```matlab
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% Math 485

% 1. Write a code (preferable in Matlab) that will compute the price of a
% call option, and a put option, in the Black-Scholes-Merton setup. Attach
% a printed version of the code at the end of the report. Using these code,
% take fixed S0 = 120, and compute the prices for calls and puts as
% follows.

% (a) Fix T = 2, r = 0.05, ? = 0.25, and vary the strike K ? [60,180] with
% step size 2. Plot the graph ?strike vs price? for both sets of options.

s0 = 120;
T = 2;
r = 0.05;
sigma = 0.25;
K = 60:2:180;
calls = NaN([1 length(K)]);
puts = NaN([1 length(K)]);
i = 1;
for k = K
    [calls(i), puts(i)] = black_scholes(s0, T, k, r, sigma);
    i = i + 1;
end

figure('Name', 'strike vs call price')
plot(calls, K)
title('strike vs call price');
xlabel('call price');
ylabel('strike price');


figure('Name', 'strike vs put price')
plot(puts, K)
title('strike vs put price');
xlabel('put price');
ylabel('strike price');

% (b) Fix K = 120, r = 0.05, ? = 0.25, and vary the maturity T ? [0.25, 4]
% with step size 1/12. Plot the graph ?maturity vs price? for both sets of
% options.

K = 120;
r = 0.05;
sigma = 0.25;
T = 0.25:1/12:4;
calls = NaN([1 length(T)]);
puts = NaN([1 length(T)]);
i = 1;
for t = T
    [calls(i), puts(i)] = black_scholes(s0, t, K, r, sigma);
    i = i + 1;
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```matlab
    end

    figure('Name', 'maturity vs call price')
    plot(calls, T)
    title('maturity vs call price');
    xlabel('call price');
    ylabel('maturity');

    figure('Name', 'maturity vs put price')
    plot(puts, T)
    title('maturity vs put price');
    xlabel('put price');
    ylabel('maturity');

    % (c) Fix K = 120, T = 2, r = 0.05, and vary the volatility ? ? [0.01, 0.5]
    % with step size 0.01. Plot the graph ?volatility vs price? for both sets
    % of options.

    K = 120;
    r = 0.05;
    T = 2;
    sigma = 0.01:0.01:0.5;
    calls = NaN([1 length(sigma)]);
    puts = NaN([1 length(sigma)]);
    i = 1;
    for sgma = sigma
        [calls(i), puts(i)] = black_scholes(s0, T, K, r, sgma);
        i = i + 1;
    end

    figure('Name', 'volatility vs call price')
    plot(calls, sigma)
    title('volatility vs call price');
    xlabel('call price');
    ylabel('maturity');

    figure('Name', 'volatility vs put price')
    plot(puts, sigma)
    title('volatility vs put price');
    xlabel('put price');
    ylabel('maturity');


    % (d) Fix K = 120, T = 2, ? = 0.25, and vary the interest rate r ? [0.01,
    % 0.1] with step size 0.005. Plot the graph ?interest rate vs price? for
    % both sets of options.

