

European Business Cycles and Economic and
Monetary Union

By

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For

GIS Project

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Abstract

Geographic Information Systems (GIS) is useful in interpreting economic data by assisting in viewing the relationship between neighboring countries. This project will involve the use of economic data (Cyclical Gross Domestic Product (CGDP), Consumer Price Index (CPI), Unemployment, and Long-term Interest Rate) to view the correlations that exist between global countries. By using cartographic relationships global data will be easier to interpret and illustrate. This research will demonstrate economic Spatial Autocorrelation and the results will be global economic cartographic correlation maps. This research will form a product for individuals interested in searching and analyzing economic data dynamically via a website written in html and with maps in PDF format.

Introduction.

The European Union (EU) was first created by the Maastricht Treaty, which was signed on February 7, 1992, in the Netherlands and passed by members of the European Community. The Maastricht Treaty also led to the creation of the Euro, introduced as the future monetary currency for the European Union that was adopted by the 12 original member states of the Economic and Monetary Union (EMU): Belgium, Germany, Greece, Spain, France, Ireland, Italy, Luxembourg, The Netherlands, Austria, Portugal and Finland. The United Kingdom, who opted out of the European Union at this meeting, and Switzerland will be analyzed as well. These two countries even though not part of the EU will still be analyzed to view the effects the EU has had on them since they are both in the same area as the EU member states.

The Maastricht Treaty will be known as one of the most influential Treaties that has had the most impact on the European continent. The Maastricht Treaty divided the formation of the EMU into Three Stages that are described on the Euro website, an additional Stage is added on by Dr. Crowley with an earlier date as Stage One:

Stage One, March 1979 to December 31, 1999

EU countries adopt relatively fixed exchange rates.

(EU website):

“**Stage One** of EMU started in July 1990 and ended on 31 December 1993. It was mainly characterized by the dismantling of all internal barriers to the free movement

of capital within the European Union.

Stage Two began on 1 January 1994. It provided for, inter alia, the establishment of the European Monetary Institute (the forerunner of the European Central Bank), the prohibition of financing of the public sector by the central banks and of privileged access to financial institutions for the public sector, and the avoidance of excessive deficits.

Stage Three started on 1 January 1999 with the transfer of monetary competence to the Eurosystem and the introduction of the euro” (www.euro.ecb.int/en/what/glossary.html, 1).

The objectives of the Maastricht Treaty are divided into 5 classes as described in an article in the Financial Times on July 31, 2001,

- “To promote economic and social progress which is balanced and sustainable, in particular through the creation of an area without internal frontiers, through the strengthening of economic and social cohesion and the establishment of economic and monetary union including, finally, a single currency.
- To assert its identity on the international scene, in particular through the implementation of a common foreign and security policy, which shall include the eventual framing of a common defence policy.
- To strengthen the protection of the rights and interests of the nationals of its Member States, through the introduction of a citizenship of the Union.
- To develop a close co-operation on home affairs and in the judicial field.
- To maintain in full the ‘acquis communautaire’ and build on it” (pg.1-2).

The principles of the Maastricht Treaty are also described in the same article mentioned above. They mainly focus on the desire of the European Union to create a euro area where all the Member States are part of one network that leads to “the strengthening of economic and social cohesion”. The main goal of the EMU given by the Maastricht Treaty was the responsibility of price stability. The EMU must create economic and monetary policies that lead to price stability and the reduction of inflation. This task is not an easy one since the EMU area is new and has an economy that has never been dealt with before. Within the EMU is the unification of different economic societies and their policies that must be joined together and at the same time, with the least amount of inflation. In a speech given by Prof. Omar Issing to the LSE European Society on November 26, 1998 in London, he stated, “It is through maintaining price stability that the

ESCB can best contribute to raising welfare and employment in the euro area ... If the ESCB were to pursue an inflationary policy, it would simply lead to higher unemployment in the long run, as the important benefits of price stability for job creation are foregone. Longer-term interest rates would rise as inflation expectations and risk premia increase, thereby raising the cost companies face when making the investment necessary for sustainable future economic growth” (ESCB, pg. 2). Therefore, the ESCB must think very carefully the economic business policy it chooses to follow and not only work in a short-term view, but more in a long-term view.

