

$$i_{nl} = \frac{\sum_{z=1}^z \mathbf{E}i_t}{n} + \rho.$$

$$i_{nl} = \frac{\sum_{z=1}^z \mathbf{E}(r_t + \pi_t)}{n} + \rho.$$

Goods, Bond, and Money Markets.

$$\frac{M^d}{P} = L(i, Y)$$

$$M^d = PL(i, Y)$$

Ignore inflation

$$M^d = PL(r, Y)$$

$$\bar{M} = PL(r, Y)$$

With flexible prices, a doubling of  $M$  induces doubling of  $P$ .

Intuition (helicopter drop). New Keynesian model gives rationale for this relationship.

Suppose fed rate is  $i^*$ . Then, by arbitrage, 2 night rate is

$$(1 + i_2)(i + i_2) = (i + i^*)(1 + i^*)$$

Clearly  $i_2 = i^*$ . So FED has a lot of control over short-run rates.

In ten years time, though, the best guess of  $i^*$  is  $r + \pi$ , where  $r$  is the natural rate and  $\pi$  the inflation target. (See this from Taylor rule below.)

$$i^* = r_n + \pi + .5(\pi - \pi^*) + .5(y - y^*)$$

$$\frac{\partial i^*}{\partial \pi} = 1.5$$

Taylor principle; e.g. if  $i = 3$  and inflation rises from 0 to 1, then cet par real rate falls from 3 to 2. In response raise nominal rate by more than 1, by 1.5. So fed raises rates to 4.5, raising real rates.

$$r^* = r_n + .5(\pi - \pi^*) + .5(y - y^*)$$

Interest Rate Smoothing

Uncertainty/Asset prices/Euro

Inflation Target: Deflation/Labour Mkts/Real Int Rates and Zero Bound.

Note: objective is real long-run rates

Affect long rates indirectly via expectations theory

## Transmission Mechanisms

1. Interest rate channel
2. Asset prices :  $P = \sum \frac{D_t}{(1+r_t+\rho)^t}$ ; Wealth effects
3. Tobin's Q
4. When asset prices rise, households have more liquid wealth, so they may buy more illiquid assets (like cars)
5. Exchange rate
6. Credit/lending channel for households/banks.

(balance sheet effects/financial accelerator)

7. As price rises, real value of debt falls, improving debtors balance sheets.

## Issues in Monetary Policy

- Nominal anchor (fixed exchange rates/inflation targeting)
- Risk premia and business cycle
- Liquidity trap (krugman/inflationary expectations/svennson)
- $r = i - \pi$ . Inflation falls, rising real rates
- Communication/monetary rules
- Deflation
- Quantitative easing



- Lags (preemptive policy)
- Money multiplier