Economics 310
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University of Wisconsin-Madison

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Handout for Lecture of 10 December

Returning to our example from the last three lectures, consider the simple regression of the US interest rate on the US inflation rate. The underlying true relationship is assumed to be:

$$y = \beta_0 + \beta_1 x_1 + \varepsilon$$

where y is USIGB_ and x_1 is USINFL1Y. The resulting output is:

Dependent Variable: USIGB_
Method: Least Squares
Date: 12/09/03 Time: 19:53
Sample(adjusted): 1961:1 2003:1
Included observations: 169 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.049855	0.002720	18.33019	0.0000
USINFL1Y	0.514719	0.050905	10.11129	0.0000

R-squared	0.379732	Mean dependent var	0.072622
Adjusted R-squared	0.376017	S.D. dependent var	0.025109
S.E. of regression	0.019834	Akaike info criterion	-4.991068
Sum squared resid	0.065696	Schwarz criterion	-4.954027
Log likelihood	423.7452	F-statistic	102.2383
Durbin-Watson stat	0.070167	Prob(F-statistic)	0.000000

The interpretation of the coefficient on USINFL1Y is that it is the change in USIGB_ for a one unit change in USINFL1Y; the estimate of this parameter is 0.515.

One might think that interest rates respond to inflation rates differently when inflation is high versus when it is low. Then, the underlying conceptual model is:

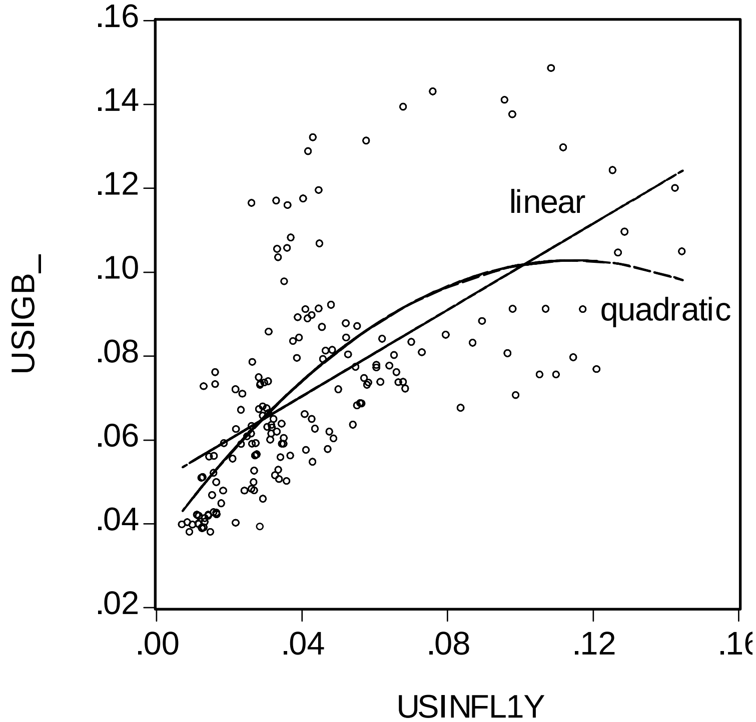
$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_1^2 + \varepsilon$$

Dependent Variable: USIGB_
Method: Least Squares
Date: 12/09/03 Time: 20:00
Sample(adjusted): 1961:1 2003:1
Included observations: 169 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.034851	0.004623	7.538492	0.0000
USINFL1Y	1.189534	0.178456	6.665691	0.0000
USINFL1Y^2	-5.199855	1.322621	-3.931478	0.0001

R-squared	0.432566	Mean dependent var	0.072622
Adjusted R-squared	0.425730	S.D. dependent var	0.025109
S.E. of regression	0.019028	Akaike info criterion	-5.068262
Sum squared resid	0.060100	Schwarz criterion	-5.012701
Log likelihood	431.2681	F-statistic	63.27256
Durbin-Watson stat	0.082729	Prob(F-statistic)	0.000000

Now the estimated impact on USIGB_ of a one unit change in USINFL1Y is $\hat{\beta}_1 + 2\hat{\beta}_2 x_1$. Notice that when inflation is high, the estimated impact of a one unit change in USINFL1Y is lower than when the inflation rate is low. In fact, at sufficiently high rates of inflation, the best fit line implies that a one unit increase in inflation decrease in interest rates.



Now, returning to the simple regression case, suppose one thought that the 1980's were different than other periods. Then one might estimate a regression with a dummy variable that takes a value of unity during the 1980's.

Dependent Variable: USIGB_
Method: Least Squares
Date: 12/09/03   Time: 20:24
Sample(adjusted): 1961:1 2003:1
Included observations: 169 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.044720	0.001906	23.45740	0.0000
USINFL1Y	0.431538	0.038887	11.09720	0.0000
DUM80S	0.042144	0.004062	10.37470	0.0000
DUM80S*USINFL1Y	-0.088185	0.067063	-1.314942	0.1904

R-squared	0.773200	Mean dependent var	0.072622
Adjusted R-squared	0.769076	S.D. dependent var	0.025109
S.E. of regression	0.012066	Akaike info criterion	-5.973483
Sum squared resid	0.024022	Schwarz criterion	-5.899402
Log likelihood	508.7593	F-statistic	187.5044
Durbin-Watson stat	0.260417	Prob(F-statistic)	0.000000

This specification allows a shift in the intercept and the slope during the 1980's.