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The underlined algorithms have been already implemented.

1 Standard European Options in the Black-Sholes Model

1.1 Call, Put, CallSpread, Digit

1.1.1 Analytic

- Black-Sholes Type Formula The general version of the Black-Sholes formula used to price European options on stocks paying a continuos dividend yields [63]

1.1.2 Tree

- Cox Ross Rubinstein Binomial Binomial algorithm with the Cox-Ross-Rubinstein stock price parameters and probabilities [62]
- Extended Cox Ross Rubinstein Binomial Two steps backward CRR scheme, for a better accuracy of the Greeks [3]
- Hull White Binomial Binomial algorithm with the Hull-White stock price parameters and probabilities modified to account for dividends [6]
- Euler Binomial Stock price parameters and probabilities obtained from the discretization of the Wiener process
- Kamrad Ritchken Trinomial Trinomial tree with a stretch parameter λ [73]
- Third Moment Trinomial tree with matching first three moments
- LnThird Moment Trinomial tree with matching first four moments giving a $o(h^2)$ order of accuracy

1.1.3 Finite-Difference

- Gauss Method For a given time step the elliptic problem is solved by the direct method of Gauss for tridiagonal matrix [19]
- Explicit Method Direct explicit scheme [19]
- Iterative Sor Method For a given time step the elliptic problem is solved by the iterative method Sor(Successive Overrelaxation) [19]
- Multigrid Method For a given time step the elliptic problem is solved by a FMG Multigrid algorithm [99]
- Adaptative Finite Element Method Adaptative time step and space varies to improve precision.[25] [8]

1.1.4 Montecarlo

- Monte Carlo Standard
- Quasi Montecarlo Low discrepancy sequences(Faure, SquareRoot, VanDerCorput, Sobol, Niedereitter, Owen's Randomization Technique) [45], [30], [38], [34], [1]
- Variance Reduction Various reduction variance methods(Antithetic Methdod, Stratified Sampling, Control Variate,Moment Matching, Importance Function, Newton,Malliavin Calculus for Digital Options) [68],[100],[41] [26]

2 Standard American Options in the Black-Sholes Model

2.1 Call, Put, CallSpread, Digit

2.1.1 Tree

- Cox Ross Rubinstein Binomial Binomial algorithm with the Cox-Ross-Rubinstein stock price parameters and probabilities [62]
- Extended Cox Ross Rubinstein Binomial Two steps backward CRR scheme, for a better accuracy of the Greeks [3]
- Hull White Binomial Binomial algorithm with the Hull-White stock price parameters and probabilities modified to account for dividends [6]
- Euler Binomial Stock price parameters and probabilities obtained from the discretization of the Wiener motion process
- Kamrad Ritchken Trinomial Trinomial tree with a stretch parameter λ [73]

- Third Moment Trinomial tree with matching first three moments
- Breen Accelerated Binomial The Breen accelerated method approximates the Geske-Johnson option pricing formula [76]
- Broadie-Detemple BBSR Binomial Black-Sholes modification of binomial algorithm with Richardson extrapolation [43]
- LnThird Moment Trinomial tree with matching first four moments giving a $o(h^2)$ order of accuracy

2.1.2 Finite-Difference

- Brennan-Schwartz Algorithm The Brennan-Schwartz algorithm solves the linear complementarity problem [24],[12]
- Splitting Gauss Method The obstacle problem is splitted in two steps. Theta-method finite difference algorithm [59]
- Splitting Explicit Method The obstacle problem is splitted in two steps. Explicit finite-difference algorithm [59]
- Iterative Psor Method Projected SOR algorithm is used to solve large-scale linear complementarity problem [14]
- Cryer's Algorithm Pivoting method to solve directly linear complementarity problem [15]
- *Interior Point Algorithm* The linear complementarity problem is solved with a interior point algorithm
- Finite Element Method Finite Element Method
- *Dempster Algorithm* The linear complementarity problem is reduced to a linear programming problem,solved with a simplex algorithm [36]
- *Brandt-Cryer Multigrid Method* The linear complementarity problem is solved by a Proiected FMG Multigrid algorithm [16]

2.1.3 Montecarlo

- Barraquand-Martineau Algorithm Stratification method. [18]
- Broadie-Glassermann Algorithm Approximation of dynamical programming using a stochastic mesh method. [71]
- Tsitsiklis-VanRoy Algorithm Approximation of dynamical programming using regression method.[83],[82]
- Longstaff-Schwartz Algorithm Estimation of optimal stopping time using regression method.[23]

