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#pragma once
#include <pnl/pnl_mathtools.h>
#include "
href../../common/math/kirkby/model_proj_h_src.pdfmodel_proj.h"

//////////
// LINEAR
//////////
static void linear_fourier_integrand(Model_proj* model, PnlVectComplex* grand, d
double w = 0.;
dcomplex chf;
model->rn_chf(t, w, &chf);

double a2 = a * a;
LET_COMPLEX(grand, 0) = CRmul(chf, 1. / (24 * a2));

for (int i = 1; i < N; i++) {
w = w + dw;
double aux = pow(sin(w / (2 * a)) / w, 2) / (2 + cos(w / a));
model->rn_chf(t, w, &chf);
LET_COMPLEX(grand, i) = Cmul(Cexp(CRmul(CI, -zmin * w)), CRmul(chf, aux));
}
}

//////////
// CUBIC
//////////
static void cubic_fourier_integrand(Model_proj* model, PnlVectComplex* grand, do
double numer, denom, b0, b1, b2, b3;
b0 = 1208. / 2520; b1 = 1191. / 2520; b2 = 120. / 2520; b3 = 1. / 2520;
double w = 0.;

dcomplex chf;
model->rn_chf(t, w, &chf);

LET_COMPLEX(grand, 0) = CRmul(chf, 1. / (32 * pow(a, 4)));

for (int i = 1; i < N; i++) {
w += dw;
```

```

numer = pow(sin(w / (2 * a)) / w, 4);
denom = b0 + b1 * cos(w / a) + b2 * cos(2 * w / a) + b3 * cos(3 * w / a);

model->rn_chf(t, w, &chf);
LET_COMPLEX(grand, i) = Cmul(Cexp(CRmul(CI, -zmin * w)), CRmul(chf, numer/denom)
}
}

static void cubic_fourier_zeta(PnlVect* zeta, int N, double dw, double a) {
// Calculates just the generator component of the integrand. Used by Asian Price
// NOTE: the zeroth value is left UNCHANGED

double numer, denom, b0, b1, b2, b3;
b0 = 1208. / 2520; b1 = 1191. / 2520; b2 = 120. / 2520; b3 = 1. / 2520;
double w = 0.;

for (int i = 1; i < N; i++) {
w += dw;
numer = pow(sin(w / (2 * a)) / w, 4);
denom = b0 + b1 * cos(w / a) + b2 * cos(2 * w / a) + b3 * cos(3 * w / a);

LET(zeta, i) = numer/denom;
}

}

```