FIN251 Fall 2022
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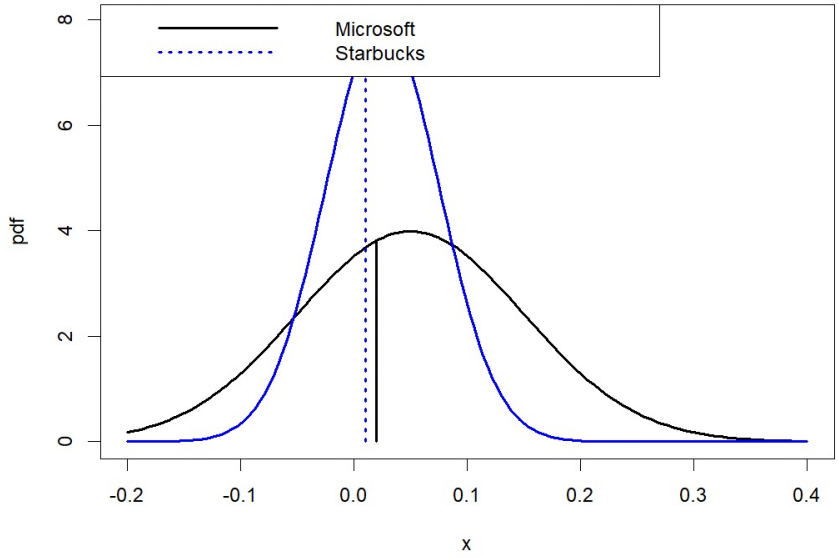
Laboratory Exercise for Group Project I
Working with Risk-Return Trade offs and Value-at-Risk
Due: Thursday, Nov. 9th

Exercises

1. Let X denote the monthly return on Microsoft stock and let Y denote the monthly return on Starbucks stock. Assume that $X \sim N(0.05, (0.10)^2)$ and $Y \sim N(0.025, (0.05)^2)$.

- Using a grid of values between -0.25 and 0.35, plot the normal curves for X and Y. Make sure that both normal curves are on the same plot.
- Comment on the risk-return tradeoffs for the two stocks.



Microsoft 주식의 수익률 분포는 평균이 0.05이고 표준편차가 0.1으로 높은 변동성을 나타냅니다. 따라서, Microsoft 주식은 더 높은 리스크를 가지고 있지만, 더 높은 수익률을 제공합니다.
반면에, Starbucks 주식 수익률 분포는 평균이 0.025이고 표준편차가 0.05로 Microsoft에 비해 낮은 변동성을 가집니다. 따라서, Starbucks 주식은 더 낮은 리스크를 가지며, 더 낮은 예상 수익률을 제공합니다.

2. Let R denote the *simple* monthly return on Microsoft stock and let W_0 denote initial wealth to be invested over the month. Assume that $R \sim N(0.04, (0.09)^2)$ and that $W_0 = \$100,000$.

- Determine the 1% and 5% value-at-risk(VaR) over the month on the investment. That is, determine the loss in investment value that may occur over the next month with 1% probability and with 5% probability.

```
> VaR.01
[1]  16937
> VaR.05
[1]  10804
```

3. Let r denote the *continuously compounded* monthly return on Microsoft stock and let W_0 denote initial wealth to be invested over the month. Assume that $r \sim iidN(0.04, (0.09)^2)$ and that $W_0 = \$100,000$.

- Determine the 1% and 5% value-at-risk (VaR) over the month on the ivestment. That is, determine the loss in investment value that may occur over the next month with 1% probability and with 5% probability. (Hint: compute the 1% and 5% quantile from the Normal distribution for r and then convert continuously compounded return quantile to a simple return quantile using the transformation $R = e^r - 1$)

- Determine the 1% and 5% value-at-risk (VaR) over *the year* on the investment. (Hint: to answer this question, you must determine the normal distribution that applies to the annual (12 month) continuously compounded return. This was done as an example in class.)

```
> VaR.01
[1]  15580
> VaR.05
[1]  10241
```

```
> print(paste("연간 1% VaR:", VaR_1_yearly))
[1] "연간 1% VaR:  21751.7318049464"
> print(paste("연간 5% VaR:", VaR_5_yearly))
[1] "연간 5% VaR:  3228.20513458605"
```