

Quantitative Macroeconomics HW1

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1. Compute (and plot) the time series of the monthly employment rate in the U.S. As source of data go to IPUMS and download the latest available CPS monthly data. Detrend and deseasonalize to show the effect of COVID19 in your estimates for year 2020.

We downloaded the data source from Current Population Survey (CPS). The data are provided monthly, so that we can analyse a labour market of USA in the period of COVID-19. Of course, we assume causality between the fall of the labour market and the outbreak of the epidemic, after we introduce a brief analyses of Spain labour market.

First We enumerate the variables that we will use in the following steps, so the reader can get an idea of how the data is displayed and how easy it is to understand.

- EMPSTAT -> Employment status code
- IND -> Industry
- CLASSWKR -> Class of worker
- AHRSWORKT -> Hours worker last week
- EDUC -> Educational attainment re-
- EARNWEEK -> Weekly earnings
- IND_CPS8 -> Detailed industry classification, main job
- WRKHOMEABLE -> Ability to work at home

In the code, you could find other variables that finally were not used it.

For do the regression and analyse the relationship between rate of employment, we used an ARIMA model with a lagging period or moving average, and this can be the reason because the prediction does not fully match that of the slides studied in class. We calculate this rate with the following equation:

$$\frac{\text{Total people employed}}{\text{Total people employed} + \text{Total people unemployed}} \quad (1)$$

As we can see in figure 1 the employment in USA is almost full employment between January of 2018 and February of 2020, so at the beginning of February the rate of employment fall down because of pandemic, around 13% as we can see in figure.

I think that the measures taken by the United States may have affected the country, but it was a global paralysis in all parts of the world, the economies were collapsing. As we can see from both graphs, there seems to have been a shock in demand and supply at the same time, as people did not move and in many countries remained at home unable to produce or buy anything except basic necessities. After the measures applied by the

US state governments and the doubling of the curve, the relaxation of the restrictive measures leads to a "V" recovery, and a much greater increase in employment than in pre-covid times, even faraway from the prediction for August.

We can also observe in figure 3 the regression without the trend and the seasonal component. The seasonal component is a causal component due to the influence of certain phenomena that repeat periodically in a year, month... In the residual we observe the shock, because this component covers unexpected phenomena.

- Redo by education group as $< HS$, HS , $College$ and $> College$. We created four variables, one for each level of education.

(a) $1 = < HS$

(b) $2 = HS$

(c) $3 = College$

(d) $4 = > College$

Notice, in the graphics above, we could see that employment had fallen, but in the figure 4 below we can see that depending on the different educational levels, this fall has been more abrupt. Here we see that people with a higher level of education have suffered less from the consequences of the covid, possibly as a result of adaptation and flexibility, but this will be the case later on.

It is also curious to see how in the recovery, low skilled jobs have recovered faster, this may be due to the restoration and the hotel industry, among other services that stopped because of the quarantine.

- Redo by industry (for example, create two groups of industries according to their ability to telework).

We took the variable ability to telework and we used it as a filter. The variable takes value 1 if the individual was able to telework and 0 otherwise. We worked out the summary of both type and we computed by industry. We took the proportion of each industry and if the proportional amount of individuals by industry exceed 0.5 % then this industry is able to telework.

As expected, We can see in figure 11, people and therefore the companies that were able to adapt to the shock suffered a minor slump in job loss. This, added to the previous graph, gives an idea of the weakness that a country can have due to the rigidity of certain jobs. Obviously, we must take into account the specialisation of the country, and how the business fabric is made up, but it is a phenomenon that is at least worth studying, since we have seen the difficulties that companies

have in retaining their workers and giving them a way out. This can increase unemployment not only in the short term, but in the long term too. It would be good to encourage investment in the digitalisation of companies. Here we can see how in the case of education the recovery is higher in companies that did not telework, this may again be due to quarantine.

- Redo by occupation. Hint: Find an interesting way to split occupations (2 or 3 groups) that you think is useful to learn the effects of COVID19.

Like in education, we created the categorical values for each kind of worker

(a) $1 = self - employed$

(b) $2 = privatesector$

(c) $3 = publicsector$

The result are provided in graph 14. We can see that the private sector is the one that suffers the most, because it is the one that employs the most people and in the face of a world economic slowdown many companies had to stop. It is expected that the public sector, because it has greater protection, will be the one that has least noticed the fall. And the sector that has suffered the most is obviously the one that depends on demand and the movement of people in order to survive. To mention the self-employed, many of them can telework or must open a business because they are small businesses, although this is not so obvious here, but they will certainly be the most affected in the long term.

