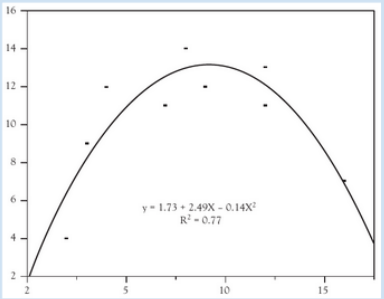
Today's Agenda

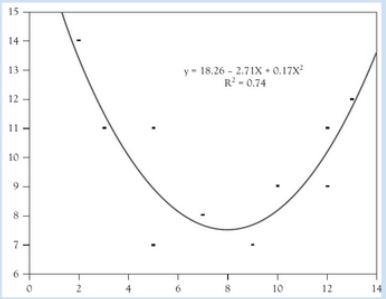
Extending the OLS Regression using Dataset 1

1. Dummy predictors
2. Categorical predictors
3. Transforming the variables
4. **Transforming the model**

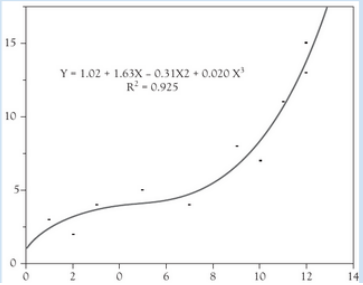
Justin Leinaweaver (Spring 2022)

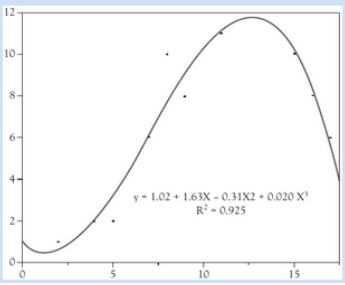
Quadratic Function





Cubic Function





Transforming the Model

Fit three separate OLS models to the data.

1. A standard, simple OLS model
2. An OLS with a quadratic function
3. An OLS with a cubic function

Do states with more manufacturing have larger economies?

Regress GDP (billions) on Manufacturing as:

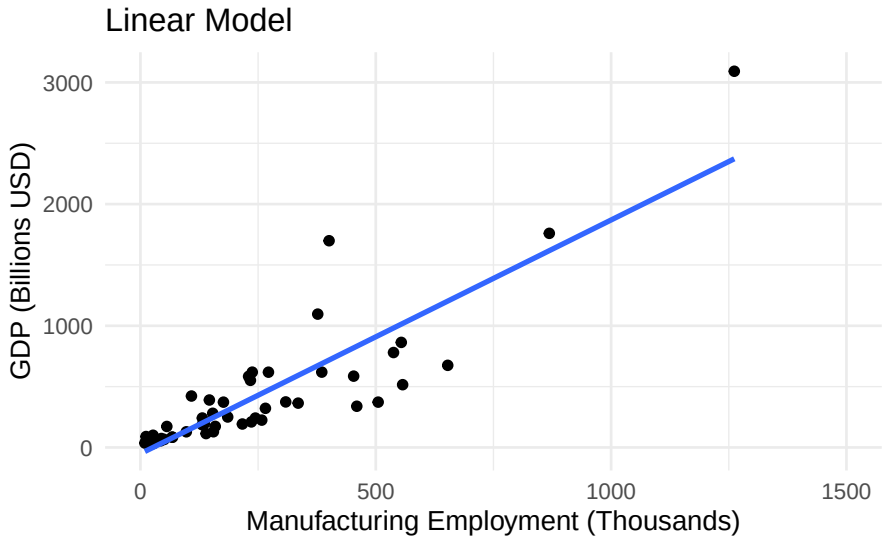
1. A standard, simple OLS model
2. An OLS with a quadratic function
3. An OLS with a cubic function

