

Numerix Models and Instruments

The Numerix analytics library offers the industry's most comprehensive collection of models and methods, allowing institutions to price any conceivable instrument using the most advanced calculations. Our infinitely flexible architecture also allows users to define bespoke deals and deploy a unified pricing and risk solution for all of their derivative and fixed income positions across all trade types. Below is a sample of some of the models we use and instruments we are able to price.

INTEREST RATE

Black-Karasinski
 Cheyette Local Volatility Model
 Cheyette LSV Model
 Cox-Ingersoll-Ross Model
 Cox-Ingersoll-Ross Model (2F)
 Deterministic model
 Hull-White (1F, 2F, 3F)
 Libor Market Model
 Shifted BK (Single/Two Factor)
 Skew BK

Instrument

Amortizing Bond/Swap
 Amortizing Floating-Rate Note
 Average Index Swap (Average Fixed Floating Interest Rate Swap)
 Average Overnight Futures Instrument
 Averaging Cap/Floor
 Bermudan Swaption
 Bond Futures/Options
 Bondes D
 Bpag28
 Bpag91
 Callable Bond
 Callable CMS inverse floater
 Callable Floating-Rate Note
 Callable Inflation Swap
 Callable Power Spread Swap
 Callable Range Accrual Bond
 Callable Reverse Floater
 Callable Zero-Coupon Bond/Swap
 Capped Swap
 CMS callable bond
 CMS cap/floor
 CMS Constant Maturity Swap
 CMS spread cap
 CMS Spread Steepener

CNY 7D repo swap
 Compound Index Fix Float Swap
 Cross-Currency Inflation-Linked Bond/Swap
 Fixed Rate Corporate Bonds
 Fixed-Floating Swap Referencing the Alternative Reference Rate
 Floating Interest Rate Swap
 Forward Rate Agreement
 Vanilla Swap/Swaption

INFLATION

Inflation Cap/Floor
 Inflation Linked Bond/Swap
 Inflation Market Model

Instrument

IR Cash Deposit
 IR General Average Index Swap/Basis Swap
 IR Libor Basis Swap
 Jarrow-Yildirim Model (Generalized/Cross-Currency)
 Limited Price Index (LPI) Swap
 Mexico Sovereign Fixed Coupon Bond
 Mexico Sovereign Zero Coupon Bond
 Overnight Index Swap
 Range Accrual Swap
 Single-Currency Inflation-Linked Bonds
 South Africa Sovereign Bonds
 Sovereign Bond
 Sovereign Fixed Coupon Bond from Mexico Based on the Udi Inflation Index
 T-Bill
 Total Return Swap
 Treasury Inflation Protected Securities (TIPS)

Year-on-Year Inflation Bond/Swap
 Year-On-Year Inflation Cap/Floor
 Zero Coupon Accreting Swap
 Zero-Coupon Inflation Indexed Swap

FIXED INCOME

Analytic/PDE/Lattice/Trinomial Tree/Monte Carlo
 Black model
 Black-Karasinski (one/two-factor)
 Classic BGM
 Deterministic (zero volatility) model
 Hull-White (single/multi-factor)
 Libor Market Model (LMM)
 Longstaff-Schwartz method
 Multi-currency models Stochastic Volatility LMM with HW/BK models for IR components and BS/Heston model for FX
 N-currency LMM
 Shifted BK
 Shifted LMM
 Stochastic Volatility LMM

Instrument

Callable flip-flop
 Callable TARN note/swap
 Differential swap/swaption
 Index-amortizing swap/swaption
 Knock-out swap/swaption
 Quanto index swap/swaption

Cross Currency Bond

Bermudan Callable CMS Spread Bonds
 Callable Quanto CMS Reverse/Inverse Floater Bond
 Callable Quanto Inverse Floater Bond

Cross Currency Callable Quanto CMS Spread Bond
 Cross-Currency FX TARN Bonds
 Power Reverse Dual-Currency (PRDC) Note

Cross Currency Options

Digital Cap on Quanto CMS Underlying (Digital CMS Cap Quanto)
 Digital CMS Floor Quanto
 Digital Libor Cap/Floor Quanto
 Dual Currency CMS Spread Cap/Floor
 Quanto Auto Cap/Floor
 Quanto Cap/Floor CMS
 Quanto Cap/Floor Libor
 Quanto CMS Spread Cap/Floor
 Quanto Flexicap
 Quanto Flexifloor