    K = 120;
    T = 2;
    sigma = 0.25;
    r = 0.01: 0.005: 0.1;
    calls = NaN([1 length(r)]);
    puts = NaN([1 length(r)]);
    i = 1;
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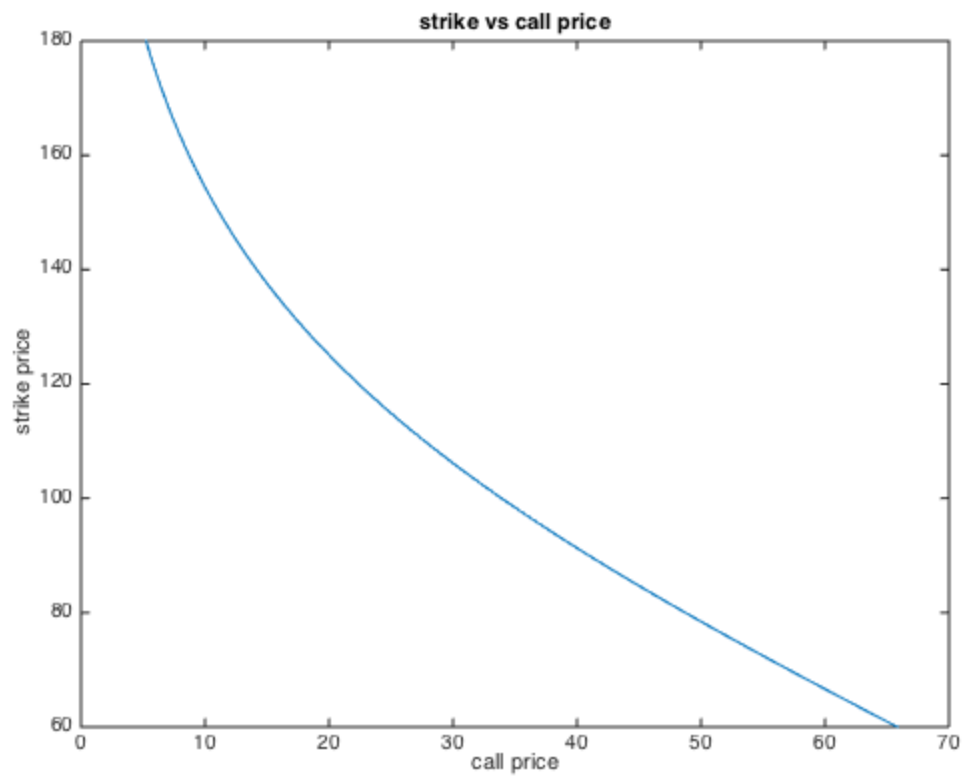