, so E can overshoot.

Timing and Overshooting

- Money market adjusts instantaneously. Goods and services market responds with a long lag.
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Monetary Policy under Fixed Rates

- Consider possible monetary changes.
  - Monetary expansion: ↑M/P → LM shifts down → LM must shift back to keep the exchange rate fixed.
  - Monetary contraction: same basic result.
- If committed to a fixed exchange rate regime, central bank cannot change real money supply.
  - Changing the real money supply affects the interest rate, and therefore exchange rate through affecting the return on domestic deposits.
  - Therefore, a fixed exchange rate regime implies that autonomous monetary policy is not an option.
Monetary Policy under Fixed Rates

Fiscal Policy under Floating Rates

- Fiscal expansion: $G \rightarrow IS$ shifts right
  - Direct effect
    - $G \rightarrow Y$
    - $G \rightarrow i$
  - Indirect effects
    - $Y \rightarrow C$
    - $Y \rightarrow IM \rightarrow TB$
    - $i \rightarrow I$
    - $i \rightarrow E \rightarrow TB$
  - A fiscal expansion leads to crowding out because it leads to an increase in the interest rate.
  - Investment demand decreases.
  - Appreciation, decreasing trade balance.

Fiscal Expansion, Floating Rates
Fiscal Policy under Fixed Rates

- Mechanics of a fixed exchange rate regime.
  - Real money supply must adjust to keep the E fixed.
  - This implies that any fiscal policy action will require a central bank action, shifting the LM curve.

- Fiscal expansion: ↑G → IS shifts right → LM must shift down to keep i and E unchanged.
  - Effects
    - ↑G → ↑Y.
    - ↑M/P → i and E unchanged.
  - Notice, in this case, a fiscal expansion does not lead to crowding out.

Fiscal Expansion, Fixed Rates

Summary

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The Rise and Fall of the Dollar in the 1980s

Policy actions circa 1980
- At the same time, the Reagan administration implemented a fiscal expansion through a combination of tax cuts and increases in government spending. IS curve shifts right.
- U.S. suffered recessions 1980 and 1981–82, suggesting monetary contraction had a larger/earlier effect than the fiscal expansion.

The Dollar in the 1980s

Model predictions
- Increase in nominal interest rate.
- Appreciation in the U.S. Dollar.
- Decrease in investment and the trade balance.

Data
- Interest rates rose significantly.
- Roughly 25% real appreciation in U.S. Dollar.
- Investment declines from 19% to 16% of GDP.
- Trade balance declines from -1% to -3% of GDP (with a lag).
Stabilization Policy

- **Stabilization policy** refers to monetary and fiscal policies designed to keep output at (or near) its full employment level.
  - In theory, if the economy experiences an adverse shock, policymakers can react against it.
  - Fiscal policy can increase demand through shifting the IS curve to the right, or,
  - Monetary policy can expand the money supply, shifting the LM curve to the right.
- In practice, stabilization policy can be challenging.
  - Mistimed or inappropriate policies can create instability.

Australia, New Zealand, and the Asian Crisis of 1997

- Australia and New Zealand rely on export demand from East Asian economies.
  - In 1997, the East Asian economic crisis lead to a recession in these countries, reducing demand for exports from Australia and New Zealand.
  - Model: a decrease in foreign output $Y^*$ leads to a decrease in the home country’s trade balance (through decreasing exports).
  - This would lead to an economic contraction in Australia and New Zealand, all else equal.
Australia, New Zealand, and the Asian Crisis of 1997

- Central banks in both Australia and N.Z. expanded real money supply, shifting LM curve right, reducing interest rates.

- Model: net effect of decrease in export demand and monetary expansion is as follows:
  - Little or no change in output.
  - Decrease in nominal interest rate—investment increases.
  - Increase in exchange rate—ambiguous effect on the trade balance because decrease in foreign income reduces exports while depreciation increases exports.

![Graph showing monetary policies and exchange rates during the Asian Crisis of 1997]
Problems in Policy Design & Implementation

- Policy Constraints
  - Policy makers may not have the freedom to implement stabilization policies.
  - The effects of policy are never precisely known, and may be variable or even asymmetric.
  - Policy affects different groups in different ways.
  - Nominal interest rates have a zero lower bound.
  - Fixed exchange rates or other “rules” for policy may limit their ability to respond.

Incomplete Information and Lags

- Model assumes policy makers observe state of the economy in real time.
  - In practice, they observe data with a lag.
  - The lag between the timing of the shock and the policy action is known as an inside lag.
  - The lag between the policy action and the intended effect is known as an outside lag.
- Institutional and political factors severely limit the timely implementation of fiscal policy (e.g., the ARRA stimulus).
- Monetary policy may take 6-12 months to have an effect. In a recession, it can be like pushing on a rope.

Long-Horizon Plans

- If households/businesses plan over long horizons, they may be less responsive to short-run changes in $i$ or $E$.
  - Example: a business borrows to finance capital expansion
    - Business is likely borrow over a long period of time.
    - Slightly higher/lower interest rates today may be unsuccessful in deterring/encouraging this investment decision, since the business knows that the changes in interest rates are only temporary.
Links from the Nominal Exchange Rate

- Model assumes changes in nominal exchange rates translate into changes in real exchange rate.
  - In practice, limited pass-through from nominal to real exchange rates, dollarization of trade, distribution margins may weaken this link.
- Unilaterally Pegged Currency Blocs: some countries use fixed/managed exchange rates in a way that limits the base country from boosting export demand through a real effective depreciation.
  - E.g. an Asian bloc of countries pegs to the U.S., and this limits the U.S.' ability to increase external demand through a depreciation in the dollar.