Cross Currency Swaps

Bermudan Callable CMS Spread Swap
 Bermudan Callable Fixed Float Swap
 Bermudan Callable Inverse Floater Swap
 Bermudan Callable Quanto Inverse Floater Swap
 Callable Cross-Currency Double Range Accrual Swap
 Cross-Currency ARR Basis Swap
 Cross-Currency Basis Swap/Swaption
 Cross-Currency Compound Fixed Float Swap
 Cross-Currency Compound Float Float Swap
 Cross-Currency Fixed Fixed Swap
 Cross-Currency Fixed Float Swap
 Cross-Currency Power Reversal Dual-Currency (PRDC) Swap with a Targeted Redemption
 Cross-Currency Resettable Basis Swap

Cross-Currency Structured Fixed Float Swap with Digital Option

Cross-Currency TARN Swap

Power Reverse Dual-Currency (PRDC) Swap

Single Currency

Bonds

Bermudan Callable Accrual CMS Spread Bond

Bermudan Callable Dual Range Accrual Bond

Bermudan Callable Range Accrual Libor Bond

Callable CMS Inverse Floater Bond

Callable CMS Spread Bond

Callable Convertible Bond

Callable Fixed Bond

Callable Inverse Floater Bond

Callable Inverse Snowball Floater Bond

Inverse Float Snowball Bond

Snowblade Bond

Options

Autocap

Autofloor

Cap/Floor Collar

CMS Spread Cap

CMS Spread Floor

CMS/Libor Cap

CMS/Libor Floor

Digital Cap/Floor on CMS Underlying

Digital Cap/Floor on Libor Underlying

European Swaption Call/Put

Flexicap

Flexifloor

Swaps

Bermudan Callable CMS Inverse Floater Swap

Bermudan Callable CMS Swap

Bermudan Callable Dual-Range Accrual Swap

Bermudan Callable Inverse Floater Swap

Bermudan Callable Range Accrual Swap

Bermudan Callable Staircase Swap

Bermudan Callable Swap

Callable/Non-Callable Ratchet Swap

Non-Callable Snowblade Swap

Non-Callable Target Redemption Note (Tarn) CMS Spread Swap

Non-Callable Target Redemption Note (Tarn) Inverse Floater Swap

EQUITY

Analytic/ tree/lattice/Monte Carlo

Anderson-Buffum model for liquid convertible bonds

Bates Stochastic Volatility Model

Black-Scholes Model

Continuous or discrete dividends

Convertible bonds

Deterministic Model

DLV

Dupire Model

Equity Convertible

Fast low-dimensional PDE methods for Asian and Lookback options

FR Heston

Heston Stochastic Volatility Model with Constant and Time-Dependent Coefficients

Local Stochastic Volatility Model

Multi-factor BS/Dupire/Heston/Bates basket models

One-factor Dupire and Two-Factor Heston models for equity index exotics

Quanto equity model

SABR Model

Vanna-Volga pricing method

Instrument

Accelerated Share Repurchase (ASR)

