

[Help](#)

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#ifndef __finance_tool_box__
#define __finance_tool_box__
#include <stdlib.h>
#include <stdio.h>
#include <string.h>
#include <math.h>
#include <assert.h>

#include "pnl/pnl_mathtools.h"
#include "pnl/pnl_vector.h"

extern double init_cond_with_dupire(const double x,
                                    const double S0,
                                    const double K0,
                                    const int dupire,
                                    const int product);

extern double init_cond(const double x,
                        const double S0,
                        const double K0,
                        const int product);

extern double bound_cond(const double x, const double S0, const double K,
                        const double rebate, const double barrier, const double
                        const int product, const int product_type);

typedef struct Option_Eqd
{
    int am; // 0 european 1 american
    int product;
    // 1 - Call ; 2 - Put ; 3 - forward
    int product_type;
    // 1- Vanilla; 2 Up-and-Out ;3 Down-and-Out ; 4 Double barrier ;5
    // parisian; 6 varswap ; 7 Forward start
    double S0;
    double K;
    double T;
    double t_start;
```

```

double rebate;
double barrier;
double price;
double delta;
double implied_vol;

// Not really in option_eqd,
double rate;
double divid;

} Option_Eqd;

// 1 - Call ; 2 - Put ; 3 - forward
// 1- European ; 2 Up-and-Out ;3 Down-and-Out ; 4 Double barrier; 5 parisain
extern Option_Eqd *option_eqd_create(int am, int product_,
                                     int product_type_, double S0_,
                                     double K_, double T_,
                                     double rebate_,
                                     double barrier_);
extern Option_Eqd *option_eqd_create_forwardstart(int am, int product_,
          int product_type_, double S0_,
          double K_, double T_,
          double t_start_,
          double rebate_,
          double barrier_);
extern void option_eqd_set_rate(Option_Eqd *opt, double rate_, double divid_);
extern double option_eqd_init_cond(const Option_Eqd *Op,
                                   const double x);
extern double option_eqd_bound_cond(const Option_Eqd *Op,
                                   const double x,
                                   double ttm);

extern int option_eqd_compute_implied_vol(Option_Eqd *op);

extern double Double_Primitive_Call_Put(const double K, const double S0, const double T, const double r, const double sigma);
extern double Compute_Projection_U0(const double K, const double S0, const double T, const double r, const double sigma);

typedef struct List_Option_Eqd
{
    int am; // 0 european 1 american

```

```

PnlVectInt *product;
// 1 - Call ; 2 - Put ; 3 - forward
int product_type;
// 1- European ; 2 Up-and-Out ;3 Down-and-Out ; 4 Double barrier ;5
// parisian ; 7 forward start options
double S0;
double rebate;
int nb_maturity; //number of option_eqd maturity in the list
int nb_options ; //number of option_eqd in the list
PnlVectInt *index_maturity;
PnlVect *K;
PnlVect *T;
PnlVect *t_start;
PnlVect *price;
PnlVect *implied_vol;

// Not really in option_eqd,
double rate;
double divid;

} List_Option_Eqd;

extern List_Option_Eqd *list_option_eqd_create(int am_, double S0_);
extern List_Option_Eqd *list_option_eqd_create_with_data(int am_, double S0_, Pn
extern List_Option_Eqd *list_option_eqd_create_forwardstart_with_data(int am_, d
extern List_Option_Eqd *list_option_eqd_copy(const List_Option_Eqd *op_in);

extern void list_option_eqd_set_rate(List_Option_Eqd *lopt, double rate_, double

extern Option_Eqd list_option_eqd_get_value(List_Option_Eqd *lopt, int it, int k

extern void list_option_eqd_free(List_Option_Eqd **op);
extern void list_option_eqd_readmarketdata(List_Option_Eqd *op, const char *file
extern void list_option_eqd_savemarketdata(List_Option_Eqd *op, const char *file
extern void list_option_eqd_print(List_Option_Eqd *op);
extern void list_option_eqd_print_nsp(List_Option_Eqd *op);
extern int list_option_eqd_compute_implied_vol(List_Option_Eqd *op);

#endif

```