PAUTA TAREA 1

Pregunta 1

1. $I_t = Y_t - C_t - G_t$

$$K_{t+1} = (1-\delta)K_t + (Y_t - C_t - G_t)$$
$$K_{t+1} - K_t = Y_t - C_t - G_t - \delta K_t \quad / \cdot \tfrac{1}{L_t}$$
$$\frac{K_{t+1}}{L_t} - \frac{K_t}{L_t} = \frac{Y_t}{L_t} - \frac{C_t}{L_t} - \frac{G_t}{L_t} - \frac{\delta K_t}{L_t}$$
$$\frac{L_{t+1}}{L_{t+1}} \cdot \frac{K_{t+1}}{L_t} - k_t = y_t - c_t - g_t - \delta k_t$$
$$\cancel{\frac{L_{t+1}}{L_t}}^{\,1} \cdot \frac{K_{t+1}}{L_{t+1}} - k_t = y_t - c_t - g_t - \delta k_t$$
$$k_{t+1} - k_t = y_t - c_t - g_t - \delta k_t$$

Ing. disponible del hogar: $y_t - g_t = (1-\tau)y_t$

$\therefore$ $s_t = s \cdot \text{Ing. disponible} = s(1-\tau)y_t$

$c_t = (1-s)\cdot\text{Ing disponible} = (1-s)(1-\tau)y_t$

$$\begin{aligned} k_{t+1} - k_t &= (y_t - g_t) - c_t - \delta k_t \\ &= (1-\tau)y_t - (1-s)(1-\tau)y_t - \delta k_t \\ &= s(1-\tau)y_t - \delta k_t \end{aligned}$$

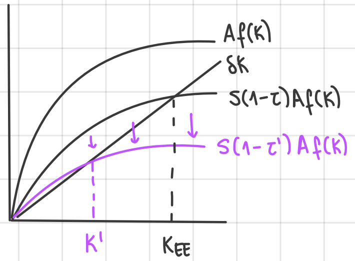
$$y_t = A_t \frac{F(K_t, L_t)}{L_t} = A_t F\left(\frac{K_t}{L_t}, \frac{L_t}{L_t}\right) = A_t f(k_t)$$

$$\Rightarrow \boxed{k_{t+1} - k_t = s(1-\tau)A_t f(k_t) - \delta k_t}$$

2. En EE: $k_{t+1} = k_t = k_{EE}$, $A_t = A$

$$0 = s(1-\tau)Af(k) - \delta k \Rightarrow \therefore k_{EE} \text{ satisface: } \delta k_{EE} = s(1-\tau)Af(k_{EE})$$

3.



- Como el gobierno no se puede endeudar, un aumento en $g \Leftrightarrow$ aumento en τ.
- Ante $\uparrow\tau$, cae la curva de inversión ($y \therefore$ el K), ya que los recursos que se usan para financiar la depreciación, ahora se usan para financiar g.
- Como el shock es transitorio, después g cae (τ también) y K vuelve a su valor de EE.

4. $y_t = c_t + i_t + g_t \Rightarrow k_t^{\alpha} g_t^{\beta} = c_t + i_t + g_t$

5. $y_t = k_t^{\alpha}(\tau y_t)^{\beta}$

$y_t = k_t^{\alpha}\tau^{\beta}y_t^{\beta}$

$$y_t^{1-\beta} = \tau^{\beta}k_t^{\alpha} \rightarrow \boxed{y_t = \left[\tau^{\beta}k_t^{\alpha}\right]^{1/1-\beta}}$$

6. Ahora ya no tenemos A_t $\therefore$ $A_t f(k_t)$ pasa a ser solo $f(k_t)$

$$k_{t+1} - k_t = s(1-\tau)f(k_t) - \delta k_t$$
$$k_{t+1} - k_t = s(1-\tau)\,\tau^{\beta/1-\beta}\,k_t^{\alpha/1-\beta} - \delta k_t$$

