$$G_t - V(S_t) = \sum_{u=t}^{T-1} \gamma^{u-t} \cdot \left(R_{u+1} + \gamma \cdot V(S_{u+1}) - V(S_u)\right)$$

$$G_t - V(S_t) =$$

$$G_t = \sum_{i=t+1}^{\infty} \gamma^{i-t-1} \cdot R_i = \sum_{i=t+1}^{T} \gamma^{i-t-1} \cdot R_i$$

$$= \sum_{i=t}^{T-1} \gamma^{i-t} R_{i+1}$$

$$G_t - V(S_t) = R_{t+1} + \gamma G_{t+1} - V(S_t)$$

$$= R_{t+1} + \gamma V(S_{t+1}) - + \gamma G_{t+1} - V(S_t) - \gamma V(S_{t+1})$$

$$= R_{t+1} + \gamma V(S_{t+1}) + \gamma\left(R_{t+2} + \gamma G_{t+2}\right) - V(S_t) - \gamma V(S_{t+1})$$

$$= \underbrace{R_{t+1} + \gamma V(S_{t+1}) - V(S_t)}_{\delta_t} + \gamma\left(\underbrace{R_{t+2} + \gamma V(S_{t+2}) - V(S_{t+1})}_{\delta_{t+1}}\right) + \gamma\left(\gamma G_{t+2} - \gamma V(S_{t+2})\right)$$

$$=$$

$$= \delta_t + \gamma \delta_{t+1} + \gamma^2\left(G_{t+2} - V(S_{t+2})\right)$$

$$= \sum_{u=t}^{T-1} \gamma^{u-t} \delta_u$$

$$= \sum_{u=t}^{T-1} \gamma^{u-t} \left[R_{u+1} + \gamma V(S_{u+1}) - V(S_u)\right]$$

$\square$