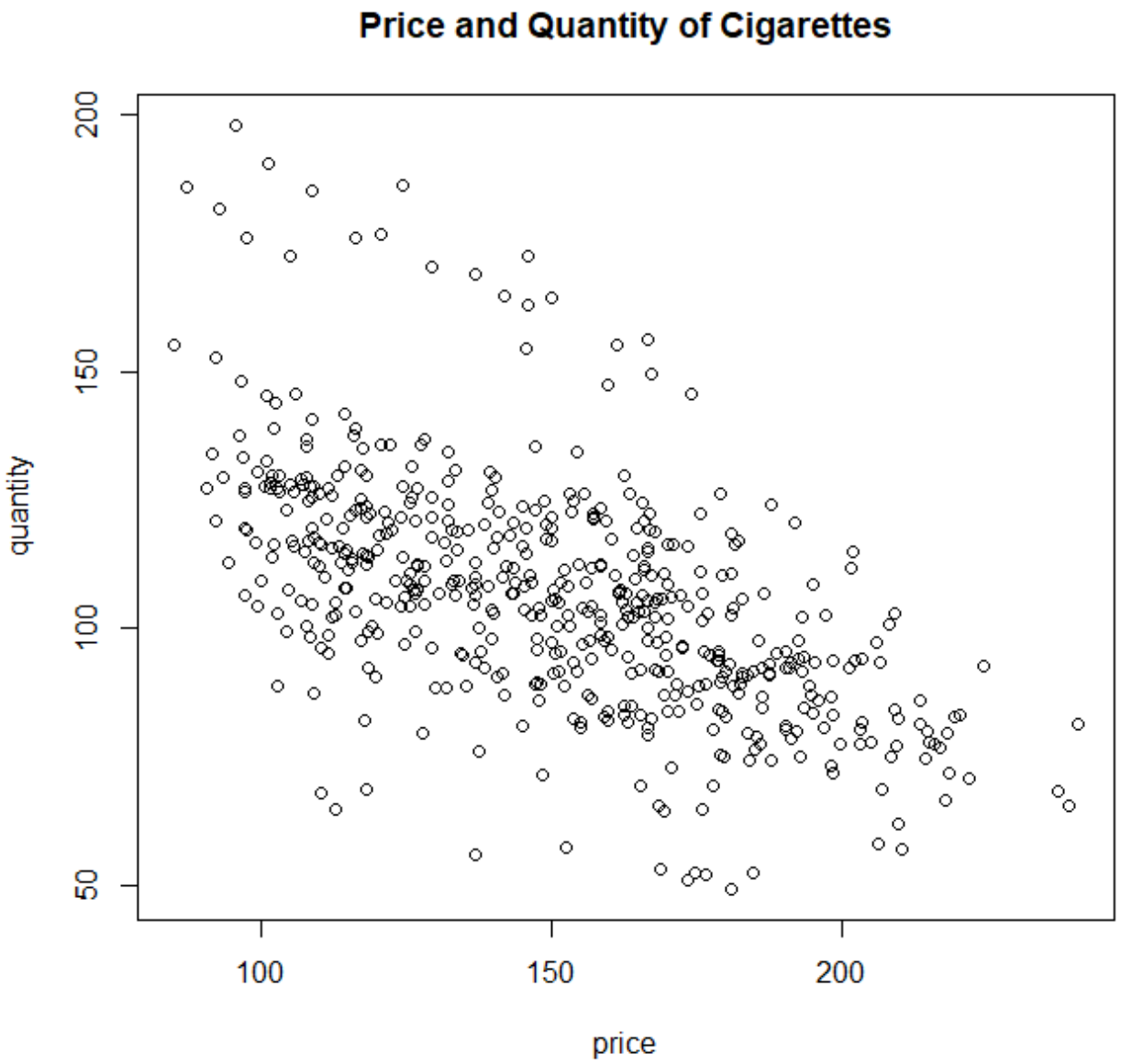
