Covid-19 Impact on Price Indexes in New Zealand

CPI , PPI and Rent Price changes during 2018-2021

Jinnuo Cai 67948593

Feng Wang 37115208

Bowen Jiang 19380653

Minfang Yu 75219495

Contents

Introduction

What data sources we used?

Our group project topic is how the Covid-19 impacts the economy in New Zealand. Firstly, we used the website 'www.stats.govt.nz' and 'https://covid.ourworldindata.org' as our data sources. The website Stats NZ is used for finding different Price indexes and other information in New Zealand and the Stats NZ API is used to get the trade and NZAC data. We will compare the data from the Covid-19 period and the data before Covid-19 period. We decided to use three years of information, which is from 2018 to 2021. For the NZ daily cases of Covid-19,we use ourworldindata.org webpage and filter it out from all daily Covid-19 cases of the world.

Why did we choose those data sources?

The reason for us to choose Stats NZ and Our-World as our data resources is these two websites can provide all the data that we need. Stats NZ is a website that shows most data the New Zealand government collected. Such as estimated population, Unemployment rate, GDP, etc. It almost collected all the data in New Zealand and it is convenient to get data from Stats NZ website and API. To get daily cases of New Zealand, Covid-19 by Our world from Github is a good choice. It recorded daily cases increasing information in different countries. New Zealand is one of these countries.

What target did we choose?

Our target is to see whether the covid-19 has an impact on the country's economy and resident life by observing the changes of several price indexes. We intend to find out the different price indexes information from 2018 to 2021 in New Zealand then form a table. After that, filter out daily cases and increasing situations. Here, we need a table as well. We will join the two tables together. Through analyzing and comparing two groups of data, we should get the results that we need.

What difficulty did we meet during the Project?

The most difficult thing we encountered was using the API function. This is a completely unfamiliar function for us, we have only heard of it before and never actually used it. When we got the example code from lab material provided, we did not know the exact code meaning or even use it. Afterwards we spent plenty of time learning it and getting some help from our tutor, we can use it proficiently.

The other difficulty was transforming the type of the data. In the original data from STATS NZ API are all types of character, and We need to transfer some data from char type to date type, to integer type and other types depending on what data we got. Similarly, the original data of period from csv files extracted from STATS NZ is double type, it will automatically remove the zero after the decimal point and October(2020.10) looks like January(2020.1). We kept tweaking and changing our equations, and finally converted and sorted all the data.

Choosing and finding correct data is also a hard thing to do. There was a lot of data we found on the internet, but there are many of them we can not use because of the copyright. Some resources are missing data and some data of date arrangement do not meet what we want.

We have used some additional libraries and package for our Project

- For data mining or warling using:
    - library(tidyverse)
    - library(httr) # to work with URLs and HTTP
    - library(purrr) # to work with lists and map functions
    - library(jsonlite) # to work with JSON in R
    - library(data.table) # extension of 'data.frame'

- llibrary(dplyr) # for data manipulation
- library(glue) # to paste strings
- library(zoo) # to work with irregular time series
- library(reshape2) # to restructure and aggregate data

- For graph pilot using:
    - ibrary(ggplot2) # to create graphics
    - library(scales) # to customise the appearance of axis and legend labels

Failed and aborted parts

We failed with choosing some data sources such as economic indicators in the rbnz website. Many websites can not be accessed, therefore we had to keep changing our objects until we are able to access and extract the data. This process also took a long time.

We failed with extracting all CPI types. There are too many subgroups in CPI and it is hard to see every trend, so we only extract the data in the first level groups and see their trend.

Successful:

- We successfully accessed the StatsNZ API and got the data frame we needed.
- We successfully accessed the StatsNZ website and got csv and zip files we needed.
- We successfully extract daily new cases in New Zealand.
- We successfully used the data to form tables and graphs.
- Our graphs are easy to see the data difference before and during the Covid-19.

Code and Results

Example of API code - NZAC Annual Percentage Change

At the beginning we use the function to access STATS NZ API and get more information about Covid-19 by specifying COVID-19 as Indicator.

We set '2018-01-01' as our start date, and '2021-09-30' as our end date. Then use them to filter the data in that period.

```
startday <- as.Date("2018-01-01") # set the start date that we need to filter data
endday <- as.Date("2021-09-30") # set the end date that we need to filter data
```

New Zealand Activity Index (NZAC)

```
# We use CPACT12 NZAC as a indicator of part of our research resources
NZAC <-  Filter(function(x)!all(is.na(x)),
                         get_odata(
                           service = "https://api.stats.govt.nz/opendata/v1",
                           endpoint = "Covid-19Indicators",  # get data in Covid-19 Indicators
                           entity = "Observations",
                           query_option = "$filter=(ResourceID eq 'CPACT12')",# CPACT12 New Zealand Activity Index (NZAC)
                           service_api_key = "b64ff0071dc049ab8891f64057d33859"))

NZAC$Period <- as.Date(NZAC$Period,"%Y-%m-%d") # convert char to date type
NZAC <- NZAC[which(NZAC$Period >= startday & NZAC$Period < endday),] # filter which period of data we need
NZAC <- NZAC %>%
    select(Period, Label1, Value) %>% # select columns we need
    rename("Type" = "Label1")  # rename the columns Label1 to Type

NZAC$Type <- gsub(pattern="New Zealand Activity Index (NZAC)", "NZAC_Total_Annual_change", NZAC$Type, fixed = TRUE) # change
NZAC$Type <- gsub("NZAC component - ", "NZAC_Annual_change_", NZAC$Type)
NZAC$Type <- gsub(" ", "_", NZAC$Type, fixed = TRUE)
NZAC %>% glimpse() # Take a brief look of the data frame
```

```
 1501 obs retrievedRows: 308
Columns: 3
$ Period <date> 2018-01-31, 2018-02-28, 2018-03-31, 2018-04-30, 2018-05-31, 20~
$ Type   <chr> "NZAC_Total_Annual_change", "NZAC_Total_Annual_change", "NZAC_T~
$ Value  <dbl> 2.7837, 2.0162, 2.3251, 3.2071, 2.4996, 2.4732, 2.0675, 2.1989,~
```

We selected the "CPACT12" indicator and downloaded the relative data as our research resources, and we used "Covid-19 Indicators" as the endpoint.

After everything we have done so far, we still need to convert the Period column from Char type to Date type.

The graph below is the table we got from the function. Of course we converted the original long table into a wide table and did some modification for better viewing.

```
# convert long data to wide data by reshape
NZAC_Wide <- reshape(NZAC, idvar="Period", timevar="Type", direction="wide",sep = " ")

#rename all columns for better view and understand
colnames(NZAC_Wide) <- gsub("Value ", "", colnames(NZAC_Wide))

NZAC_Wide %>% head() # get the first six rows of this data frame
```

	Period	NZAC_Total_Annual_change	NZAC_Annual_change_Card_transaction_spend	NZAC_Annual_change_Electricity_grid_demand	NZAC_
	<date>	<dbl>	<dbl>	<dbl>	
169	2018-01-31	2.7837	5.3782	1.3820	
172	2018-02-28	2.0162	4.7941	-2.5886	
173	2018-03-31	2.3251	5.5985	-2.2209	
175	2018-04-30	3.2071	3.5565	2.5937	
176	2018-05-31	2.4996	4.6429	-0.3676	
177	2018-06-30	2.4732	4.9796	3.1897	

We work through similar steps like above we described, using the API of statc.nz to download the Weekly Mean Rent Price and Weekly Median Rent Price data . At the same time, some data on the Ststs.NZ does not provide API interface and only provides compressed CSV files.

