

# **Financial Derivatives Toolbox Release Notes**

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## Summary by Version

This table provides quick access to what's new in each version. For clarification, see "About Release Notes" on page 1.

Version (Release)	New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
<b>Latest Version V4.1 (R2006b)</b>	No	No	No bug fixes	Printable Release Notes: PDF  Current product documentation
V4.0.1 (R2006a)	No	No	No bug fixes	No
V4.0 (R14SP3)	Yes Details	No	No bug fixes	No
V3.0 (R14)	Yes Details	No	No bug fixes	No

### About Release Notes

Use release notes when upgrading to a newer version to learn about new features and changes, and the potential impact on your existing files and practices. Release notes are also beneficial if you use or support multiple versions.

If you are not upgrading from the most recent previous version, review release notes for all interim versions, not just for the version you are installing. For example, when upgrading from V1.0 to V1.2, review the New Features and Changes, Version Compatibility Considerations, and Bug Reports for V1.1 and V1.2.

### New Features and Changes

These include

- New functionality

- Changes to existing functionality
- Changes to system requirements (complete system requirements for the current version are at the MathWorks Web site)
- Any version compatibility considerations associated with each new feature or change

### **Version Compatibility Considerations**

When a new feature or change introduces a known incompatibility with the previous version, its description includes a **Compatibility Considerations** subsection that details the impact. For a list of all new features and changes that have compatibility impact, see the “Compatibility Summary for Financial Derivatives Toolbox” on page 13.

Compatibility issues that become known after the product has been released are added to Bug Reports at the MathWorks Web site. Because bug fixes can sometimes result in incompatibilities, also review fixed bugs in Bug Reports for any compatibility impact.

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

MathWorks Bug Reports is a user-searchable database of known problems, workarounds, and fixes. The MathWorks updates the Bug Reports database as new problems and resolutions become known, so check it as needed for the latest information.

Access Bug Reports at the MathWorks Web site using your MathWorks Account. If you are not logged in to your MathWorks Account when you link to Bug Reports, you are prompted to log in or create an account. You then can view bug fixes and known problems for R14SP2 and more recent releases.

The Bug Reports database was introduced for R14SP2 and does not include information for prior releases. You can access a list of bug fixes made in prior versions via the links in the summary table.

## **Related Documentation at Web Site**

**Printable Release Notes (PDF).** You can print release notes from the PDF version, located at the MathWorks Web site. The PDF version does not support links to other documents or to the Web site, such as to Bug Reports. Use the browser-based version of release notes for access to all information.

**Product Documentation.** At the MathWorks Web site, you can access complete product documentation for the current version and some previous versions, as noted in the summary table.

## Version 4.1 (R2006b) Financial Derivatives Toolbox

This table summarizes what's new in Version 4.1 (R2006b):

<b>New Features and Changes</b>	<b>Version Compatibility Considerations</b>	<b>Fixed Bugs and Known Problems</b>	<b>Related Documentation at Web Site</b>
No	No	No bug fixes	Printable Release Notes: PDF  Current product documentation



## Version 4.0.1 (R2006a) Financial Derivatives Toolbox

This table summarizes what's new in Version 4.0.1 (R2006a):

<b>New Features and Changes</b>	<b>Version Compatibility Considerations</b>	<b>Fixed Bugs and Known Problems</b>	<b>Related Documentation at Web Site</b>
No	No	No bug fixes	No

## Version 4.0 (R14SP3) Financial Derivatives Toolbox

This table summarizes what's new in Version 4.0 (R14SP3):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Yes Details below	No	No bug fixes	No

New features and changes introduced in this version are

- “New Interest Rate Models” on page 6
- “Recombining Trinomial Trees” on page 9
- “Enhancement to the treeviewer Function” on page 9

### New Interest Rate Models

The two new interest rate models that have been introduced with Version 4.0 are

- Hull-White (HW) model

The Hull-White model incorporates the initial term structure of interest rates and the volatility term structure to build a trinomial recombining tree of short rates. The resulting tree is used to value interest rate dependent securities. The implementation of the HW model in the Financial Derivatives Toolbox is limited to one factor.

- Black-Karasinski (BK) model

The BK model is a single-factor, log-normal version of the Hull-White model.

### Hull-White and Black-Karasinski Functions

The following tables summarize the Black-Karasinski and Hull-White functions by their category of usage.

## Price and Sensitivity from Black-Karasinski Trees

Function	Purpose
bkprice	Instrument prices from Black-Karasinski tree
bksens	Instrument prices and sensitivities from Black-Karasinski tree
bktimespec	Specify time structure for Black-Karasinski tree
bktree	Construct Black-Karasinski interest-rate tree
bkvolspec	Specify Black-Karasinski interest-rate volatility process

## Price and Sensitivity from Hull-White Trees

Function	Purpose
hwprice	Instrument prices from Hull-White tree
hwsens	Instrument prices and sensitivities from Hull-White tree
hwtimespec	Specify time structure for Hull-White tree
hwtree	Construct Hull-White interest-rate tree
hwvolspec	Specify Hull-White interest-rate volatility process

## Black-Karasinski Utilities

Function	Purpose
bondbybk	Price bond from Black-Karasinski interest-rate tree
capbybk	Price cap instrument from Black-Karasinski interest-rate tree
cfbybk	Price arbitrary set of cash flows from Black-Karasinski interest-rate tree
fixedbybk	Price fixed-rate note from Black-Karasinski interest-rate tree

