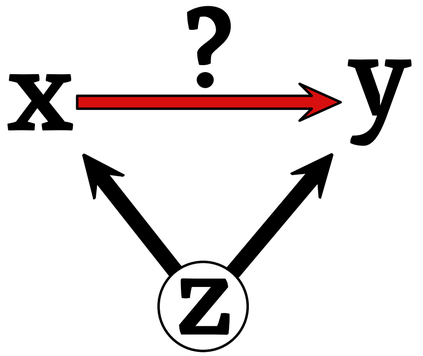
Simulating a shared cause

Math

$$y \sim Normal(\mu = 1 + 0.5x + 2z, \sigma = 1)$$

$$x \sim Normal(\mu = 1 + z, \sigma = 1)$$

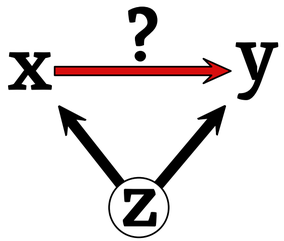
$$z \sim Bernoulli(p = 0.5)$$



R Code

```
N = 200
z = rbinom(N, 1, 0.5)           # z ~ bernoulli(0.5)
x = rnorm(N, 1 + z)             # x ~ normal(1 + z, 1)
y = rnorm(N, 1 + 0.5*x + 2*z) # y ~ normal(1 + 0.5x + 2z, 1)
```

Statistical model without the confounder z



Code

x → y

```
N = 200
z = rbinom(N, 1, 0.5)
x = rnorm(N, 1 + z)
y = rnorm(N, 1 + 0.5*x + 2*z)
m1 = lm(y ~ x)
```