To Be or Not to Be:

Examining the effects of membership of the European Union on growth and stability

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BRIEF

This project proposes to study the causal relationship between being in an economic union and a country's economic health. Economic health will be defined as growth and price/inflation stability as determined by the Gross Domestic Production per capita annual growth rate and inflation annual rate respectively. Through descriptive analysis, there is a better picture of health variables and their relationship with the independent variables.

INTRODUCTION

All of the data necessary to partake in this econometric analysis is publicly available through innumerable international organizations. The database was created using information collected from the European Union (EU) website and the World Bank databases. The dataset consists of annual macroeconomic data of 19 European countries covering 1997 to 2016.

The EU website contains various data pertaining to the regional union. This includes the constituents, the entrance date for every member state and the names of countries that are in the process of integrating into the system (European Union 2017). This is important because it allows us to choose the treatment and counterfactual groups for regression purposes.

As the treatment is being a part of the European Union, it makes the most sense for the treatment group to have been in the EU for long enough to collect a sizable amount of post-entrance information. As such, the treatment group became the group of ten countries that were annexed into the EU on 1 May 2004 (EU 2017). Many of the previously added countries have large economies; as such, these were disallowed as unions are supposed to be particularly useful to smaller markets. The control group is nine non-EU countries that are geographically and culturally similar to the countries that are in the treatment group. However, some of these countries are candidates and potential members of the EU.

The essential source for data collection is the World Bank World Development Indicators website that collects and tracks numerous economic and social indicators for countries around the world. Gross Domestic Production (GDP) per capita annual growth rate and inflation annual rate based on the consumer price index (CPI) were collected to test the economic health of countries.

The indicator GDP measures the total value of goods and services produced in a country. The growth rate is based on the constant local currency that they receive from the World Bank and the OECD national accounts data files (World Bank 2017[a]). Using the per capita annual growth rates will make it easier to see the economic growth that occurs per person, the increase in welfare for each individual.

Due to the free movement in the European Union, Gross National Income (GNI), another indicator, would not be a good measurement to use. GNI measures the income of all residents of a country, including those that live abroad, and excluding immigrants that live in a country. Within the European Union, citizens can move freely to other countries that have more jobs or higher pay. After integrating into the EU, citizens moving abroad could lead to a higher GNI, however, this is not an effect of trade.

The World Bank also tracks annual inflation from countries all over the world, with its sources as the International Monetary Fund and the International Financial Statistics data files (World Bank 2017[b]). Inflation based on the consumer price index is the annual percentage change for a specific basket of goods and services that may be fixed or changed at specified intervals (U.S. Department of Labor 2017). The Laspeyres formula is generally used in order to create the inflation percentage. Using the cost to consumers shows the change in purchasing power of consumers, how much they can buy in their country with their currency. A stable economy is often defined as one that has a low and steady rate of inflation. A low level of inflation disallows prices from skyrocketing while also reducing the severity of economic recessions. Therefore, it makes sense to use this as an indicator of economic health.

EXAMINIATION

This dissertation will attempt to find the effect that time and European Union membership has on the economic wellbeing of a country. As there are two models, that have Country, Year, and European Union membership in common, GDP per capita annual rate and the annual inflation rate will be examined separately.

TIME

In this investigation, time is denoted as 2004 within the equations and expressed as a dummy variable. A dummy variable is a proxy for qualitative values. The value one will be given if the year of the data collected is within the treatment period, 2004 and later, and the value zero will be given for any years prior. The time range of the data is 20 years of the most recent data. As these countries were annexed in 2004, there is 13 years (65% of the years) within the treatment period and 7 years (35%) outside of it.

EUROPEAN UNION

A country's status as a member state in the European Union, indicated with by variable named EU, is also expressed as a dummy variable. The value one is set for those countries in the treatment group and zero otherwise. The treatment group is those countries that are currently in the European Union. There are ten countries in the treatment group: Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, the Slovak Republic, and Slovenia. The nine control countries are Albania, Belarus, Kosovo, Liechtenstein, Macedonia (FYR), Montenegro, Norway, Serbia, and Switzerland. There is almost an even breakdown of the two groups, with the treatment group being 53% of the data.

