Financial Derivatives Toolbox™ Release Notes

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Financial Derivatives Toolbox™ Release Notes

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Contents

Summary by Version

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

Version (Release)	New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Latest Version V5.3 (R2008b)	Yes Details	No	Bug Reports Includes fixes	Printable Release Notes: PDF Current product documentation
V5.2 (R2008a)	Yes Details	No	Bug Reports Includes fixes	No
V5.1 (R2007b)	Yes Details	No	Bug Reports	No
V5.0 (R2007a)	Yes Details	No	Bug Reports	No
V4.1 (R2006b)	No	No	Bug Reports	No
V4.0.1 (R2006a)	No	No	Bug Reports	No
V4.0 (R14SP3)	Yes Details	No	Bug Reports	No
V3.0 (R14)	Yes Details	No	No bug fixes	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®) for enhancements, bugs, and compatibility considerations that also might impact you.

If you are upgrading from a software version other than the most recent one, review the 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 release notes for V1.1 and V1.2.

What's 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 is released appear under Bug Reports at the MathWorks Web site. Bug fixes can sometimes result in incompatibilities, so you should also review the fixed bugs in Bug Reports for any compatibility impact.

Fixed Bugs and Known Problems

The 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. This includes 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.

Version 5.3 (R2008b) Financial Derivatives Toolbox Software

This table summarizes what's new in Version 5.3 (R2008b):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Yes Details below	No	Bug Reports Includes fixes	Printable Release Notes: PDF Current product documentation

New features and changes introduced in this version are:

- "Support for European Chooser Options Using Black-Scholes Model" on page 3
- "Support for Black Model for European Options " on page 4
- "Support for Black-Scholes Model for European Options with Different Type of Dividends" on page 4
- "Support for Bjerksund-Stensland Model for American Options with Continuous Dividend" on page 5
- "Support for Roll-Geske-Whaley Model for American Call Options with a Single Cash Dividend" on page 5
- "Enhancements to stockspec" on page 5

Support for European Chooser Options Using Black-Scholes Model

Supports the following:

Function	Purpose
chooserbybls	Prices European simple chooser options using the Black-Scholes model

Support for Black Model for European Options

Supports the following:

Function	Purpose
optstockbyblk	Prices options using the Black option pricing model
optstocksensbyblk	Calculates option prices and sensitivities on futures using the Black pricing model
impvbyblk	Calculates implied volatility using the Black option pricing model

For more information on the Black model, see "Computing Prices and Sensitivities Using the Black Model".

Support for Black-Scholes Model for European Options with Different Type of Dividends

Supports the following:

Function	Purpose
optstockbybls	Prices options using the Black-Scholes option pricing model
optstocksensbybls	Calculates option prices and sensitivities on futures using the Black-Scholes option pricing model
impvbybls	Calculate implied volatility using the Black–Scholes option pricing model

For more information on the Black-Scholes model, see "Computing Prices and Sensitivities Using the Black-Scholes Model".

Support for Bjerksund-Stensland Model for American Options with Continuous Dividend

Supports the following:

Function	Purpose
optstockbybjs	Prices options using the Bjerksund-Stensland option pricing model
optstocksensbybjs	Calculates option prices and sensitivities on futures using the Bjerksund-Stensland option pricing model
impvbybjs	Calculates implied volatility using the Bjerksund-Stensland option pricing model

For more information on the Bjerksund-Stensland model, see "Computing Prices and Sensitivities Using the Bjerksund-Stensland Model".

Support for Roll-Geske-Whaley Model for American Call Options with a Single Cash Dividend

Supports the following:

Function	Purpose
optstockbyrgw	Prices options using the Roll-Geske-Whaley option pricing model
optstocksensbyrgw	Calculates option prices and sensitivities on futures using the Roll-Geske-Whaley option pricing model
impvbyrgw	Calculates implied volatility using the Roll-Geske-Whaley option pricing model

For more information on the Roll-Geske-Whaley model, see "Computing Prices and Sensitivities Using the Roll-Geske-Whaley Model".

Enhancements to stockspec

stockspec is now capable of handling several instruments. This modified implementation of stockspec is particularly useful when pricing equity options using some of the equity models, such as the closed-form solutions and analytical approximations. For the equity tree models, stockspec takes

only the first instrument represented in the structure `StockSpec` to build the equity tree.

