Adoption of the Euro: The Cases of Spain and Portugal

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Abstract

Portugal and Spain are two countries who first adopted the euro in 1999. When it went into circulation in 2002, Portugal experienced slowed economic growth and higher unemployment, whereas Spain did not. This paper examines the components of gross domestic product to forecast the period right after the euro went into circulation. The disparity between the forecasted and actual values for Portugal's unemployment rate is believed to be due to the European Central bank taking control of monetary policy and having no control over its own interest rate. Spain is believed to not have experienced its own increase in unemployment due to economic growth being driven by its own domestic housing market.

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I.   Introduction

The similarities between Spain and Portugal are striking. The countries are neighbors, at

the southwest corner of Europe: both spent much of the 20th century governed by dictators; in

both, dictatorship came to an end in the mid 1970's. In both countries the late 1970's were

characterized by a social and wage explosion, and the 1980's by a return to economic and

political stability (Olivier Blanchard and Juan F. Jimeno, 1995; Mário Centeno and Miguel C.

Coelho, 2018).

Both countries joined the European Union (EU) in 1986. The countries labor markets are

similar. Portugal and Spain's unemployment rates are mirrors of each other (see figure 1). The

exception is the period of 2002-2007, during this period, Portugal's unemployment rate

continued to rise whereas Spain's unemployment rate decreased.

Figure 1: Unemployment Rate of Spain and Portugal

Data Retrieved from Worldbank
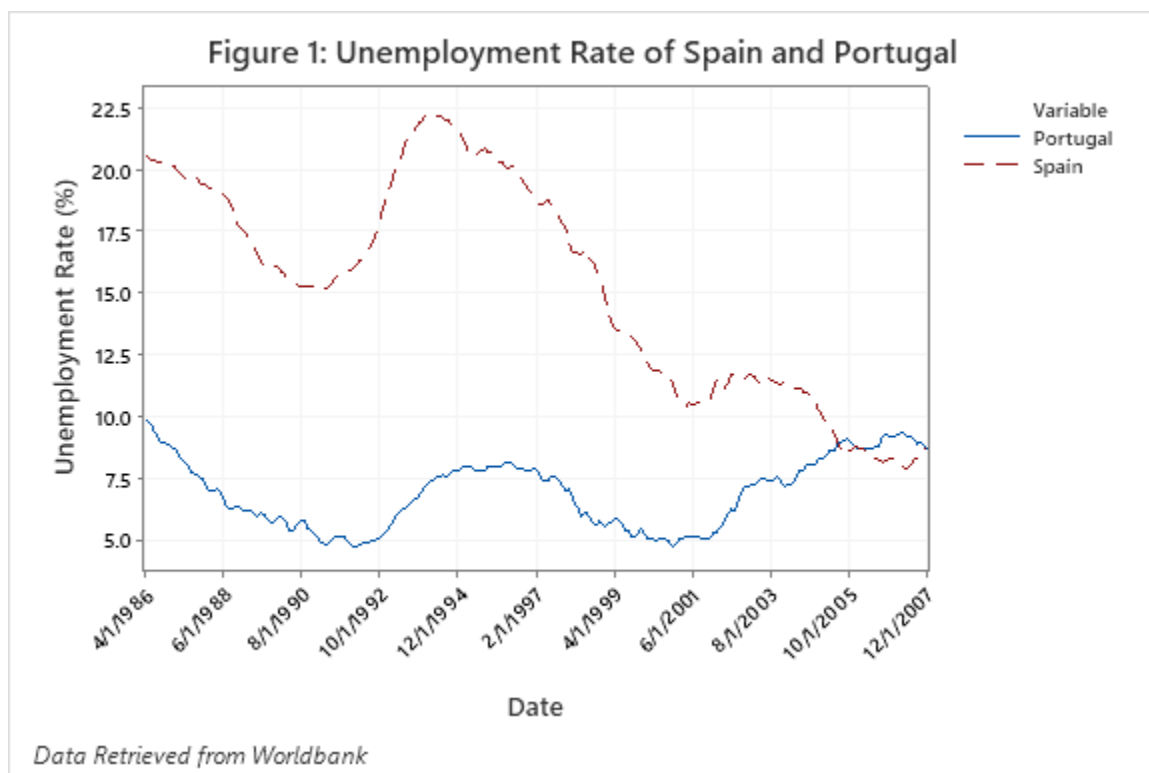
The economies of these two countries are also similar. Both countries Gross Domestic Product (GDP) growth rates are similar (see figure 2). The two had similar trends, never straying far from each other for an extended period of time however, during 2002-2007, Spain experienced continued positive growth where Portugal experienced slowed growth, even negative during 2003.

Figure 2: GDP Growth Rate of Spain and Portugal

Data Retrieved from Worldbank
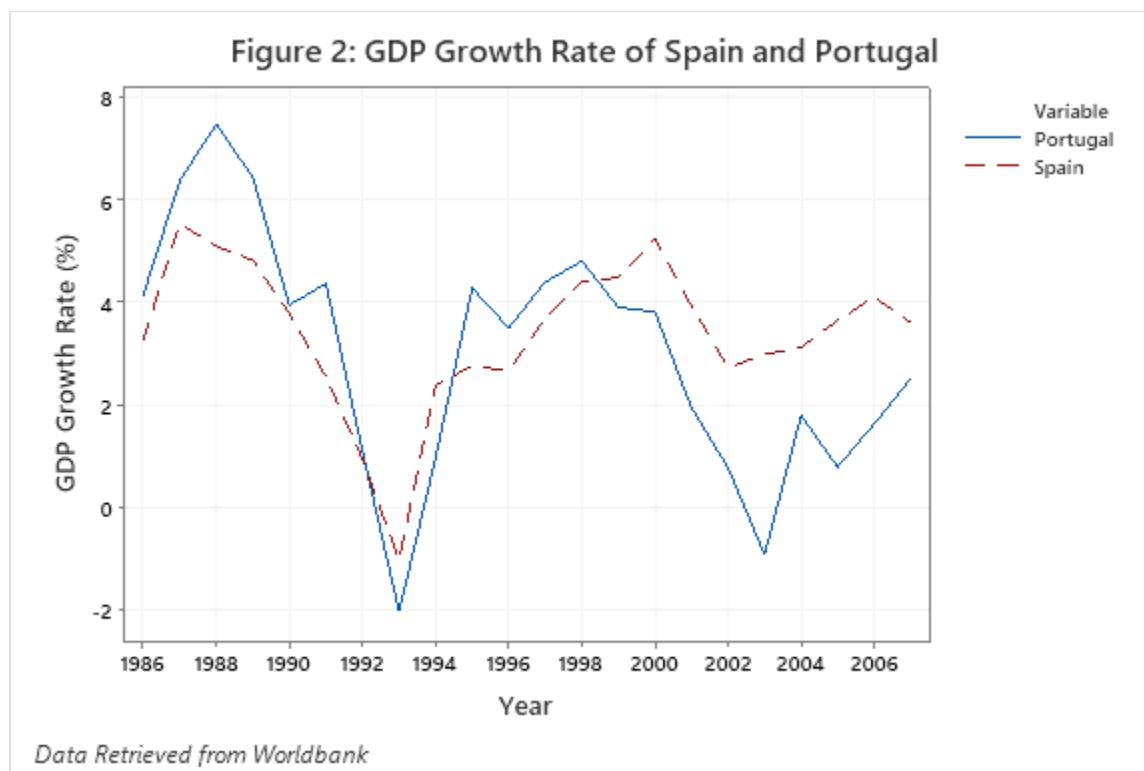
Triggered by the commitment to join the EMU, Portugal experienced a sharp drop in interest rates and expectations of faster growth both led to a decrease in private saving and an increase in investment (See figure 3). The result was high output growth, decreasing unemployment, increasing wages, and fast increasing current account deficits (Olivier Blanchard, 2007).

