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Modelling European Business Cycles (EBC Model)

A macroeconometric model of Spain

IMPRESSUM

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I. General Structure

- work started in 2001 with a modelling team in the department of macro analysis and forecasting
- co-operation with Prof. Wolters at the Free University of Berlin
- support of the Ministry of Finance, Berlin

Focus of the model

- Short- to medium-term forecasts of macroeconomic development in Germany and major European countries
- Analysis of different macroeconomic policies

Theory versus data based model

- The model should be data based using economic theory for the specifications
- No calibration
- Time series analysis and specifications of error correction models (ECM)
- Economic theory is important to specify the co-integration relationships
- Common underlying structure estimated across all economies
- Same equations are used for forecasts and for economic policy simulations

Single country versus multi country approach

- Main focus on Germany (47 stochastic equations)
- Second focus on larger EU (EMU) countries (France, Italy, Spain, (GB)) and the Netherlands (10-15 stochastic equations for each country)
- Other EMU-countries are treated as one zone (10-15 stochastic equations)
- EU (EMU) aggregates are calculated by identities
- Later on USA are modelled separately
- Non-EU (and non-US) growth and price indicators for different regions are exogenous
- Linkages via imports and exports, exchange rates and interest rates

Special modelling strategies

- Trade is disaggregated into trade with EU (EMU) countries and with non-EU countries
- Until now only adaptive expectations, backward looking, are used
- Error correction framework is used to distinguish between short term dynamics and the long run solution
- Feedback rules to stabilise the model results: Unemployment, capacity utilisation, interest rates, unit labour costs, real effective exchange rates, wealth (savings), (public deficit ratio)