En EE:
$$\delta k_{EE} = s(1-\tau)\,\tau^{\beta/1-\beta}\,k_{EE}^{\alpha/1-\beta}$$
$$k_{EE}^{1-\alpha/1-\beta} = \frac{s(1-\tau)\,\tau^{\beta/1-\beta}}{\delta}$$
$$k_{EE}^{\frac{1-\alpha-\beta}{1-\beta}} = \frac{s(1-\tau)\,\tau^{\beta/1-\beta}}{\delta}$$

$$\boxed{k_{EE} = \left[\frac{s(1-\tau)\,\tau^{\beta/1-\beta}}{\delta}\right]^{\frac{1-\alpha-\beta}{1-\beta}}}$$

7. $$k_{EE} = \left(\frac{s}{\delta}\right)^{\frac{1-\alpha-\beta}{1-\beta}}\left[\tau^{\beta/1-\beta} - \tau^{1/1-\beta}\right]^{\frac{1-\alpha-\beta}{1-\beta}}$$

$$\frac{\partial k_{EE}}{\partial \tau} = 0 \Rightarrow \frac{\partial k_{EE}}{\partial \tau} = \cancel{\left(\frac{s}{\delta}\right)^{\frac{1-\alpha-\beta}{1-\beta}}} \left[\cancel{\left(\frac{1-\alpha-\beta}{1-\beta}\right)} \left[\tau^{\beta/1-\beta} - \tau^{1/1-\beta}\right]^{-\alpha/1-\beta} \left(\left(\frac{\beta}{\cancel{1-\beta}}\right)\tau^{-1/1-\beta} - \left(\frac{1}{\cancel{1-\beta}}\right)\tau^{-\beta/1-\beta} \right) \right] = 0$$

$$\left[\tau^{\beta/1-\beta} - \tau^{1/1-\beta}\right]^{-\alpha/1-\beta} \left[\beta\tau^{-1/1-\beta} - \tau^{-\beta/1-\beta}\right] = 0$$

Asumiendo que $\left[\tau^{\beta/1-\beta} - \tau^{1/1-\beta}\right]^{-\alpha/1-\beta} \neq 0$:

$$\beta\tau^{-1/1-\beta} - \tau^{-\beta/1-\beta} = 0$$

$$\tau^{-\beta/1-\beta + 1/1-\beta} = \beta$$

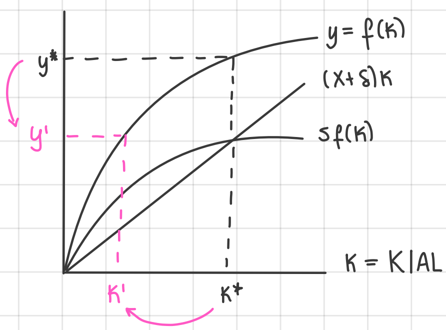
$\boxed{\tau^* = \beta}$ → corresponde a la participación del gasto de gobierno en la fn. de producción

Pregunta 2

1.

- $n = 0$, estado estacionario
- ¿qué sucede con $y = Y/AL$ si hay un aumento en L?

- Un aumento en L, hace que $k = K/AL$ caiga, es decir, cae el capital por trabajador efectivo. Un menor k, dado que, $f'(k) > 0$, también hace que $y = f(k)$ sea menor, por lo tanto, el producto por trabajador efectivo también cae. Ahora bien, además del efecto directo sobre el producto, un k menor implica que este es más productivo (porque $f''(k) < 0$), la economía va a invertir más en capital, haciendo que este aumente. Lo anterior, va acompañado de un mayor producto por trabajor efectivo.
El aumento continuo de k eventualmente se va a topar con los rendimientos decrecientes, llegando al punto donde se comienza a depreciar. En ese punto, k queda constante en su valor de estado estacionario, al igual que el producto.

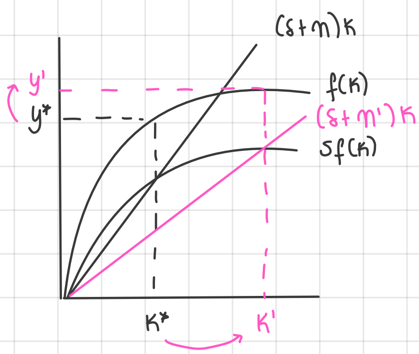


$\dot{k} = sf(k) - (\delta + x)k$, $y = f(k)$, $k = K/AL$,

Etapa 1 : $\uparrow L \Rightarrow \downarrow k \Rightarrow k' < k^* \Rightarrow y' < y^*$ (debido a $f'(k) > 0$)
Etapa 2 : $k' < k^* \Rightarrow sf(k') > (\delta + x)k' \Rightarrow \uparrow k' \Rightarrow \uparrow y'$
Etapa 3 : $\uparrow k'$ hasta que $sf(k') = (\delta + x)k' \Rightarrow k' = k^* \Rightarrow y' = y^*$

2.

