Latest Releases: SAS/ETS® 14.1

Econometric and time series methods for modeling and forecasting

Overview

SAS/ETS 14.1 introduces many new estimation features, including additional Bayesian estimation options for limited dependent variable and count data models, count data models with spatial effects, new linear panel data regression models with options to compare models, limited dependent variable models for panel data, and many other enhancements. SAS/ETS 14.1 also releases the X13 procedure for seasonal adjustment.

SASEFRED and SASEQUANDL Interface Engines

Federal Reserve Economic Data (FRED) and Quandl data can now be accessed from new SAS/ETS access engine utilities. These utilities conveniently enable you to dynamically query the most up-to-date information from the FRED and Quandl databases and then include these data to enrich and enhance your models.
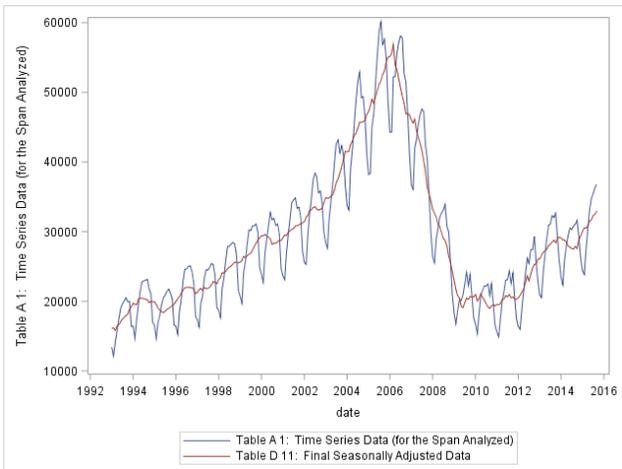
Seasonally Adjusted Data from PROC X13

PROC X13 for Seasonal Adjustment

The X13 procedure is an adaptation of the US Bureau of the Census X-13ARIMA-SEATS seasonal adjustment program (US Bureau of the Census 2013). The X-13ARIMA-SEATS program was developed by the Time Series Staff of the Statistical Research Division, US Census Bureau, by incorporating the SEATS method into the X-12-ARIMA seasonal adjustment program. The X-12-ARIMA seasonal adjustment program contains components developed from Statistics Canada's X-11-ARIMA program (US Bureau of the Census 2010). The X-12-ARIMA

automatic modeling method and the SEATS method are based on the work of Gómez and Maravall.

New Features for PROC PANEL

SAS/ETS 14.1 introduces two new estimators for panel data models: the Hausman-Taylor (1981) and Amemiya-MaCurdy (1986) estimators, which are hybrids that combine the desirable properties of fixed-effects and random-effects models. Under the right circumstances, these estimators afford you the consistency of fixed effects and the efficiency and wider applicability of random effects. Both estimators are instrumental-variables regressions, where you stipulate a set of regressors as correlated with individual effects. The instrumental variables are then determined internally from the set of uncorrelated regressors, their individual-level means, and their deviations from individual-level means. To obtain these estimators, first specify the correlated regressors in the CORRELATED= option in the INSTRUMENTS statement, and then specify the HTAYLOR or AMACURDY option in the MODEL statement.

Comparison of Model Parameter Estimates					
Variable		Model 1 RanOne	Model 2 FixOne	Model 3 AMaCurdy	Model 4 HTaylor
Intercept	Estimate	4.030811	5.618905	2.927338	2.912726
	Std Err	0.104447	0.068116	0.275127	0.283652
wks	Estimate	0.000954	0.000836	0.000838	0.000837
	Std Err	0.000740	0.000600	0.000599	0.000600
south	Estimate	-0.007879	-0.001861	0.007282	0.007440
	Std Err	0.028137	0.034299	0.031936	0.031955
smsa	Estimate	-0.028976	-0.042469	-0.041951	-0.041833
	Std Err	0.020207	0.019428	0.018947	0.018958

COMPARE option from PROC PANEL

Comparison tables for multiple models: The new COMPARE statement creates tables of side-by-side comparisons of parameter estimates and other model statistics. You can fit multiple models in the PANEL procedure by issuing multiple MODEL statements. Also specifying a COMPARE statement creates tables that compare the models. The COMPARE statement creates two tables: the first table compares model fit statistics such as R^2 and MSE; the second table compares regression coefficients, their standard errors, and (optionally) *t* tests.

