

## [Help](#)

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#include <stdlib.h>
#include "
href../../mod/bs1d/bs1d_pad/bs1d_pad_h_src.pdfbs1d_pad.h"
#include "
href../../common/error_msg_h_src.pdferror_msg.h"

static int Babbs_95_FloatingCall(int am, double s, double s_min, NumFunc_2 *p,
{
    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, intrinsic 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));
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eta0 = (int)floor(eta);
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*/

    /*Intrinsic 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 barrier*/
    {

        /*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++)
        {
            for (j = 0; j < npoints; j++)

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    {
        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)
    P[0] = MAX(iv[N], P[0]);

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        /*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 da
    {
        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*/

    /*First time step*/

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        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 between u*s and d*s*/
        /*One computes the finite difference approximation between s and us*/
        *ptdelta = (up_price - (exp(-r * h) * flat_price + exp(r * h) * P[0])
    } /*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)
{
    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.);

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    return Babbs_95_FloatingCall(ptOpt->EuOrAm.Val.V_BOOL, ptMod->S0.Val.V_PDOUBL
}

static int CHK_OPT(TR_Babbs_Call)(void *Opt, void *Mod)
{
    if ((strcmp(((Option *)Opt)->Name, "LookBackCallFloatingEuro") == 0) || (strcmp
        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}, FORBID} , {" ", PR
    CHK_OPT(TR_Babbs_Call),
    CHK_tree,
    MET(Init)
};

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