Discuss your all your results.

2. Redo the previous item for average weekly hours. Discuss your results.

The figure 8 show us the evolution on the average weekly hours vs the predictive average, as we can observe in 7 there is a seasonal component that said us in January there was a decreasing hours but in this period the fall was much deeper.

In graph 9, we can see that the big drop in hours is in the self-employed, who, being small businesses, work much less hours and before the shortage of demand. We must remember that we are talking here about the average number of hours worked which has nothing to do with the loss of employment, both the public and the private sector need a minimum number of hours to be able to continue working.

Here in figure 10 we have as in the case of the employment ratio the same distribution, the people with less education are again the most affected because they tend to have more unstable jobs, even several jobs per hour because the US legislation allows it, then they depend on the day to day, the other categories move in the expected parameters

with a slight decrease in the weekly hours worked.

The differences whether weekly hours worked by ability to telework or not, say us in 12 that in the Covid period the industry with low ability to telework work less hours in average than the other.

3. Is the behaviour of aggregate hours driven by employment or by average weekly hours. Decompose using percentage deviations from the predicted value of these items. Discuss your results.
4. Redo for wages (or earnings).

We can observe in figure 20 a curious case in which the spite of the shock, average wages are rising exponentially, which is in contrast to what we have seen so far in terms of job losses, this is due to the outliers. Why is the average rising? People with lower salaries leave the market because of the covid while more qualified people with higher salaries remain in it. We can see a softening of this in graph 16 red line. This can also be seen as an intuition of the large number of low-wage people in the US, as the growth is exponential after they leave the market. In graph 22 there is no a substantial changes.

In figure 21 the self-employed disappear from this graph, it may be due to the large drop in hours worked that we saw in the previous graph, although salaries in the public sector increase, as well as in the private sector, very accurate conclusions cannot be drawn from this graph, except that the trend is positive

The graph 13 say that there is a differences among both group and there is a slightly higher increase in the telework, but the tendency is positive.

5. Redo for your own country. Discuss difficulties (if any) in getting the data. Discuss your results.

For the data of Spain I went to the INE but there is hardly any data available and they are not on a monthly basis, which makes the comparison with the US almost impossible unless it is done in a different measure of time. It has been very difficult to access data with a minimum of quality. On the EUROSTAT page, it was where I was able to get these data, but they were not available on a monthly basis and for Spain there were many variables that were not even there. For the employment data I downloaded the quarterly data by level of education, I also downloaded a table for industry but it was quite difficult to understand since it had negative values in employment, it could possibly be in percentage variation. For the hours, download a table from the INE, in which they were hours by occupation, but it is not the same measure as the table from the USA.

For the employment ratio we can observe several points in 30 the first is the positive

trend that has been going on since 2018, then there is a small peak that descends but returns to increasing values, the problem comes with the arrival of the covid and the restrictive measures approved by the government that cause unemployment to skyrocket, for the prediction we have taken a ma (5) that was the one that most closely approximated the data, which means that the behaviour of our variable is explained by 5 past values of a White noise process. If we compare with the USA, although the data are not in the same measure of time, we can see that Spain has not improved yet while the USA has managed to reach the pre-Covid levels in employment rate, even surpass it well above it, this is due not only to the different measures taken by both governments and the aid given by them, but also the structural problem of the Spanish market, which is much more rigid than the American one and therefore has less flexibility. In the figure 26 we have again a categorical variable for education level, that is:

- 1 = Less than primary, primary and lower secondary education.
- 2 = (Upper secondary and post-secondary non-tertiary education.
- 3 = Tertiary education.

As we can observe the behaviour is very similar. This can once again be explained by the regime and protectionism of the Spanish market, which leaves companies little room for maneuver. This can be good for experienced workers but leaves young people in a very vulnerable situation.

