Financial Engineering II
Lab Assignment 10

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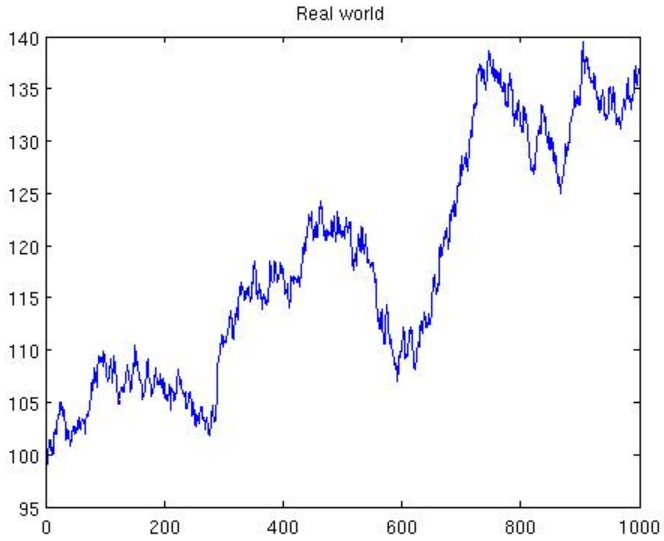
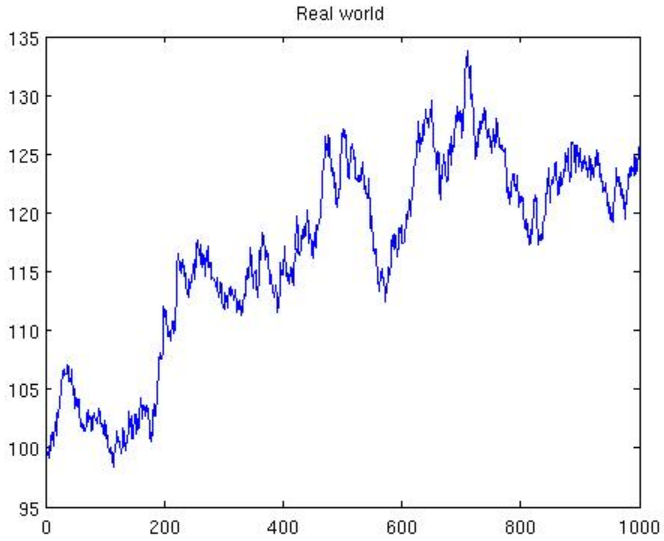
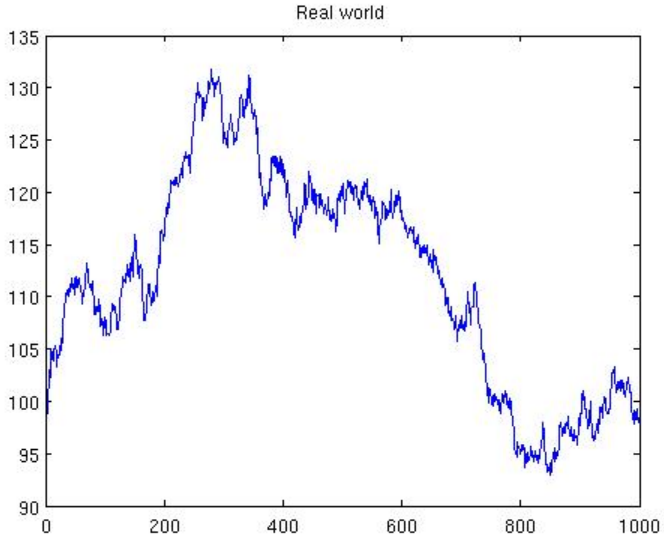
Contents

