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Physics 250
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Project 4

Physics 250 Econophysics

In this project, the goal is to write a computer code that will take the 10 time series that you used in Project 1, and the plotting methods you developed in Project 2, and determine whether the daily returns of the time series are also Leptokurtoric. One of you time series should be the S&P500.

1. We will use Log(Price), where "Log" is natural logarithm.

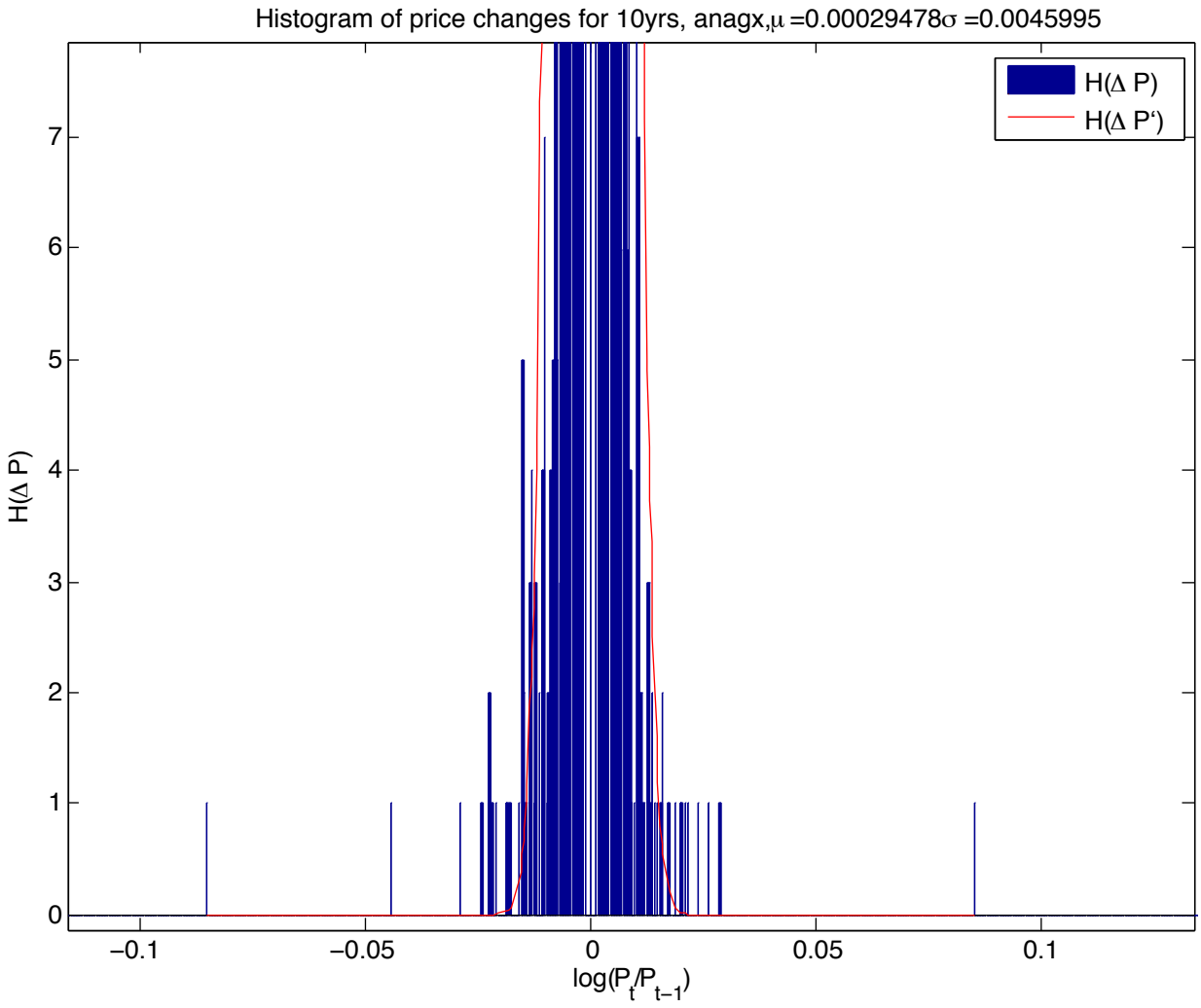
2. So instead of $\Delta P(t_i) = P(t_i) - P(t_{i-1})$ from last time, we will replace this by:

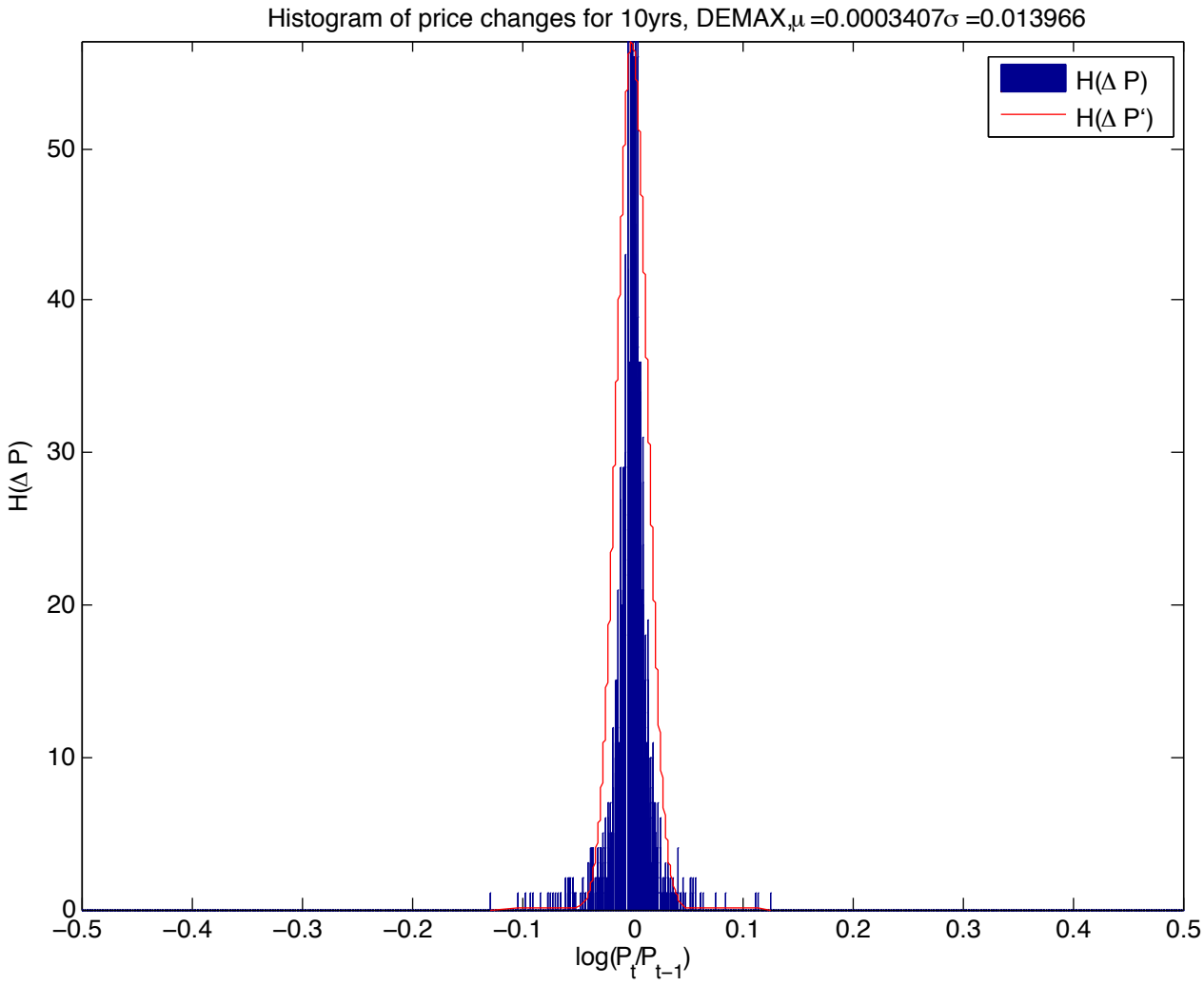
$$\Delta P(t_i) = Log(P(t_i)) - Log(P(t_{i-1})) = Log\left(\frac{P(t_i)}{P(t_{i-1})}\right)$$

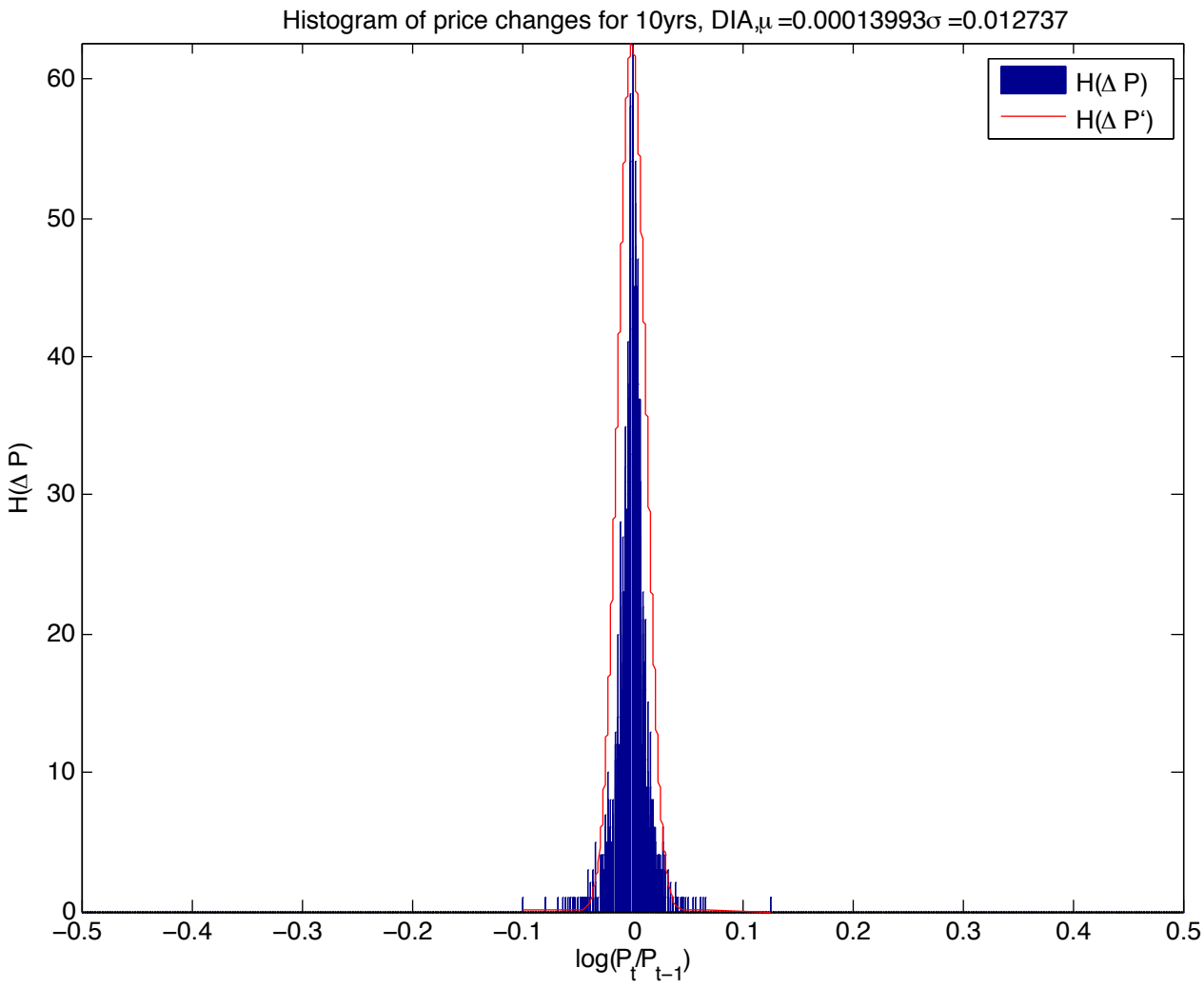
Note that $P(t_i)$ is the price, or value of the index, at the close on day i.