Literary Review

Geographic Information Systems (GIS) is useful in interpreting economic data by assisting in viewing the relationship between neighboring countries and unions. By being able to view economic data along with its corresponding spatial data the user can gain a better understanding of its significance and importance. By making this data available through a website many users with different interests will have access to this information. This easy access wasn't always available in the past due to technology constraints but has over the years become available. The method of distributing spatial data has also become more popular in the GIS community as stated by the International Cartographic Association Commission on Maps and the Internet, “The Internet has changed the process of mapping and map use. The new medium has already led to more interactive forms of mapping and the increased availability of map animations. Much work lies ahead in order to make the Internet an effective means of transmitting spatial information in the form of maps” (<http://maps.unomaha.edu>, 1). The use of the Internet as a medium for “transmitting spatial information” will soon become commonplace as stated previously because of its obvious benefits and the growing use of the Internet as a teaching tool. As a result the user will learn to appreciate the importance the effect that one country has on its neighbors as well as economic unions. The cartographic maps will be available online to anyone looking for economic data. This will be beneficial in order to make the field of Economics more accessible to anyone who is interested in what exactly economists do and how economic policies affect our world today in every aspect. Geographic Information Systems would be a useful tool in helping to view the effects that the formation of the EMU has had on its Member States by allowing the EU and EMU to view their economic and social characteristics through the use of a map.

Geographic location is very important when it comes to economics especially nationally because the economy of a neighboring country will always have an effect on its neighbors either good or bad. That is why the formation of the EMU is so interesting because through this action countries that for many years had their own economies and monetary policies are now adopting the same policies and currency. They are uniting in order to create a stronger “European Union” with the hope of improving their economies and those of their citizens. This is a great undertaking that has limitless possibilities as well as mistakes.

As a result, due to a great interest in economics and with the help of Dr. Patrick Crowley, Assistant Professor of Economics at Texas A&M University-Corpus Christi, the effects that the formation of the EU has had on its Member States will be analyzed. With the suggestion of Dr. Crowley, 4 economic indicators for each Member State: Cyclical Gross Domestic Product (CGDP), Consumer Price Index (CPI), Long-term Interest Rate (LINT), and Unemployment (UNEMP) will be used to view each Member States correlations with the EU. These four indicators give a very good picture of the current economic state of each country for the periods of 1980 to 1991 and 1992 to 2001. The dates chosen were specially divided at the year 1991 from (1980 to 1991 and 1992 to 2001), since in that year the Maastricht Treaty was passed. Therefore, the economies of each country will be viewed before and after the Treaty to view the effects that have taken place. This data will be used to view the correlations that exist between the EMU countries toward the European Union and vice versa. More data will later be added to this website, but for now these will be the only ones available. Through the research done in this project the user will be able to analyze whether or not the creation of the European Union has had a positive affect on its member’s national economies and single out the EMU members as well. If there has been no positive effect then the user will be able to view this by the negative or no correlation displayed in the maps in the time frames of 1980 to 1991 and 1992 to 2001, available on the website.

Methodology

The methodology used was the Correlation Coefficient, which is just a basic correlation function that can be found on Excel or any Statistics book (next page):

$$r = \frac{N\sum xy - (\sum x)(\sum y)}{\sqrt{[N\sum x^2 - (\sum x)^2][N\sum y^2 - (\sum y)^2]}}$$

Where:

- N = number of pairs of scores
- $\sum xy$ = sum of the products of paired scores
- $\sum x$ = sum of x scores
- $\sum y$ = sum of y scores
- $\sum x^2$ = sum of squared x scores
- $\sum y^2$ = sum of squared y scores