1 Paths of asset price

1.1 Real world






Real world
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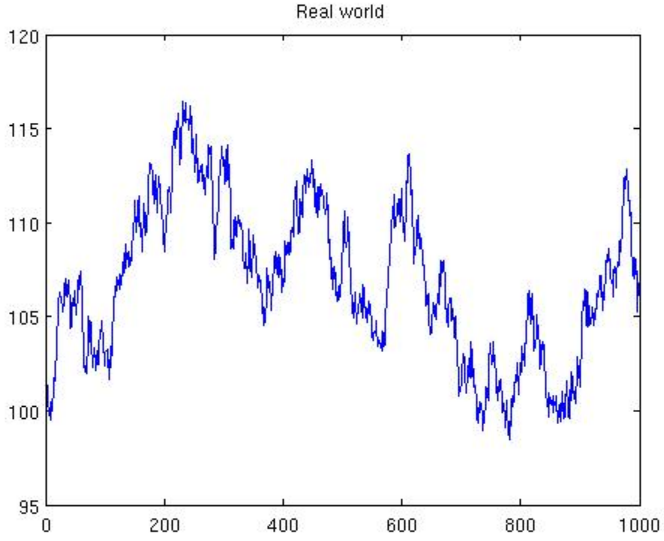
Real world
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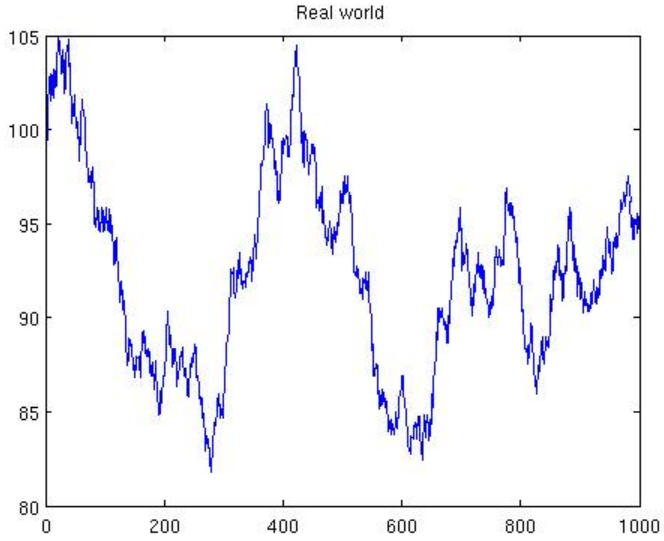
Real world
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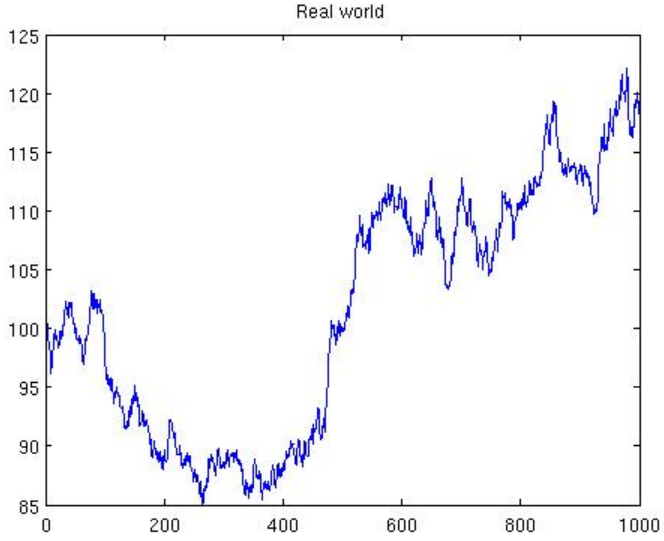
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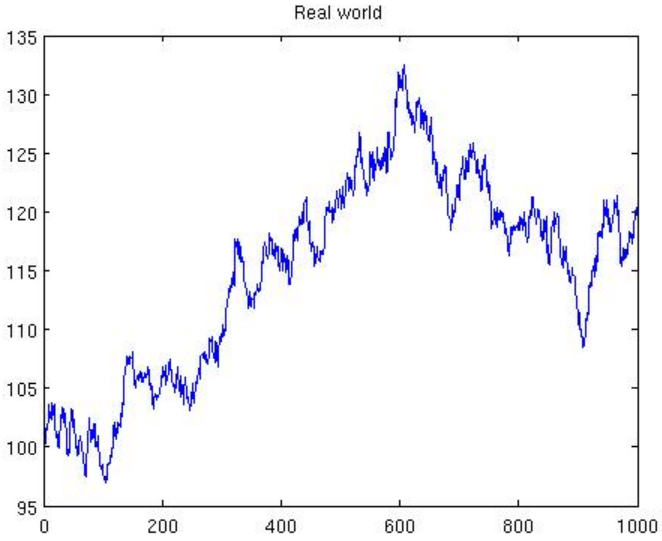
