```
   Help
#include  "bs1d_pad.h"

static int Fixed_CallLookback_ConzeWiswanathan(double s,
    double s_max, double k, double t, double r,
                 double divid, double sigma, double *
    ptprice, double *ptdelta)
{
  double  b,sigmasqrt,a1,a2,esp,disc;

  if (s_max < s)
    {
      *ptprice=0.;
      *ptdelta=0.;
    }
  else
    {
      b=r-divid;
      sigmasqrt=sigma*sqrt(t);
      esp=2.*b/SQR(sigma);
      disc=exp(-r*t);

      if (k>s_max)
  {
    a1=(log(s/k)+ (b+SQR(sigma)/2.)*t)/sigmasqrt;
    a2=a1-sigmasqrt;
    if (b == 0)
      {
        *ptprice = s*disc*(1.+SQR(sigma)*t/2.+log(s/k))*
    cdf_nor(a1) +
    s*disc*sigmasqrt*pnl_normal_density(a1) - k*disc*cdf_
    nor(a2);

        *ptdelta = disc*cdf_nor(a1)*(2.+SQR(sigma)*t/2.+
    log(s/k)) +
                disc*pnl_normal_density(a1)*(1.+SQR(sigma)*
    t)/sigmasqrt   -
                disc*(k/s)*pnl_normal_density(a2)/sigmasq
    rt;
      }
    else
    {
      *ptprice=s*exp(-divid*t)*cdf_nor(a1)-k*exp(-r*t)*
  cdf_nor(a2)+
  s*exp(-r*t)*(SQR(sigma)/(2.*b))*
  (-pow(s/k,-esp)*cdf_nor(a1-(2.*b/sigma)*sqrt(t))+exp(
  b*t)*cdf_nor(a1));

      *ptdelta=exp(-divid*t)*cdf_nor(a1)*(1.+SQR(sigma)/
  (2.*b))+
  exp(-divid*t)*pnl_normal_density(a1)/(sigma*sqrt(t))-
  exp(-r*t)*(k/s)*pnl_normal_density(a2)/sigmasqrt+
  exp(-r*t)*pow(s/k,-esp)*cdf_nor(a1-2.*(b/sigma)*sqrt(
  t))*(1.-SQR(sigma)/(2*b));
    }
}
    else
{
  a1=(log(s/s_max)+ (b+SQR(sigma)/2.)*t)/sigmasqrt;
  a2=a1-sigmasqrt;
  if (b == 0)
    {
      *ptprice = disc*(s_max-k) + s*disc*(1.+SQR(sigma)*
  t/2.+log(s/s_max))*cdf_nor(a1) +
  s*disc*sigmasqrt*pnl_normal_density(a1) - s_max*disc*
  cdf_nor(a2) ;

      *ptdelta = disc*cdf_nor(a1)*(2.+SQR(sigma)*t/2.+
  log(s/s_max)) +
  disc*pnl_normal_density(a1)*(1.+SQR(sigma)*t)/sigmasq
  rt   -
  disc*(s_max/s)*pnl_normal_density(a2)/sigmasqrt;
    }
  else
    {

      *ptprice=exp(-r*t)*(s_max-k)+s*exp(-divid*t)*cdf_
  nor(a1)-
  s_max*exp(-r*t)*cdf_nor(a2)+
  s*exp(-r*t)*(SQR(sigma)/(2.*b))*
  (-pow(s/s_max,-esp)*cdf_nor(a1-(2.*b/sigma)*sqrt(t))+
  exp(b*t)*cdf_nor(a1));
```

```
        *ptdelta=exp(-divid*t)*cdf_nor(a1)*(1.+SQR(sigma)/
    (2.*b))+
    exp(-divid*t)*pnl_normal_density(a1)/(sigma*sqrt(t))-
    exp(-r*t)*(s_max/s)*pnl_normal_density(a2)/sigmasqrt+
    exp(-r*t)*pow(s/s_max,-esp)*cdf_nor(a1-2.*(b/sigma)*
    sqrt(t))*(1.-SQR(sigma)/(2*b));
      }
  }
    }


  return OK;
}

int CALC(CF_Fixed_CallLookBack)(void*Opt,void *Mod,Pricing
    Method *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 Fixed_CallLookback_ConzeWiswanathan(ptMod->S0.Val.
    V_PDOUBLE,
               (ptOpt->PathDep.Val.V_NUMFUNC_2)->Par[4
    ].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,
               divid,
               ptMod->Sigma.Val.V_PDOUBLE,
               &(Met->Res[0].Val.V_DOUBLE),
               &(Met->Res[1].Val.V_DOUBLE));
}

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

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

  return OK;
}

PricingMethod MET(CF_Fixed_CallLookBack)=
{
  "CF_Fixed_CallLookBack",
  {{" ",PREMIA_NULLTYPE,{0},FORBID}},
  CALC(CF_Fixed_CallLookBack),
  {{"Price",DOUBLE,{100},FORBID},{"Delta",DOUBLE,{100},FORB
    ID} ,{" ",PREMIA_NULLTYPE,{0},FORBID}},
  CHK_OPT(CF_Fixed_CallLookBack),
  CHK_ok ,
  MET(Init)
} ;
```

References