The x = a specific country and y = Europe as a whole. By using the correlation method one is able to view the relationship that exists between each individual country and the EU as a whole. By using the four economic indicators mentioned previously Dr. Crowley was able to view the correlations that existed between the European Union and the EMU Member States. The use of correlations was to view whether or not the business cycles of each country have started to correlate with each other and most importantly with the European Union. A positive correlation would show that a correlation does exist between the EU and a specific country. A negative or no correlation would be seen as the business cycle of a specific country not being synchronized with that of the EU. This information is important in order to view the effect that the EU has had on Europe as a whole as well as each individual country. As mentioned before, the United Kingdom and Switzerland are not members of the EU and therefore calculating a correlation for them would be interesting to view the effects the EU has had on them as well. The timeframes used were from 1980 to 1991 and 1992 to 2001. The reason for choosing 1991 and 1992 as the breaking points in the periods is that the EU was created in 1992. Therefore, this would better show any changes in the European business cycles.

Results

The result of mapping the correlations for Cyclical Gross Domestic Product (CGDP), Consumer Price Index (CPI), Long-term Interest Rate (LINT), and Unemployment (Unemp) are shown in the maps of Figures 1.1 to 1.4. Figure 1.1 for CGDP for the years 1980 to 1991 and 1992 to 2001, Figure 1.2 for CPI for 1980 to 1991 and 1992 to 2001, Figure 1.3 for LINT for 1980 to

1991 and 1992 to 2001 and Figure 1.4 for Unemp for 1980 to 1991 and 1992 to 2001. The corresponding data or correlations are found in Table 1.1 for 1980 to 1991 and Table 1.2 for 1992 to 2001. As a result of these maps, positive correlations can be seen in CGDP, LINT and Unemployment. CPI had a reverse effect with negative or no correlations after 1992. One reason that can be given for this was given by Dr. Crowley stating, "Germany at that time was trying to join with East Germany, and therefore it took on a lot of debt. At the same time, Germany had one of the strongest economies in the EU and many of the Member States were following Germany's economic cycles. Therefore, since Germany's economy was falling so were theirs especially in regards to inflation.

Conclusions

In conclusion, the EMU has had a positive effect on its Member States as viewed by the maps mentioned previously. Therefore, the euro must be seen as a driving force that will have to be dealt with in the future by the American dollar as the top currency. With the new countries that will join the EMU in May 2004 – Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia, they will bring with them their unique economic policies that have been greatly influence by United States intervention and help. Therefore, they must meet the criteria set out by the EMU in order to join the Union. It will be interesting to see what effect these new countries will have on the EU and EMU as well as the value that they will bring to the euro.

Figure 1.1 Map - Correlation for CGDP (1980 to 1991 and 1992 to 2001)

