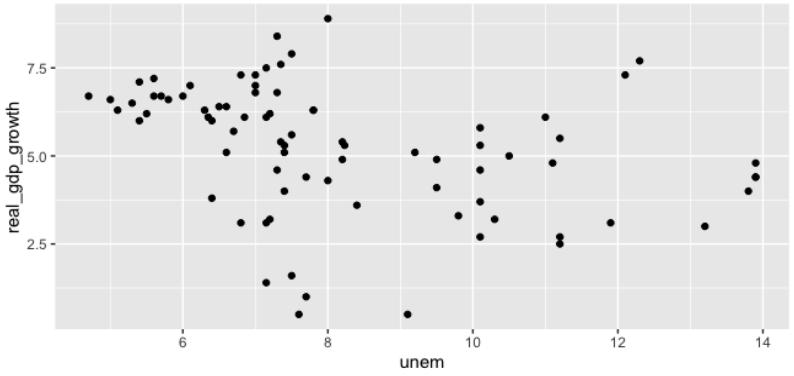
GDP & UNEMPLOYMENT
Analysis

Index

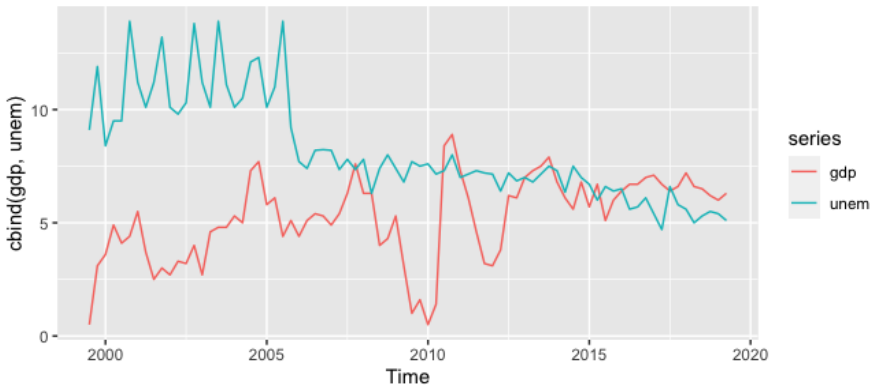
The aim of this analysis will be to analyse through Vector autoregression trying to do association between unemployment and GDP.
Recall from theory the 2 ways in which GDP can be composed, we have the **expenditure approach** and the **income approach.** Essentially both explain the same but from different points of view.
The dataset used for the analysis takes into account five variables such as GDP, unemployment, overnight reverse purchase (bsp rrp) and Turkey Stock Market value.

This association typically is called **okun's law**.
In the economics field this rule is an empirical relationship between unemployment and GDP. Standing to the "gap version ", for every 1% increase in the unemployment rate, a country's GDP will be roughly an additional 2% lower than its potential GDP.

What we can see from the analysis is related to the scatterplot. This allows us to understand that generally what we can see is that : if unemployment is low (for example we take a look at value = 6) GDP tends to be high.
There are some situations in which outlier value occurs. For example when unemployment is equal to 8 our GDP is also high even if the level of unemployment is increased.
As we already said the negative relation between unemployment and GDP is defined by okun's law but in this particular data set which represents the **Turkish** trend , that relationship may not be bound.



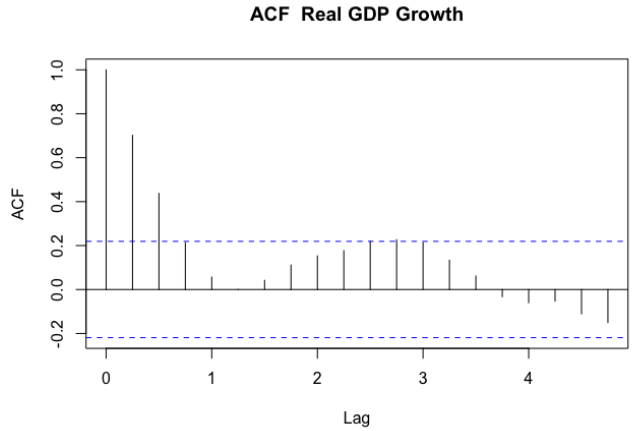
Plotting our 2 variables on a time series the result will be:

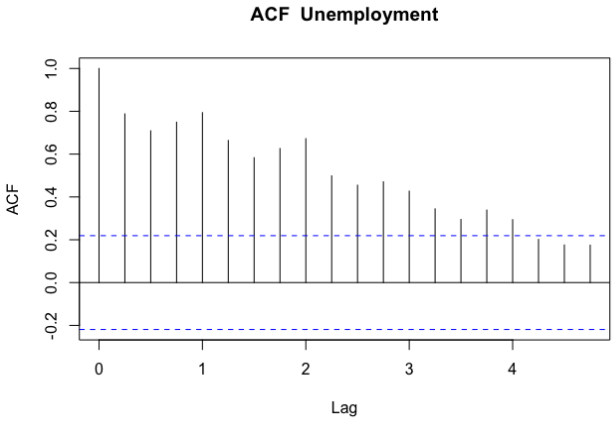


In order to understand if there is any sort of relation between unemployment and GDP and if they behave like a dependent variable we will analyse it with vector autoregression.

The philosophy we imposed on the analysis is to analyse any type of causality which derives from the data.
To be simple: if we compute a linear regression where our dependent variable is unemployment and the independent variable is the GDP , there will be a negative correlation between them with a p value less than 0.5 so we can say that the correlation is valid.
We use the VAR analysis in order to understand any causality between variables not in only one direction but in any direction.

In order to understand the phenomena behind this model, let's determine the persistence of the model we're gonna use the ACF and PACF.

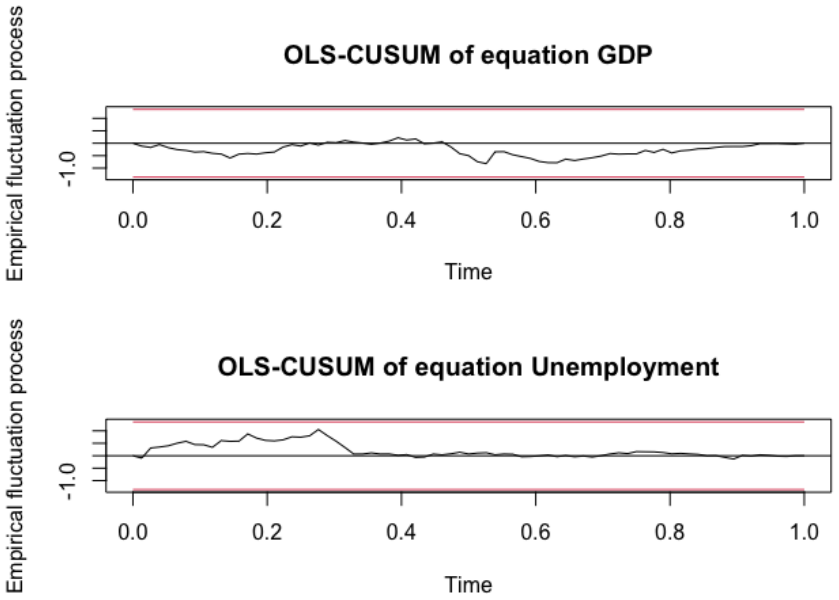




As we can see there is some sort of persistence in the model in the first lag.
From now on we have to find the **optimal lags** for the vector **auto regressive model.**
According to our result we'll use 4 which is the number of lags suggested by Akaike information criterion. After we've built the VAR model inside the software we can notice there won't be significant lags but what we can notice is that all the routes K are inside the unit circle.

VAR DIAGNOSTIC

One test that could be done to check serial correlation is the **Portmanteau Test,** since we have p-value = 0.2044 this means that there isn't serial correlation and this is good cause we don't want inside the VAR.
Doing Another check called **heteroskedasticity test** we can check whether or not there is unequal variance of the residuals over a range of measured values. In our case the p-value indicates no heteroskedasticity.
One violation of the model derived from a **test for normal distribution of the residuals** which highlights the non normality of the residuals.