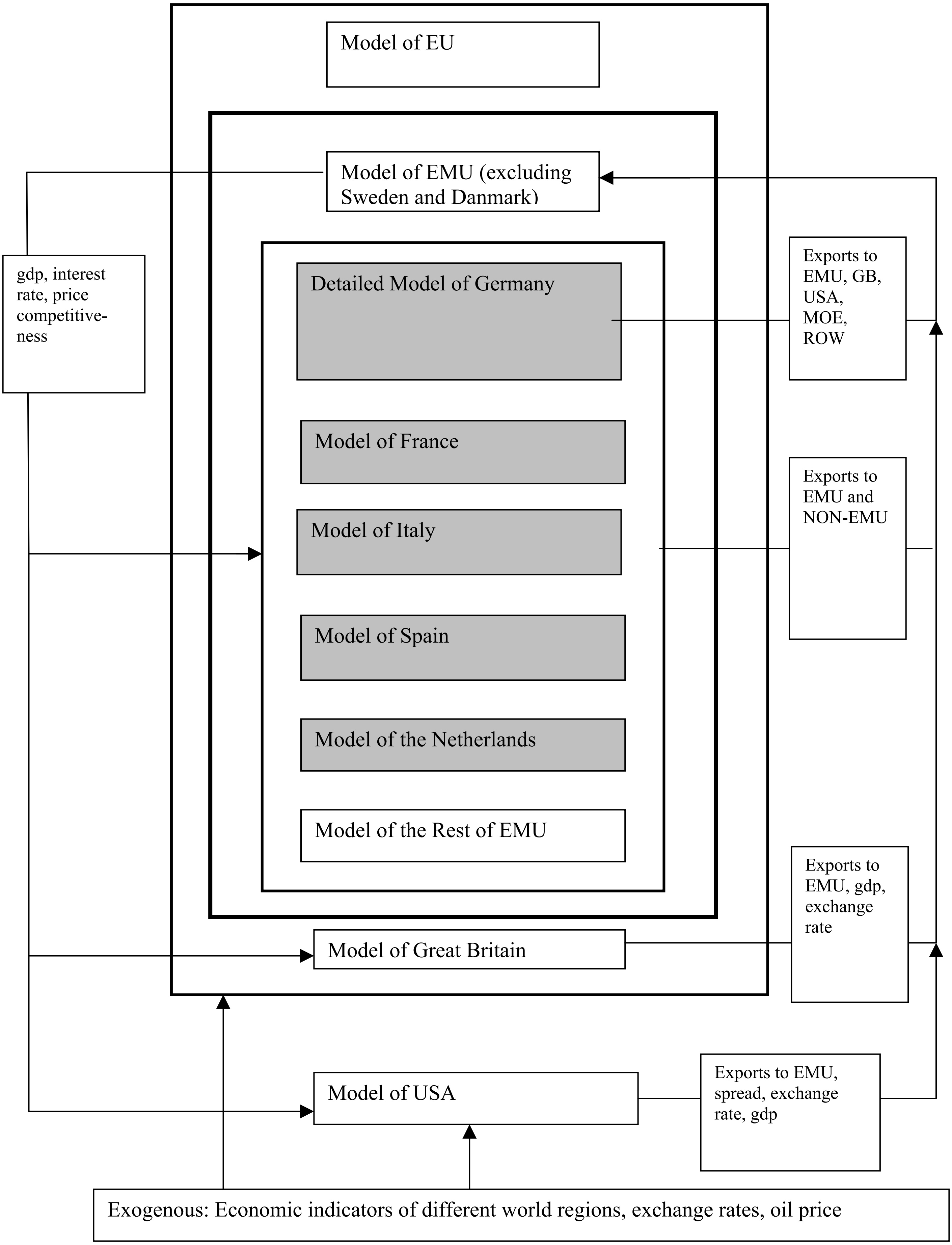
Theoretical base

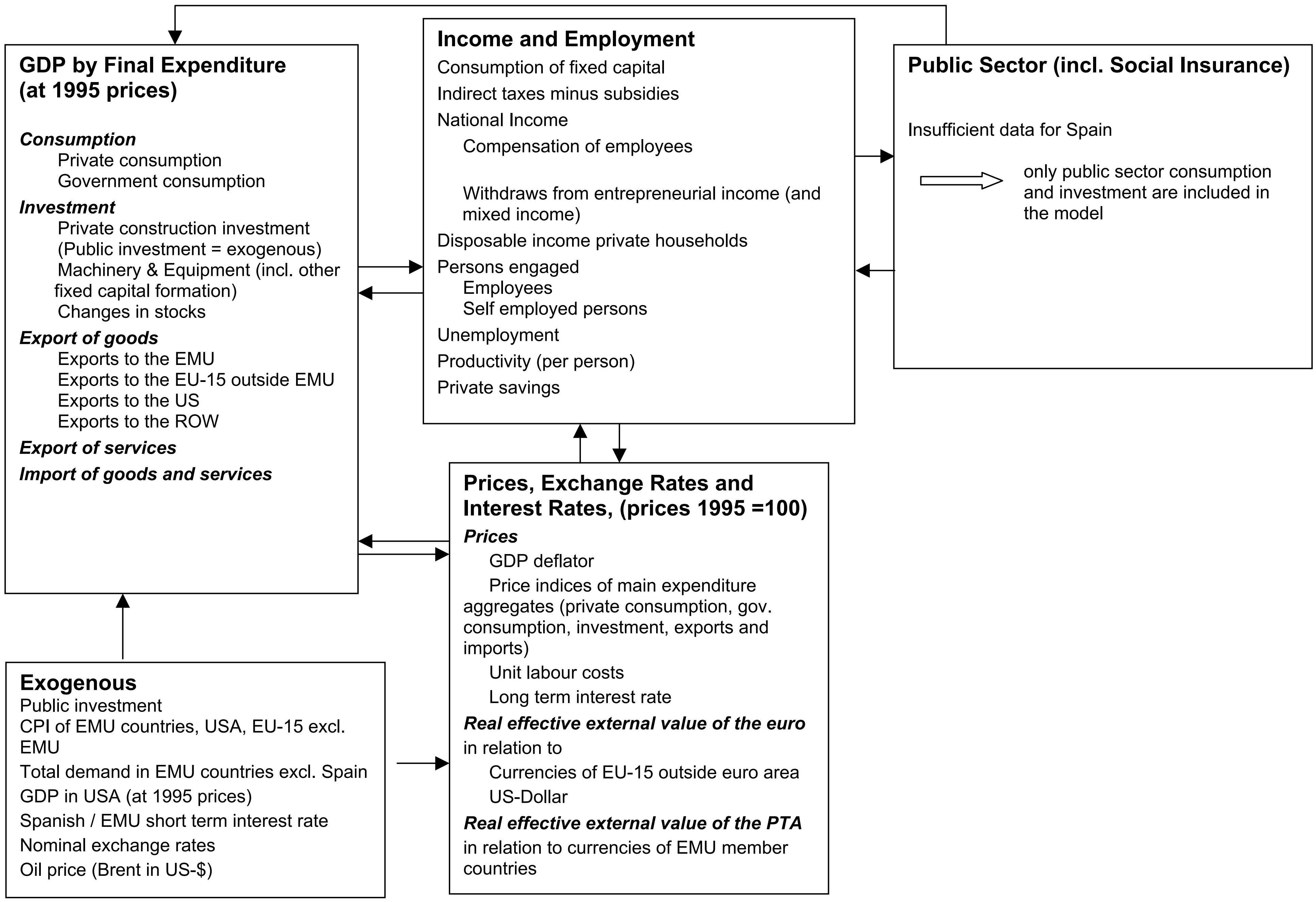
- Existence of nominal rigidities
- Real effects of economic policy
- Market spillovers
- Possibility of unemployment in the long run
- Difference between short- and long-term impacts of explanatory variables

