



# A time series comparison study using ARIMA model for plastic products trade

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# INTRODUCTION

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- The use of plastic products is one of the main obstacles to achieving sustainable goals in terms of the green economy. Although a lot of effort is being invested in reducing the use of plastic, it is still at an alarmingly high level.
- This study deals with the import and export of plastic product in EU and it will forecast on trade in plastics in both primary and non-primary forms to examine whether the trend in plastic use is declining.

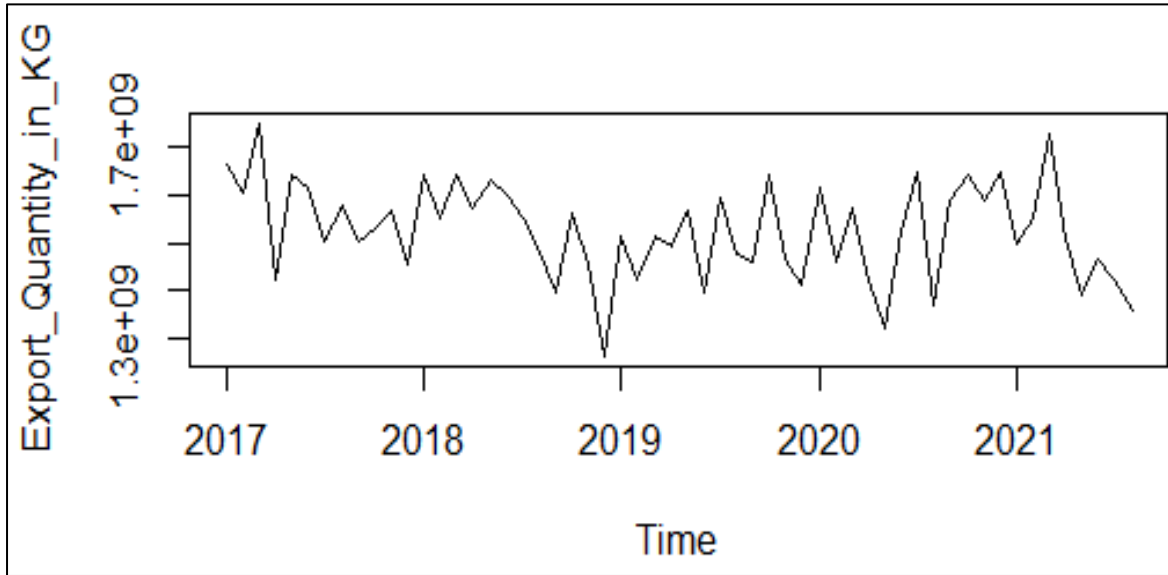


# DATA

- In this study the Comext, database for detailed statistics on international trade in goods, has been used. The considered dataset can be found on the Eurostat website.
- Monthly data for period from January 2017 to August 2021 has been analysed.
- Comext data by itself contains a lot of data, because of how detailed it is (over 22GB for the period of 5 years) and hardware limitations were the main problems in the process of data cleaning.
- Only a small part of the available data has been used for this analysis. The final output of the data cleaning process can be seen on the image below.