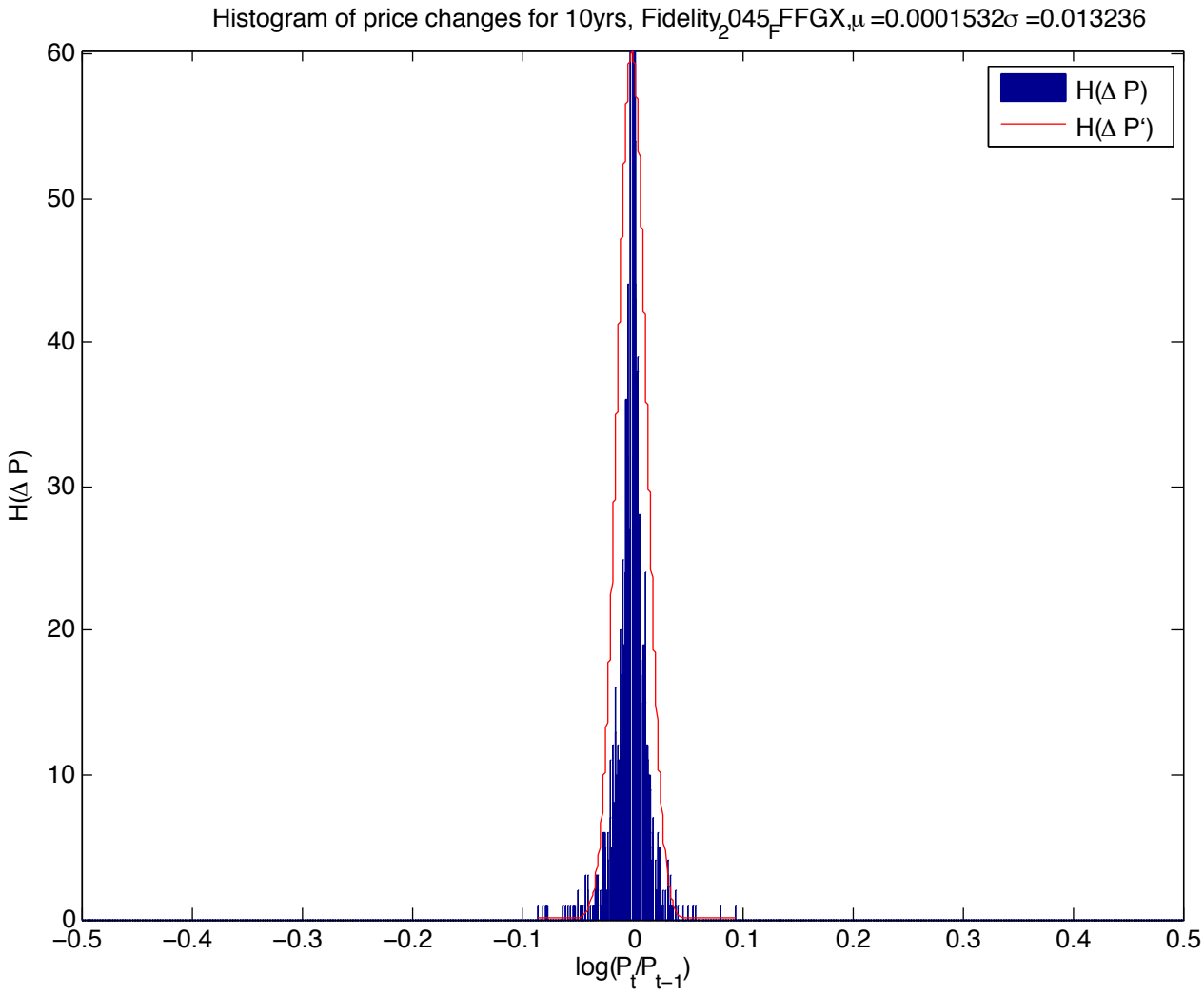
3. Plot the 10 histograms as in Project 2, and also plot the Gaussian histogram as before on the same plot. As before, the Gaussian you want has the same mean and standard deviation as the actual data.