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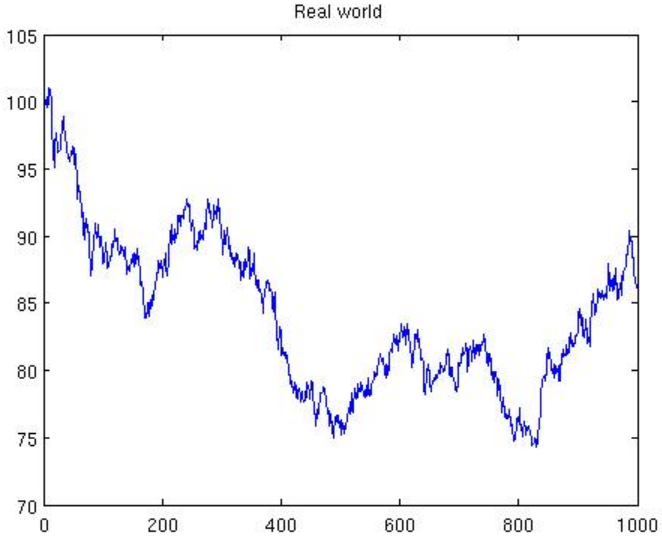
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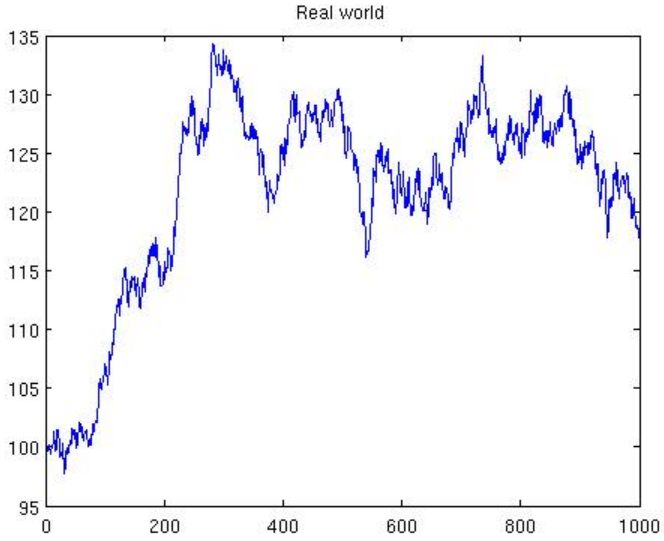
Real world
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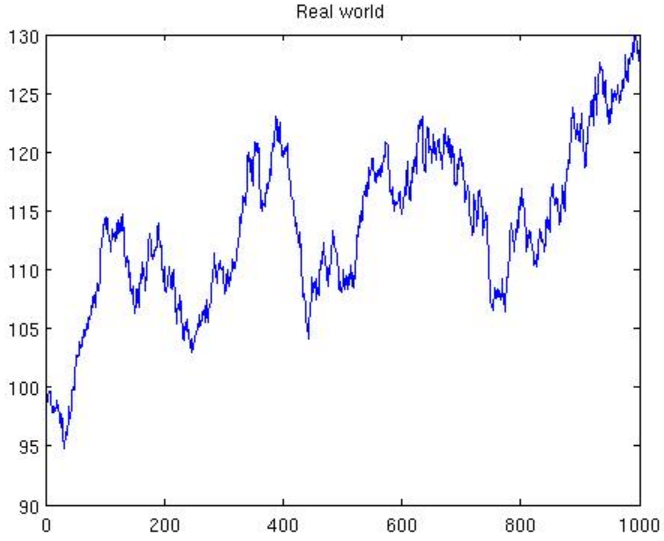
Real world
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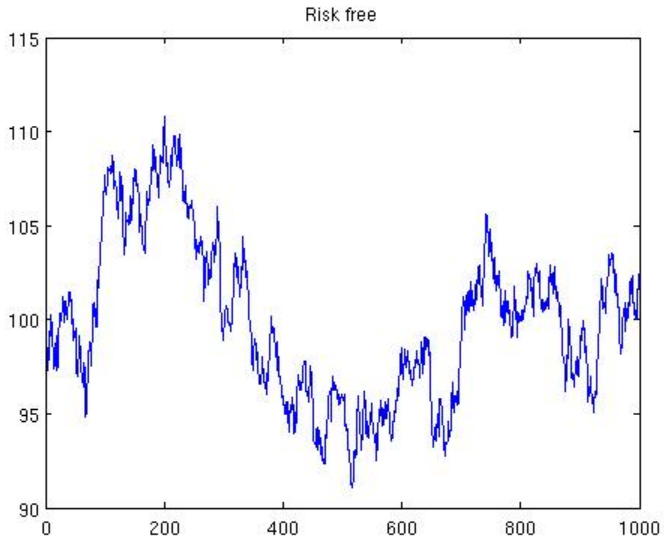
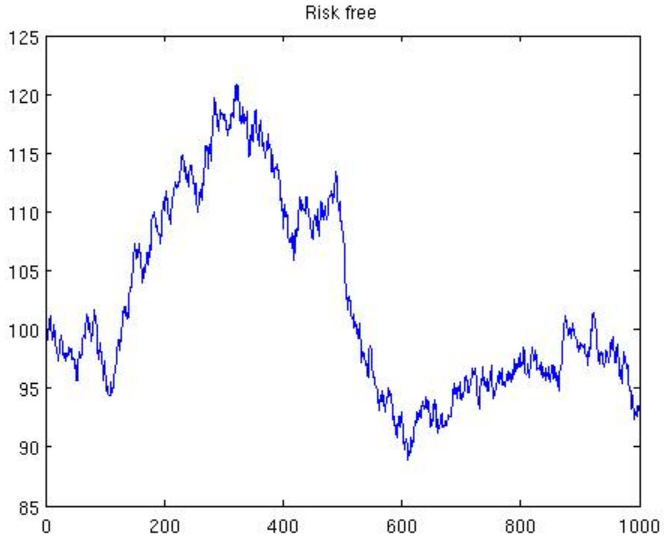
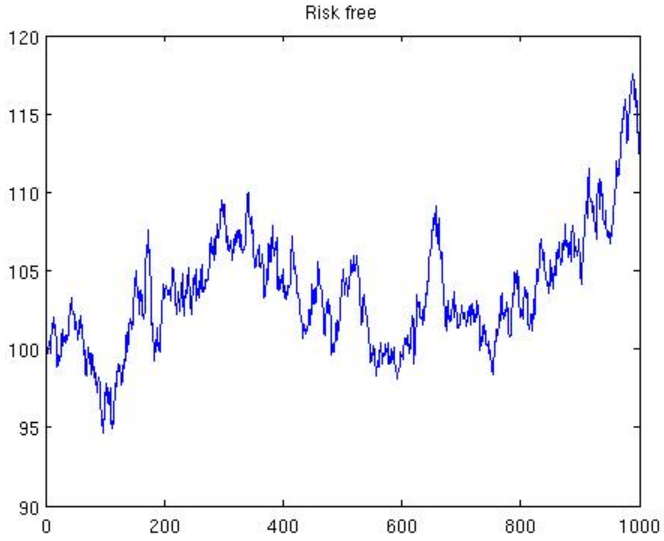
1.2 Risk neutral world