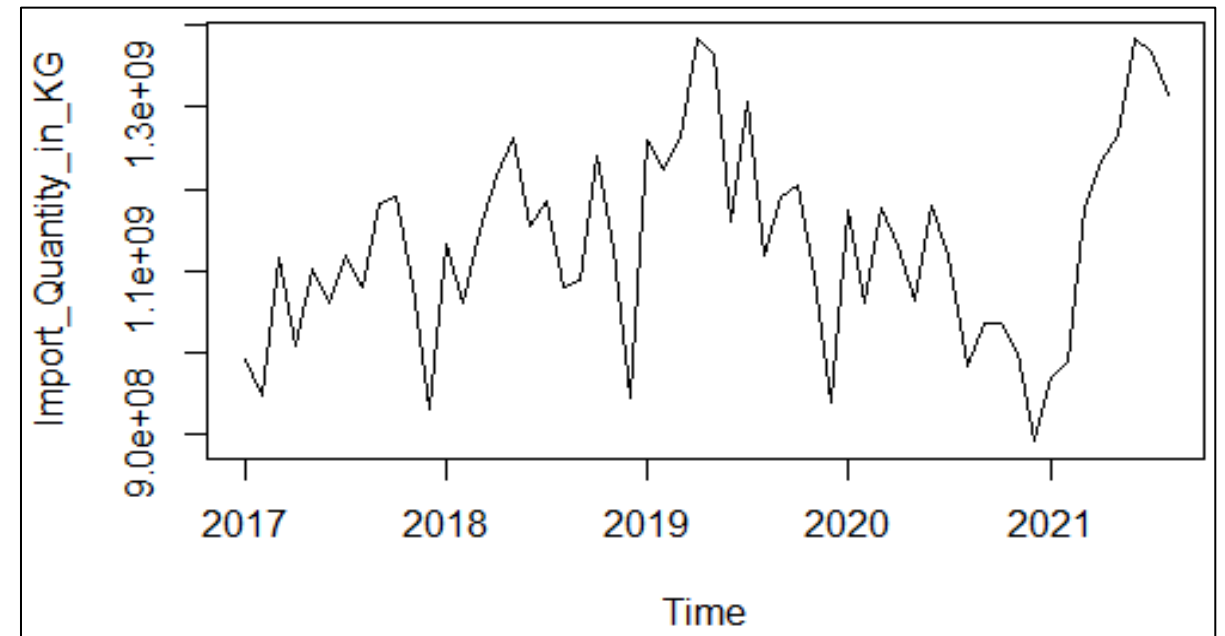
	A	B	C	D	E	F
1		Period	Export_Value_in_Euros	Export_Quantity_in_KG	Import_Value_in_Euros	Import_Quantity_in_KG
2	0	201701	3301886443	1666374047	2043406815	989951540
3	1	201702	3307861691	1606363086	1901881872	945729192
4	2	201703	3838610602	1751097985	2308822842	1115714174
5	3	201704	3259997722	1420991842	2080045989	1009163563
6	4	201705	3765374544	1643213898	2378692769	1103174092
7	5	201706	3630500328	1615792859	2192496831	1060329097

# MAKING PLOTS FROM OUR DATA



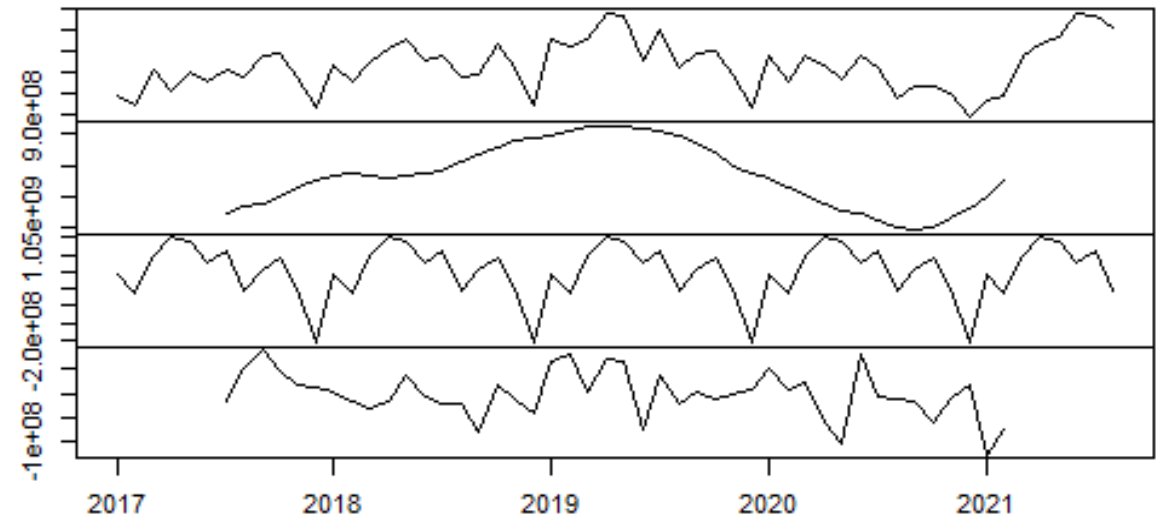
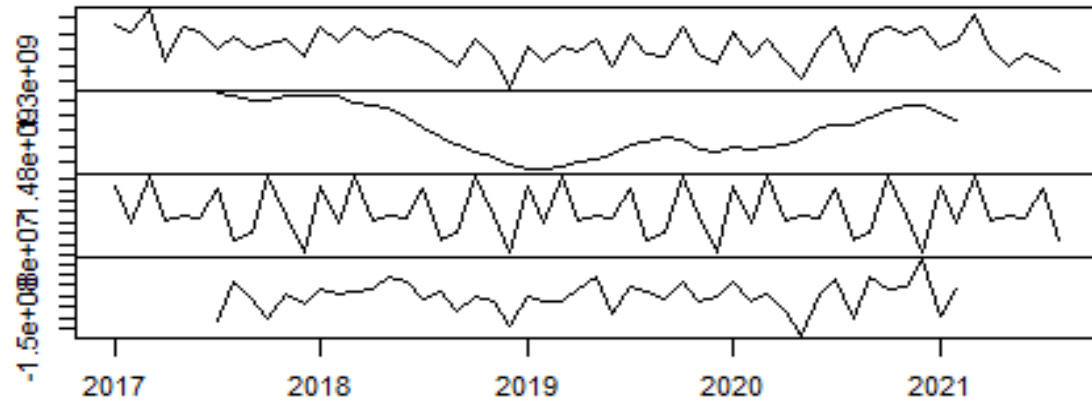
Plot of actual dataset for export

