

[Help](#)

```
extern "C" {
#include "temperedstable1d_vol.h"
}
#include "math/numerics.h"
extern "C" {

#if defined(PremiaCurrentVersion) && PremiaCurrentVersion < (2008+2) //The "#els
static int CHK_OPT(AP_REPL2_VARIANCESWAP)(void *Opt, void *Mod)
{
    return NONACTIVE;
}
int CALC(AP_REPL2_VARIANCESWAP)(void *Opt, void *Mod, PricingMethod *Met)
{
    return AVAILABLE_IN_FULL_PREMIA;
}
#else

static double replFun(double v, double m);

//-----
static int ap_cgmy_varswap_repl2(double S0, double Strike, double T, double r,
{
    //S0 is a forward price
    double *replStrikes;
    double *replOptions;
    double *replWeights;
    int *CallPuts;
    int flag;
    double strikестep = 0.05 * S0, kfirst = 0.5 * S0;
    double pvfactor = exp(-r * T);

    int k, k0, res, replN = 22;
    double optprice, tweight, tstrike, tprice;

    replStrikes = new double[replN];
    replOptions = new double[replN];
    replWeights = new double[replN];
    CallPuts = new int[replN];
```

```

tprice = 0.0;

tstrike = S0;
k = 0;
flag = 1;
while ((k < replN) && (flag))
{
    replStrikes[k] = kfirst + k * strikeshstep;
    CallPuts[k] = (S0 <= replStrikes[k]);
    flag = !CallPuts[k];
    k++;
}

if (S0 == replStrikes[k - 1])
{
    replStrikes[k - 1] += strikeshstep;
    kfirst += strikeshstep;
}

k0 = k - 2;
for (; k < replN; k++)
{
    replStrikes[k] = kfirst + k * strikeshstep;
    CallPuts[k] = 1;
}

//weights for puts
tweight = 0;
tstrike = S0;
for (k = k0; k >= 0; k--)
{
    replWeights[k] = (replFun(replStrikes[k], S0) - replFun(tstrike, S0)) /
    tweight += replWeights[k];
    res = iac_kobol_europut(CallPuts[k], lam, lap, am, ap, cmm, cpp, r, T, t
    if (res)
    {
        return 1;
    }
    replOptions[k] = optprice;
    tsstrike = replStrikes[k];
    tprice += replOptions[k] * replWeights[k];
}

```

```

    }
    //weights for calls
    tweight = 0;
    tstrike = S0;
    for (k = k0 + 1; k < replN; k++)
    {
        replWeights[k] = (replFun(replStrikes[k], S0) - replFun(tstrike, S0)) /
        tweight += replWeights[k];
        res = iac_kobol_europut(CallPuts[k], lam, lap, am, ap, cmm, cpp, r, T, t
        if (res)
        {
            return 1;
        }
        replOptions[k] = optprice;
        tstrike = replStrikes[k];
        tprice += replOptions[k] * replWeights[k];
    }

    //portfolio value
    tprice = 2.0 / T * (/*1.0+r*T-exp(r*T)+*/tprice);

    //fair strike of variance swap, in annual volatility points
    *fairval = sqrt(tprice / pvfactor) * 100;
    // strike in variance points
    kfirst = pvfactor * Strike * Strike;
    // price of var swap
    *ptprice = tprice * 10000 - kfirst;

    delete [] replStrikes;
    delete [] replOptions;
    delete [] replWeights;
    delete [] CallPuts;

    return OK;
}
//-----
static double replFun(double v, double m)
{
    return (v - m) / m - log(v / m);
}

```

```

int CALC(AP_REPL2_VARIANCESWAP)(void *Opt, void *Mod, PricingMethod *Met)
{
    TYPEOPT *ptOpt = (TYPEOPT *)Opt;
    TYPEMOD *ptMod = (TYPEMOD *)Mod;
    double r, divid, strike, spot;
    NumFunc_1 *p;

    r = log(1. + ptMod->R.Val.V_DOUBLE / 100.);
    divid = log(1. + ptMod->Divid.Val.V_DOUBLE / 100.);
    p = ptOpt->PayOff.Val.V_NUMFUNC_1;
    strike = p->Par[0].Val.V_DOUBLE;
    spot = ptMod->S0.Val.V_DOUBLE;

    return ap_cgmy_varswap_repl2(
        spot, strike, ptOpt->Maturity.Val.V_DATE - ptMod->T.Val.V_DATE, r,
        &(Met->Res[0].Val.V_DOUBLE), &(Met->Res[1].Val.V_DOUBLE));
}

static int CHK_OPT(AP_REPL2_VARIANCESWAP)(void *Opt, void *Mod)
{
    if ((strcmp(((Option *)Opt)->Name, "VarianceSwap") == 0))
        return OK;

    return WRONG;
}

#endif //PremiaCurrentVersion
static int MET(Init)(PricingMethod *Met, Option *Opt)
{
    static int first = 1;

    if (first)
    {
        first = 0;
        Met->HelpFilenameHint = "ap_cgmy_varswap_repl2";
    }
    return OK;
}

PricingMethod MET(AP_REPL2_VARIANCESWAP) =

```

```
{
  "AP_CGMY_VARSWAP_REP2",
  {{ " ", PREMIA_NULLTYPE, {0}, FORBID}},
  CALC(AP_REPL2_VARIANCESWAP),
  { {"Fair strike in annual volatility points", DOUBLE, {100}, FORBID},
    {"Price in 10000 variance points", DOUBLE, {100}, FORBID},
    {" ", PREMIA_NULLTYPE, {0}, FORBID}
  },
  CHK_OPT(AP_REPL2_VARIANCESWAP),
  CHK_ok ,
  MET(Init)
} ;

/*////////////////////////////////////////*/
}
```