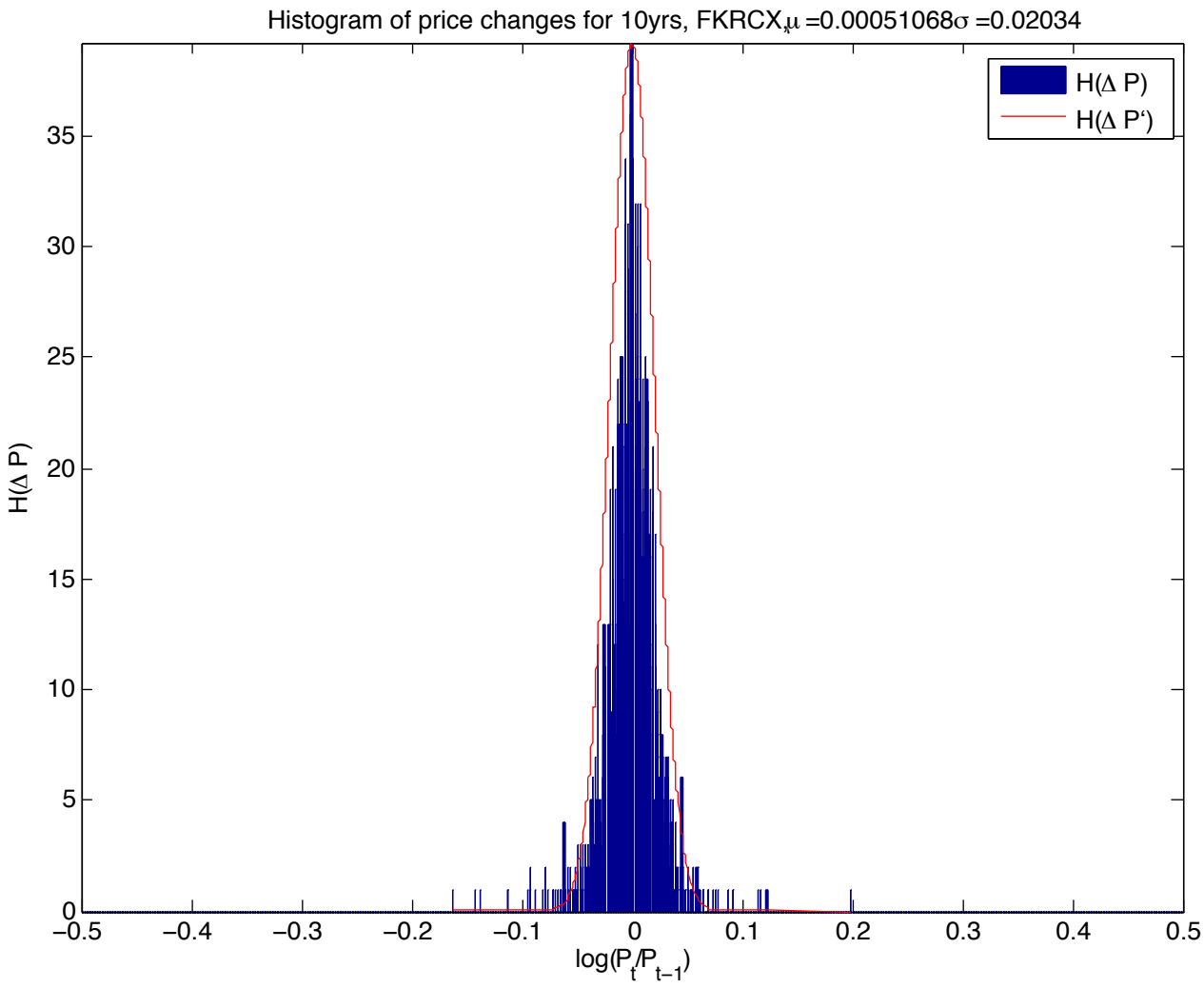
```
%READ CSV FILE
%This creates a matrix without the headings
clear, clc
str = 'SWISX';
fileID = fopen([str '.csv']);
C = textscan(fileID, '%s%*f%*f%*f%*f%*f%f','HeaderLines',1,'Delimiter',',');
fclose(fileID);%This grabs the dates and adjusted closing price

date = C{1,1}; %First cell contains dates
date_format= 'yyyy-mm-dd';  %used to convert to datenum
date=datenum(date,date_format);


closing = C{1,2}; %Second cell contains closing values

date=flipud(date); %reverse the order of date
closing=flipud(closing); %reverse the order of date


%need first date in date array: date_1=date(1,1)
% give the number of elements in array numel(date, :, 1)

delta_t = 1;
%Define delta_P function. This For loop function steps through the date array
% and performs the delta_P alogorithm, saving it to an array called delta_P
for m = delta_t+1:numel(date, :, 1)%starts with delta_t and ends with number of elements
in date array
    delta_P(m) = log(closing(m))-log(closing(m-delta_t));
end
mu = mean(delta_P);
sigma = std(delta_P);

x = linspace(-.5,.5,numel(delta_P, 1, :));
% generates a row vector y of n points linearly spaced between and including a and b
% this is necessary for ploting HG
%creates bin sizes
new = histc(delta_P,x);

P = sort(delta_P);
HG = (2)*exp(-(.5)*((P-mu)/(sigma)).^2)/(sigma*sqrt(2*pi));


figure(2)
bar(x,new/trapz(x,new));hold on %Divide by area to normalize plot
plot(P,HG,'r');hold off
title(['Histogram of price changes for 10yrs, ',str,',','\mu =', num2str(mu),'\sigma =',
num2str(sigma)])
legend('H(\Delta P)','H(\Delta P')');
ylabel('H(\Delta P)')
xlabel('log({P_t}/{P_{t-1}})')
axis ([min(x(:)) max(x(:)) 0 max(HG(:))])
```

