# Econometrics Toolbox™ Release Notes

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508-647-7000 (Phone)



508-647-7001 (Fax)



The MathWorks, Inc. 3 Apple Hill Drive Natick, MA 01760-2098

For contact information about worldwide offices, see the MathWorks Web site.

Econometrics Toolbox<sup>TM</sup> Release Notes

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# **Summary by Version**

This table provides quick access to what's new in each version. For clarification, see "Using Release Notes" on page 2.

Version (Release)	New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Latest Version V2.0 (R2011a) Econometrics Toolbox Software	Yes. Details	No	No
V1.4 (R2010b) Econometrics Toolbox Software	Yes. Details	Yes Summary	No
V1.3 (R2010a) Econometrics Toolbox™ Software	Yes Details	Yes Summary	No
V1.2 (R2009b) Econometrics Toolbox Software	Yes Details	Yes Summary	No
V1.1 (R2009a) Econometrics Toolbox Software	Yes Details	Yes Summary	No
V1.0 (R2008b) Econometrics Toolbox Software	Yes Details	No	No
V2.4 (R2008a) GARCH Toolbox™ Software	Yes Details	No	No
V2.3.2 (R2007b) GARCH Toolbox Software	Yes Details	No	No

Version (Release)	New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
V2.3.1 (R2007a) GARCH Toolbox Software	No	No	No
V2.3 (R2006b) GARCH Toolbox Software	Yes Details	No	No
V2.2 (R2006a) GARCH Toolbox Software	Yes Details	No	No
V2.1 (R14SP3) GARCH Toolbox Software	Yes Details	Yes Summary	No

# **Using Release Notes**

Use release notes when upgrading to a newer version to learn about:

- New features
- Changes
- Potential impact on your existing files and practices

Review the release notes for other MathWorks® products required for this product (for example, MATLAB® or Simulink®). Determine if enhancements, bugs, or compatibility considerations in other products impact you.

If you are upgrading from a software version other than the most recent one, review the current release notes and all interim versions. For example, when you upgrade from V1.0 to V1.2, review the release notes for V1.1 and V1.2.

#### What Is in the Release Notes

#### **New Features and Changes**

- New functionality
- Changes to existing functionality

#### **Version Compatibility Considerations**

When a new feature or change introduces a reported incompatibility between versions, the **Compatibility Considerations** subsection explains the impact.

Compatibility issues reported after the product release appear under Bug Reports at the MathWorks Web site. Bug fixes can sometimes result in incompatibilities, so review the fixed bugs in Bug Reports for any compatibility impact.

#### **Fixed Bugs and Known Problems**

MathWorks offers a user-searchable Bug Reports database so you can view Bug Reports. The development team updates this database at release time and as more information becomes available. Bug Reports include provisions for any known workarounds or file replacements. Information is available for bugs existing in or fixed in Release 14SP2 or later. Information is not available for all bugs in earlier releases.

Access Bug Reports using your MathWorks Account.

### **Documentation on the MathWorks Web Site**

Related documentation is available on mathworks.com for the latest release and for previous releases:

- Latest product documentation
- Archived documentation

# Version 2.0 (R2011a) Econometrics Toolbox Software

This table summarizes new features in V2.0 (R2011a).

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	No

New features and changes follow.

- "New Cointegration Functionality" on page 4
- "Convert Vector Autoregressive Models to and from Vector Error-Correction Models" on page 4
- "Data Sets for Calibrating Economic Models" on page 4

## **New Cointegration Functionality**

Econometrics Toolbox now offers functions for cointegration testing and modeling. The egcitest function uses Engle-Granger methods to test for individual cointegrating relationships, and estimates their parameters. The jcitest function uses Johansen methods to test for multiple cointegrating relationships, and estimates parameters in corresponding vector error-correction models. The jcontest function tests linear restrictions on both error-correction speeds and the space of cointegrating vectors, and estimates restricted model parameters.

# Convert Vector Autoregressive Models to and from Vector Error-Correction Models

The functions vectovar and vartovec allow you to convert between vector autoregressive (VAR) models and vector error-correction (VEC) models.