GDP GROWTH RATE

In the economic growth model, GDP per capita annual rate (abbreviated in the model as GDP) is the dependent variable with time, membership in the European Union, and an interaction between the two as the independent variables. There are 368 observations in the sample as there is missing data explained in the below Problems section. By using the rate of growth, we are able to normalize the data, making it easier to work with. The mean is 3.234 and the median is 3.187. Skewness is a measure of asymmetry in the data with a normal distribution having a skew of zero. While there is some negative skewness, it is small as the mean and median are quite close together. The skewness is -0.209 gives no reason to

transform the data as it is fairly symmetrical. This can also be seen in the GDP histogram in figure 1. Kurtosis is a measure of the heaviness of the tails, describing the abundance or lack of outliers. As a normal distribution has a kurtosis of three, the GDP data has a fatter tail with a value of 7.694.

In the histogram of GDP rates (figure 1), the distribution of the variable is fairly symmetric with an outlier in the 30% range. Figure 2 shows the time trend of the growth rate. Prior to 2004, there seems to be a slight increase in the growth rate before slowly beginning to fall. Although the rate of growth decreased, it is not much lower than where it started in 1997. However, we can see that the time trend is overall negative. A majority of these plots are above zero, meaning that while growth slowed, it was still occurring. When plotted against EU Status (figure 2), the GDP growth rates appear to be similar, if not slightly higher for the European Union. There is one high outlier in the control group and many smaller outliers for those in the treatment group but most of the points for those within the EU are clustered higher than those without.

STABILITY

In the economic stability model, a dummy stability variable (signified with Stab) is used as a way of expressing a good economic health. The European Central Bank's primary objective is to create price stability by maintaining inflation rates around two percent based on the Harmonized Index of Consumer Prices (European Central Bank 2017). By keeping inflation at this level, there is a safety margin to keep the economy from going into deflation, which is considered as a weak economic condition. On the other hand, a higher inflation rate would raise prices and increase uncertainty about long-term economic and financial decisions. As such, stability will be defined in the model as an inflation rate between one percent and three percent, considered by many central banks, as the optimum level of inflation.

As a binary variable, stability will have a range of one with the minimum being zero signifying a country being unstable and the maximum being one indicating price stability. With 330 observations, the mean is 0.3212 and the median is 0 which signifies that there are more values to the left of the graph. Only a third of the inflation rates are stable causing the variable to have a moderate positive skew, unlike GDP. This is backed up by the 0.766 skewness reported in table 2. By using a dummy variable instead of the full inflation rate, we are able to reduce the skew as given by the skewness coefficients in table two, stability, and table three, inflation. It also decreases the kurtosis by 111.695.

The histograms of the inflation rate and stability are both positively skewed with long right-hand tails. As stability is a binary variable, it is not surprising that the data is skewed in some way. However, by changing the variable from quantitative to qualitative, we are able to change from a high peak and a rather long right tail (figure 4) to a distribution with a shorter peak and brief but fat tail (figure 5). We can see the same trends in stability over time and membership in the European Union as with GDP growth rate. After around 2004, there is a drop in the likelihood of being stable but the possibility is higher in 2016 than it is in 1997. There is also a higher probability of being stable if in the treatment group than if not.

PROBLEMS

There are very few data problems that arise in this research. The two main problems that are likely to arise are measurement error and a lack of data. As this dissertation is focused on the recent economic history of European countries, these are less likely to occur.

There should be little to no data quality issues as most developed countries collect and give honest records. Measurement error can occur in the Growth Domestic Production growth rate and the annual inflation rate by consumer price index (CPI). The CPI is based on urban spending and goods within the basket can change over time. The limitations in measurement errors can be put into two groups, sampling and non-sampling (U.S. Department of Labor). Sampling error occurs as the price changes are based on a sample of items rather than all retail purchases which limits the accuracy of the index. Non-sampling errors cause persistent bias and are more challenging to rectify. Non-sampling errors hurt the accuracy of the index more so than sampling errors. With GDP there is a chance that growth might be based on nominal estimates and not reflect the real rate of growth. By using nominal estimates of GDP, inflation over time is not taken into account.

