

Analyzing the patterns in Economic indicators of U.S., Evaluating the Factors influencing Recession, and comparing it with previous Recessions

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HS-Fresenius: Data Science for Business

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Introduction

Indicators of an economy always have a story to tell; from that story, we can get a clear idea about our past, what is happening in the present, and even predict the future. The project tries to understand what these economic indicators have to say.

The project is based on a data set containing different economic indicators like the house price index, consumer price index, Gross Domestic Product(GDP), unemployment rate, etc. The project tries to find a pattern between these indicators, time and other economic indicators.

One other thing to try in this project is to predict the Recession, comparing with the historical data and comparing the patterns of different economic indicators during the Recession. For beginners, a recession is the negative growth of Gross Domestic Product (GDP) during two consecutive quarters. As a disclaimer, the Recession is influenced by many non-financial and psychological factors, So a study only using economic parameters gives a strong prediction of similar events.

Data-set

The primary resource of the dataset refers to the original source from which the data was obtained before being compiled and organized into the excel file acquired from Kaggle.com. Each of the seven economic indicators mentioned in the project likely came from a different primary resource.

1. House Price Index: The Federal Housing Finance Agency (FHFA) publishes the House Price Index (HPI), which measures the average changes in the sale prices of single-family homes backed by Fannie Mae and Freddie Mac.
2. Stock Price Index: The U.S.'s most widely followed stock price indices are the Dow Jones Industrial Average (DJIA) and the Standard & Poor's 500 (S&P 500) index. S&P Dow Jones Indices, a subsidiary of S&P Global, publish both indices.
3. Consumer Price Index: The Consumer Price Index (CPI) is published by the Bureau of Labor Statistics (BLS) and measures the average change over time in the prices paid by urban consumers for a basket of goods and services.
4. Unemployment Rate: The unemployment rate is also published by the Bureau of Labor Statistics (BLS) and measures the percentage of the labor force that is unemployed but actively seeking employment and willing to work.
5. GDP: The Gross Domestic Product (GDP) is published by the Bureau of Economic Analysis (BEA), a U.S. Department of Commerce division. It measures the value of all goods and services produced in the U.S. economy, adjusted for inflation.

6. Mortgage Rate: The average mortgage rate is published by the Federal Reserve Bank of St. Louis and is based on survey data from the Federal Home Loan Mortgage Corporation (Freddie Mac).
7. Disposable Income: The disposable income is published by the Bureau of Economic Analysis (BEA), a U.S. Department of Commerce division. It measures the amount of money households have available for spending after adjusting for inflation and taxes.

```
getwd()

## [1] "C:/Users/theju/OneDrive/Documents"

#Calling required Library functions
library(tidyverse)

## — Attaching packages — tidyverse
1.3.2 —
## ✓ ggplot2 3.4.0      ✓ purrr 1.0.1
## ✓ tibble 3.1.8       ✓ dplyr 1.1.0
## ✓ tidyr 1.3.0        ✓ stringr 1.5.0
## ✓ readr 2.1.3       ✓ forcats 1.0.0
## — Conflicts —
tidyverse_conflicts() —
## ✗ dplyr::filter() masks stats::filter()
## ✗ dplyr::lag()     masks stats::lag()

library(dplyr)
library(tidyr)
library(ggplot2)
#Importing the Dataframe from storage using read.csv
amf<- read.csv("AMF.csv")
head(amf)

##      Date House_Price_Index Stock_Price_Index Consumer_Price_Index
## 1 1975-01-01      61.0900      67.14653      65.30488
## 2 1976-01-01      65.5250      79.96264      69.05653
## 3 1977-01-01      73.4350      78.82540      73.54636
## 4 1978-01-01      83.7450      78.84679      79.15866
## 5 1979-01-01      95.1325      85.63207      88.06755
## 6 1980-01-01     102.6675     100.00000     100.00000
##      Population Unemployment_Rate Real_GDP Mortgage_Rate
## 1      0.98599      8.46667 5648.462      9.04712
19908
## 2      0.95022      7.71667 5952.809      8.86585
20346
## 3      1.00577      7.06667 6228.076      8.84519
20780
## 4      1.05957      6.06667 6572.819      9.64173
```

```

21497
## 5      1.10358          5.83333 6780.924      11.20365
21672
## 6      0.95959          7.14167 6763.514      13.74212
21584

class(amf)

## [1] "data.frame"

view(amf)
#Formatting the Date column and Creating a new columns with Years
amf$Date <- as.Date( amf$Date, "%Y-%m-%d")
order(amf$Date)

## [1]  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
24 25
## [26] 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47

Year<-format(amf$Date, "%Y")
Year

## [1] "1975" "1976" "1977" "1978" "1979" "1980" "1981" "1982" "1983" "1984"
## [11] "1985" "1986" "1987" "1988" "1989" "1990" "1991" "1992" "1993" "1994"
## [21] "1995" "1996" "1997" "1998" "1999" "2000" "2001" "2002" "2003" "2004"
## [31] "2005" "2006" "2007" "2008" "2009" "2010" "2011" "2012" "2013" "2014"
## [41] "2015" "2016" "2017" "2018" "2019" "2020" "2021"

#Making new column in amf dataframe
Years<- data.frame(Year)
#Replace a column with another one
new_amf<- cbind(amf,Years)
view(new_amf)
summary(new_amf)

##      Date      House_Price_Index Stock_Price_Index
Consumer_Price_Index
## Min.   :1975-01-01   Min.    : 61.09    Min.    : 67.15   Min.    : 65.3
## 1st Qu.:1986-07-02   1st Qu.:140.79    1st Qu.: 209.90   1st Qu.:135.4
## Median :1998-01-01   Median :211.46    Median : 756.56   Median :197.8
## Mean   :1997-12-31   Mean    :240.15    Mean    : 743.13   Mean    :198.6
## 3rd Qu.:2009-07-02   3rd Qu.:339.35    3rd Qu.:1114.17   3rd Qu.:262.9
## Max.   :2021-01-01   Max.    :523.26    Max.    :2255.84   Max.    :328.8
##   Population  Unemployment_Rate   Real_GDP   Mortgage_Rate
## Min.   :0.1184   Min.   :3.667    Min.   : 5648   Min.   : 2.958
## 1st Qu.:0.8627   1st Qu.:5.167    1st Qu.: 8374   1st Qu.: 4.863
## Median :0.9459   Median :5.992    Median :12046   Median : 7.440
## Mean   :0.9352   Mean    :6.310    Mean    :12140   Mean    : 7.781
## 3rd Qu.:1.0816   3rd Qu.:7.442    3rd Qu.:15646   3rd Qu.: 9.886
## Max.   :1.3869   Max.    :9.708    Max.    :19427   Max.    :16.642
## Real_Disposable_Income   Year
## Min.   :19908          Length:47

