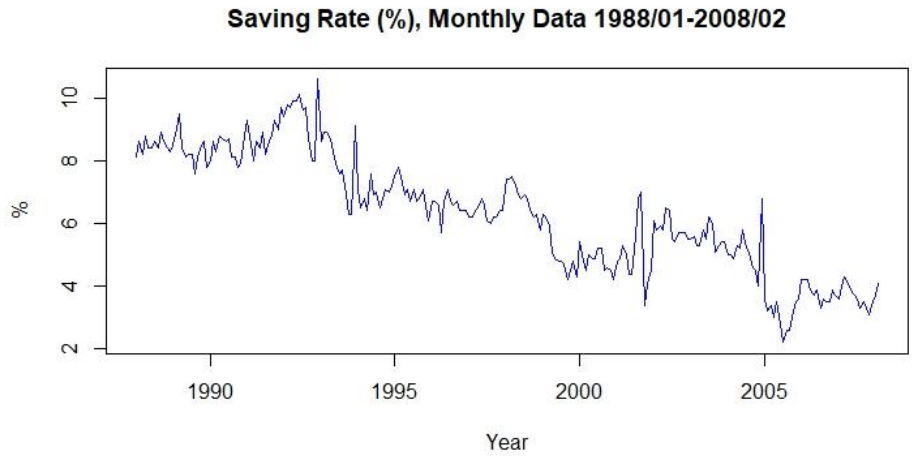
1.

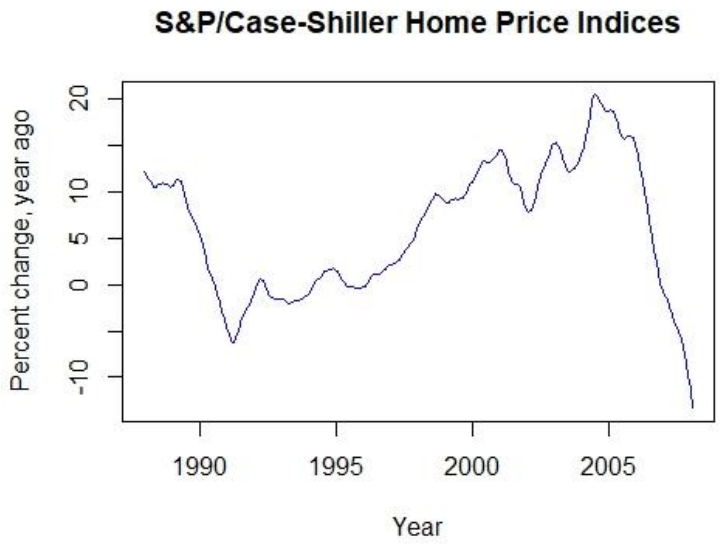
Figure E.2



This figure depicts the saving rate time series measured in terms of a percentage. The periodicity is monthly and the time series displays a general downward trend

a. The saving rate is the amount of money that is subtracted from an individual's disposable income that is expressed as a percentage
b. A negative saving rate is where individuals of a population consume and spend more than their individual disposable income. We observe a dip in Figure E.2 where the Saving Rate goes below 0 and it occurs during both 2005 as well as the end of 2007, approaching 2008.
c. With increasing income and GDP, people tend to spend and consume more. Additionally, there has been an increase in the population's access to borrowed funds such as through financial intermediaries as well as government policies which encourage people to consume rather than save. This creates a high level of debt which fuels consumption and decrease savings over time.