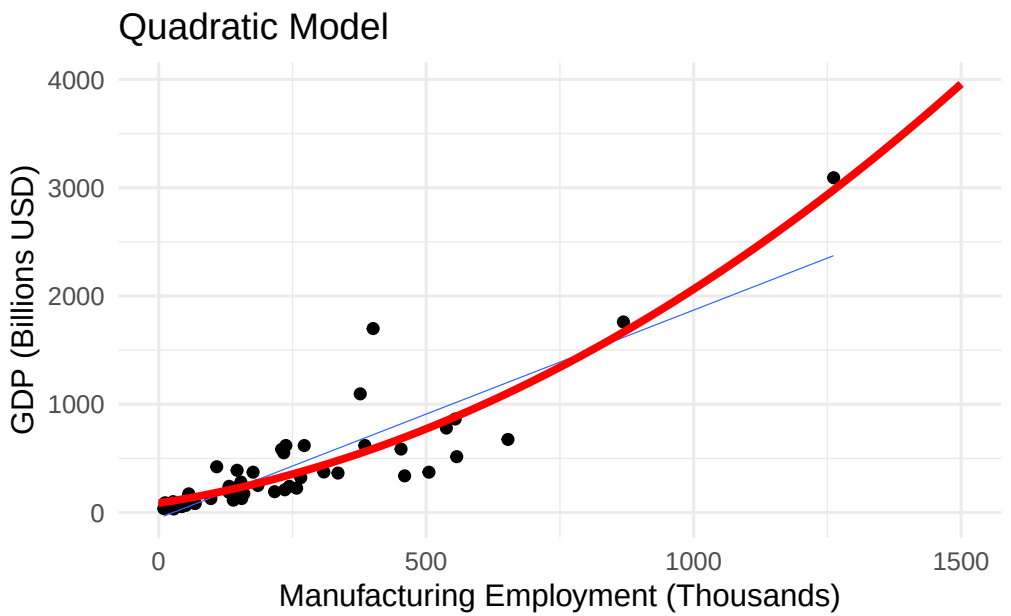
Do states with more manufacturing have larger economies?

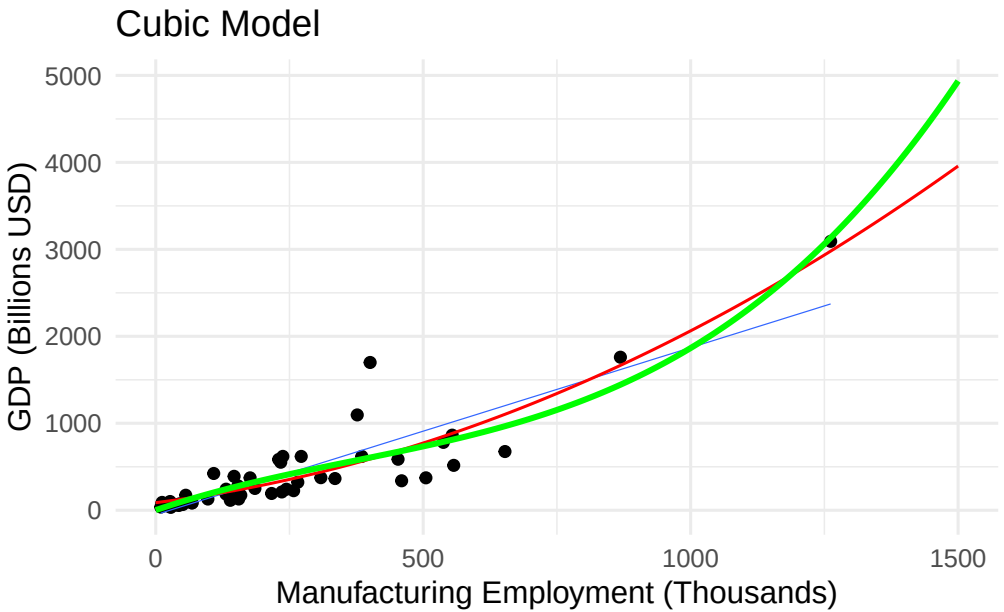
Regress GDP (billions) on Manufacturing as:

1. Manufacturing
2. Manufacturing + Manufacturing^2
3. Manufacturing + Manufacturing^2 + Manufacturing^3

	GDP (billions)		
	(1)	(2)	(3)
Manufacturing	1.92*	0.77*	2.10*
	(0.16)	(0.35)	(0.77)
Squared		0.001*	−0.002
		(0.0003)	(0.002)
Cubed			0.0000
			(0.0000)
Constant	−51.20	87.00	1.36
	(53.79)	(61.08)	(74.17)
Observations	50	50	50
Adjusted R^2	0.75	0.80	0.81
Residual Std. Error	268.27 (df = 48)	239.24 (df = 47)	232.61 (df = 46)
F Statistic	148.54* (df = 1; 48)	100.07* (df = 2; 47)	71.81* (df = 3; 46)
Note:			*p<0.05