```

##	1st Qu.:25433	Class :character
##	Median :31712	Mode :character
##	Mean :32041	
##	3rd Qu.:38235	
##	Max. :48219	

Question

The questions that would be answered via projects are;

How are different economic indicators related to each other? Trying to find patterns between different parameters using R tools.

How are these indicators changed during the Recession?

If any patterns are found between the indicators and the Recession, how can we use these patterns to predict the Recession in future?

Current Status

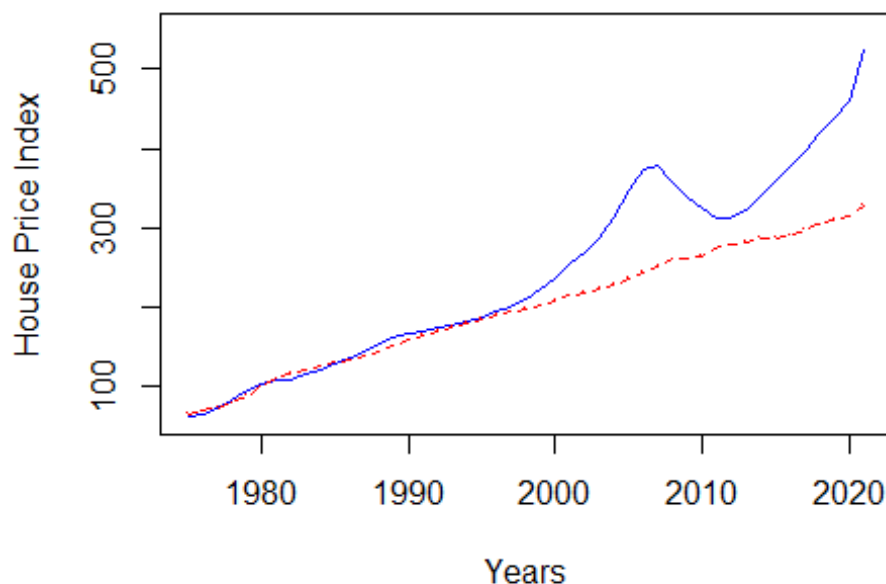
The current state of the project is that it is working with different indicators of the US economy and trying to produce different kinds of graphical data, which will offer the user an easy understanding and help to find the pattern in different graphs.