- Pages-Bally Algorithm Approximation of dynamical programming using quantization method. [97]
- *Broadie-Glassermann Algorithm* Simulation algorithm for estimating the prices of American option with exercise opprtunities in a finite set of times. [70]
- Rogers Algorithm Method based on martingale Lagrangian. [81]
- Lions Regnier Algorithm Method based on Malliavin Calculus. [53]

2.1.4 Approximation

- MacMillan Approximation Quadratic method based on exact solutions to approximations of the partial differential equation [54]
- Whaley Approximation Quadratic method based on exact solutions to approximations of the partial differential equation [79]
- Bjerksund-Stensland Approximation The approximation is based on an exercise strategy corresponding to a flat exercise boundary [29]
- Ho-Stapleton-Subrahmanyam Approximation 2-points approximation formula with exponential extrapolation [94]
- Bunch-Johnson Approximation 2-points Geske-Johnson approximation formula [32]
- Carr Approximation Randomization and the American Put [13]
- Ju Approximation Pricing an American Option by approximating Its Early Exercise Boundary as a Multipiece Exponential Function [69]
- Broadie-Detemple LBA and LUBA Methods Approximation methods based on lower and upper bounds [43]

3 Barrier European Options in the Black-Sholes Model

3.1 Call, Put In-Out/Down-Up, Parisian

3.1.1 Analytic

- Reiner-Rubinstein Formula Black-Sholes type formula [61]
- *Heynen-Kat Formula* Formulas for partial barrier option [33] [35]

3.1.2 Trees

- Derman Kani Ergener Bardhan Algorithm Interpolation scheme for improving the pricing error of a binomial method [37]
- Ritchken Trinomial Algorithm Choosing the strech parameter λ of the Kamrad-Ritchken method such that the barrier is hit exactly [72]
- Rogers-Stapleton Method Tree with random time steps corresponding to hitting times [21]
- *Lyuu Method* Binomial combinatorial algorithm [101]

3.1.3 Finite-Difference

- Gauss Method Finite-difference algorithm with an interpolation scheme
- Finite Element Method Finite Element Method [42]

3.1.4 Montecarlo

- Baldi-Caramellino-Iovino Method Large deviations technique [58]

3.2 Discrete Barrier Option

3.2.1 Approximation

- Broadie-Glassermann-Kou Method A continuity correction for discrete barrier options [90]

3.2.2 Montecarlo

- Variance Reduction Reduction variance methods

4 Barrier American Options

4.1 Call, Put In-Out/Down-Up

4.1.1 Trees

- Derman Kani Ergener Bardhan Algorithm Interpolation scheme for improving the pricing error of a binomial method [37]
- Ritchken Trinomial Algorithm Choosing the strech parameter λ of the Kamrad-Ritchken method such that the barrier is hit exactly [72]

4.1.2 Finite-Difference

- Psor Method Psor Finite-difference algorithm with interpolation scheme [14]
- Cryer's Algorithm Pivoting method to solve directly linear complementarity problem algorithm with interpolation scheme [15]
- Finite Element Method Finite Element Method [42]

5 Double Barrier European Options In/Out, Parisian in the Black-Sholes Model

5.1 Call, Put In/Out

5.1.1 Analytic

- Kunitomo-Ikeda Formula Pricing formula expressed as the sum of an infinite series [66]

5.1.2 Approximation

- Geman-Yor Method Laplace transform method [65]

5.1.3 Trees

- Ritchken Trinomial Algorithm Choosing the strech parameter λ of the Kamrad-Ritchken method such that the barrier is hit exactly [72]
- *Rogers-Stapleton Method* Tree with random time steps corresponding to hitting times [21]
- *Lyuu Method* Binomial combinatorial algorithm [101]

5.1.4 Finite-Difference

- Gauss Method Finite-difference algorithm with interpolation scheme
- Finite Element Method Finite Element Method [42]

5.1.5 Montecarlo

- Baldi-Caramellino-Iovino Method Large deviations technique [58]

6 Double Barrier American Options In/Out in the Black-Sholes Model

6.1 Call, Put In/Out

6.1.1 Trees

- Ritchken Trinomial Algorithm Choosing the strech parameter λ of the Kamrad-Ritchken method such that the barrier is hit exactly [72]

6.1.2 Finite-Difference

- Psor Method Psor Finite-difference algorithm with interpolation scheme [14]
- Cryer's Algorithm Pivoting method to solve directly linear complementarity problem algorithm with interpolation scheme [15]
- Finite Element Method Finite Element Method [42]