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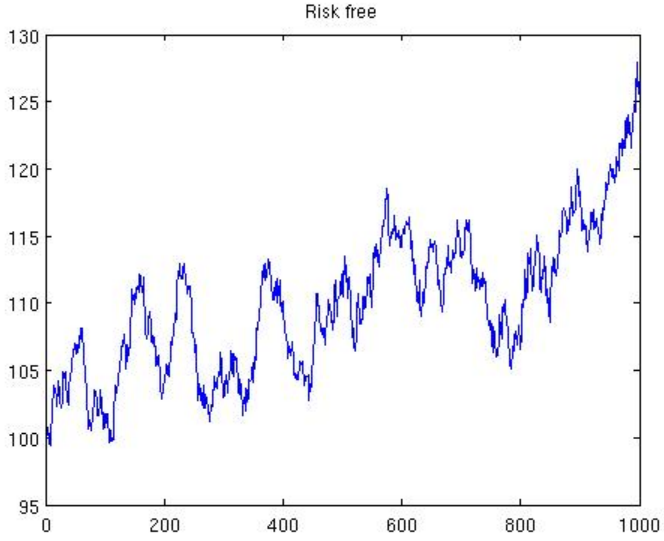
Risk free
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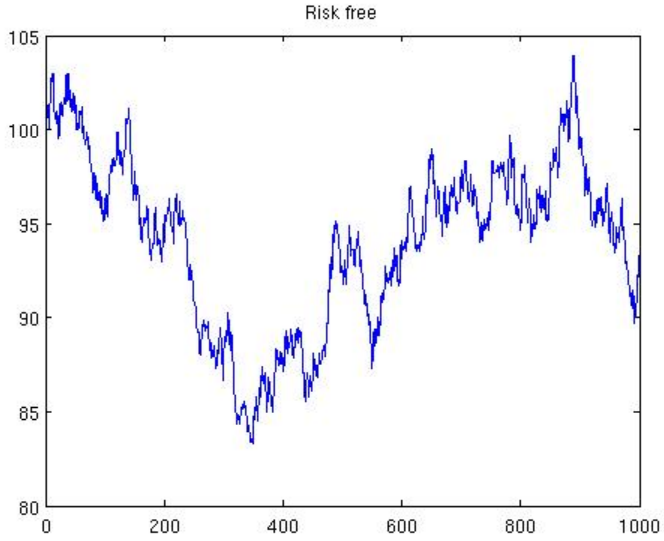
Risk free
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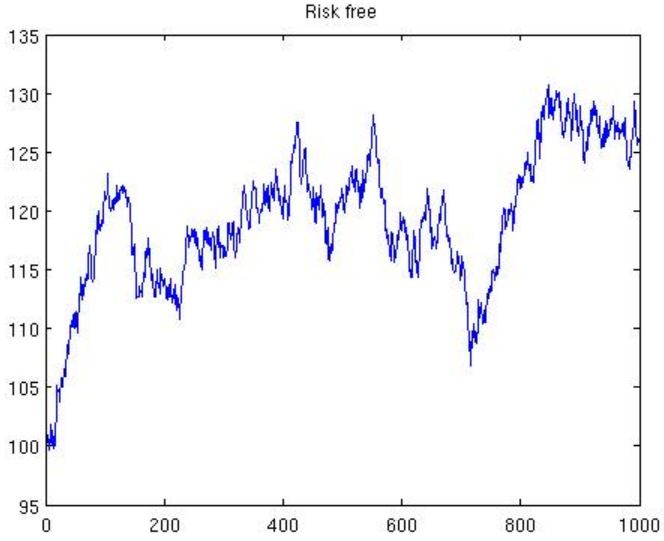
Risk free
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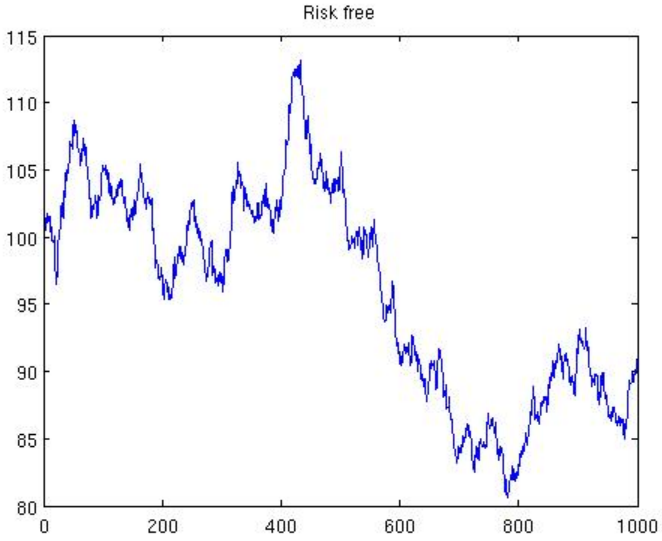
