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#include "bs2d_std2d.h"
#include "pnl/pnl_cdf.h"

static int ExchangeAn(double s1,double s2,double ratio,
    double t,
        double r,double divid1,double divid2,
        double sigma1,double sigma2,double rho,
        double *ptprice,double *ptdelta1,double *ptdelt
    a2)
{
    double b1,b2,sigma,d1,d2;

    b1=r-divid1;
    b2=r-divid2;
    sigma=sqrt(SQR(sigma1)+SQR(sigma2)-2.0*rho*sigma1*sigma2)
        ;
    d1=(log(s1/(s2*ratio) )+ (b1-b2+SQR(sigma)/2.0)*t)/(sigma
        *sqrt(t));
    d2=d1-sigma*sqrt(t);

    /*Price*/
    *ptprice=s1*exp((b1-r)*t)*cdf_nor(d1)-ratio*s2*exp((b2-r)
        *t)*cdf_nor(d2);

    /*Deltas*/
    *ptdelta1=exp((b1-r)*t)*cdf_nor(d1);
    *ptdelta2=-ratio*exp((b2-r)*t)*cdf_nor(d2);

    return OK;
}

int CALC(CF\_Exchange)(void *Opt,void *Mod,PricingMethod *
    Met)
{
    TYPEOPT* ptOpt=(TYPEOPT*)Opt;
    TYPEMOD* ptMod=(TYPEMOD*)Mod;
    double r,divid1,divid2;

    r=log(1.+ptMod->R.Val.V_DOUBLE/100.);
    divid1=log(1.+ptMod->Divid1.Val.V_DOUBLE/100.);

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divid2=log(1.+ptMod->Divid2.Val.V_DOUBLE/100.);

return ExchangeAn(ptMod->S01.Val.V_PDOUBLE,ptMod->S02.Val
.V_PDOUBLE,(ptOpt->PayOff.Val.V_NUMFUNC_2)->Par[0].Val.V_
PDOUBLE,
    ptOpt->Maturity.Val.V_DATE-ptMod->T.Val.V_DATE,
    r,divid1,divid2,
    ptMod->Sigma1.Val.V_PDOUBLE,ptMod->Sigma2.Val.V_
PDOUBLE,ptMod->Rho.Val.V_RGDOUBLE,
    &(Met->Res[0].Val.V_DOUBLE),&(Met->Res[1].Val.V_
DOUBLE),&(Met->Res[2].Val.V_DOUBLE) );
}

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

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

    return OK;
}

PricingMethod MET(CF_Exchange)=
{
    "CF_Exchange",
    {" ",PREMIA_NULLTYPE,{0},FORBID}},
    CALC(CF_Exchange),
    {"Price",DOUBLE,{100},FORBID},{"Delta1",DOUBLE,{100},FO
RBID} ,{"Delta2",DOUBLE,{100},FORBID} ,
    {" ",PREMIA_NULLTYPE,{0},FORBID}},
    CHK_OPT(CF_Exchange),
    CHK_ok,
    MET(Init)
} ;

```

References