7 Lookback European Options in the Black-Sholes Model

7.1 Call, Put Fixed-Floating

7.1.1 Analytic

- Goldman-Sosin-Gatto and Conze-Viswanathan Formula Black-Sholes type formula [55],[85]
- *Heynen-Kat Formula* Formulas for partial lookback option [33] [35]

7.1.2 Trees

- Babbs Method Change of numeraire technique [86],[96]
- *Forward Shooting Grid Method* Barraquand-Pudet or Hull-White enhenced method [93],[7]

7.1.3 Finite-Difference

- *Wilmott-Dewyne-Howison Method* Resolution of two-dimensional PDE. Similarity reduction [89]
- *Andreasen Method* A change of numeraire approach [39]

7.1.4 Montecarlo

- Anderson-Brotherton-Ratcliffe Method Bias Elimination for efficient simulation procedure [77]
- *Clerlow-Carvehill method* Control variate technique [2]

8 Lookback American Options

8.1 Call, Put Fixed-Floating

8.1.1 Trees

- Babbs Method Change of numeraire technique [86],[96]
- *Forward Shooting Grid Method* Barraquand-Pudet or Hull-White enhanced method [93],[7]

8.1.2 Finite-Difference

- *Wilmott-Dewyne-Howison Method* Resolution of a two-dimensional VI. Similarity reduction [89]

8.1.3 Approximation

- *Zhang-Taksar Method* Quadratic methods for american path-dependant options [95]

9 European Asian Options in the Black-Sholes Model

9.1 Call, Put Fixed-Floating

9.1.1 Approximation

- Geman-Yor Method Laplace transform method [65]

9.1.2 Trees

- Forward Shooting Grid Method Barraquand-Pudet or Hull-White enhanced method [93],[7]

9.1.3 Finite-Difference

- Rogers-Shi Method Reduction to a one-dimensional PDE [103]
- Hameur Breton Ecuyer Method Finite Element Method [52]
- *Zvan-Forsyth-Vetzal Method* Finite Volume Techinque [49]

- *Andreasen Method* A change of numeraire approach [39]

9.1.4 Montecarlo

- Kemma-Vorst Method Control variate variance reduction method to compute the price of fixed-strike average-rate options with the approximation of the integral using the law of the brownian bridge [48],[27]
- Glasserman-Heidelberger-Shahabuddin Method Gaussian Importance sampling and stratification computational issue [74],[75]
- Variance Reduction and Robbind-Monro algorithm [10]

9.1.5 Approximation

- Rogers-Shi Method Rogers-Shi upper and lower bounds[103]
- Thompson Method Upper and lower bounds [92]
- Levy Formula Lognormal approximation with first two moments.[22]
- Turnbull-Wakeman Formula Edgeworth expansion around a lognormal using first four moments.[50]
- Milevski-Posner Formula Reciprocal gamma distribution using first two moments. [87]
- Fusai-Tagliani Approximation Edgeworth expansion around a normal and maximum entropy approximation using first four logarithmic moments.[4]
- Zhang Approximation Analytical approximation formula with error correction obtained by numerical solution of PDE.[44]

10 American Asian Options in the Black-Sholes Model

10.1 Call, Put Fixed-Floating

10.1.1 Trees

- Forward Shooting Grid Method Barraquand-Pudet or Hull-White enhanced method [93],[7]

10.1.2 Finite-Difference

- Hameur Breton Ecuyer Method Finite Element Method
- *Zvan-Forsyth-Vetzal Method* Finite Volume technique [49]

11 Europeen 2D Standard Options in the Black-Sholes Model

11.1 CallMax, PutMin, BestOf, Exchange

11.1.1 Analytic

- Stulz and Johnson Formula Black-Sholes type formula [84] ,[31]

11.1.2 Tree

- Boyle-Evnine-Gibbs 4-branches Algorithm General lattice method to price contingent claims on k assets [88]
- Kamrad-Ritchken 5-branches Algorithm 5-branches tree with a stretch parameter λ [73]
- Euler 4-branches Algorithm Stock price paramenters and probabilities obtained from the discretization of the Wiener motion processes [60]
- Product Tree 4-branches Algorithm The tree is the product of two one-dimensional trees

11.1.3 Finite-Difference

- Alterning Direction Implicite Algorithm(ADI) At each time step, one can integrate "in each direction" [46], [47]
- Explicit Method Direct explicit scheme [19]
- Implicit Method Implicit scheme solved with iterative stationary(SOR) and not stationary methods(GMRES and BiCgStab).[98],[64], [14]
- Multigrid Method The elliptic problem is solved by a FMG multigrid algorithm [99]
- Howard Method Implicit scheme solved with iterative Howard Method