- $n > 0$, $x = 0$, estado estacionario
- ¿qué sucede con k, y, c si cae n?



- $\downarrow n$, cae la pendiente de $(\delta + n)k$
- $\dot{k} = sf(k) - (\delta + \downarrow n)k \Rightarrow$ antes $\dot{k} = 0$, ahora $\dot{k} > 0 \therefore k' > k^*$
- $\uparrow k \Rightarrow \uparrow y$ $(y' > y^*)$
- $c = (1 - s)y \Rightarrow \uparrow y \Rightarrow \uparrow c$

$\therefore$ sube el capital, producto y consumo

3. Economía centralizada (problema del planner)

- $Y(t) = C(t) + I(t)$, $\dot{K}(t) = I(t) - \delta K(t)$, $I(t) = sY(t)$

- $\dot{K}(t) = sY(t) - \delta K(t) \quad / \cdot 1/A(t)L(t) \rightarrow$ fn. de producción es labor augmenting

$$\frac{\dot{K}(t)}{A(t)L(t)} = s\frac{Y(t)}{A(t)L(t)} - \delta\frac{K(t)}{A(t)L(t)}$$

- $$\dot{k}(t) = \frac{\partial K(t)/A(t)L(t)}{\partial t}$$

$$= \frac{\dot{K}(t)}{A(t)L(t)} - \frac{K(t)}{A(t)^2L(t)^2}\left[\dot{A}(t)L(t) + A(t)\dot{L}(t)\right]$$

$$\dot{k}(t) = \frac{\dot{K}(t)}{A(t)L(t)} - k(t)\left[\overset{x}{\frac{\dot{A}(t)\cancel{L(t)}}{A(t)\cancel{L(t)}}} + \overset{n}{\frac{\cancel{A(t)}\dot{L}(t)}{\cancel{A(t)}L(t)}}\right]$$

$$\dot{k}(t) = \frac{\dot{K}(t)}{A(t)L(t)} - k(t)(n+x)$$

- $$Y(t)/A(t)L(t) = (K(t)/A(t)L(t))^{\alpha}(A(t)L(t)/A(t)L(t))^{1-\alpha}$$

$$f(k(t)) = k(t)^{\alpha}$$

En EE : $\dot{k}(t) = 0$, $k(t) = k^{EE}$

$$0 = s k^{EE^{\alpha}} - k^{EE}(\delta + n + x)$$

$$s k^{EE^{\alpha}} = k^{EE}(\delta + n + x)$$

$$k_{EE}^{\alpha-1} = \frac{\delta + n + x}{s}$$

$$\boxed{k_{EE} = \left[\frac{\delta + n + x}{s}\right]^{1/\alpha-1}}$$

- $$\dot{k}(t) = \frac{\dot{K}(t)}{A(t)L(t)} - k(t)(n+x)$$

$$\dot{k}(t) = s\frac{Y(t)}{A(t)L(t)} - \frac{\delta K(t)}{A(t)L(t)} - k(t)(x+n)$$

$$\boxed{\dot{k}(t) = s k(t)^{\alpha} - k(t)(\delta + n + x)}$$

Economía descentralizada (problema del hogar y la firma)

Hogares :

- acumulación de activos (A : tecnología, $\mathbb{A}$: activos) :

$$\dot{\mathbb{A}}(t) = [r(t)\mathbb{A}(t) + w(t)L(t)] - c(t) \quad / \cdot 1/A(t)L(t)$$

$$\frac{\dot{\mathbb{A}}(t)}{A(t)L(t)} = \frac{r(t)\mathbb{A}(t)}{A(t)L(t)} + \frac{w(t)L(t)}{A(t)L(t)} - \frac{c(t)}{A(t)L(t)}$$