Download file from website

The following graph shows how we download the files from Stats.nz, uncompress all CSV files and finally read them into a dataframe.

```
# function to visit the specified website to get the Labour-market-statistics zip file and then unzip it to
# extract four csv files
download.file("https://www.stats.govt.nz/assets/Uploads/Labour-market-statistics/Labour-market-statistics-June-2021-qu
file <- unzip("LMS.zip") # unzip LMS.zip file
unzip("labour-market-statistics-june-2021-quarter-csv.zip") # unzip file to get the folder
file_names <- unzip(file, list=TRUE) # unzip file to get the four csv file names
file_names
data_multiple <- lapply(file_names$Name, function(x) {read.csv(x)}) # read these csv files to the data_multiple list
unlink("LMS.zip") # delete the LMS.zip file
unlink("labour-market-statistics-june-2021-quarter-csv.zip") # delete the zip file
unlink("labour-market-statistics-june-2021-quarter-csv", recursive=TRUE) # delete the folder with inside files
```

A data.frame: 4 × 3

Name	Length	Date
<chr>	<dbl>	<dttm>
labour-market-statistics-june-2021-quarter-csv/hlfs-jun-21qtr-csv.csv	285413527	2021-09-08 10:44:00
labour-market-statistics-june-2021-quarter-csv/lci-jun-21qtr-csv.csv	5144215	2021-07-30 09:25:00
labour-market-statistics-june-2021-quarter-csv/lms-jun-21qtr-tables.csv	213226081	2021-07-30 09:25:00
labour-market-statistics-june-2021-quarter-csv/qes-jun-21qtr-csv.csv	34523487	2021-07-30 09:25:00

Daily New Cases

Of course, to analyze the impact of Covid-19 to the economy in New Zealand we must have the data about Covid-19 new cases. To do this, we will access Our_World_in_Data from Github to get all the data. The website records daily new cases in the world, but we only need the information in New Zealand, thus we need to filter out the daily cases in New Zealand.

```
# get the trade csv file from this website
Case_Data <- fread('https://covid.ourworldindata.org/data/owid-covid-data.csv')
Case_Data %>% glimpse() # Take a brief look of the data frame
```

```
Rows: 127,516
Columns: 65
$ iso_code                              <chr> "AFG", "AFG", "AFG", "AFG", "A~
$ continent                             <chr> "Asia", "Asia", "Asia", "Asia"~
$ location                              <chr> "Afghanistan", "Afghanistan", ~
$ date                                  <date> 2020-02-24, 2020-02-25, 2020-~
$ total_cases                           <dbl> 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, ~
$ new_cases                             <dbl> 5, 0, 0, 0, 0, 0, 0, 0, 0, 0, ~
```

```r
# get the New Zealand everyday new cases
NZ_Cases <- Case_Data %>%
  filter(iso_code =="NZL") %>%
  select(date, new_cases) %>%
  rename("Period" = date, "Value" = new_cases)
NZ_Cases$Period <- as.Date(NZ_Cases$Period,"%Y-%m-%d") # format time from char to date type
NZ_Cases$Value <- as.integer(NZ_Cases$Value) # transform char type to int type
NZ_Cases$Type <- c("New_Cases") # add a column for easier combine
NZ_Cases %>% glimpse() # Take a brief look of the data frame
```

```
Rows: 612
Columns: 3
$ Period <date> 2020-02-28, 2020-02-29, 2020-03-01, 2020-03-02, 2020-03-03, 20~
$ Value  <int> 1, 0, 0, 0, 0, 2, 0, 1, 1, 0, 0, 0, 0, 0, 0, 1, 2, 0, 4, 8, 8, ~
$ Type   <chr> "New_Cases", "New_Cases", "New_Cases", "New_Cases", "New_Cases"~
```

Overseas Merchandise Trade Annual Cumulative

We wanted to see how the Covid-19 impacted on trade, so we downloaded the New Zealand trade csv file from the Stats NZ website.

Imports and Exports Trade

```r
# get the trade csv file from the stats website
Trade_Data <- fread('https://www.stats.govt.nz/assets/Uploads/Effects-of-COVID-19-on-
Trade_Data %>% glimpse() # a brief view of the content
```

```
Rows: 108,358
Columns: 10
$ Direction      <chr> "Exports", "Exports", "Exports", "Exports", "Exports", ~
$ Year           <int> 2015, 2015, 2015, 2015, 2015, 2015, 2015, 2015, 2015, 2~
$ Date           <chr> "01/01/2015", "02/01/2015", "03/01/2015", "04/01/2015",~
$ Weekday        <chr> "Thursday", "Friday", "Saturday", "Sunday", "Monday", "~
$ Country        <chr> "All", "All", "All", "All", "All", "All", "All", "All",~
$ Commodity      <chr> "All", "All", "All", "All", "All", "All", "All", "All",~
$ Transport_Mode <chr> "All", "All", "All", "All", "All", "All", "All", "All",~
$ Measure        <chr> "$", "$", "$", "$", "$", "$", "$", "$", "$", "$", "$", ~
$ Value          <int> 104000000, 96000000, 61000000, 74000000, 105000000, 760~
$ Cumulative     <int64> 104000000, 200000000, 262000000, 336000000, 442000000~
```

```r
# filter and select useful data from raw trade data table, get imports and exports cumulative value in billion NZD
get_trade_data <- function(data, type){
    filtered <- data %>% # filter imports and exports trade in all countries, all commodity, all transport mode
      filter(Country == "All", Commodity == "All", Transport_Mode == "All", Direction == type) %>%
      select(Date, Cumulative) %>% # select date and cumulative values two columns
      rename("Period" = Date, "{type}_Cumulative_billion" := Cumulative)  # rename it for imports or exports

    filtered$Period <- as.Date(filtered$Period,"%d/%m/%Y") # format the period to date type
    filtered <- filtered[which(filtered$Period >= startday & filtered$Period < endday),] # filter which period of data we need
    return(filtered) # the function outputs what is in the return() function
}
```

```r
exports <- get_trade_data(Trade_Data, "Exports") # get exports data frame
imports <- get_trade_data(Trade_Data, "Imports") # get imports data frame
```

```r
trade <- full_join( # use full_join to merge exports and imports by Period
  exports,
  imports,
  by = "Period")

start <- "Exports_Cumulative_billion" # set the start column to Exports_Cumulative_billion for convering to long data format
end <- "Imports_Cumulative_billion" # set the end column to Imports_Cumulative_billion for convering to long data format
# cause cumulative is to large, we convet they in to billion unit
trade$Exports_Cumulative_billion <- as.double(trade$Exports_Cumulative_billion/1000000000)
trade$Imports_Cumulative_billion <- as.double(trade$Imports_Cumulative_billion/1000000000)
trade_long <- convert_long(trade, start, end) # convert trade to long data format trade_long for better combine
trade %>% head() # show the first six rows of trade data frame
```

A data.table: 6 × 3

Period	Exports_Cumulative_billion	Imports_Cumulative_billion
<date>	<dbl>	<dbl>
2018-01-01	0.065	0.069
2018-01-02	0.141	0.104
2018-01-03	0.230	0.311
2018-01-04	0.322	0.532

The graph above is the part of import and export cumulative.