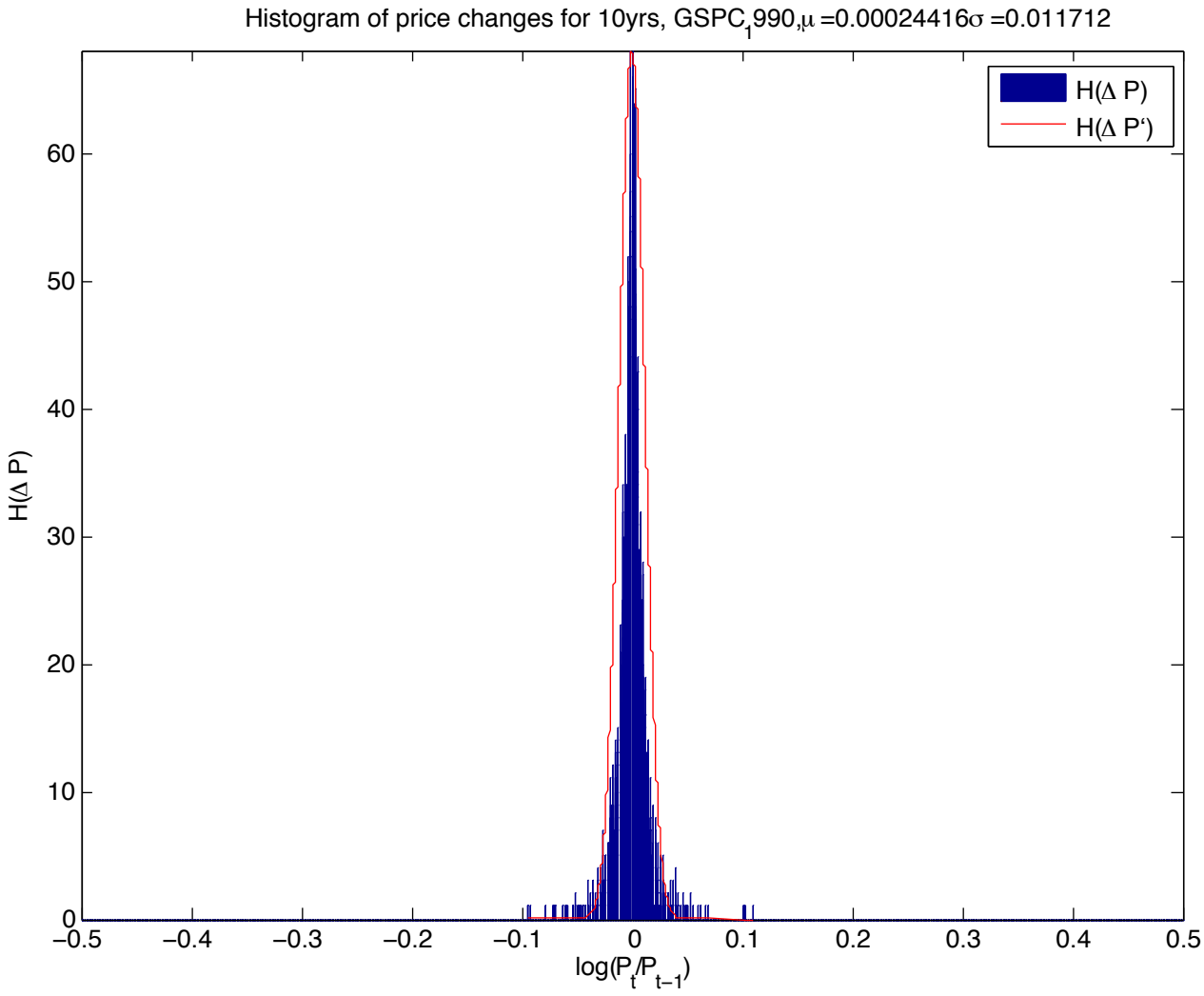

Histogram of price changes for 10yrs, anagx,μ =0.00029478σ =0.0045995
H(Δ P)
H(Δ P')
H(Δ P)
log(P_t/P_t−1)
0
1
2
3
4
5
6
7
−0.1
−0.05
0
0.05
0.1

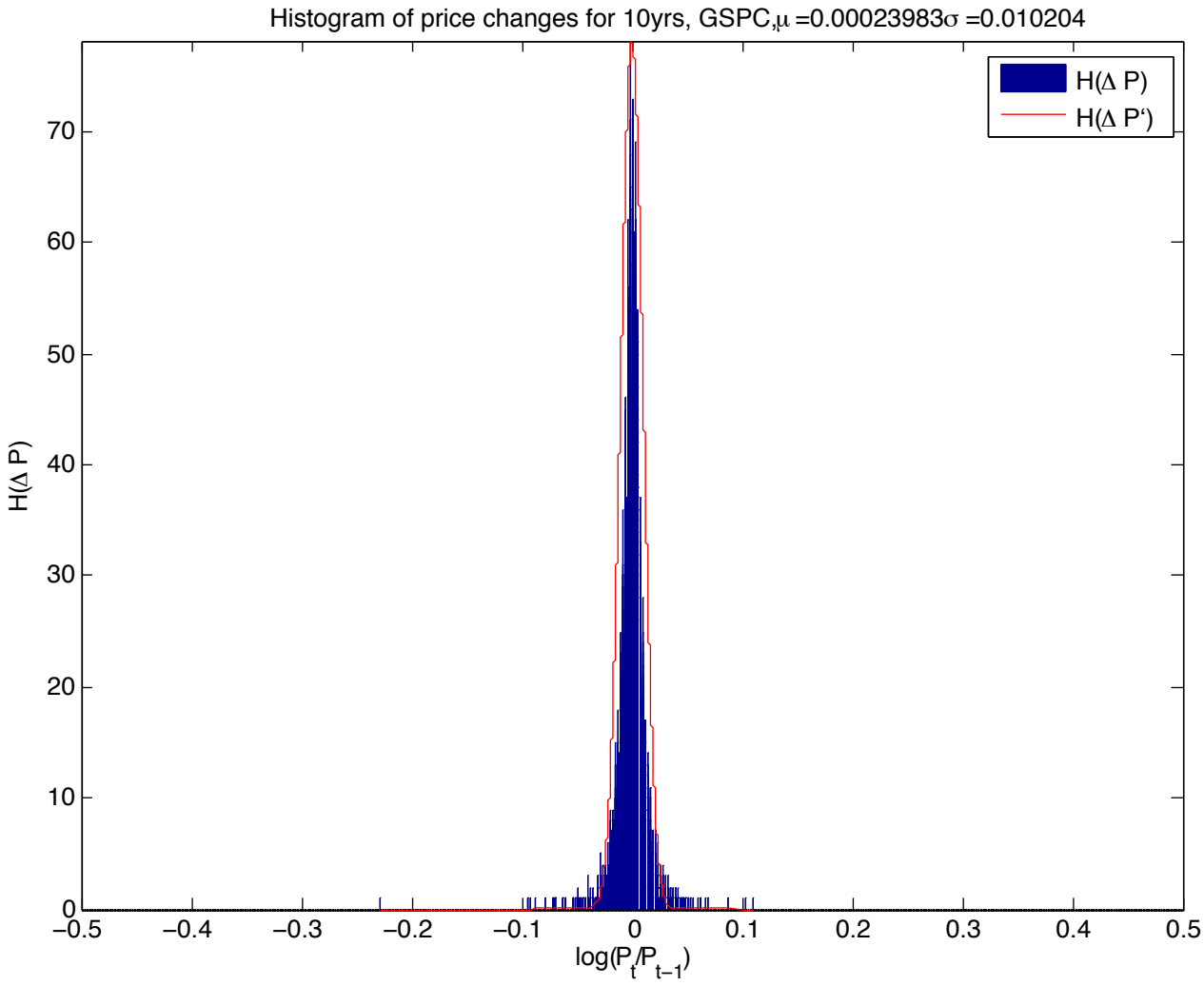

Histogram of price changes for 10yrs, DEMAX,μ =0.0003407σ =0.013966
H(Δ P)
H(Δ P')
H(Δ P)
log(P_t/P_t−1)
0
10
20
30
40
50
−0.5
−0.4
−0.3
−0.2
−0.1
0
0.1
0.2
0.3
0.4
0.5

