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 $= \frac{8 \cdot 5 \cdot 50}{16 \cdot 365} = \frac{1}{3}$
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 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
        - $\lim_{c \to 0} U_c = \infty$
        - $\lim_{l \to \infty} U_l = \infty$
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: $y = zf(k, m)$
    - Propreties 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 $\gamma = 0$: $y = z \left[\alpha k^\gamma (1 - \alpha) m^\gamma\right]^{\frac{1}{\gamma}}$ for $\gamma \in (-\infty, 1), \alpha \in (0, 1)$
9. Government
    - Government budget constraint $g = t$ where spending g is a parameter.