1. Now you compute the time-series average of each of these parameters and test for the statistical significance of these parameters using the standard *t*-test. Are they statistically significant? Do you find a trade-off between the market beta and expected return? Is the market risk premium you estimated from the regressions statistically different from the empirical risk premium estimated using the sample averages? Do you find a significant mis-pricing?

We first compute the 180 betas for time period from 2004.1 to 2018.12. From the computed t-statistics for these betas, we can observe that the beta parameters are significant for all of the 10 stocks.

The t-statistics for gamma_1 is 2.4584. Gamma_1 is significant when we use a significance level of 5%. It is not significant is we use a significance level of 1%. This is because the critical t-value is 2.3 for 5% and 3.35 for 1%.

The t-statistics for the diffence between the estimated market premium and empirical risk premium is 1.1557. This value is smaller than the critical value for 5% significance level. Therefore, the diffence is not significantly different from 0. Therefore is no significant mis-pricing.

There is no significant mispricing.

```
% fit a linear regression using 60 past observations
% Compute a vector of 180 betas

% r_i - r_f = alpha + beta * (r_m - r_f) + sigma

stocks_ret = stocks(:,[2 4]);
r_i = stocks_ret{:,2};
r_f = tbill{:,2};
r_m = sp500{:,2};
% fit linear regression for stock KO
betas = zeros(180,10);
params = zeros(1,2);
index = 0;
for j = 1:240:2400
    index = index +1;
    r_i_selected = r_i(j:j+239);
    for i = 1:180
        r_i_train = r_i_selected(i:i+59);
        r_m_train = r_m(i:i+59);
        r_f_train = r_f(i:i+59);
        y = r_i_train - r_f_train;
        x = r_m_train - r_f_train;
        x_new = [ones(length(x),1) x];
        params = inv(x_new.'*x_new)*x_new.'*y;
        betas(i,index) = params(2);
    end
end


ret_mat = zeros(240,10);
index = 0;
for j = 1:240:2400
    index = index +1;
    r_i_selected = r_i(j:j+239);
```

```
    ret_mat(:,index) = r_i_selected;
end

% Compute gamma values using beta
gamas = zeros(180,2);
params = zeros(1,2);
for i = 61:240
    r_i_select = ret_mat(i,:);
    y = r_i_select - r_f(i);
    y = y.';
    beta = betas(i-60,:);
    beta = beta.';
    x = [ones(length(beta),1) beta];
    params = inv(x.'*x)*x.'*y;
    gamas(i-60,:) = params;
end

% Compute t statistics for beta and gammas
mu_beta = mean(betas);
sigma_beta = sqrt(var(betas));
t_betas = mu_beta./(sigma_beta/sqrt(length(betas)))
```

```
t_betas = 1×10
   53.2349   47.6315   49.4320   75.0647   54.8292   47.2613  145.8029   62.8402 ⋯
```

```
gama_0 = gamas(:,1);
gama_1 = gamas(:,2);
mu_gama_0 = mean(gama_0);
sigma_gama_0 = sqrt(var(gama_0));
t_gama_0 = mu_gama_0./(sigma_gama_0/sqrt(length(gama_0)))
```

```
t_gama_0 = 0.2787
```

```
mu_gama_1 = mean(gama_1);
sigma_gama_1 = sqrt(var(gama_1));
t_gama_1 = mu_gama_1./(sigma_gama_1/sqrt(length(gama_1)))
```

```
t_gama_1 = 2.4584
```

```
% Compute t-statistics for risk premium
emp_risk_premium = r_m(61:240) - r_f(61:240);
t_premium = mean(gama_1-emp_risk_premium)/(sigma_gama_1/sqrt(length(gama_1)))
```

```
t_premium = 1.1557
```