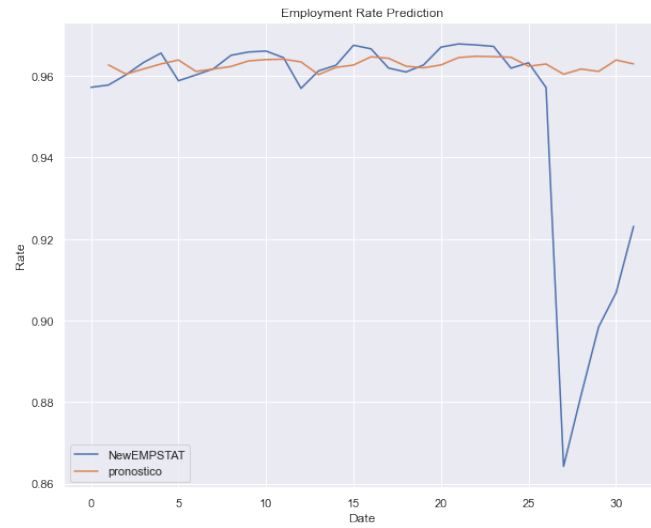


Figure 1: Employment rate vs Employment rate prediction

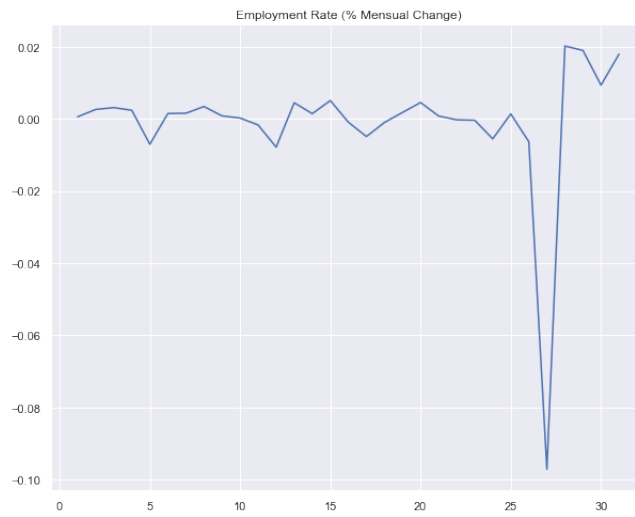


Figure 2: Employment rate percentage change

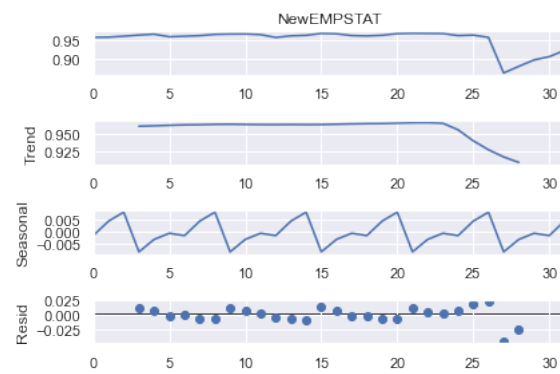


Figure 3: Employment rate without trend & seasonal

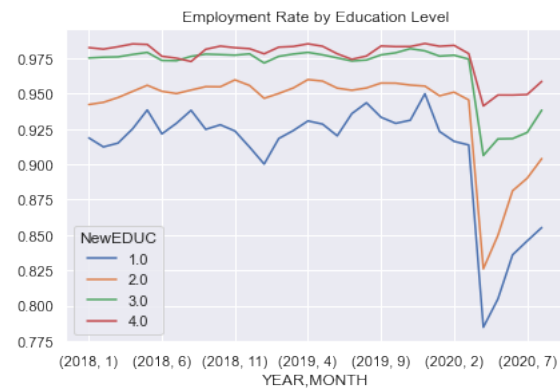


Figure 4: Employment rate by Education level

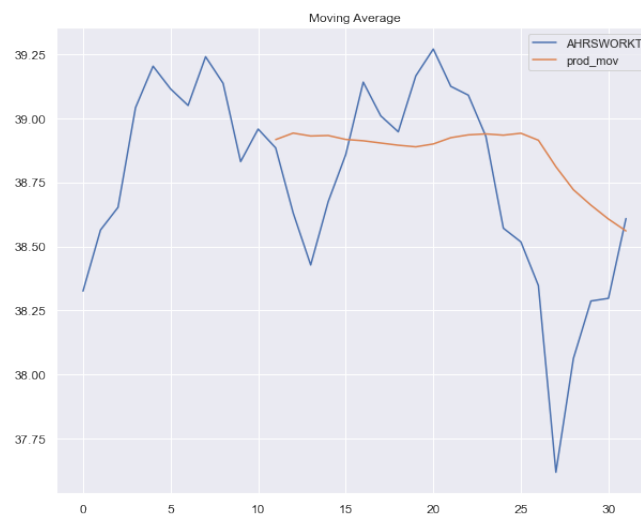


Figure 5: Moving Average by Hours

