

```
errorcolor##  
Error  
in  
library("readr"):  
there  
is  
no  
package  
called  
'readr',  
{  
{  
}  
}  
errorcolor##  
Error  
in  
library("pols503"):  
there  
is  
no  
package  
called  
'pols503',
```

POLS/CS&SS 503:
Advanced Quantitative Political Methodology

MEASUREMENT ERROR

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Jeffrey B. Arnold



Measurement Error (One Variable)

$$Y = \beta_0 + \beta_1 X_1 + \epsilon$$

but estimate

$$Y = \hat{\beta}_0 + \hat{\beta}_1 X_1^* + \epsilon$$
$$X_1^* = X_1 + \delta$$

- X_1^* is X_1 measured with error.
- Assumptions
 - $E(\delta) = 0$
 - Meas error: $C(\delta, X_1) = 0$. What if measurement error increases with X_1 ?
 - Meas error uncorrelated with regression components: $C(\delta, \epsilon) = 0$, $C(\delta, X_1) = 0$
 - Meas error: $C(\delta, X_1) = 0$
- Reliability: measure of measurement error

$$r = v(X_1)/v(X_1^*) = v(X_1)/(v(X_1^*) + v(\delta))$$

Example of Measurement Error

Population

$$Y_i = X_{1,i} + X_{2,i} + \epsilon_i$$
$$X_i^* = X_{1,i} + \delta_i$$

Sample Estimate

$$y_i = \hat{\beta}_0 + \hat{\beta}_1 x_{1,i}^* + \hat{\beta}_2 x_{2,i} + \hat{\epsilon}_i$$

Look at cases in which $r = 0$, no measurement error in X_1^* , and $r = 0.5$, $V(\delta) = V(X_1)$.