Final dataframe Merge part

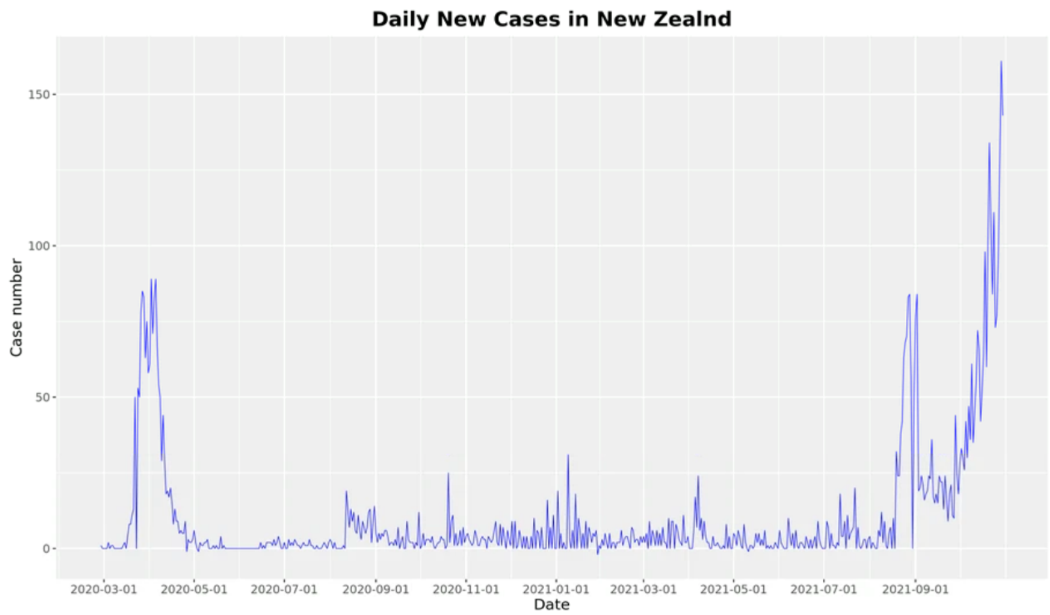
After we get all the data we need in this project, we should merge all the different tables into a big dataframe by time. we use full_join, left_join and other functions such as rbind to merge them.

```r
final_Quarterly <- full_join( # merge the previous final_Quarterly and QES by Period
  final_Quarterly,
  QES,
  by = "Period")


final_Quarterly <- left_join( # merge the previous final_Quarterly and final_Monthly by Period
  final_Quarterly,
  final_Monthly,
  by = "Period")%>%
  arrange(Period)

final_Quarterly
write_csv(final_Quarterly, "final_Quarterly.csv") # save the data frame into final_Quarterly.csv file for further use
```

```r
# combine specified Data Frame by rows, there are 14 long data frames merge into one data frame
# the long data frame is for any other scientists use to plot, it is easy to exract type
final_long <- rbind(rent_table_long, NZ_Cases) %>%
    rbind(RPI_long) %>%
    rbind(CPI_long) %>%
    rbind(FPI_long) %>%
    rbind(HPI_long) %>%
    rbind(CEP_long) %>%
    rbind(PPI_input_long) %>%
    rbind(PPI_output_long) %>%
    rbind(LCI_long) %>%
    rbind(LMS_long) %>%
    rbind(QES_long) %>%
    rbind(trade_long) %>%
    rbind(NZAC) %>%
    na.omit() %>%  # removes any rows from the dataframe with NA values
    arrange(Period) # by Period
final_long
write.csv(final_long, "final_long.csv") # save the data frame into final_long.csv file for further use
```

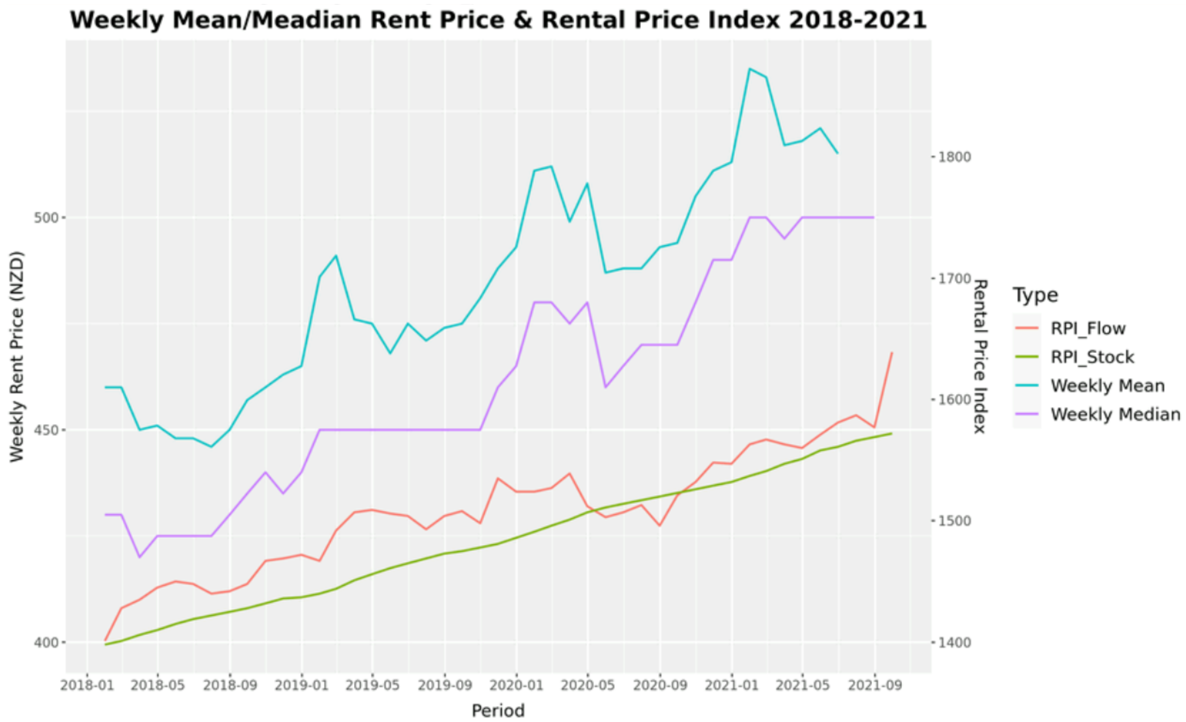
Graph and Analysis

Daily New Cases



This graph shows the daily cases in New Zealand. The first case appeared at the end of February 2020. It rose sharply in mid-March and reached the peak of cases in 2020 in early April. Then it began to fall. In mid-May, there were 0 new cases till mid-June in 2020. Before the middle of August this year, the number of New Cases showed a relatively stable trend. Although the number of New Cases increased almost every day, the number of New Cases did not exceed 40 every day. Since the middle of August this year, the number of New Cases has increased significantly, even surpassing last year's record.