Figure 5: Portugal Gross Savings (% of GDP)

Data Retrieved from Worldbank
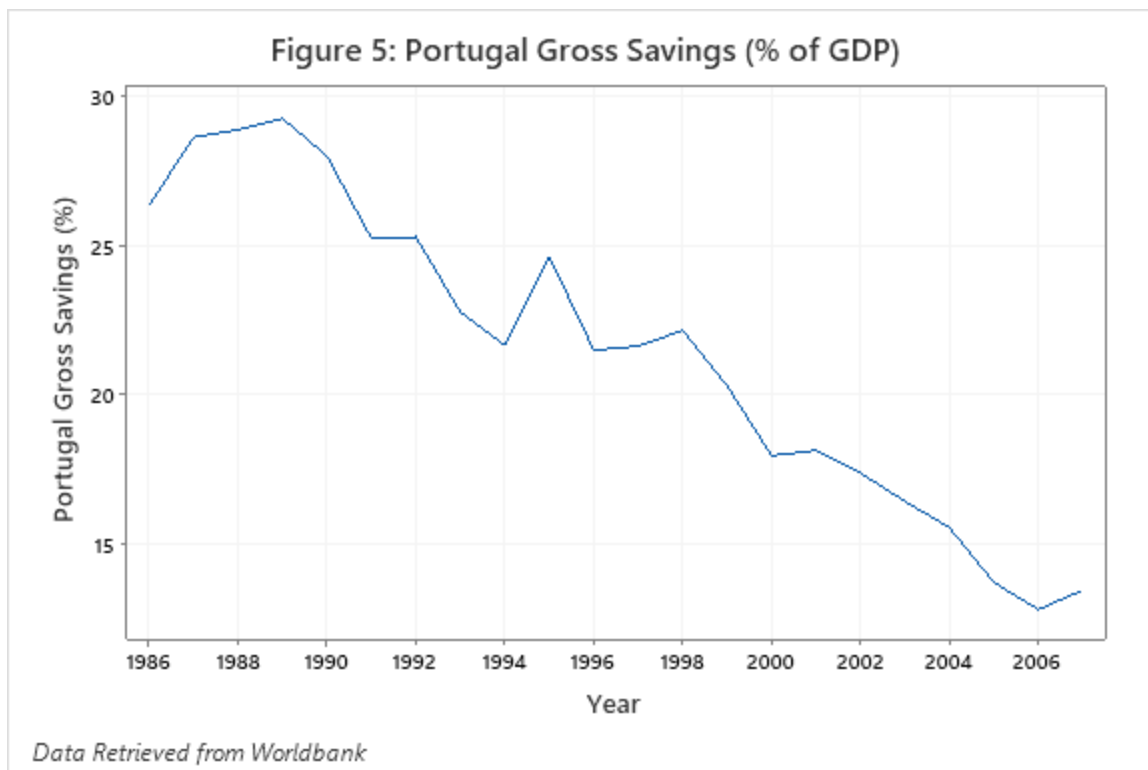
II.   Literature Review

The overall effects of EMU integration were very positive for Spain. Integration contributed to macroeconomic stability, it imposed fiscal discipline and central bank independence, and it dramatically lowered the cost of capital (Sebastián Royo, 2010). One of the key benefits was the dramatic reduction in short-term and long-term nominal interest rates (see figure 4).

Figure 4: Various Interest Rates in Spain

Data Retrieved from Federal Reserve Economic Data
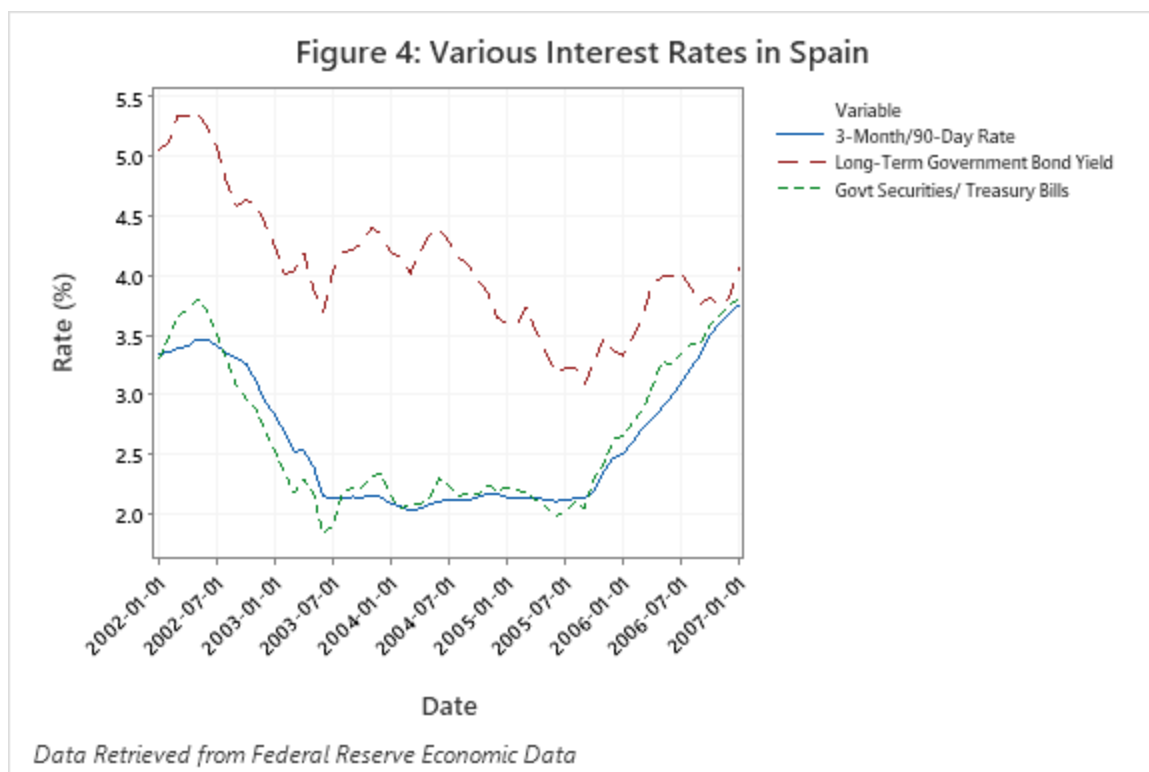
There are undeniable benefits of adopting the common currency, and the most important of these are a greater monetary stability, reduced transaction costs, decreased exchange rate volatility and lower interest rates (Cristian Ştefan Ovidiu, 2011). The euro was launched on 1 January 1999: for the first three years it was an 'invisible' currency, only used for accounting purposes and electronic payments. Coins and banknotes were launched on 1 January 2002. Following the adoption of the euro, Portugal experienced a recession, while Spain experienced a slight downturn however, the GDP growth rate never fell below 2%. Between 2000 and 2012, the Portuguese economy grew less than the United States during the Great Depression (Ricardo Reis, 2013). In addition to slowed economic growth, Portugal experienced an increase in its unemployment rate, while Spain experienced a decrease in its unemployment rate.