Version 5.2 (R2008a) Financial Derivatives Toolbox Software

This table summarizes what's new in Version 5.2 (R2008a):

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

New features and changes introduced in this version are:

- "Pricing Callable and Puttable Bonds" on page 7
- "Support for Actual/365 (ISDA)" on page 8

Pricing Callable and Puttable Bonds

Supports the following pricing for callable and puttable bonds:

Function	Purpose
optembndbybdt	Price bonds with embedded options by a Black-Derman-Toy interest rate tree
optembndbybk	Price bonds with embedded options by a Black-Karasinski interest-rate tree
optembndbyhjm	Price bonds with embedded options by an Heath-Jarrow-Morton interest-rate tree
optembndbyhw	Price bonds with embedded options by a Hull-White interest-rate tree
instoptembnd	Constructor for the 'Type', 'OptEmBond' instrument bond option

In addition, the following functions have been modified to support callable and puttable bonds:

- instadd
- bdtprice
- hwprice
- hjmprice
- bkprice
- bdtsens
- hwsens
- hjmsens
- bksens

Support for Actual/365 (ISDA)

The following functions now support day count conventions for the basis argument based on ISDA (International Swap Dealers Association) actual/365:

- bondbybdt
- bondbybk
- bondbyhjm
- bondbyhw
- bondbyzero
- capbybdt
- capbybk
- capbyhjm
- capbyhw
- cfbybdt
- cfbybk
- cfbyhjm
- cfbyhw
- cfbyzero

- `date2time`
- `disc2rate`
- `fixedbybdt`
- `fixedbybk`
- `fixedbyhjm`
- `fixedbyhw`
- `fixedbyzero`
- `floatbybdt`
- `floatbybk`
- `floatbyhjm`
- `floatbyhw`
- `floatbyzero`
- `floorbybdt`
- `floorbybk`
- `floorbyhjm`
- `floorbyhw`
- `instbond`
- `instcap`
- `instcf`
- `instfixed`
- `instfloat`
- `instfloor`
- `instswap`
- `instswaption`
- `intenvset`
- `optbndbybdt`
- `optbndbybk`

- `optbndbyhjm`
- `optbndbyhw`
- `rate2disc`
- `swapbybdt`
- `swapbybk`
- `swapbyhjm`
- `swapbyhw`
- `swapbyzero`
- `swaptionbybdt`
- `swaptionbybk`
- `swaptionbyhjm`
- `swaptionbyhw`
- `time2date`

Version 5.1 (R2007b) Financial Derivatives Toolbox Software

This table summarizes what's new in Version 5.1 (R2007b):

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

New features and changes introduced in this version are:

ISMA Support for 30/360 Basis as a Variant of 30/360E with Annual Compounding

The following functions now support day count conventions for the `basis` argument to support 30/360 International Securities Market Association (ISMA) convention as a variant of 30/360E with annual compounding:

- bondbybdt
- bondbybk
- bondbyhjm
- bondbyhw
- bondbyzero
- capbybdt
- capbybk
- capbyhjm
- capbyhw
- cfbybdt
- cfbybk
- cfbyhjm

- cfbyhw
- cfbyzero
- date2time
- disc2rate
- fixedbybdt
- fixedbybk
- fixedbyhjm
- fixedbyhw
- fixedbyzero
- floatbybdt
- floatbybk
- floatbyhjm
- floatbyhw
- floatbyzero
- floorbybdt
- floorbybk
- floorbyhjm
- floorbyhw
- instbond
- instcap
- instcf
- instfixed
- instfloat
- instfloor
- instswap
- instswaption
- intenvset

- `optbndbybdt`
- `optbndbybk`
- `optbndbyhjm`
- `optbndbyhw`
- `rate2disc`
- `swapbybdt`
- `swapbybk`
- `swapbyhjm`
- `swapbyhw`
- `swapbyzero`
- `swaptionbybdt`
- `swaptionbybk`
- `swaptionbyhjm`
- `swaptionbyhw`
- `time2date`

Version 5.0 (R2007a) Financial Derivatives Toolbox Software

This table summarizes what's new in Version 5.0 (R2007a):

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

New features and changes introduced in this version are:

- "Pricing and Sensitivity from the Implied Trinomial Tree Stock Tree" on page 14
- "Implied Trinomial Tree Utilities" on page 15
- "Enhancement to the treeviewer Function" on page 15
- "ISMA Support" on page 15

Pricing and Sensitivity from the Implied Trinomial Tree Stock Tree

The following table summarizes the functions supported for pricing and sensitivity from implied trinomial trees.