Weekly Mean/Median Rent Price & Rental Price Index



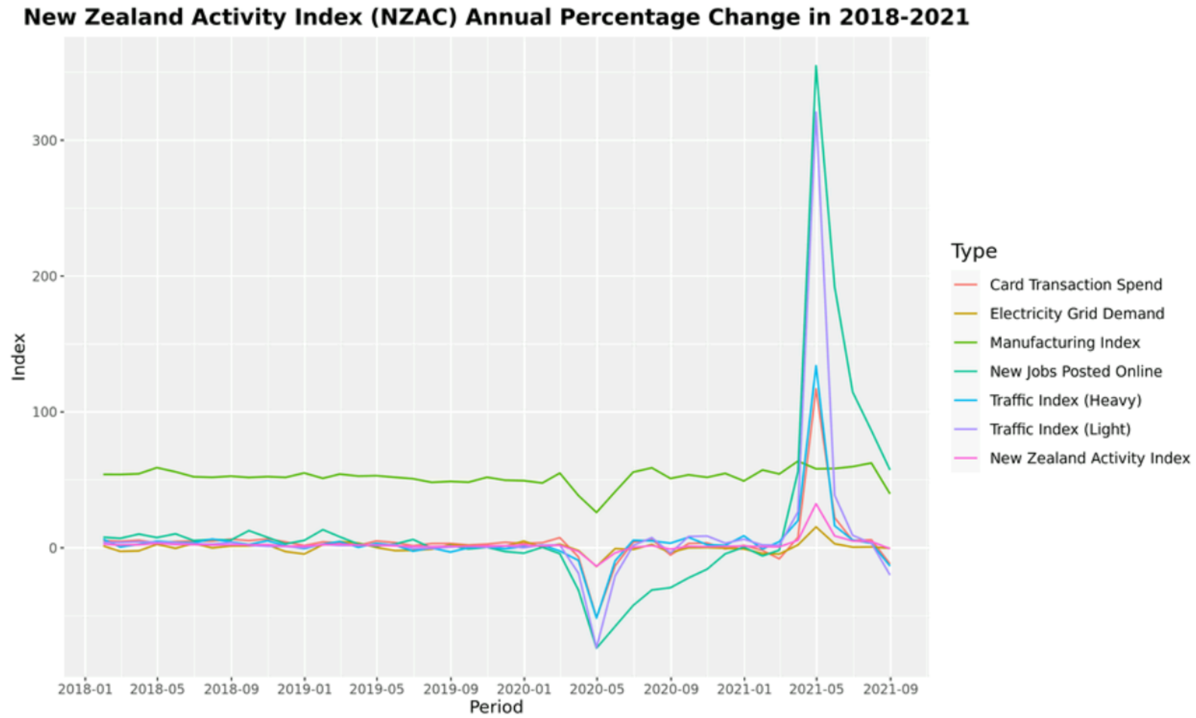
We can see that rental prices have shown an upward trend since 2018. But it's worth noting that median rental prices were flat from February 2019 to November 2019 and from May 2021 to September 2021. This shows that prices and rental prices are in a reasonable state during this period and do not need to be adjusted to maintain economic balance. The rent price dropped in March and May 2020 because of uncertainty for jobs and tourism restrictions under the covid19 situation. Thus we can see that cobid-19 affected the rent price in New Zealand.

From this graph, we can see that rental prices have been rising continuously from 2018 to 2021, which means Covid-19 may have had a slight impact on rent prices in New Zealand, yet it does not have any effect on the overall trend.

RPI Flow: Shows rental price changes across the whole rental population, including renters currently in tenancies. The Covid-19has a great impact on Rental price flow.

RPI Stock: Shows rental price changes only for dwellings that have a new tenancy started in the reference month. The Covid-19 does not affect theStock and it is steady growth.

NZAC Annual Percentage Change



NZAC is the New Zealand Activity Index, which summarizes monthly indicators of economic activity. It is intended to be interpreted as a broad measure of economic activity.

This graph is showing the annual percentage changes in new zealand activities. All activities are decreased from March 2020 which is obviously due to covid-19. In May 2020, covid cases were basically cleared, so all activities went back to normal status except New Jobs Posted Online, that's because merchants need time to recover from the losses caused by the covid19. The green line over other lines is the manufacturing industry, it is less affected by covid-19 because essential food-related businesses continued working during the lockdown.

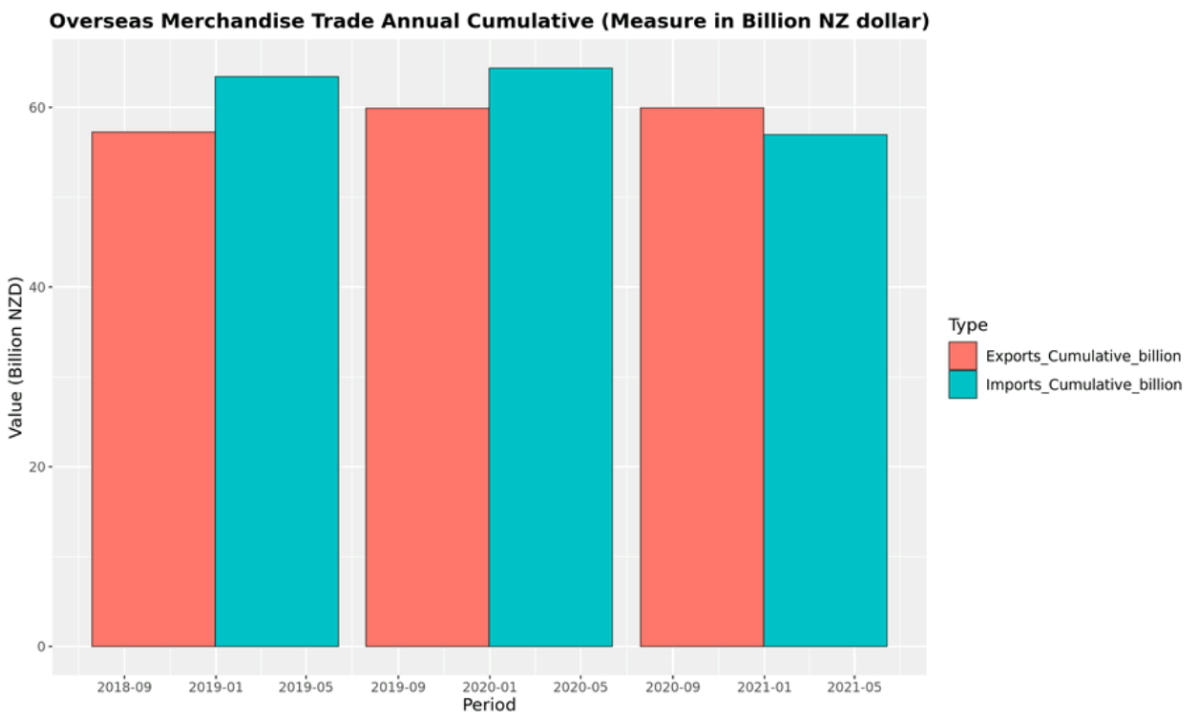
New Zealand Unemployment Rate & Weekly Earnings Change

This graph shows average weekly earned and unemployment Rate.

