ECOM 2001 Term Project: (Your Assigned Stocks Here)

Your Name Here (Your Student ID here)

Due 30/09/2024 at 9:00 AM AWST

```
# Include comments in your coding to explain what you are doing.

# You can delete unnecessary comments/hints that I have provided.

# Replace your name, student ID and your three assigned stocks in the YAML.

# Knit frequently to ensure your coding is working and explanations are formatted
# in the text as you intend.

# YOU MUST ONLY USE THE STOCKS ASSIGNED TO YOU

# Any deviation from the assigned stocks will results in a grade of zero.
```

```
# packages
library(tidyquant) # for importing stock data

library(tidyverse)   # for working with data
# library(broom)     # for tidying output from various statistical procedures
library(knitr)       # for tables
# library(kableExtra)  # for improving the appearance of tables

# Add any additional packages that you use to this code chunk
```

1 Import the Data (2 points)

```
## 1) Import your assigned stocks

## Use the package tidyquant. You may need to install this package first.

## Replace Stock1, Stock2, Stock3 with your assigned stock names (in quotation marks),
## uncomment the code, and Run

## The beginnig date is January 01,2000

## The ending date is the date you knit and submit your project

# yourDataName<-c("Stock1", "Stock2","Stock3") %>%
#   tq_get(get = "stock.prices", from = "2000-01-01")%>%
```

```
#   select(symbol, date, adjusted)

## This is your data set for this project (rename yourDataName to something more descriptive)

## output the first 6 rows of your data frame:

# head(yourDataName, n = 6 )%>%
#    kable(caption = "Your caption.")
```

2 The Analysis

2.1 Plot prices over time (4 points)

Plot the **prices** of each asset over time separately.

Succinctly describe in words the evolution of each asset over time. **(limit: 100 words for each time series)**.

```
## Don't forget to add fig.cap= "Your caption" to the code chunk header.

## facet_wrap() may be useful
```

2.2 Calculate returns and plot returns over time (4 points)

Calculate **the daily percentage returns** of **each asset** using the following formula:

$$r_t = 100 * \ln\left(\frac{P_t}{P_{t-1}}\right)$$

Where P_t is the asset price at time t. Then plot the **returns** for each asset over time.

```
## Hint: you need to add a column to your data frame (yourDataName).

## You can use the mutate() function

## Don't forget to group_by()

## The lag() function can be used to find the price in the previous date

## Double check your results!!
```

2.3 Histogram of returns (6 points)

Create a **histogram** for **each of the returns series**.

You have to explain your choice of bins. (Hint: Discuss the formula you use to calculate the bins)

2.4 Summary table of returns (5 points)

Report the descriptive statistics **in a single table** which includes the mean, median, variance, standard deviation, skewness and kurtosis for each series.

What conclusions can you draw from these descriptive statistics?

```
## Your summary table here. Be sure to format the table appropriately.
```

2.5 Are average returns significantly different from zero? (6 points)

Under the assumption that the **returns of each asset** are drawn from an **independently and identically distributed normal distribution**, are the expected returns of each asset statistically different from zero at the 1% level of significance?

Part 1: Provide details for **all 5 steps to conduct a hypothesis test**, including **the equation for the test statistic**. (1 points)

Part 2: Calculate and report all the relevant values for your conclusion and be sure to provide an interpretation of the results. (Hint: you will need to repeat the test for expected returns of each asset) (3 points - one for each stock)

Part 3: If you would have done this question using Chat-GPT, what answer will you get? (hints: you will need to describe how you **prompt** the question in Chat-GPT to guide the answer (1 point), would expect your answer to be different or similar to your answer above (1 point))

```
## Hint: you can extract specific values from t.test objects using the $

## Eg. using  t.test(x,y)$statistic   will extract the value of the test statistic.

## Consult the help file for the other values generated by the t.test() function.

## The relevant values are: the t-test method, the estimated mean ,  the test statistic,
## whether the test is one or two tailed, the degrees of freedom, and the p-value.
## (You might wish to present this in a table)
```

2.6 Are average returns different from each other? (7 points)

Assume the **returns of each asset** are **independent from each other**. With this assumption, are the mean returns statistically different from each other at the 1% level of significance?

Provide **details for all 5 steps to conduct each of the hypothesis tests** using what your have learned in the unit.(2 points)

Calculate and report all the relevant values for your conclusion and be sure to provide and interpretation of the results. (*Hint: You need to discuss the equality of variances to determine which type of test to use.*) (3 points)

If you have a chance to engage Chat-GPT, how would you approach this question? That is, you need to **clearly lay out ALL STEPS that you would ask the question to Chat-GPT**. (1 points)

Now, compare your answer to Chat-GPT, **why do you think your answer is different or similar?** Please attach a picture of the screenshot of the answer you have got from Chat-GPT. **What do you learn from this exercise?** (1 points)

```
## Decide on which test is appropriate for testing differences in mean returns

## Hint: Include the results of your supporting test for the differences in variances
## (include all 5 hypothesis step tests and the equation for the test statistics,
## and a clear interpretation of the result).

## Hint: http://www.sthda.com/english/wiki/one-way-anova-test-in-r

## So this section has (at least) 2 significance tests.
```

2.7 Correlations (2 points)

Calculate and present the **correlation matrix of the returns**.

Discuss the direction and strength of the correlations.

```
## Include a formatted correlation matrix here

## Hint: http://www.sthda.com/english/wiki/correlation-matrix-a-quick-start-guide-to-analyze-format-and
```

2.8 Testing the significance of correlations (2 points)

Is the assumption of independence of stock returns realistic?

Provide evidence (the hypothesis test including **all 5 steps of the hypothesis test** and **the equation for the test statistic**) and a rationale to support your conclusion.

```
## Report the results of tests for statistical significance of the correlations here.

## Hint: http://www.sthda.com/english/wiki/correlation-matrix-a-quick-start-guide-to-analyze-format-and
```

2.9 Advising an investor (12 points)

Suppose that an investor has asked you to assist them in choosing **two** of these three stocks to include in their portfolio. The portfolio is defined by

$$r = w_1 r_1 + w_2 r_2$$

Where r_1 and r_2 represent the returns from the first and second stock, respectively, and w_1 and w_2 represent the proportion of the investment placed in each stock. The entire investment is allocated between the two stocks, so $w_1 + w_2 = 1$.

The investor favours the combination of stocks that provides the highest return, but dislikes risk. Thus the investor's happiness is a function of the portfolio, r:

$$h(r) = \mathbb{E}(r) - \mathbb{V}ar(r)$$

Where $\mathbb{E}(r)$ is the expected return of the portfolio, and $\mathbb{V}ar(r)$ is the variance of the portfolio.[1]

Given your values for $\mathbb{E}(r_1)$, $\mathbb{E}(r_2)$, $\mathbb{V}ar(r_1)$, $\mathbb{V}ar(r_2)$ and $\mathbb{C}ov(r_1, r_2)$ which portfolio would you recommend to the investor? What is the expected return to this portfolio?

[1] Note that $\mathbb{E}(r) = w_1 E(r_1) + w_2 \mathbb{E}(r_2)$, and $\mathbb{V}ar(r) = w_1^2 \mathbb{V}ar(r_1) + w_2^2 \mathbb{V}ar(r_2) + 2 w_1 w_2 \mathbb{C}ov(r_1, r_2)$

Provide evidence to support your answer, including all the steps undertaken to arrive at the result. (*Hint: review your notes from tutorial 6 on portfolio optimisation. A complete answer will include the optimal weights for each possible portfolio (pair of stocks) and the expected return for each of these portfolios.)

```
# You can use this section to create a table of your results.
```