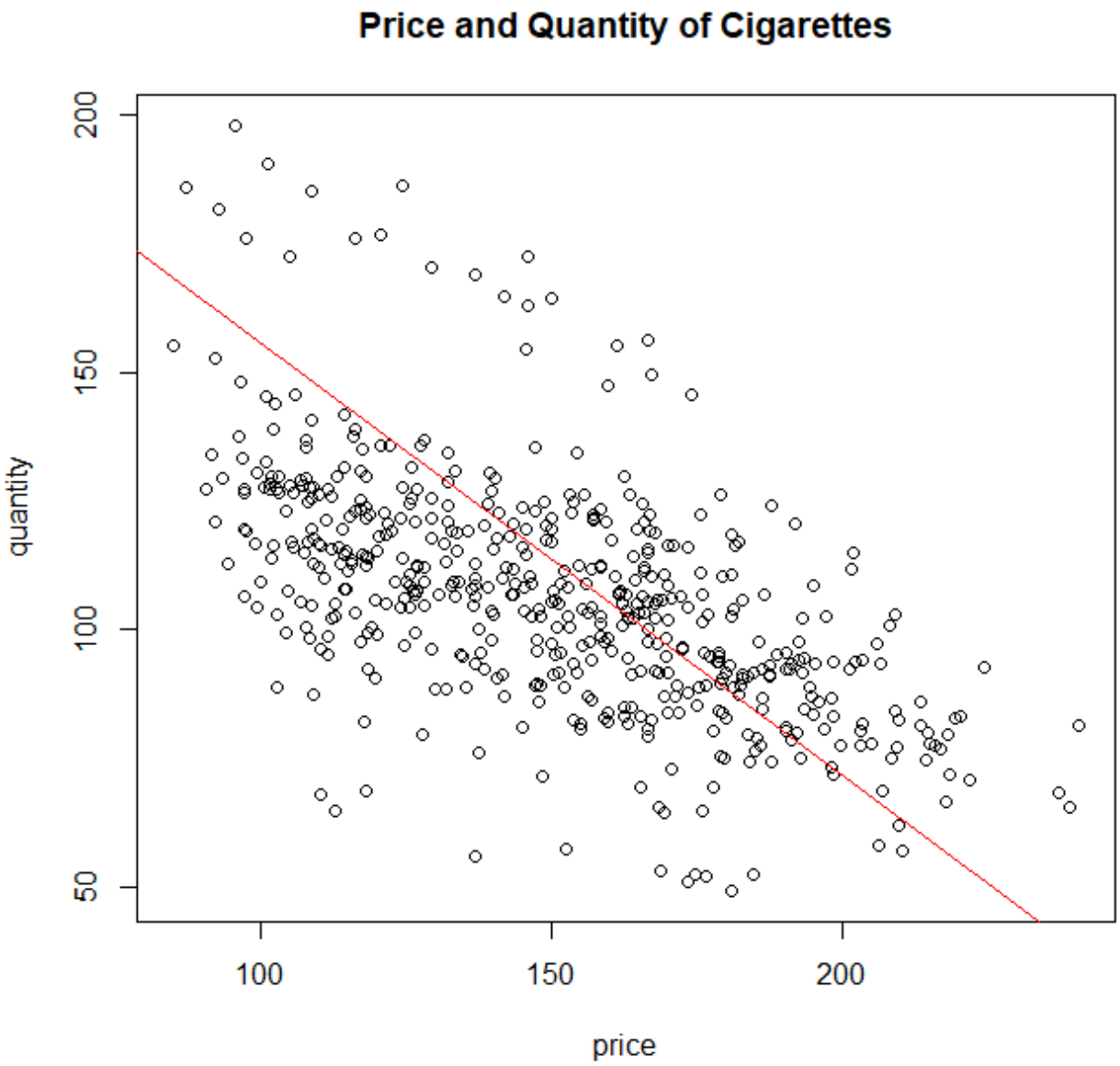
Cigarette Consumption