III.   Theoretical Discussion

The Single Market of the European Union is the common area between the EU countries where goods, services, capital and persons can circulate freely. The creation of a 'Single Market' was a part of the long cycle of economic integration that Europe began at the end of the Second World War. Regional integration benefits the members countries by ensuring access to the markets of their partners, lessening the risk and uncertainty as regards the effects of trade liberalization on domestic industry, easing the task of policy coordination, and reducing the cost of infant industry production (Bela Balassa and Ardy Stoutjesdijk, 1975). Both Portugal and Spain signed the Single European Act in 1986. This Act provided the basis for a six-year program aimed at sorting out the problems with the free flow of trade across EU borders and thus created the 'Single Market'(Single European Act, 1986). With the creation of the 'Single Market' from the SEA, the next step in integration is to create a single currency that would in turn further integrate the markets of the participating countries.

The creation of a single currency follows the theory of an optimum currency area. This theory states that an," optimum currency area is a region where no fiscal or monetary intervention is needed to bring the economy back to its equilibrium" (Oleksandra Stoykova, 2018). The father of this theory, Robert Mundell, argued that," transaction and information costs increase with a number of currencies" and "a huge number of small currency areas makes foreign exchange market too thin" (Stoykova, 2018). Peter Kenen furthered the optimum currency area theory by emphasizing that fiscally integrated regions are suitable for a monetary union (Stoykova, 2018). The adoption of the euro was expected to force under performing countries into reform since monetary and fiscal policies were out of the hands of the countries governments (Jesús Fernández-Villaverde, Luis Garicano, and Taño Santos, 2013). The Treaty

on European Union states that the European System of Central Banks has the responsibility of implementing monetary policy and the European Central Bank may act as a fiscal agent (Treaty on European Union pp 149, 158).

The IS-LM model, which stands for "investment-savings" (IS) and "liquidity preference-money supply" (LM) is a Keynesian macroeconomic model that shows how the market for economic goods (IS) interacts with the loanable funds market (LM) or money market. In the case of Spain and Portugal, both countries gave up the control of their own monetary policy therefore, in the IS-LM model, Spain and Portugal can only directly influence the IS side.

IV.   Data

All of the data used in this analysis comes from the world bank and the federal reserve of economic data. Complete time series were available for all of the variables (See table 1). All of the variables are representative of two different time series, one for Spain and one for Portugal. A table of summary statistics gives a synopsis of the variables (See table 2).

Table 1: Variables		
Variable Name	Period of Time	Source
GDP growth (annual %) - Spain & Portugal	1986-2007 (Annual)	Worldbank
3-Month or 90-day Rates and Yields: Interbank Rates for Spain & Portugal	1986-2007 (Annual)	FRED
Unemployment, total (% of total labor force) (national estimate) - Spain & Portugal	1986-2007 (Annual)	Worldbank

Foreign direct investment, net inflows (% of GDP) - Spain & Portugal	1986-2007 (Annual)	Worldbank
Foreign direct investment, net outflows (% of GDP) - Spain & Portugal	1986-2007 (Annual)	Worldbank
General Government Final Expenditure - Spain & Portugal	1986-2007 (Annual)	Worldbank
Net Trade: Value Goods - Spain & Portugal	1986-2007 (Annual)	FRED
Final Consumption Expenditure (current US$) - Spain & Portugal	1986-2007 (Annual)	Worldbank

Table 2: Summary Statistics									
		Consumption	FDI Inflow	FDI Outflow	GDP	Three Month Rate	Government	Unemployment	Net Trade
Spain	Min	1.94E+11	1.347	0.1502	-1.031	2.963	3.77E+10	10.35	-3.46E+09
	1st Quarter	3.93E+11	1.58	0.3533	2.632	5.128	8.18E+10	16.18	-2.65E+09
	Median	4.54E+11	2.045	0.7846	3.742	10.503	9.87E+10	19.26	-1.85E+09
	Mean	4.12E+11	2.424	2.1671	3.407	9.604	8.96E+10	18.7	-2.03E+09
	3rd Quarter	4.78E+11	2.555	2.7618	4.575	13.256	1.05E+11	21.48	-1.32E+09
	Max	5.03E+11	6.787	9.8997	5.547	15.822	1.12E+11	24.21	-6.66E+08
Portugal	Min	3.03E+10	0.5795	-0.02114	-2.043	2.963	5.18E+09	3.81	-1.30E+09
	1st Quarter	5.83E+10	1.197	0.15168	3.114	5.404	1.12E+10	4.43	-1.02E+09
	Median	8.64E+10	1.6884	0.55097	4.046	12.037	1.78E+10	5.215	-8.25E+08

Mean	7.76E+10	2.3516	1.64758	3.715	10.726	1.63E+10	5.598	-8.21E+08
3rd Quarter	9.79E+10	2.9788	2.07587	4.503	15.011	2.18E+10	6.798	-6.62E+08
Max	1.04E+11	6.1639	7.4216	7.489	17.738	2.34E+10	8.7	-1.77E+08

V.   Methodology

This analysis will build a vector autoregressive model (VAR), using GDP growth (annual %) as the response variable with 3-Month or 90-day Rates and Yields Interbank Rates, final consumption expenditure (current US$), foreign direct investment, net inflows (% of GDP), foreign direct investment, net outflows (% of GDP), general government final consumption expenditure (current US$) , unemployment total (% of total labor force) (national estimate), and net trade: value goods as the predictor variables, for both Spain and Portugal. The analysis will focus on the performance in the years leading up to the introduction of the euro and then up to the financial crisis of 2007.

A VAR model will be built for each Portugal and Spain, using data from 1986 to 2001 The first VAR is of Portugal (See equation 1). The second VAR is of Spain (See equation 2). In both equations the predictor variables, with a single lag, are represented by "X".

GDP Growth Rate Portugal $= X + const$

(Equation 1)

GDP Growth Rate Spain $= X + const$

(Equation 2)

These years are chosen because 1986 is when both Spain and Portugal joined the European Union and 2001 is the year before the euro went into full circulation. Once the VAR models are

made then they will be used to create a forecast of the countries respective GDP growth rates up

to 2007, before the financial crisis.