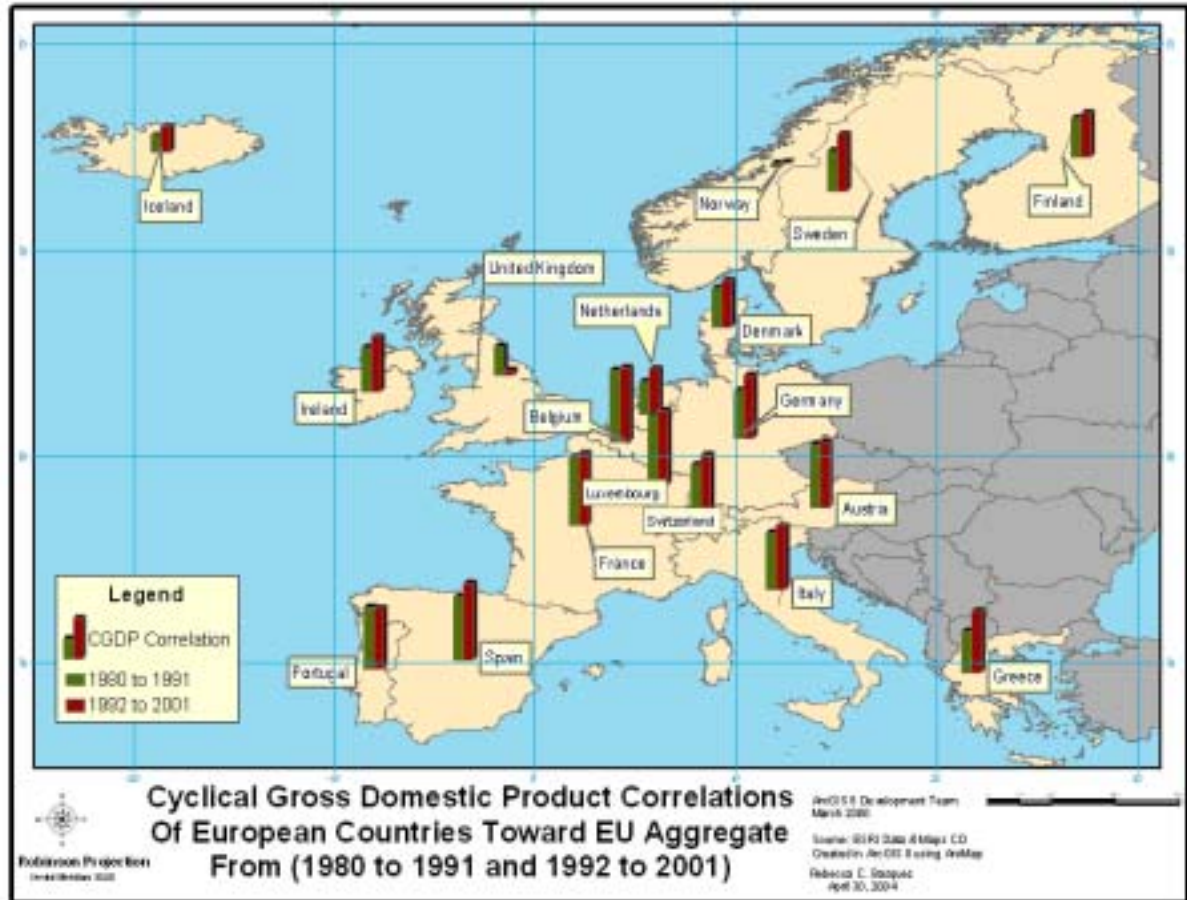


Figure 1.2 Map – Correlation for CPI (1980 to 1991 and 1992 to 2001)