- Law of demand
- Equation?
- Inverse demand
- What *defines* a line?
- What is it about this model that is important for policy makers who are trying to reduce smoking?
- Data: **packpc** – number of packs per capita, **avgprs** – average price during fiscal year, including sales taxes
- U.S. data from 1985-1995 (Ecdat R package, original source Jonathan Gruber)


Price and Quantity of Cigarettes
quantity
price
50
100
150
200
100
150
200

- What is the *econometric* model?
- How should we *estimate* this model?
- How should we fit a *line* through the data?

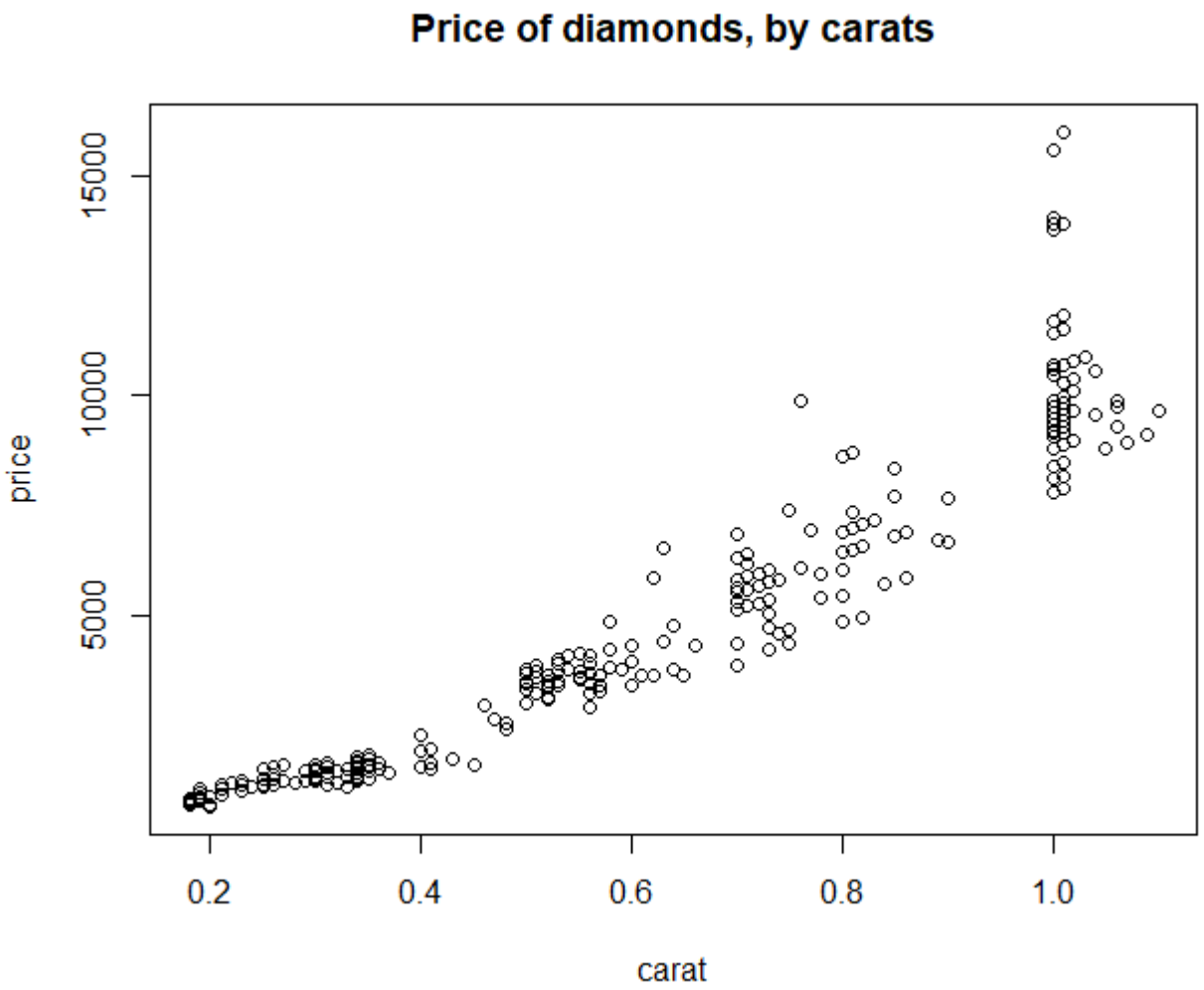
```
> summary(lm(quantity ~ price))

Call:
lm(formula = quantity ~ price)

Residuals:
    Min      1Q  Median      3Q     Max
-56.977  -9.710  -0.716   8.550  69.451

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 167.87737    3.79749   44.21   <2e-16 ***
price        -0.40879    0.02468  -16.56   <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 18.76 on 526 degrees of freedom
Multiple R-squared:  0.3427, Adjusted R-squared:  0.3415
F-statistic: 274.3 on 1 and 526 DF,  p-value: < 2.2e-16
```