We can see the unemployment rate rose a lot during the Covid-19.

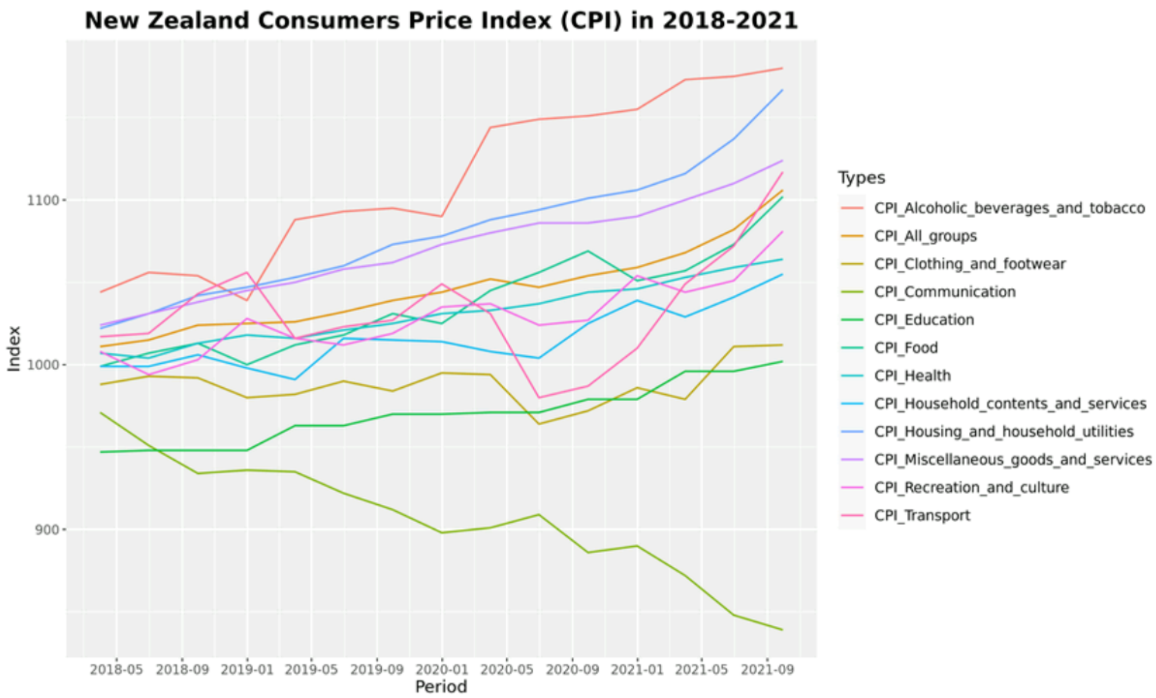
The average weekly income showed an overall upward trend. There was a slight decrease during the Covid-19 period, but it returned to normal soon after the epidemic.

Overseas Merchandise Trade Annual Cumulative (Measure in Billion NZ dollar)



In this table, we clearly find that the total amount of overseas trade in 2020 declined in both imports and exports, but the decline is not much. The larger decline in imports compared to exports, should be caused by the decline in overseas production.

New Zealand Consumer Price Index (CPI)



This graph visually shows all the different types of price indices calculated by the New Zealand government.

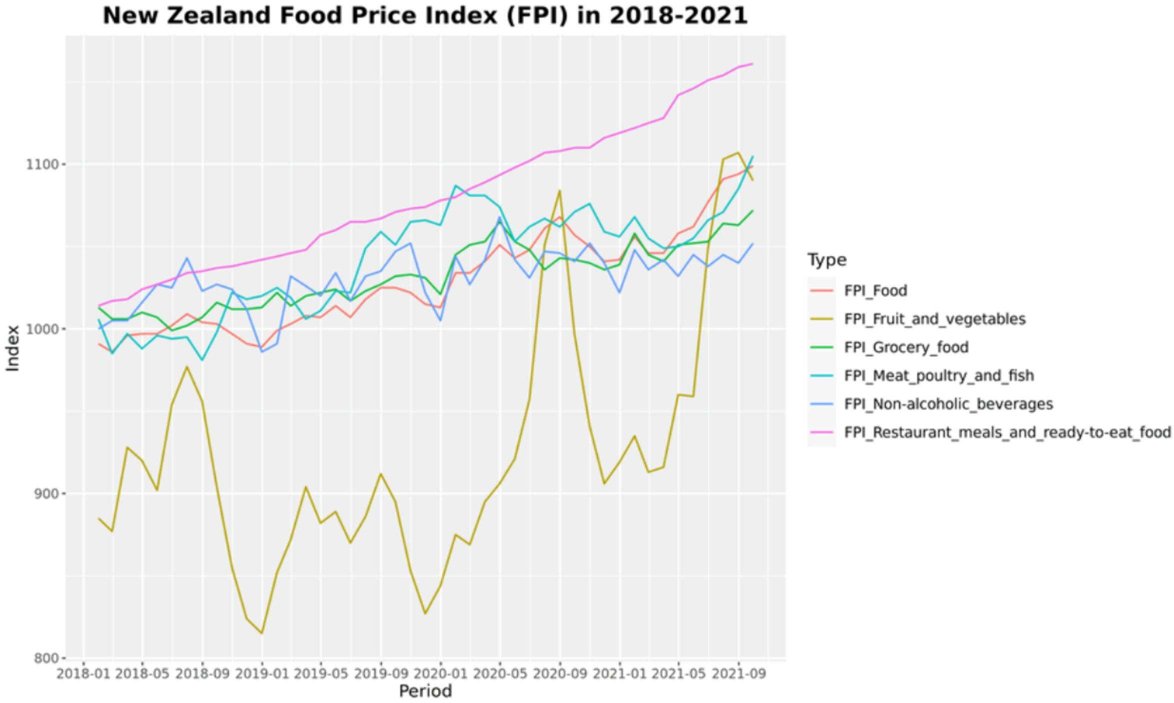
CPI of communication always decreases from the start date and it is hard to see any effect from the Covid19. I think it is just affected by technology.

CPI of all groups dropped a little during the Covid 19 period which means the Covid 19 actually affected the NZ economy but not too much.

CPI of food is most affected by Covid 19 in NZ. Food prices are the market changes that people can most intuitively feel. It's about everyone's life.

The prices of other categories are more or less affected but not as intuitive as food.

New Zealand Food Price Index (FPI)



From the above picture, we find that the Covid19 has a greater impact on food, so we plotted the food price index separately.