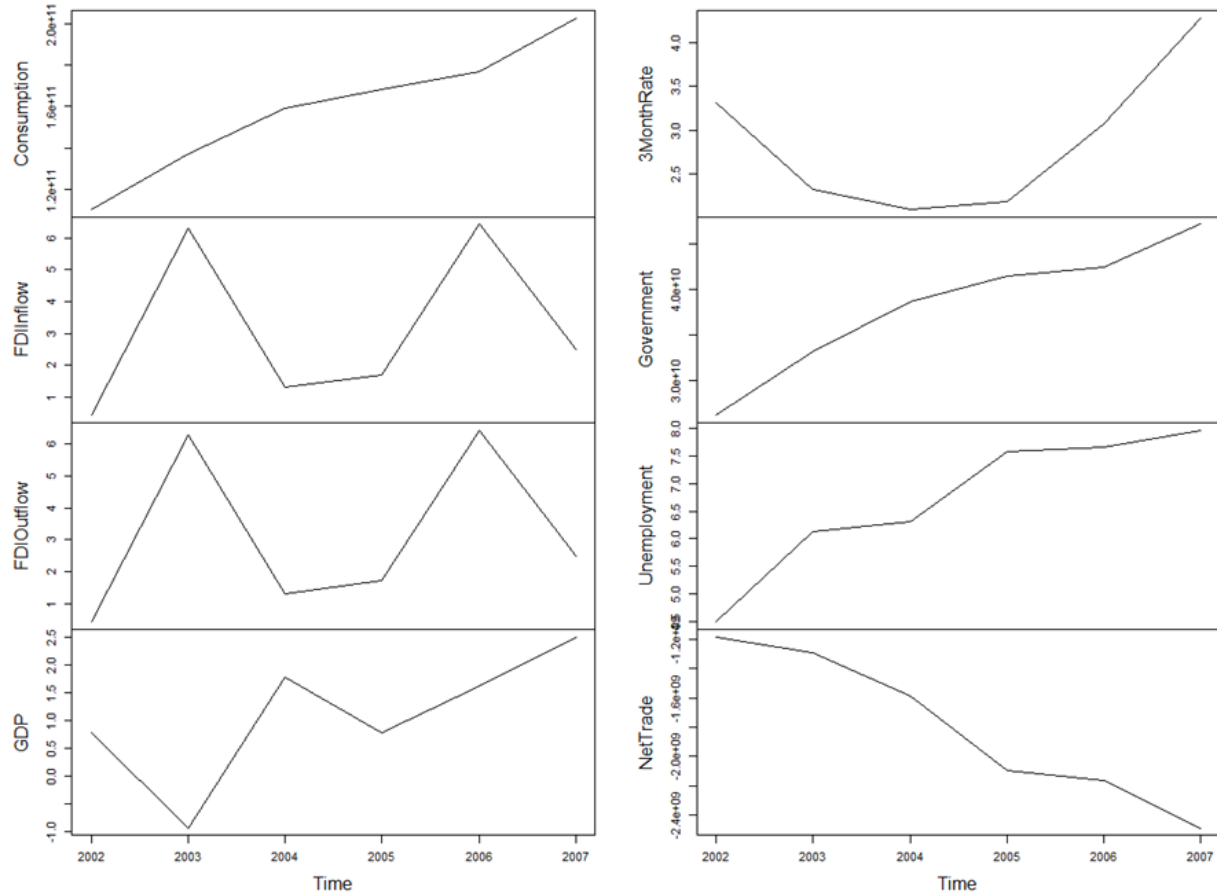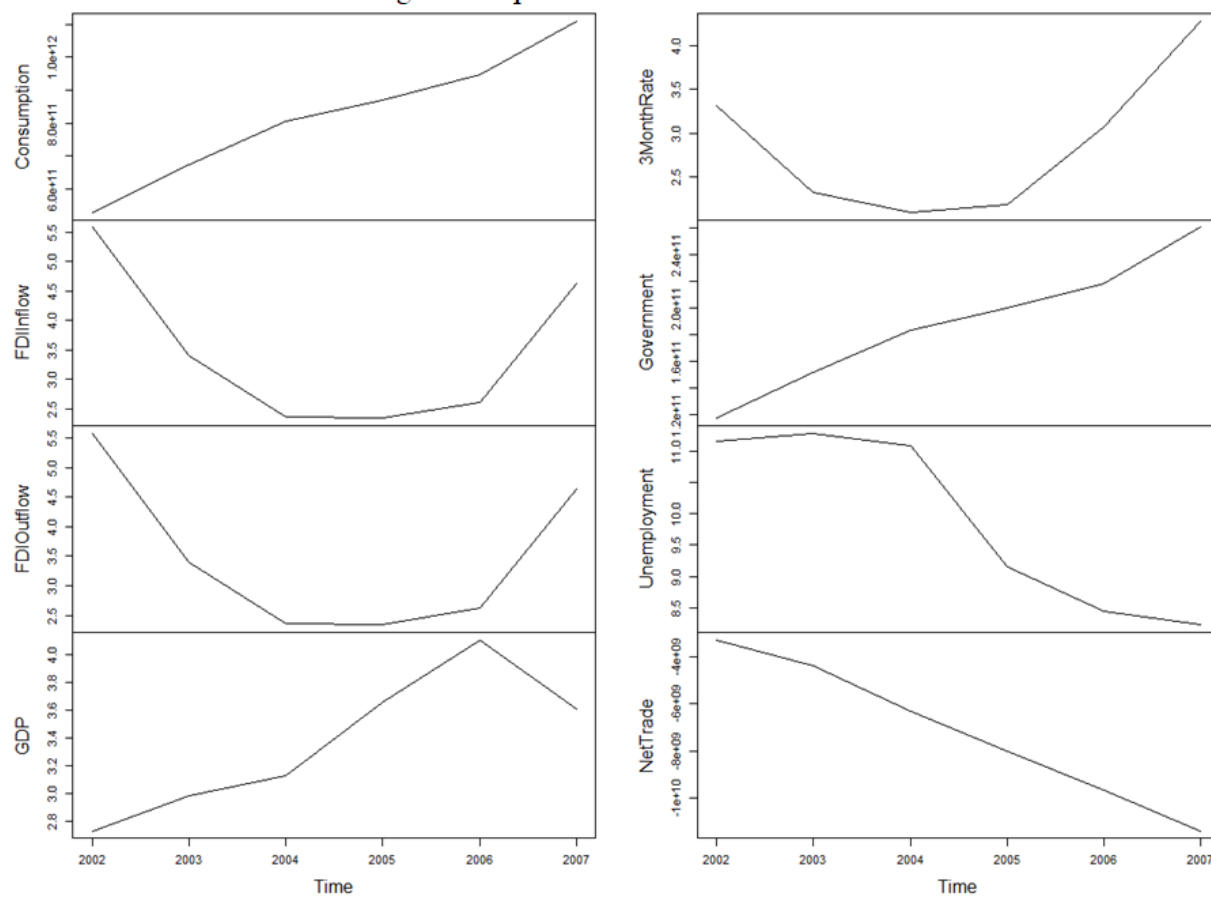Figure 5: Portugal Actual 2002-2007

Figure 6: Spain Actual 2002-2007

Conclusions, based on knowledge of economic integration, optimal currency areas and the IS-LM model, will be made to explain differences between the forecasted and actual values (See figures 5 & 6). Furthermore, comparisons will be made as to the reason(s) Spain's GDP Growth rate remained higher than Portugals during the 1999-2007 time period, when the two countries are extremely similar.

VI.   Results

The predicted values of the variables with a 95% confidence interval for Portugal and Spain are shown in Figures 7 and 8 respectively. In both countries, the forecasted 3 month rate decreased whereas the actual values increased. This is because both countries do not set their own target interest rates, the European Central Bank has control. In Portugal, the forecasted unemployment rate was to decrease but the actual unemployment rate increased.

