1. (10 points) Price of a bond that pays coupon C every 6 months until maturity and and the face value F at maturity can be calculated as:

$$P = \sum_{j=1}^{n} Ce^{-y(t_j) \times t_j} + Fe^{-y(t_n) \times t_n}$$

where n is the total number of coupon payments received from the bond, t_j is the time until a coupon j is paid, and $y(t_j)$ is the interest rate for maturity t_j.

Write a program in R to calculate the price of the bond, given its coupon C, face value F, the number of coupon payments n, and the interest rate $y(0.5), y(1), ..., y(n)$. (Assume that the time to the first coupon payment is 6 months.)

Remember to include

1. your `GitHub` username,

2. the name of the public repository you've created to store your files in, and

3. the file names themselves.

2. (10 points) In five hundred words (one page maximum) summarise the important points made in §3.1 and §3.2 of the textbook.

3. (15 points) We have a dataset, `singapore.economy.csv`, that contains Singapore economic variables as well as foreign variables. The variables in the dataset are described in Table 1.

   (a) (1 point) Read the dataset into R and name it dataset

   (b) (1 point) Some data fields contain `NA`. Please exclude all records that contain NA (Hint: use `na.omit()`)

   (c) (2 points) Plot Singapore GDP against time. Label horizontal axis as 'Time'; label vertical axis as 'GDP (%)'. Put a title 'Singapore GDP growth' on above the plot.

   (d) (2 points) Calculate the mean and standard deviation of Singapore GDP for each of the three periods defined by variable *period*. Then use the calculated statistics for each period to create a data table named 'stat.table'.

   (e) (2 points) Using function pairs(), provide a scatterplot for every pair of variables in the dataset, except for *time* and *period*.

   (f) (2 points) Use the lm() function to perform a simple linear regression with *gdp* as the response and *exp* as the predictor. Use the summary() function to print the results. Comment on the output.

(g) (2 points) Fit a multiple regression model to predict *gdp* using the following variables: *exp*, *epg*, *hpr*, *oil*, *gdpus*, *crd*. Use the summary() function to print the results. Comment on the output.

(h) (3 points) Calculate the 5% quantile of *gdp* using function quantile(). The economy is said to be in a crisis state if *gdp* is lower than its 0.05 quantile, and in a normal state otherwise. Based on *gdp*, create a factor vector for the economy state and name it *state*. Then put this vector in the dataset using the data.frame() function. For the *state*, fit the logistic regression model using up to year 2007 as training data period, with *bci* as the only predictor. Compute the confusion matrix.

Table 1: Variables in 'singapore.economy.csv' dataset

Variable notation	Description
time	Time measured in years.
gdp	GDP growth rate (%)
exp	Export growth rate (%)
epg	Real price of main equity
crd	Credit to gdp ratio
hpr	Real house price
gdpus	US GDP growth rate (%)
oil	Real price of crude oil
bci	Business confidence index
period	Equals 1 for years [1990-1998]; 2 for [1999-2007]; 3 for [2008-2017]

$$\boxed{\text{End of quiz}}$$

The submission deadline for this part of your Take Home Quiz 1 assessment is noon on March 21 2019. You need to submit your solutions (in one `.pdf` file) to the link on `iLearn` prior to this time. Your solutions may be typed or handwritten and scanned. You *must* show all your working in your solutions for full marks. Refer to the `Background information:` `take-home quiz 1 (THQ1)` link on `iLearn` for further submission details. Please note that uploading a file can take up to 15 minutes. You need to submit your file at least 20 minutes before the deadline to ensure a successful submission.