Help

```
#include <stdlib.h>
#include "sg1d_stdi.h"
#include "math/InterestRateModelTree/TreeShortRate/TreeShortRate.h"
#include "pnl/pnl_vector.h"
#include "math/read_market_zc/InitialYieldCurve.h"


#if defined(PremiaCurrentVersion) && PremiaCurrentVersion < (2007+2) //The "#els
int CALC(TR_BermudianSwaptionSG1D)(void *Opt, void *Mod, PricingMethod *Met)
{
  return AVAILABLE_IN_FULL_PREMIA;
}
static int CHK_OPT(TR_BermudianSwaptionSG1D)(void *Opt, void *Mod)
{
  return NONACTIVE;
}
#else

static void BermudianSwaption_InitialPayoffSG1D(TreeShortRate *Meth, ModelParame
{
  double Ti2, Ti1, payoff;
  int i, j, i_Ti2, i_Ti1, n;
  int jminprev, jmaxprev;

  Ti2 = contract_maturity;
  Ti1 = Ti2 - periodicity;
  i_Ti1 = IndexTime(Meth, Ti1);

  jminprev = pnl_vect_int_get(Meth->Jminimum, Meth->Ngrid);  // jmin(Ngrid)
  jmaxprev = pnl_vect_int_get(Meth->Jmaximum, Meth->Ngrid);  // jmax(Ngrid)

  pnl_vect_resize(ZCbondPriceVect2, jmaxprev - jminprev + 1);
  pnl_vect_resize(OptionVect2, jmaxprev - jminprev + 1);
  pnl_vect_set_double(ZCbondPriceVect2, 1 + SwaptionFixedRate * periodicity);

  n = (int)((contract_maturity - first_reset_date) / periodicity + 0.1);

  Ti1 = contract_maturity - periodicity; // Ti1 = T(n-1)
  i_Ti1 = IndexTime(Meth, Ti1);
```

```
  p->Par[0].Val.V_DOUBLE = 1.0 ;

  BackwardIteration(Meth, ModelParam, ZCbondPriceVect1, ZCbondPriceVect2, Meth->

  for (j = 0 ; j < ZCbondPriceVect1->size ; j++) // Price at T(n-1)
    {
      payoff = (p->Compute)(p->Par, GET(ZCbondPriceVect1, j));
      LET(OptionVect2, j) = payoff;
    }

  for (i = n - 2; i >= 0; i--)
    {
      Ti1 = first_reset_date + i * periodicity; // Ti1 = T(i)
      Ti2 = Ti1 + periodicity;                  // Ti2 = T(i+1)

      i_Ti2 = IndexTime(Meth, Ti2);
      i_Ti1 = IndexTime(Meth, Ti1);

      pnl_vect_plus_double(ZCbondPriceVect2, SwaptionFixedRate * periodicity);

      BackwardIteration(Meth, ModelParam, ZCbondPriceVect1, ZCbondPriceVect2, i_

      BackwardIteration(Meth, ModelParam, OptionVect1, OptionVect2, i_Ti2, i_Ti1


      for (j = 0 ; j < ZCbondPriceVect1->size ; j++)
        {
          payoff = (p->Compute)(p->Par, GET(ZCbondPriceVect1, j)); // payoff at

          if (payoff > GET(OptionVect2, j))
            {
              LET(OptionVect2, j) = payoff;
              LET(OptionVect1, j) = payoff;
            }
        }
    }
}

/// Price of a Swaption using a trinomial tree
```

```
static double tr_sg1d_bermudianswaption(TreeShortRate *Meth, ModelParameters *Mo
{
  double OptionPrice, Ti1;
  int i_Ti1;

  PnlVect *OptionPriceVect1; // Vector of prices of the option at i
  PnlVect *OptionPriceVect2; // Vector of prices of the option at i+1
  PnlVect *ZCbondPriceVect1; // Vector of prices of the option at i+1
  PnlVect *ZCbondPriceVect2; // Vector of prices of the option at i+1
  OptionPriceVect1 = pnl_vect_create(1);
  OptionPriceVect2 = pnl_vect_create(1);
  ZCbondPriceVect1 = pnl_vect_create(1);
  ZCbondPriceVect2 = pnl_vect_create(1);


  ///**************** PAYOFF at the MATURITY of the OPTION : T(0)***************

  BermudianSwaption_InitialPayoffSG1D(Meth, ModelParam, ZCbondPriceVect1, ZCbond

  ///**************** Backward computation of the option price ***************/

  Ti1 = first_reset_date; // Ti1 = T(0)
  i_Ti1 = IndexTime(Meth, Ti1);

