# 10.3 Time Trends

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past affects future so std error isn't right

spurious correlations!

linear trends by regressing time and a variable

Time trends

$y_t = \alpha_0 + \alpha_1 t + r_{it}$ $\qquad x_t = \gamma_0 + \gamma_1 t + r_{xt}$

$\hat{y}_t = \hat{\alpha}_0 + \hat{\alpha}_{1t}$

$\hat{r}_{it} = (y_t - \hat{\alpha}_0 - \hat{\alpha}_{1t})$

suppose $y_t = \beta_0 + \beta_1 x_t + \delta t + r_t$

How is $y$ correlated with $x$?

detrending = put in t trend take residuals afterwards

differencing =

Lags:

$L.y_t = y_{t-1}$ $\qquad f.y_t = y_{t+1}$

$L2.y_t = y_{t-2}$

$D.y_t = y_t - y_{t-1}$

differencing

$y_t = \beta_0 + \beta_1 x_t + \delta t + r_t$

$y_{t-1} = \beta_0 + \beta_1 x_{t-1} + \delta(t-1) + r_{t-1}$

$\hookrightarrow d.y_t = y_t - y_{t-1} = \delta + \beta_1(x_t - x_{t-1}) + (r_t - r_{t-1})$