Price and Quantity of Cigarettes
quantity
price
50
100
150
200
100
150
200

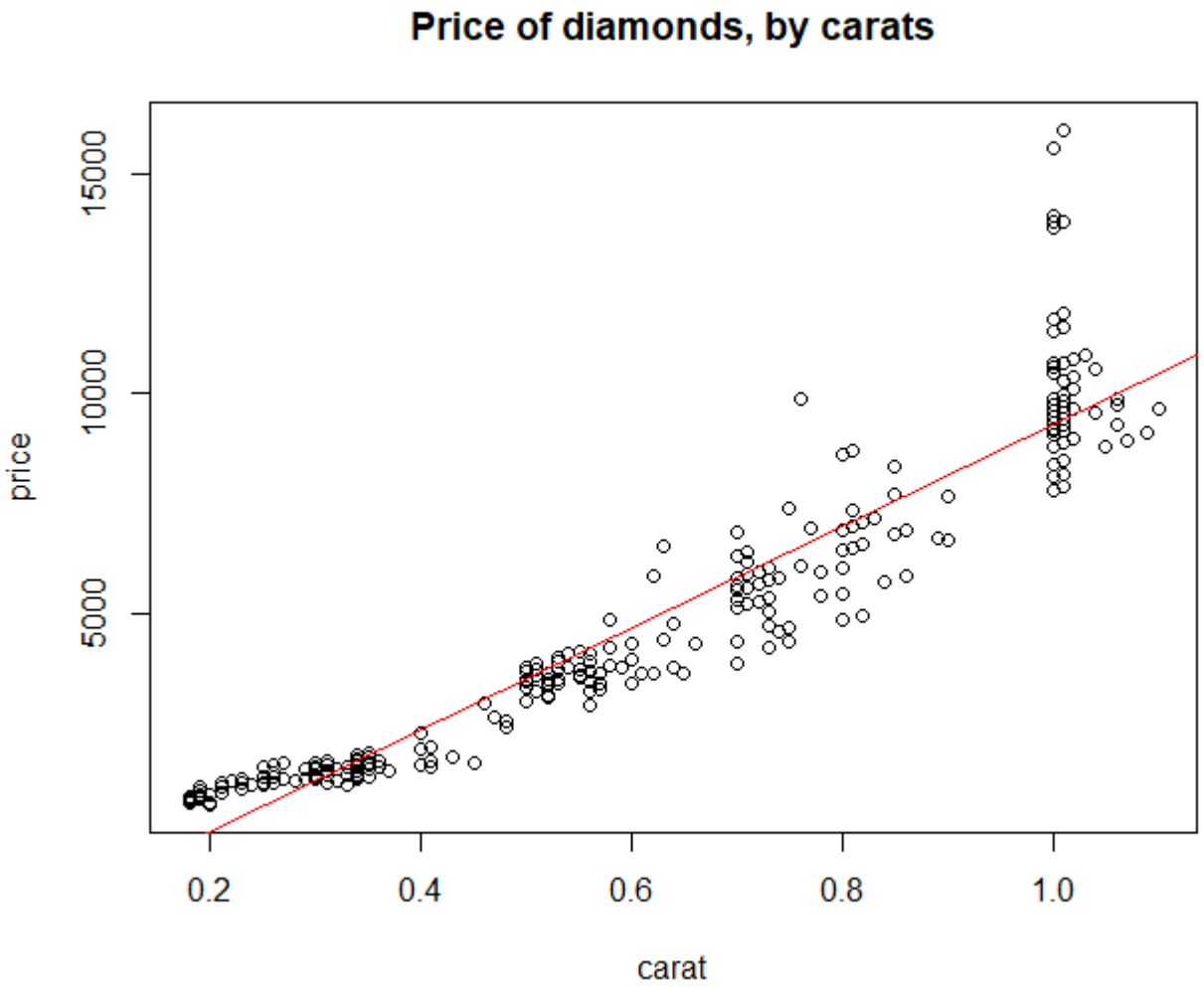
Price of Diamonds

- What determines the price of a diamond?
- How can the “model” for diamond pricing be represented in an equation?
- How is this useful?

- Data: **price** – price in Singapore $s, **carat** – weight of diamond stones in carat unit
- From 2000, $n = 308$ (Source Chu, Singfat (2001) "Pricing the C's of Diamond Stones", Journal of Statistics Education, 9(2).)