Lack of data, although an unlikely expectation for European countries, does occur in the database, making the panel data unbalanced. Three countries are missing various years in both indicators. Kosovo is missing 1997 – 2000 GDP growth data and all inflation data but the lack of GDP data might be due to the Kosovo war that lasted from 1998 to 1999. Liechtenstein is missing 2010 – 2014 GDP data and all inflation data. Montenegro is missing 1997 GDP data and 1997 – 2005 and 2016 inflation data but as Montenegro has only been an independent country since 2006 the lack of inflation data can be excused.

There is nothing to rectify for this as a simple linear regression model will delete the missing observations.

Appendix

GDP per capita annual rate

Minimum	1st Quarter	Median	Mean	3rd Quarter	Maximum
-14.560	1.404	3.187	3.234	5.258	26.890
Range	**Std Error**	**Variance**	**Std deviation**	**Skewness**	**Kurtosis**
41.448	0.220	17.742	4.212	-0.209	7.694

Table 1 – based on 368 observations

Stability

Minimum	1st Quarter	Median	Mean	3rd Quarter	Maximum
0	0	0	.3212	1	1
Range	**Std Error**	**Variance**	**Std deviation**	**Skewness**	**Kurtosis**
1	0.026	0.219	0.468	0.766	1.586

Table 2 – based on 330 observations

Inflation annual rate, based on CPI

Minimum	1st Quarter	Median	Mean	3rd Quarter	Maximum
-2.097	1.174	2.715	7.026	5.986	293.700
Range	**Std Error**	**Variance**	**Std deviation**	**Skewness**	**Kurtosis**
295.679	1.169	451.219	21.242	9.430762	113.2814

