PS2

Final Draft

1.

(a): removing $e^{g(m)}$

$$W(z) = \sum_{t=1}^{40} 0.99^{12t}\left[\sum_{m=1}^{12}\beta^{m-1}\frac{(e^{-0.2/2}\cdot u\cdot e^{-0.2/2}\cdot \varepsilon_t)^{1-\eta}}{1-\eta}\right]$$

If $\eta=1$ $u(c)=\ln C$

$$W(z)=\sum_{t=1}^{40} 0.99^{12t}\left[\sum_{m=1}^{12}\beta^{m-1}(-0.2+\ln u+\ln\varepsilon_t)\right]$$

$\ln u \sim N(0,0.2)$ $\ln\varepsilon_t \sim N(0,0.2)$

$$\therefore W(z) = \sum_{t=1}^{40} 0.99^{12t}\left[\sum_{m=1}^{12}\beta^{m-1}(-0.2)\right]$$

$\triangle$ (将展开所有项，最后归得所有 $\ln u$ 的均值为 0)

(b). $$W(z)=\sum_{t=1}^{40}\beta^{12t}\left[\sum_{m=1}^{12}\beta^{m-1}(\ln(e^{-\frac{\sigma_u^2}{2}}\cdot u\cdot e^{g(m)}))\right]$$

$$=\sum_{t=1}^{40}\beta^{12t}\left[\sum_{m=1}^{12}\beta^{m-1}(-0.1+g(m))\right]$$

(d): $\eta=2$. removing $e^{g(m)}$

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(a):

$u(C_{m,t}) = -C_{m,t}^{-1}$

$u(C_{m,t}) = -(e^{-\frac{\sigma_u^2}{2}}\cdot u\cdot e^{-\frac{\sigma_\varepsilon^2}{2}}\cdot\varepsilon_t)^{-1}$

$\triangle$ ($e^{-\frac{\sigma_u^2}{2}}u$ expectation $=1$, $e^{-\frac{\sigma_\varepsilon^2}{2}}\cdot\varepsilon_t$ - expectation $=1$)

$C_{m,t}=-1$

$$W(z)=\sum_{t=1}^{40}\beta^{12t}\left[\sum_{m=1}^{12}\beta^{m-1}(-1)\right]$$

· $\eta=4$ removing $e^{g(m)}$

$u(C_{m,t}) = \dfrac{C_{m,t}^{-3}}{-3} = -\dfrac{1}{3}C_{m,t}^{-3}$

$C_{m,t}=-1$

$$u(-1) = -\frac{1}{3}(-1)^{-3} = \frac{1}{3}$$

$$W(Z) = \sum_{t=1}^{40} \beta^{12t} \left[\sum_{m=1}^{12} \beta^{m-1} \left(\frac{1}{3}\right) \right]$$

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· $\eta = 2$ removing $e^{-\frac{\sigma_\varepsilon^2}{2}} \cdot \varepsilon_t$

$$C_{m,t} = Z \cdot e^{g(m)}$$

$\triangle$ $(E[Z] = 1)$

X $u(C_{m,t}) = -\frac{1}{3}\left(e^{g(m)}\right)^{-3}$

X $W(Z) = \sum_{t=1}^{40} \beta^{12t} \left[\sum_{m=1}^{12} \beta^{m-1} \left(-\frac{1}{3} \cdot e^{g(m)} \right)^{-3} \right]$

·· $\eta = 4$

2 (a). removing seasonal component: same with 1(a)

(b). removing nonseasonal component:

$$C_{m,t} = Z\left(e^{g(m)} \cdot e^{-\frac{\sigma_\varepsilon^2}{2}} \varepsilon_t\right)$$

$$= e^{-\frac{\sigma_u^2}{2}} \cdot u \cdot \left(e^{g(m)} \cdot e^{-\frac{\sigma_m^2}{2}} \cdot \varepsilon_m\right)$$