More general Hausman specification tests: In previous versions, Hausman tests for random effects required that the random-

effects model contain no time-invariant regressors (regressors that would be dropped from the fixed-effects model). That requirement has been relaxed in SAS/ETS 14.1, and the Hausman test is now a comparison of regressors that are common to both the random-effects and fixed-effects models. A new column labeled "Coefficients" has been added to the output table for the Hausman test; this column tells you how many coefficients are common to both models, and thus also tells you the nominal rank of the test.

Spatial Count Data Models

Spatial regression models explicitly consider the relative nearness or farness of data in the data generating process. Explicitly controlling for these differences can provide meaningful information about how one observation affects another. SAS/ETS 14.1 now includes options to estimate count data regression models on data that have a spatial lag component. The SPATIALEFFECTS, SPATIALDISPEFFECTS, and SPATIALZEROEFFECTS statements have been added to allow for spatial effects in the MODEL, DISPMODEL, and ZEROMODEL statements, respectively.

## Limited Dependent Variable Models for Panel Data

The QLIM procedure now supports simulated-maximum likelihood estimates for models that include random effects or random intercepts. These response variables can be continuous, discrete, censored, or truncated. Among these estimable models are all univariate models in the QLIM procedure, including the following:

- Probit with random effects
- logit with random effects
- ordered probit with random effects
- ordered logit with random effects
- Tobit with random effects
- stochastic frontier with random effects

Marginal Likelihoods for Models

The COUNTREG and QLIM procedures now provide options to generate marginal likelihoods when they perform Bayesian analysis. Marginal likelihood can be thought of as a measure of the probability that is associated with a specification being true given the data. Often it is thought of as a Bayesian corollary to the frequentist fit statistic adjusted R^2.

These marginal likelihoods offer consistent and intuitive ways to compare specifications across models in a Bayesian analysis. The marginal likelihoods also offer weights or importance statistics that might be used to create ensemble models. The marginal likelihood values are computed using the MARGINLIKE option on the BAYES statements within PROC QLIM and PROC COUNTREG.
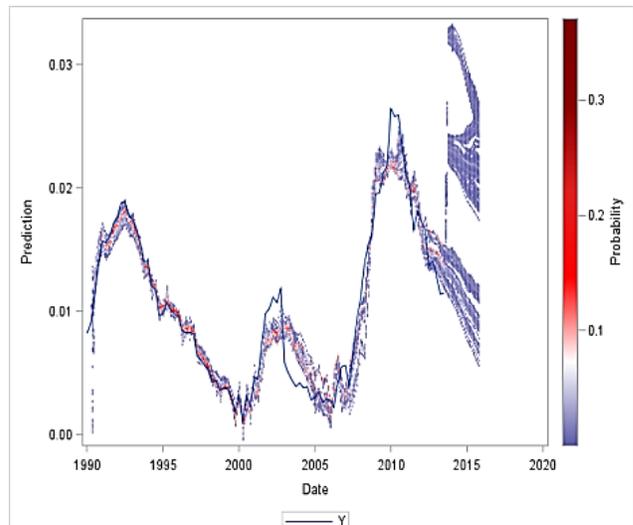
Ensemble Model from Marginal Likelihood Calculations

Other Enhancements to SAS/ETS

The MODEL procedure adds the %EQAR and %EQMA macros. Model programs that are expressed using general form equations can now use the %EQAR macro to specify autoregressive error processes, or the %EQMA macro to specify moving average error processes. The %EQAR and %EQMA macros modify general form equations similarly to how the %AR and %MA macros modify normal form equations.

The following features have been added to the VARMAX procedure:

- Vector error correction models in ARMA-GARCH form are supported.
- The linear equality and inequality constraints for any parameters to be estimated in vector error correction models are supported.
- You can specify initial values, by using the INITIAL statement, for any parameters to be estimated in vector error correction models.
- A new estimation method, the conditional maximum likelihood method (CML), is supported. This method is especially suitable for estimating VARMAX models on large samples.
- The log likelihoods for all types of models are output.

For More Information

For more information, ask your organization's SAS representative to contact the SAS Customer Interaction Center at 1.800.727.0025.