Table 3 – based on 330 observations

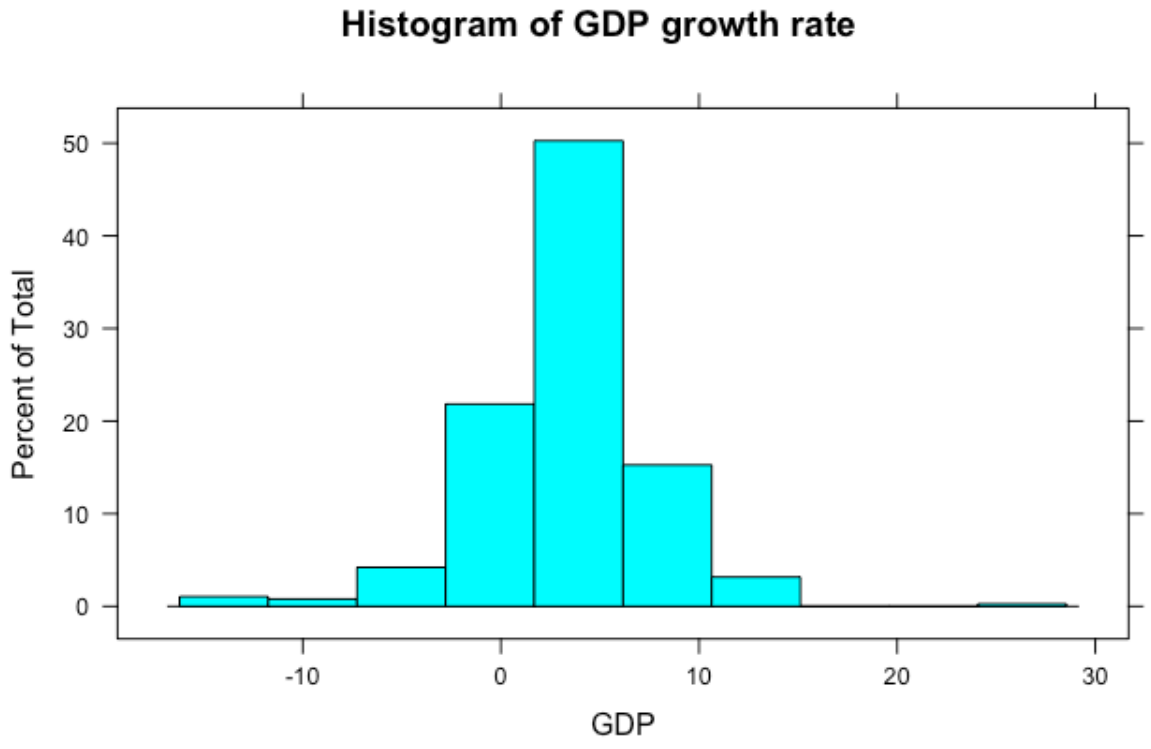


Figure 1