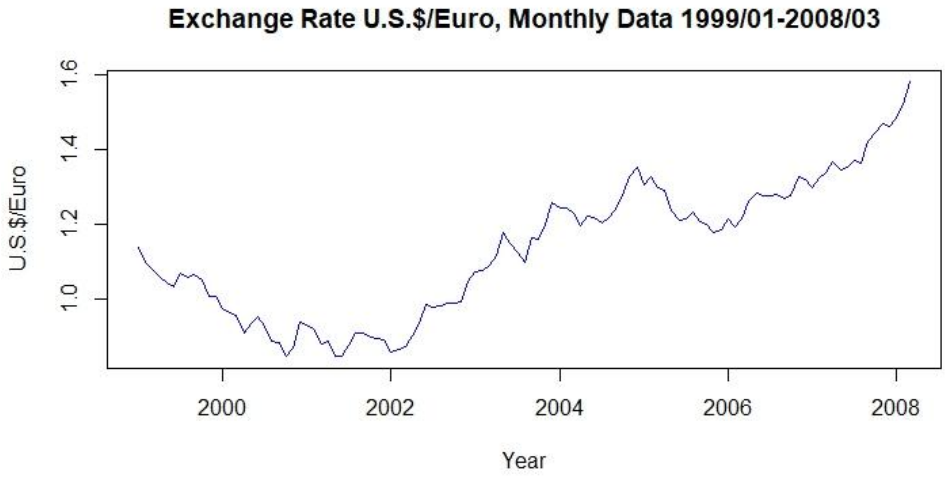
Figure E.4



This figure depicts the Case-Shiller home price index time series measured in terms of a percent change from a year ago. The periodicity is monthly and the time series displays an upward trend from 1992 onwards up till around 2004 where it declines rapidly

a. The Case-Shiller Index is a group of indexes that measures the changes in home prices throughout the 10 and 20 largest cities in the US.
b. There is a housing market bubble from 1996 to 2006 as observed in the index as the house prices are increasing at a tremendous rate.
c. Several factors occurred during this period which led to the 2008 Housing Bubble Crisis. Regulation in the financial markets was weak as lending conditions were very loose. Interest rates were very low and the US Government also promoted the concept of owning houses. Thus, this leads to huge inflows of money into the housing markets. As the interest rates began to rise during 2006, it caused house prices to fall which led to mortgage defaults leading to many foreclosures, causing the housing bubble to burst.

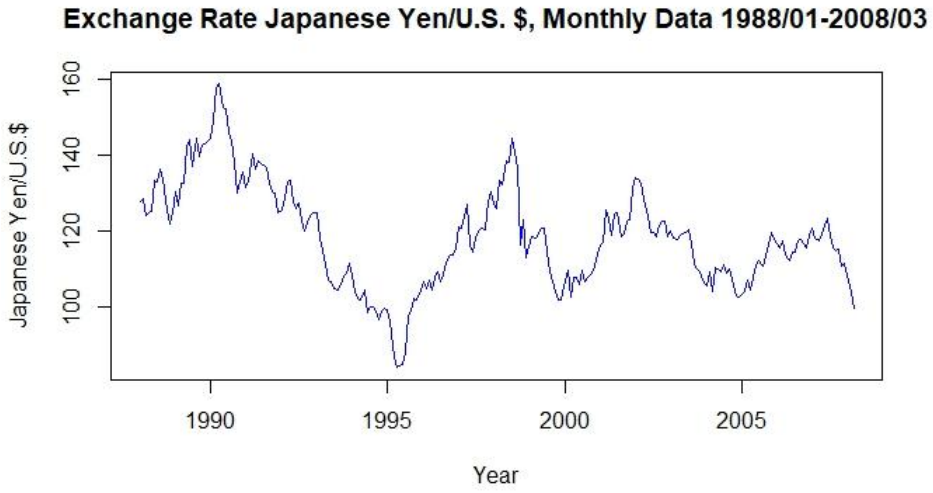
Figure E.6



This figure depicts the time series of the exchange rate, U.S. $/euro. The periodicity is monthly and the time series displays a general downward trend from 1999 to 2002 and a gradual upward trend from 2002 onwards.

a. The exchange rate is the value of a country's currency in terms of another country's currency. The value of the US/euro = 1.5 means that 1 Euro is equivalent to $1.5 US.
b. In Figure E.6, we observe that the Euro is appreciating from the year 2002 to 2008.
c. Similarly, the dollar is depreciating from the year 2002 to 2008.