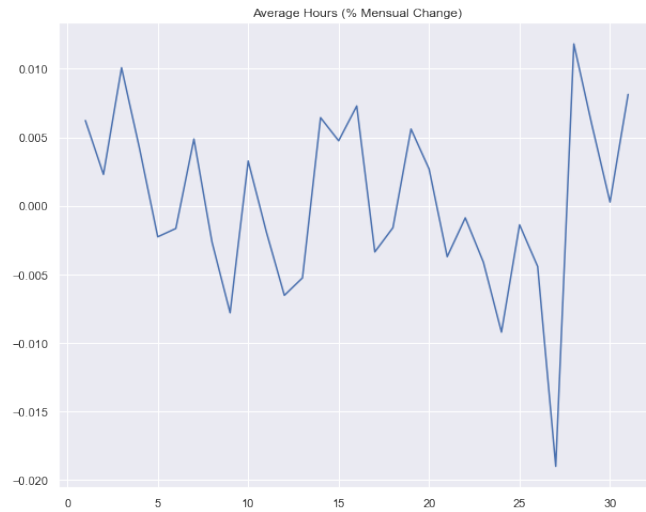


Figure 6: Average Weekly Change

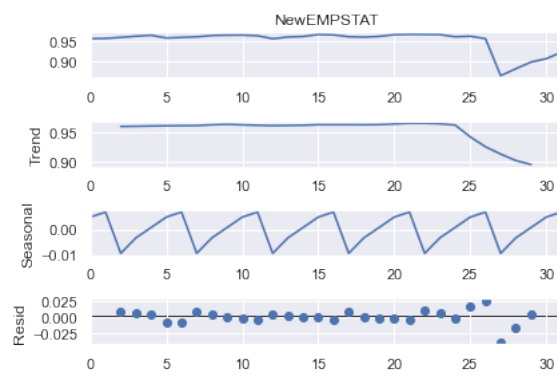


Figure 7: Average Weekly without trend and seasonal

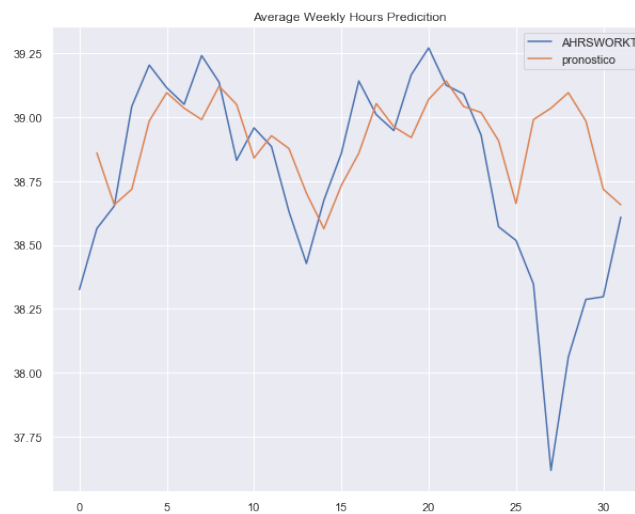


Figure 8: Average Weekly prediction

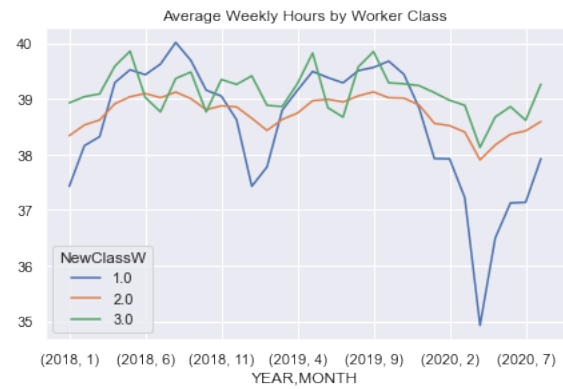


Figure 9: Average Weekly Hours by Worker Class

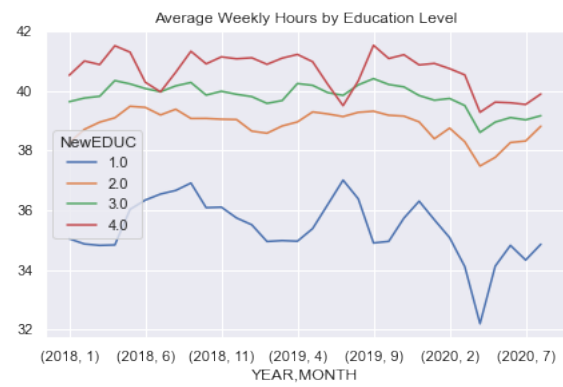


Figure 10: Average Weekly Hours by Education Level