Methodological base

- Analysis of the properties of the time series
- Estimation of error correction models
- Tests of the forecast quality of the stochastic equations
- Tests of auto correlation of the residuals and stability of the coefficients
- Tests of ex post simulation of an equation inside the model

A.1. European Business Cycle Model





A.2. Structural Macroeconometric Model of Spain

II. Econometric Methods

Most economic time series are non-stationary and it is generally agreed that they follow a stochastic trend. They are characterized by asymptotically infinite variance and autocorrelations which imply a shock has a permanent effect on the series and thus the series tends to "wander" from a deterministic path without a tendency to return.

Cointegration means that two or more series „wander together". While each of the series is influenced by the permanent effects of shocks there exists a long-run equilibrium relationship between them and a mechanism that forces them back to this equilibrium.

Technically two or more series are cointegrated if they are integrated of degree I(d) and there exists a linear combination of them that is I(d-b). In the bivariate case with d=b=1 that means if there are two economic time series Y_t and X_t that are I(1) and there is a relationship $Y_t - a*X_t = Z_t$ that is I(0) they are cointegrated with cointegrating vector [1 -a] and Z_t is called the equilibrium error.

The concept of Cointegration has become central to econometric time series analysis. One reason is that the equilibrium concept implied closely relates to the theoretical equilibrium view of the economy. Since most economic time series are taken to be I(1) theoretically established equilibrium relations between these imply a cointegrating relationship if the theory is indeed empirically valid. Non-cointegration would lead to I(1) error terms Z_t. And this basically means that no equilibrium exists since the errors are permanently deviating from zero.

Econometrically the analysis of the relationship between two or more cointegrated I(1) time series is performed in an error correction framework. This approach is a re-parametrization of an autoregressive distributed-lag equation that explicitly takes into account the long-run equilibrium relation as well as the short-term dynamics of the series.
An error correction model (ECM) for Y_t as endogenous and X_t as exogenous series can be written as follows:

$$\Delta(Y_t) = \delta + \underbrace{\gamma\left[Y_{t-1} - \det - a * X_{t-1}\right]}_{\text{error correction term}} + \underbrace{\sum_{i=1}^{p} \alpha_i * \Delta(Y_{t-i}) + \sum_{j=1}^{q} \beta_j * \Delta(X_{t-j})}_{\text{short-term dynamics}} + \varepsilon_t$$

Δ is the difference operator
det is Deterministic (constant, seasonal dummies etc)
δ is a constant
γ is the speed of adjustment parameter
ε_t is a white noise error term.

The change in Y is influenced by last period's deviation from the theoretically founded equilibrium relationship between the two economic time series and lagged difference terms of the endogenous and exogenous variables. The number of lagged difference terms is chosen as to make the error term white noise. One can see that OLS provides consistent parameter estimates as all elements are I(0) by definition if the two I(1) variables are cointegrated.