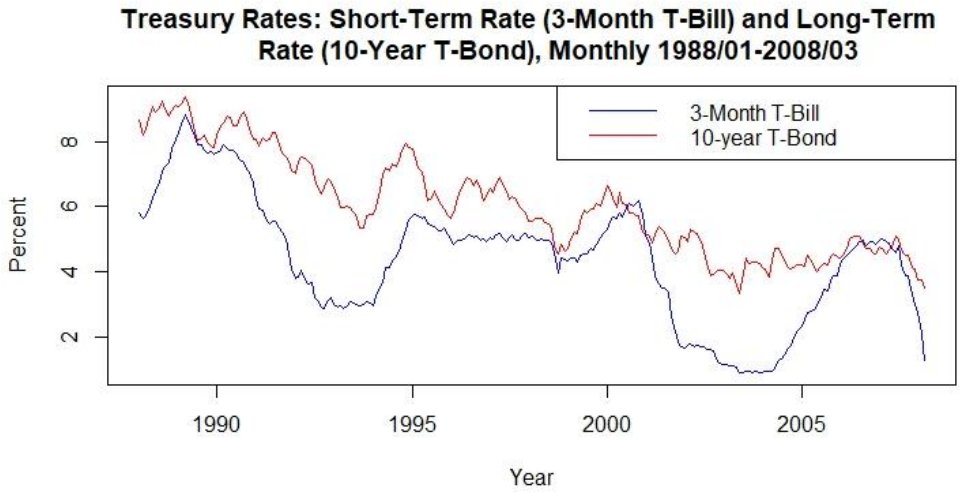
Figure E.7



This figure depicts the time series of the exchange rate, Yen/U.S. $. The periodicity is monthly and the time series does not display a general trend throughout the years.

a. The value of the yen/$ = 120 means that 1 US dollar is equivalent to 120 Japanese yen.
b. The yen appreciates during the time period of the downward sloping trend in Figure E.7. This includes the years 1990-1995, 1998-2000, 2002-2005 and 2007-2008.
c. Similarly, the US dollar depreciates during the time period of the downward sloping trend in Figure E.7. This includes the years 1990-1995, 1998-2000, 2002-2005 and 2007-2008.
d. Yes. If we were to take the information in Figure E.6 with US$/euro and multiply it with the information in Figure E.7 with Yen/US$, we would obtain the exchange rate of Yen/Euro, allowing us to construct its series.

Figure E.9



This figure depicts the short-term rate (3-month T-Bill) and the long-term rate (10-year T-Bond) time series. The periodicity is monthly and the time series displays a general downward trend throughout the years.

- No sub questions were posted in Figure E.9

2.

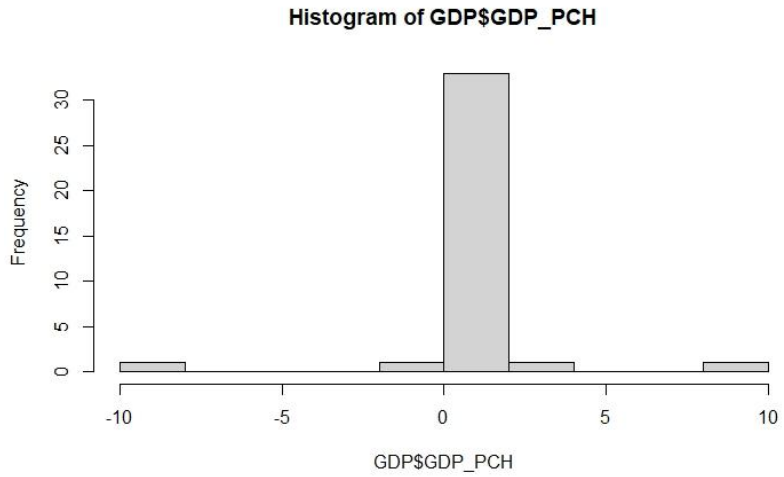
Exercise 2

U.S. GDP quarterly growth rates from 1/1/2012-1/1/2021

Descriptive Statistics

```
    DATE               GDP_PCH
Length:37          Min.   :-9.4662
Class :character   1st Qu.: 0.7237
Mode  :character   Median : 0.9866
                   Mean   : 0.9313
                   3rd Qu.: 1.3911
                   Max.   : 8.4535
```