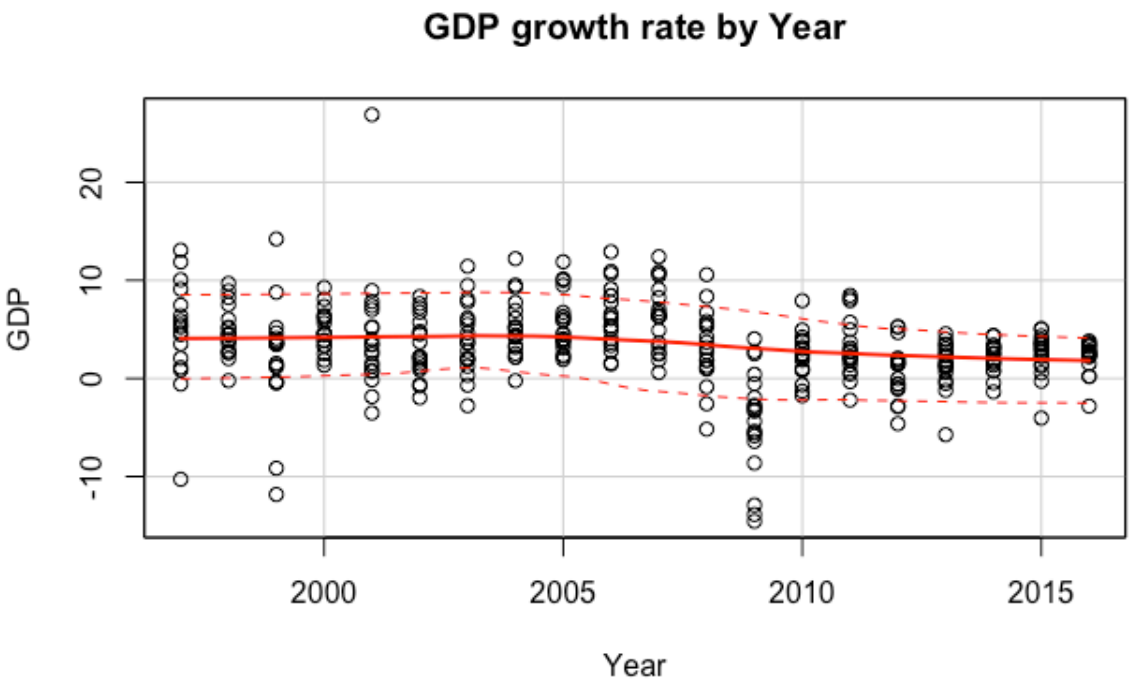


Figure 2

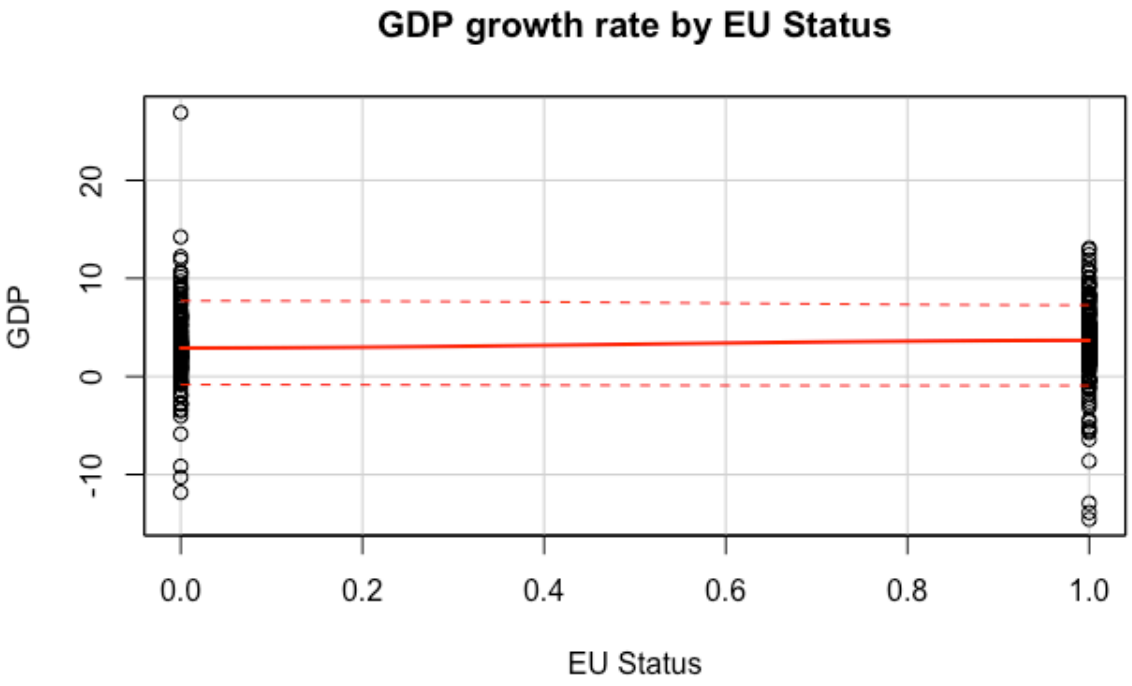