## **Data Sets for Calibrating Economic Models**

Econometrics Toolbox includes three new data sets:

- Data\_Canada. Mackinnon's data on inflation and interest rates in Canada, 1954–1994. Data are those used in: MacKinnon, J. G. "Numerical Distribution Functions for Unit Root and Cointegration Tests." *Journal of Applied Econometrics*. v. 11, 1996, pp. 601–618.
- Data\_JDanish, Data\_JAustralian. Johansen's data on money and income in Denmark, 1974–1987, and Australia/U.S. purchasing power and interest parity, 1972–1991. Data are those used in: Johansen, Likelihood-Based Inference in Cointegrated Vector Autoregressive Models. Oxford: Oxford University Press, 1995.

# Version 1.4 (R2010b) Econometrics Toolbox Software

This table summarizes new features in V1.4 (R2010b).

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	Yes Summary	No

New features and changes follow.

- "Functions Being Removed" on page 6
- "Additional Syntax Options for archtest and lbqtest" on page 7
- "New Data Set for Calibrating Economic Models" on page 7

# **Functions Being Removed**

Function Name	What Happens When You Use This Function?	Use This Function Instead	Compatibility Considerations
dfARDTest	Error	adftest	The new function syntax differs. Replace all existing instances of dfARDTest with the correct adftest syntax.
dfARTest	Error	adftest	The new function syntax differs. Replace all existing instances of dfARTest with the correct adftest syntax.

Function Name	What Happens When You Use This Function?	Use This Function Instead	Compatibility Considerations
dfTSTest	Error	adftest	The new function syntax differs. Replace all existing instances of dfTSTest with the correct adftest syntax.
ppARDTest	Error	pptest	The new function syntax differs. Replace all existing instances of ppARDTest with the correct pptest syntax.
ppARTest	Error	pptest	The new function syntax differs. Replace all existing instances of ppARTest with the correct pptest syntax.
ppTSTest	Error	pptest	The new function syntax differs. Replace all existing instances of ppTSTest with the correct pptest syntax.

# **Additional Syntax Options for archtest and lbqtest**

The functions archtest and lbqtest now take name-value pair arguments as inputs. The old syntax of individual arguments will continue to work but will not be documented.

## **New Data Set for Calibrating Economic Models**

The economic data from the paper by Nielsen and Risager, "Stock Returns and Bond Yields in Denmark, 1922–99," (Department of Economics,

Copenhagen Business School; Working paper 3-2001, 2001) is now included with Econometrics Toolbox in the file  $Data\_Danish$ .

# Version 1.3 (R2010a) Econometrics Toolbox Software

This table summarizes new features in V1.3 (R2010a).

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes	Yes	No
Details below	Summary	

New features and changes follow.

- "Functions Being Removed" on page 9
- "Demo Showing Multivariate Modeling of the U.S. Economy" on page 10
- "Lag Operator Polynomial Objects" on page 11
- "Leybourne-McCabe Test for Stationarity" on page 11
- "Historical Data Sets for Calibrating Economic Models" on page 11
- "New Organization and Naming Standard for Data Sets" on page 11
- "New Naming Convention for Demos and Example Functions" on page 12

## **Functions Being Removed**

Function Name	What Happens When You Use This Function?	Use This Function Instead	Compatibility Considerations
dfARDTest	Error	adftest	The new function syntax differs. Replace all existing instances of dfARDTest with the correct adftest syntax.
dfARTest	Error	adftest	The new function syntax differs. Replace all existing instances of

Function Name	What Happens When You Use This Function?	Use This Function Instead	Compatibility Considerations
			dfARTest with the correct adftest syntax.
dfTSTest	Error	adftest	The new function syntax differs. Replace all existing instances of dfTSTest with the correct adftest syntax.
ppARDTest	Error	pptest	The new function syntax differs. Replace all existing instances of ppARDTest with the correct pptest syntax.
ppARTest	Error	pptest	The new function syntax differs. Replace all existing instances of ppARTest with the correct pptest syntax.
ppTSTest	Error	pptest	The new function syntax differs. Replace all existing instances of ppTSTest with the correct pptest syntax.

# Demo Showing Multivariate Modeling of the U.S. Economy

A new demo, "Modeling the United States Economy," develops a small macroeconomic model. This model is used to examine the impact of various shocks on the United States economy, particularly around the period of the 2008 fiscal crisis. It uses the multiple time series tools from the Econometrics Toolbox.

To run the demo in the command window, use the command echodemo Demo USEconModel.