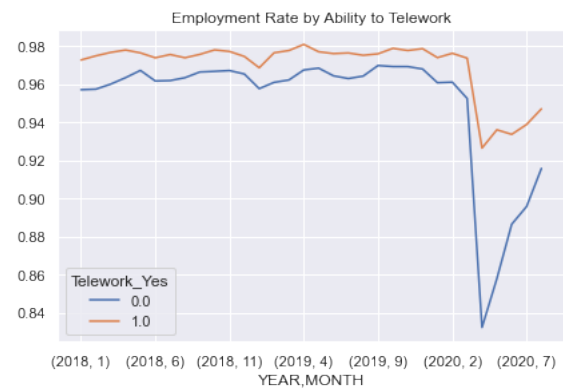


Figure 11: Employment Rate by Ability to Telework

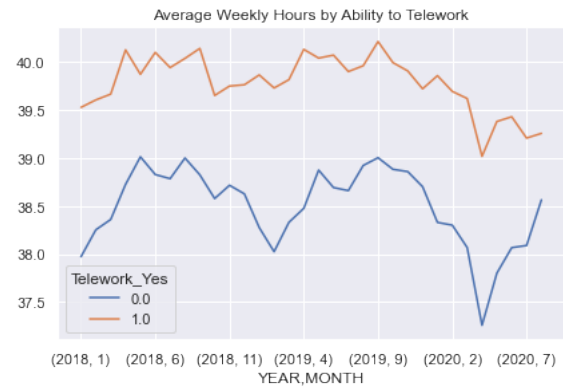


Figure 12: Average Weekly Hours by Ability to Telework

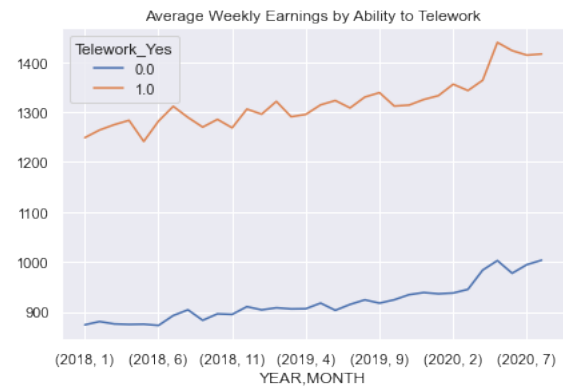


Figure 13: Average Weekly Earnings by Ability to Telework

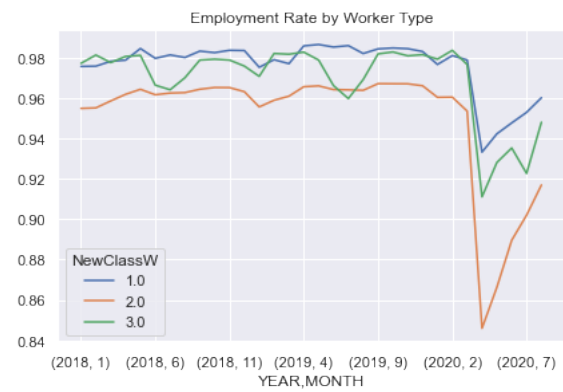


Figure 14: Employment rate by Worker type

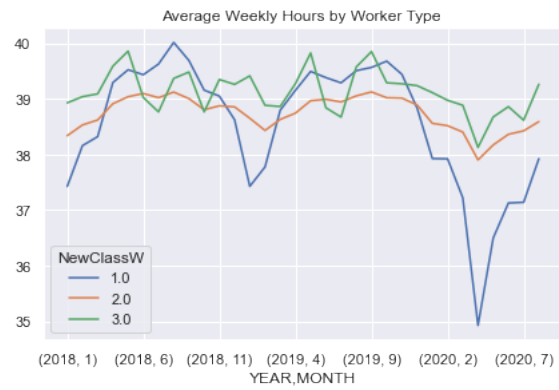