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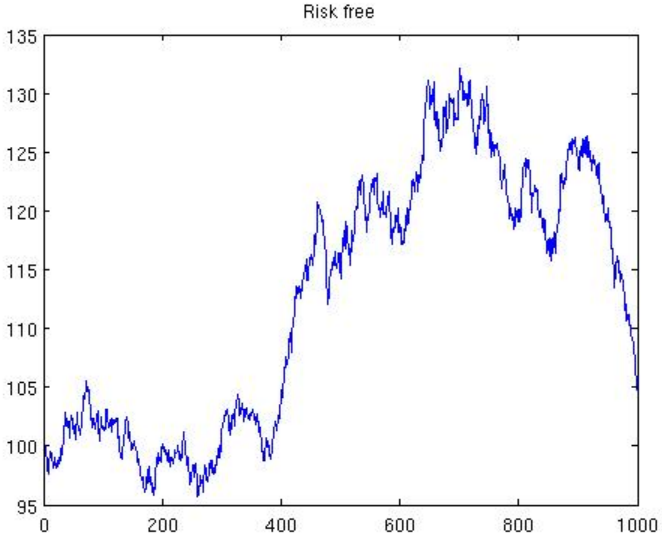
Risk free
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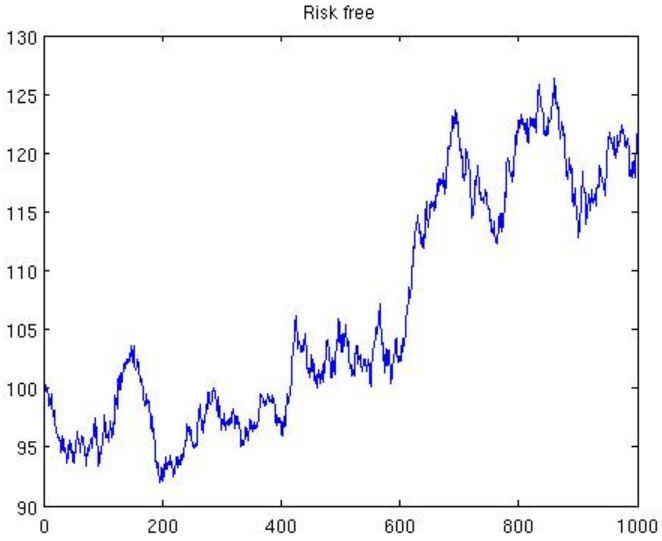
Risk free
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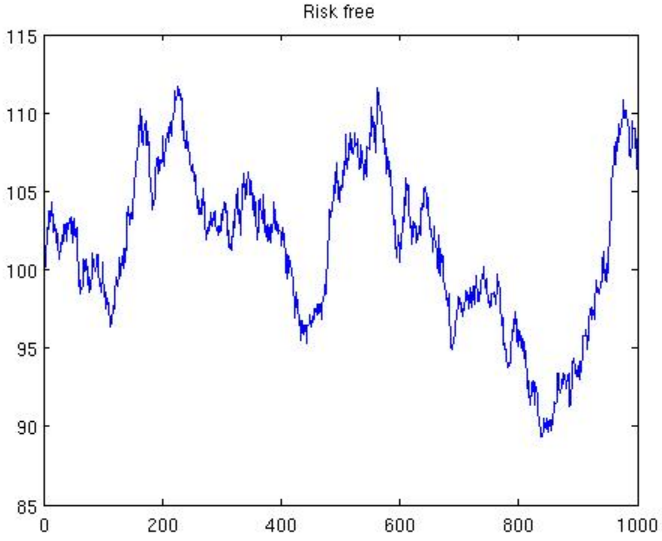
Risk free
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2 Asian option prices

