Lecture notes, Nov 24th, 2020

Q3 in PS5

SDF $\quad m_{t,t+1} = \beta \cdot E_t \frac{u'(c_{t+1})}{u'(c_t)}$

For all possible states tomorrow

compute $\quad m_{\cdot} = \beta \cdot \frac{u'(c_{t+1})}{u'(c_t)}$

$(a_t, y_t) \Rightarrow c_t \Rightarrow a_{t+1}$ $\quad$ enumerate all possible y_{t+1} (in the PS, 3 states)

$$\underbrace{m}_{\text{3 values}} = \beta \cdot \frac{u'[c_{t+1}(a_{t+1}, y_{t+1})]}{u'[c_t(a_t, y_t)]}$$

Assume $\begin{pmatrix} a_t = 3.0 \\ y_t = \text{middle point} \quad 0.25 \end{pmatrix}$

$m_{old} \cdot (1, 2, 3)$

$\Updownarrow$

$m_{new} \cdot (1, 2, 3)$

Firm model

owns capital k

hire labor l at wage w

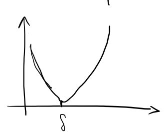
production function $f(k, l)$ $\qquad$ profit $\pi(k)$

$$\pi(k) = \max_{l} f(k, l) - w \cdot l$$

capital accumulation $\quad k' = (1-\delta)k + i$

Bellman Eq. $\quad V(k) = \max_{k'} \{ \pi(k) - \underbrace{[k' - (1-\delta)k]}_{\text{investment}} + \beta E V(k') \}$

Necessary condition for Φ



$$V(z, k) = \max_{k'} \{ \pi(z, k) - i - \Phi(\tfrac{i}{k}) \cdot k + \beta E V(z', k') \}$$

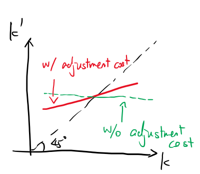
$$\mathcal{L} = V(z, k) - q(k' - (1-\delta)k - i)$$

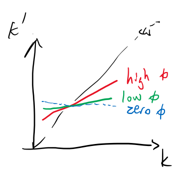
$$\frac{\partial \mathcal{L}}{\partial k'}$$

$$V(z, k) = \max_{i} \{ z \cdot k - i - \Phi(\tfrac{i}{k}) \cdot k + \beta E V(z', k') \}$$

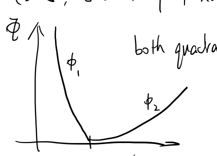
Guess & Verify $\quad \begin{cases} V(z, k) = a \cdot k \\ k'(z, k) = b(z) \cdot k \end{cases}$

$$\Phi'(\tfrac{i}{k}) = c \cdot \frac{i}{k}$$





Lu Zhang (2005, Journal of Finance)



both quadratic, but asymmetric

$\phi_1 \approx 40$

$\phi_2 \approx 2.0$