Macroeconomics A: Review Session X

Overview of the Semester

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Overview

- Economics does not rely on one model
- Different models for different situations
- What we have seen in class this semester are the basic building blocks of closed economy macro
- Four major themes:
  - Monetary policy
  - Household saving, capital accumulation, and growth
  - Government deficits and debt
  - Banking and financial stability
- I cover bank runs today, I do not include search and match and efficiency wages (not on the exam)

IS-LM

- Establishes a relationship between inflation, output, and interest rates
- Now often called IS-TR where ‘TR’ refers to the Taylor Rule
- IS-TR relates the interest rate and output
  - The IS-TR equilibrium shifts with inflation
  - This set of equilibria gives the AD curve
- We assume that AS is either fixed (LRAS) or moves temporarily (SRAS) with adaptive inflation expectations

Optimal Monetary Policy

- We assign a loss function to the central bank, which it seeks to minimize
  - In the example from class, we use quadratic loss
- Three ways to conduct policy
  - Discretion: the central bank does whatever it wants
  - Strict commitment: the central bank commits to a value of π
  - Flexible commitment: the central bank commits to a rule giving π as a function of the shock *e*
- Compare outcomes (i.e. loss) given different volatility of shocks

Solow Growth Model

- Explains economic growth through capital accumulation
- The rate of saving is exogenous
- Output is an increasing function of capital
- Steady state capital is where saving = headwinds
- Golden rule: saving equals the capital share of production (αY_t)
  - This maximizes consumption

Ramsey Model

- Similar to Solow model, except saving rate is endogenous
- Households save because they want to maximize intertemporal utility
  - Basic intuition: I save today to consume more tomorrow
- Households adjust their saving based on the interest rate
  - When the interest rate is high, they want to save more
- The interest rate is set by the marginal product of capital
  - When capital is low, MPK is high
  - This implies a high interest rate and saving
- Equilibrium capital can fall below the Golden rule

Real Business Cycles

- While Solow and Ramsey address long-term dynamics, RBC looks at the short-term and how exogenous shocks affect behavior
- Households solve intertemporal utility accounting for different states of nature, i.e. the probability of shocks
  - We also introduce a trade-off between consumption and work
- In the end, interest rate still governs the rate of saving (Euler equation)
- To solve the system, we log-linearize, solve for an exogenous shock

New Keynesian Model

- Basic intuitions follow IS-LM model
  - Three basic relations: IS, TR, and New Keynesian Phillips Curve
  - NKPC = relation between output and inflation
- Some elements are also similar to RBC
- Several elaborations:
  - Firms set prices above marginal costs (imperfect competition)
  - Pricing frictions (nominal rigidites) mean that firms cannot set their price in every period
  - We have to solve for the optimal reset price
  - Central bank stabilizes change in prices by adjusting interest rate
  - This adjusts the marginal costs for firms; offsets shocks

Cagan Model

- Gives relation between money demand and inflation
- Basic intuition: as monetary base grows, inflation increases
- As money grows quickly, households want to hold smaller real balances
- Low inflation increases demand for money
- Simple model, but there are more elaborate ways to do this
  - Money in the utility (MIU)
  - Cash in advance (CIA)

Overlapping Generations

- Long-term model with endogenous saving
- While agents in Ramsey, RBC, and NK models have infinite horizon, agents in OLG models optimize over finite lifespans
- Households are target savers – they want a certain level of saving irrespective of interest rates
  - This leads to a different steady state capital
  - Asset creation becomes important and government debt can play a role
  - If there are insufficient assets, interest rates fall and ZLB binds
  - If interest rates are at zero, asset bubbles may occur

Debt Sustainability

- It may be optimal for governments to issue some amount of debt, but how much?
- We can develop a simple framework to assess whether debt grows relative to GDP (a proxy for ability to repay)
- Easiest to assume constant growth and interest rates

$$b_{t+k} = \sum_{s=0}^{k-1} \left(1 + \frac{i-g}{1+g}\right)^s \frac{d_{t+s}^{prim}}{1+g} + \left(1 + \frac{i-g}{1+g}\right)^k b_t \quad \text{for} \quad k > 0$$

- Debt must be paid off in the future
- Last term converges to 0 iff $i < g$

Debt Sustainability: Derivation

- Rearranging the expression on slide 29 from class 10 (making i and g constant)

$$b_{t+1} = \frac{d_t^{prim}}{1+g} + \left(1 + \frac{i-g}{1+g}\right) b_t$$

- Iterating forward

$$b_{t+2} = \frac{d_{t+1}^{prim}}{1+g} + \left(1 + \frac{i-g}{1+g}\right)\left(\frac{d_t^{prim}}{1+g} + \left(1 + \frac{i-g}{1+g}\right) b_t\right)$$

$$b_{t+k} = \sum_{s=0}^{k-1} \left(1 + \frac{i-g}{1+g}\right)^{k-s-1} \frac{d_{t+s}^{prim}}{1+g} + \left(1 + \frac{i-g}{1+g}\right)^{k} b_t \quad \text{for} \quad k > 0$$

- Clear that if $i > g$, the last term explodes as $k \to \infty$

Financial Accelerator

- There are frictions between entrepreneurs (who borrow capital) and banks (who lend capital)
- Projects are risky and may succeed or fail
- Entrepreneurs have an incentive to lie about their projects and not repay banks
- Therefore, banks have to audit projects make sure incentives align
- Audit is expensive, consumes capital
  - One application: link ability to borrow to net worth of entrepreneurs (collateral)
  - Positive productivity shock raises net worth, lowers monitoring cost
  - Leads to persistent increase in investment