$$
\begin{aligned}
\sum_{j=1}^{S}(1-p)^{j-1}p &= p\sum_{j=0}^{S-1}(1-p)^{j-1} \\
&= p\frac{1-(1-p)^S}{1-(1-p)} \\
&= 1-(1-p)^S
\end{aligned}
$$

$$
U_{t-1}=\sum_{s=t}^{\infty}\frac{u_s^{1-\rho}}{1-\rho}\beta^{1+s-t}
$$

$$
u_t=\begin{cases} w & \text{hvis beskæftiget} \\ b\,e^{-\eta S} & \text{hvis ikke beskæftiget}\end{cases}
$$

- - - - - -

State variable

$$
e_t=\begin{cases} 1 & \text{if employed} \\ 0 & \text{if not employed}\end{cases}
$$

$$
\begin{aligned}
V_t(e_{t-1}) &= E_t\left[\sum_{s=t}^{\infty}\frac{u(e_s,S_s)^{1-\rho}}{1-\rho}\beta^{1+s-t}\right] \\
u(1,S_t) &= w \\
u(0,S_t) &= b\,e^{-\gamma S_t}
\end{aligned}
$$

$$
V_t(0)=\pi^{0,1}\left(\frac{w^{1-\rho}}{1-\rho}+\beta V_{t+1}(1)\right)+\pi^{0,0}\left(\frac{\left(b\,e^{-\gamma S}\right)^{1-\rho}}{1-\rho}+\beta V_{t+1}(0)\right)
$$

$$
V_t(1)=\pi^{1,1}\left(\frac{w^{1-\rho}}{1-\rho}+\beta V_{t+1}(1)\right)+\pi^{1,0}\left(\frac{\left(b\,e^{-\gamma S}\right)^{1-\rho}}{1-\rho}+\beta V_{t+1}(0)\right)
$$

- - - -

$$
V(0)=\pi^{0,1}\left(\frac{w^{1-\rho}}{1-\rho}+\beta V(1)\right)+\left(1-\pi^{0,1}\right)\left(\frac{\left(b\,e^{-\gamma S}\right)^{1-\rho}}{1-\rho}+\beta V(0)\right)
$$

$$
V(1)=(1-\delta)\left(\frac{w^{1-\rho}}{1-\rho}+\beta V(1)\right)+\delta\left(\frac{\left(b\,e^{-\gamma S}\right)^{1-\rho}}{1-\rho}+\beta V(0)\right)
$$

- - - - -

$$
\begin{aligned}
\frac{d}{dS}V(0) = {} & \frac{d}{dS}\pi^{0,1}\left(\frac{w^{1-\rho}}{1-\rho}+\beta V(1)\right)+\pi^{0,1}\beta\frac{d}{dS}V(1)+\left(1-\pi^{0,1}\right)\left(-\gamma\left(b\,e^{-\gamma S}\right)^{-\rho}b\,e^{-\gamma S}+\beta\frac{d}{dS}V(0)\right) \\
& -\frac{d}{dS}\pi^{0,1}\left(\frac{\left(b\,e^{-\gamma S}\right)^{1-\rho}}{1-\rho}+\beta V(0)\right)
\end{aligned}
$$

$$\frac{d}{dS}V(1) = (1-\delta)\left(\frac{w^{1-\rho}}{1-\rho} + \beta\frac{d}{dS}V(1)\right) + \delta\left(-\gamma\left(be^{-\gamma S}\right)^{-\rho}be^{-\gamma S} + \beta\frac{d}{dS}V(0)\right)$$

- - - -

$$\left(1-\pi^{0,1}\right)\gamma\left(be^{-\gamma S}\right)^{1-\rho} = \frac{d}{dS}\pi^{0,1}\left(\frac{w^{1-\rho}}{1-\rho} - \frac{\left(be^{-\gamma S}\right)^{1-\rho}}{1-\rho} + \beta\left(V(1)-V(0)\right)\right)$$

$$\delta\gamma\left(be^{-\gamma S}\right)^{1-\rho} = (1-\delta)\left(\frac{w^{1-\rho}}{1-\rho}\right)$$

- - - - -

$$\begin{aligned}\pi^{0,1} &= 1-(1-p)^S \\ &= 1-e^{S\,log(1-p)}\end{aligned}$$

such that

$$\frac{d}{dS}\pi^{0,1} = -log(1-p)\left(1-\pi^{0,1}\right)$$

- - - - -

$$S = -\frac{1}{\gamma}\left(\frac{1}{1-\rho}log\left(\frac{1-\delta}{\delta\gamma(1-\rho)}\right) + log\left(\frac{w}{b}\right)\right)$$

- - - -