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extern "C" {
#include "
href../../../../mod/kou1d/kou1d_std/kou1d_std_h_src.pdfkou1d_std.h"
}
#include "
href../../../../common/math/levy_h_src.pdfmath/levy.h"
#include "
href../../../../common/math/fft_h_src.pdfmath/fft.h"

extern "C" {
#if defined(PremiaCurrentVersion) && PremiaCurrentVersion < (2007+2) //The "#els
    static int CHK_OPT(AP_CarrKou)(void *Opt, void *Mod)
    {
        return NONACTIVE;
    }
    int CALC(AP_CarrKou)(void *Opt, void *Mod, PricingMethod *Met)
    {
        return AVAILABLE_IN_FULL_PREMIA;
    }
#else
    static int CarrKou(double S0, NumFunc_1 *p, double T, double r, double divid,
    {
        double K;
        double Sigma = 0.2;
        K = p->Par[0].Val.V_DOUBLE;

        /*Construction of the model*/
        Kou_measure measure(lambda, lambdap, lambdam, P, sigma, 0.1);

        S0 *= exp(-divid * T); //taking account of dividends
        int Nlimit = 2048; //number of integral discretization steps
        double logstrikestep = 0.01;
        double k0 = log(K / S0);
        double h = 2 * M_PI / Nlimit / logstrikestep; //integral discretization step
        double A = (Nlimit - 1) * h; // integration domain is (-A/2,A/2)

        std::vector<double> z(Nlimit), z_img(Nlimit), y(Nlimit), y_img(Nlimit);

        double vn = -A / 2;
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//double weight = 0.5; //trapezoidal rule weights
double weight = 1. / 3; //Simpson's rule weights

//delta
complex<double> dzeta = exp(I * vn * (r * T - k0)) * (measure.cf(T, vn - I)
- exp(-T * Sigma * Sigma / 2 * (vn - I) * vn)) / (I
z[0] = weight * real(dzeta);
z_img[0] = weight * imag(dzeta);

//price
y[0] = weight * real(dzeta / (1. + I * vn));
y_img[0] = weight * imag(dzeta / (1. + I * vn));
for (int n = 1; n < Nlimit - 1; n++)
{
    vn += h;
    //weight = 1; //trapezoidal rule weights
    weight = (weight < 1) ? 4. / 3 : 2. / 3; //Simpson's rule weights

    //delta
    dzeta = exp(I * vn * (r * T - k0)) * (measure.cf(T, vn - I)
- exp(-T * Sigma * Sigma / 2 * (vn - I) * vn)) / (I
    z[n] = weight * real(dzeta);
    z_img[n] = weight * imag(dzeta);

    //price
    y[n] = weight * real(dzeta / (1. + I * vn));
    y_img[n] = weight * imag(dzeta / (1. + I * vn));
}
vn += h;
//weight = 0.5; //trapezoidal rule weights
weight = 2. / 3; //Simpson's rule weights

//delta
dzeta = exp(I * vn * (r * T - k0)) * (measure.cf(T, vn - I)
- exp(-T * Sigma * Sigma / 2 * (vn - I) * vn)) / (I
z[Nlimit - 1] = weight * real(dzeta);
z_img[Nlimit - 1] = weight * imag(dzeta);

//price
y[Nlimit - 1] = weight * real(dzeta / (1. + I * vn));
y_img[Nlimit - 1] = weight * imag(dzeta / (1. + I * vn));

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fft1d(&z[0], &z_img[0], Nlimit, -1);
fft1d(&y[0], &y_img[0], Nlimit, -1);

//Black-Scholes formula
double d1 = (log(S0 / K) + (r + Sigma * Sigma / 2) * T) / Sigma / sqrt(T);
double d2 = d1 - Sigma * sqrt(T);
double CallBS = S0 * normCDF(d1) - K * exp(-r * T) * normCDF(d2);
double DeltaBS = normCDF(d1);

/*Call Case*/
*ptprice = CallBS + S0 * A / 2 / M_PI / (Nlimit - 1) * y[0];
*ptdelta = exp(-divid * T) * (DeltaBS + A / 2 / M_PI / (Nlimit - 1) * z[0]);

/*Put Case via parity*/
if ((p->Compute) == &Put)
{
    *ptprice = *ptprice - S0 + K * exp(-r * T);
    *ptdelta = *ptdelta - exp(-divid * T);
}

return OK;
}

int CALC(AP_CarrKou)(void *Opt, void *Mod, PricingMethod *Met)
{
    TYPEOPT *ptOpt = (TYPEOPT *)Opt;
    TYPEMOD *ptMod = (TYPEMOD *)Mod;
    double r, divid;

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

    return CarrKou(ptMod->S0.Val.V_PDOUBLE, ptOpt->PayOff.Val.V_NUMFUNC_1, ptOpt);
}

static int CHK_OPT(AP_CarrKou)(void *Opt, void *Mod)
{
    if ((strcmp(((Option *)Opt)->Name, "CallEuro") == 0) || (strcmp(((Option *)Opt)->Name, "PutEuro") == 0))
        return OK;
}

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    return WRONG;
}

#endif //PremiaCurrentVersion
static int MET(Init)(PricingMethod *Met, Option *Opt)
{
    return OK;
}

PricingMethod MET(AP_CarrKou) =
{
    "AP_Carr_Kou",
    {{" ", PREMIA_NULLTYPE, {0}, FORBID}},
    CALC(AP_CarrKou),
    {{"Price", DOUBLE, {100}, FORBID}, {"Delta", DOUBLE, {100}, FORBID}, {" ", P
    CHK_OPT(AP_CarrKou),
    CHK_ok,
    MET(Init)
} ;
}

```