

[Help](#)

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#include "
href../../../../mod/hullwhite1dgeneralized/hullwhite1dgeneralized_std/hullwhite1dg

#include "
href../../../../common/math/read_market_zc/InitialYieldCurve_h_src.pdfmath/read_mar
#include "
href../../../../mod/hullwhite1dgeneralized/hullwhite1dgeneralized_std/hullwhite1dg

//The "#else" part of the code will be freely available after the (year of creat
#if defined(PremiaCurrentVersion) && PremiaCurrentVersion < (2010+2)
int CALC(CF_ReceiverSwaptionHW1dG)(void *Opt, void *Mod, PricingMethod *Met)
{
    return AVAILABLE_IN_FULL_PREMIA;
}
static int CHK_OPT(CF_ReceiverSwaptionHW1dG)(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, ModelHW1dG *HW1dG_Parameters, double r
{
    int i, nb_payment;
    double a, ci, sum, sum_der, T, Ti, B_tT, ZCPrice;

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

    ci = periodicity * SwaptionFixedRate;
    T = option_maturity;
    Ti = option_maturity;

    a = HW1dG_Parameters->MeanReversion;

    nb_payment = (int)((contract_maturity - option_maturity) / periodicity);
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for (i = 1; i <= nb_payement; i++)
{
    Ti += periodicity;

    B_tT = (1 - exp(-a * (Ti - T))) / a;
    ZCPrice = DiscountFactor(ZCMarket, HW1dG_Parameters, T, Ti, r);

    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, ModelHW1dG *HW1dG_Parameters
{
    double previous, current_rate;
    int nbr_iterations;

    const double precision = 0.0001;

    current_rate = r_initial;
    nbr_iterations = 0;

    do
    {
        nbr_iterations++;
        previous = current_rate;
        current_rate = current_rate - phi(ZCMarket, HW1dG_Parameters, current_rate);
    }
    while ((fabs(previous - current_rate) > precision) && (nbr_iterations <= 10));

    return current_rate;
}

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/** Receiver Swaption price as a combination of ZC Put option prices
static int cf_rs1d(int flat_flag, double r_t, char *curve, int CapletCurve, double
{
    int i, nb_payment;
    double ci, sum, Ti;

    double critical_r, Strike_i, PutOptionPrice;

    ModelHW1dG HW1dG_Parameters;
    ZCMarketData ZCMarket;
    MktATMCapletVolData MktATMCapletVol;

    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);
        }
    }

    // Read the caplet volatilities from file "impliedcapletvol.dat".
    ReadCapletMarketData(&MktATMCapletVol, CapletCurve);

    hw1dg_calibrate_volatility(&HW1dG_Parameters, &ZCMarket, &MktATMCapletVol, a);

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    Ti = option_maturity;
    ci = periodicity * SwaptionFixedRate;

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

    critical_r = Critical_Rate(&ZCMarket, &HW1dG_Parameters, r_t, periodicity, opt

    sum = 0.;

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

        Strike_i = DiscountFactor(&ZCMarket, &HW1dG_Parameters, option_maturity, T

        PutOptionPrice = hw1dg_zc_call_price(&ZCMarket, &HW1dG_Parameters, Strike_

        sum += ci * PutOptionPrice;
    }

    sum += PutOptionPrice;

    *price = Nominal * sum;

    DeleteZCMarketData(&ZCMarket);
    DeleteMktATMCapletVolData(&MktATMCapletVol);
    DeletModelHW1dG(&HW1dG_Parameters);

    return OK;
}

int CALC(CF_ReceiverSwaptionHW1dG)(void *Opt, void *Mod, PricingMethod *Met)
{
    TYPEOPT *ptOpt = (TYPEOPT *)Opt;
    TYPEMOD *ptMod = (TYPEMOD *)Mod;

    return cf_rs1d(ptMod->flat_flag.Val.V_INT,
                   MOD(GetYield)(ptMod),
                   MOD(GetCurve)(ptMod),
                   ptMod->CapletCurve.Val.V_ENUM.value,

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        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,
        &(Met->Res[0].Val.V_DOUBLE));
    }

static int CHK_OPT(CF_ReceiverSwaptionHW1dG)(void *Opt, void *Mod)
{
    return strcmp(((Option *)Opt)->Name, "ReceiverSwaption");
}
#endif //PremiaCurrentVersion

static int MET(Init)(PricingMethod *Met, Option *Opt)
{
    if (Met->init == 0)
    {
        Met->init = 1;
        Met->HelpFilenameHint = "cf_hullwhite1dgeneralized_receiverswaption";
    }

    return OK;
}

PricingMethod MET(CF_ReceiverSwaptionHW1dG) =
{
    "CF_HullWhite1dG_ReceiverSwaption",
    {" ", PREMIA_NULLTYPE, {0}, FORBID}},
    CALC(CF_ReceiverSwaptionHW1dG),
    {"Price", DOUBLE, {100}, FORBID}, {" ", PREMIA_NULLTYPE, {0}, FORBID}},
    CHK_OPT(CF_ReceiverSwaptionHW1dG),
    CHK_ok,
    MET(Init)
} ;

```