## **Lag Operator Polynomial Objects**

The new LagOp polynomial class provides methods to create and manipulate lag operator polynomials and filter time series data, as well as methods to perform polynomial algebra including addition, subtraction, multiplication, and division.

# Leybourne-McCabe Test for Stationarity

The new Leybourne-McCabe test function 1mctest assesses the null hypothesis that a univariate time series y is a trend-stationary AR(p) process against the alternative that y is a nonstationary ARIMA(p,1,1) process.

# **Historical Data Sets for Calibrating Economic Models**

The new data set Data\_SchwertMacro contains original data from G. William Schwert's article "Effects of Model Specification on Tests for Unit Roots in Macroeconomic Data," (*Journal of Monetary Economics*, Vol. 20, 1987, pp. 73–103.). These data are a benchmark for unit root tests. The new data set Data\_SchwertStock contains indices of U.S. stock prices as published in G. William Schwert's article "Indexes of U.S. Stock Prices from 1802 to 1987," (*The Journal of Business*, Vol. 63, 1990, pp. 399–42.). The new data set Data\_USEconModelcontains the macroeconomic series for the new demo Demo USEconModel.

## New Organization and Naming Standard for Data Sets

Econometrics Toolbox has a new set of naming conventions for data sets. Data set names are prefixed by Data\_.

For full information on the available data sets, demos, and examples, see "Data Sets, Demos, and Example Functions" or type help econ/econdemos at the command line. For more information on Dataset Array objects, see dataset in the Statistics Toolbox<sup>TM</sup> documentation.

#### **Compatibility Considerations**

Replace any instances of load Old Data with load and the new file name.

# New Naming Convention for Demos and Example Functions

All demos and examples in the Econometrics Toolbox have been moved to the folder econ/econdemos and renamed according to the following convention:

- Demos are named Demo DemoName
- Examples are named Example ExampleName

For full information on the available, demos, and examples, see "Data Sets, Demos, and Example Functions" or type help econ/econdemos at the command line.

# Version 1.2 (R2009b) Econometrics Toolbox Software

This table summarizes new features in V1.2 (R2009b).

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes	Yes	No
Details below	Summary	

New features and changes follow.

- "Unit Root Tests" on page 13
- "Financial Toolbox Required" on page 14
- "Nelson-Plosser Data" on page 14

#### **Unit Root Tests**

There are now four classes of unit root tests. More information on the tests is available in the "Unit Root Tests" section of the User's Guide.

## **Dickey-Fuller and Phillips-Perron Tests**

Dickey-Fuller and Phillips-Perron tests now have single interfaces, with new capabilities for multiple testing. Both adftest and pptest test a unit root null hypothesis against autoregressive, autoregressive with drift, or trend-stationary alternatives.

#### **KPSS Test**

The new kpsstest function tests a null hypothesis of (trend) stationarity against nonstationary unit root alternatives.

#### Variance Ratio Test

The new vratiotest function tests a null hypothesis of a random walk against alternatives with innovations that are not independent and identically distributed.

### **Compatibility Considerations**

The ardtest function replaces the dfARDTest, dfARTest, and dfTSTest functions. The pptest function replaces the ppARDTest, ppARTest, and ppTSTest functions. The new function syntax differs from the functions they replace.

# **Financial Toolbox Required**

Econometrics Toolbox requires Financial Toolbox $^{\text{TM}}$  as of this version.

#### **Nelson-Plosser Data**

The Nelson and Plosser [50] data set is now available. To access the data, enter load Data\_NelsonPlosser at the MATLAB command line.

# Version 1.1 (R2009a) Econometrics Toolbox Software

This table summarizes new features in V1.1 (R2009a).

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	Yes Summary	No

New features and changes follow.

- "Hypothesis Tests" on page 15
- "Structural VAR, VARX, and VARMAX models" on page 15
- "New Demo" on page 16

## **Hypothesis Tests**

There are two new hypothesis tests for model misspecification:

- Lagrange Multiplier tests, 1mtest
- Wald tests, waldtest

Furthermore, the likelihood ratio test, 1ratiotest, has been enhanced to be able to "test up" as well as "test down" when performing multiple model comparisons. It now accepts vectors of model parameters for restricted log likelihoods, for unrestricted log likelihoods, or for both.

There is a new demo about these tests; see "New Demo" on page 16.