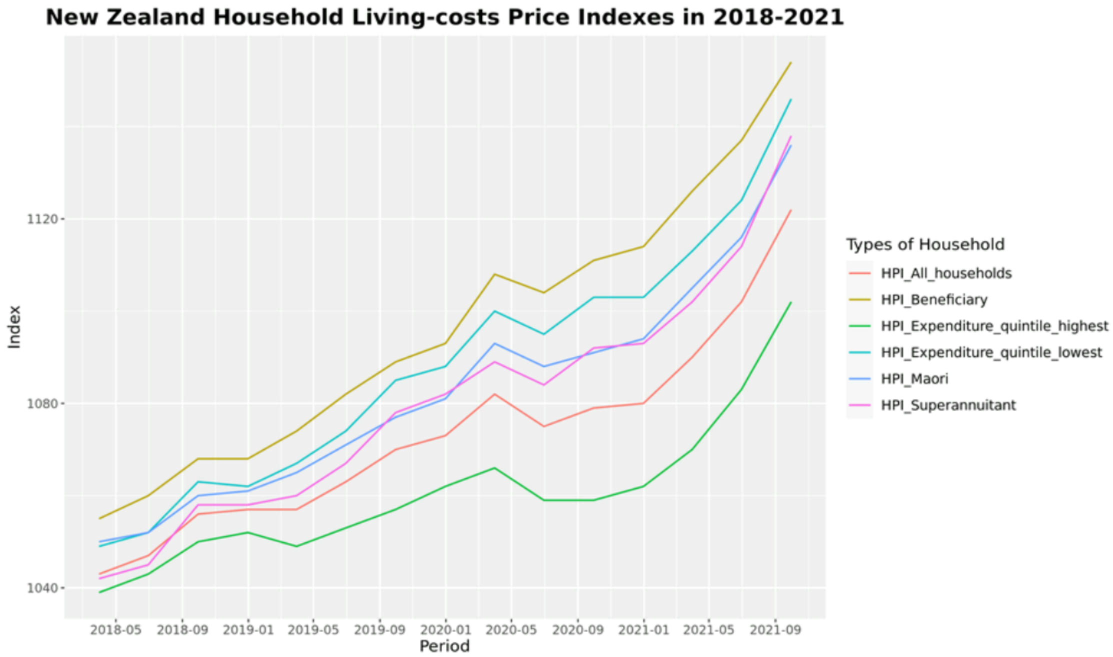
The price index of fruit and vegetables fluctuates greatly, and they are very low throughout 2020.

The ready to eat food price index is a steadily increasing trend every year, even the Covid-19 did not cause long-term effects.

The red line, which combines all different food price indexes together, dropped a little during the Covid-19 period. It is not a normal trend in a long period, we think this is affected by Covid-19.

The most interesting thing is the index of meat and fish, after Covid-19 they are retaliatory growth for one year then back to normal.

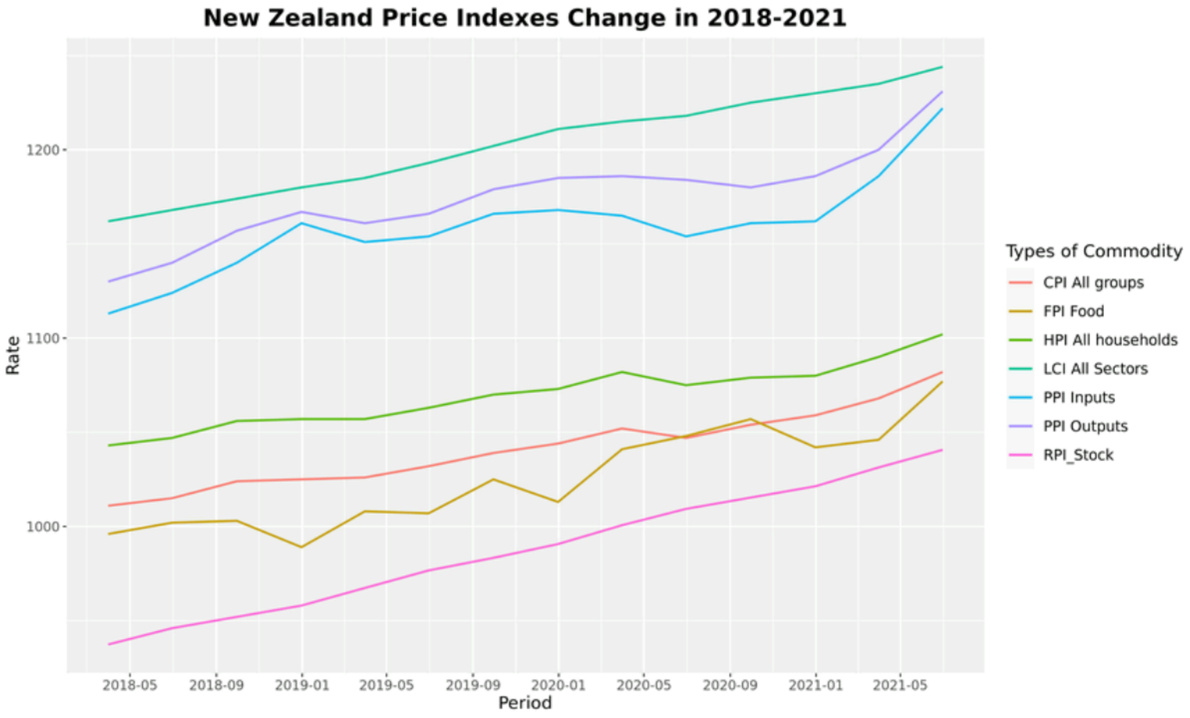
New Zealand Household Living-costs Price Indexes Changes



In this picture, we see that everything about the household has declined during the Covid-19 period.

I think there must be a lot of people who are struggling at that time, but the good news is that New Zealand returned to normal soon after the Covid-19. This is unexpectedly good news.

New Zealand Price Indexes Changes



Price indexes measure the change in price for a fixed 'basket' of goods and services between two time periods. This change is often called inflation.

Consumer price index (CPI) measures the changing price of the goods and services New Zealand households buy. It provides a measure of inflation. we can see the trend slows down during the COVID-19 period.

In this graph we can see five indexes that have reduced during Covid-19:

·Business price indexes include the producer's price index (PPI), capital goods price index (CGPI), and farm expenses price index (FEPI).

·Food price index (FPI) measures the changes in prices that households pay for food and food services. We measure the price change by tracking the prices of individual food items that make up a representative food basket.

·Household living-costs price indexes provide information on the rate of price change for goods and services purchased by select household groups, giving a measure of inflation for sub-sections of the population.

·Overseas trade indexes (prices and volumes) measure changes in the levels of prices and volumes of merchandise imports and exports between New Zealand and the rest of the world.

·Labour market statistics provide a picture of the New Zealand labour market. They include the labour cost index, which measures changes in wages and salaries.

Although many indexes have fallen, the One index has not been greatly affected:

·Rental prices indexes measure the changes in prices that households pay for housing rentals.

Depth and Extension

Through the analysis of various CPI data, unemployment rate, average income and other data, the impact of the Covid-19 on New Zealand is still very serious, but it is gratifying that New Zealand has quickly passed the downturn and returned the economy to normal trends.

Who can and who will use this data

The data sources of our project are all legal and publicly used, and anyone who is interested in these data can use it.

The charts generated in this project reflect the various industries and different residents' living price indices in New Zealand. Economists or scholars can directly use these diagrams, saving them the trouble of sorting out.

Data availability and data status

We have combined all the data into two different tables, both of them are driven by time. one is on a monthly basis and another one is on a quarterly basis. Those in need can use these two forms according to different needs. Both tables have clear classifications, which are very convenient for selection and application.

Ethical issue

If COVID-19 exists in New Zealand for a long time, people have to take some measures to control new cases, which will break the balance of New Zealand's economy and lead to an economic crisis. When people are under economic pressure and health pressure, it is easy to be biased against the government. This is also the time when riots are most likely to occur, because government decisions can not meet the needs of everyone. The resulting discrimination between people, and even conflict in order to fight for medical resources.