Price of diamonds, by carats
price
5000
10000
15000
0.2
0.4
0.6
0.8
1.0
carat

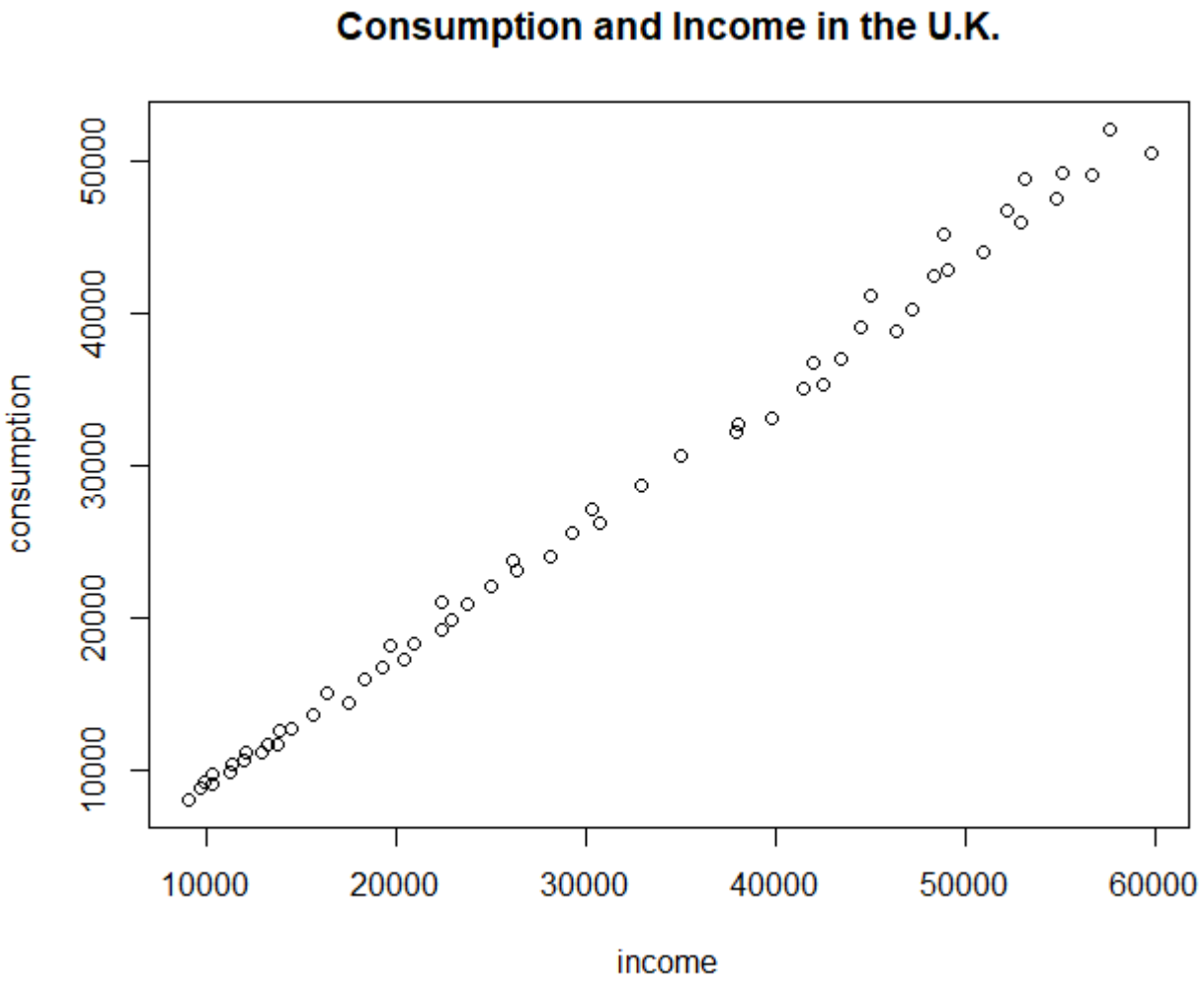
```
> summary(lm(price ~ carat))

Call:
lm(formula = price ~ carat)

Residuals:
    Min      1Q  Median      3Q     Max
-2264.7  -604.3  -116.1   435.1  6591.5

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept)  -2298.4      158.5  -14.50   <2e-16 ***
carat        11598.9      230.1   50.41   <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 1118 on 306 degrees of freedom
Multiple R-squared:  0.8925,Adjusted R-squared:  0.8922
F-statistic:  2541 on 1 and 306 DF,  p-value: < 2.2e-16
```