Linear Model
GDP (Billions USD)
3000
2000
1000
0
0
500
1000
1500
Manufacturing Employment (Thousands)


Quadratic Model
GDP (Billions USD)
4000
3000
2000
1000
0
0
500
1000
1500
Manufacturing Employment (Thousands)

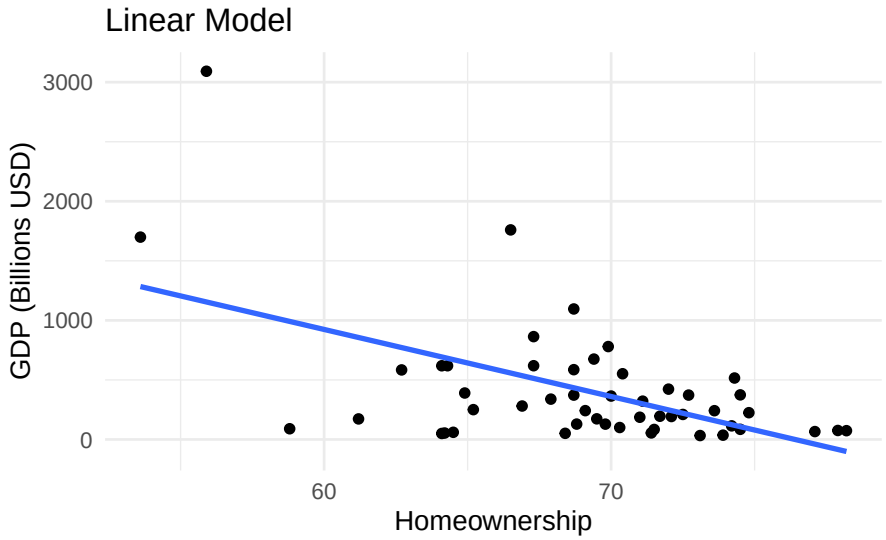

Cubic Model
GDP (Billions USD)
5000
4000
3000
2000
1000
0
0
500
1000
1500
Manufacturing Employment (Thousands)

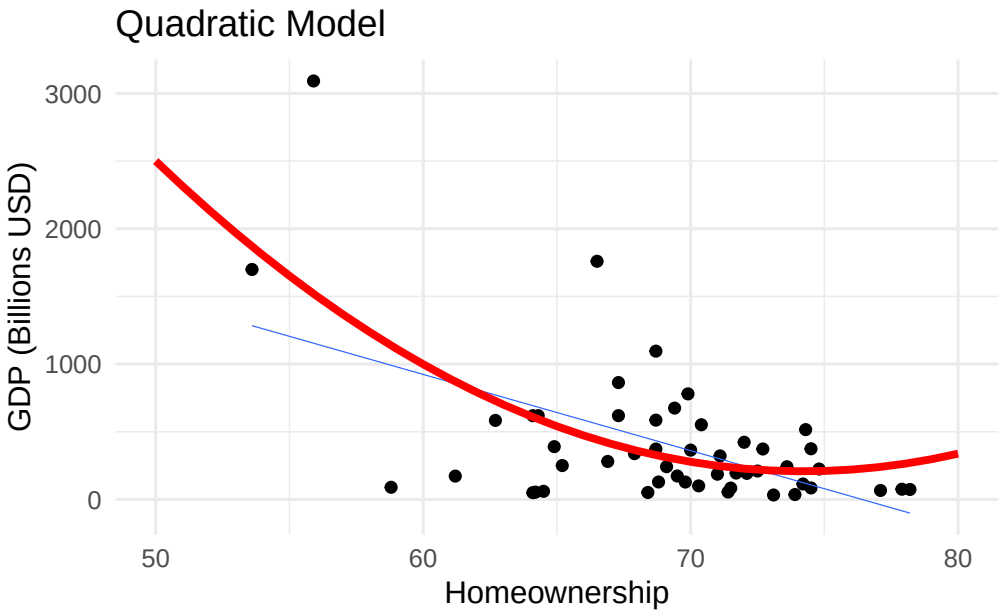
Does homeownership explain the size of the economy?

