Empirical Finance: Assignment 1

By Group 15

Lanlan Hou	2801069
Rick van der Ploeg	2782774
Sebastiaan van Dijen	2769505
Wa Chak Sou	2796840

School of Business and Economics

3rd November 2025

QUESTION 1: Stock prices and returns

a. Prices and returns plots of HSBC stocks

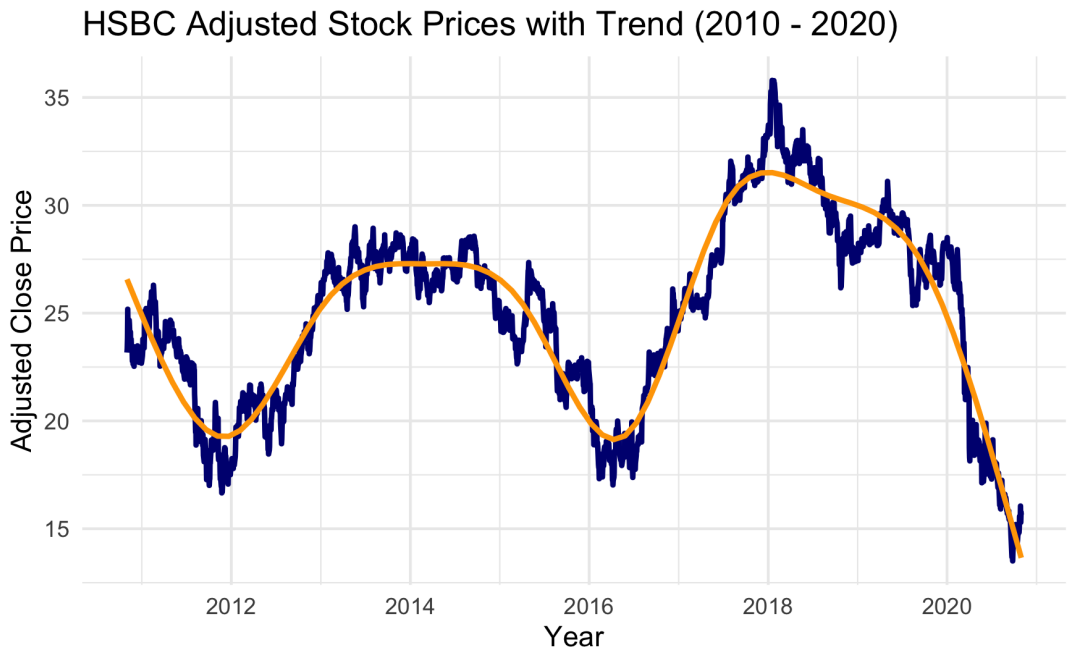

Figure 1.1 Adjusted Close Price of HSBC (November 2010 to November 2020)

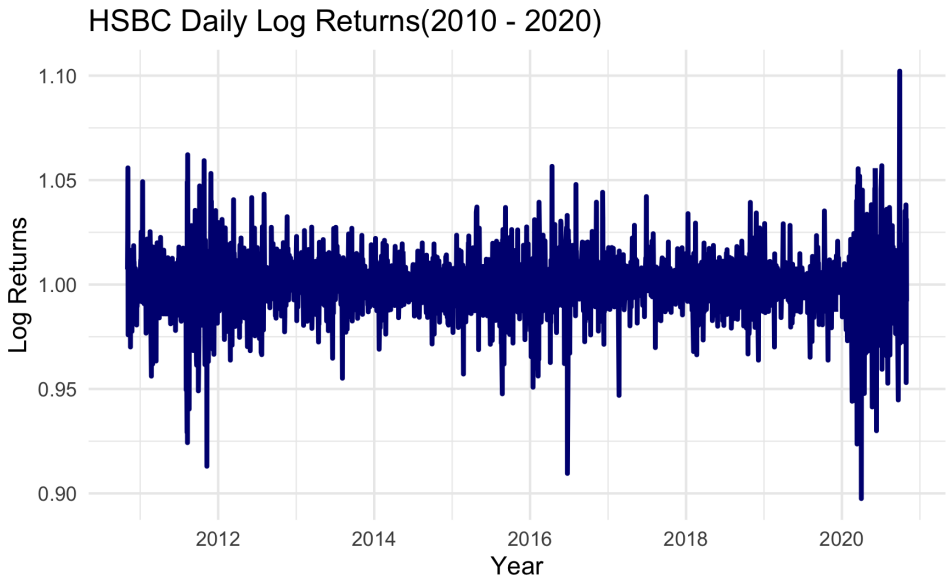

Figure 1.2 Log Returns of HSBC (November 2010 to November 2020)

b. Relevant summary statistics

Statistic	Value
Mean	24.994385
Std. Deviation	4.356907
Minimum	13.508404
P10	18.641351
Median	25.693600
P90	30.548970
Maximum	35.793488
Skewness	-0.200543
Kurtosis	-0.553233

Table 1.2.1: Summary Statistics for Daily HSBC Adjusted Close Price

Statistic	Value
Mean	0.999951
Standard Deviation	0.014561
Minimum	0.897537
P10	0.984219
Median	1.000000
P90	1.015472
Maximum	1.102154
Skewness	-0.389458
Kurtosis	5.470995

Table 1.2.2: Summary Statistics for Daily HSBC Log Returns

From the table we observe that the HSBC's adjusted prices fluctuated between roughly $13.50 and $35.79 during 2010-2020, with an average around $25, suggesting moderate long-term volatility(4.36). The daily log returns show a slightly negative mean and moderate volatility. The negative skewness(-0.55) and high kurtosis(5.8) indicate that the return distribution is left-skewness and leptokurtic – implying more large drops than large gains, and extreme movements are more common than in a normal distribution.