· $\eta = 1$

$$u(C_{m,t}) = \ln(C_{m,t}) = \ln\left(e^{-\frac{\sigma_u^2}{2}} \cdot u \cdot e^{g(m)} e^{-\frac{\sigma_m^2}{2}} \cdot \varepsilon_m\right)$$

$$= -\frac{\sigma_u^2}{2} + \ln u + g(m) - \frac{\sigma_m^2}{2} + \ln \varepsilon_m$$

$$= -0.1 + 0 + g(m) - \frac{1}{2} \cdot (\sigma_m^2) + 0$$

$$W(Z) = \sum_{t=1}^{40} \beta^{12t} \left[\sum_{t=1}^{12} \beta^{m-1} \left(-0.1 + g(m) - \frac{1}{2}(\sigma_m^2) \right) \right]$$

- $\eta = 2$

$$C_{m,t} = e^{-\frac{\sigma_u^2}{2}} \cdot u \cdot e^{g(m)} \cdot e^{-\frac{\sigma_m^2}{2}} \cdot \varepsilon_m$$

Δ $\downarrow$

$$u(C_{m,t}) = -\left(e^{g(m)} \cdot e^{-\frac{\sigma_m^2}{2}}\right)^{-1}$$

$$= -\left(e^{-g(m)} \cdot e^{\frac{\sigma_m^2}{2}}\right)$$

$$= -\left(e^{-g(m)+\frac{\sigma_m^2}{2}}\right)$$

$$W(z) = \sum_{t=1}^{40} \beta^{12t} \left[\sum_{t=1}^{12} \beta^{m-1} \left(-e^{-g(m)+\frac{\sigma_m^2}{2}}\right)\right]$$

- $\eta = 4$

$$u(C_{m,t}) = -\frac{1}{3}\left(e^{g(m)-\frac{\sigma_m^2}{2}}\right)^{-3}$$

$$= -\frac{1}{3}\left(e^{-3\left(g(m)-\frac{\sigma_m^2}{2}\right)}\right)$$

$$W(z) = \sum_{t=1}^{40} \beta^{12t} \left[\sum_{t=1}^{12} \beta^{m-1} \left(-e^{-3\left(g(m)-\frac{\sigma_m^2}{2}\right)}\right)\right]$$

Q2: (a) isolating consumption

$$W(z) = \sum_{t=1}^{40} \beta^{12t} \left[u(C_{m,t})\right]$$

$$u(C_{m,t}) = \ln C_{m,t}$$

$$= \ln\left(e^{-\frac{\sigma_u^2}{2}} \cdot \varepsilon_u \cdot e^{g(m)} \cdot e^{-\frac{\sigma_m^2}{2}} \cdot \varepsilon_m\right)$$

$$= \underbrace{-\frac{\sigma_u^2}{2}}_{-0.1} + \underbrace{\ln u}_{0} + \underbrace{g(m)}_{1} - \underbrace{\frac{\sigma_m^2}{2}}_{1} + \underbrace{\ln \varepsilon_m}_{0}$$

$$u(C_{m,t}) = -0.1$$

$$W(z) = \sum_{t=1}^{40} \beta^{12t} \left[-0.1 \times 12\right]$$

): isolating leisure

$$u(h_{m,t}) = -k \cdot \frac{1}{2} \left(\underbrace{e^{-\frac{\sigma_u^2}{2}} \cdot \varepsilon_u}_{1} \cdot \underbrace{e^{g(m)}}_{e} \cdot \underbrace{e^{\frac{\sigma_m^2}{2}} \cdot \varepsilon_m}_{1} \right)^2$$

$$= -k \cdot \frac{1}{2} \cdot e^2$$

Δ

$$= -28.5 \times 30/7 \times \frac{1}{2} e^2$$

$$W(\mathbb{Z}) = \sum_{t=1}^{40} \beta^{12t} \left[12 \cdot \left(-28.5 \times 30/7 \times \frac{1}{2} e^2 \right) \right]$$

(b): isolating consumption — same with (a)

isolating leisure

$$u(h_{m,t}) = -k \cdot \frac{1}{2} \left(-e^{-\frac{\sigma_u^2}{2}} \cdot \varepsilon_u \cdot e^{g(m)} \cdot e^{\frac{\sigma_m^2}{2}} \cdot \varepsilon_m \right)^2$$

$$= -k \cdot \frac{1}{2} \cdot e$$

— same with (a).