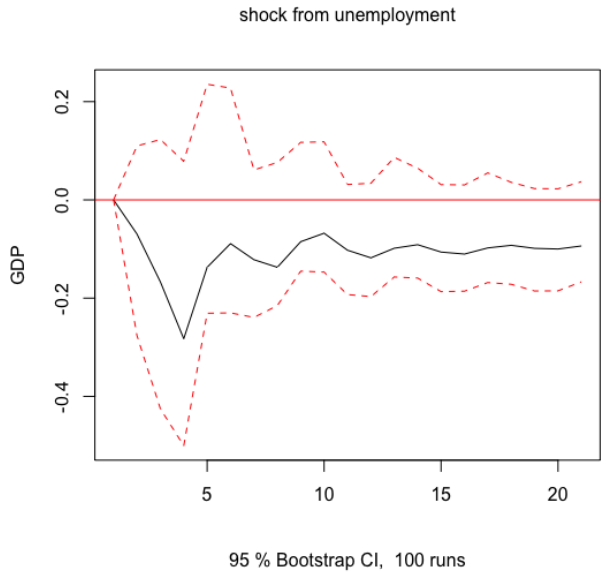
Another useful test is **structural breaks in the residuals**.
Looking at the graph (on the left hand-side) we can state that because both GDP and unemployment don't exceed the confidence interval marked by the red line, the model is stable.

So from here what we're gonna see is if the variable granger causes the other one.
Remember that granger causality happens when a variable helps to predict another variable regardless of the order of the variable , could be both GDP granger causes Unemployment and vice versa.

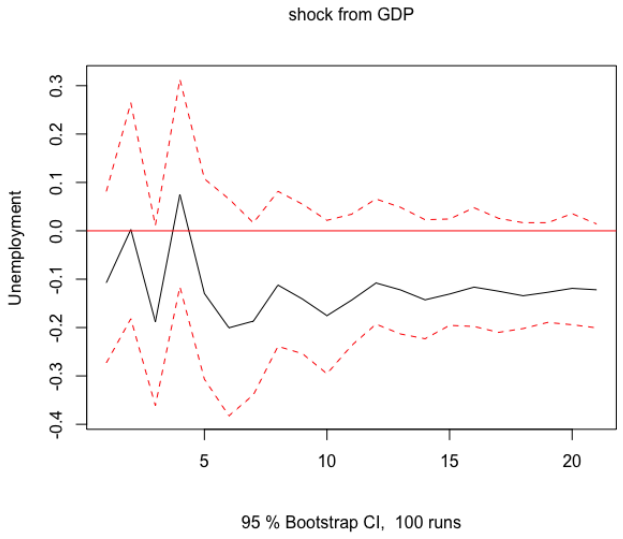
So the aim is to see if there is unidirectional , bidirectional or no causality altogether.
In our specific case from the analysis we can see how GDP do not granger cause Unemployment. If we see the other side, going to analyse if Unemployment granger causes GDP we will earn the same result obtained before.

IRF

The next step will be the computation of **IRF** (impulse response function). So what the IRF provides is how the data would behave in a certain time if there is a shock that affects that variable. Generally this type of analysis is applied on the behaviour of the economy after the interest rate hike from central banks. In this specific case we could analyse what's the effect of an unemployment shock on GDP ?
So the main question to deal with is, how the model is gonna impact on unemployment and how GDP reacts to this shock ?



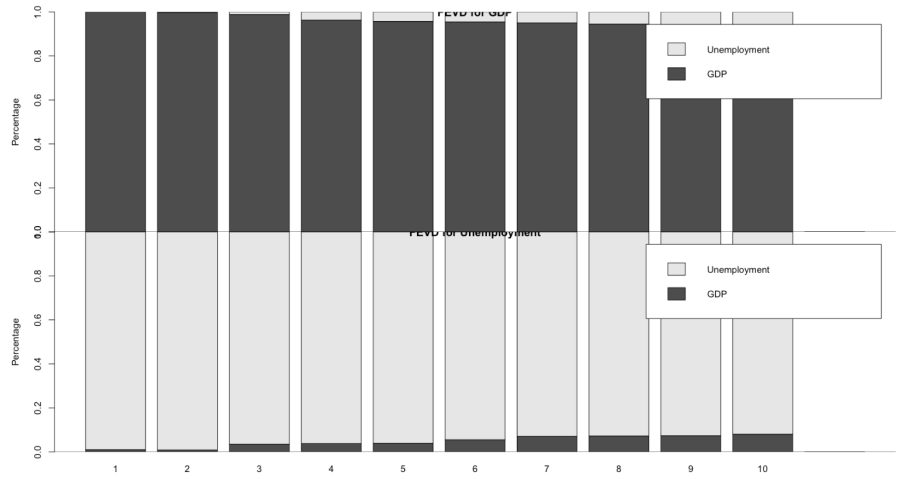
As we can see from the graph a positive shock in unemployment in the first period will really decrease GDP but from the Black line we can see as the time goes by the line will recover a bit. The red-crossed line represents the confidence interval from which we can notice that the confidence interval for error is very large. The next step will be to compute the IRF on the unemployment side, analyse the opposite relation and see how the unemployment reacts to shocks in GDP.