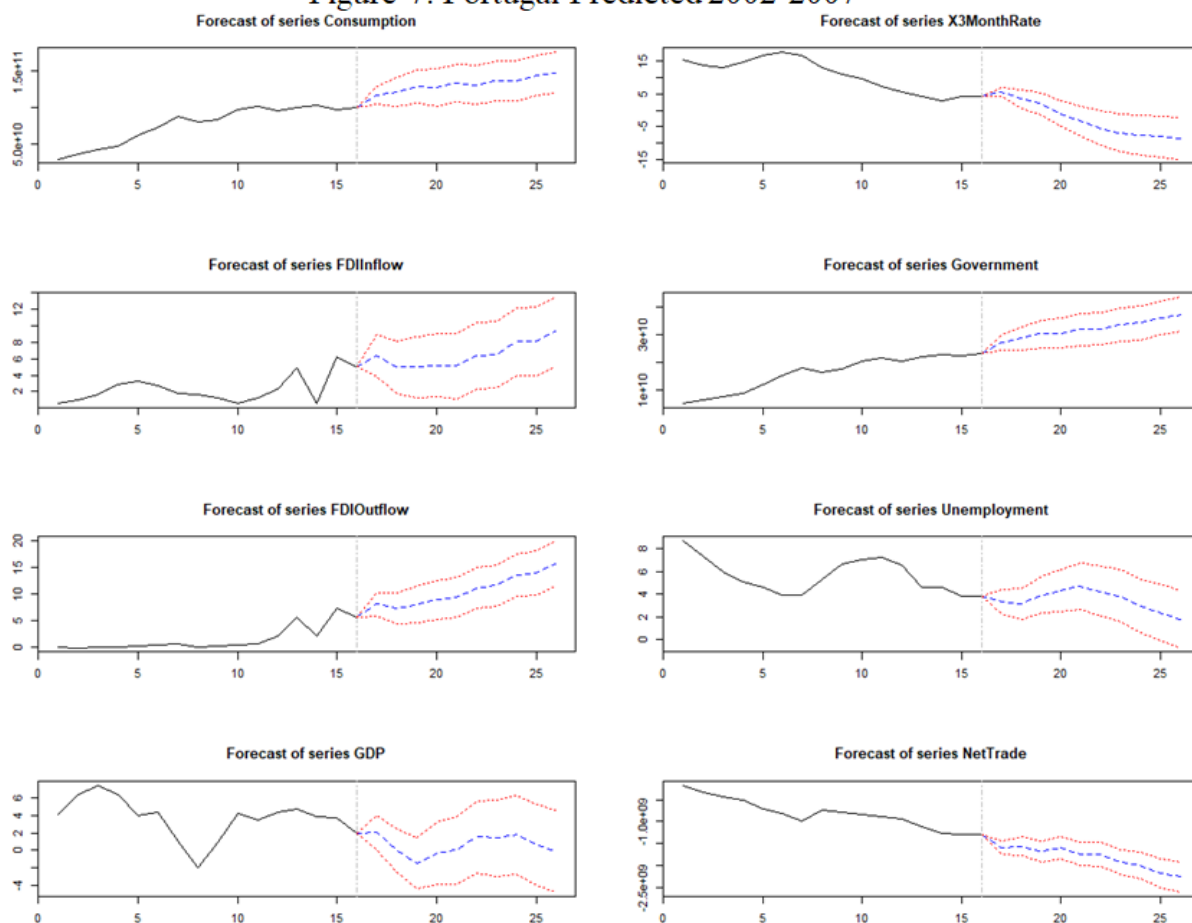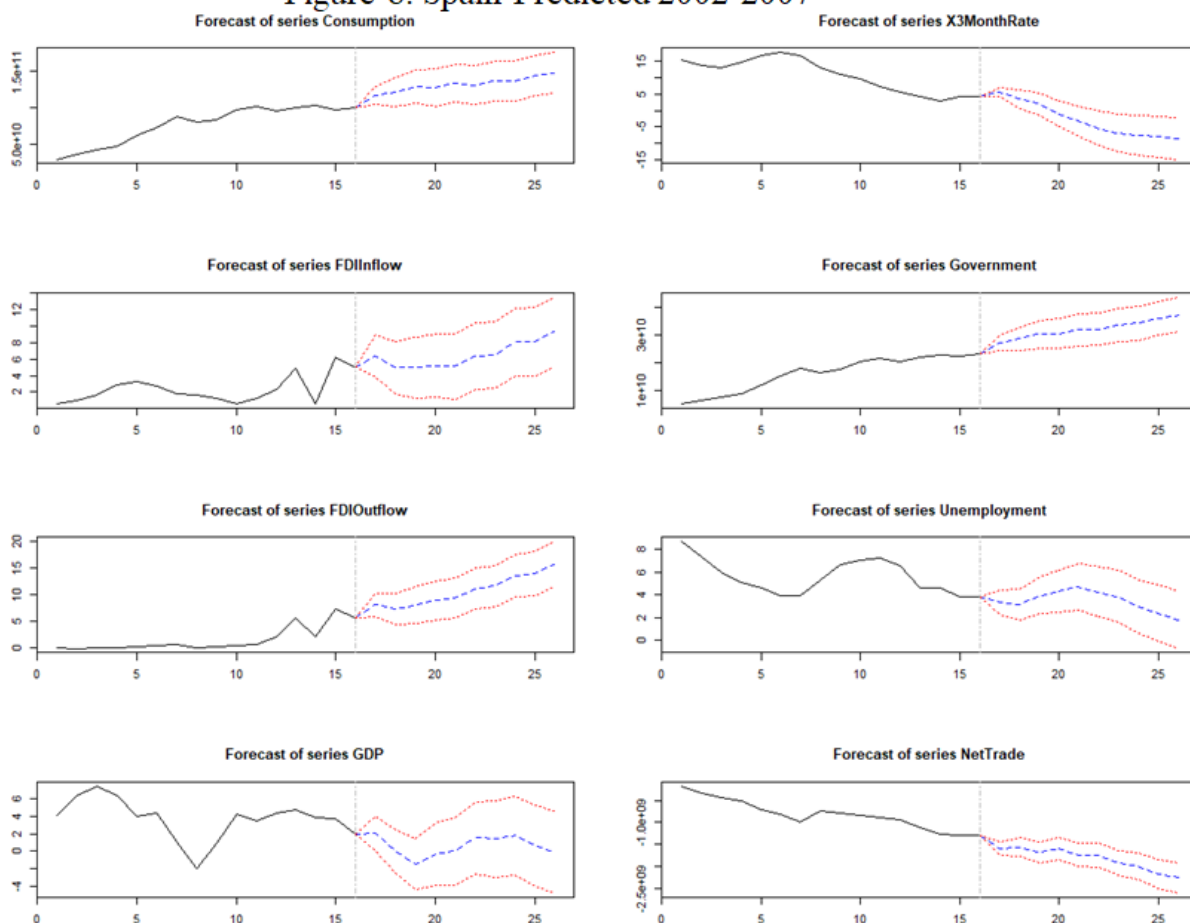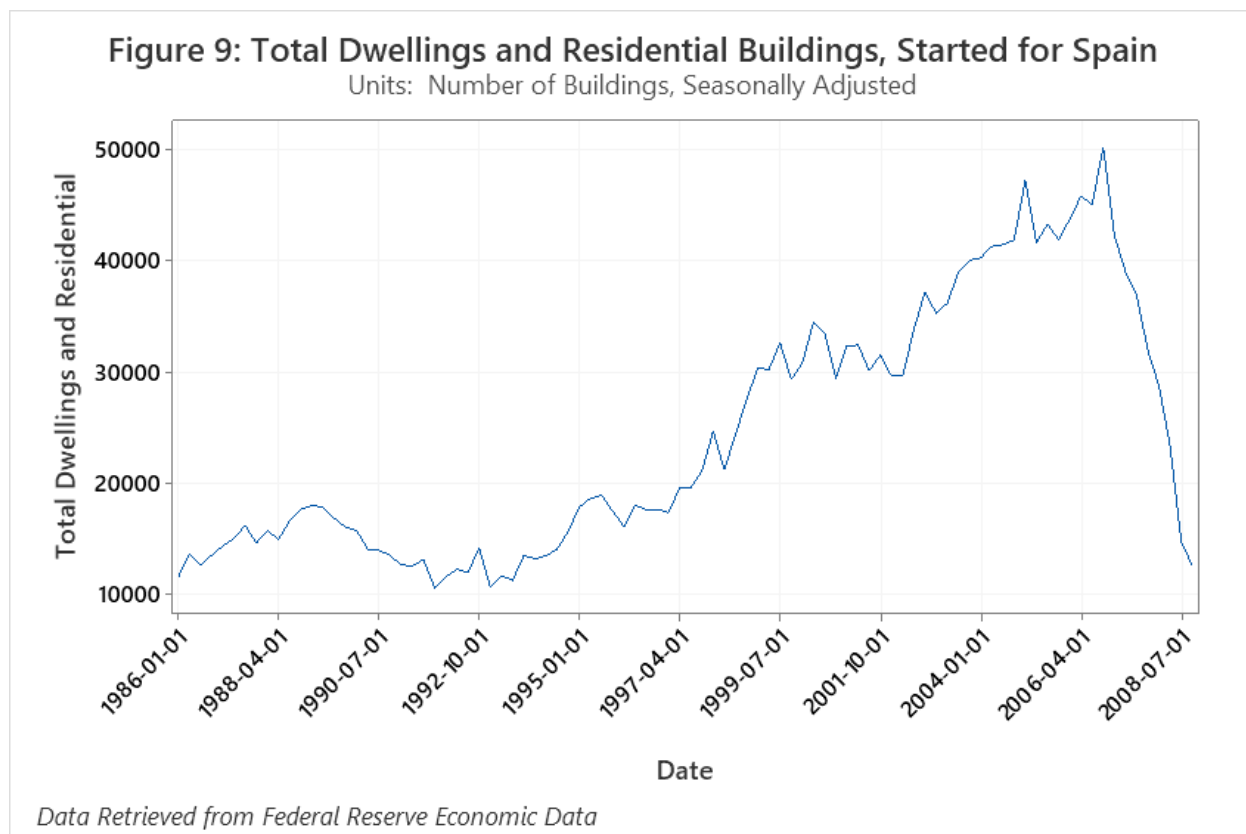Figure 7: Portugal Predicted 2002-2007