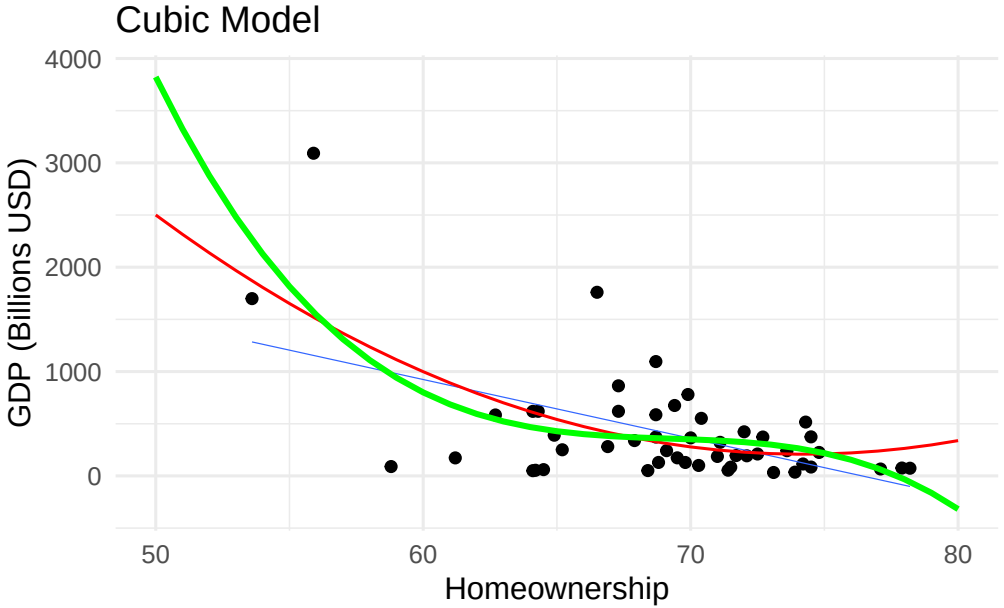
Regress GDP (billions) on Homeownership as:

1. A standard, simple OLS model
2. An OLS with a quadratic function
3. An OLS with a cubic function

	GDP (billions)		
	(1)	(2)	(3)
Homeownership	−56.30*	−579.69*	−6,694.52*
	(12.70)	(212.84)	(2,976.30)
Squared		3.90*	96.59*
		(1.59)	(45.03)
Cubed			−0.47*
			(0.23)
Constant	4,301.63*	21,723.19*	155,210.00*
	(879.84)	(7,122.48)	(65,182.20)
Observations	50	50	50
Adjusted R^2	0.28	0.34	0.39
Residual Std. Error	457.31 (df = 48)	434.93 (df = 47)	420.67 (df = 46)
F Statistic	19.64* (df = 1; 48)	13.89* (df = 2; 47)	11.31* (df = 3; 46)
Note:			*p<0.05


Linear Model
3000
2000
1000
0
GDP (Billions USD)
60
70
Homeownership


Quadratic Model
GDP (Billions USD)
3000
2000
1000
0
50
60
70
80
Homeownership


Cubic Model
GDP (Billions USD)
4000
3000
2000
1000
0
50
60
70
80
Homeownership

Does unemployment explain the size of the economy?

