3.2 $Y_t = \beta_0 + \beta_1 t + X_t$

$$\bar{Y} = \frac{1}{n}\sum Y_t = \frac{1}{n}\sum(\mu + e_t - e_{t-1}) = \mu + \frac{1}{n}\sum(e_t - e_{t-1}) = \mu + \frac{1}{n}(e_n - e_0)$$

$$Var(\bar{Y}) = Var\left(\mu + \frac{1}{n}(e_n - e_0)\right) = \frac{1}{n^2}Var(e_n - e_0) = \frac{1}{n^2}(\sigma_e^2 + \sigma_e^2) = \frac{2\sigma_e^2}{n^2}$$

IT'S UNUSUAL FOR THE SAMPLE SIZE TO HAVE A BIG IMPACT ON THE VARIANCE.

$Y_t = \mu + e_t$

$$\bar{Y} = \frac{1}{n}\sum Y_t = \frac{1}{n}\sum(\mu + e_t) = \mu + \frac{1}{n}\sum e_t = \mu + \bar{e}$$

$$Var(\bar{Y}) = Var(\mu + \bar{e}) = Var(\bar{e}) = \sigma_e^2/n$$

3.3 $Y_t = \mu + e_t + e_{t-1}$

$$\bar{Y} = \frac{1}{n}\sum Y_t = \frac{1}{n}\sum(\mu + e_t + e_{t-1}) = \mu + \frac{1}{n}\sum(e_t + e_{t-1})$$

$$= \mu + \frac{1}{n}\left(e_n + e_0 + 2\sum^{n-1} t\right)$$

$$Var(\bar{Y}) = Var\left(\mu + \frac{1}{n}\left(e_n + e_0 + 2\sum^{n-1} t\right)\right)$$

$$= \frac{1}{n^2}\left(\sigma_e^2 + \sigma_e^2 + 4(n-1)\sigma_e^2\right) = \frac{2(2n-1)\sigma_e^2}{n^2}$$

$Y_t = \mu + e_t$

FROM 3.2: $Var(\bar{Y}) = \sigma_e^2/n$

AS $n \to \infty$, THE VARIANCE FROM THE ORIGINAL Y_t BECOMES 4 TIMES LARGER THAN THE SECOND Y_t