Implications for culture

The negative economic impact of COVID-19 is not only on individuals and businesses, but also on governments. Governments need to spend a lot of money to control COVID-19 and subsidize taxpayers. The construction and development of culture will be shelved due to lack of funds. The COVID-19 lockdown has made it impossible for some Maori cultural festivals to proceed normally, and even if they do, they are subject to restrictions. This prevents the development and promotion of Maori culture.

Implications for society

For a country, COVID-19 has an impact on the economy and it has a huge impact on government funding. Many businesses can't function, which means the government loses a lot of tax revenue. Containment of COVID-19 will also cost a lot of extra money for New Zealand. This will not only lead to a shortage of national funds, but also disrupt New Zealand's future development plans. Many things need to be rescheduled.

For an enterprise, the normal operation of the company means that there will be a huge loss of income, even with government subsidies can not restore the company to the normal state. Many companies went bankrupt because of huge debts.

For people, not all of them received government subsidies during the lockdown, which meant they had no income during that time. The collapse of the company makes many people lose their jobs. Increased financial stress from the negative economic impact of COVID-19, and with concerns about health, it has taken a toll on many people psychologically. When people are under economic pressure, they spend less to save money, which causes companies to make less money. This is a vicious cycle that can even lead to economic crises.

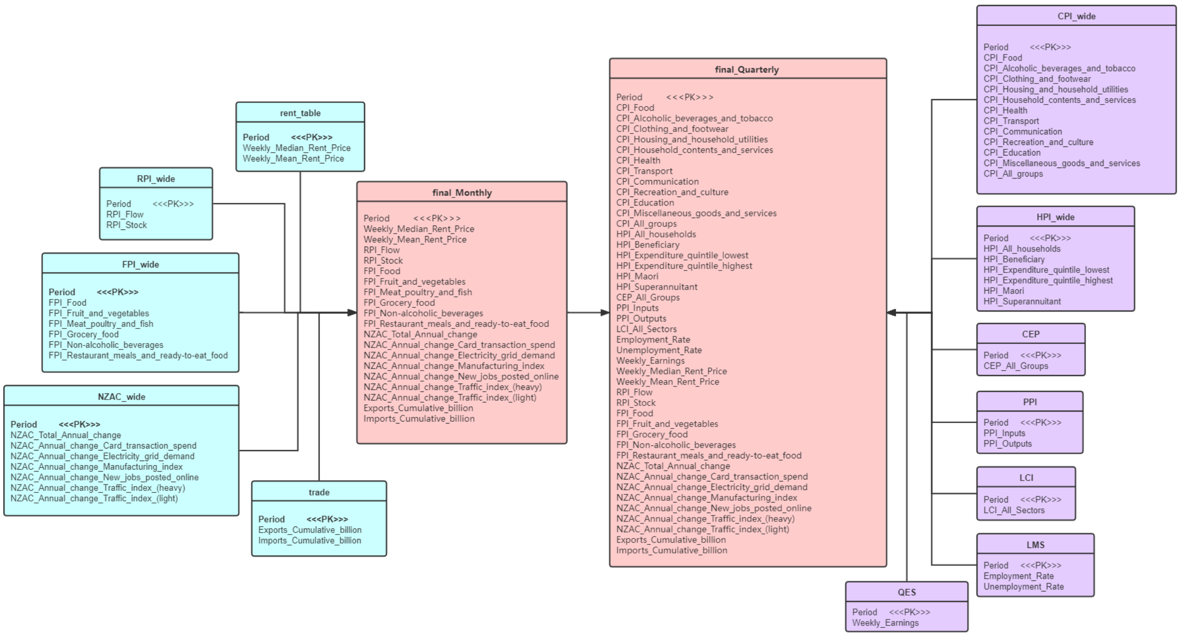
Implications for legal frameworks

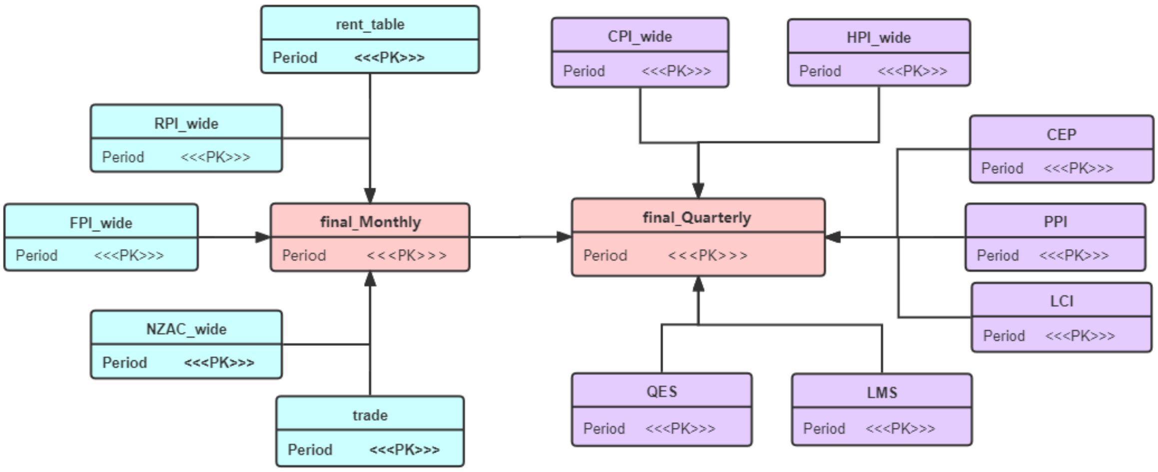
To prevent the growing impact of COVID-19 on the economy, governments need new policies. Existing policies also need to be changed. For example, the immigration policy, which currently prevents people who are not New Zealand citizens or have permanent residency in New Zealand from entering New Zealand. This has also caused a huge loss to New Zealand's tourism.

Conclusion

If you look at just a few of the industries that we analyzed, the impact of COVID-19 on New Zealand has not been significant. But across all industries, the damage is irreversible. A lot of things are linked together. It is like the butterfly effect, when one small event has an impact, the next series of events will be affected. In other words, COVID-19 has not only had a negative impact on the economy, yet on all aspects of society, all aspects of the country. Therefore, controlling Covid-19 and decreasing daily new cases are the first target of the country and everyone. The price index of food has risen severely, which is related to people’s lives, and government intervention is needed to reduce the negative impact. Production costs and prices have fallen, which is not a good economic trend.

Final Dataset





We have three final data sets: ***final_Monthly, final_Quarterly, and final_long***

The final_Monthly dataset uses month as the period. The primary key Period is one month. It integrates all data frames with monthly data. It is wide data.

The final_Quarterly dataset uses quarter as the period. The primary key Period is three months (i.e. one quarter). It integrates all data frames with quarterly data, and also joins final_Monthly data with left join the data in each quarter. It is also wide data.