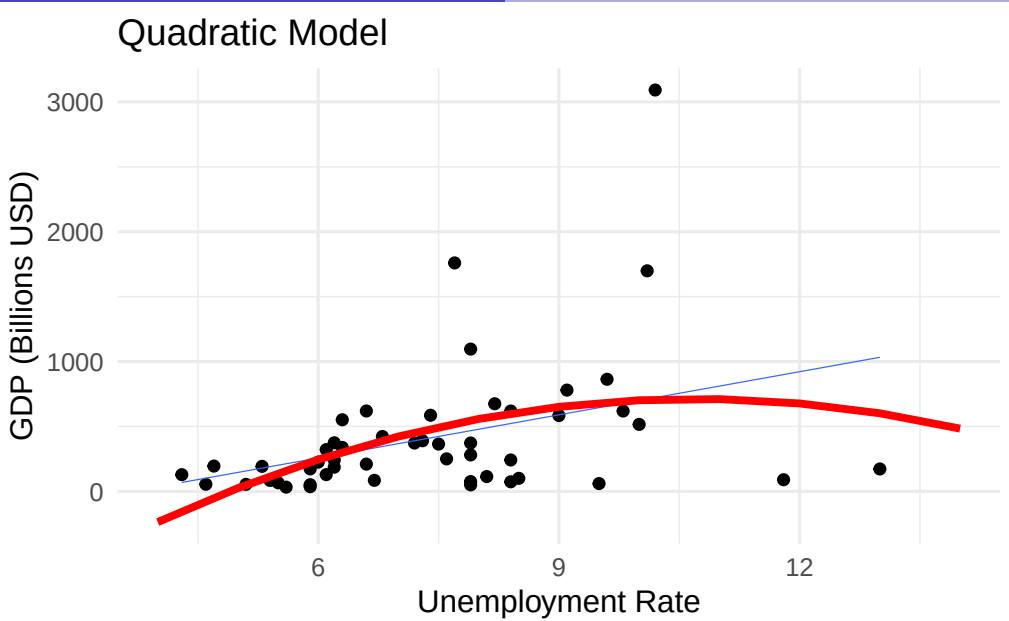
Regress GDP (billions) on Unemployment as:

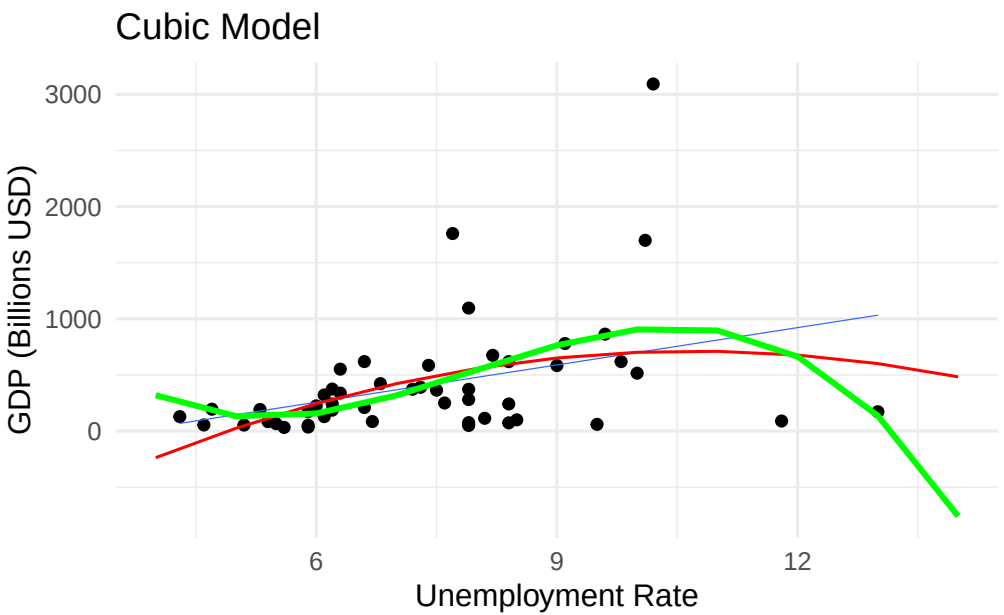
1. A standard, simple OLS model
2. An OLS with a quadratic function
3. An OLS with a cubic function

	GDP (billions)		
	(1)	(2)	(3)
Unemployment	110.80*	451.98	−2,018.53
	(38.97)	(247.19)	(1,253.15)
Squared		−21.11	285.01
		(15.11)	(153.11)
Cubed			−12.01
			(5.98)
Constant	−407.76	−1,706.80	4,602.56
	(297.43)	(975.16)	(3,280.45)
Observations	50	50	50
Adjusted R^2	0.13	0.14	0.20
Residual Std. Error	502.19 (df = 48)	497.28 (df = 47)	481.97 (df = 46)
F Statistic	8.09* (df = 1; 48)	5.10* (df = 2; 47)	4.96* (df = 3; 46)

Note: *p<0.05


Linear Model
GDP (Billions USD)
3000
2000
1000
0
4
6
8
10
12
Unemployment Rate


Quadratic Model
GDP (Billions USD)
3000
2000
1000
0
6
9
12
Unemployment Rate


Cubic Model
3000
2000
1000
0
GDP (Billions USD)
6
9
12
Unemployment Rate