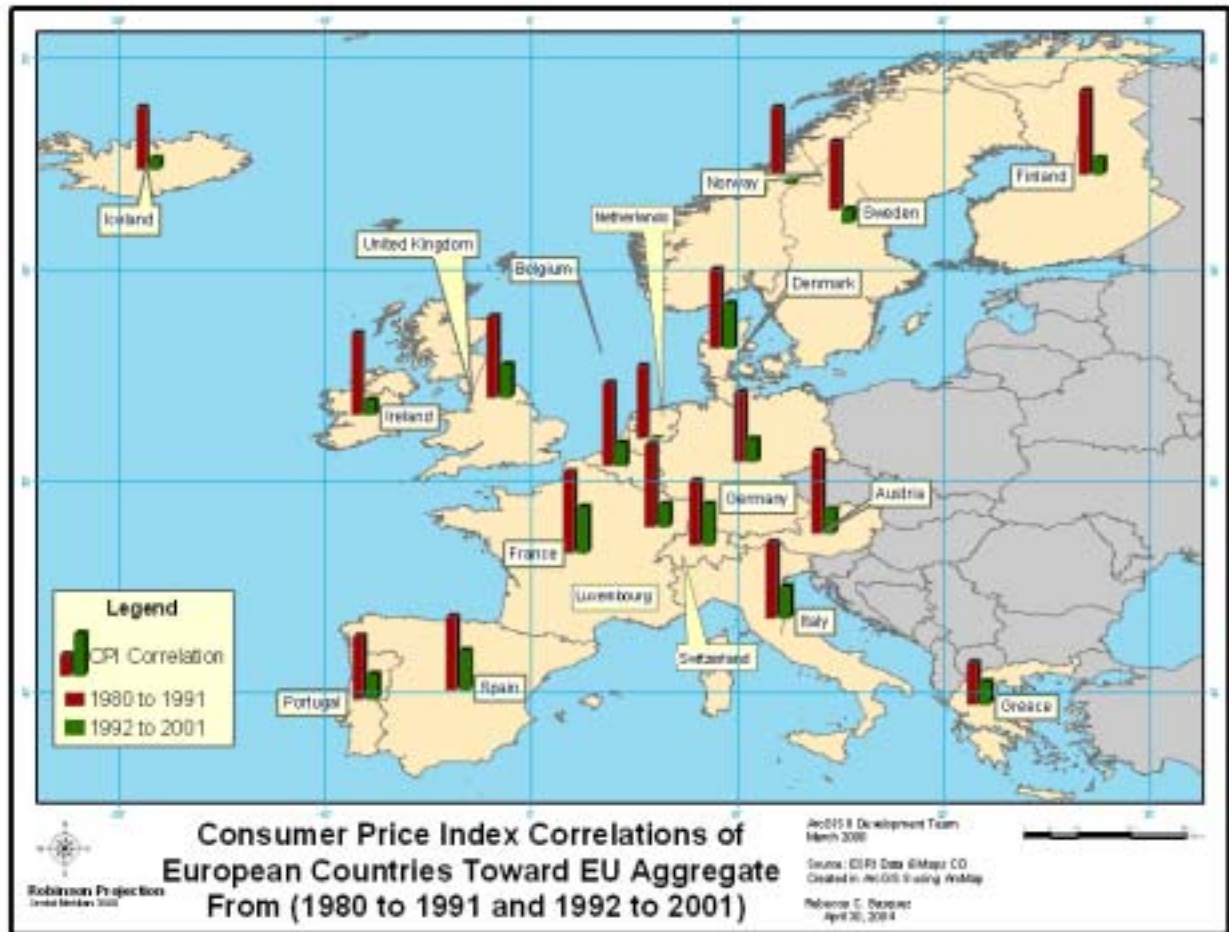


Figure 1.3 Map – Correlation for Long-term Interest Rate (1980 to 1991 and 1992 to 2001)

