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```
#ifndef _LMM_PITERBARG
#define _LMM_PITERBARG

#include <stdio.h>
#include <stdlib.h>
#include <math.h>

#include "pnl/pnl_vector.h"
#include "pnl/pnl_matrix.h"
#include "pnl/pnl_mathtools.h"
#include "math/read_market_zc/InitialYieldCurve.h"

// 0<T(0)<T(1)<....<T(N)
// L(0), L(1), ..., L(N-1)
// beta(0), beta(1), ..., beta(N-1)
// sigma(0), sigma(1), ..., sigma(N-1)
typedef struct StructLmmPiterbarg
{
    ZCMarketData *ZCMarket; // Structure that constraints initial yield curve

    PnlVect *TimeDates;

    double Var_SpeedMeanReversion;
    double Var_Volatility;
    int NbrVolFactors;

    PnlMat *SkewsParams;
    PnlMat *VolsParams;
} StructLmmPiterbarg;

StructLmmPiterbarg *SetLmmPiterbarg(int InitYieldCurve_flag, double R_flat, char

double LiborRate_skew(StructLmmPiterbarg *LmmPiterbarg, double t, double Tn);

void FreeLmmPiterbarg(StructLmmPiterbarg **LmmPiterbarg);
```

```
int indiceTimeGrid(PnlVect *TimeGrid, double s);  
double SwapRate_skew(StructLmmPiterbarg *LmmPiterbarg, double t, int n_swap, int  
double SwapRate_vol(StructLmmPiterbarg *LmmPiterbarg, double t, int n_swap, int  
  
double SwapRate_skew_avg(StructLmmPiterbarg *LmmPiterbarg, int n_swap, int m_swap  
  
double SwapRate_vol_avg(StructLmmPiterbarg *LmmPiterbarg, int n_swap, int m_swap  
  
#endif
```