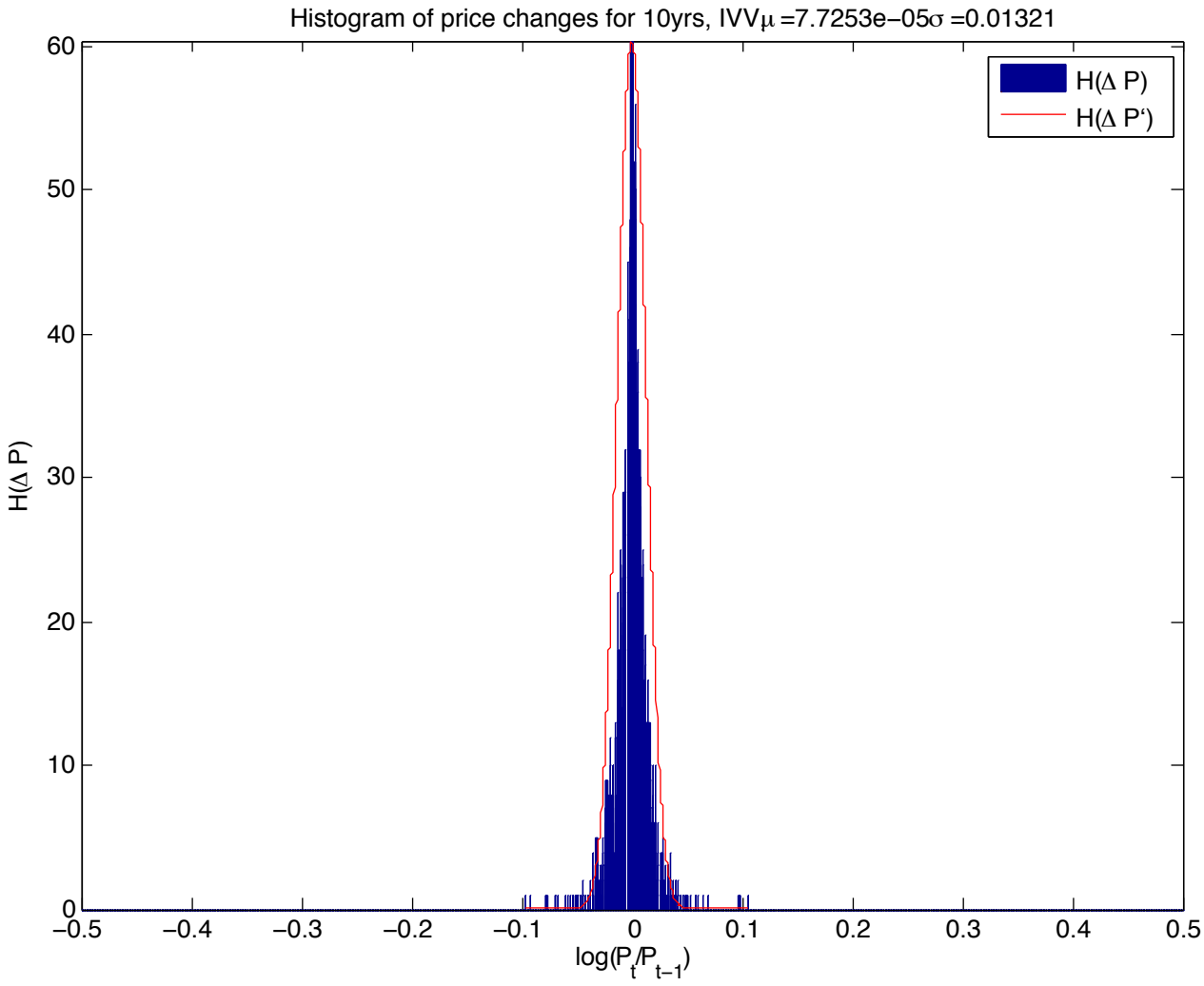

Histogram of price changes for 10yrs, DIA,μ =0.00013993σ =0.012737
H(Δ P)
H(Δ P')
H(Δ P)
log(P_t/P_t−1)
60
50
40
30
20
10
0
−0.5
−0.4
−0.3
−0.2
−0.1
0
0.1
0.2
0.3
0.4
0.5