Plot of actual dataset for import



# EXPLORATORY ANALYSIS

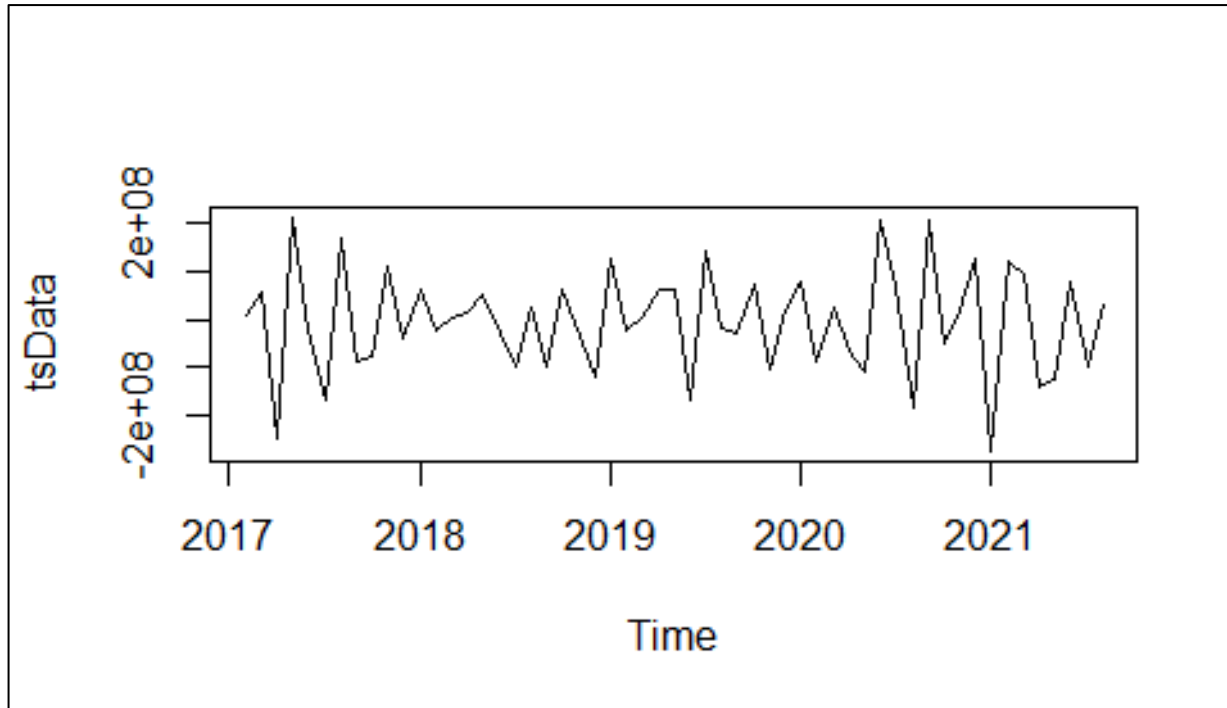
- Decomposition of the time series into its 4 components.



