

Primitives of an Economy

1. Time
 - Static
 - Dynamic
 - Continuous: $t \in [0, T]$
 - Discrete: $t \in \mathbb{Z}$
2. Agents:
 - Households
 - Firms
 - Government
 - Fiscal authority
 - Monetary authority
3. Commodity set
 - Inputs and outputs: Commonly restricted to \mathbb{R}^+
4. Market structure
5. Preferences
6. Budget constraint
7. Time constraint
8. Production technology
9. Government budget constraint

Static Economy

1. Time: static
2. Agents
3. Commodity set - Two goods:
 - Input: labor services h
 - Output - Final good - Consumption:
 - Private c
 - Public g
4. Markets
 1. Final good market
 2. Labor market
5. Time constraint $h + l = 1$
 - Time allocated to work $= \frac{8*5*50}{16*365} = \frac{1}{3}$
6. Preferences
 - Utility function $u(c, l, g) = U(c, l) + V(g)$ meets the following properties:
 1. Monotonicity: First derivative is positive
 2. Concavity: Second derivative is negative (decreasing marginal utility)
 - Preferences only defined on the monotonically increasing range and are concave down on that region.
 - Indifference curves
 - Marginal rate of substitution = slope of indifference curve
 - MRS higher on the indifference curve is higher (slope of indifference curve is negative convex up)
 - Preferences are convex
 - Preference for variety: a convex combination of two points on an indifference curve is strictly preferred to those points.
 - Inada Conditions: avoid corner cases / ensure global optimum is always a local optimum
 - $\lim_{c \rightarrow 0} U_c = \infty$
 - $\lim_{l \rightarrow \infty} U_l = \infty$
7. Budget constraint
 - In dollar terms, with price p , quantity c , nominal wage w , dividend d , lump sum tax t :
 $pc \leq w^N h + d^N - t^N$ where N tags as nominal.
 - In real terms, with numeraire of economy c , then other variables in terms of c : $c \leq wh + d - t$
 where $h = 1 - l$
 - Shown with budget constraint as non-axis boundary of budget set, and wage is the price of leisure, illustrated by $c + wl \leq w + d - t$
8. Production Technology
 - Total factor productivity z , labor m , capital k : $y = zf(k, m)$
 - Properties of f
 1. Monotonicity: marginal product of labor $f_m > 0$, marginal product of capital $f_k > 0$
 2. Concavity: decreasing marginal returns
 - Two inputs are complementary if $f_{mk} \geq 0$
 3. Linearity: constant returns to scale
 - Increasing returns to scale is $f(\alpha k, \alpha m) > \alpha f(k, m)$
 - Common f :
 - Cobb-Douglas: $y = zk^\alpha m^{1-\alpha}$ for $\alpha \in (0, 1)$
 - Constant Elasticity of Substitution subsumes Cobb-Douglas when $\gamma = 0$:
 $y = z[\alpha k^\gamma (1 - \alpha)m^\gamma]^{\frac{1}{\gamma}}$ for $\gamma \in (-\infty, 1), \alpha \in (0, 1)$
9. Government
 - Government budget constraint $g = t$ where spending g is a parameter.