

Econometrics Toolbox 1

Model and analyze financial and economic systems using statistical methods

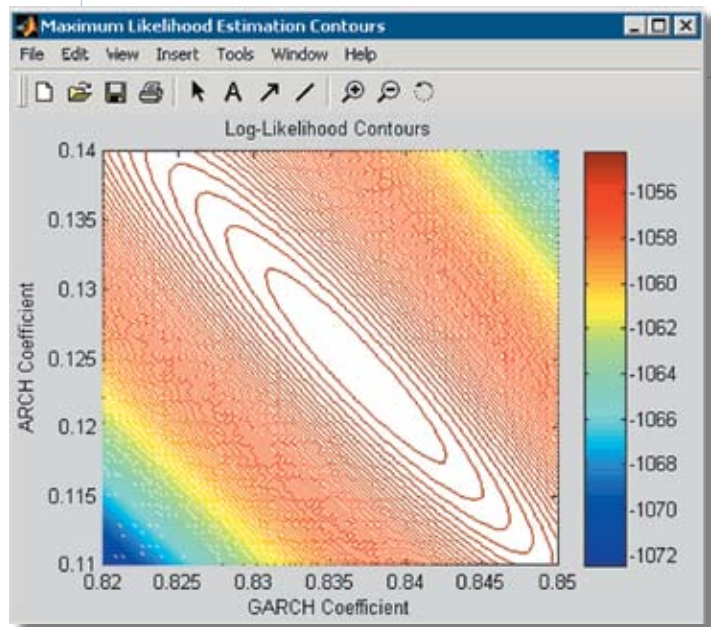
Econometrics Toolbox™ provides functions for modeling economic principles and behavior, with a focus on volatility modeling. It lets you perform Monte Carlo simulation and forecasting with linear and nonlinear stochastic differential equations (SDEs) and build univariate ARMAX/GARCH composite models with several GARCH variants and multivariate VARMAX models. You can use the toolbox to generate minimum mean square error forecasts, estimate parameters in ARMAX/GARCH models and unrestricted/restricted VARX models, and model volatility with Heston stochastic volatility models. You can also perform diagnostic and statistical hypothesis tests, including the likelihood ratio test and variants of Dickey-Fuller and Phillips-Perron unit root tests.

Parameter Estimation

With Econometrics Toolbox, you can perform parameter estimation (model calibration) of univariate ARMAX/GARCH composite models and multivariate VAR/VARX models. The software also provides a variety of pre- and post-estimation diagnostics and statistical tests of interest in financial and economic time-series analysis, including tests of the presence of conditional heteroscedasticity, Q tests, likelihood ratio tests, and several variants of Dickey-Fuller and Phillips-Perron unit root tests, as well as AIC/BIC information criteria model order selection utilities.

KEY FEATURES

- Univariate ARMAX/GARCH composite models, with EGARCH, GJR, and other variants
- Multivariate VARX and VARMAX simulation and forecasting
- Dickey-Fuller and Phillips-Perron unit root tests
- Monte Carlo simulation of stochastic differential equations (SDEs), including Brownian motion, CEV, CIR, Hull-White, Vasicek, Heston stochastic volatility, and user-defined SDEs
- Statistical tests, including likelihood ratio, Engle's ARCH, and Ljung-Box Q
- Diagnostic tools, including AIC/BIC model selection and partial-, auto-, and cross-correlation functions
- Hodrick-Prescott filter for business-cycle analysis



Contour plot of a log-likelihood function for a GARCH(1,1) model fitted to a typical equity return series.

Sample Functions

Univariate Time-Series Modeling

Estimate parameters of composite ARMAX/GARCH processes

Forecast conditional mean and volatility of ARMAX/GARCH processes

Simulate ARMAX/GARCH processes

Infer residuals and time-dependent standard deviations

Multiple Time-Series Modeling

Estimate parameters of VAR/VARX multiple time-series processes

Forecast VARMAX multiple time-series processes

Simulate VARMAX multiple time-series processes

Infer residuals from VARMAX multiple time-series processes

Monte Carlo Simulation of Stochastic Differential Equations

Simulate common stochastic differential equations with predefined model classes

Simulate any linear or nonlinear stochastic differential equation with predefined interfaces

Statistics and Tests

Compute Akaike and Bayesian information criteria for model selection

Perform Engle's hypothesis test for the presence of ARCH/GARCH

Compute or plot sample autocorrelation, cross-correlation, and partial autocorrelation functions

Perform Ljung-Box Q-statistic lack-of-fit and likelihood ratio hypothesis tests

Perform Dickey-Fuller and Phillips-Perron unit root test

Monte Carlo Simulation and Forecasting

Econometrics Toolbox lets you perform Monte Carlo simulations and generate minimum mean square error forecasts of both single and multiple time-series models, including univariate ARMAX/GARCH composite models and multivariate VARMAX models.

The toolbox also offers an object hierarchy that lets you simulate a variety of popular SDEs, as well as a suite of interfaces for customizing your own SDE simulation models and methods.

Volatility Modeling

Econometrics Toolbox includes a focus on time-varying volatility models. The toolbox supports several variants of univariate GARCH models, including standard ARCH/GARCH models, as well as asymmetric EGARCH and GJR models designed to capture leverage effects in asset returns. The software supports the simulation of stochastic volatility models, including the Heston model.

Required Products

MATLAB®

Optimization Toolbox™

Statistics Toolbox™

Related Products

Curve Fitting Toolbox™

Create curve fits and regression models of data

Financial Derivatives Toolbox™

Model and analyze equity and fixed-income derivatives

Financial Toolbox™

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Platform and System Requirements

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