11.1.4 Montecarlo

- Monte Carlo Standard
- Quasi Montecarlo Low discrepancy sequences(Faure, SquareRoot, Halton, Sobol, Niedereitter, Owen's Randomization Technique) [45], [30], [38], [34], [1]
- Variance Reduction Various reduction variance methods(Antithetic Methdod, Stratified Sampling, Control Variate,Moment Matching, Importance Function, Newton) [68],[100],[41] [26]

12 American 2D Standard Options in the Black-Sholes Model

12.1 CallMax, PutMin, BestOf, Exchange

12.1.1 Tree

- Boyle-Evnine-Gibbs 4-branches Algorithm General lattice method to price contingent claims on k assets [88]
- Kamrad-Ritchken 5-branches Algorithm 5-branches tree with a stretch parameter λ [73]
- Euler 4-branches Algorithm Stock price paramenters and probabilities obtained from the discretization of the Wiener motion processes [60]
- Product Tree 4-branches Algorithm The tree is the product of two one-dimensional trees

12.1.2 Finite-Difference

- Splitting Adi Method One combines an Adi method with splitting technique [59],[9]
- Splitting Explicit Method Splitting method and an explicit scheme [59]
- Splitting Implicit Method Implicit scheme solved with iterative stationary(SOR) and not stationary methods(GMRES and BiCgStab).[98],[64], [14]
- *Brandt-Cryer Multigrid Method* The linear complementarity problem is solved by a Proiected FMG multigrid algorithm [16]
- FMGH Multigrid Method The linear complementarity problem is solved by a FMGH multigrid algorithm
- Howard Method Implicit scheme solved with iterative Howard Method

12.1.3 Montecarlo

- Barraquand-Martineau Algorithm Stratification method. [18]
- Broadie-Glassermann Algorithm Approximation of dynamical programming using a stochastic mesh method. [71]
- Tsitsiklis-VanRoy Algorithm Approximation of dynamical programming using regression method.[83],[82]
- Longstaff-Schwartz Algorithm Estimation of optimal stopping time using regression method.[23]

- Pages-Bally Algorithm Approximation of dynamical programming using quantization method. [97]
- *Broadie-Glassermann Algorithm* Simulation algorithm for estimating the prices of American option with exercise opprtunities in a finite set of times. [70]
- Lions Regnier Algorithm Method based on Malliavin Calculus. [53]

13 Standard European Options in the Merton Model

13.1 Call, Put, CallSpread, Digit

13.1.1 Analytic

- Merton Formula Pricing formula expressed as the sum of an infinite series. [78]

13.1.2 Approximation

- Carr-Madan Approximation Fast Fourier Transform Algorithm [17]

13.1.3 Finite-Difference

- Explicit Method Direct explicit scheme [19]
- ADI-FFT Method ADI-FFT alogrithm [40]

13.1.4 Montecarlo

- Monte Carlo Standard

14 Standard American Options in the Merton Model

14.1 Call, Put, CallSpread, Digit

14.1.1 Finite-Difference

- Splitting Explicit Method The obstacle problem is splitted in two steps. Explicit finite-difference algorithm [59]
- Splitting ADI-FFT Method The obstacle problem is splitted in two steps. ADI-FFT finite-difference algorithm [40],[102]

15 Standard European Options in the Dupire-Local Volatility Model

15.1 Call, Put, CallSpread, Digit

15.1.1 Finite-Difference

- Implicit Method Implicit scheme [19]
- Adaptative Finite Element Method Adaptative time step and space varies to improve precision.[25] [8]

15.1.2 Montecarlo

- Monte Carlo with variance reduction

16 Standard European Options in the Hull-White Model

16.1 Call, Put, CallSpread, Digit

16.1.1 Montecarlo

- Variance Reduction and Robbind-Monro algorithm [10], [5]

17 Standard European Options in the Heston Model

17.1 Call, Put, CallSpread, Digit

17.1.1 Montecarlo

- Heston Closed-Form Solution [91]
- Variance Reduction and Robbind-Monro algorithm [10]

18 Calibration in the Dupire Model

- Numerical solution of an inverse problem.[80],[67],
- Mercurio-Brigo Lognormal-mixture dynammics and calibration to market [28]
- Weighted Monte-Carlo Approach [56]
- Inference of a consistent implied volatility under a minimum of entropy criterion [57]

- Tree calibration algorithm [20],[11]

19 Calibration in the Merton Model

- Algorithmes de type Andersen Andreasen [51].

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