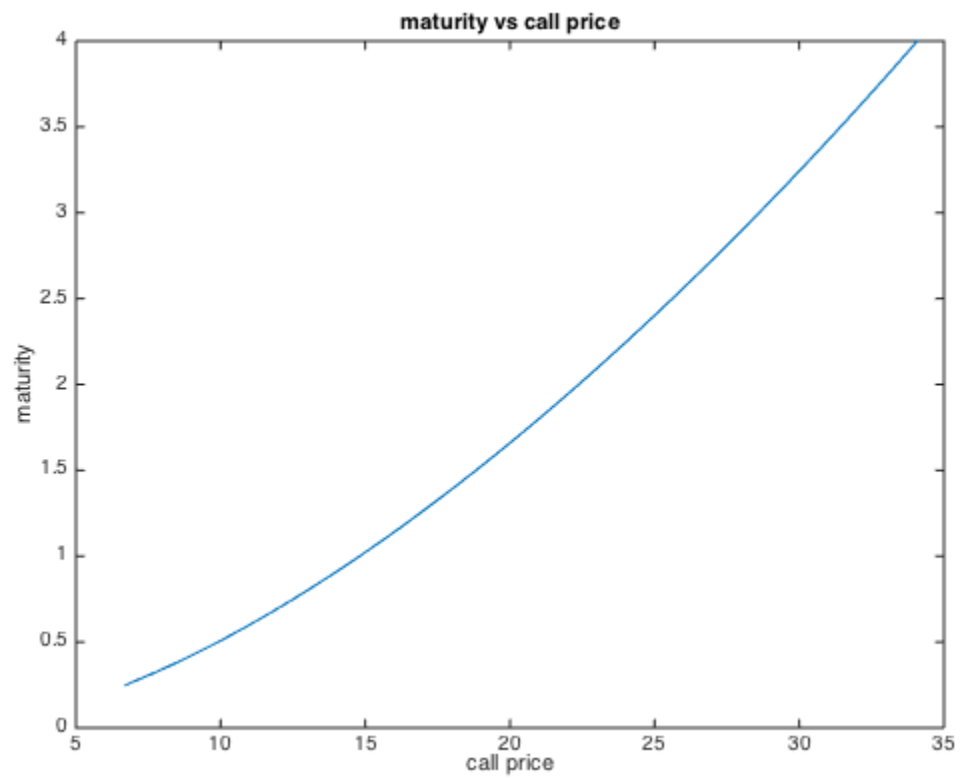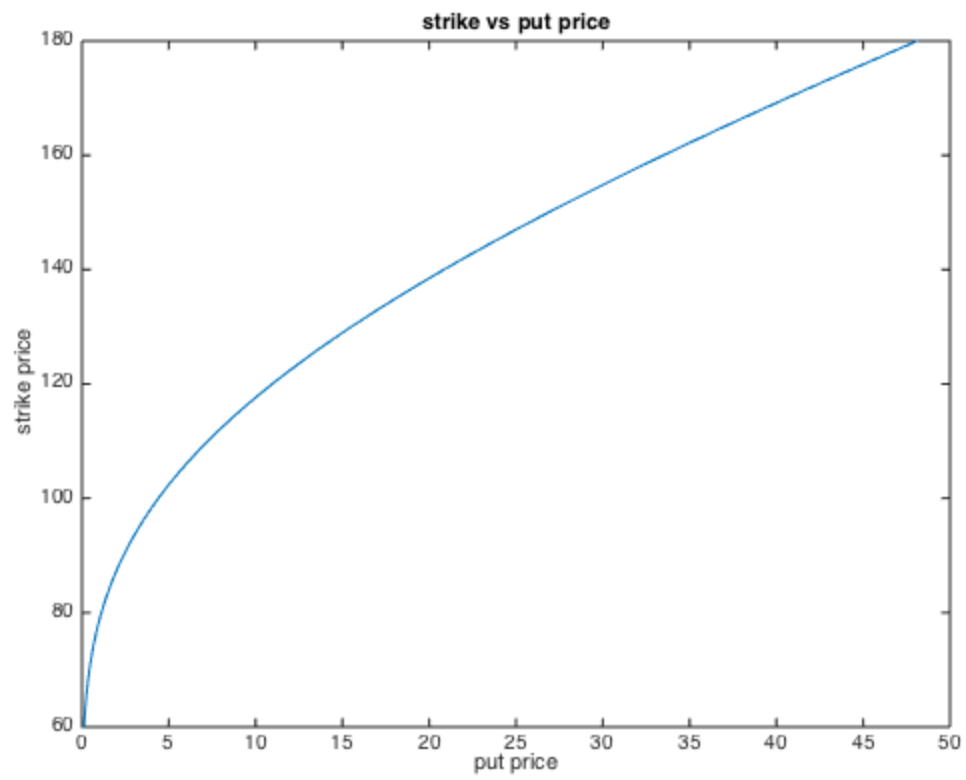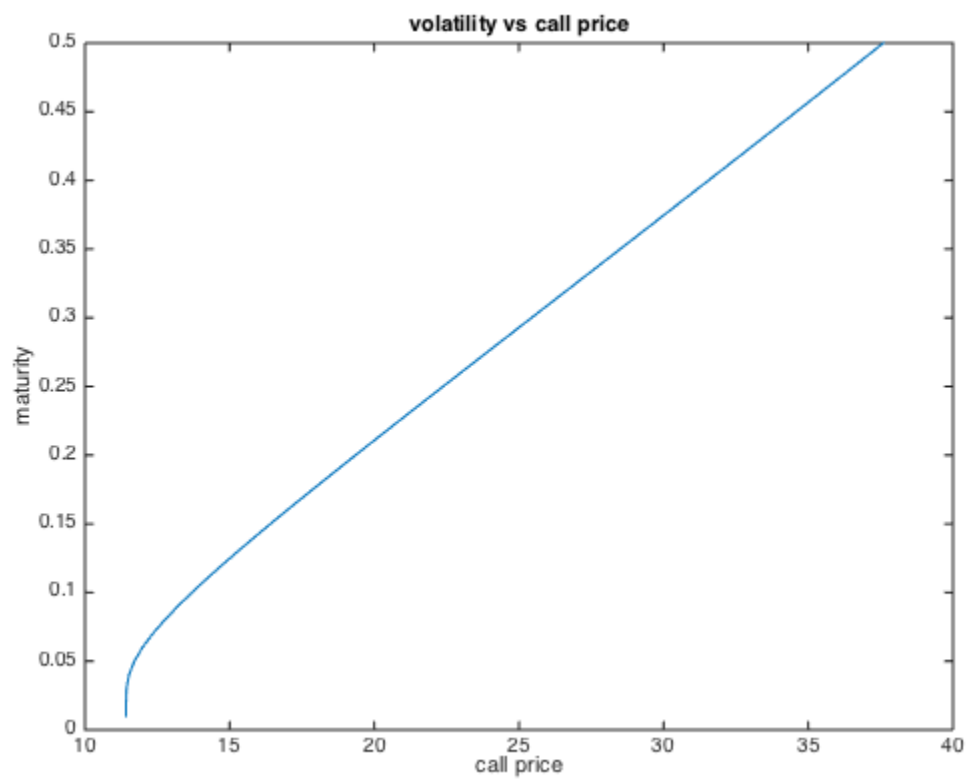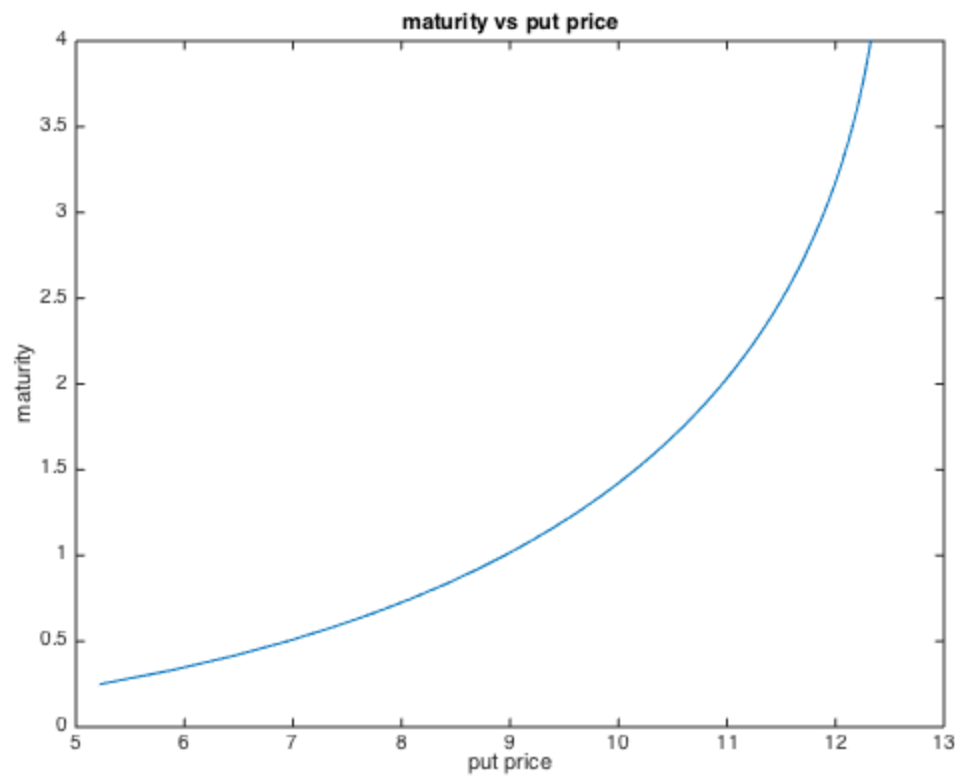
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for rate = r
    [calls(i), puts(i)] = black_scholes(s0, T, K, rate, sigma);
