```
% Computer Lab 7
% Exercise 1
L = 1000;
accepts = 0;
for k = 1:L
    h = 0.001;
    M = 100; % number of simulations/paths per value of h
    mu = 0.06; % = r
    K = 105;
    T = 1;
    sigma = 0.15;
    X_0 = 100;
    N = round(T./h); % number of grid points per simulation
    payoffs = zeros(M,1); % for MC estimator
    for jj = 1:M
        X = zeros(N,1); % vector to store the path
        dB = sqrt(h).*randn(N,1); % Brownian increments
        X(1,1) = X_0;
        % simulate the path of X using the EM scheme
        for n = 1:N-1
            X(n+1,1) = X(n,1) + h*mu*X(n,1) + sigma*X(n,1)*dB(n+1,1);
        end
        payoffs(jj,1) = exp(-mu*T)*max(X(N,1)-K,0);
    end
    % parts (a) and (b)
    % Comparing simulated price to the closed form solution (see page
 59 of the
    % notes for details)
    simulated_prices = mean(payoffs);
    true_price = BS_price(X_0,mu,sigma,T,K);

    % part (c)
    % Using CLT approximation to produce 95% confidence interval for
 the
    % computed prices
    % NB the true price will fall within the computed confidence
 interval
    %approximately 95% of the time - this is testable....
    mu_hat = simulated_prices;
    sigma_hat = sqrt(var(payoffs));
    lower = mu_hat - 1.96*sigma_hat/sqrt(M);
    upper = mu_hat + 1.96*sigma_hat/sqrt(M);
    if (lower <= true_price) && (true_price <= upper)
        accepts = accepts + 1;
    end
end
text = ['The true price fell inside the 95% confidence interval
 approx. ',num2str(accepts*100/L), '% of the time.'];
disp(text)
```

```
The true price fell inside the 95% confidence interval approx. 93.4%
 of the time.
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