## **Compatibility Considerations**

1ratiotest error messages and message IDs differ from previous versions.

### Structural VAR, VARX, and VARMAX models

Econometrics Toolbox multiple time series functions now include structural multiple time series. Structural models have the general form

$$A_0Y_t = a + X_tb + \sum_{i=1}^p A_iY_{t-i} + \sum_{j=1}^q B_jW_{t-j} + B_0W_t.$$

Previously, Econometrics Toolbox multiple time series functions addressed models of the form

$$Y_t = a + X_t b + \sum_{i=1}^{p} A_i Y_{t-i} + \sum_{j=1}^{q} B_i W_{t-j} + W_t.$$

The mathematical difference is the inclusion of  $A_0$  and  $B_0$  matrices. These matrices allow practitioners to specify structural dependencies between variables. For more information, see the "Multivariate Time Series Models" chapter of the Econometrics Toolbox User's Guide.

### **Compatibility Considerations**

Objects created with the Econometrics Toolbox V1.0 vgxset function, and saved in MAT files, do not work with Econometrics Toolbox V1.1 functions. Recreate the objects with the Econometrics Toolbox V1.1 vgxset function.

#### **New Demo**

There is a new demo on hypothesis tests. Run the demo at the MATLAB command line by entering showdemo classicalTestsDemo.

# Version 1.0 (R2008b) Econometrics Toolbox Software

This table summarizes new features in V1.0 (R2008b).

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	No

New features and changes follow.

- "Multivariate VAR, VARX, and VARMA Models" on page 17
- "Heston Stochastic Volatility Models" on page 18

### Multivariate VAR, VARX, and VARMA Models

A new suite of functions, listed in the following table, adds support for multivariate VAR, VARX, and VARMA models.

Function	Description
vgxar	Convert VARMA specification into a pure vector autoregressive (VAR) model
vgxcount	Count restricted and unrestricted parameters in VAR or VARX models
vgxdisp	Display VGX model parameters and standard errors in different formats
vgxget	Get multivariate time-series specification parameters
	Infer innovations of a VGX process
vgxloglik	Compute conditional log-likelihoods of VGX process
vgxma	Convert VARMA specification into a pure vector moving average (VMA) model
vgxplot	Plot multivariate time series process
vgxpred	Generate transient response of VGX process during a specified forecast period

Function	Description
	Generate a VGX process from an innovations process
vgxqual	Determine if a VGX process is stable and invertible
vgxset	Set or modify multivariate time-series specification parameters
	Simulate VGX processes
vgxvarx	Solve VAR or VARX model using maximum likelihood estimation

# **Heston Stochastic Volatility Models**

The new heston function adds support for Heston stochastic volatility models to the SDE engine.

# Version 2.4 (R2008a) GARCH Toolbox Software

This table summarizes new features in V2.4 (R2008a).

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	No

New features and changes follow:

# Monte Carlo Simulation of Stochastic Differential Equations

The GARCH Toolbox software now allows you to model dependent financial and economic variables, such as interest rates and equity prices, via Monte Carlo simulation of multivariate diffusion processes. For more information, see "Stochastic Differential Equations" in the GARCH Toolbox documentation.

# Version 2.3.2 (R2007b) GARCH Toolbox Software

This table summarizes new features in V2.3.2 (R2007b).

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	No

New features and changes follow:

## Changes to garchsim

The garchsim function previously allowed you to specify the State argument as either a scalar or a time series matrix of standardized, independent, identically distributed disturbances to drive the output Innovations in a time series process. The State argument must now be a time series matrix. See the State input argument on the garchsim reference page for more information.

# Version 2.3.1 (R2007a) GARCH Toolbox Software

This table summarizes new features in V2.3.1 (R2007a).

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
No	No	No

There are no new features or changes in this version.

# Version 2.3 (R2006b) GARCH Toolbox Software

This table summarizes new features in V2.3 (R2006b).

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	No

New features and changes follow:

- "Data Preprocessing" on page 22
- "Demos" on page 22

## **Data Preprocessing**

A new Hodrick-Prescott filter, hpfilter, separates time series into trend and cyclical components

#### **Demos**

A new demo uses the hpfilter function to reproduce the results in Hodrick and Prescott's original paper on U.S. business cycles

# Version 2.2 (R2006a) GARCH Toolbox Software

This table summarizes new features in V2.2 (R2006a).

