Recall from last lecture

- Economy $\Leftrightarrow$ resource allocation problem $\Leftrightarrow$ primitives
- where primitives $=$
  - preferences
  - technology
  - endowments
- This lecture: economy $=$ growth model
- Next slide: complete description of economy in terms of primitives

Growth Model: Setup

- **Preferences:** a single household with preferences defined by

$$\sum_{t=0}^{\infty} \beta^t u(c_t, 1 - h_t)$$

with $u : \mathbb{R}_+ \times [0, 1] \to \mathbb{R}$

- **Technology:**

$$\begin{aligned} y_t &= F(k_t, h_t), \quad F : \mathbb{R}_+ \times \mathbb{R}_+ \to \mathbb{R}_+ \\ c_t + i_t &= y_t \\ k_{t+1} &= i_t + (1 - \delta)k_t \\ c_t &\geq 0, \quad i_t \geq -(1 - \delta)k_t \end{aligned}$$

- **Endowments:**
  - 1 unit of time each period
  - $\hat{k}_0$ units of capital at time 0

Assumptions

- **Preferences:** $0 < \beta < 1$ and u is
  - strictly increasing
  - strictly concave
  - C^2 (twice continuously differentiable)
- **Technology:** $0 < \delta \leq 1$ and F is
  - constant returns to scale
  - strictly increasing
  - weakly concance in (k, h) jointly, strictly concave in each argument individually
  - $F(0, h) = 0$ for all h.
  - C^2
  - ("Inada conditions")

$$\lim_{k \to 0} F_k(k, h) = \infty, \quad \forall h > 0,$$
$$\lim_{k \to \infty} F_k(k, h) = 0, \quad \forall h > 0,$$

Comments

- **Tradeoffs** in the model
  - consumption today c_t vs. consumption tomorrow c_{t+1}
  - consumption c_t vs. leisure $1 - h_t$
- Model assumes **"representative household"** and **"representative firm"** (jointly = "representative agent")
- When is this justified? If at least one of following 3 conditions are satisfied
  1. all individuals in economy are identical
  2. particular assumptions on preferences ("homotheticity", "Gorman aggregation")
  3. perfect markets
     - representative firm $\Leftrightarrow$ perfect factor markets (capital, labor), equalize marginal products
     - representative HH $\Leftrightarrow$ perfect insurance markets, equalize marginal utilities
- Do we believe these conditions are satisfied? **No**, but...

General Comment: Modeling in (Macro)economics

- Objective is **not** to build one big model that we use to address all issues
  - descriptive realism is not the objective
  - instead make modeling choices that are dependent on the issue
  - whether a model is "good" is context dependent
- Approach to modeling in macro(economics) well summarized by following two statements
  - "All models are false; some are useful"
  - "If you want a model of the real world, look out the window" (kidding, but only half kidding)

General Comment: Modeling in (Macro)economics

- But: growth model is **"the"** benchmark model of macro
- Why is this the benchmark model?
  - minimal model of y where $y = F(k, h)$
- Also, growth model = great laboratory for teaching you tools of macro...
- ... and many other models in macroeconomics build on growth model. Examples:
  - Real business cycle (RBC) model = growth model with aggregate productivity shocks
  - New Keynesian model = RBC model + sticky prices
  - Incomplete markets model (Aiyagari-Bewley-Huggett) = growth model + heterogeneity in form of uninsurable idiosyncratic shocks

What issues is growth model useful for?

- Growth model is designed to be model of capital accumulation process
- Growth model is **not** a "good" model of
  - growth (somewhat ironically given its name)
  - income and wealth distribution (given rep. agent assumption)
  - inflation and monetary policy
  - unemployment
  - financial crises
- But some of growth model's extensions (e.g. those mentioned on previous slide) are "good" models of these issues

Some Concepts

- **Definition:** A **feasible allocation** for the growth model is a list of sequences $\{c_t, h_t, k_t\}$ such that

$$c_t + k_{t+1} = F(k_t, h_t) + (1 - \delta)k_t$$

$$0 \leq h_t \leq 1, \quad c_t \geq 0, \quad k_t \geq 0, \quad k_0 = \hat{k}_0$$