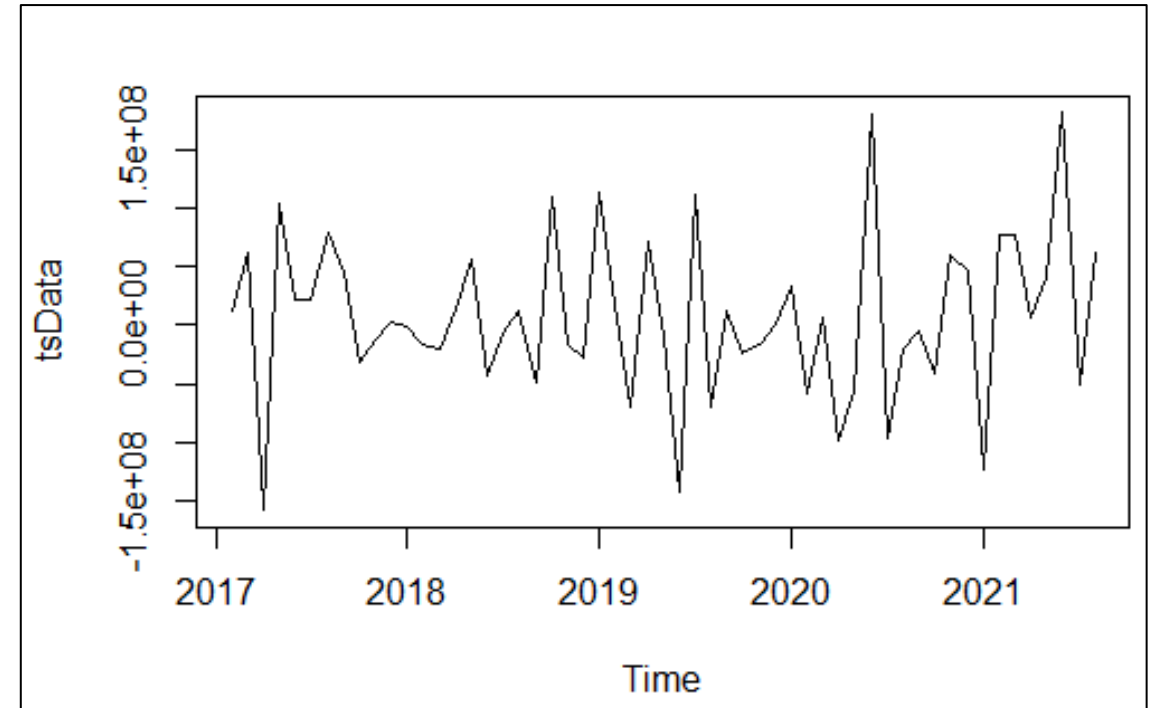
# REMOVE SEASONALITY FROM THE DATA

- To achieve stationarity: UNIT ROOT TEST
- Detecting seasonality: AUTOCORRELATION