Graphs

House Price Index and Consumer Price Index vs Year

The House Price Index (HPI) is a comprehensive indicator of changes in single-family house price in the US. It is issued by the Federal Housing Finance Agency (FHFA) utilizing data provided by Fannie Mae and Freddie Mac on a monthly and quarterly basis. On the other hand, The Consumer Price Index (CPI) tracks changes in consumer prices on a monthly basis in the United States. The consumer price index (CPI) is determined by the Bureau of Labor Statistics (BLS) as a weighted average of prices for a sample of products and services that is indicative of total consumer spending in the United States.

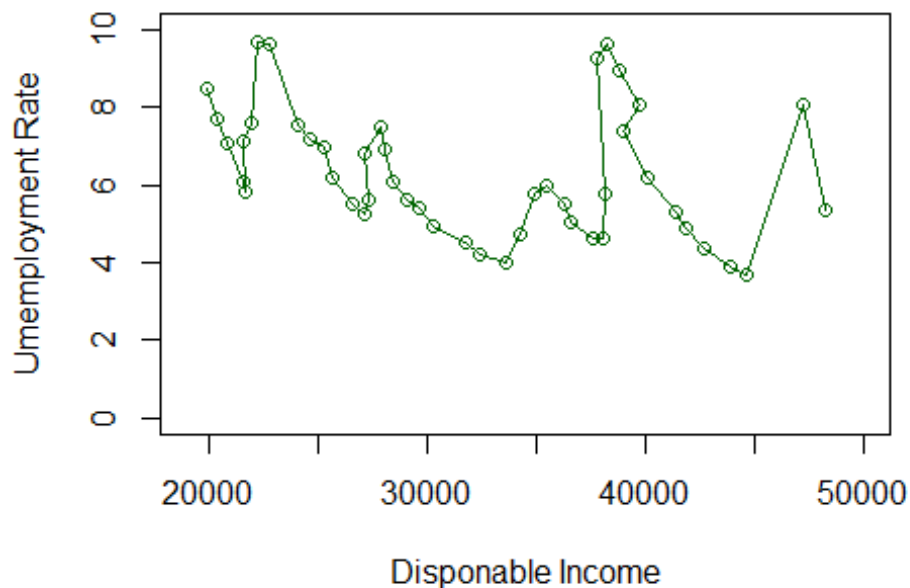
```
#Plot the graph with new_amf
plot(x=new_amf$Year, y=new_amf$House_Price_Index,
     type = "l", col= "blue",
     xlab="Years", ylab="House Price Index",
     xlim= c(1975,2021), ylim=c(60,550))
#Plotting multiple y variables with same x axis
# Add second curve to the same plot by calling points() and lines()
# Use symbol '*' for points.
points(new_amf$Year, y= new_amf$Consumer_Price_Index , col="red", pch=".")
lines(new_amf$Year, y= new_amf$Consumer_Price_Index, col="red", lty=2)
```



Unemployment Rate vs Disposable Income

The percentage of the labor force that is not now employed but has the potential to be is known as the unemployment rate. Contrarily, disposable income, commonly referred to as disposable personal income (DPI), is the amount of money that a person or household has left over after income taxes have been deducted.

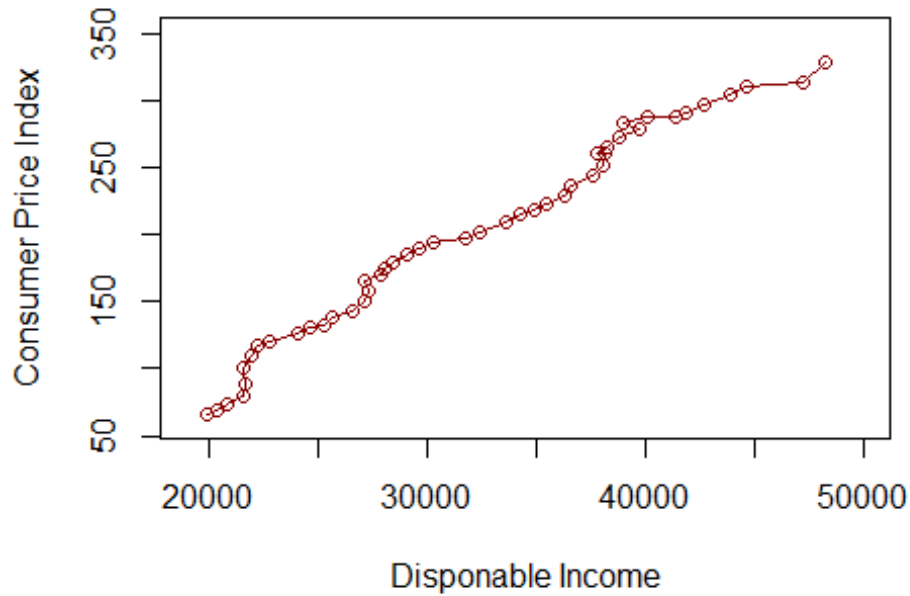
```
#Plotting Graph with Unemployment Rate with Disposable Income
plot(x=new_amf$Real_Disposable_Income, y=new_amf$Unemployment_Rate,
     type = "o", col= "Dark Green",
     xlab="Disponable Income", ylab="Umemployment Rate",
     xlim= c(19000,50000), ylim=c(0,10))
```



