

## Help

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#if defined(PremiaCurrentVersion) && PremiaCurrentVersion <
    (2008+2) //The "#else" part of the code will be freely available
    after the (year of creation of this file + 2)
#else

#ifndef TreeHW2D_H_INCLUDED
#define TreeHW2D_H_INCLUDED
#include "math/read_market_zc/InitialYieldCurve.h"

//*****TreeHW2D structure*****/
//
typedef struct TreeHW2D
{
    double Tf;           // Final time of the tree, dt=Tf/
    Ngrid
    int Ngrid;           // Number of time step in the TreeHW2D

    PnlVect* t;          // Time step grid, from t[0] to t[
    Ngrid].

    PnlVectInt* uIndexMin; // Jminimum[i] : Minimal index of
    u at time i
    PnlVectInt* uIndexMax; // Jmaximum[i] : Maximal index of
    u at time i

    PnlVectInt* yIndexMin; // Jminimum[i] : Minimal index of
    y at time i
    PnlVectInt* yIndexMax; // Jmaximum[i] : Maximal index of
    y at time i

    PnlMat* ProbasMatrix; // Matrix 3x3 of probabilities
    PnlVect* alpha;        // Translation from x to r. ( r_t
    = y_t - u/(b-a) + alpha_t)
}TreeHW2D;

//***** Datas specific to Hull and White *****/
//
typedef struct ModelHW2D
{
    double rMeanReversion;           /*Speed reversion

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    n of r */
    double rVolatility;                /*Volatility of
    r */
    double uVolatility;                /*Speed reversio
    n of u */
    double uMeanReversion;            /*Volatility of
    u */
    double correlation;                /*Correlation
    between r and u */
} ModelHW2D;

//***** Functions specifics to the construction of the
    tree *****/

int SetTimegridHW2D(TreeHW2D *Meth, int n, double T);

int SetTimegridHW2D_Cap(TreeHW2D *Meth, int NtY, double T_
    intermediate, double T_final, double periodicity);

// Construction of the tree (uIndexMin, uIndexMax, yIndexM
    in, yIndexMax and alpha)
void SetTreeHW2D(TreeHW2D* Meth, ModelHW2D* ModelParam,
    ZCMarketData* ZCMarket);

void BackwardIterationHW2D(TreeHW2D* Meth, ModelHW2D*
    ModelParam, ZCMarketData* ZCMarket, PnlMat* OptionPriceMat1, Pn
    lMat* OptionPriceMat2, int index_last, int index_first);

int indiceTimeHW2D(TreeHW2D *Meth, double s); // t[indiceT
    imeHW2D(s)] < s <= t[indiceTimeHW2D(s) + 1]

double delta_xHW2D(double delta_t, double a, double sigma);
    // Return the step (for a process x : dx=-a*x*dt+sigma*dW
    t) at time i : Delta_x(i)

double ProbaUpHW2D(double x);        // x : eta_ijk/delta_x
    HW2D(i+1) avec les notations de Brigo&Mercurio
double ProbaMiddleHW2D(double x);    // x : eta_ijk/delta_x
    HW2D(i+1) avec les notations de Brigo&Mercurio
double ProbaDownHW2D(double x);      // x : eta_ijk/delta_x
    HW2D(i+1) avec les notations de Brigo&Mercurio

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// Build the matrix 3x3 of probabilities
void BuildProbasMatrixHW2D(TreeHW2D* Meth, double eta_over_
    deltau, double eta_over_deltay, double rho);

int DeleteTimegridHW2D(TreeHW2D *Meth); // Delete the PnlV
    ect t
int DeleteTreeHW2D(TreeHW2D* Meth);      // Delete the PnlV
    ect s uIndexMin, uIndexMax, yIndexMin, yIndexMax and alpha

#endif // TreeHW2D_H_INCLUDED
#endif //PremiaCurrentVersion
```

## References