$$\dot{a}(t) = \frac{\partial(\mathbb{A}(t)/A(t)L(t))}{\partial t}$$

$$= \frac{\dot{\mathbb{A}}(t)}{A(t)L(t)} - \frac{\mathbb{A}(t)}{A(t)^2L(t)^2}\left[\dot{A}(t)L(t) + A(t)\dot{L}(t)\right]$$

$$\dot{a}(t) = \frac{\dot{\mathbb{A}}(t)}{A(t)L(t)} - a(t)\left[\overset{x}{\frac{\dot{A}(t)\cancel{L(t)}}{A(t)\cancel{L(t)}}} + \overset{n}{\frac{\cancel{A(t)}\dot{L}(t)}{\cancel{A(t)}L(t)}}\right]$$

$$\dot{a}(t) = \frac{\dot{\mathbb{A}}(t)}{A(t)L(t)} - a(t)(n+x)$$

$$\dot{a}(t) = \frac{r(t)\mathbb{A}(t)}{A(t)L(t)} + \frac{w(t)\cancel{L(t)}}{A(t)\cancel{L(t)}} - \frac{c(t)}{A(t)L(t)} - a(t)(n+x)$$

$$\dot{a}(t) = r(t)a(t) + \frac{w(t)}{A(t)} - c(t) - a(t)(n+x)$$

Usaremos que $A(t) = A(0)e^{xt}$ con $A(0) = 1 \therefore A(t) = e^{xt}$

$$\boxed{\dot{a}(t) = (r(t) - n - x)a(t) + w(t)e^{-xt} - c(t)}$$

Firmas:

- max. sus beneficios con $R(t) = r(t) + \delta$

$$\pi(t) = F(K(t), A(t)L(t)) - R(t)K(t) - w(t)L(t)$$

$$F(K(t), A(t)L(t)) - (r(t)+\delta)K(t) - w(t)L(t) \quad /\cdot \frac{A(t)L(t)}{A(t)L(t)}$$

$$A(t)L(t)\left[F\left(\frac{K(t)}{A(t)L(t)}, 1\right) - (r(t)+\delta)\frac{K(t)}{A(t)L(t)} - w(t)e^{-xt}\right]$$

$$= A(t)L(t)\left[k(t)^{\alpha} - (r(t)+\delta)k(t) - w(t)e^{-xt}\right]$$

$$\frac{\partial \pi}{\partial k} = 0 \rightarrow \alpha k(t)^{\alpha-1} - (r(t)+\delta) = 0 \rightarrow \boxed{r(t) = \alpha k(t)^{\alpha-1} - \delta}$$

$$\frac{\partial \pi}{\partial L} = 0 \longrightarrow \cancel{A(t)}\left[\left(k(t)^{\alpha} - (r(t)+\delta)k(t) - w(t)e^{-xt}\right) + L(t)\left(\alpha k(t)^{\alpha-1}\cdot(-1)\cdot\frac{k(t)}{L(t)^2} - (r(t)+\delta)\cdot(-1)\frac{k(t)}{L(t)^2}\right)\right] = 0$$

$$k(t)^{\alpha} - (r(t)+\delta)k(t) - w(t)e^{-xt} + \frac{\cancel{L(t)}}{\cancel{L(t)}}\left(-\alpha k(t)^{\alpha-1}k(t) + (r(t)+\delta)k(t)\right) = 0$$

$$k(t)^{\alpha} - \cancel{(r(t)+\delta)k(t)} - w(t)e^{-xt} - \alpha k(t)^{\alpha-1}k(t) + \cancel{(r(t)+\delta)k(t)} = 0$$

$$\boxed{w(t) = e^{xt}\left[k(t)^{\alpha} - \alpha k(t)^{\alpha-1}k(t)\right]} \iff w(t) = e^{xt}\left[f(k(t)) - k(t)f'(k(t))\right]$$