Figure 3

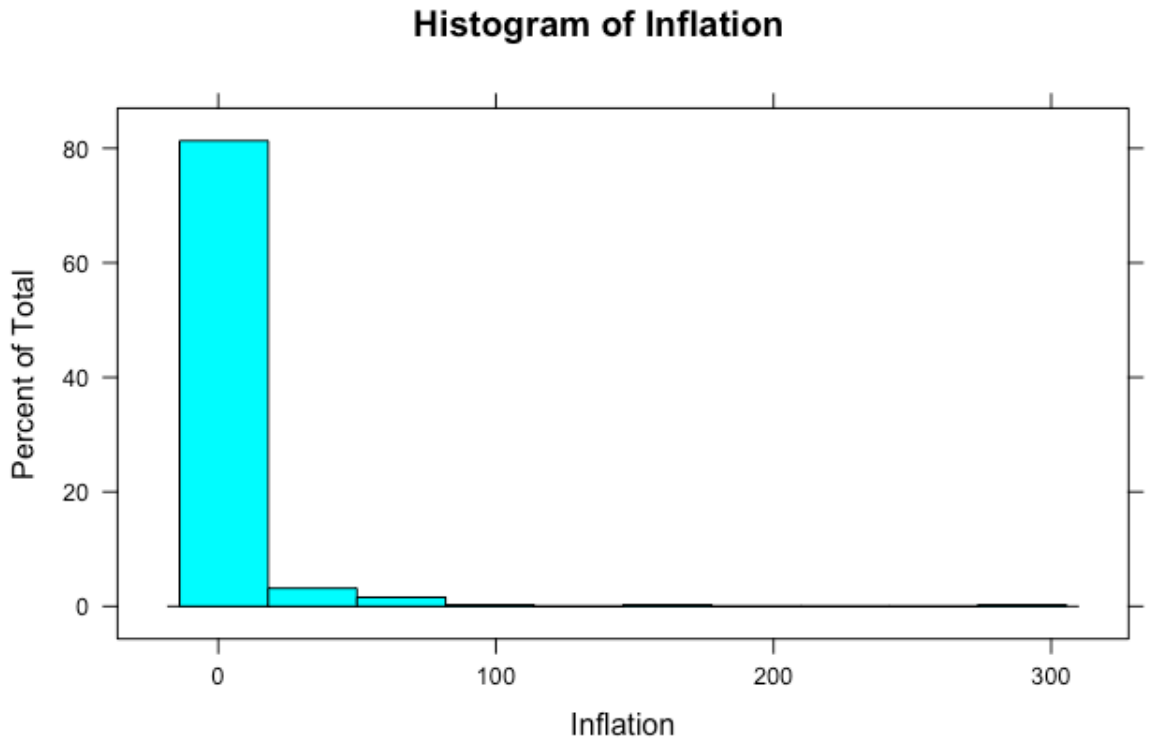
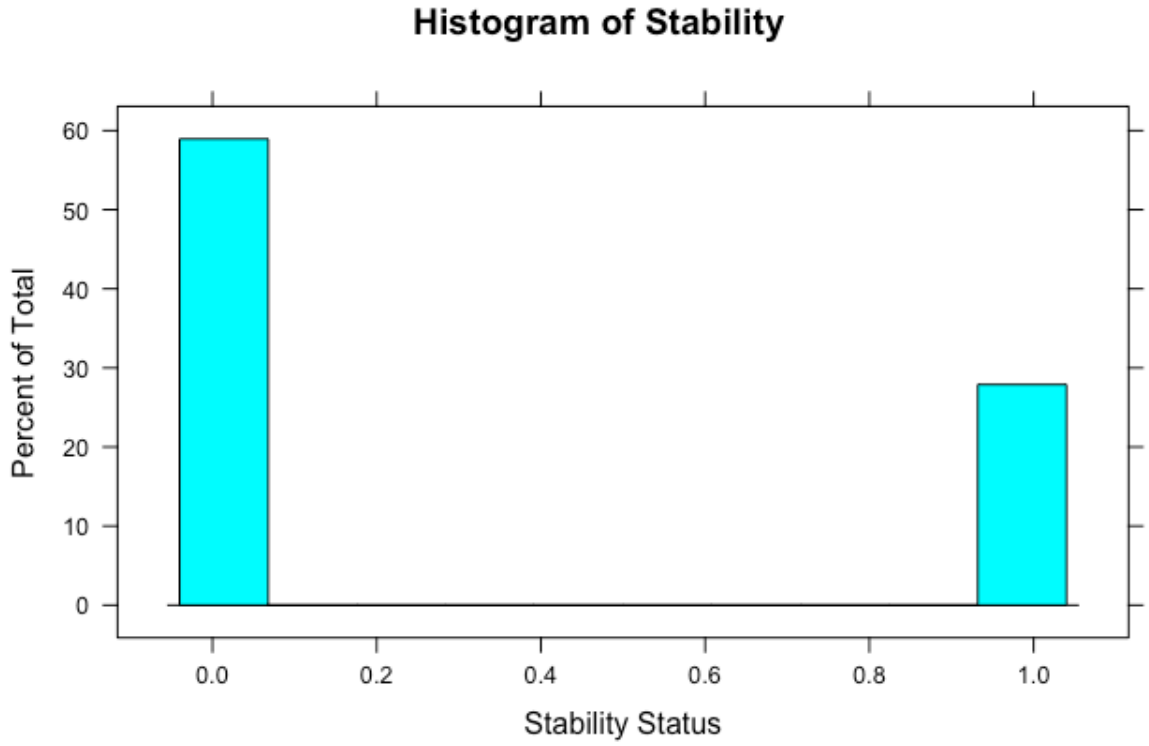


