

[Help](#)

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#include <stdlib.h>
#include "hullwhite1d_std.h"
#include "hullwhite1d_includes.h"

//The "#else" part of the code will be freely available after the (year of creat
#if defined(PremiaCurrentVersion) && PremiaCurrentVersion < (2007+2)
int CALC(CF_PayerSwaptionHW1D)(void *Opt, void *Mod, PricingMethod *Met)
{
    return AVAILABLE_IN_FULL_PREMIA;
}
static int CHK_OPT(CF_PayerSwaptionHW1D)(void *Opt, void *Mod)
{
    return NONACTIVE;
}
#else

/**/ Computation the function phi used to find the Critical Rate in the Jamishid
static double phi(ZCMarketData *ZCMarket, double r, double periodicity, double o
                double SwaptionFixedRate, double a, double sigma)
{
    int i, nb_payerment;
    double ci, sum, sum_der, ti;

    double ZCPrice;
    double A_tT, B_tT;

    ZCPrice = 0.;
    A_tT = 0;
    B_tT = 0;
    sum = 0.;
    sum_der = 0.;

    ci = periodicity * SwaptionFixedRate;
    ti = option_maturity;

    nb_payerment = (int)((contract_maturity - option_maturity) / periodicity);

    for (i = 1; i <= nb_payerment; i++)
    {
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    ti += periodicity;

    ZCPrice_CoefficientHW1D(ZCMarket, a, sigma, option_maturity, ti, &A_tT, &B_tT);

    ZCPrice = ZCPrice_Using_CoefficientHW1D(r, A_tT, B_tT);

    sum += ci * ZCPrice;

    sum_der += ci * ZCPrice * (-B_tT);
}

sum += ZCPrice;

sum_der += ZCPrice * (-B_tT);

return (sum - 1.) / sum_der;
}

/** Computation of Critical Rate in the Jamishidian decomposition, with the new
static double Critical_Rate(ZCMarketData *ZCMarket, double r_initial, double per
{
    double previous, current;
    int nbr_iterations;

    const double precision = 0.0001;

    current = r_initial;
    nbr_iterations = 0;

    do
    {
        nbr_iterations++;
        previous = current;
        current = current - phi(ZCMarket, current, periodicity, option_maturity, c
    }
    while ((fabs(previous - current) > precision) && (nbr_iterations <= 10));

    return current;
}

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/** Payer Swaption price as a combination of ZC Put option prices
static int cf_ps1d(int flat_flag, double r_t, char *curve, double Nominal, double
                    double option_maturity, double contract_maturity,
                    double SwaptionFixedRate, double a, double sigma, double *pri
{
    int i, nb_payment;
    double ci, sum , ti;

    double critical_r, Strike_i, PutOptionPrice;

    ZCMarketData ZCMarket;

    PutOptionPrice = 0.; /* to avoid warning */
    /* Flag to decide to read or not ZC bond datas in "initialyields.dat" */
    /* If P(0,T) not read then P(0,T)=exp(-r0*T) */
    if (flat_flag == 0)
    {
        ZCMarket.FlatOrMarket = 0;
        ZCMarket.Rate = r_t;
    }

    else
    {
        ZCMarket.FlatOrMarket = 1;
        ZCMarket.filename = curve;
        ReadMarketData(&ZCMarket);
        r_t = -log(BondPrice(INC, &ZCMarket)) / INC;

        if (contract_maturity > GET(ZCMarket.tm, ZCMarket.Nvalue - 1))
        {
            printf("\ nError : time bigger than the last time value entered in ini
            exit(EXIT_FAILURE);
        }
    }

    ti = option_maturity;
    ci = periodicity * SwaptionFixedRate;

    nb_payment = (int)((contract_maturity - option_maturity) / periodicity);

    critical_r = Critical_Rate(&ZCMarket, r_t, periodicity, option_maturity, contr

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sum = 0.;

for (i = 1; i <= nb_payement; i++)
{
    ti += periodicity;

    Strike_i = cf_hw1d_zcb(&ZCMarket, a, sigma, option_maturity, critical_r, t

    PutOptionPrice = cf_hw1d_zbput(&ZCMarket, a, sigma, ti, option_maturity, S

    sum += ci * PutOptionPrice;
}

sum += PutOptionPrice;

*price = Nominal * sum;

DeleteZCMarketData(&ZCMarket);

return OK;
}

int CALC(CF_PayerSwaptionHW1D)(void *Opt, void *Mod, PricingMethod *Met)
{
    TYPEOPT *ptOpt = (TYPEOPT *)Opt;
    TYPEMOD *ptMod = (TYPEMOD *)Mod;

    return cf_ps1d(ptMod->flat_flag.Val.V_INT,
        MOD(GetYield)(ptMod),
        MOD(GetCurve)(ptMod),
        ptOpt->Nominal.Val.V_PDOUBLE,
        ptOpt->ResetPeriod.Val.V_DATE,
        ptOpt->OMaturity.Val.V_DATE - ptMod->T.Val.V_DATE,
        ptOpt->BMaturity.Val.V_DATE - ptMod->T.Val.V_DATE,
        ptOpt->FixedRate.Val.V_PDOUBLE,
        ptMod->a.Val.V_DOUBLE,
        ptMod->Sigma.Val.V_PDOUBLE,
        &(Met->Res[0].Val.V_DOUBLE));
}

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```
static int CHK_OPT(CF_PayerSwaptionHW1D)(void *Opt, void *Mod)
{
    return strcmp(((Option *)Opt)->Name, "PayerSwaption");
}
#endif //PremiaCurrentVersion

static int MET(Init)(PricingMethod *Met, Option *Opt)
{
    if (Met->init == 0)
    {
        Met->init = 1;
    }

    return OK;
}

PricingMethod MET(CF_PayerSwaptionHW1D) =
{
    "CF_HullWhite1d_PayerSwaption",
    {" ", PREMIA_NULLTYPE, {0}, FORBID}},
    CALC(CF_PayerSwaptionHW1D),
    {"Price", DOUBLE, {100}, FORBID}, {" ", PREMIA_NULLTYPE, {0}, FORBID}},
    CHK_OPT(CF_PayerSwaptionHW1D),
    CHK_ok,
    MET(Init)
} ;
```