Equilibrio

- Tenemos:

$$\dot{a}(t) = (r(t) - n - x)a(t) + w(t)e^{-xt} - c(t)$$
$$r(t) = \alpha k(t)^{\alpha-1} - \delta$$
$$w(t) = e^{xt}\left[k(t)^{\alpha} - \alpha k(t)^{\alpha-1}k(t)\right]$$
$$a(t) = k(t) \longrightarrow \text{en ec. cerrada}$$

$$\therefore \dot{k}(t) = (\alpha k(t)^{\alpha-1} - \delta - n - x)k(t) + \cancel{e^{-xt}}\cdot\cancel{e^{xt}}\left[k(t)^{\alpha} - \alpha k(t)^{\alpha-1}k(t)\right] - c(t)$$
$$= -(\delta+n+x)k(t) + \cancel{\alpha k(t)^{\alpha-1}k(t)} + k(t)^{\alpha} - \cancel{\alpha k(t)^{\alpha-1}k(t)} - c(t)$$
$$= k(t)^{\alpha} - c(t) - (\delta+n+x)k(t)$$

recordando que $k(t)^{\alpha} = f(k(t))$, $f(k(t)) = c(t) + i(t)$, $i(t) = s f(k(t))$

$$f(k(t)) - c(t) = i(t) = s f(k(t))$$
$$k(t)^{\alpha} - c(t) = s k(t)^{\alpha}$$

$$\therefore \boxed{\dot{k}(t) = s k(t)^{\alpha} - k(t)(\delta+n+x)}$$

Dado que no hay distorsiones, las dinámicas del capital son equivalentes en ambas economías, y, $\therefore$ el KEE también.

4. Trayectoria analítica del capital

$$\dot{k}(t) = s k(t)^{\alpha} - k(t)(\delta+n+x) \quad /\cdot k(t)^{-\alpha}$$
$$\dot{k}(t)\cdot k(t)^{-\alpha} = s - k(t)^{1-\alpha}(\delta+n+x) \qquad (1)$$

Definimos $v(t) = k(t)^{1-\alpha} \Rightarrow \ln(v(t)) = (1-\alpha)\ln(k(t))$

$$\overset{\circ}{\ln}(v(t)) = (1-\alpha)\overset{\circ}{\ln}(k(t)) \iff \frac{\dot{v}(t)}{v(t)} = (1-\alpha)\cdot\frac{\dot{k}(t)}{k(t)} \equiv \dot{k}(t) = k(t)\cdot\frac{\dot{v}(t)}{v(t)}\cdot\left(\frac{1}{1-\alpha}\right)$$

Reemplazamos $\dot{K}(t) = K(t) \cdot \frac{\dot{V}(t)}{V(t)} \cdot \left(\frac{1}{1-\alpha}\right)$ en (1)

$$K(t) \cdot \frac{\dot{V}(t)}{V(t)} \cdot \left(\frac{1}{1-\alpha}\right) \cdot K(t)^{-\alpha} = s - K(t)^{1-\alpha}(\delta + n + x)$$

$$s = K(t)^{1-\alpha} \cdot \frac{\dot{V}(t)}{V(t)}\left(\frac{1}{1-\alpha}\right) + K(t)^{1-\alpha}(\delta + n + x)$$

$$s = K(t)^{1-\alpha}\left[\frac{\dot{V}(t)}{V(t)}\left(\frac{1}{1-\alpha}\right) + (\delta + n + x)\right]$$

Reemplazamos $K(t)^{1-\alpha} = V(t)$

$$s = V(t)\left[\frac{\dot{V}(t)}{V(t)}\left(\frac{1}{1-\alpha}\right) + (\delta + n + x)\right]$$

$$s = \left(\frac{1}{1-\alpha}\right)\dot{V}(t) + (\delta + n + x)V(t)$$

$$s(1-\alpha) = \dot{V}(t) + (1-\alpha)(\delta + n + x)V(t)$$

Dado que necesitamos trabajar con integrales, cambiamos el argumento de $\dot{V}()$ y $V()$ a b.

$$s(1-\alpha) = \dot{V}(b) + (1-\alpha)(\delta + n + x)V(b) \quad / \ e^{(1-\alpha)(\delta+n+x)b}$$

$$e^{(1-\alpha)(\delta+n+x)b} s(1-\alpha) = e^{(1-\alpha)(\delta+n+x)b}\left[\dot{V}(b) + (1-\alpha)(\delta+n+x)V(b)\right] \quad / \ \int_0^t (\,)\,db$$

$$\int_0^t e^{(1-\alpha)(\delta+n+x)b} s(1-\alpha)\,db = \int_0^t e^{(1-\alpha)(\delta+n+x)b}\left[\dot{V}(b) + (1-\alpha)(\delta+n+x)V(b)\right]db$$

