Computer Handout 6: Modeling and Forecasting Trend

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Econ 3342

This Computer Handout 6 will compare models with different trend structure and illustrate the use of the AIC and the SIC as two forms of selection criteria.

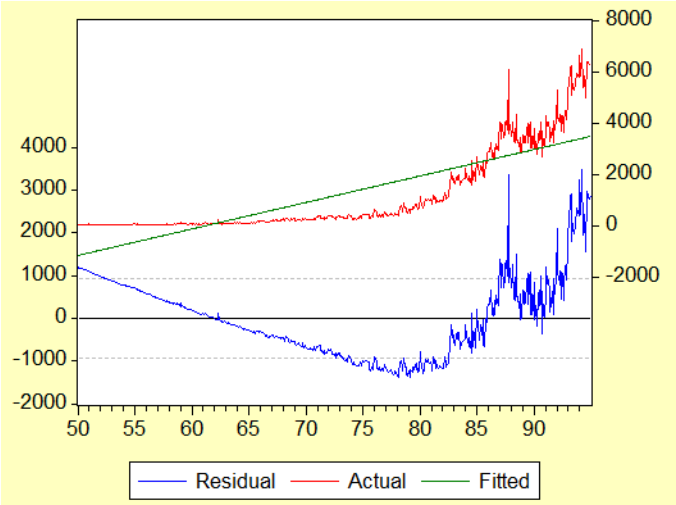
The variable of interest is the volume on the New York Stock Exchange.

Model 1) Linear trend: ls nysevol c @trend

Dependent Variable: NYSEVOL
Method: Least Squares
Date: 10/03/10 Time: 22:29
Sample: 1950M01 1994M12
Included observations: 540

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-6311.367	227.6358	-27.72572	0.0000
@TREND	8.592274	0.257692	33.34316	0.0000

R-squared	0.673893	Mean dependent var	1159.615
Adjusted R-squared	0.673287	S.D. dependent var	1633.118
S.E. of regression	933.4706	Akaike info criterion	16.51939
Sum squared resid	4.69E+08	Schwarz criterion	16.53529
Log likelihood	-4458.236	F-statistic	1111.766
Durbin-Watson stat	0.113092	Prob(F-statistic)	0.000000



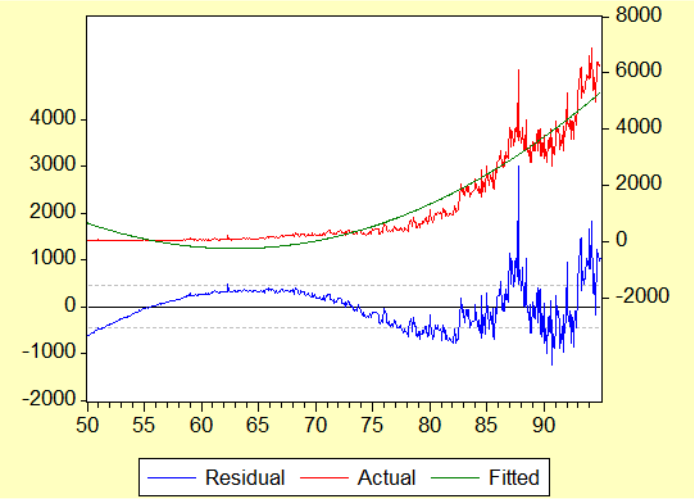
Model 2) Quadratic trend:

Model 2) Quadratic trend: ls nysevol c @trend @trend^2

Dependent Variable: NYSEVOL
Method: Least Squares
Date: 10/03/10 Time: 22:37
Sample: 1950M01 1994M12
Included observations: 540

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	21239.88	656.3047	32.36284	0.0000
@TREND	-56.88488	1.543046	-36.86532	0.0000
@TREND^2	0.037652	0.000884	42.56987	0.0000

R-squared	0.925456	Mean dependent var	1159.615
Adjusted R-squared	0.925178	S.D. dependent var	1633.118
S.E. of regression	446.7168	Akaike info criterion	15.04727
Sum squared resid	1.07E+08	Schwarz criterion	15.07111
Log likelihood	-4059.762	F-statistic	3333.379
Durbin-Watson stat	0.493887	Prob(F-statistic)	0.000000

