Help

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#include <stdlib.h>
#include  "bs1d_pad.h"
#include "error_msg.h"

static int  Babbs_95_FloatingCall(int am,double s,double s_
    min,NumFunc_2*p,double t,double r,double divid,double sigma
    ,int N,double *ptprice,double *ptdelta)
{
  int i,j,eta0,npoints;
  double u,d,h,pu,pd,a1,stock,eta,y_0;
  double *P,*iv,*Q,*Boundary;
  double upperstock;
  int odd;
  double flat_price=0.,up_price;

  /*Price, intrisic value arrays*/
  P= malloc((2*N+1)*sizeof(double));
  if (P==NULL)
    return MEMORY_ALLOCATION_FAILURE;
  Q= malloc((2*N+1)*sizeof(double));
  if (Q==NULL)
    return MEMORY_ALLOCATION_FAILURE;
  iv= malloc((2*N+1)*sizeof(double));
  if (iv==NULL)
    return MEMORY_ALLOCATION_FAILURE;
  Boundary= malloc((N+1)*sizeof(double));
  if (Boundary==NULL)
    return MEMORY_ALLOCATION_FAILURE;


  /*Up and Down factors*/
  y_0=s_min/s;
  h=t/(double)N;
  a1=exp(h*(r-divid));
  u=exp(sigma*sqrt(h));
  d=1./u;

  /*Critical Index*/
  eta=-log(y_0)/(sigma*sqrt(h));
  eta0=(int)floor(eta);
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if (eta0>N)
  eta0=N;

/*Risk-Neutral Probability*/
pu=(a1-d)/(u-d);
pd=1.-pu;
pu*=exp(-r*h)*u;
pd*=exp(-r*h)*d;

if(eta0<N)
  {
    /*First Stage:Computation of price value along the
  line spot=maximum*/

    /*Intrisic value initialisation*/
    for (i=0;i<=N;i++)
Boundary[i]=0.;

    stock=1.;
    for (i=0;i<N+eta0;i++)
{
  iv[i]=(p->Compute)(p->Par,1.,stock);
  P[i]=iv[i];
  Q[i]=P[i];
  stock*=d;
      }

    Boundary[N]=P[0];

    /*Backward Resolution*/
    for (i=1;i<N-eta0;i++)
{
  P[0]=pd*Q[0]+pu*Q[1];
  if (am)
          P[0]=MAX(iv[0],P[0]);
  Boundary[N-i]=P[0];

  for (j=1;j<=N-eta0-i;j++)
          {
      P[j]=pd*Q[j-1]+pu*Q[j+1];
      if (am)
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                P[j]=MAX(iv[j],P[j]);
            }

    for (j=0;j<=N-eta0-i;j++)
            Q[j]=P[j];
        }
    }

  if (s_min<s)
    {
      /*Second Stage:Computation of price value */
      /*Intrinsic value initialization*/
      upperstock=y_0;
      for (i=0;i<N;i++)
  upperstock*=d;
      stock=upperstock;
      for (i=0;i<=N+eta0;i++)
  {
    iv[i]=(p->Compute)(p->Par,1.,stock);
    stock*=u;
  }

      /*Terminal Values*/
      npoints=eta0+(N-eta0)/2;
      for (j=0;j<=npoints;j++)
  P[j]=iv[2*j];

      /*Backward Resolution*/
      if (eta0>0) /*The first mesh does not breach the bar
    rier*/
  {

    /*First part-the barrier is active*/
    odd=1;
    for (i=eta0;i<N-1;i++)
      odd=!odd;

    if (!odd) npoints=npoints-1;

    for (i=1;i<=N-eta0;i++)
      {
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```
    for (j=0;j<npoints;j++)
{
  P[j]=pu*P[j]+ pd*P[j+1];
  if (am)
    P[j]=MAX(iv[i+2*j],P[j]);
}
    /*Special handling of the critical node*/
    if (odd)
{
  P[npoints]=pu*P[npoints]+pd*Boundary[N+1-i];
  if (am)
    P[npoints]=MAX(iv[i+2*npoints],P[npoints]);
}

    /*For the critical node at the next iteration*/
    if (!odd)
{
  npoints=npoints-1;
}
    odd=!odd;
  }