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	No

New features and changes follow:

- "User's Guide" on page 23
- "Statistical Functions" on page 23

### User's Guide

A new chapter in the *GARCH Toolbox User's Guide* explains how to conduct Dickey-Fuller and Phillips-Perron unit root tests with the new statistical functions in the toolbox.

### **Statistical Functions**

Version 2.2 of the GARCH Toolbox software has six new functions. All of them support the ability to conduct univariate unit root tests on time series data. Three functions support augmented Dickey-Fuller unit root tests. The remaining three support Phillips-Perron unit root tests.

#### **Dickey-Fuller Unit Root Tests**

Function	Purpose
dfARDTest	Augmented Dickey-Fuller unit root test based on AR model with drift.
dfARTest	Augmented Dickey-Fuller unit root test based on zero drift AR model.
dfTSTest	Augmented Dickey-Fuller unit root test based on trend stationary AR model.

# **Phillips-Perron Unit Root Tests**

Function	Purpose
ppARDTest	Phillips-Perron unit root test based on AR(1) model with drift.
ppARTest	Phillips-Perron unit root test based on zero drift AR(1) model.
ppTSTest	Phillips-Perron unit root test based on trend stationary AR(1) model.

# Version 2.1 (R14SP3) GARCH Toolbox Software

This table summarizes what's new in V2.1 (R14SP3):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	Yes Summary	No bug fixes

New features and changes follow:

## Changes to garchsim

A change introduced in V2.1 of the GARCH Toolbox software concerns user-specified noise processes. The garchsim function now allows you to provide a time series matrix of standardized, i.i.d. disturbances to drive the output Innovations in a time series process. In previous versions, you could only provide a state that was used to generate a random noise process. See the State input argument on the garchsim reference page for more information.

#### **Compatibility Considerations**

garchsim argument is renamed. In V2.1, the garchsim argument Seed is renamed to State for consistency with the MATLAB rand and randn functions. The name change, in itself, introduces no backward incompatibilities. The following topic explains a related change.

garchsim defaults to current random number generator state. In V2.0.1 of the GARCH Toolbox software, thegarchsim function used the initial random number generator state, 0, if you did not specify a value for the Seed argument. The Seed argument corresponded to the rand and random state value.

In V2.1, if you do not specify a value for the State (formerly Seed) argument, garchsim uses the current state of rand and randn, rather than the initial state. Use the commands s = rand('state') and s = randn('state') to determine the current state of these random number generators. For more information, see the rand and randn reference pages.

# Compatibility Summary for Econometrics Toolbox Software

This table summarizes new features and changes that might cause incompatibilities when you upgrade from an earlier version, or when you use files on multiple versions.

Version (Release)	New Features and Changes with Version Compatibility Impact
Latest Version Econometrics Toolbox Software V2.0 (R2011a)	None
Econometrics Toolbox Software V1.4 (R2010b)	See the Compatibility Considerations subheading for each of these new features and changes:  • "Functions Being Removed" on page 6
Econometrics Toolbox Software V1.3 (R2010a)	See the Compatibility Considerations subheading for each of these new features and changes:  • "Functions Being Removed" on page 9  • "New Organization and Naming Standard for Data Sets" on page 11  • "New Naming Convention for Demos and Example Functions" on page 12

Version (Release)	New Features and Changes with Version Compatibility Impact
Econometrics Toolbox Software V1.2 (R2009b)	See the <b>Compatibility Considerations</b> subheading for each of these new features and changes:  • "Unit Root Tests" on page 13
Econometrics Toolbox Software V1.1 (R2009a)	See the Compatibility Considerations subheading for each of these new features and changes:  • "Hypothesis Tests" on page 15 • "Structural VAR, VARX, and VARMAX models" on page 15
Econometrics Toolbox Software V1.0 (R2008b)	None
GARCH Toolbox Software V2.4 (R2008a)	None
GARCH Toolbox Software V2.3.2 (R2007b)	None
GARCH Toolbox Software V2.3.1 (R2007a)	None
GARCH Toolbox Software V2.3 (R2006b)	None
GARCH Toolbox Software V2.2 (R2006a)	None
GARCH Toolbox Software V2.1 (R14SP3)	See the Compatibility Considerations subheading for each of these new features and changes:  • "Changes to garchsim" on page 25