American/European Call/Put

Asian Dual Call/Put Option

Asian Options

Asian Strike Call/Put Option

Asian Underlying Call/Put Option

Auto-callable single asset option

Average Growth Protected Option

Barrier Double Digital at End Option

Barrier Double Digital No Touch Option

Barrier Double Digital on Hit Option

Barrier Options

Basket Call/Put Option

Best of/Worst of N Asset Equity Basket Option

Best of/Worst of N Performance Equity Basket Option

Booster Note

Compound Options

Convertible Bond

Correlation Equity Basket Option

Digital call/put

Digital call/put no touch

Digital call/put one touch at end

Digital call/put one touch on hit

Digital Options

Dividend Futures/Swaps

Eq IR Performance Linked Swap

Equity Baskets

Equity Call/Put Spread Option

Equity Callable Bull/Bear Contract

Equity Conditional Variance Swap

Equity Corridor Variance Swap

Equity Forward Contract

Equity Forward Start Call/Put Option

Equity Installment Option

Equity Position

Equity Range Accrual

Equity Timer Option

Equity Total Return Swap

Equity Variance Swap

Equity Volatility Swap

Equity-Linked Note (ELN) With Knock-In (KI) And Knock-Out (Ko) Barriers

European Call/Put on an American/European Call/Put Option

European Cliquet Equity Call/Put Option

European Double Barrier Call/Put Equity Option

European Equity Call/Put Option

European Equity Chooser Option

European Up/Down-Style Barrier Call/Put Equity Option

Fader Option

Forward Start European Option

Forward-Start Call/Put Option

Galaxy (or Swing) Equity Basket Option

Installment Option

Knock-In (KI) Knock-Out (KO) Barrier Option

Locked Return Option

Lookback Call/Put Option

Lookback Options

Lookback Range Call/Put Option

Lookback strike call/put

Mountain range basket options (Altiplano, Annapurna, Atlas, Everest, Himalayan)

Napoleon Equity Basket Option

Podium Basket Option

Range Accrual Option

Realized Volatility Swap

Reverse Convertible Option

S&P 500 Futures

Simple Digital Call/Put Equity Option

Single Name Products

VIX Futures

VIX Option Contracts

Single Name Quantos

Asian Options

Quanto European Asian Dual Call/Put

Equity Option

Quanto European Asian Strike Call/Put Equity Option

Quanto European Asian Underlying Call/Put Equity Option

Barrier Call Options

Quanto European Double Barrier Call/Put Equity Option

Quanto European Up/Down Barrier Call/Put Equity Option

Compound Options

Quanto European Call/Put on American Call/Put Option

Quanto European Call/Put on Call/Put Option

Digital Options

Quanto Barrier Digital Call/Put at End Equity/ on Hit Option

Quanto Barrier Double Digital at End/ No Touch/on Hit Equity Option

Quanto Digital Call/Put Equity Option

Quanto No Touch Equity Digital Call/Put Option

Lookback Options

Quanto Equity Lookback Call/Put Option

Quanto Equity Lookback Range Call/Put Option

Quanto Equity Lookback Strike Call/Put Option

FOREIGN EXCHANGE

Analytic/PDE/tree/lattice/Monte Carlo

Arbitrage-free volatility smoothing

Bates stochastic volatility jump-diffusion model

Black-Scholes model

Continuity corrections for FX barriers

Deterministic model

DLV

Dupire local volatility model, also with advanced fit of local volatility surface

FR Heston

Heston stochastic volatility model with constant and time-dependent coefficients

Local stochastic volatility model

Multi-factor BS basket model

SABR model

Vanna-Volga pricing method

Instrument

Accumulator

American Vanilla Long-Dated Option

American/European Option Call/Put

Chooser Option

Cliquet Call/Put

Conditional Variance Swap/Put
Fader Option
Forward-Start Call/Put Option

FX Butterfly
FX Linked Note
FX Single/Double Discrete Barrier
FX Strangle Option
FX Swap

FX Target Redemption Note
Installment Option
Range Accrual Option/Swap
Realized Volatility Swap
Risk Reversal Option
Target FX Forward
Variance Swap

Asian Options

Asian Dual Put/Call FX Option
Asian Strike Call/Put FX Option
Asian Underlying Call/Put FX Option

Barrier Options

Barrier down call/put continuous
Barrier Down-Style Call/Put
Barrier Up-Style Call/Put
Double Barrier Call/Put

Compound Options

Compound Call/Put on an American/
European Call/Put

Digital Options

Barrier Double Digital at End
Barrier Double Digital No Touch
Barrier Double Digital on Hit
Digital Call/Put
Digital Call/Put No Touch
Digital Call/Put One Touch at End
Digital Call/Put One Touch on Hit
FX Basket
FX Basket Call/Put Option
FX Best-of/Worst-of-Basket Option
FX Max/Min-of-basket option
FX Two Assets Out-Performance-of
Basket Option
FX Two Assets Out-Spread-of Basket
Option
Lookback Call/Put
Lookback Options
Lookback Range Call/Put
Lookback Strike Call/Put

HYBRIDS

Hybrid models using any model listed above for interest rates, credit, equity, FX and commodities as building blocks, with deterministic or stochastic components
Correlations between different asset classes