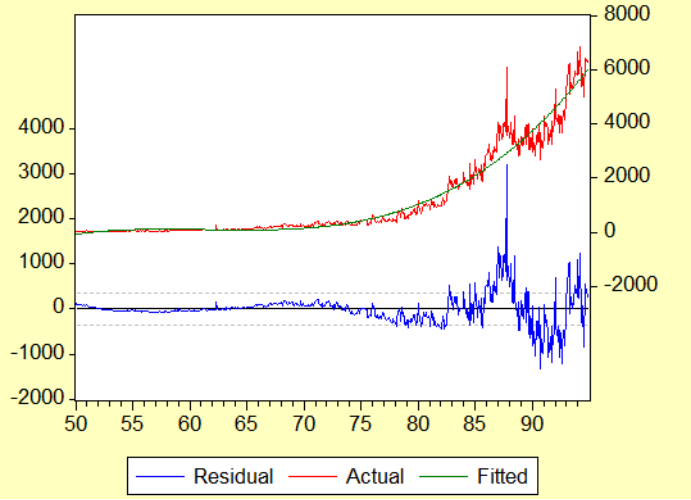


Model 3) Cubic trend: ls nysevol c @trend @trend^2 @trend^3

Dependent Variable: NYSEVOL
Method: Least Squares
Date: 10/03/10 Time: 22:38
Sample: 1950M01 1994M12
Included observations: 540

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-37461.26	3141.303	-11.92539	0.0000
@TREND	153.9406	11.19722	13.74810	0.0000
@TREND^2	-0.209583	0.013074	-16.03063	0.0000
@TREND^3	9.48E-05	5.01E-06	18.93661	0.0000

R-squared	0.955336	Mean dependent var	1159.615
Adjusted R-squared	0.955086	S.D. dependent var	1633.118
S.E. of regression	346.1037	Akaike info criterion	14.53873
Sum squared resid	64206230	Schwarz criterion	14.57052
Log likelihood	-3921.458	F-statistic	3821.611
Durbin-Watson stat	0.823825	Prob(F-statistic)	0.000000

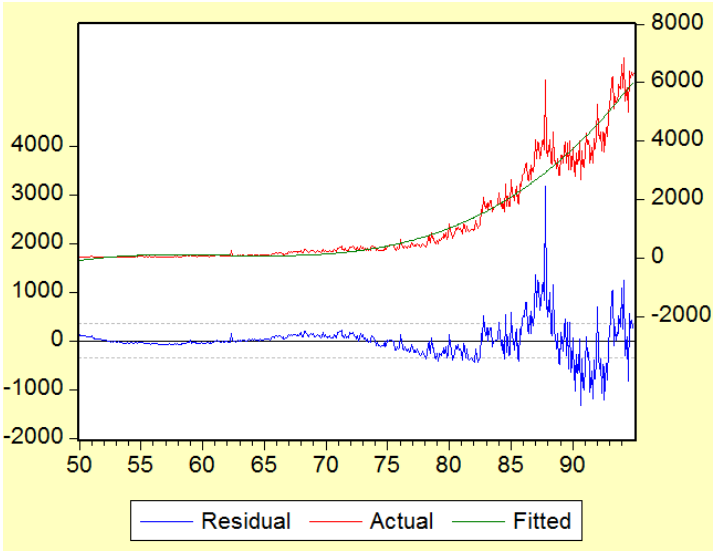


Model 4) Fourth power trend: ls nysevol c @trend @trend^2 @trend^3 @trend^4

Dependent Variable: NYSEVOL
Method: Least Squares
Date: 10/03/10 Time: 22:42
Sample: 1950M01 1994M12
Included observations: 540

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-40938.43	19576.47	-2.091206	0.0370
@TREND	170.6429	93.48719	1.825307	0.0685
@TREND^2	-0.239225	0.165235	-1.447789	0.1483
@TREND^3	0.000118	0.000128	0.919407	0.3583
@TREND^4	-6.63E-09	3.68E-08	-0.179956	0.8573