  BackwardIteration(Meth, ModelParam, OptionPriceVect1, OptionPriceVect2, i_Ti1,

  OptionPrice = GET(OptionPriceVect1, 0);

  pnl_vect_free(& OptionPriceVect1);
  pnl_vect_free(& OptionPriceVect2);
  pnl_vect_free(& ZCbondPriceVect1);
  pnl_vect_free(& ZCbondPriceVect2);

  return OptionPrice;

}

static int tr_bermudianswaption1d(int flat_flag, double r0, char *curve, double
{
  TreeShortRate Tr;
  ModelParameters ModelParams;
```

```
  ZCMarketData ZCMarket;

  /* Flag to decide to read or not ZC bond datas in "initialyields.dat" */
  /* If P(0,T) not read then P(0,T)=exp(-r0*T) */
  if (flat_flag == 0)
    {
      ZCMarket.FlatOrMarket = 0;
      ZCMarket.Rate = r0;
    }

  else
    {
      ZCMarket.FlatOrMarket = 1;
      ZCMarket.filename = curve;
      ReadMarketData(&ZCMarket);

      if (contract_maturity > GET(ZCMarket.tm, ZCMarket.Nvalue - 1))
        {
          printf("\ nError : time bigger than the last time value entered in ini
          exit(EXIT_FAILURE);
        }
    }

  ModelParams.MeanReversion  = a;
  ModelParams.RateVolatility = sigma;

  SetTimeGrid_Tenor(&Tr, N_steps, first_reset_date, contract_maturity, periodici

  SetTreeShortRate(&Tr, &ModelParams, &ZCMarket, &func_model_sg1d, &func_model_d

  *price =  Nominal * tr_sg1d_bermudianswaption(&Tr, &ModelParams, &ZCMarket, N_

  DeleteTreeShortRate(&Tr);
  DeleteZCMarketData(&ZCMarket);

  return OK;
}



///********************************************** PREMIA FUNCTIONS ***********
```

```
int CALC(TR_BermudianSwaptionSG1D)(void *Opt, void *Mod, PricingMethod *Met)
{
  TYPEOPT *ptOpt = (TYPEOPT *)Opt;
  TYPEMOD *ptMod = (TYPEMOD *)Mod;

  return  tr_bermudianswaption1d(ptMod->flat_flag.Val.V_INT,
                                 MOD(GetYield)(ptMod),
                                 MOD(GetCurve)(ptMod),
                                 ptMod->a.Val.V_DOUBLE,
                                 ptMod->Sigma.Val.V_PDOUBLE,
                                 ptOpt->BMaturity.Val.V_DATE - ptMod->T.Val.V_DA
                                 ptOpt->OMaturity.Val.V_DATE - ptMod->T.Val.V_DA
                                 ptOpt->ResetPeriod.Val.V_DATE,
                                 ptOpt->Nominal.Val.V_PDOUBLE,
                                 ptOpt->FixedRate.Val.V_PDOUBLE,
                                 ptOpt->PayOff.Val.V_NUMFUNC_1,
                                 Met->Par[0].Val.V_LONG,
                                 &(Met->Res[0].Val.V_DOUBLE));
}
static int CHK_OPT(TR_BermudianSwaptionSG1D)(void *Opt, void *Mod)
{
  if ((strcmp(((Option *)Opt)->Name, "PayerBermudanSwaption") == 0) || (strcmp((
    return OK;
  else
    return WRONG;
}
#endif //PremiaCurrentVersion


static int MET(Init)(PricingMethod *Met, Option *Opt)
{
  if (Met->init == 0)
    {
      Met->init = 1;
      Met->HelpFilenameHint = "tr_quadratic1d_bermudianswaption";

      Met->Par[0].Val.V_INT = 50;
    }

  return OK;
```

```
}

PricingMethod MET(TR_BermudianSwaptionSG1D) =
{
  "TR_SquareGaussian1d_Swaption",
  { {"TimeStepNumber per Period", INT, {100}, ALLOW},
    {" ", PREMIA_NULLTYPE, {0}, FORBID}
  },
  CALC(TR_BermudianSwaptionSG1D),
  {{"Price", DOUBLE, {100}, FORBID} , {" ", PREMIA_NULLTYPE, {0}, FORBID}},
  CHK_OPT(TR_BermudianSwaptionSG1D),
  CHK_ok,
  MET(Init)
} ;
```