```
% Calibrate theta_3: Given current market price p_3_market of zero-coupon bond
(94.1011) with 2-year maturity, knowing fixed annual vol and delta
%                    Assuming interest rate tree follows Ho and Lee with varying
theta_t with initial guess theta_3=0.011
%                    Knowing: r_1u, r_1d, r_2uu, r_2dd, r_2ud(=r_2du)
%                    First get: r_3uuu, r_3ddd, r_3uud(=r_3duu), r_3ddu(=r_3dud)
%                    Second get: p_3uuu, p_3ddd, p_3uud(=p_3duu), p_3ddu(=p_3dud),
p_3uu, p_3dd, p_3ud(=p_3du), p_3u, p_3d, p_3_model
%                    Third: using p_3_model=p_3_market to obtain theta_3
%                    Forth: using theta_3 obtaining interest_Tree_3 and bond_Tree_3
p_3_market = 94.1011;
vol = 0.0173;
delta = 0.5;

r_0 = 0.0173994664;

r_1u = 0.0374713845;
r_1d = 0.0130054899;

r_2uu = 0.0606155122;
r_2ud = 0.0361496176;
r_2dd = 0.0116837230;

theta_3 = 0.011;

r_3uuu = r_2uu + theta_3*delta + vol*delta^0.5;
r_3uud = r_2uu + theta_3*delta - vol*delta^0.5;
r_3ddu = r_2dd + theta_3*delta + vol*delta^0.5;
r_3ddd = r_2dd + theta_3*delta - vol*delta^0.5;

p_3uuu = 100*exp(-r_3uuu*delta);
p_3uud = 100*exp(-r_3uud*delta);
p_3ddu = 100*exp(-r_3ddu*delta);
p_3ddd = 100*exp(-r_3ddd*delta);

p_3uu = (1/2)*p_3uuu*exp(-r_2uu*delta) + (1/2)*p_3uud*exp(-r_2uu*delta);
p_3ud = (1/2)*p_3uud*exp(-r_2ud*delta) + (1/2)*p_3ddu*exp(-r_2ud*delta);
p_3dd = (1/2)*p_3ddu*exp(-r_2dd*delta) + (1/2)*p_3ddd*exp(-r_2dd*delta);

p_3u = (1/2)*p_3uu*exp(-r_1u*delta) + (1/2)*p_3ud*exp(-r_1u*delta);
p_3d = (1/2)*p_3ud*exp(-r_1d*delta) + (1/2)*p_3dd*exp(-r_1d*delta);

p_3_model = (1/2)*p_3u*exp(-r_0*delta) + (1/2)*p_3d*exp(-r_0*delta);

error3 = (p_3_model - p_3_market)^2;

% We write the function for error3 following the above steps
```