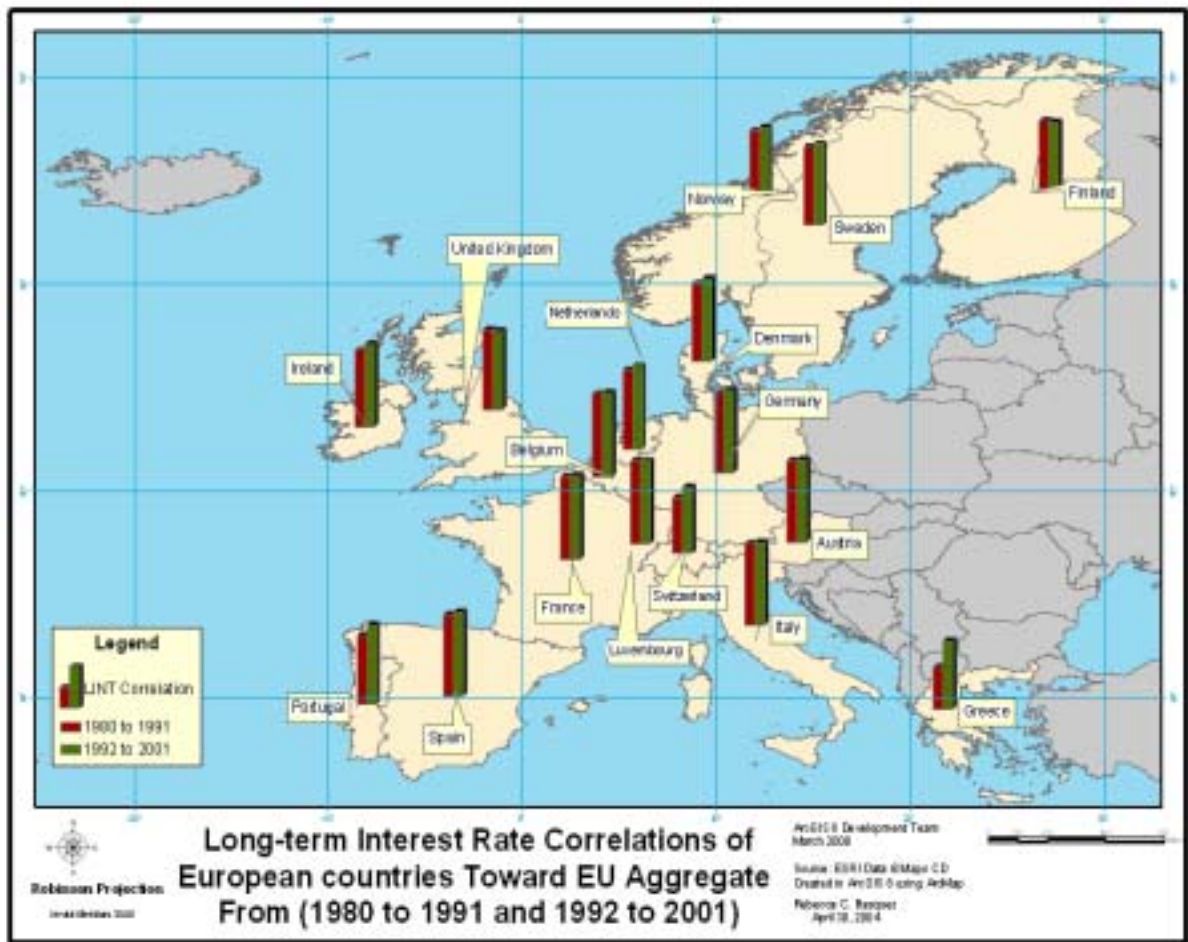
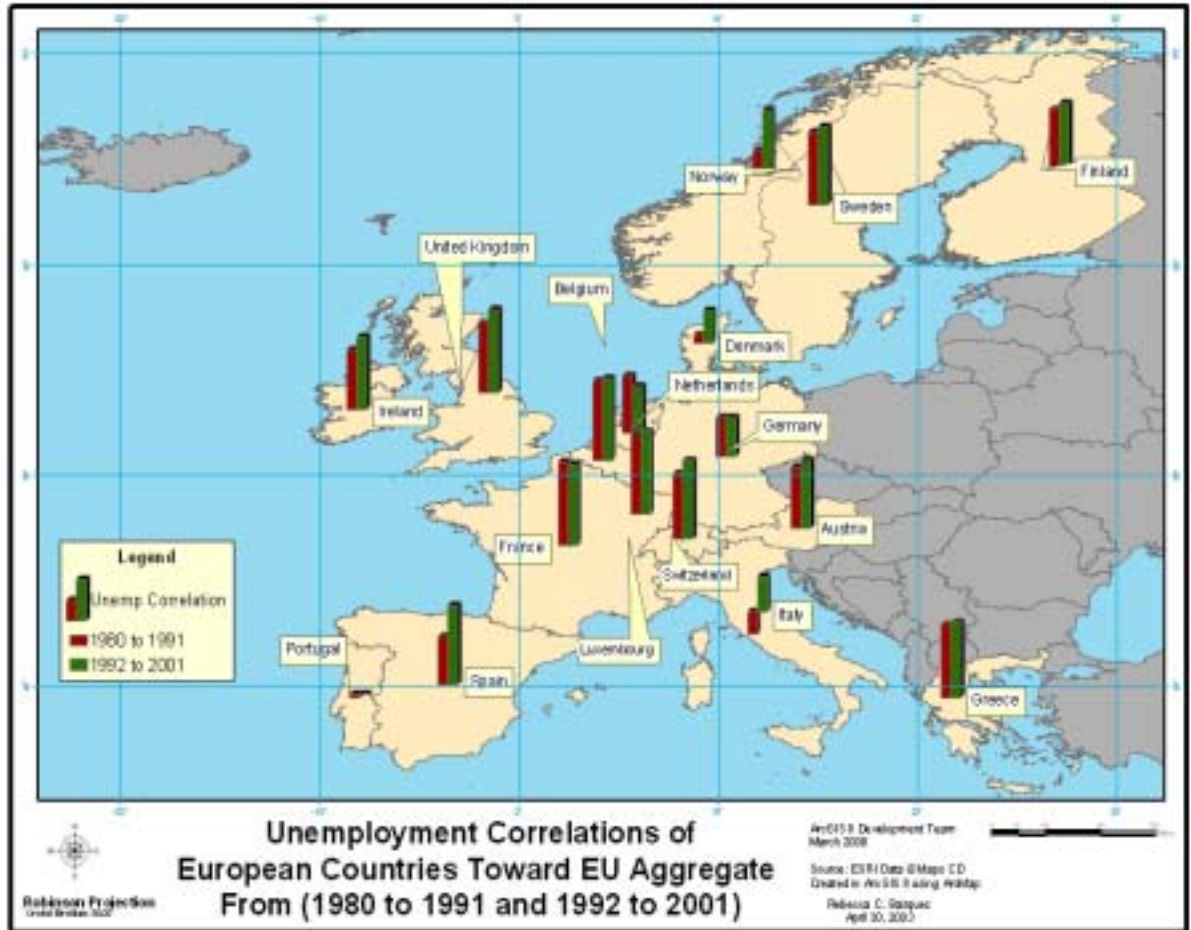