$$s(1-\alpha)\left[\frac{e^{(1-\alpha)(\delta+n+x)b}}{(1-\alpha)(\delta+n+x)} + C_1\right]\Bigg|_0^t = \left[e^{(1-\alpha)(\delta+n+x)b}V(b) + C_2\right]\Bigg|_0^t$$

$$s\cancel{(1-\alpha)}\left[\frac{e^{(1-\alpha)(\delta+n+x)t}}{\cancel{(1-\alpha)}(\delta+n+x)} + \cancel{C_1} - \frac{e^{(1-\alpha)(\delta+n+x)0}}{\cancel{(1-\alpha)}(\delta+n+x)} - \cancel{C_1}\right] = e^{(1-\alpha)(\delta+n+x)t}V(t) + \cancel{C_2} - e^{(1-\alpha)(\delta+n+x)0}V(0) - \cancel{C_2}$$

$$\left(\frac{s}{\delta+n+x}\right)e^{(1-\alpha)(\delta+n+x)t} - \left(\frac{s}{\delta+n+x}\right) = e^{(1-\alpha)(\delta+n+x)t}V(t) - V(0)$$

$$V(t) = \left(\frac{s}{\delta+n+x}\right) - \left(\frac{s}{\delta+n+x}\right)e^{-(1-\alpha)(\delta+n+x)t} + V(0)\,e^{-(1-\alpha)(\delta+n+x)t}$$

$$V(t) = \left(\frac{s}{\delta+n+x}\right) + e^{-(1-\alpha)(\delta+n+x)t}\left[V(0) - \left(\frac{s}{\delta+n+x}\right)\right]$$

Reemplazamos $V(t) = K(t)^{1-\alpha}$

$$K(t)^{1-\alpha} = \left(\frac{s}{\delta+n+x}\right)e^{-(1-\alpha)(\delta+n+x)t}\left[K(0)^{1-\alpha} - \left(\frac{s}{\delta+n+x}\right)\right]$$

$$K(t) = \left[\left(\frac{s}{\delta+n+x}\right)e^{-(1-\alpha)(\delta+n+x)t}\left[K(0)^{1-\alpha} - \left(\frac{s}{\delta+n+x}\right)\right]\right]^{1/1-\alpha}$$

→ La brecha entre K y su valor de EE se cierra a tasa $(1-\alpha)(\delta+n+x)$.

5. Ecuación de convergencia del producto. Velocidad de convergencia

$$\dot{K}(t) = sK(t)^{\alpha} - K(t)(\delta + n + x) \quad / \cdot 1/K(t)$$

$$\frac{\dot{K}(t)}{K(t)} = sK(t)^{\alpha-1} - (\delta + n + x)$$

$$\ln(\dot{K(t)}) = s \cdot e^{-(1-\alpha)\ln(K(t))} - (\delta + n + x)$$

Hacemos una expansión de Taylor en torno a su EE:

$$\ln(\dot{K(t)}) \approx \cancel{\ln(\dot{K(t)})\Big|_{\ln(K^{EE})}} + \left(\frac{\partial \ln(\dot{K(t)})}{\partial \ln(K(t))}\right)\Bigg|_{\ln(K^{EE})} (\ln(K(t)) - \ln(K^{EE}))$$

$$\ln(\dot{K(t)}) = -s(1-\alpha)K_{EE}^{\alpha-1}(\ln(K(t)) - \ln(K^{EE}))$$

Calculamos $K^{EE^{\alpha-1}}$.

$$0 = sK_{EE}^{\alpha} - K_{EE}(\delta + n + x)$$
$$sK_{EE}^{\alpha} = K_{EE}(\delta + n + x)$$
$$K_{EE}^{\alpha-1} = \left(\frac{\delta + n + x}{s}\right)$$

$$\therefore \ln(\dot{K(t)}) \approx -\cancel{s}(1-\alpha)\left(\frac{\delta + n + x}{\cancel{s}}\right)(\ln(K(t)) - \ln(K_{EE}))$$

$$\ln(\dot{K(t)}) \approx -(1-\alpha)(\delta + n + x)(\ln(K(t)) - \ln(K_{EE}))$$

$$\ln(\dot{K(t)}) + (1-\alpha)(\delta + n + x)\ln(K(t)) = (1-\alpha)(\delta + n + x)\ln(K_{EE})$$