Histogram

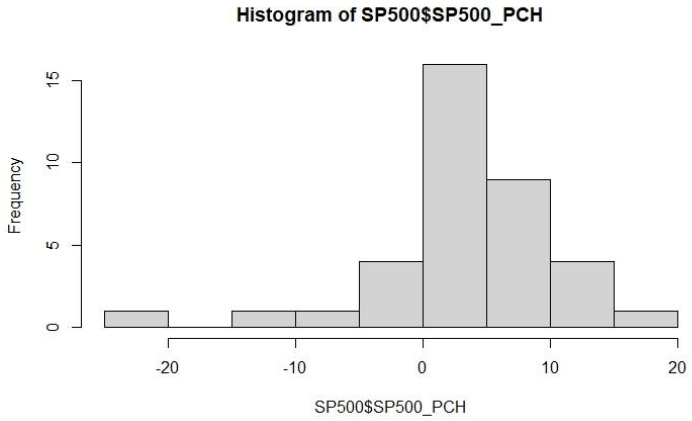


S&P 500 quarterly returns from 2011/10-2021/04

Descriptive Statistics

```
    DATE              SP500_PCH
Length:37          Min.   :-20.001
Class :character   1st Qu.:  0.773
Mode  :character   Median :  3.788
                   Mean   :  3.405
                   3rd Qu.:  6.454
                   Max.   : 19.953
```

Histogram



We would expect the two series to be contemporaneously positively correlated. This is because we would expect the stock market to boom as the economy grows. On the other hand, we would also expect the stock market to crash if the economy experiences a recession.

Exercise 3

The results of the R-squared and Adjusted R-squared determined from R are as follows.

Regression	R-squared	Adjusted R-squared
a. reg1	0.0145	-0.01365
b. reg2	0.4335	0.4168
c. reg3	0.4866	0.4132
d. reg4	0.535	0.4489

The R-squared value determines the goodness of fit of the data. With higher R-squared values, it implies that a higher proportion of the variation in the dependent variable is explained by the independent variable. However, a drawback of the R-squared is that it is also positively correlated with more independent variables. Thus, the adjusted R-squared takes this factor into account.

I prefer the regression from part d. (reg4) the most since both the R-squared and adjusted R-squared have the largest value thus, having the best goodness of fit measure for the model.

Exercise 4

Model (a)
The significance level I have selected is a 5% significance level. Since there are 37 observations, our degrees of freedom is 36. Therefore, for a two-tailed test, the critical value would be +/- 2.0281 whereas for the one tailed test, it would be +/- 1.6883 depending on whether it is a right tailed test or left tailed test.

From our code in R, we obtained a t value of -0.718 for the coefficient of the S&P 500 growth rate. Conducting a two-tailed test, we would reject the null hypothesis if the t value is larger than 2.0281. Therefore, since the t value is not larger than 2.0281, we have insufficient evidence to reject the null hypothesis. Hence, the correlation between the S&P 500 returns and GDP growth is statistically insignificant.

On the other hand, for the right tailed test, the t value of -0.718 is not larger than 1.6883. Therefore, we have insufficient evidence to reject the null hypothesis. Hence, the positive correlation between the S&P 500 returns and GDP growth is statistically insignificant.

For the left tailed test, the t value of -0.718 is not less than -1.6883. Therefore, we have insufficient evidence and we fail to reject the null hypothesis. Hence, the negative correlation between the S&P 500 returns and GDP growth is statistically insignificant.

Thus, we conclude that there is no correlation between S&P 500 returns and GDP growth in model (a).

Model (b)
Similarly to Model (a), the significance level I have selected is a 5% significance level. Therefore, for a two-tailed test, the critical value would be +/- 2.0281 whereas for the one tailed test, it would be +/- 1.6883 depending on whether it is a right tailed test or left tailed test.

From our code in R, we obtained a t value of 5.101 for the coefficient of the lagged S&P 500 growth rate. Conducting a two-tailed test, we would reject the null hypothesis if the t value is larger than 2.0262. Therefore, since the t value is larger than 2.0262, we have sufficient evidence to reject the null hypothesis. Hence, the correlation between the lagged S&P 500 returns by a period and GDP growth is statistically significant.

For the right tailed test, the t value of 5.101 is larger than 1.6871. Therefore, we have sufficient evidence to reject the null hypothesis. Hence, the positive correlation between the lagged S&P 500 returns and GDP growth is statistically significant.

For the left tailed test, the t value of 5.101 is within the acceptance region since it is not less than -1.6883. Therefore, we have insufficient evidence and we fail to reject the null hypothesis. Hence, the negative correlation between the S&P500 returns and GDP growth is statistically insignificant.

Since the coefficient of the lagged S&P500 returns appear to be statistically positively correlated with GDP growth, we conclude that from the data analysed, the stock market is a leading indicator of GDP growth for a time period of one-quarter.