Figure 4



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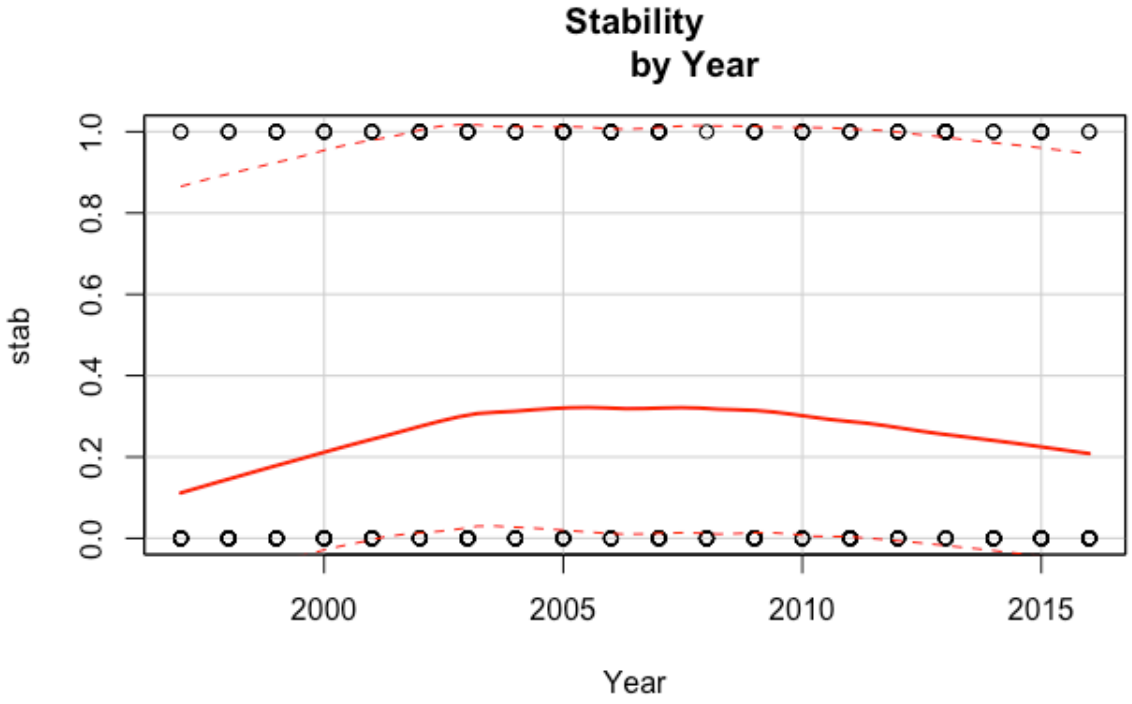

Figure 6

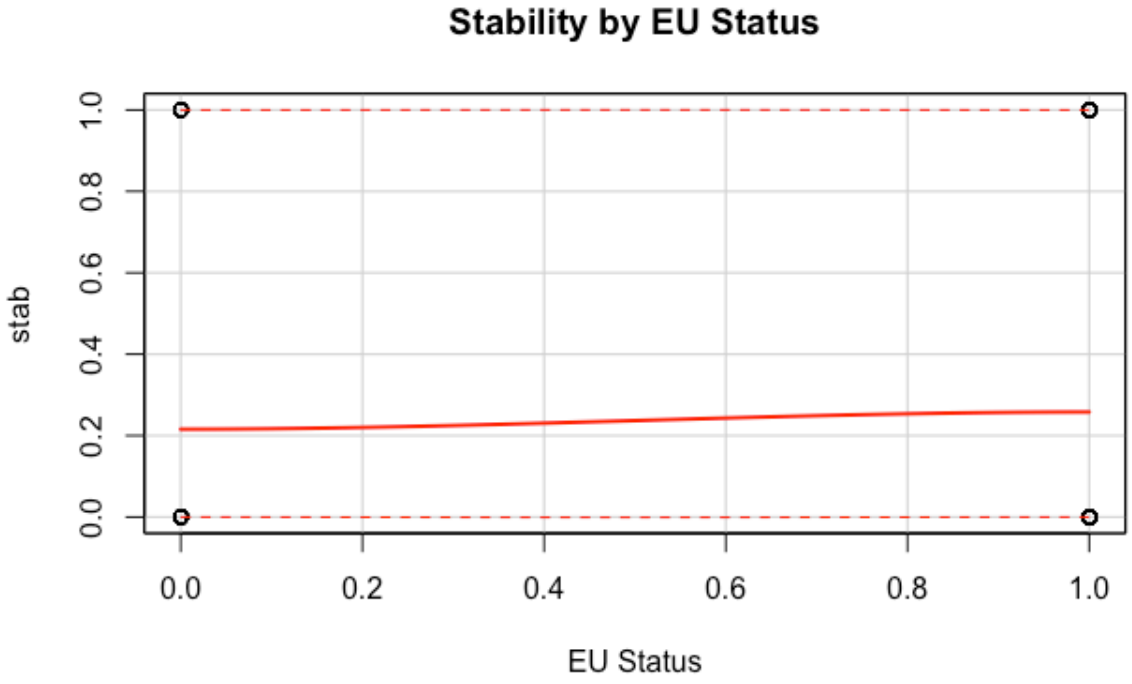

Figure 7

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