```
data = readtable('Economic_Predictor_GWData.xlsx');
data1 = readtable('er_MS_data.xlsx');

er = data1{:, "excessReturn"};
MS = data1{:, "MS"};

[E,v] = eig(cov(data{:, :}));
[v,ind] = sort(diag(v),'descend');
E = E(:,ind(1:14));

pcaf = data{:, :}*E(:,1:1);


% Horizon-1 Regression

res_hor_1 = ols(er(2:end),[ones(143,1) pcaf(1:end-1,:)]);


% Horizon-3 Regression

arr = [];
arr(end+1) = er(2) + er(3) + er(4);
for i=3:142

     temp_er = er(i)+er(i+1)+er(i+2);
     arr(end+1) = temp_er;

end

n = length(er);
arr = reshape(arr, [141,1]);

res_hor_3 = ols(arr(1:end),[ones(n-3,1) pcaf(1:end-3)]);


f_start = 0.5;
n1 = fix(n*f_start);
n2 = n-n1;


% MSE for Horizon-1
h = 1;
y = zeros(n-h+1,1);
for i=1:(n-h+1);
    s=0;
    for j=0:(h-1);
        s=s+er(i+j);
    end;
    y(i)=s;
end;

y_true=y((n1+1):(n-h+1));

%historical mean
y_hm=zeros(n2-h+1,1);
for i=1:length(y_hm);
    y_hm(i)=mean(y(1:(n1-h+i)));
end;
```

```
MSE_hm=mean((y_hm-y_true).^2);
MSE_0=mean((0-y_true).^2);

%direct method
y_direct=zeros(n2-h+1,1);
for i=1:length(y_direct);
    [a_lh,b_lh,~]=long_horizon_regression_direct(er(1:(n1-h+i)), pcaf(1:(n1-
h+i)),h);
    y_direct(i)=a_lh+b_lh*x(n1-1+i);
end;


% MSE for Horizon-3
h = 3;
y = zeros(n-h+1,1);
for i=1:(n-h+1);
    s=0;
    for j=0:(h-1);
        s=s+er(i+j);
    end;
    y(i)=s;
end;

y_true=y((n1+1):(n-h+1));

%historical mean
y_hm=zeros(n2-h+1,1);
for i=1:length(y_hm);
    y_hm(i)=mean(y(1:(n1-h+i)));
end;

MSE_hm=mean((y_hm-y_true).^2);
MSE_0=mean((0-y_true).^2);

%direct method
y_direct=zeros(n2-h+1,1);
for i=1:length(y_direct);
    [a_lh,b_lh,~]=long_horizon_regression_direct(er(1:(n1-h+i)), pcaf(1:(n1-
h+i)),h);
    y_direct(i)=a_lh+b_lh*x(n1-1+i);
end;
```