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 V5.5 (R2009b)	Yes Details	No	Bug Reports Includes fixes	Printable Release Notes: PDF Current product documentation
V5.4 (R2009a)	Yes Details	No	Bug Reports Includes fixes	No
V5.3 (R2008b)	Yes Details	No	Bug Reports Includes fixes	No
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®). 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

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. 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.

Version 5.5 (R2009b) Financial Derivatives Toolbox Software

This table summarizes what's new in Version 5.5 (R2009b):

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 the Basket Option Instrument Using the Longstaff-Schwartz Model and Nengjiu Ju Approximation Model

Supports the following using the Longstaff-Schwartz model:

Function	Purpose
`basketbyls`	Price basket options using the Longstaff-Schwartz model.
`basketsensbyls`	Calculate price and sensitivities for basket options using the Longstaff-Schwartz model.
`basketstockspec`	Specify basket stock structure.

Supports the following using the Nengjiu Ju approximation model:

Function	Purpose
`basketbyju`	Price basket options using the Nengjiu Ju model.
`basketsensbyju`	Calculate price and sensitivities for basket options using the Nengjiu Ju model.

For more information, see Basket Options in the Financial Derivatives Toolbox™ User's Guide documentation.

Support for the BUS/252 Day-Count Convention

Support for the `Basis` day-count convention for BUS/252. BUS/252 is the number of business days between the previous coupon payment and the settlement data divided by 252. BUS/252 business days are non-weekend, non-holiday days. The `holidays.m` file defines holidays.

Version 5.4 (R2009a) Financial Derivatives Toolbox Software

This table summarizes what's new in Version 5.4 (R2009a):

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:

Support for European Digital Options Using the Black-Scholes Pricing Model

Supports the following:

Function	Purpose
`cashbybls`	Calculate price of cash-or-nothing digital options using the Black-Scholes model.
`assetbybls`	Calculate price of asset-or-nothing digital options using the Black-Scholes model.
`gapbybls`	Calculate price of gap digital options using the Black-Scholes model.

Function	Purpose
supersharebybls	Calculate price of supershare digital options using the Black-Scholes model.
cashsensbybls	Calculate price and sensitivities of cash-or-nothing digital options using the Black-Scholes model.
assetsensbybls	Calculate price and sensitivities of asset-or-nothing digital options using the Black-Scholes model.
gapsensbybls	Calculate price and sensitivities of gap digital options using the Black-Scholes model.
supersharesensbybls	Calculate price and sensitivities of supershare digital options using the Black-Scholes model.

For more information, see “Digital Option”.

Support for European Rainbow Options Using the Stulz Option Pricing Model

Supports the following:

Function	Purpose
minassetbystulz	Calculate European rainbow option price on minimum of two risky assets using the Stulz option pricing model.
minassetsensbystulz	Calculate European rainbow option prices and sensitivities on minimum of two risky assets using the Stulz pricing model.
maxassetbystulz	Calculate European rainbow option price on maximum of two risky assets using the Stulz option pricing model.
maxassetsensbystulz	Calculate European rainbow option prices and sensitivities on maximum of two risky assets using the Stulz pricing model.

For more information, see “Rainbow Option”.

Support for Caps and Floors Using the Black Option Pricing Model

Supports the following:

Function	Purpose
`capbyblk`	Price caps using the Black option pricing model.
`floorbyblk`	Price floors using the Black option pricing model.

For more information, see “Interest Rate Derivatives Using Closed Form Solutions”.

Support for Calibrating the Hull-White Model Using Market Data of Caps and Floors

Supports the following:

Function	Purpose
`hwcalbycap`	Calibrate Hull-White tree using caps.
`hwcalbyfloor`	Calibrate Hull-White tree using floors.

For more information, see “Calibrating the Hull-White Model Using Market Data”.

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	No

New features and changes introduced in this version are:

Support for European Chooser Options Using the Black-Scholes Model

Supports the following:

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

Support for the 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 the 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 the 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 the 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 12
- "Support for Actual/365 (ISDA)" on page 13

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

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

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

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 V5.5 (R2009b)	None
V5.4 (R2009a)	None
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