To construct the model the following methodology was employed:

1. relationship(s) for the variable in question were taken from economic theory
2. the time series properties of the endogenous and explanatory series were tested; all series had to be I(1) for cointegration relationships with I(0) equilibrium errors to be feasible
3. (several) cointegrating equations for the variables were tested
4. the empirically verified equilibrium relationship was used to construct an ECM
5. a (second) cointegration test was performed in estimating the ECM
6. the stability and forecasting properties of the ECM were tested, if necessary a respecification was performed
7. the performance of each ECM in the complete system was analyzed, if necessary a respecification was performed

There are several possibilities to test for (Co-)Integration. To check the time series properties the Augmented Dickey Fuller (ADF) Test was used, the results are shown in the documentation chapter IV B. For step 3. of the analysis either the Granger methodology or the Johansen procedure was employed. This is not shown in the documentation as cointegration can also be verified in the final ECM used in the model (step 5).

This kind of test was proposed by Banerjee et al. (1992) and it makes use of the t-statistic of the speed of adjustment parameter. The argument from above that each element in the ECM has to be I(0) if Y and X are cointegrated can be turned around: if all elements in the ECM are I(0) than Y and X must be cointegrated. Then if X is exogenous γ must be significant for the adjustment to equilibrium to take place. Thus the Null Hypothesis of non-cointegration implies $\gamma = 0$. The critical values are taken from Banerjee et al. (1992) and are shown in the Appendix. The significance of γ is shown in each of the equations.

Furthermore a battery of specification tests were performed (Serial Correlation LM Test, White's Heteroscedasticity Test, ARCH LM Test, Normality Test and Ramsey's Reset Test) as well as a stability analysis (Cusum, Cusum squared) and a detailed forecast evaluation. For the most important equations a single equation simulation was also added to analyze the effect of shocks to the explanatory variables.

After an equation for each endogenous variable was satisfactorily specified the definition equations were added and all equations were put together to form the model. Again each equation was analyzed, now in its performance in the complete model.

Data base

Raw (seasonally unadjusted) quarterly time series data is used whenever available. The estimation period is from 1980:1 to 2001:4 or until 2002:4 for most equations. Quarterly national accounts data is taken from the Spanish statistics office (INE). Additional data sources are used to complement the quarterly national accounts data base. For details c.f. Appendix.

III. Stochastic Equations

A. National Accounts Statistics: GDP by Final Expenditure

A.1. Private Consumption

Private consumption expenditure; at constant prices (1995)

Dependent Variable: D(LOG(ES_C95))
Method: Least Squares
Date: 08/23/04 Time: 17:50
Sample: 1986:1 2002:4
Included observations: 68

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.403751	0.122384	3.299053	0.0018
Z1	-0.069080	0.013596	-5.081008	0.0000
Z2	-0.016729	0.005317	-3.146400	0.0028
Z3	-0.046669	0.014644	-3.186909	0.0025
SD9301	**-0.023624**	**0.004265**	**-5.538478**	**0.0000**
D(SD9301(-2))	0.012560	0.006884	1.824504	0.0741
D(SD9301(-3))	0.016079	0.007357	2.185563	0.0336
LOG(ES_C95(-1))	**-0.349546**	**0.065428**	**-5.342432**	**0.0000**
LOG(ES_YDR(-1))	**0.315137**	**0.066149**	**4.764046**	**0.0000**
ES_LANG(-4)	**-0.003356**	**0.000622**	**-5.395230**	**0.0000**
D(LOG(ES_YDR(-1)))	-0.312449	0.074260	-4.207484	0.0001
D(LOG(ES_YDR(-2)))	-0.201019	0.049227	-4.083475	0.0002
D(LOG(ES_YDR(-3)))	-0.112235	0.059986	-1.871026	0.0672
D(LOG(ES_C95(-1)))	-0.249847	0.096190	-2.597425	0.0123
D(LOG(ES_C95(-2)))	-0.407967	0.081764	-4.989578	0.0000
D(LOG(ES_C95(-3)))	-0.200949	0.098845	-2.032981	0.0474
D(ES_URATE)	-0.010439	0.001496	-6.977513	0.0000
D(ES_URATE(-4))	-0.009139	0.001794	-5.093003	0.0000

R-squared	0.985622	Mean dependent var	0.007352
Adjusted R-squared	0.980733	S.D. dependent var	0.041308
S.E. of regression	0.005734	Akaike info criterion	-7.262971
Sum squared resid	0.001644	Schwarz criterion	-6.675454
Log likelihood	264.9410	F-statistic	201.6166
Durbin-Watson stat	1.710201	Prob(F-statistic)	0.000000