We can see how unemployment (black line) fluctuates sharply when the impulse affects the data while as the time goes by the effect decreases.

Variance Decomposition

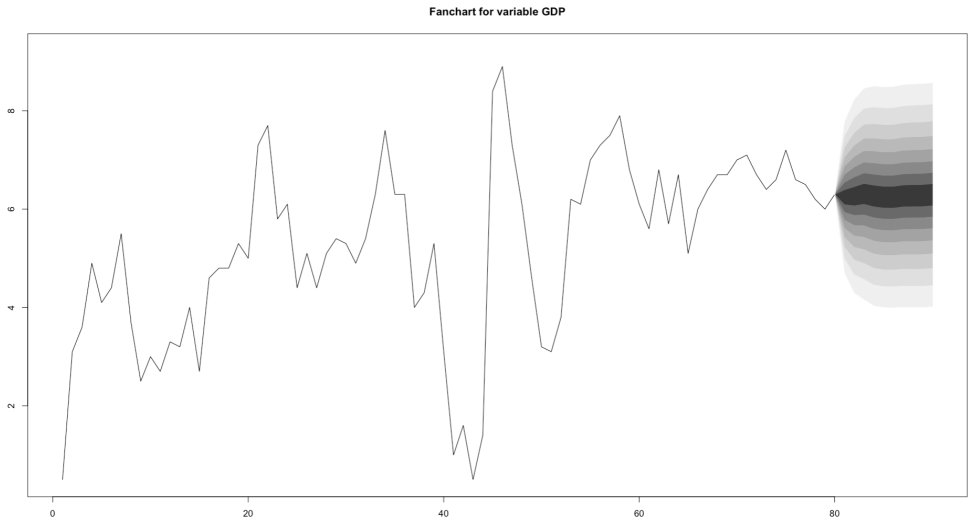
With this simple analysis we're gonna analyse how much these variables are influenced by the shocks.



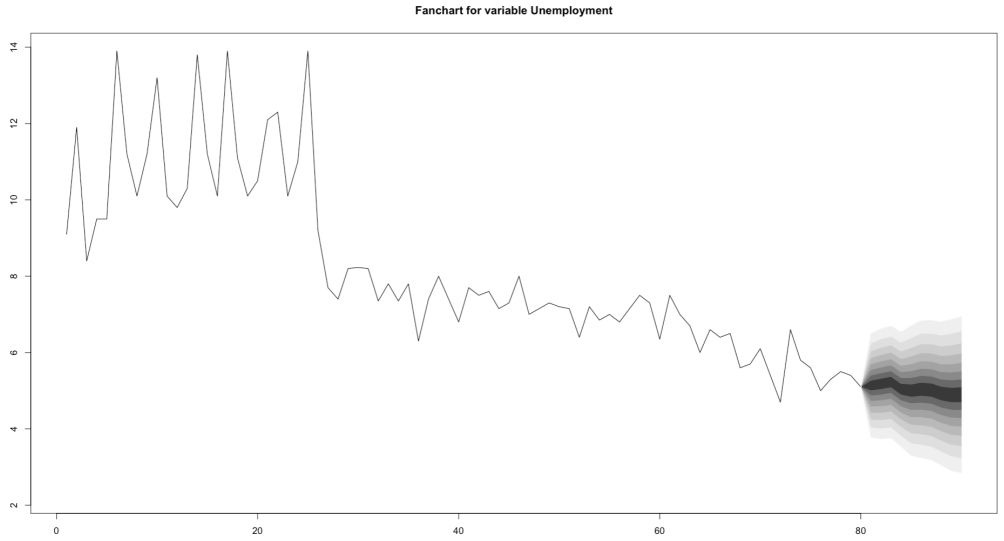
We can see how both unemployment and GDP are relatively influenced by their own shock so what we can state is that typically unemployment is typically the ones that are gona influence the value of GDP and vice versa.

VAR forecasting

From all the analysis already done, there are the elements to make forecasts and think to predict in such a good way the path of both GDP and unemployment.



The forecast made on the system is a short term forecast which uses quarter data. Going to analyse the graph we notice from the darkest colour how roughly the GDP is gonna be stable in the period ahead, staying on a level about 6.5%.



Forecasting Unemployment we can notice a short trends which tends a little downward with the darkest are which has a hump shaped trend and it will end up with a probability to go down around 4.5%.