Strike = 105

Call = 3.3637
Put = 5.9741

Strike = 110

Call = 1.9017
Put = 9.1457

Strike = 90

Call = 12.4386
Put = 0.34147

3 Code

3.1 Function to simulate asset price using GBM

```
function [ gbmpath ] = geometricbrownian( mu, sig, start, steps )
%UNTITLED Summary of this function goes here
%   Detailed explanation goes here

rn = normrnd(0, 1, 1, steps);
t = 0:1/steps:1;
gbmpath = zeros(1, steps);
gbmpath(1) = start;
for i=2:steps
    gbmpath(i) = gbmpath(i-1)*exp((mu - 0.5*sig*sig)*(t(i)-t(i-1)
        )...
         + sig*sqrt(t(i)-t(i-1))*rn(i));
end

end
```

3.2 Driver program

```
format long; clear all; clc;
```

```
steps = 1000;
n = 10;
mu = 0.1; sig = 0.2; start = 100; r = 0.05;

% simulate 10 paths of asset price
gbmreal = zeros(n, steps);
for i=1:n
    gbmreal(i,:) = geometricbrownian(mu, sig, start, steps);
    figure
    plot(gbmreal(i,:))
    title('Real world')
end

gbmrfree = zeros(n, steps);
for i=1:n
    gbmrfree(i,:) = geometricbrownian(r, sig, start, steps);
    figure
    plot(gbmrfree(i,:))
    title('Risk free')
end


% pricing Asian options
K = [105, 110, 90];
n = 100;
for i=1:length(K)
    tempcall = 0;
    tempput = 0;
    for j=1:n
        tempcall = tempcall + max(mean(geometricbrownian(r, sig,
            start, steps)) - K(i), 0);
        tempput = tempput + max(K(i) - mean(geometricbrownian(r,
            sig, start, steps)), 0);
    end
    call = exp(-r)*tempcall/n;
    put = exp(-r)*tempput/n;
    disp(['strike = ', num2str(K(i)), '; call = ', num2str(call),
        '; put = ', num2str(put)]);
end
```