Joint calibration of all components
Generic Tree, Forward/Backward Monte Carlo

Instrument

Callable Generic Index Note
Callable Risky Bond
Callable Single/Dual Generic Index Range Accrual Swap
Callable Single/Dual Generic Index Spread Swap
Commodity Fixed Float Asian Swap
Commodity Fixed Float Swap
Commodity Float Float Swap
Cross Currency CMS Spread Swap
EQ Best-Of/ Worst-Of Option
EQ Contingent Option
EQ Correlation Swap
EQ Cross-Corridor Variance Swap
EQ Dual Digital Option
EQ FX Contingent Option
EQ FX Covariance Swap
EQ FX Dual Digital Option
EQ Quanto Digital Option
Equity Outperformance Option
FX Best-of/Worst-of Option
FX Contingent Option
FX Correlation Swap
FX Double No-Touch Quanto Swap
FX Dual Digital Option
FX Dual Digital Single/Double Knock-Out Option
FX Dual-Range Accrual Target Redemption Note
FX Long-Dated American Option
FX Out Spread Option
FX Outperformance Option
Hybrid Convertible Bond
Hybrid Equity Knock-Out Swap
Hybrid products of any complexity, with arbitrary payoff and any underlyings covered by the Numerix model library
Mixed basket deals containing Equities, FX rates and Commodities as underlyings
Total Return Swap
Treasury Linked Convertible Bond

COMMODITY

Black Model
Deterministic Model
Gabillon Model/ Gabillon 3F
Gibson-Schwartz 2F model with stochastic convenience yield
Gibson-Schwartz Local Volatility Model

Gibson-Schwartz Model
Heston Stochastic Volatility Model
Local Volatility Model
Schwartz 1F Model with Mean-Reverting Dynamics
Estimating seasonality coefficients from historical data
Support of rolling underlying future contracts

Instrument

All commodity underlyings, such as WTI, heating oil, natural gas, metals, agricultural commodities and others
American/European Asian Commodity Options
Best-of/worst-of-N asset basket option
Best-of/worst-of-N performance basket option
Commodity Accumulator
Commodity Autocallable Note
Commodity Basket Autocallable Note
Commodity Bullet Option
Commodity Calendar Spread Option
Commodity Crack Spread Option
Commodity Forward Contract
Commodity Futures
Commodity FX Swap
Commodity Interest Rate Swap with Trigger
Commodity principal-protected note
Commodity Quanto Basket with Trigger
Commodity Range Accrual Note
Commodity Swap/Swaption
Commodity Target Redemption Note
Commodity TARS Swap
Commodity-linked note
WTI Linked Bull Note

CREDIT

Advanced-Factor Models of Credit Baskets
Asymptotic Saddlepoint Methods
Black-Karasinski Model
Calibration of Base Correlations for Various Market Conditions
Cox-Ingersoll-Ross Model
Cox-Ingersoll-Ross Model (2F)
CRB: Calibrate NIG
CRB: CDO
CRB: CDO2
CRB: Generalized Nth-To-Default
CRB: Single Tranche CDO
CRB: STCDO with RFL
Credit Spread Var For Credit Portfolios
Credit Transition Model

Default Var and Expected Shortfall for Credit Portfolios
Deterministic Model
Direct Grid Convolution
Dynamic Credit Model (Top-Down Approach)
Dynamic Credit Model for Pricing/Hedging Heterogeneous CDOs (Bottom-Up Approach)
Fourier/Laplace Transform
Gaussian Copula Model With Optional Correlated/Stochastic Recovery
Hull-White (Single Factor)
Multi-Period Simulation Models (Hull White)
NIG Copula Model
Student-T Copula Model
Twisted Monte Carlo Simulations

Instrument

Amortizing Credit Default Swap
Asset Swaps
Basket Default Swaps
Bespoke Tranches
Bond/Loan Portfolios
Brady Bonds
Callable/Puttable Corporate Bonds
Cancelable Asset Swaps
Cashflow CDOS
CDO-Squared
CDS Index Swaps
CDS Indices
Constant-Maturity CDS
Credit Baskets
Credit Default Swap/Swaptions
Credit Linked Note
Credit Spread Options
Equity Default Swaps
First-To-Default Basket Swaps
Fixed Rate Bond
Floating Rate Note
Loan CDS
Loan CDS Indices
Loss CDF
Nth-To-Default Basket Swap
Options on CDS Indices
Single Name Product
Single Tranche Bespoke CDO
Single Tranche CDO
Single Tranche CDO (Interest-Only, Principal Only, Portfolio)
Synthetic Single-Tranche CDOS
Total Return Swaps
Zero Coupon Bond