

[Help](#)

```
#include <stdlib.h>
#include "bs1d_std.h"
#include "error_msg.h"

static int Euler(int am, double s, NumFunc_1 *p, double t, double r, double divid)
{
    double h, mu, u, d, scan, proba, lowerstock, iv, stock;
    double *P;
    int i, j;

    /*Price array*/
    P = malloc((N + 1) * sizeof(double));
    if (P == NULL)
        return MEMORY_ALLOCATION_FAILURE;

    /*Up and Down factors*/
    h = t / (double)N;
    mu = (r - divid) - .5 * sigma * sigma;
    u = exp(sigma * sqrt(h));
    d = 1. / u;
    u *= exp(mu * h);
    d *= exp(mu * h);
    scan = u / d;

    /*Discounted Probability*/
    proba = .5 * exp(-r * h);

    /*Terminal Values*/
    lowerstock = s;
    for (i = 0; i < N; i++)
        lowerstock *= d;

    stock = lowerstock;
    for (i = 0; i <= N; i++)
    {
        iv = (p->Compute)(p->Par, stock);
        P[i] = iv;
        stock *= scan;
    }
}
```

```
/*Backward Resolution*/
for (i = N; i > 1; i--)
{
    lowerstock /= d;
    stock = lowerstock;
    for (j = 0; j < i; j++)
    {
        P[j] = proba * (P[j] + P[j + 1]);
        if (am)
        {
            iv = (p->Compute)(p->Par, stock);
            P[j] = MAX(iv, P[j]);
        }
        stock *= scan;
    }

}

lowerstock /= d;
stock = lowerstock;

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

/*First time step*/
P[0] = proba * (P[0] + P[1]);
if (am)
{
    iv = (p->Compute)(p->Par, stock);
    P[0] = MAX(iv, P[0]);
}
/*Price*/
*ptprice = P[0];

/*Memory desallocation*/
free(P);

return OK;
}
```

```

static int CHK_OPT(TR_Euler)(void *Opt, void *Mod)
{
    return OK;
}

int CALC(TR_Euler)(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 Euler(ptOpt->EuOrAm.Val.V_BOOL, ptMod->S0.Val.V_PDOUBLE, ptOpt->PayOff.
        ptOpt->Maturity.Val.V_DATE - ptMod->T.Val.V_DATE, r, divid, ptMod
        Met->Par[0].Val.V_INT, &(Met->Res[0].Val.V_DOUBLE), &(Met->Res[1]
}

static int MET(Init)(PricingMethod *Met, Option *Opt)
{
    if (Met->init == 0)
    {
        Met->init = 1;
        Met->HelpFilenameHint = "tr_euler_bs";
        Met->Par[0].Val.V_INT2 = 100;

    }

    return OK;
}

PricingMethod MET(TR_Euler) =
{
    "TR_Euler",
    {"StepNumber", INT2, {100}, ALLOW}, {" ", PREMIA_NULLTYPE, {0}, FORBID}},
    CALC(TR_Euler),
    {"Price", DOUBLE, {100}, FORBID}, {"Delta", DOUBLE, {100}, FORBID} , {" ", PR
    CHK_OPT(TR_Euler),
    CHK_tree,

```

```
    MET(Init)  
};
```