Function	Purpose
ittprice	Price instruments by an implied trinomial tree.
ittsens	Instrument sensitivities and prices by an implied trinomial tree.
itttree	Build an implied trinomial stock tree.
itttimespec	Specify time structure for an implied trinomial tree.
stockoptspec	Specify European stock options structure.

Implied Trinomial Tree Utilities

The following table summarizes the functions supported for implied trinomial trees.

Function	Purpose
optstockbyitt	Price options on stocks by an implied trinomial tree.
barrierbyitt	Price barrier options by an implied trinomial tree.
asianbyitt	Price Asian options by an implied trinomial tree.
lookbackbyitt	Price lookback option from an implied trinomial tree.
compoundbyitt	Price compound options by an implied trinomial tree.

Enhancement to the treeviewer Function

The treeviewer function, which provides a graphical display of rates and prices, has been modified to accept Implied Trinomial Trees (ITTs) as input.

ISMA Support

The following functions now support the International Securities Market Association (ISMA) convention for the basis argument:

- bondbybdt
- bondbybk
- bondbyhjm
- bondbyhw
- bondbyzero
- capbybdt
- capbybk
- capbyhjm
- capbyhw
- cfbybdt
- cfbybk

- cfbyhjm
- cfbyhw
- cfbyzero
- date2time
- disc2rate
- fixedbybdt
- fixedbybk
- fixedbyhjm
- fixedbyhw
- fixedbyzero
- floatbybdt
- floatbybk
- floatbyhjm
- floatbyhw
- floatbyzero
- floorbybdt
- floorbybk
- floorbyhjm
- floorbyhw
- instbond
- instcap
- instcf
- instfixed
- instfloat
- instfloor
- instswap
- intenvset

- `optbndbybdt`
- `optbndbybk`
- `optbndbyhjm`
- `optbndbyhw`
- `rate2disc`
- `swapbybdt`
- `swapbybk`
- `swapbyhjm`
- `swapbyhw`
- `swapbyzero`
- `time2date`

Version 4.1 (R2006b) Financial Derivatives Toolbox Software

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

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
No	No	Bug Reports	No

Version 4.0.1 (R2006a) Financial Derivatives Toolbox Software

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

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
No	No	Bug Reports	No

Version 4.0 (R14SP3) Financial Derivatives Toolbox Software

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	Bug Reports	No

New features and changes introduced in this version are:

- "New Interest Rate Models" on page 20
- "Recombining Trinomial Trees" on page 23
- "Enhancement to the treeviewer Function" on page 23

New Interest Rate Models

Two interest rate models have been introduced with Version 4.0:

- 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 Financial Derivatives Toolbox™ software 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.

Function	Purpose
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

Function	Purpose
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
cvtree	Convert inverse discount tree to interest-rate tree.

Function	Purpose
mktrintree	Create recombining trinomial tree.
trintreepath	Extract entries from node of recombining trinomial tree.
trintreeshape	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 Software

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 24

- "Enhancement to the treeviewer Function" on page 26

Support for Equity Derivatives

Starting with Version 3.0, Financial Derivatives Toolbox software 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

Function	Purpose
crrprice	Instrument prices from a CRR tree.
crrsens	Instrument prices and sensitivities by a CRR tree.
crrtimespec	Specify time structure for a CRR tree.
crrtimespec	Construct a CRR stock tree.

Cox-Ross-Rubinstein Utilities

Function	Purpose
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

Function	Purpose
eqpprice	Instrument prices from an EQP binomial tree.
eqpsens	Instrument prices and sensitivities from an EQP binomial tree.
eqptimespec	Specify time structure for EQP tree.
eqptree	Construct EQP stock tree.

Equal Probabilities Tree Utilities

Function	Purpose
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

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

Version (Release)	New Features and Changes with Version Compatibility Impact
Latest Version V5.3 (R2008b)	None
V5.2 (R2008a)	None
V5.1 (R2007b)	None
V5.0 (R2007a)	None
V4.1 (R2006b)	None
V4.0.1 (R2006a)	None
V4.0 (R14SP3)	None
V3.0 (R14)	None