**Signal:**

$$\tilde{y}_t = \alpha_1 \tilde{y}_{t-1} + \alpha_2 (r_{t-1} - r^*_{t-1}) + \varepsilon_{1,t}$$

$$\pi_t = \beta_1 \pi_{t-1} + \beta_1 \tilde{y}_{t-1} + \varepsilon_{2,t}$$

**State:**

$$r^*_t = c g_t + z_t$$

$$z_t = \gamma_1 z_{t-1} + \varepsilon_{3,t}$$

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**Data (observable):**

$$\tilde{y}_t = output\ gap$$
$$r_t = real\ interest\ rate$$
$$\pi_t = inflation\ rate$$
$$g_t = trend\ growth\ rate\ of\ potential\ output$$

**not observable:**

$$r^*_t = natural\ rate\ of\ interest$$

*Note:* **c** *is a constant*