Si $y(t) = K(t)^{\alpha} \rightarrow K(t) = y(t)^{1/\alpha}$:

$$\ln(\dot{y(t)^{1/\alpha}}) + (1-\alpha)(\delta + n + x)\ln(y(t)^{1/\alpha}) = (1-\alpha)(\delta + n + x)\ln(y_{EE}^{1/\alpha})$$

$$\cancel{1/\alpha}\ln(\dot{y(t)}) + \cancel{1/\alpha}(1-\alpha)(\delta + n + x)\ln(y(t)) = \cancel{1/\alpha}(1-\alpha)(\delta + n + x)\ln(y_{EE})$$

$$\ln(\dot{y(t)}) = -(1-\alpha)(\delta + n + x)[\ln(y(t)) - \ln(y_{EE})]$$

Dado que necesitamos trabajar con integrales cambiamos el argumento a b.

$$\ln(\dot{y(b)}) = -(1-\alpha)(\delta + n + x)[\ln(y(b)) - \ln(y_{EE})] \quad / \; e^{(1-\alpha)(\delta+n+x)b}$$

$$e^{(1-\alpha)(\delta+n+x)b}\ln(\dot{y(b)}) = e^{(1-\alpha)(\delta+n+x)b}(1-\alpha)(\delta+n+x)\ln(y_{EE}) - e^{(1-\alpha)(\delta+n+x)b}(1-\alpha)(\delta+n+x)\ln(y(b)) \quad / \int_0^t db$$

$$\int_0^t e^{(1-\alpha)(\delta+n+x)b}\ln(\dot{y(b)})\,db = \int_0^t [e^{(1-\alpha)(\delta+n+x)b}(1-\alpha)(\delta+n+x)\ln(y_{EE})]\,db - \int_0^t e^{(1-\alpha)(\delta+n+x)b}(1-\alpha)(\delta+n+x)\ln(y(b))\,db$$

$$\int_0^t [e^{(1-\alpha)(\delta+n+x)b}\ln(\dot{y(b)}) + e^{(1-\alpha)(\delta+n+x)b}(1-\alpha)(\delta+n+x)\ln(y(b))]\,db = (1-\alpha)(\delta+n+x)\ln(y_{EE})\int_0^t e^{(1-\alpha)(\delta+n+x)b}\,db$$

$$\left[e^{(1-\alpha)(\delta+n+x)b}\ln(y(b)) + C_1\right]\Bigg|_0^t = (1-\alpha)(\delta+n+x)\ln(y_{EE})\left[\frac{e^{(1-\alpha)(\delta+n+x)b}}{(1-\alpha)(\delta+n+x)} + C_2\right]\Bigg|_0^t$$

$$e^{(1-\alpha)(\delta+n+x)t}\ln(y(t)) - \ln(y(0)) = \ln(y_{EE})(e^{(1-\alpha)(\delta+n+x)t} - 1) \quad / \; e^{-(1-\alpha)(\delta+n+x)t}$$

$$\ln(y(t)) - e^{-(1-\alpha)(\delta+n+x)t}\ln(y(0)) = \ln(y_{EE}) - e^{-(1-\alpha)(\delta+n+x)t}\ln(y_{EE})$$

$$\ln(y(t)) = \ln(y_{EE}) - e^{-(1-\alpha)(\delta+n+x)t}\ln(y_{EE}) + e^{-(1-\alpha)(\delta+n+x)t}\ln(y(0))$$

Velocidad de convergencia: $\beta = -\left.\dfrac{\partial \dot{k}/k}{\partial \ln(k)}\right|_{k_{EE}} = -(-(1-\alpha)(\delta+n+x)) = (1-\alpha)(\delta+n+x)$

$$\therefore \ln(y(t)) = \ln(y_{EE}) - e^{-\beta t}\ln(y_{EE}) + e^{-\beta t}\ln(y(0))$$

6. Respuesta libre pero era importante mencionar que la convergencia condicional depende de las condiciones iniciales, en este caso, $\ln(y(0))$.