# Econometrics Assignment 3

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**C) Data Summary:**

| Variable | Mean | SD | Min | Max |
|---|---:|---:|---:|---:|
| General Motors Return | $-0.0122$ | 0.1291 | $-0.3893$ | 0.2766 |
| Microsoft Return | 0.0023 | 0.1072 | $-0.3435$ | 0.4078 |
| Exxon-Mobil Return | 0.0097 | 0.0538 | $-0.1165$ | 0.2322 |
| General Motors Risk Premium | $-0.0147$ | 0.1289 | $-0.3893$ | 0.2714 |
| Microsoft Risk Premium | $-0.0003$ | 0.1072 | $-0.3479$ | 0.4038 |
| Exxon-Mobil Risk Premium | 0.0072 | 0.0537 | $-0.1195$ | 0.2301 |
| Market Return | 0.0009 | 0.0464 | $-0.1847$ | 0.0839 |
| Market Risk Premium | $-0.0017$ | 0.0463 | $-0.1849$ | 0.0819 |
| Risk Free Return | 0.0026 | 0.0014 | 0.0000 | 0.0052 |

From this summary table, we can see that the average return for General Motors is negative with a value of -0.0122. The other two stocks - Microsoft and Exxon-Mobil - each demonstrate a positive mean return. Additionally, General Motors has the highest standard deviation on its returns, more than double the Exxon-Mobil standard deviation and slightly above Microsoft's standard deviation. We will see that this extra volatility demonstrated by both General Motors and Microsoft as compared to Exxon-Mobil will be mirrored in the securities' beta values. The market return in this period had an average value of 0.0009 with a standard deviation of 0.0464, only slightly lower than Exxon-Mobil's standard deviation. The risk-free return in this period was 0.0026 on average wit ha standard deviation of 0.0014. This extremely low volatility is what we expect from U.S. Treasury Bills.

**D)**

# Distribution of Microsoft Risk Premium

Using data from 120 monthly observations from January 1999 – December 2008
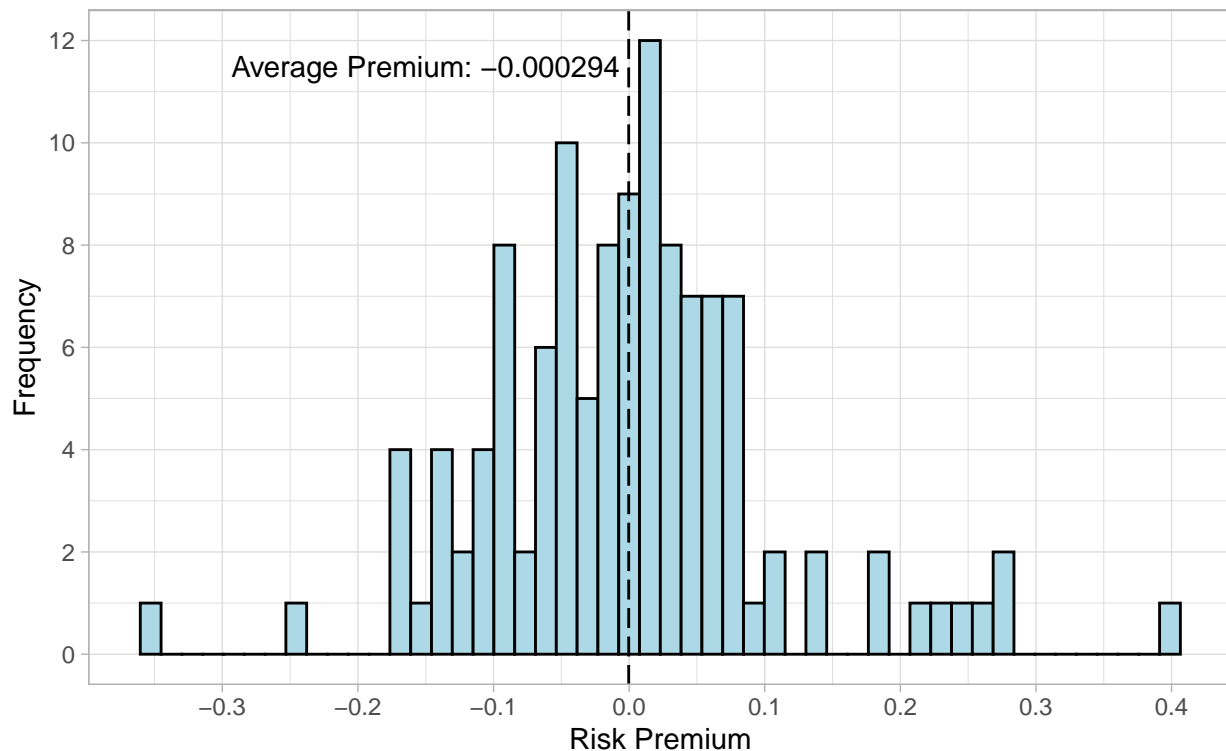


This histogram demonstrates the fairly normal distribution of the Microsoft risk premium. Most of the monthly risk premium data fall in the range from -0.1 to 0.1 with several observations well beyond this mark in both positive and negative directions. The most common range of risk premiums recorded was in the bin just above 0 from about 0 to 0.02.

**E)**

Using OLS regression of company risk premium on the market risk premium, we find that the CAPM beta values for the three companies are as follows: Microsoft: 1.332; General Motors: 1.302; Exxon-Mobil: 0.395. These security beta values sugest Microsoft and General Motors are more aggressive stocks - with Microsoft being slightly more aggressive - while Exxon-Mobil presents a more defensive position.

**F)**

```
null <- 1
se_msft <- 0.174326
beta_msft <- 1.33228
t_msft <- (beta_msft - null) / (se_msft)
p_msft <- 2*(1 - 0.9716)
# p-value Microsoft 0.0568

se_gm <- 0.22656
beta_gm <- 1.30222
t_gm <- (beta_gm - null) / (se_gm)
p_gm <- 2*(1 - 0.9082)
# p-value GM 0.1836

se_xom <- 0.1005
```

```
beta_xom <- 0.3945
t_xom <- (beta_xom - null) / (se_xom)
# p-value Exxon < 0.0001
```

Based on the above calculations, we find the p-value for Microsoft is 0.0568, which is greater than the alpha value of 0.05 at a 5% significance level. Therefore, we fail to reject the null hypothesis that the beta for Microsoft is equal to 1 at a 5% significance level. The p-value of General Motors is 0.1836, well above 0.05; we are unable to reject the null hypothesis that the beta of General Motors is 1. The p-value of Exxon-Mobil is extremely close to 0 and well below 0.05, meaning we are able to reject the null hypothesis that the beta of Exxon-Mobil is equal to 1.

**G)**

For a company in a given month, a factor that may contribute to the error term is a new product that increases the stock's monthly return above its normal performance. Additionally, a firm's quarterly earnings report may very well affect the stock's returns for a given month, as could a change in leadership at the company.