    i = i + 1;
end

figure('Name', 'interest rate vs call price')
plot(calls, r)
title('interest rate vs call price');
xlabel('call price');
ylabel('iterest rate');


figure('Name', 'interest rate vs put price')
plot(puts, r)
title('interest rate vs put price');
xlabel('put price');
ylabel('iterest rate');
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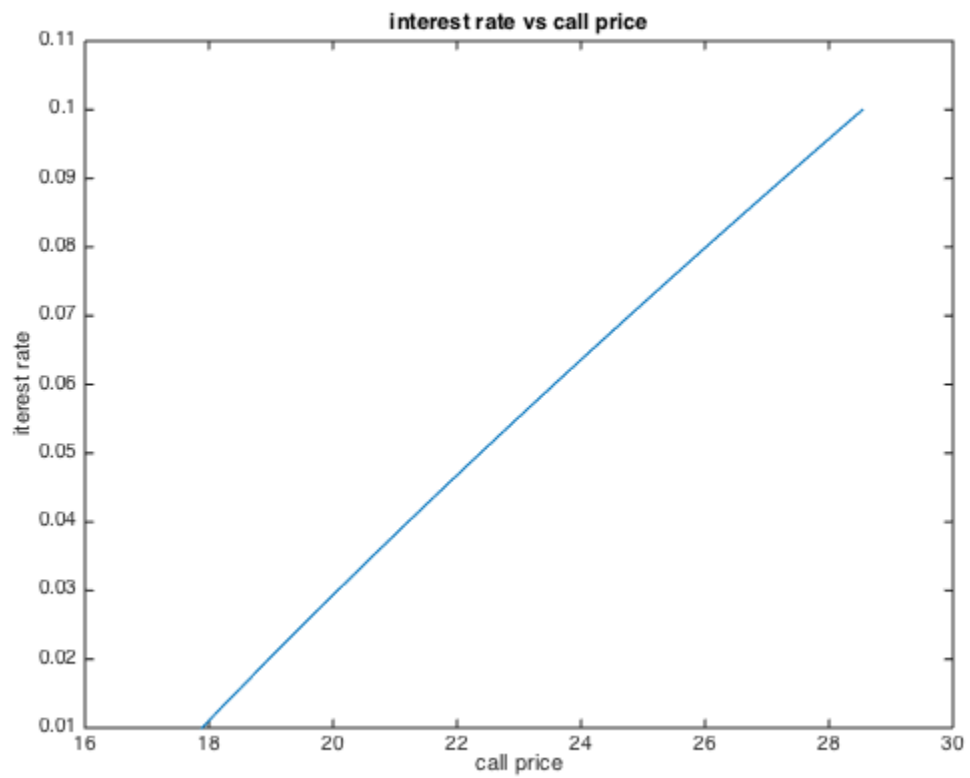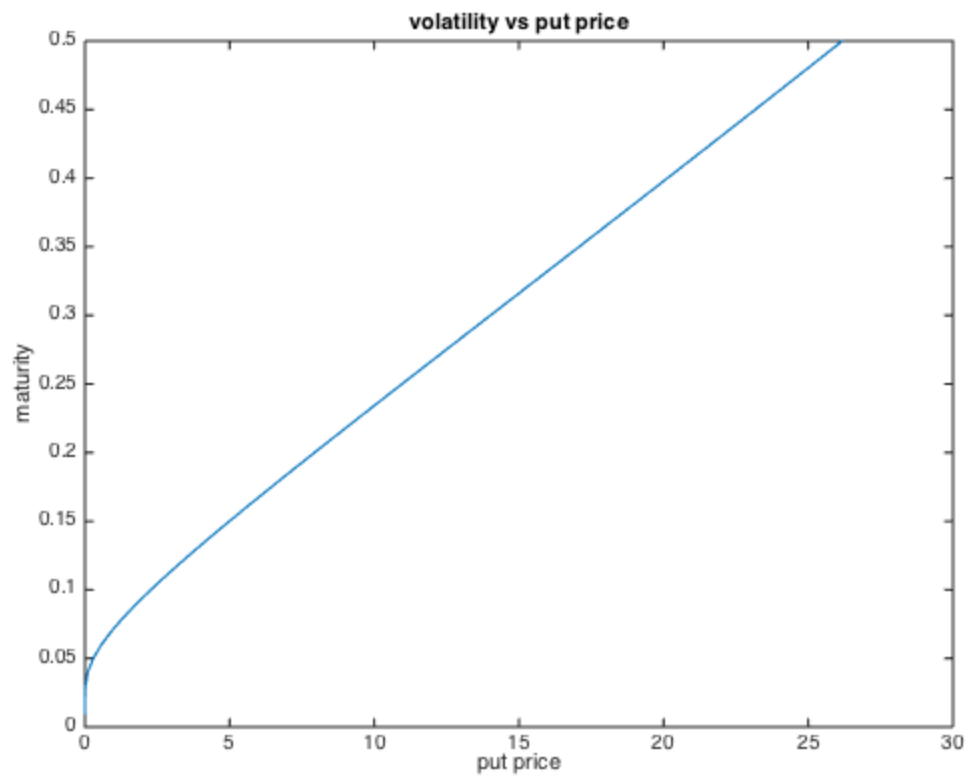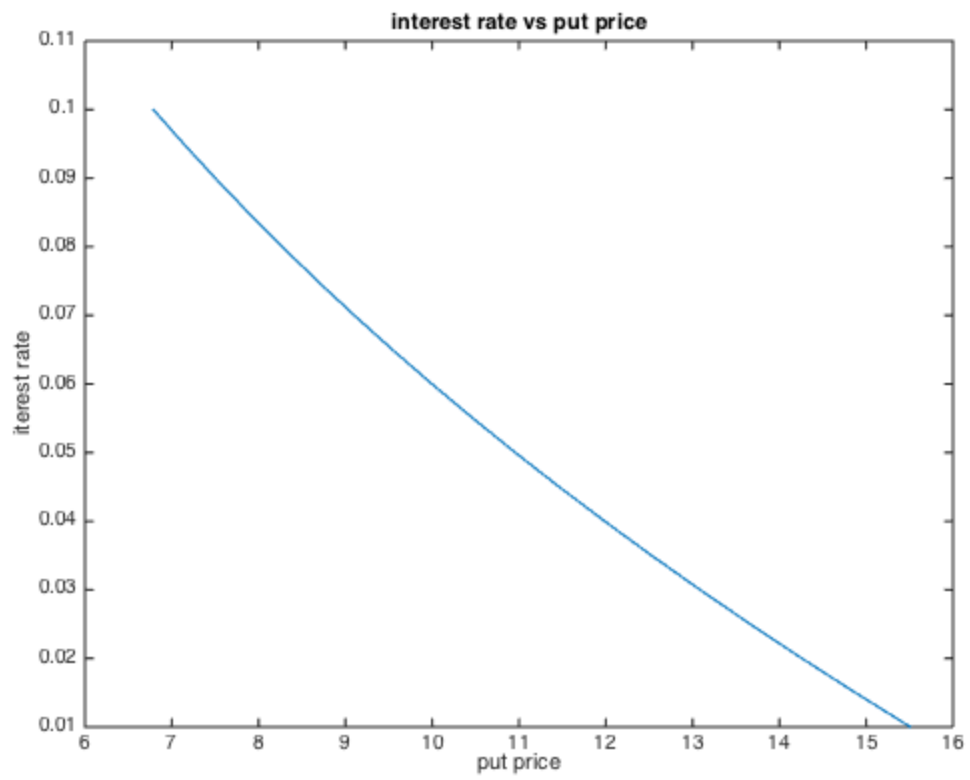

strike vs call price

strike vs put price

maturity vs call price

maturity vs put price

volatility vs call price

volatility vs put price

interest rate vs call price

interest rate vs put price

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