The final_long dataset just simply merges every long data frame by Period, Type and Value. It is easy to use its type to extract the same type value and plot.

```
write_csv(final_Monthly, "final_Monthly.csv") # save the data frame into final_Monthly.csv file for further use
```

Period	Weekly_Median_Rent_Price	Weekly_Mean_Rent_Price	RPI_Flow	RPI_Stock	FPI_Food	FPI_Fruit_and_vegetables	FPI_Me
<date>	<int>	<int>	<int>	<int>	<dbl>	<dbl>	
2018-01-31	430	460	1401	1398	991	885	
2018-02-28	430	460	1428	1401	986	877	
2018-03-31	420	450	1435	1406	996	928	
2018-04-30	425	451	1445	1410	997	920	

```
write_csv(final_Quarterly, "final_Quarterly.csv") # save the data frame into final_Quarterly.csv file for further use
```

Period	CPI_Food	CPI_Alcoholic_beverages_and_tobacco	CPI_Clothing_and_footwear	CPI_Housing_and_household_utilities	CPI_Household_cor
<date>	<dbl>	<dbl>	<dbl>	<dbl>	
2018-03-31	999	1044	988	1022	
2018-06-30	1007	1056	993	1031	
2018-09-30	1013	1054	992	1042	
2018-12-31	1000	1039	980	1047	

```
write.csv(final_long, "final_long.csv") # save t
```

A data.frame: 4469 × 3

	Period	Value	Type
	<date>	<dbl>	<chr>
11000	2018-01-01	0.065	Exports_Cumulative_billion
1369	2018-01-01	0.069	Imports_Cumulative_billion
2737	2018-01-02	0.141	Exports_Cumulative_billion
1370	2018-01-02	0.104	Imports_Cumulative_billion
3107	2018-01-03	0.230	Exports_Cumulative_billion

Documentation of the final_Monthly data set:

This is our first final data set. It uses month as the time unit. It integrates all data frames with monthly data. This is a wide data type. The following is a note on column names:

・**Period**: The period which is monthly, is the primary key

・**Weekly_Median_Rent_Price**: National weekly Median Rent Price (NZD)

・**Weekly_Mean_Rent_Price**: National weekly Median Rent Price (NZD)

The rental price indexes measure the changes in prices that households pay for housing rentals.

・**RPI_Flow**: Shows rental price changes across the whole rental population, including renters currently in tenancies.

・**RPI_Stock**: Shows rental price changes only for dwellings that have a new tenancy started in the reference month.

The food price index (FPI) measures the changes in prices that households pay for food.

・**FPI_Food**: National food total price index

・**FPI_Fruit_and_vegetables**: National fruit and vegetables price index

・**FPI_Meat_poultry_and_fish**: National meat, poultry and fish price index

・**FPI_Grocery_food**: National grocery food price index

・**FPI_Non-alcoholic_beverages**: National Non-alcoholic beverages price index

・**FPI_Restaurant_meals_and_ready-to-eat_food**: National restaurant meals and ready-to-eat food price index, 2020-04-30 it is NA because businesses were shut during the COVID-19 lockdown

NZAC is a broad measure of economic activity.

・**NZAC_Total_Annual_change**: New Zealand Activity Index annual percentage change overall

・**NZAC_Annual_change_Card_transaction_spend**: NZAC component card transaction spend annual percentage change

・**NZAC_Annual_change_Electricity_grid_demand**: NZAC component electricity grid demand annual percentage change

・**NZAC_Annual_change_Manufacturing_index**: NZAC component electricity grid demand annual percentage change

・**NZAC_Annual_change_New_jobs_posted_online**: NZAC component new jobs posted online annual percentage change

・**NZAC_Annual_change_Traffic_index_(heavy)**: NZAC component heavy traffic index annual percentage change

・**NZAC_Annual_change_Traffic_index_(light)**: NZAC component light traffic index annual percentage change

These two columns show imports and exports between New Zealand and the rest of the world.

・**Exports_Cumulative_billion**: Exports trade cumulative value every year, in billion NZD unit¶

・**Imports_Cumulative_billion**: Imports trade cumulative value every year, in billion NZD unit

Documentation of the final_Quarterly data set:

This is our second final data set, with quarter as the time unit. The primary key Period is three months (i.e. one quarter). It integrates all data frames with quarterly data, and also joins final_Monthly data with left join the data in each quarter. This is also a wide data type. The following is the description of column names:

・**Period**: The period which is quarterly, the primary key

The CPI measures the rate of price change of goods and services purchased by New Zealand households.

・**CPI_Food**: CPI component Food price index

・**CPI_Alcoholic_beverages_and_tobacco**: CPI component Alcoholic beverages and tobacco price index

・**CPI_Clothing_and_footwear**: CPI component Clothing and footwear price index

・**CPI_Housing_and_household_utilities**: CPI component Housing and household utilities price index

・**CPI_Household_contents_and_services**: CPI component Household contents and services price index

・**CPI_Health**: CPI component Health price index

・**CPI_Transport**: CPI component Transport price index

・**CPI_Communication**: CPI component Communication price index

・**CPI_Recreation_and_culture**: CPI component Recreation and culture price index

・**CPI_Education**: CPI component Education price index

・**CPI_Miscellaneous_goods_and_services**: CPI component Miscellaneous goods and services price index

・**CPI_All_groups**: CPI overall

Household living-costs price indexes (HLPIs) provide new insights into the inflation experienced by 13 different household groups: beneficiaries, Māori, income quintiles (five groups), expenditure quintiles (five groups), and superannuitants. Here we choose five representative household groups.

・**HPI_All_households**: All private New Zealand-resident households living-costs price index overall

・**HPI_Beneficiary**: Beneficiary living-costs price index, it is the households where the highest-income recipient receives a benefit payment, classified as a 'main benefit' in the Household Economic Survey.

・**HPI_Expenditure_quintile_lowest**: Lowest-expenditure household living-costs price index

・**HPI_Expenditure_quintile_highest**: Highest-expenditure household living-costs price index

・**HPI_Maori**: Maori living-costs price index

・**HPI_Superannuitant**: Superannuitant living-costs price index, it is the households where the highest-income recipient received a New Zealand government pension

CEP is Capital goods price index, it estimates the overall price change in physical assets that the productive sector acquires or builds.

・**CEP_All_Groups**: All groups CEP overall

The Producers Price Index (PPI) measures changes in prices of outputs that generate operating income and inputs that incur operating expense.

・**PPI_Inputs**: PPI input indexes measure changes in prices paid by producers for goods and services they use.

・**PPI_Outputs**: PPI output indexes measure changes in the prices of goods and services received by producers.

The Labour Cost Index (LCI) measures changes in salary and wage rates for a fixed quantity and quality of labour input. It is a measure of wage inflation

・**LCI_All_Sectors**: LCI for all sectors, industries, sexes

・**Employment_Rate**: The employment rate change

・**Unemployment_Rate**: The unemployment rate change

・**Weekly_Earnings**: Average weekly earnings of all workers in all sectors, industries and sexes

The following content is the same as the final_Monthly data:

・**Weekly_Median_Rent_Price**: National weekly Median Rent Price (NZD)

・**Weekly_Mean_Rent_Price**: National weekly Median Rent Price (NZD)

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・**Imports_Cumulative_billion**: Imports trade cumulative value every year, in billion NZD unit

Github

Github link

https://github.com/MinfangYu/DATA201-Project
We have also uploaded our work to github, it can be accessed from the link above.