<b>Function</b>	<b>Purpose</b>
floatbybk	Price floating-rate note from Black-Karasinski interest-rate tree
floorbybk	Price floor instrument from Black-Karasinski interest-rate tree
optbndbybk	Price bond option from Black-Karasinski interest-rate tree
swapbybk	Price swap instrument from Black-Karasinski interest-rate tree

### **Hull-White Utilities**

<b>Function</b>	<b>Purpose</b>
bondbyhw	Price bond from Hull-White interest-rate tree
capbyhw	Price cap instrument from Hull-White interest-rate tree
cfbyhw	Price arbitrary set of cash flows from Hull-White interest-rate tree
fixedbyhw	Price fixed-rate note from Hull-White interest-rate tree
floatbyhw	Price floating-rate note from Hull-White interest-rate tree
floorbyhw	Price floor instrument from Hull-White interest-rate tree
optbndbyhw	Price bond option from Hull-White interest-rate tree
swapbyhw	Price swap instrument from HJM interest-rate tree

## Tree Manipulation

Function	Purpose
<code>cvtree</code>	Convert inverse discount tree to interest-rate tree
<code>mktrintree</code>	Create recombining trinomial tree
<code>trintreepath</code>	Extract entries from node of recombining trinomial tree
<code>trintreeshape</code>	Retrieve shape of recombining trinomial tree

## Recombining Trinomial Trees

The interest-rate or price trees supported in this toolbox can be either *binomial* (two branches per node) or *trinomial* (three branches per node). Typically, binomial trees assume that underlying interest rates or prices can only either increase or decrease at each node. Trinomial trees allow for a more complex movement of rates or prices. With trinomial trees the movement of rates or prices at each node is unrestricted (for example, up-up-up or unchanged-down-down).

## Enhancement to the treeviewer Function

The `treeviewer` function, which provides a graphical display of rates and prices, has been modified to display recombining trinomial trees.

## Version 3.0 (R14) Financial Derivatives Toolbox

This table summarizes what's new in Version 3.0 (R14):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Yes Details below	No	No bug fixes	No

New features and changes introduced in this version are

- “Support for Equity Derivatives” on page 10
- “Enhancement to the treeviewer Function” on page 12

### Support for Equity Derivatives

Starting with Version 3.0 the Financial Derivatives Toolbox supports two types of recombining tree models to represent the evolution of stock prices: the Cox-Ross-Rubinstein (CRR) model and the Equal Probabilities (EQP) model. The CRR and EQP models are examples of discrete time models. A discrete time model divides time into discrete bits, and prices can be computed at these specific times only.

The CRR model is one of the most common methods used to model the evolution of stock processes. The strength of the CRR model lies in its simplicity. It is a good model when dealing with a large number of tree levels. The CRR model yields the correct expected value for each node of the tree and provides a good approximation for the corresponding local volatility. The approximation becomes better as the number of time steps represented in the tree is increased.

The EQP model is another discrete time model. It has the advantage of building a tree with the exact volatility in each tree node, even with small numbers of time steps. It also provides better results than CRR in some given trading environments, e.g., when stock volatility is low and interest rates are

high. However, this additional precision causes increased complexity, which is reflected in the number of calculations required to build a tree.

### **New Functions in Version 3.0**

The following set of functions has been added to the toolbox for Version 3.0:

#### **Price and Sensitivity from Cox-Ross-Rubinstein Trees**

<b>Function</b>	<b>Purpose</b>
crprice	Instrument prices from a CRR tree
crsens	Instrument prices and sensitivities by a CRR tree
crtimespec	Specify time structure for CRR tree
crtimespec	Construct CRR stock tree

#### **Cox-Ross-Rubinstein Utilities**

<b>Function</b>	<b>Purpose</b>
asianbycrr	Price Asian option by a CRR tree
barrierbycrr	Price barrier option by a CRR tree
compoundbycrr	Price compound option by a CRR tree
lookbackbycrr	Price lookback option by a CRR tree
optstockbycrr	Price stock option by a CRR tree

#### **Price and Sensitivity from Equal Probabilities Binomial Trees**

<b>Function</b>	<b>Purpose</b>
eqprice	Instrument prices from an EQP binomial tree
eqpsens	Instrument prices and sensitivities from an EQP binomial tree

<b>Function</b>	<b>Purpose</b>
eqptimespec	Specify time structure for EQP tree
eqptree	Construct EQP stock tree

### **Equal Probabilities Tree Utilities**

<b>Function</b>	<b>Purpose</b>
asianbyeqp	Price Asian option by an EQP tree
barrierbyeqp	Price barrier option by an EQP tree
compoundbyeqp	Price compound option by an EQP tree
lookbackbyeqp	Price lookback option by an EQP tree
optstockbyeqp	Price stock option by an EQP tree

### **Instrument Portfolio Handling**

<b>Function</b>	<b>Purpose</b>
instasian	Construct Asian option instrument
instbarrier	Construct barrier option instrument
instcompound	Construct compound option instrument
instlookback	Construct lookback instrument
instoptstock	Construct stock option

### **Enhancement to the treeviewer Function**

The treeviewer function, which provides a graphical display of rates and prices, has been modified to accept Cox-Ross-Rubenstein (CRR) and Equal Probabilities (EQP) equity trees as input.



## Compatibility Summary for Financial Derivatives Toolbox

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. Details are provided with the description of the new feature or change.

<b>Version (Release)</b>	<b>New Features and Changes with Version Compatibility Impact</b>
<b>Latest Version V4.1 (R2006b)</b>	None
V4.0.1 (R2006a)	None
V4.0 (R14SP3)	None
V3.0 (R14)	None