Figure 8: Spain Predicted 2002-2007

Forecast of series Consumption

Forecast of series X3MonthRate

Forecast of series FDIInflow

Forecast of series Government

Forecast of series FDIOutflow

Forecast of series Unemployment

Forecast of series GDP

Forecast of series NetTrade

VII.   Conclusion

The only variable that was outside of the forecasted 95% confidence interval was Portugal's unemployment rate. This disparity is due to the fact that Portugal's interest rate increased resulting in decreased investment. This decrease in investment spending slows job growth and lowers GDP growth. The government of Portugal continued to increase government spending to mitigate the loss that decreased investment spending caused but the European Central Bank controlled money flow so they were unable to increase spending to fully cover the loss. The loss of investment spending combined with not enough expansionary monetary policy

resulted in the higher unemployment that Portugal experienced after the advent of the euro.

Spain did not experience the increased unemployment that Portugal did because Spain was in the

midst of an economic expansion driven by a housing bubble (See figure 9). The decrease in

Spain's unemployment was driven by seasonal and part-time workers in the housing market

(Martín, Moral-Benito, and Schmitz, 2019).

Figure 9: Total Dwellings and Residential Buildings, Started for Spain
Units: Number of Buildings, Seasonally Adjusted

Data Retrieved from Federal Reserve Economic Data

Economic integration to a monetary union can reduce the costs of trade, improve the

availability of goods and services, and increase consumer purchasing power in member nations.

Employment opportunities tend to improve because trade liberalization leads to market

expansion, technology sharing, and cross-border investment. However, as seen in the case of

Portugal, economic integration can have a short term negative impact due to the member

countries giving up control of their own monetary policy and conforming to the rules and

regulations of overseeing bodies.

VIII. References

Aguilar, Hendrickson, Manuel, and Ana Arriba González de Durana. "Out of the Wilderness? The Coming Back of the Debate on Minimum Income in Spain and the Great Recession." *Social Policy & Administration*, vol. 54, no. 4, July 2020, pp. 556–573. doi:10.1111/spol.12605.

Baglioni, Simone, and Luis F.Oliveira Mota. "Alike but Not Alike: Welfare State and Unemployment Policies in Southern Europe Italy and Portugal Compared." *International Journal of Social Welfare*, vol. 22, no. 3, July 2013, pp. 319–327. doi:10.1111/ijsw.12028.

Balassa, Bela, and Ardy Stoutjesdijk. "Economic Integration among Developing Countries." *Journal of Common Market Studies*, vol. 14, no. 1, Sept. 1975, p. 37. doi:10.1111/j.1468-5965.1975.tb00736.x.

Blanchard, Olivier. "Adjustment within the Euro. The Difficult Case of Portugal." *Portuguese Economic Journal*, vol. 6, no. 1, Apr. 2007, pp. 1–21. doi:10.1007/s10258-006-0015-4.

Blanchard, Olivier, and Juan F. Jimeno. "Structural Unemployment: Spain versus Portugal." *The American Economic Review*, vol. 85, no. 2, 1995, pp. 212–218. *JSTOR*, www.jstor.org/stable/2117921. Accessed 19 Jan. 2021.

Börzel, Tanja A., and Thomas Risse. "Identity Politics, Core State Powers and Regional Integration: Europe and Beyond." *Journal of Common Market Studies*, vol. 58, no. 1, Jan. 2020, pp. 21–40. doi:10.1111/jcms.12982.

Centeno, Mário, and Miguel C Coelho. "The Turnaround of the Portuguese Economy."

VOX, CEPR Policy Portal, 6 June 2018, voxeu.org/article/turnaround-portuguese-

economy.

Fernández-Villaverde, Jesús, et al. "Political Credit Cycles: The Case of the Eurozone."

Journal of Economic Perspectives, vol. 27, no. 3, Summer 2013, pp. 145–166.

doi:10.1257/jep.27.3.145.

Gorjón, Lucía, et al. "The Cost of Unemployment from a Social Welfare Approach: The

Case of Spain and Its Regions." *Social Indicators Research*, vol. 150, no. 3, Aug. 2020,

pp. 955–976. doi:10.1007/s11205-020-02360-5.

Josifidis, Kosta, et al. "The European Welfare State Regimes: Questioning the Typology

during the Crisis." *Technological & Economic Development of Economy*, vol. 21, no. 4,

July 2015, pp. 577–595. doi:10.3846/20294913.2015.1055612.

Martin, Alberto and Moral-Benito, Enrique and Schmitz, Tom, The Financial Transmission

of Housing Bubbles: Evidence from Spain (February 22, 2019). ECB Working Paper

No. 2245 (2019).

Mongelli, Francesco. (2002). 'New' Views on the Optimum Currency Area Theory: What is

EMU Telling Us?. 138.

Organization for Economic Co-operation and Development, 3-Month or 90-day Rates and

Yields: Interbank Rates for Portugal [IR3TIB01PTM156N], retrieved from FRED,

Federal Reserve Bank of St. Louis;

https://fred.stlouisfed.org/series/IR3TIB01PTM156N, March 10, 2021.

Organization for Economic Co-operation and Development, 3-Month or 90-day Rates and

Yields: Interbank Rates for Spain [IR3TIB01ESM156N], retrieved from FRED, Federal

Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/IR3TIB01ESM156N,
March 10, 2021.

Organization for Economic Co-operation and Development, Net Trade: Value Goods for
Portugal [XTNTVA01PTM667S], retrieved from FRED, Federal Reserve Bank of St.
Louis; https://fred.stlouisfed.org/series/XTNTVA01PTM667S, March 12, 2021.

Organization for Economic Co-operation and Development, Net Trade: Value Goods for
Spain [XTNTVA01ESM667S], retrieved from FRED, Federal Reserve Bank of St.
Louis; https://fred.stlouisfed.org/series/XTNTVA01ESM667S, March 12, 2021.

