Generic deterministic problem

$V\big(s(0)\big) = \max_{c}\{\int_0^\infty e^{-\rho t} r\big(s(t), c(t)\big)dt\}$

$ds_i(t) = \mu_i\big(s(t), c(t)\big)dt$ for $i \in \{1, \dots, n_s\}$

State variables: $s_i(t)$ for $i \in \{1, \dots, n_s\}$

Control variables: $c_i(t)$ for $i \in \{1, \dots, n_c\}$

Return function: $r\big(s(t), c(t)\big)$

Transition function: $\mu_i\big(s(t), c(t)\big)$ for $i \in \{1, \dots, n_s\}$

HJB: $\rho V(s) = \max_{c}\{r\big(s(t), c(t)\big) + \nabla V \cdot \mu\big(s(t), c(t)\big)\}$

Neoclassical growth model: (slides 16+, Moll Julia code)

$r\big(s(t), c(t)\big) = \frac{\big(c(t)\big)^{1-\sigma}}{1-\sigma}$

$\mu_1\big(s(t), c(t)\big) = As(t)^\alpha - \delta s(t) - c(t)$

Consumption saving model: (Moll notes, Julia code)

$r\big(s(t), c(t)\big) = \frac{\big(c(t)\big)^{1-\sigma}}{1-\sigma}$

$\mu_1\big(s(t), c(t)\big) = r \times s(t) - c(t)$