Consumer Price Index vs Disposable Income

#Plotting Graph with Consumer Price Index with Disposable Income

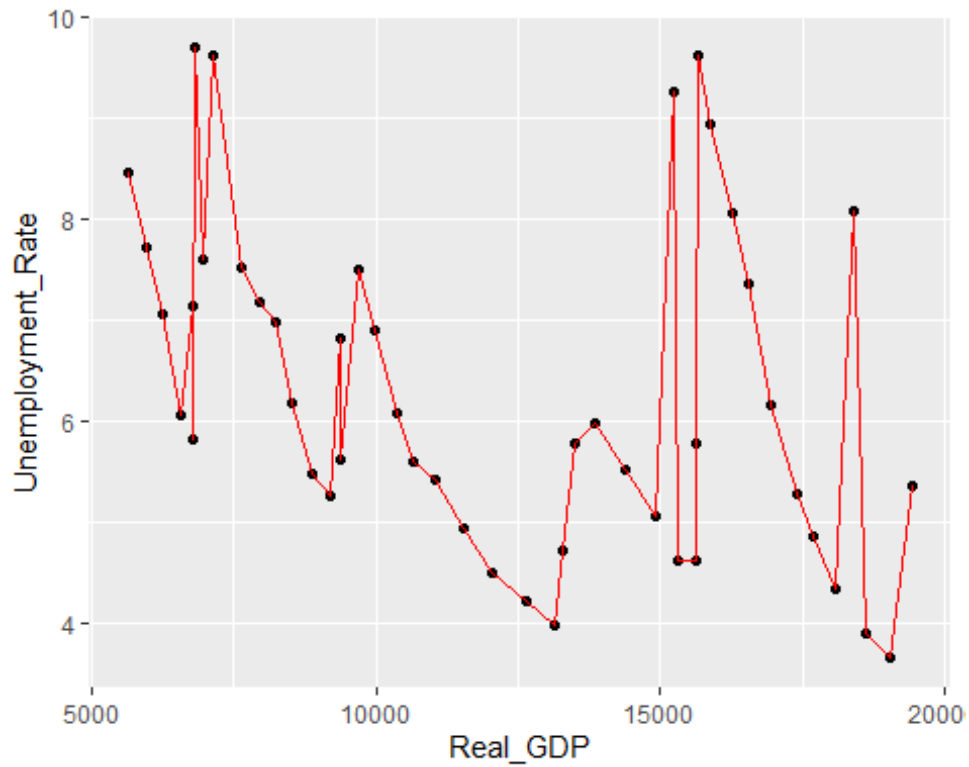
```
plot(x=new_amf$Real_Disposable_Income, y=new_amf$Consumer_Price_Index,  
     type = "o", col= "dark Red",  
     xlab="Disponable Income", ylab="Consumer Price Index",  
     xlim= c(19000,50000), ylim=c(60,350))
```



GDP vs Unemployment Rate

#Plotting a ggplot with a graph GDP vs Unemployment Rate

```
ggplot( data = new_amf,  
        mapping = aes(x=Real_GDP,y= Unemployment_Rate)) +  
  geom_point() +geom_line(colour= "red")
```



House Price Index vs Mortgage Rate

An interest charge on a mortgage is known as a mortgage rate. Mortgage rates may be either fixed at a certain interest rate or variable, varying in accordance with a benchmark interest rate.

```
#Plotting a ggplot with House Price Index vs Mortgage
ggplot( data = new_amf,
        mapping = aes(x= Mortgage_Rate ,y= House_Price_Index)) +
  geom_point() +geom_line(colour= "green")
```



Future Plans

The project has a long way to go since, before many analyses, a deep study must be conducted. Therefore, the studies will mainly focus on the relationship and theories regarding these economic indicators.

The historical data of the Recession faced by the US economy will also be considered to study the pattern changes in these indicators in those times.