Organization for Economic Co-operation and Development, Total Dwellings and
Residential Buildings by Stage of Construction, Started for Spain
[WSCNDW01ESQ470S], retrieved from FRED, Federal Reserve Bank of St. Louis;
https://fred.stlouisfed.org/series/WSCNDW01ESQ470S, May 7, 2021.

Ovidiu, Cristian Ştefan. "The Risks of a Too Quick Euro Adoption by the Eu Member
States. The Case of Portugal." *Annals of the University of Oradea*, Economic Science
Series, vol. 20, no. 2, Dec. 2011, pp. 25–32.
search.ebscohost.com/login.aspx?direct=true&db=bth&AN=71959404&site=ehost-
live.

Pranulis, Vytautas Pranas. "The Maastricht Inflation Criterion: Current Economic Problems
and Medium-Term Prospects of Eurozone Accession Seeking Country." *Economics &
Management*, Aug. 2007, pp. 454–458.
search.ebscohost.com/login.aspx?direct=true&db=bth&AN=25963527&site=ehost-
live.

Reis, Ricardo. "The Portuguese Slump and Crash and the Euro Crisis." *Brookings Papers on Economic Activity*, Spring 2013, pp. 143–193. doi:10.1353/eca.2013.0005.

Rivera-Solis, Luis Eduardo, 2007. "The Impact of the Adoption of the Euro: Evidence From Portugal," MPRA Paper 59624, University Library of Munich, Germany.

Rohde-Moe, Caroline Mürer (2014) The Eurozone: Effects on Spain After the Implementation of the Euro. Undergraduate thesis, under the direction of Joshua Hendrickson from Economics, The University of Mississippi.

Royo, Sebastián. "Portugal and Spain in the EU: The Challenges of Economic Reforms." Conference Papers -- *American Political Science Association*, Jan. 2010, pp. 1–45. search.ebscohost.com/login.aspx?direct=true&db=poh&AN=94850295&site=ehost-live.

Single European Act. Luxembourg: Office for Official Publications of the European Communities, 1986. Print.

Srinivasan, Naveen, and Pratik Mitra. "The European Unemployment Problem: Its Cause and Cure." *Empirical Economics*, vol. 47, no. 1, Aug. 2014, pp. 57–73. doi:10.1007/s00181-013-0746-x.

Stoykova, Oleksandra. "Optimum Currency Areas: Theory and Applications." *Economic & Political Thought / Mysl Ekonomiczna & Polityczna*, vol. 63, no. 4, Oct. 2018, pp. 17–53. doi:10.26399/meip.4(63).2018.43/o.stoykova.

Treaty on European Union. Luxembourg: Office for Official Publications of the European Communities, 1992. Print.