Question 2: Return distributions

a. Distribution of the returns

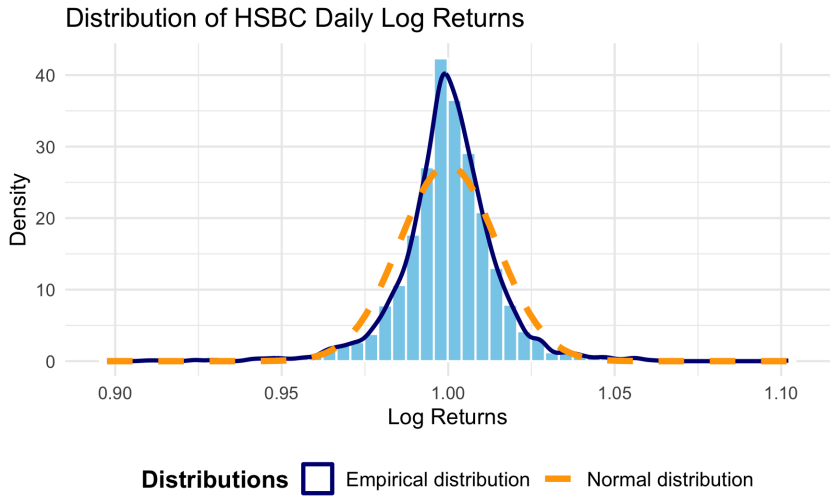

Figure 2.1 Distribution of log returns)

Figure 2.1 shows the distribution of the log returns for HSBC. The histogram of log returns (in blue) is overlaid with the corresponding normal distribution curve (in red) for comparison. It is evident that the distribution is leptokurtic (more peaked) and exhibits minor skewness, indicating only small deviations from a perfectly normal shape. Overall, the returns appear to be approximately normally distributed, as the normal curve fits the histogram, with no strong evidence of fat tails or extreme outliers.

b. Normality test of returns

To formally test for normality, the **Jarque–Bera (JB)** test was conducted. The hypotheses for the test are formulated as follows:

$$H_0 : \text{The returns are normally distributed,}$$
$$H_1 : \text{The returns are not normally distributed.}$$

JB Test Statistic	Critical Value (5% level)	p-Value
3202.7	5.99	0.00

Table 2.1: Jarque–Bera (JB) normality test for HSBC Log Returns

Table 2.1 reports the results of the JB normality test. The computed JB statistic (3202.7) is far greater than the 5% critical value (5.99), and the associated p-value is 0.00. Hence, we **reject the null hypothesis** of normality at the 5% significance level.

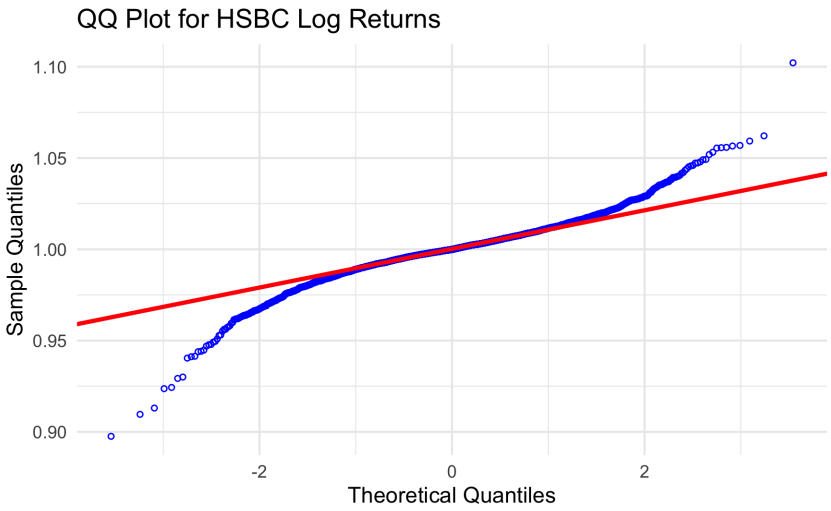

Figure 2.2 QQ Plot for HSBC Log Returns)

The QQ plot (Figure 2.2) further supports this conclusion, showing clear deviations from the theoretical normal line, particularly in the tails.

Conclusion: The results clearly indicate that the HSBC log returns are not normally distributed. The distribution exhibits excess kurtosis and fat tails, confirming the presence of non-normal behavior commonly observed in empirical financial data.