

Help

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#include "vasicek1d_std.h"

static int nb_payement;
static double A,B;

/*Zero Coupon Bond*/
static double zcb_vasicek1d(double theta, double r,double
    k,double sigma,double ti,double Ti)
{
    B=(1./k)*(1.-exp(-k*(Ti-ti)));
    A=exp((theta-SQR(sigma)/(2.*SQR(k)))*(B-Ti+ti)-(SQR(sigma)
        )/(4.*k))*SQR(B));

    return A*exp(-B*r);
}

/*Call Option on Zero Coupon Bond*/
static double zbc_vasicek1d(double t,double T,double S,
    double r, double k, double theta,double sigma,double K,double pe
    riodicity)
{
    double PtS,PtT;
    double d1,d2,sigma_p;
    double new_K;

    new_K=1./(1.+K*periodicity);

    PtT=zcb_vasicek1d(theta,r,k,sigma,t,T);
    PtS=zcb_vasicek1d(theta,r,k,sigma,t,S);
    sigma_p=sigma*sqrt((1.-exp(-2.*k*(T-t)))/(2*k))*(1./k)*(1
        .-exp(-k*(S-T)));
    d1=1./(sigma_p)*log(PtS/(PtT*new_K))+0.5*sigma_p;
    d2=d1-sigma_p;

    return PtS*cdf_nor(d1)-new_K*PtT*cdf_nor(d2);
}

/*Floor*/
static int floor_vasicek1d(double r,double k, double date,

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        double sigma,double theta,double Nominal,double K,double perio
        dicity,double first_payment,double contract_maturity,
        double *price)
{
    double sum,tim,tip;
    int i;

    nb_payment=(int)((contract_maturity-first_payment)/pe
        riodicity);

    /*Floor=Portfolio of zero-bond Call options*/
    sum=0.;
    for(i=0;i<nb_payment;i++)
    {
        tim=first_payment+(double)i*periodicity;
        tip=tim+periodicity;
        sum+=(1.+K*periodicity)*zbc_vasicek1d(date,tim,tip,r,
            k,theta,sigma,K,periodicity);
    }

    /*Price*/
    *price=Nominal*sum;

    return OK;
}

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

    return floor_vasicek1d(ptMod->r0.Val.V_PDOUBLE,ptMod->k.
        Val.V_DOUBLE,ptMod->T.Val.V_DATE,ptMod->Sigma.Val.V_PDOUBLE,
        ptMod->theta.Val.V_PDOUBLE,ptOpt->Nominal.Val.V_PDOUBLE,pt
        Opt->FixedRate.Val.V_PDOUBLE,ptOpt->ResetPeriod.Val.V_DATE,pt
        Opt->FirstResetDate.Val.V_DATE,ptOpt->BMaturity.Val.V_DATE,&(
        Met->Res[0].Val.V_DOUBLE));
}

static int CHK_OPT(CF_Floor)(void *Opt, void *Mod)

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{
    return strcmp( ((Option*)Opt)->Name,"Floor");
}

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

    return OK;
}

PricingMethod MET(CF_Floor)=
{
    "CF_Vasicek1d_Floor",
    {{" ",PREMIA_NULLTYPE,{0},FORBID}},
    CALC(CF_Floor),
    {{"Price",DOUBLE,{100},FORBID},{" ",PREMIA_NULLTYPE,{0},
        FORBID}},
    CHK_OPT(CF_Floor),
    CHK_ok,
    MET(Init)
} ;
```

References