World Bank, World Development Indicators

IX.   R Code

```
# 86-07 Portugal
portugal <- read.table("E:\\Spring 2021\\Senior Project\\Data\\Senior Project_Portugal.csv", sep
= ",", header = TRUE)
vardata.p.86_07 <- cbind(consumption.p, fdiinflow.p, fdioutflow.p, gdp.p, threemonthrate.p,
government.p, unemployment.p, nettreade.p)
colnames(vardata.p.86_07) <- cbind("Consumption", "FDIInflow", "FDIOutflow", "GDP",
"3MonthRate", "Government", "Unemployment","NetTrade" )
threemonthrate.p <-
ts(portugal$X3.Month.or.90.day.Rates.and.Yields_.Interbank.Rates.for.Portugal, start =
c(1986,1), end = c(2007,1), frequency = 1)
consumption.p <- ts(portugal$Final.consumption.expenditure..current.US.....Portugal, start =
c(1986,1), end = c(2007,1), frequency = 1)
fdiinflow.p <- ts(portugal$Foreign.direct.investment..net.inflows....of.GDP....Portugal,start =
c(1986,1), end = c(2007,1), frequency = 1)
fdioutflow.p <- ts(portugal$Foreign.direct.investment..net.outflows....of.GDP....Portugal, start =
c(1986,1), end = c(2007,1), frequency = 1)
gdp.p <- ts(portugal$GDP.growth..annual......Portugal, start = c(1986,1), end = c(2007,1),
frequency = 1)
government.p <-
ts(portugal$General.government.final.consumption.expenditure..current.US.....Portugal, start =
c(1986,1), end = c(2007,1), frequency = 1)
unemployment.p <-
ts(portugal$Unemployment..total....of.total.labor.force...national.estimate....Portugal, start =
c(1986,1), end = c(2007,1), frequency = 1)
nettreade.p <- ts(portugal$Net.Trade..Value.Goods.for.Portugal, start = c(1986,1), end =
c(2007,1), frequency = 1)
# 86-07 Spain
spain <- read.table("E:\\Spring 2021\\Senior Project\\Data\\Senior Project_Spain.csv", sep = ",",
header = TRUE)
threemonthrate.s <-
ts(spain$X3.Month.or.90.day.Rates.and.Yields_.Interbank.Rates.for.Spain,start = c(1986,1), end
= c(2007,1), frequency = 1)
consumption.s <- ts(spain$Final.consumption.expenditure..current.US.....Spain, start =
c(1986,1), end = c(2007,1), frequency = 1)
fdiinflow.s <- ts(spain$Foreign.direct.investment..net.inflows....of.GDP....Spain,start =
c(1986,1), end = c(2007,1), frequency = 1)
fdioutflow.s <- ts(spain$Foreign.direct.investment..net.outflows....of.GDP....Spain, start =
c(1986,1), end = c(2007,1), frequency = 1)
```

```r
gdp.s <- ts(spain$GDP.growth..annual......Spain, start = c(1986,1), end = c(2007,1), frequency =
1)
government.s <-
ts(spain$General.government.final.consumption.expenditure..current.US.....Spain, start =
c(1986,1), end = c(2007,1), frequency = 1)
unemployment.s <-
ts(spain$Unemployment..total....of.total.labor.force...national.estimate....Spain,start = c(1986,1),
end = c(2007,1), frequency = 1)
nettrade.s <- ts(spain$Net.Trade..Value.Goods.for.Spain, start = c(1986,1), end = c(2007,1),
frequency = 1)
# 86-01 Portugal
portugal_86_01 <- read.table("E:\\Spring 2021\\Senior Project\\Data\\Senior
Project_Portugal_86-01.csv", sep = ",", header = TRUE)
consumption.p.86_01 <-
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= c(2001,1), frequency = 1)
fdiinflow.p.86_01 <-
ts(portugal_86_01$Foreign.direct.investment..net.inflows....of.GDP....Portugal, start = c(1986,1),
end = c(2001,1), frequency = 1)
fdioutflow.p.86_01 <-
ts(portugal_86_01$Foreign.direct.investment..net.outflows....of.GDP....Portugal, start =
c(1986,1), end = c(2001,1), frequency = 1)
gdp.p.86_01 <- ts(portugal_86_01$GDP.growth..annual......Portugal, start = c(1986,1), end =
c(2001,1), frequency = 1)
threemonthrate.p.86_01 <-
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c(1986,1), end = c(2001,1), frequency = 1)
nettrade.p.86_01 <- ts(portugal_86_01$Net.Trade..Value.Goods.for.Portugal, start = c(1986,1),
end = c(2001,1), frequency = 1)
unemployment.p.86_01 <-
ts(portugal_86_01$Unemployment..total....of.total.labor.force...national.estimate....Portugal, start
= c(1986,1), end = c(2001,1), frequency = 1)
government.p.86_01 <-
ts(portugal_86_01$General.government.final.consumption.expenditure..current.US.....Portugal,
start = c(1986,1), end = c(2001,1), frequency = 1)
# 86-01 Spain
spain_86_01 <-  read.table("E:\\Spring 2021\\Senior Project\\Data\\Senior Project_Spain_86-
01.csv", sep = ",", header = TRUE)
consumption.s.86_01 <- ts(spain_86_01$Final.consumption.expenditure..current.US.....Spain,
start = c(1986,1), end = c(2001,1), frequency = 1)
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start = c(1986,1), end = c(2001,1), frequency = 1)
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start = c(1986,1), end = c(2001,1), frequency = 1)
gdp.s.86_01 <- ts(spain_86_01$GDP.growth..annual......Spain, start = c(1986,1), end =
c(2001,1), frequency = 1)
threemonthrate.s.86_01 <-
ts(spain_86_01$X3.Month.or.90.day.Rates.and.Yields_.Interbank.Rates.for.Spain, start =
c(1986,1), end = c(2001,1), frequency = 1)
nettrade.s.86_01 <- ts(spain_86_01$Net.Trade..Value.Goods.for.Spain, start = c(1986,1), end =
c(2001,1), frequency = 1)
unemployment.s.86_01 <-
ts(spain_86_01$Unemployment..total....of.total.labor.force...national.estimate....Spain, start =
c(1986,1), end = c(2001,1), frequency = 1)
government.s.86_01 <-
ts(spain_86_01$General.government.final.consumption.expenditure..current.US.....Spain, start =
c(1986,1), end = c(2001,1), frequency = 1)
# 02-07 Portugal
portugal_02_07 <- read.table("E:\\Spring 2021\\Senior Project\\Data\\Senior
Project_Portugal_02-07.csv", sep = ",", header = TRUE)
consumption.p.02_07 <-
ts(portugal_02_07$Final.consumption.expenditure..current.US.....Portugal, start = c(2002,1), end
= c(2007,1), frequency = 1)
fdiinflow.p.02_07 <-
ts(portugal_02_07$Foreign.direct.investment..net.inflows....of.GDP....Portugal, start = c(2002,1),
end = c(2007,1), frequency = 1)
fdioutflow.p.02_07 <-
ts(portugal_02_07$Foreign.direct.investment..net.outflows....of.GDP....Portugal, start =
c(2002,1), end = c(2007,1), frequency = 1)
gdp.p.02_07 <- ts(portugal_02_07$GDP.growth..annual......Portugal, start = c(2002,1), end =
c(2007,1), frequency = 1)
threemonthrate.p.02_07 <-
ts(portugal_02_07$X3.Month.or.90.day.Rates.and.Yields_.Interbank.Rates.for.Portugal, start =
c(2002,1), end = c(2007,1), frequency = 1)
nettrade.p.02_07 <- ts(portugal_02_07$Net.Trade..Value.Goods.for.Portugal, start = c(2002,1),
end = c(2007,1), frequency = 1)
unemployment.p.02_07 <-
ts(portugal_02_07$Unemployment..total....of.total.labor.force...national.estimate....Portugal, start
= c(2002,1), end = c(2007,1), frequency = 1)
```

```
government.p.02_07 <-
ts(portugal_02_07$General.government.final.consumption.expenditure..current.US.....Portugal,
start = c(2002,1), end = c(2007,1), frequency = 1)
# 02-07 Spain
spain_02_07 <- read.table("E:\\Spring 2021\\Senior Project\\Data\\Senior Project_Spain_02-
07.csv", sep = ",", header = TRUE)
consumption.s.02_07 <- ts(spain_02_07$Final.consumption.expenditure..current.US.....Spain,
start = c(2002,1), end = c(2007,1), frequency = 1)
fdiinflow.s.02_07 <- ts(spain_02_07$Foreign.direct.investment..net.inflows....of.GDP....Spain,
start = c(2002,1), end = c(2007,1), frequency = 1)
fdioutflow.s.02_07 <- ts(spain_02_07$Foreign.direct.investment..net.outflows....of.GDP....Spain,
start = c(2002,1), end = c(2007,1), frequency = 1)
gdp.s.02_07 <- ts(spain_02_07$GDP.growth..annual......Spain, end = c(2007,1), frequency = 1)
threemonthrate.s.02_07 <-
ts(spain_02_07$X3.Month.or.90.day.Rates.and.Yields_.Interbank.Rates.for.Spain, start =
c(2002,1), end = c(2007,1), frequency = 1)
nettrade.s.02_07 <- ts(spain_02_07$Net.Trade..Value.Goods.for.Spain, start = c(2002,1), end =
c(2007,1), frequency = 1)
unemployment.s.02_07 <-
ts(spain_02_07$Unemployment..total....of.total.labor.force...national.estimate....Spain, start =
c(2002,1), end = c(2007,1), frequency = 1)
government.s.02_07 <-
ts(spain_02_07$General.government.final.consumption.expenditure..current.US.....Spain, start =
c(2002,1), end = c(2007,1), frequency = 1)
# model portugal
vardata.p.86_01 <- cbind(consumption.p.86_01, fdiinflow.p.86_01, fdioutflow.p.86_01,
gdp.p.86_01, threemonthrate.p.86_01, government.p.86_01, unemployment.p.86_01,
nettrade.p.86_01)
summary(vardata.p.86_01)
colnames(vardata.p.86_01) <- cbind("Consumption", "FDIInflow", "FDIOutflow", "GDP",
"3MonthRate", "Government", "Unemployment","NetTrade" )
lagselect.p <- VARselect(vardata.p.86_01, lag.max = 5, type = "const")
lagselect.p$selection
var.p.1 <- VAR(vardata.p.86_01, p= 1, ic = c("AIC"), type = "const", season = NULL)
var.p.1
var.predict.p <- predict((var.p.1), h = 6 , level = 0.95)
var.predict.p
summary(var.predict.p)
plot(var.predict.p)
```

```
vardata.p.02_07 <- cbind(consumption.p.02_07, fdiinflow.p.02_07, fdiinflow.p.02_07,
gdp.p.02_07, threemonthrate.p.02_07, government.p.02_07, unemployment.p.02_07,
nettrade.p.02_07)
colnames(vardata.p.02_07) <- cbind("Consumption", "FDIInflow", "FDIOutflow", "GDP",
"3MonthRate", "Government", "Unemployment","NetTrade" )
plot(vardata.p.02_07)
# model spain
vardata.s.86_01 <- window(ts.union(consumption.s.86_01, fdiinflow.s.86_01,
fdioutflow.s.86_01, gdp.s.86_01, threemonthrate.s.86_01, government.s.86_01,
unemployment.s.86_01, nettrade.s.86_01))
summary(vardata.s.86_01)
lagselect.s <- VARselect(vardata.s.86_01, lag.max = 5, type = "const")
lagselect.s$selection
var.s.1 <- VAR(vardata.s.86_01, p = 1, ic = c("AIC"), type = "const", season = NULL)
var.s.1
var.predict.s <- predict((var.p.1), h = 6 , level = 0.95)
var.predict.s
plot(var.predict.s)
vardata.s.02_07 <- cbind(consumption.s.02_07, fdiinflow.s.02_07, fdiinflow.s.02_07,
gdp.s.02_07, threemonthrate.s.02_07, government.s.02_07, unemployment.s.02_07,
nettrade.s.02_07)
colnames(vardata.s.02_07) <- cbind("Consumption", "FDIInflow", "FDIOutflow", "GDP",
"3MonthRate", "Government", "Unemployment","NetTrade" )
plot(vardata.s.02_07)
```