Monetary competitive equilibrium

- Using the budget constraint and the indifference curves, we can find the competitive monetary equilibrium.

- Stationary equilibria may not be the only monetary equilibria, there may be more complicated non-stationary equilibria.

- The quantity theory of money in its simplest version predicts that the price level is exactly proportional to the stock of money in the economy,

- In our model this theory is supported since:

\[ p_t = \frac{1}{v_t} = \frac{M}{N(y - c_1)}. \]
Neutrality

- In this stationary equilibrium the nominal size of the stock of money has no effect on the real values of consumption or money demand. This property is known as the **neutrality of money**.

- Note that the introduction of valued fiat money improves the individual’s utility (compared to autarky) even though fiat money is intrinsically worthless.

- This happens because fiat money allows people to acquire market goods (second period consumption) they otherwise would not be able to.

- With constant population and a constant money stock, the budget constraint is the same as the central planner’s feasible set, therefore this **stationary competitive equilibrium allocation** coincides with the golden rule allocation.
Equilibrium and the golden rule

- The monetary competitive equilibrium does not always attain the golden rule, as the budget set and the feasible set may differ under some circumstances we will study later.

- In short, a stationary allocation in a monetary competitive equilibrium:
  - provides the maximum utility given the individual’s budget set;
  - lies on the feasible set line.

- In this case, a fixed value of money ($v_t = v$) led to an equilibrium that maximized the welfare of the future generations. Is this also the case if $v_t$ varies over time?
An expanding economy

- Consider the case of an economy that grows over time: its population increases at a constant rate $n > 0$. In this case, in any period $t$, $N_t = nN_{t-1}$.

- The amount of consumption good available in the economy, $N_t y$, is also growing at the same rate as population, $n$.

- The constraint describing feasible, stationary allocations is still:

$$N_t c_1 + N_{t-1} c_2 \leq N_t y.$$

- This is the same as:

$$c_1 + \left(\frac{1}{n}\right) c_2 \leq y.$$
An expanding economy

- We will now determine the monetary stationary equilibrium in the case of a growing population.

- Market clearing, implies, as before:

  \[ v_t = \frac{N_t(y - c_1)}{M_t} \text{ and } v_{t+1} = \frac{N_{t+1}(y - c_1)}{M_{t+1}}. \]

- The rate of return on money equals the rate of population growth:

  \[ \frac{v_{t+1}}{v_t} = \frac{\frac{N_{t+1}(y - c_1)}{M_{t+1}}}{\frac{N_t(y - c_1)}{M_t}} = \frac{N_{t+1}M_t}{N_tM_{t+1}} = \frac{N_{t+1}}{N_t} = n. \]

- If the rate of population growth is positive, the value of money is increasing over time and the price of consumption is decreasing over time.
An expanding economy

- The individual’s budget constraint is:

\[ c_1 + \left( \frac{v_t}{v_{t+1}} \right) c_2 \leq y. \]

- In this case of a growing population we get \( \frac{v_t}{v_{t+1}} = \frac{1}{n} \). Replacing this in the budget constraint above yields:

\[ c_1 + \left( \frac{1}{n} \right) c_2 \leq y. \]

- Again, the budget constraint coincides with the feasible set, meaning the monetary stationary equilibrium is optimal, it attains the golden rule allocation.

- This analysis also applies to a shrinking economy, where \( n < 1 \).
The competitive monetary equilibrium

\[ (v_{t+1}/v_t) \cdot y \]
Stationary monetary equilibrium attains golden rule.

Diagram showing the relationship between $c_1$ and $c_2$ with equilibrium points labeled $c_1^m$ and $c_2^m$. The curve representing the stationary monetary equilibrium is shown, intersecting with the line $y$. The golden rule is indicated by the equilibrium point.
Budget constraint in an expanding economy

Slope = -n
An expanding economy

Golden rule allocation

c_{1}^{gr}

ny