Figure 15: Average Weekly Hours by Worker type

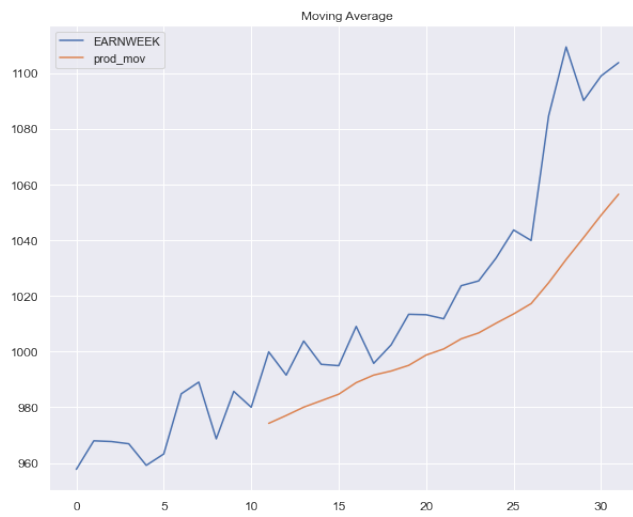


Figure 16: Earning Moving Average

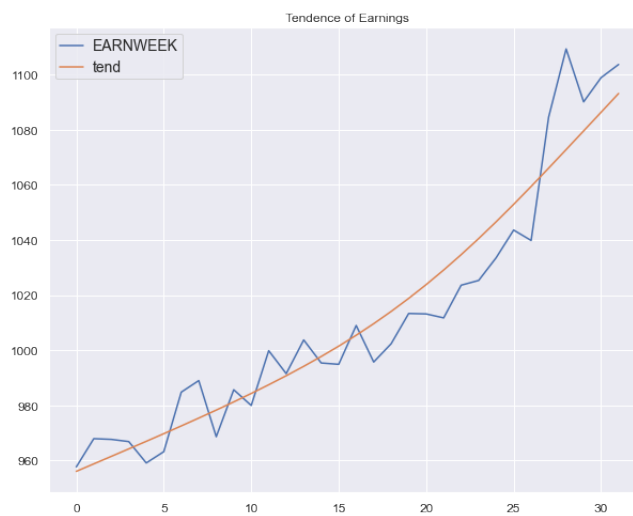


Figure 17: Earning tendency

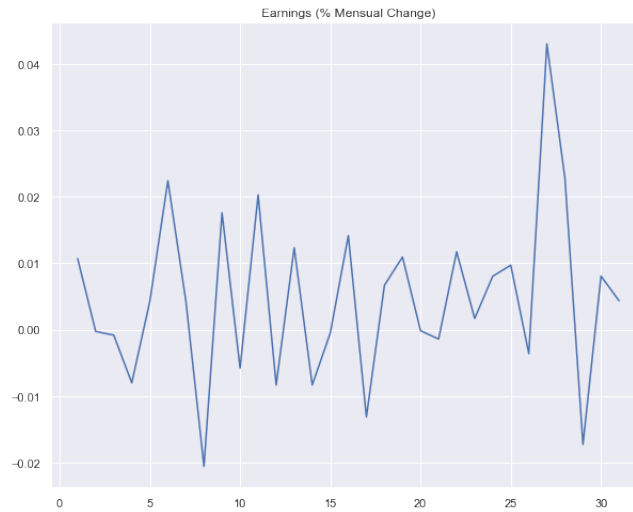


Figure 18: Earning Month Change

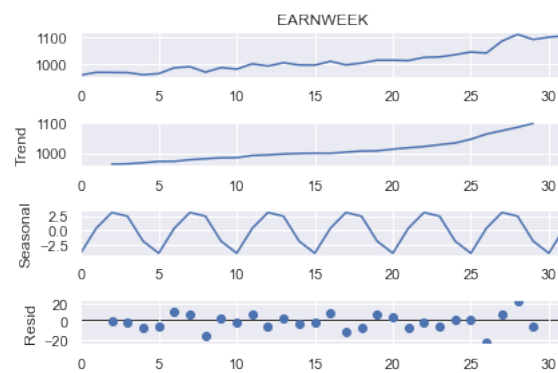


Figure 19: Earning without trend & seasonal

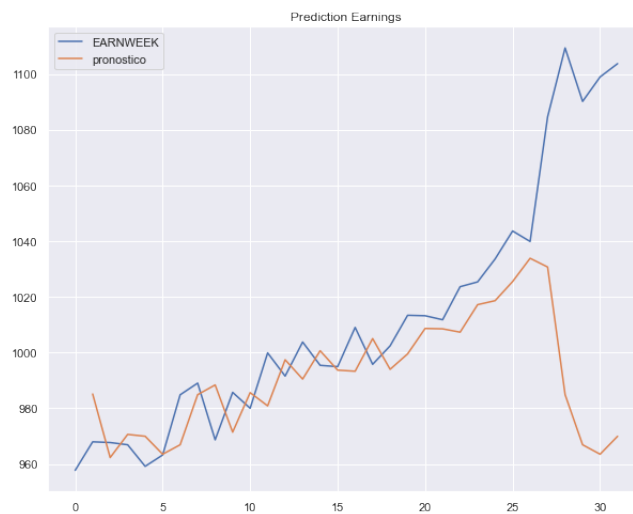


Figure 20: Earning prediction

