numerix®
Taking Analytics Further

Numerix Models and Instruments

FIXED INCOME

Models/Methods

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

Sample Instruments*

- Vanilla swap/swaption
- Cross-currency basis swap/swaption
- CMS swap/swaption
- Quanto index swap/swaption
- Differential swap/swaption
- Knock-out swap/swaption
- Index-amortizing swap/swaption
- Quanto/chooser auto/flexi/limit cap/floor
- Digital/callable/quanto cap/floor on Libor/ CMS
- Callable/putable bond
- Lookback option
- Callable flip-flop
- Dual-currency CMS spread cap/floor
- Callable CMS spread note/swap quanto
- Callable/quanto reverse/inverse floater
- Quanto CMS inverse floater note/swap
- Callable range accrual note/swap with step-up coupons/ranges
- Callable Snowball/Snowbear/ Snowblade/ Thunderball
- Callable TARN note/swap
- FX TARN note/swap
- Power reverse dual-currency (PRDC) note/ swap

INFLATION

Models/Methods

- Generalized Jarrow-Yildirim model
- Cross-Currency JY hybrid model
- Stripping of real rate curve from zero-coupon inflation indexed swaps (ZCIIS)
- Support for CPI Index with seasonality corrections
- Analytic/Generic Tree/Monte Carlo

Sample Instruments*

- Zero-coupon inflation-indexed swap
- Year-on-year inflation bond/swap
- Inflation caps/floors
- Inflation-linked bond/swap
- Cross-currency inflation-linked bond/swap

CREDIT

Models/Methods

- Gaussian Copula model with optional correlated/stochastic recovery
- Student-T Copula model
- NIG Copula model
- Calibration of base correlations for various market conditions
- Dynamic credit model (top-down approach)
- Dynamic credit model for pricing/ hedging heterogeneous CDOs (bottom-up approach)
- Advanced-factor models of credit baskets
- Multi-period simulation models (Hull-White)
- Twisted Monte Carlo simulations
- Direct grid convolution
- Fourier/Laplace transform
- Asymptotic Saddlepoint methods
- Credit spread VaR for credit portfolios
- Default VaR and Expected Shortfall for credit portfolios

Sample Instruments*

- Credit default swaps/swaptions
- Asset swaps
- Credit spread options
- Cancelable asset swaps
- Total return swaps
- Callable/putable corporate bonds
- Brady bonds
- Equity default swaps
- Constant-maturity CDS
- Credit-linked notes
- CDS indices
- Options on CDS indices
- Synthetic single-tranche CDOs
- Cashflow CDOs
- CDO-squareds
- Bespoke tranches
- Basket default swaps
- Loan CDS
- Loan CDS indices
- Nth-to-default baskets
- Bond/loan portfolios

EQUITY

Models/Methods

- Black-Scholes model
- Dupire local volatility model, also with advanced fit of local volatility surface
- Heston stochastic volatility model with constant and time-dependent coefficients
- Bates stochastic volatility jump-diffusion model
- Local stochastic volatility model
- SABR model
- Quanto equity model
- Multi-factor BS/Dupire/Heston/Bates basket models
- One-factor Dupire and Two-Factor Heston models for equity index exotics
- Continuous or discrete dividends
- Vanna-Volga pricing method
- Fast low-dimensional PDE methods for Asian and Lookback options
- Analytic/ tree/lattice/Monte Carlo

Sample Instruments*

Single-Name Products

- American/European call/put
- Forward-start call/put option
- Auto-callable single asset option
- Average growth protected option
- Booster note.
- Bull-Bear note
- Chooser option
- Cliquet call/put option
- Fader option
- Installment option
- Locked return option
- Range accrual
- Realized volatility swap
- Reverse convertible option
- Variance swap

Asian Options

- Asian dual call/put
- Asian strike call/put
- Asian underlying call/put

EQUITY (cont'd)

Sample Instruments*

Barrier Options

- Barrier down-style call/put
- Barrier up-style call/put
- Double barrier call/put

Compound Options

- Compound call/put on American/European call/put

Digital Options

- Digital call/put
- Digital call/put no touch
- Digital call/put one touch at end
- Digital call/put one touch on hit
- Barrier double digital no touch
- Barrier double digital at end
- Barrier double digital on hit

Lookback Options

- Lookback call/put
- Lookback range call/put
- Lookback strike call/put

Equity Baskets

- Equity basket call/put option
- Best-of/worst-of-N asset basket options
- Best-of/worst-of-N performance basket options
- Correlation basket option
- Galaxy (swing) basket option
- Mountain range basket options (Altiplano, Annapurna, Atlas, Everest, Himalayan)
- Napoleon basket option
- Podium basket option

FOREIGN EXCHANGE

Models/Methods

- Deterministic model
- Black-Scholes/Garman-Kolhagen model
- Dupire local volatility model, also with advanced fit of local volatility surface
- Heston stochastic volatility model with constant and time-dependent coefficients
- Bates stochastic volatility jump-diffusion model
- Local stochastic volatility model
- SABR model
- Multi-factor BS basket model
- Arbitrage-free volatility smoothing
- Continuity corrections for FX barriers
- Vanna-Volga pricing method
- Analytic/PDE/tree/lattice/Monte Carlo

Sample Instruments*

- American/European call/put
- American vanilla long-dated option
- Forward-start call/put option
- Accumulator
- Chooser option
- Cliquet call/put option
- Fader option
- Installment option
- Range accrual
- Realized volatility swap
- Variance swap

Asian Options

- Asian dual call/put
- Asian strike call/put
- Asian underlying call/put

Barrier Options

- Barrier down-style call/put
- Barrier down call/put continuous
- Barrier up-style call/put
- Double barrier call/put

Compound Options

- Compound call/put on American/European call/put

Digital Options

- Digital call/put
- Digital call/put no touch
- Digital call/put one touch at end
- Digital call/put one touch on hit
- Barrier double digital no touch
- Barrier double digital at end
- Barrier double digital on hit

Lookback Options

- Lookback call/put
- Lookback range call/put
- Lookback strike call/put

FX Baskets

- 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

COMMODITIES

Models/Methods

- Black model
- Schwartz 1F model (mean-reverting)
- Gibson-Schwartz 2F model (stochastic convenience yield)
- Heston stochastic volatility model
- Estimating seasonality coefficients from historical data
- Support of rolling underlying future contracts

Sample Instruments*

- All commodity underlyings, such as WTI, heating oil, natural gas, metals, agricultural commodities and others
- Commodity futures
- European commodity options
- European options on commodity futures
- Asian commodity options
- Commodity swap
- Commodity-linked note
- Commodity principal-protected note
- Best-of/worst-of-N asset basket option
- Best-of/worst-of-N performance basket option

HYBRIDS

Models/Methods

- 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

Sample Instruments*

- Convertible bonds
- Mixed basket deals containing Equities, FX rates and Commodities as underlyings
- Hybrid products of any complexity, with arbitrary payoff and any underlyings covered by the Numerix model library

*Not a comprehensive list