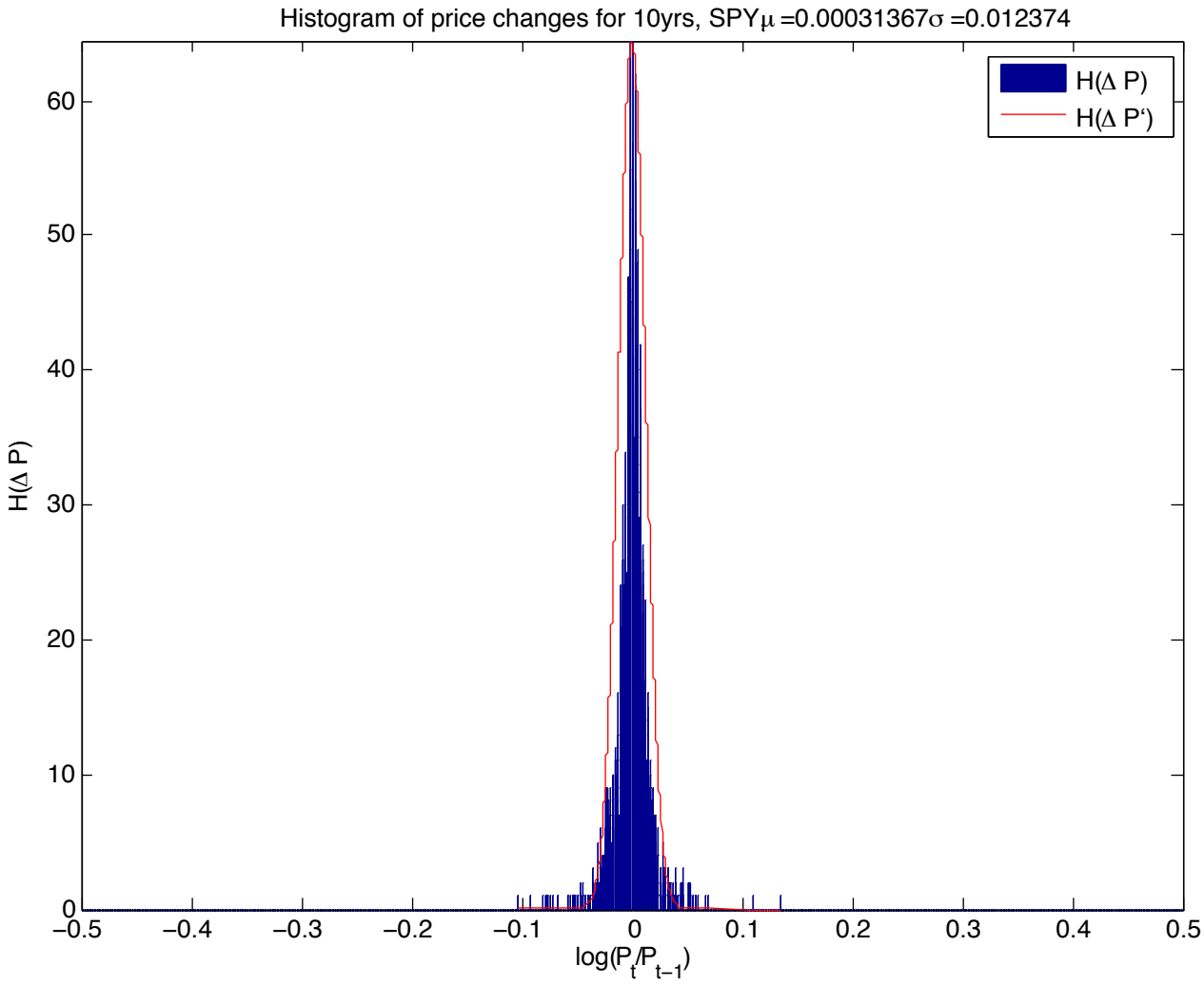

Histogram of price changes for 10yrs, Fidelity2045FFGX,μ =0.0001532σ =0.013236
H(Δ P)
H(Δ P')
H(Δ P)
log(Pt/Pt−1)
60
50
40
30
20
10
0
−0.5
−0.4
−0.3
−0.2
−0.1
0
0.1
0.2
0.3
0.4
0.5

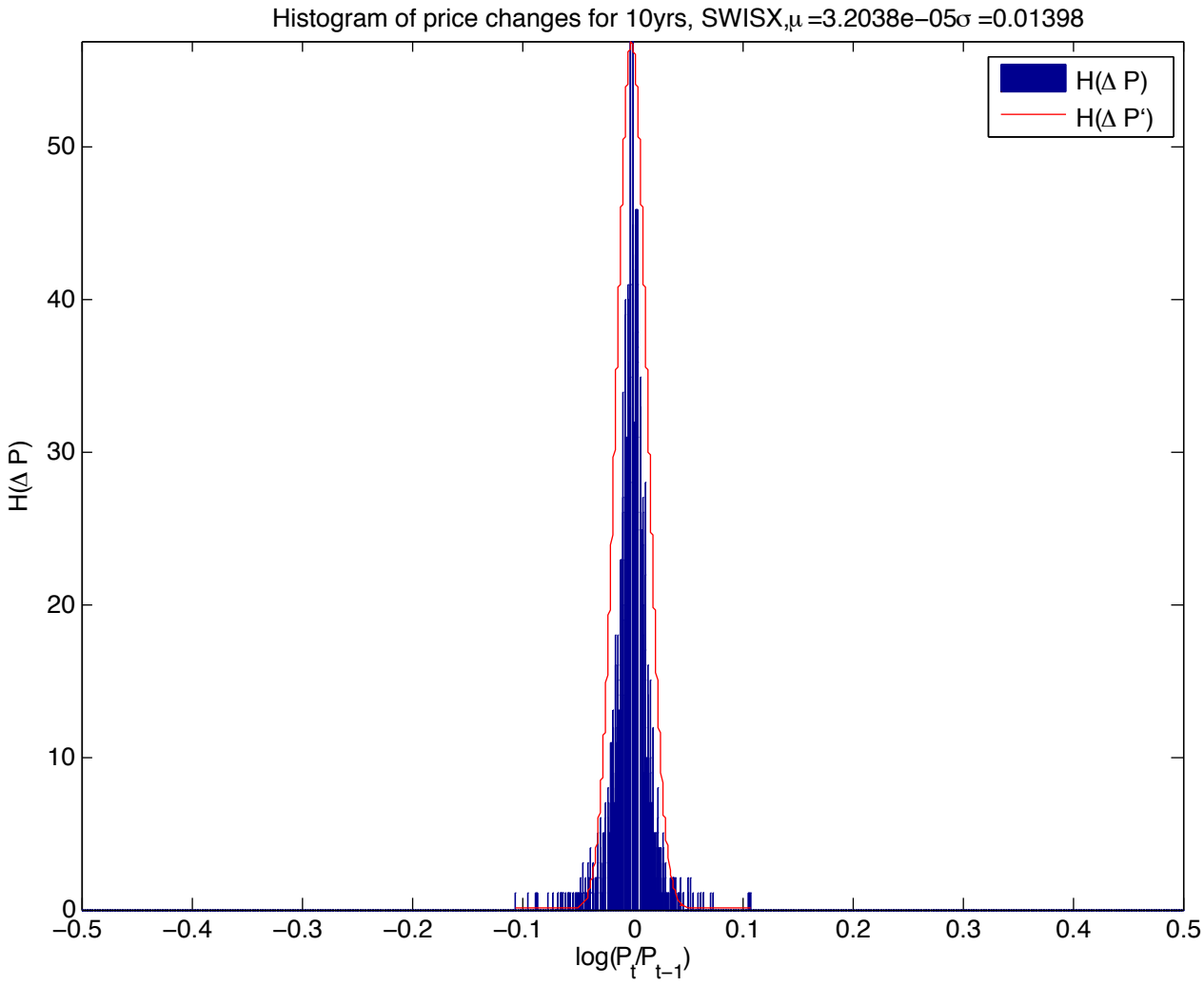

Histogram of price changes for 10yrs, FKRCX, μ =0.00051068 σ =0.02034
H(Δ P)
H(Δ P')
H(Δ P)
log(P_t/P_t−1)
35
30
25
20
15
10
5
0
−0.5
−0.4
−0.3
−0.2
−0.1
0
0.1
0.2
0.3
0.4
0.5