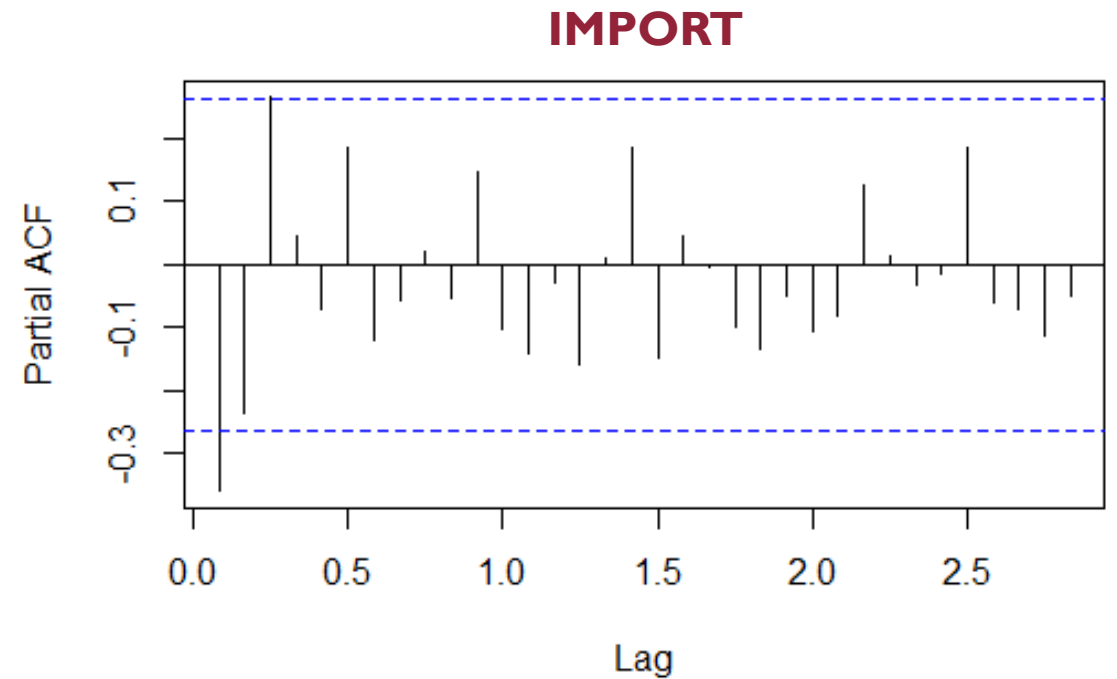
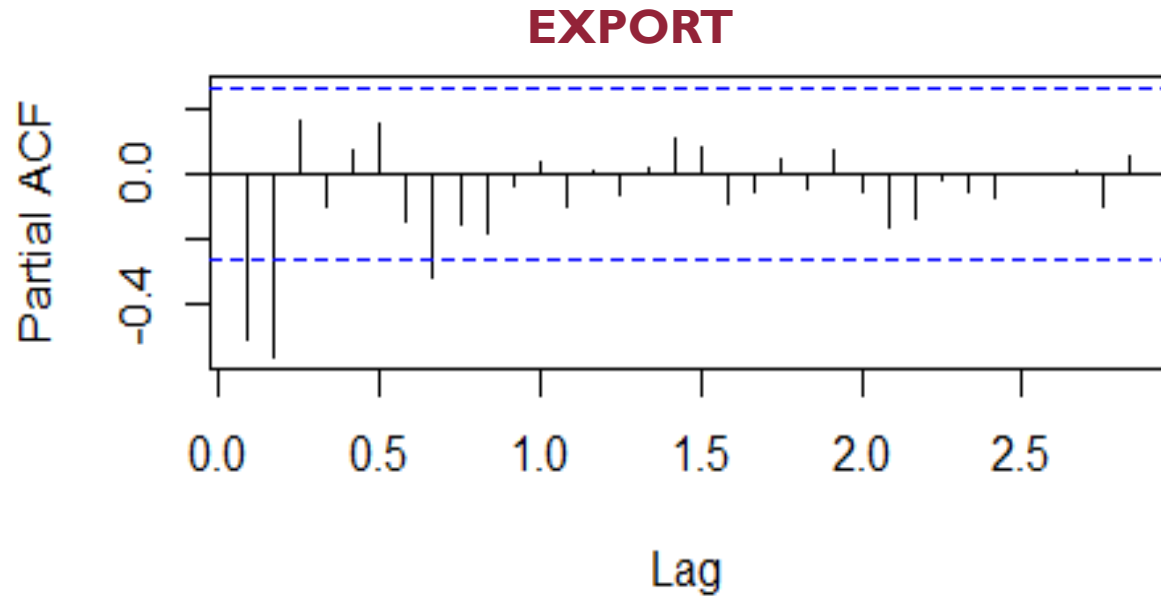
## EXPORT