Figure 1.4 Map – Correlation for Unemployment (1980 to 1991 and 1992 to 2001)



**Table 1.1 Quantitative Data calculated with the Correlation Coefficient
for 1980 to 1991**

Name	CGDP	CPI	UN	LINT
Austria	0.7734	0.8585	0.7087	0.9658
Belgium	0.8804	0.8649	0.9250	0.9846
Denmark	0.4847	0.8213	0.0968	0.9303
Finland	0.4820	0.8740	0.6972	0.8308
France	0.8470	0.8494	0.9664	0.9726
Germany	0.5921	0.7316	0.4551	0.9385
Greece	0.5147	0.4374	0.8554	0.4996
Iceland	0.2127	0.6347		
Ireland	0.5556	0.8579	0.6958	0.9070
Italy	0.7016	0.7906	-0.2513	0.9655
Luxembourg	0.8804	0.8649	0.9250	0.9846
Netherlands	0.4158	0.7567	0.6691	0.9414
Norway	-0.0501	0.7495	0.2714	0.7779
Portugal	0.7622	0.6611	-0.0597	0.8132
Spain	0.7808	0.7682	0.5595	0.9588
Sweden	0.5125	0.7083	0.8468	0.9286
Switzerland	0.6731	0.6663	0.7662	0.6628
United				
Kingdom	0.3522	0.8427	0.8076	0.9400
EU	1.0000	1.0000	1.0000	1.0000
United				
States	0.4034	0.7035	-0.0122	0.7824
Canada	0.3508	0.8066	0.4002	0.8402

**Table 1.2 Quantitative Data calculated with the Correlation Coefficient
For 1991 to 2001**

Name	CGDP	CPI	UNEMP	LINT
Austria	0.8078	0.2558	0.7880	0.9754
Belgium	0.9200	0.2368	0.9615	0.9887
Denmark	0.5721	0.4677	0.3801	0.9872
Finland	0.5388	0.1653	0.7587	0.8156
France	0.9057	0.4685	0.9323	0.9969
Germany	0.7772	0.2417	0.4551	0.9839
Greece	0.7733	0.2323	0.8854	0.8084
Iceland	0.3217	0.1136		0.8457
Ireland	0.6837	0.1558	0.8463	0.9812
Italy	0.7906	0.3272	0.4156	0.9843
Luxembourg	0.9200	0.2368	0.9615	0.9887
Netherlands	0.5693	-0.0012	0.5401	0.9915
Norway	0.0165	-0.0432	0.7589	0.8213
Portugal	0.7492	0.2647	-0.0063	0.9479
Spain	0.9492	0.4097	0.9174	0.9869
Sweden	0.7085	-0.1389	0.9101	0.9656
Switzerland	0.7867	0.4209	0.9245	0.7920
United Kingdom	0.0585	0.3477	0.9703	0.9290
EU	1.0000	1.0000	1.0000	1.0000
United States	0.5060	0.5739	0.1861	-0.5306
Canada	0.3162	0.2216	0.4997	0.6460

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