/*Second part-the barrier is strictly below the tree*/
npoints=eta0-1;
for (i=N-eta0+1;i<N;i++)
  {
    for (j=0;j<=npoints;j++)
{
  P[j]=pu*P[j]+ pd*P[j+1];
  if (am)
    P[j]=MAX(iv[i+2*j],P[j]);
}

    npoints=npoints-1;
  }
/*Delta*/
*ptdelta=(P[1]-P[0])/(y_0*(u-d));

/*First time step*/
P[0]=pu*P[0]+pd*P[1];
if (am)
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    P[0]=MAX(iv[N],P[0]);
  /*Price*/
  *ptprice=P[0];
}
    else /*eta0=0, the first mesh breaches the barrier*/
{
  /*The barrier is always active*/
  odd=1;
  for (i=eta0;i<N-1;i++)
    odd=!odd;

  if (!odd) npoints=npoints-1;

  for (i=1;i<=N-eta0-1;i++) /*We go backward until the
  next date*/
    {
      flat_price=P[1]; /*Only for the delta*/

      for (j=0;j<npoints;j++)
{
  P[j]=pu*P[j]+ pd*P[j+1];
  if (am)
    P[j]=MAX(iv[i+2*j],P[j]);
}
      /*Special handling of the critical node*/
      if (odd)
{
  P[npoints]=pu*P[npoints]+pd*Boundary[N+1-i];
  if (am)
    P[npoints]=MAX(iv[i+2*npoints],P[npoints]);;
}


      if (!odd)
{
  npoints=npoints-1;
}
      odd=!odd;

    }
  up_price=P[0];   /*For the delta*/
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```
    /*First time step*/
    P[0]=pu*P[0]+pd*P[1];

    /*Special handling of the critical node*/
    P[0]=pu*P[0]+pd*Boundary[1];
    if (am)
      P[0]=MAX(iv[N],P[0]);

    /*Delta*/
    /*Corresponds to setting a third point at level s bet
    ween u*s and d*s*/
    /*One computes the finite difference approximation bet
    ween s and us*/
    *ptdelta=(up_price-(exp(-r*h)*flat_price+exp(r*h)*P[0]
    )*.5)/(y_0*(d-1.));
  } /*eta0=0*/
    }

  else /*s=s_min*/
    *ptdelta=(P[1]-P[0])/(d-1.);

  /*Price*/
  *ptprice=s*P[0];

  /*Delta*/
  *ptdelta=(*ptdelta)*(-y_0)+P[0];

  /*Memory Desallocation*/
  free(P);
  free(Q);
  free(iv);
  free(Boundary);

  return OK;

}

int CALC(TR_Babbs_Call)(void *Opt,void *Mod,PricingMethod *
    Met)
{
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```
  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  Babbs_95_FloatingCall(ptOpt->EuOrAm.Val.V_BOOL,pt
    Mod->S0.Val.V_PDOUBLE,(ptOpt->PathDep.Val.V_NUMFUNC_2)->Par[4
    ].Val.V_PDOUBLE,ptOpt->PayOff.Val.V_NUMFUNC_2,ptOpt->Matu
    rity.Val.V_DATE-ptMod->T.Val.V_DATE,r,divid,ptMod->Sigma.Val
    .V_PDOUBLE,Met->Par[0].Val.V_INT2,&(Met->Res[0].Val.V_
    DOUBLE),&(Met->Res[1].Val.V_DOUBLE));
}

static int CHK_OPT(TR_Babbs_Call)(void *Opt, void *Mod)
{
  if ((strcmp(((Option*)Opt)->Name,"    LookBackCallFloatingEuro")==0) || (strcm
    return OK;
  return WRONG;
}

static int MET(Init)(PricingMethod *Met,Option *Opt)
{
  if ( Met->init == 0)
    {
      Met->init=1;
      Met->Par[0].Val.V_INT2=1000;

    }

  return OK;
}

PricingMethod MET(TR_Babbs_Call)=
{
  "TR_Babbs_Call",
  {{"StepNumber",INT2,{100},ALLOW},{" ",PREMIA_NULLTYPE,{0}
    ,FORBID}},
  CALC(TR_Babbs_Call),
  {{"Price",DOUBLE,{100},FORBID},{"Delta",DOUBLE,{100},FORB
```

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    ID} ,{" ",PREMIA_NULLTYPE,{0},FORBID}},
  CHK_OPT(TR_Babbs_Call),
  CHK_tree,
  MET(Init)
};
```

References