## IMPORT



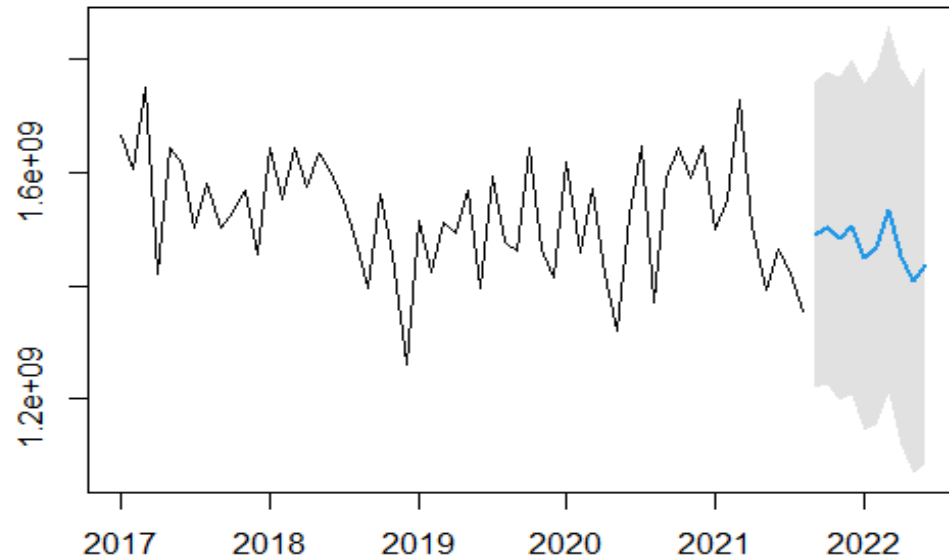
# FIT THE MODEL



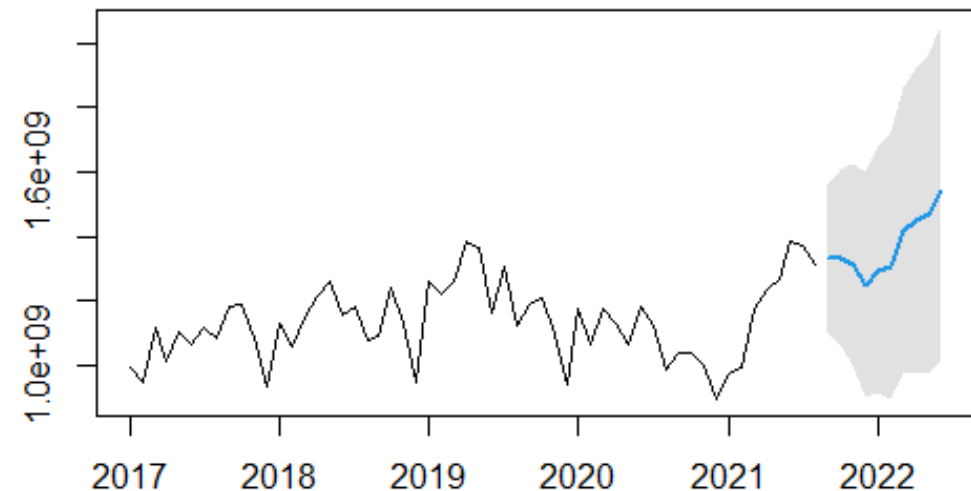
# DIAGNOSTIC MEASURES AND CALCULATING FORECAST

- The forecasts are shown as a blue line, with the 80% prediction intervals as a dark shaded area, and the 95% prediction intervals as a light shaded area.

Forecasts from ARIMA(1,1,1)(1,0,0)[12]



Forecasts from ARIMA(1,1,1)(1,0,0)[12]





# EXPANSIONS AND POTENTIALS OF THE ANALYSIS

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- In the second part of the study a chow test is used to verify whether the onset of the pandemic in March 2020 generated a structural break in the time series of import and export.
- Furthermore, instead of choosing the breakpoint in an exogenous manner, we try a data-driven approach, to learn if the data itself could tell where the breakpoints lie. Such an endogenous technique detects about multiple structural breaks in longitudinal data, testing for breaks empirically, using a dynamic programming algorithm in R. After that, we will Compare both breakpoint detections and comment the results with respect to the initial working hypothesis and about policy or economic points that may arise.
- Repeat procedures for different plastic products (e.g., plastic plates, cups, and forks).

# Thank you for your attention! 😊

