

[Help](#)

```

extern "C" {
#include "variancegamma1d_std.h"
}
#include "math/levy.h"
#include "math/fft.h"

extern "C" {

#if defined(PremiaCurrentVersion) && PremiaCurrentVersion < (2007+2) //The "#els
    static int CHK_OPT(AP_CarrVG)(void *Opt, void *Mod)
    {
        return NONACTIVE;
    }
    int CALC(AP_CarrVG)(void *Opt, void *Mod, PricingMethod *Met)
    {
        return AVAILABLE_IN_FULL_PREMIA;
    }
#else

    static int CarrVG(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*/
        VG_measure measure(theta, sigma, kappa, 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)

        double *z = new double [Nlimit];
        double *z_img = new double [Nlimit];
        double *y = new double [Nlimit];
        double *y_img = new double [Nlimit];

```

```

double vn = -A / 2;
//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
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
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));

ffft1d(z, z_img, Nlimit, -1);
ffft1d(y, y_img, 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);
}
//memory deallocation
delete [] z;
delete [] z_img;
delete [] y;
delete [] y_img;

return OK;
}

int CALC(AP_CarrVG)(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 CarrVG(ptMod->S0.Val.V_PDOUBLE, ptOpt->PayOff.Val.V_NUMFUNC_1, ptOpt

```

```

    }

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

        return WRONG;
    }

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

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

```