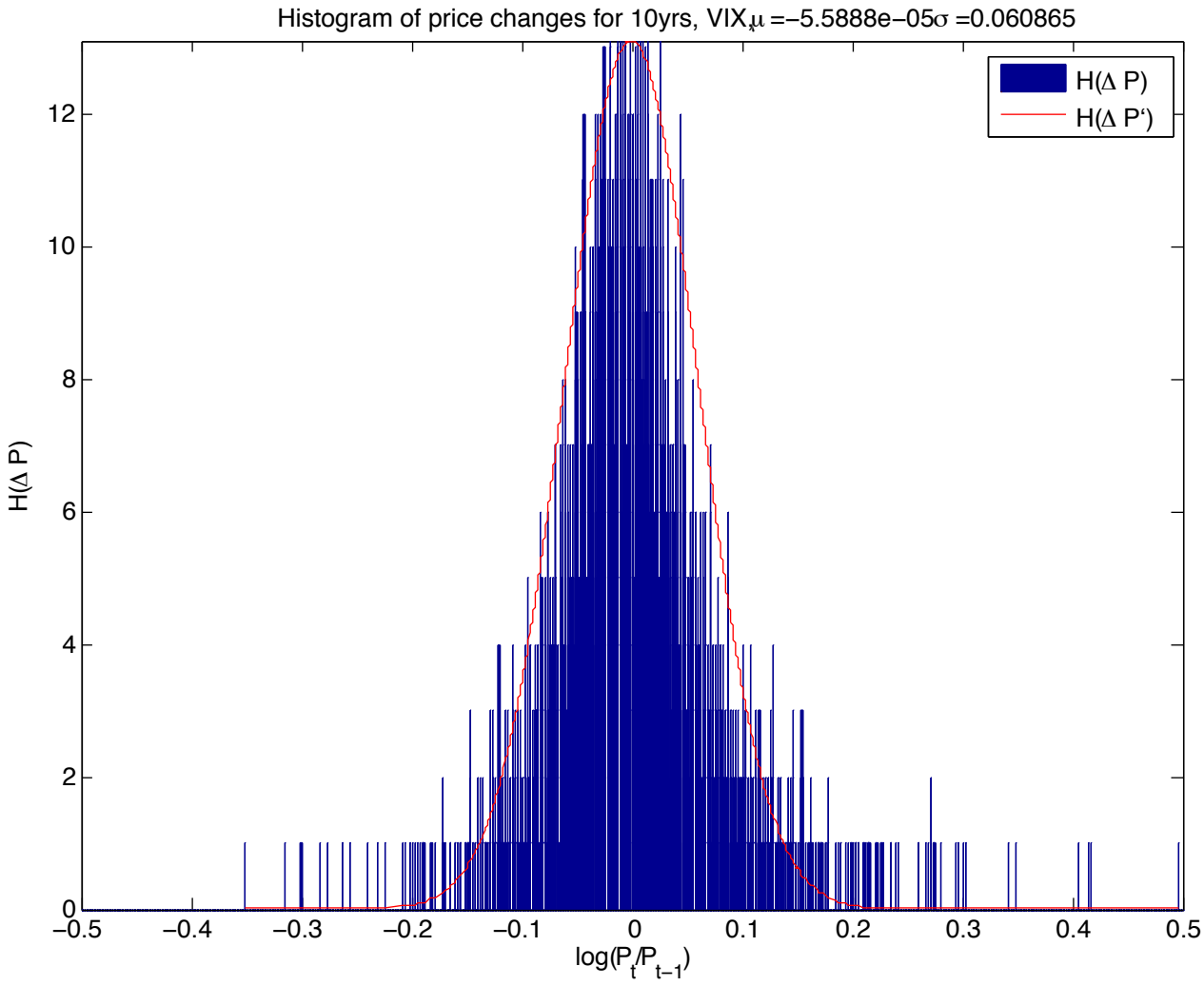

Histogram of price changes for 10yrs, GSPC_1990,μ =0.00024416σ =0.011712
H(Δ P)
H(Δ P')
H(Δ P)
log(P_t/P_t−1)
60
50
40
30
20
10
0
−0.5
−0.4
−0.3
−0.2
−0.1
0
0.1
0.2
0.3
0.4
0.5


Histogram of price changes for 10yrs, GSPC,μ =0.00023983σ =0.010204
H(Δ P)
H(Δ P')
H(Δ P)
log(P_t/P_t−1)
0
10
20
30
40
50
60
70
−0.5
−0.4
−0.3
−0.2
−0.1
0
0.1
0.2
0.3
0.4
0.5


Histogram of price changes for 10yrs, IVVμ =7.7253e−05σ =0.01321
H(Δ P)
H(Δ P')
H(Δ P)
log(P_t/P_t−1)
60
50
40
30
20
10
0
−0.5
−0.4
−0.3
−0.2
−0.1
0
0.1
0.2
0.3
0.4
0.5


Histogram of price changes for 10yrs, SPYμ =0.00031367σ =0.012374
H(Δ P)
H(Δ P')
H(Δ P)
log(P_t/P_t−1)
60
50
40
30
20
10
0
−0.5
−0.4
−0.3
−0.2
−0.1
0
0.1
0.2
0.3
0.4
0.5


Histogram of price changes for 10yrs, SWISX,μ =3.2038e−05σ =0.01398
H(Δ P)
H(Δ P')
H(Δ P)
log(P_t/P_t−1)
0
10
20
30
40
50
−0.5
−0.4
−0.3
−0.2
−0.1
0
0.1
0.2
0.3
0.4
0.5


Histogram of price changes for 10yrs, VIXμ =−5.5888e−05σ =0.060865
H(Δ P)
H(Δ P')
H(Δ P)
log(P_t/P_t−1)
0
2
4
6
8
10
12
−0.5
−0.4
−0.3
−0.2
−0.1
0
0.1
0.2
0.3
0.4
0.5