Price of diamonds, by carats
price
5000
10000
15000
0.2
0.4
0.6
0.8
1.0
carat

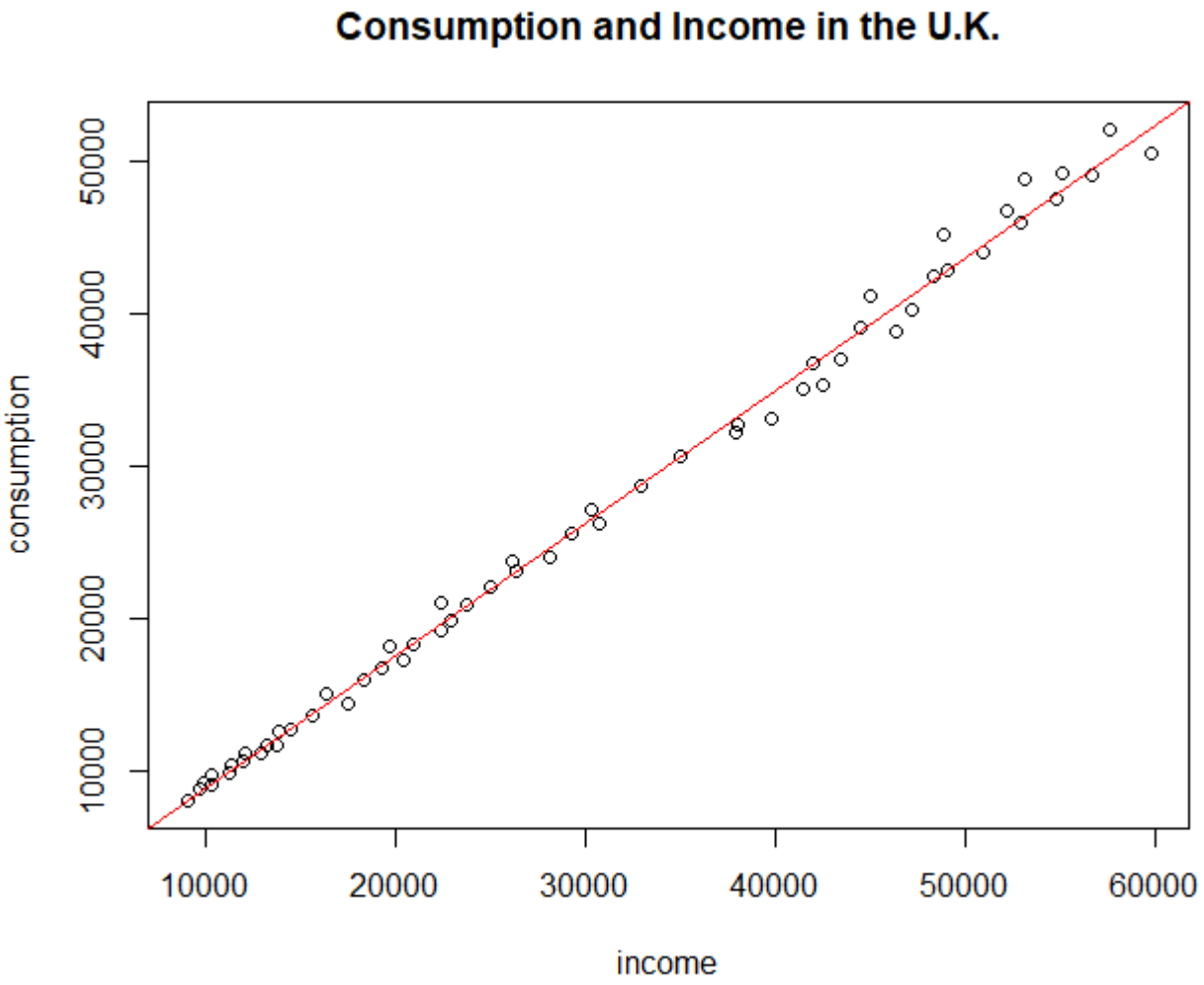
Marginal Propensity to Consume

- What is it?
- Equation?
- Keynes said it should be less than 1

- Data: **income -** total disposable income (million Pounds, current prices), **consumption -** consumer expenditure (million Pounds, current prices)
- From U.K., 1971-1985 (quarterly), $n = 58$ (References Verbeek, Marno (2004) A Guide to Modern Econometrics, John Wiley and Sons, chapters 8 and 9.)


Consumption and Income in the U.K.
consumption
income
10000
20000
30000
40000
50000
60000

```
> summary(lm(consumption ~ income))

Call:
lm(formula = consumption ~ income)

Residuals:
     Min       1Q   Median       3Q      Max
-1804.00  -455.08   -57.85   388.88  2439.82

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 1.768e+02  2.584e+02   0.684    0.497
income      8.690e-01  7.497e-03 115.911   <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 905.3 on 56 degrees of freedom
Multiple R-squared:  0.9958, Adjusted R-squared:  0.9958
F-statistic: 1.344e+04 on 1 and 56 DF,  p-value: < 2.2e-16
```


Consumption and Income in the U.K.
consumption
10000
20000
30000
40000
50000
income
10000
20000
30000
40000
50000
60000

How should we choose the line? (estimate the intercept and slope?)