R-squared	0.955339	Mean dependent var	1159.615
Adjusted R-squared	0.955005	S.D. dependent var	1633.118
S.E. of regression	346.4165	Akaike info criterion	14.54238
Sum squared resid	64202344	Schwarz criterion	14.58211
Log likelihood	-3921.442	F-statistic	2861.042
Durbin-Watson stat	0.823879	Prob(F-statistic)	0.000000



	Linear	Quadratic	Cubic	Four	Five
R-squared	0.6739	0.9255	0.9553	0.9553	0.9561
Adjusted R-squared	0.6733	0.9252	0.9551	0.9550	0.9557
S.E. of regression	933.4706	446.7168	346.1037	346.4165	343.6152
Akaike info criterion (AIC)	16.5194	15.0473	14.5387	14.5424	14.5280
Schwarz critetion (SIC)	16.5353	15.0711	14.5705	14.5821	14.5757

Model Selection Summary:

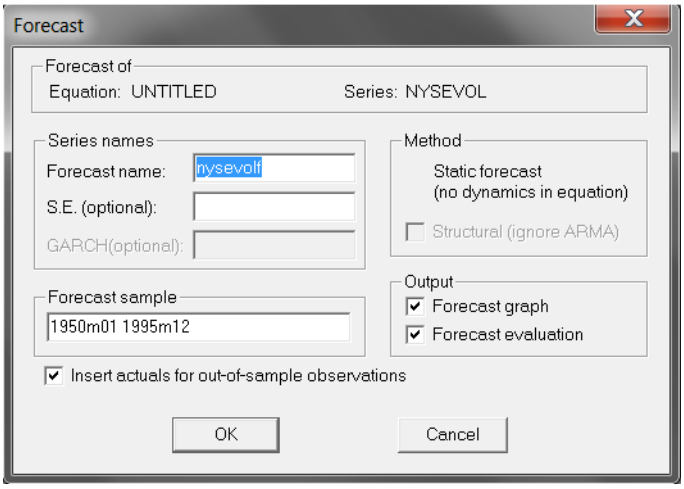
The R-squared will always increase as we include more variables into the model, hence does not work as a model selection criterion.

The Adjusted R-squared and the Standard Error of the regression do penalize for the inclusion of more variables into the model (which decreases the degrees of freedom), but the penalty is not severe enough. They can increase or decrease as more variables are included.

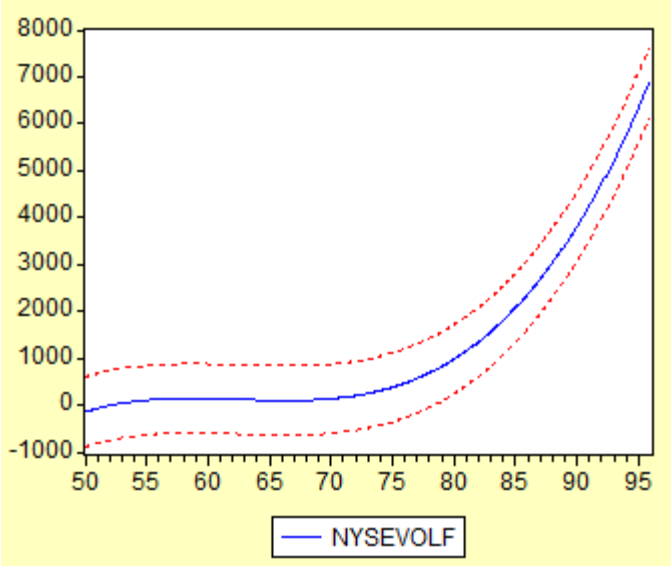
The AIC and the SIC can increase or decrease as more variables are included. The selected model should be the one that has the smallest AIC and SIC. When they do not select the same model, the parsimonious model should be selected. That is, the one with the least number of estimated parameters and this will be given by the SIC. In the models above, AIC selects the fifth specification, but SIC selects the cubic specification. We pick the parsimonious model: the cubic.

Forecasting:

Getting the out-of-sample point forecast values is simple. After estimating the equation, just click on Forecast and make sure the "Forecasting sample" contains some values into the future:



For the selected cubic model we have:



The dotter red lines are the one standard deviation confidence intervals. Notice that the sample spans for an additional year (the twelve months of 1995).