Help

```
extern "C" {
#include "mer1d_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_Carr)(void *Opt, void *Mod)
  {
    return NONACTIVE;
  }
  int CALC(AP_Carr)(void *Opt, void *Mod, PricingMethod *Met)
  {
    return AVAILABLE_IN_FULL_PREMIA;
  }
#else
  static int CarrMadanMer(double S0, NumFunc_1  *p, double T, double r, double d
  {
    double K;
    double Sigma = 0.2;
    double delta = sqrt(gamma2);

    /*Construction of the model*/
    Merton_measure measure(mu, delta, lambda, sigma, 0.1);
    K = p->Par[0].Val.V_DOUBLE;

    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));

  fft1d(z, z_img, Nlimit, -1);
  fft1d(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 desallocation
  delete [] z;
  delete [] z_img;
  delete [] y;
  delete [] y_img;

  return OK;
}

int CALC(AP_Carr)(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  CarrMadanMer(ptMod->S0.Val.V_PDOUBLE, ptOpt->PayOff.Val.V_NUMFUNC_1,
}
```

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

    return WRONG;
  }


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

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