

## Help

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#include "vasicek1d_std.h"

static double A,B;

/*Zero Coupon Bond*/
static double zcb_vasicek1d(double theta, double r,double
    k,double sigma,double ti,double Ti)
{
    /*A,B coefficient*/
    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*/
static int zbc_vasicek1d(double r, double k,double t,
    double sigma,double theta, double S, double T,NumFunc_1 *p,
    double *price,double *delta)
{
    double PtS,PtT;
    double d1,d2,sigma_p,K;

    K=p->Par[0].Val.V_DOUBLE;
    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*K))+0.5*sigma_p;
    d2=d1-sigma_p;

    /*Price*/
    *price=PtS*cdf_nor(d1)-K*PtT*cdf_nor(d2);

    /*Delta*/
    *delta=cdf_nor(d1);

    return OK;
}

```

```

int CALC(CF_ZCCallBondEuro)(void *Opt,void *Mod,Pricing
    Method *Met)
{
    TYPEOPT* ptOpt=(TYPEOPT*)Opt;
    TYPEMOD* ptMod=(TYPEMOD*)Mod;

    return zbc_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->BMaturity.
                Val.V_DATE,ptOpt->OMaturity.Val.V_DATE,ptOpt->PayOff.Val.V_
                    NUMFUNC_1,
                        &(Met->Res[0].Val.V_DOUBLE),&(Met->Res[1].Val.
                            V_DOUBLE));
}

static int CHK_OPT(CF_ZCCallBondEuro)(void *Opt, void *Mod)
{
    return strcmp( ((Option*)Opt)->Name,"ZeroCouponCallBondEu
        ro");
}

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

    return OK;
}

PricingMethod MET(CF_ZCCallBondEuro)=
{
    "CF_Vasicek1d_ZBCallEuro",
    {{ " ",PREMIA_NULLTYPE,{0},FORBID}},
    CALC(CF_ZCCallBondEuro),
    {{ "Price",DOUBLE,{100},FORBID},{ "Delta",DOUBLE,{100},FORB
        ID} ,{ " ",PREMIA_NULLTYPE,{0},FORBID}},

```

```
    CHK_OPT(CF_ZCCallBondEuro),  
    CHK_ok,  
    MET(Init)  
} ;
```

## References