

Final Exam

1. Macroeconomic Accounting (20 points)

Consider the following data for our idealized economy with two goods: apples and bananas.

		2014	
		Quantities	Prices
Apples		3	\$4
Bananas		2	\$6
		2015	
		Quantities	Prices
Apples		3	\$5
Bananas		4	\$3

- (a) Using the chain weighting method, compute the real GDP growth rate (in %) from 2014 to 2015.
- (b) Let 2014 be the base year for CPI. Using the consumer price index (CPI) as the price index, compute the inflation rate (in %) from 2014 to 2015.

2. Microfoundations (20 points)

Consider an economy with two households and two commodities. The utility function for household 1 is:

$$\alpha_1^1 u^1(x_1^1) + \alpha_2^1 u^1(x_2^1) = \frac{1}{3} \ln(x_1^1) + \frac{2}{3} \ln(x_2^1). \quad (1)$$

The utility function for household 2 is

$$\alpha_1^2 u^2(x_1^2) + \alpha_2^2 u^2(x_2^2) = \frac{2}{3} \ln(x_1^2) + \frac{1}{3} \ln(x_2^2). \quad (2)$$

The household endowments are $(e_1^1, e_2^1) = (1, 3)$ and $(e_1^2, e_2^2) = (1, 1)$.

Solve for the equilibrium price ratio and the equilibrium allocation of the two commodities between the two households.

3. Real Business Cycle Model (30 points)

Consider a variation of the stochastic growth model with a labor income tax. There is only one tax, which is the labor income tax and the rate of the labor income tax is τ . The Bellman equation for this model is given as follows:

$$V(k, y) = \max_{c \geq 0, k' \geq 0, n \geq 0} u(c, n) + \beta \sum_{y' \in Y} \pi(y, y') V(k', y') \quad . \quad (3)$$

subject to $c + k' = Rk + wn(1 - \tau) + T$

Recall $y = (z, \tau)$ is a vector of both the productivity shock z and the tax rate τ . The government market clearing condition (budget balance) requires that $T = \tau wn$. Assume $u(c, n) = \ln(c) - \gamma n$ for some parameter $\gamma > 0$ and $f(k, n, z) = zk^\theta n^{1-\theta}$ for some $\theta \in (0, 1)$. Solve for the equilibrium policy function (also called the capital investment function), consumption function, and labor supply function.

4. Leverage Cycle Model (30 points)

Consider a 2-period leverage cycle model with one asset and one commodity. In the second period, two possible states can occur (Good and Bad). The payout of the asset in the Good state is 1 and the payout of the asset in the Bad state is 0.25. The initial endowment of the commodity equals 1 for all households. The initial endowment of the asset equals 1 for all households. There exists a unit mass of households in the economy. The household beliefs are uniformly distributed in the set $[0.2, 0.8]$, where household h believes the Good state occurs with probability h and the Bad state occurs with probability $1 - h$.

Allow the households to borrow, where borrowing is secured with collateral.

- (a) Solve for the equilibrium price of the asset in the initial period.
- (b) Solve for the equilibrium leverage in the economy.