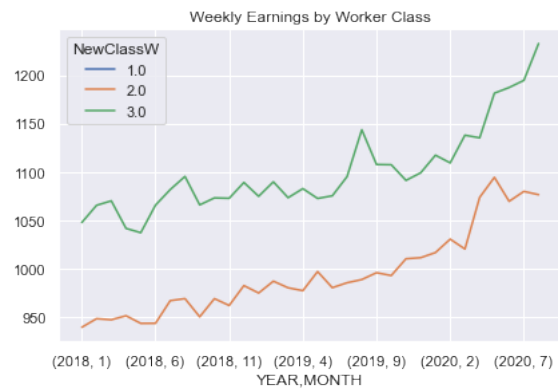


Figure 21: Earning by worker class

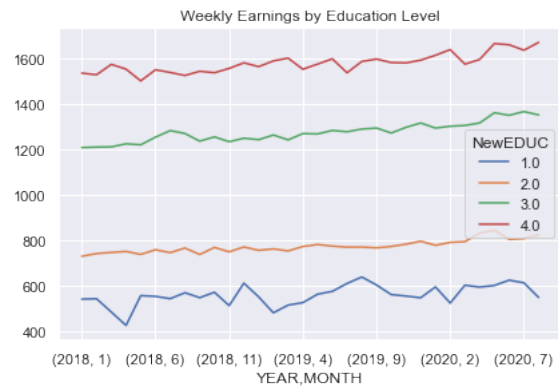


Figure 22: Earning by education level

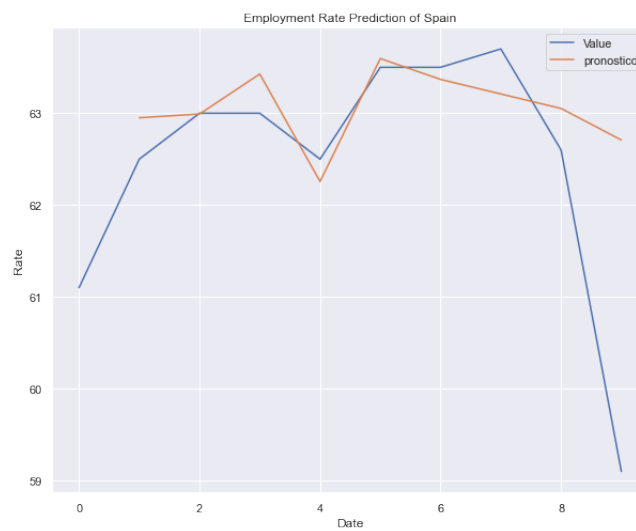


Figure 23: Employment Rate Prediction of Spain

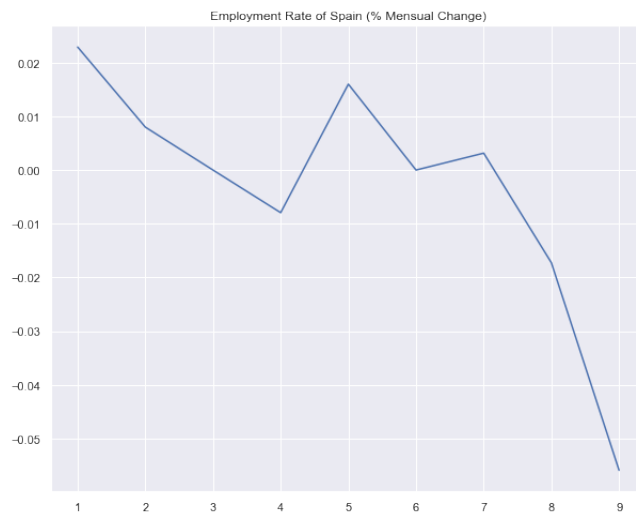


Figure 24: Employment Rate Trimester's Change of Spain

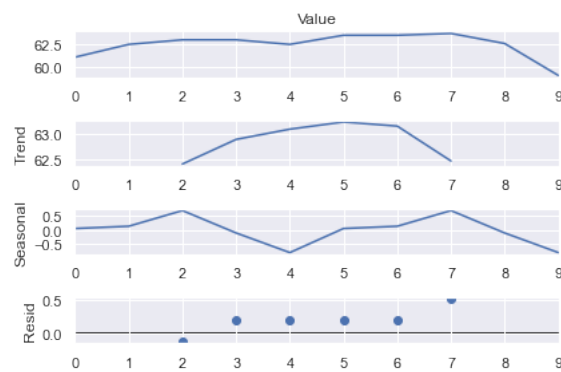


Figure 25: Employment Rate without trend & seasonal of Spain

