TERM PAPER
BAN436

Spring, 2023

Start: 13.01.23 14:00

End: 27.01.23 14:00

THE TERM PAPER SHOULD BE SUBMITTED IN WISEFLOW

You can find information on how to submit your paper here:
https://www.nhh.no/en/for-students/examinations/home-exams-and-assignments/

Your candidate number will be announced on StudentWeb. The candidate number should be noted on all pages (not your name or student number). In case of group examinations, the candidate numbers of all group members should be noted.

SUPPLEMENTARY REGULATIONS FOR EXAMINATIONS

You can find supplementary regulations under the headline "Regulations"

https://www.nhh.no/en/for-students/regulations/

Find more information under chapter 4.0 in the Supplementary provisions to the regulations for fulltime study programmes

Number of pages, including front page: 5

Number of attachments: 3

BAN436 Group term paper

About the exam

- Deadline for submission is Friday 27th of January at 14:00. This is a hard deadline!
- You must register and submit as a group in Wiseflow. Groups can consist of 2-3 students.
- Your submission must be a zipped folder that contains your jupyter notebook and any other additional data files that are necessary to execute the code.
- Be aware that you will most likely need to use modules and functions not explicitly covered in the lectures. Google is your friend! Learning how to search online for help and read function documentation are important learning outcomes in this course.

Price and wage growth in Norway

When the general price level in the economy increases, each unit of money buys fewer goods and services than before. This process of increasing prices is known as inflation. Different goods and services, however, tend to experience different rates of price growth. We therefore usually measure inflation as the growth in the *consumer price index* (CPI), which measures the price of a representative basket of consumer goods purchased by private households. To keep up with inflation, workers demand higher wages every year. When prices grow faster than wages, workers experience a reduction in their real purchasing power.

As in many other countries, Norway is currently experiencing high inflation rates. Your boss came across two articles from Statistics Norway, one on price growth and one on wage growth. She wants to write a report with the key insights from these articles, and she has assigned your team the task of producing some of the numbers and plots for the report.

You and your team are asked to complete the following five tasks:

Task 1 – current CPI growth

Statistics Norway maintains and updates a time series on the monthly estimate of the CPI. Your boss gives you this link to a data set that contains the following variables:

- "Consumer Price Index" (base year is 2015)
- "Monthly change" (change in consumer price index from previous month)
- "12-month rate" (change in consumer price index over the last 12 months)

This is a small data set that contains observations on these three variables only for the two most recent months with available data.

Your boss asks you to write a program that imports the data from the link and that prints the most recent estimate of the 12-month change in the CPI. The print statement should also contain information on the period for which inflation is measured over. For an example, see here.

Task 2 – CPI versus CPI-ATE

In addition to the total CPI, Statistics Norway also calculates the CPI-ATE, which is the CPI adjusted for tax changes and excluding energy products. The CPI-ATE is an important measure of inflation since it captures the underlying growth in consumer prices.

Your boss wants to reproduce figure 1 in the article on price growth, which compares the CPI to CPI-ATE over time.

For this task, you are given two files, monthly_cpi.xlsx and monthly_cpi_ate.xlsx, to create a line plot that shows the 12-month change in CPI and CPI-ATE from November 2020 to November 2022.

Task 3 – CPI by group of consumption goods

According to figure 3 in the article on price growth, different groups of consumer goods have experienced very different rates of inflation in the last year. While prices have grown on average by 6.5 % from November 2021 to November 2022, inflation for "food and non-alcoholic beverages" has been almost the double. Your boss is interested in knowing more about how inflation has evolved for different groups of consumer goods over time.

You are given this link to a data set from Statistics Norway that records observations on the same three variables as in task 1, but for 12 different groups of consumer goods. The data set contains monthly observations since 1979 and it is updated monthly.

Your boss asks you to write a program that plots time series of the 12-month change in CPI for different groups of consumption goods. However, your boss has not yet decided which groups that she wants to include in the plot and for which period to create the plot for. In the meantime, you should write a program that can produce a plot for any given set of groups and for a given time range.

Since you want to impress your boss, you also take extra care in making sure that your program can handle errors caused by invalid group names. The names of the different groups tend to be quite long, and you don't want a simple typo to cause your program to crash.

Task 4 – wage growth versus inflation

As seen in figure 1 in the article on wage growth, there have been large differences in average wage growth across years and different sectors. Your boss is interested in exploring whether wages have kept up with inflation.

You are given a file, monthly_earnings.xlsx, that contains data on the average monthly earnings (in NOK) by year and sector. Your boss wants you to use the data to produce a bar plot that shows the percent growth in average monthly earnings from 2016 to 2021 by sector.

To make it easier to compare whether wages have kept up with inflation or not, your boss wants the bar plot to also include a line (or scatter) plot that shows annual inflation in each of the years. It is up to you to decide how to measure annual inflation, but your boss suggests that you can use the 12-month change in monthly CPI with November each year as the reference month.

Task 5 – inflation around the world

Your boss is interested in exploring why some countries experience high inflation rates, and potential variables that can explain the different inflation rates across countries. She gives you this link to the World Development Indicators (WDI) database by the World Bank, which contains comparable statistics on social and economic outcomes around the globe. The database contains over 1,400 time series for 217 economies around the world, with data on many of the indicators going back more than 50 years.

You are asked to construct a data set on inflation rates and 6 potential explanatory variables of inflation for all countries in 2019 in the WDI data. You should use this indicator for inflation, but you are free to choose whichever 6 indicators in the database that think correlates with high inflation rates. Your boss wants you to create scatter plots that illustrate the relationship between inflation and the 6 indicators that you have chosen.

You notice that you can easily download the data in Excel or CSV format directly from the web page. However, you have also come across the pandas-datareader package that allows you to import data from different online sources directly into your Python program. Again, since you want to impress your boss, you read the function documentation on the wb module to figure out how to import the data that you need directly into your program.

Assessment of group term paper

The learning outcomes defines the targets for the assessment of the group term paper. The examiners will use the point system below to score each submission. To pass, a submission must achieve at least **6 out of 12** possible points.

Points	Criteria	Learning outcome
1	Jupyter notebook compiles without any errors or warnings.	• write, modify and execute Python code in Jupyter Notebook.
1	Code and analysis are explained and documented using Markdown cells.	• conduct reproducible research in Jupyter Notebook.
1	Nice-looking graphs that summarize the data well.	• visualize data.
1	Data in task 5 is imported directly into the notebook using the pandas-datareader package.	• search package documentation and online sources for help with coding.
1	The use of loops when appropriate to avoid unnecessary duplication of code.	• create functions and loops.

1	The use of self-defined functions when appropriate to avoid unnecessary duplication of code.	• create functions and loops.
1	Cleaning and transforming raw data to a format that is suitable for the analysis.	• load, manipulate and save data. • identify the appropriate format of data sets with regards to data analysis (i.e. tidy data).
5	Solutions to tasks 1-5 (1 point for each).	• perform simple data analysis (e.g. descriptive statistics, correlation analysis).