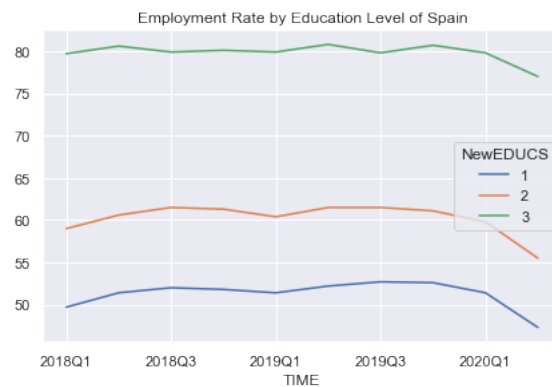


Figure 26: Employment Rate by Education Level



Figure 27: Average Hours Tendency of Spain

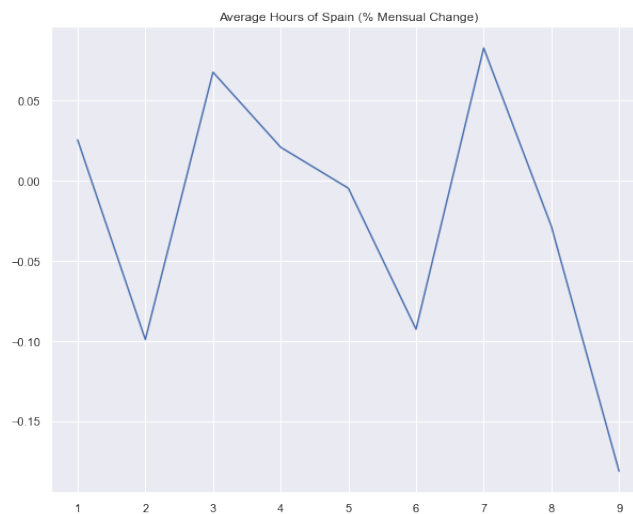


Figure 28: Average Hours Change of Spain

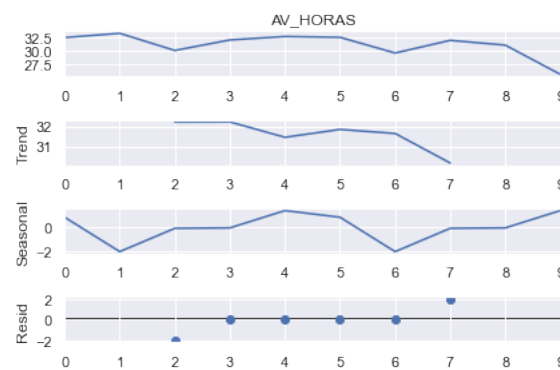


Figure 29: Average Hours without trend & seasonal of Spain

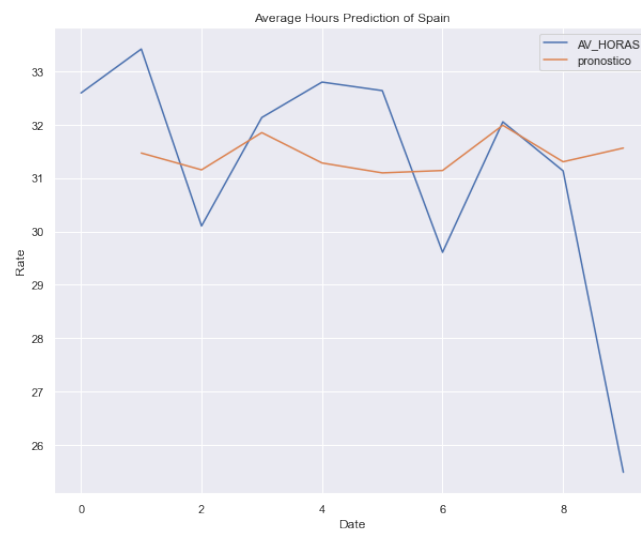


Figure 30: Average Hours prediction of Spain