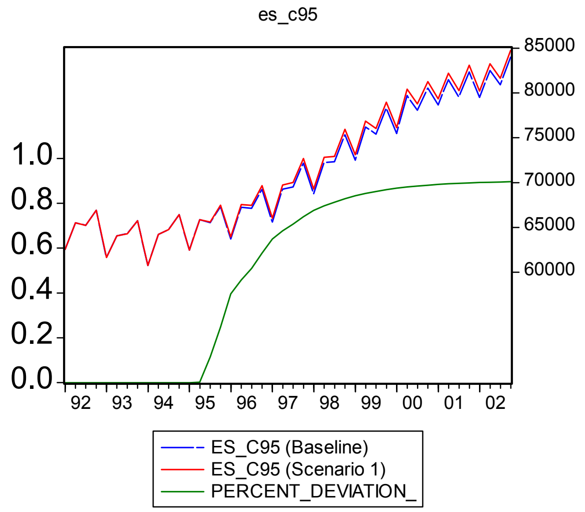
The main explanatory variable for private final consumption expenditure at prices of 1995 (ES_C95) is real disposable income (ES_YDR), but nominal longterm interest rates (ES_LANG) also affect consumption in the long run. In addition to lagged consumption and income unemployment exerts some short-run influence. The fact that *nominal* rather than *real* interest rates affect consumption expenditure seems implausible at first sight. One explanation may be the prevalence of variable rate mortgages in the Spanish housing market. Any change in interest rates immediately affects the purchasing power of a large number of households.

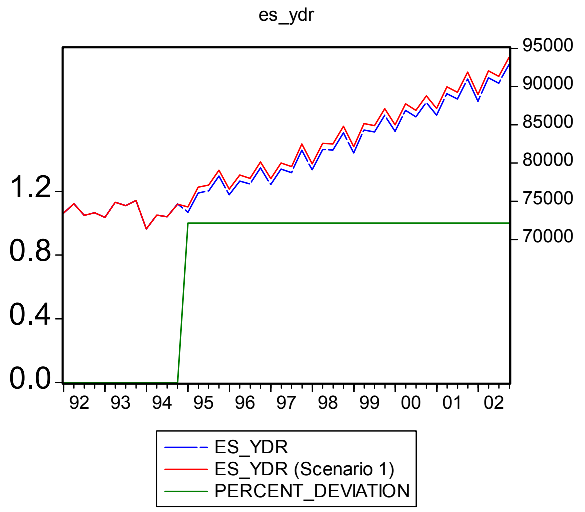
Residual tests	***Probability***	***Forecast evaluation (dynamic in-sample)***	
Normality test (Jarque-Bera)	0.576454	Root Mean Squared Error	616.0133
Serial Correlation LM test (lag 1)	0.020780	Mean Absolute Percent Error	0.877091
Serial Correlation LM test (lag 4)	0.011362	Theil inequality coefficient	0.004861
White's heteroscedasticity test	0.263419	Bias proportion	0.000989
RESET test (No. of fitted terms:1)	0.450494	Variance proportion	0.000002
ARCH LM test (lag 1)	0.882736	Covariance proportion	0.999008
ARCH LM test (lag 4)	0.997879		
CUSUM test[a]	0		
$CUSUM^2$ test[a]	0		

[a] Number of quarters where the cumulative sum goes outside the area between the 5% critical lines.

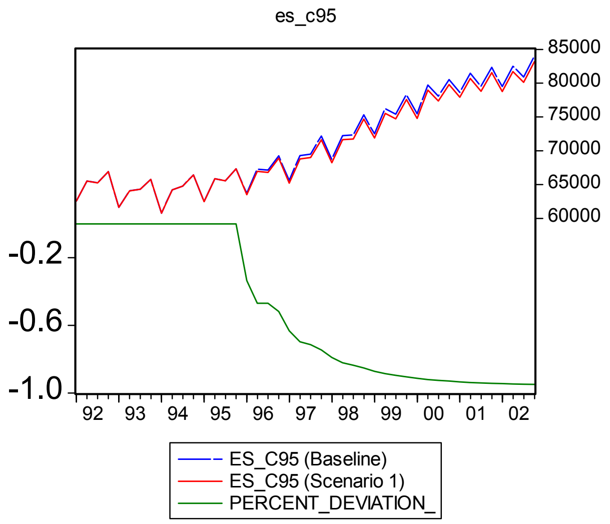
Simulation properties of the equation:

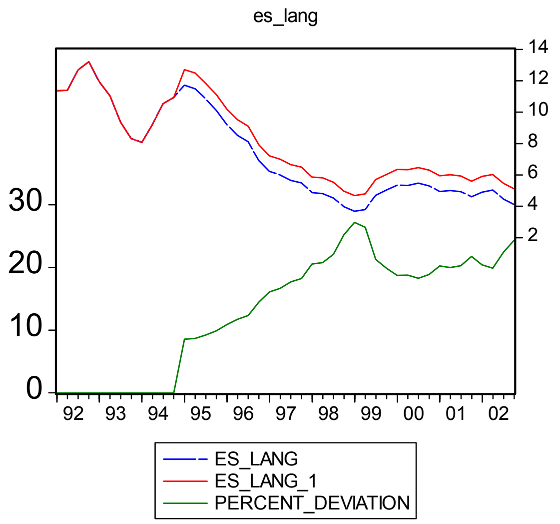
1% increase in real disposable income





1 percentage point increase in long-term interest rate





A.2. Government Consumption

Government Consumption; at constant prices (1995)

Dependent Variable: D(LOG(ES_CGOV95))
Method: Least Squares
Date: 04/20/04 Time: 16:58
Sample(adjusted): 1981:2 2002:4
Included observations: 87 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.828785	0.747296	5.123515	0.0000
Z1	-0.002692	0.004118	-0.653704	0.5153
Z2	-0.001818	0.004128	-0.440406	0.6609
Z3	0.001893	0.004096	0.462156	0.6453
Z1SD	-0.021421	0.007166	-2.989185	0.0038
Z2SD	-0.000153	0.007921	-0.019312	0.9846
Z3SD	0.011752	0.007016	1.675121	0.0981
@TREND	**0.005275**	**0.001053**	**5.009840**	**0.0000**
KT9301	-0.003377	0.000695	-4.859314	0.0000
LOG(ES_CGOV95(-1))	**-0.397639**	**0.078270**	**-5.080356**	**0.0000**
LOG(ES_URATE(-1))	**-0.059272**	**0.012159**	**-4.874835**	**0.0000**
D(LOG(ES_CGOV95(-3)))	-0.239707	0.086567	-2.769024	0.0071
D(LOG(ES_CGOV95(-4)))	0.229513	0.086324	2.658721	0.0096

R-squared	0.833869	Mean dependent var	0.010384
Adjusted R-squared	0.806929	S.D. dependent var	0.021118
S.E. of regression	0.009279	Akaike info criterion	-6.385082
Sum squared resid	0.006372	Schwarz criterion	-6.016613
Log likelihood	290.7511	F-statistic	30.95265
Durbin-Watson stat	1.746186	Prob(F-statistic)	0.000000

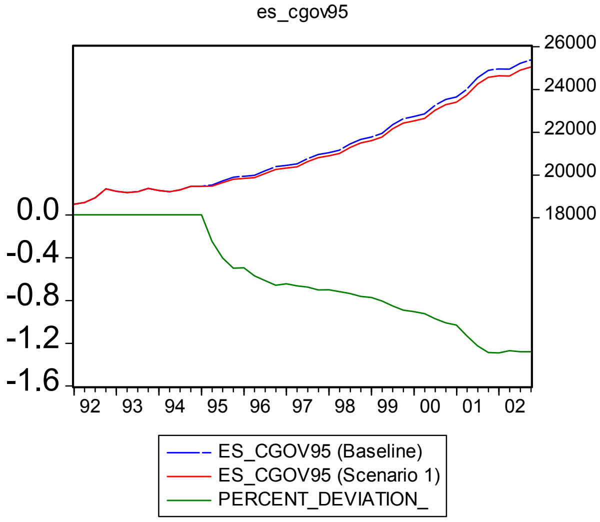
Government consumption shows a rather procyclical behaviour. In the equation the unemployment rate functions as a cyclical indicator, whereas the (broken) trend reflects the long-term tendency. An alternative way of modelling may have been the use of real GDP combined with the broken trend.

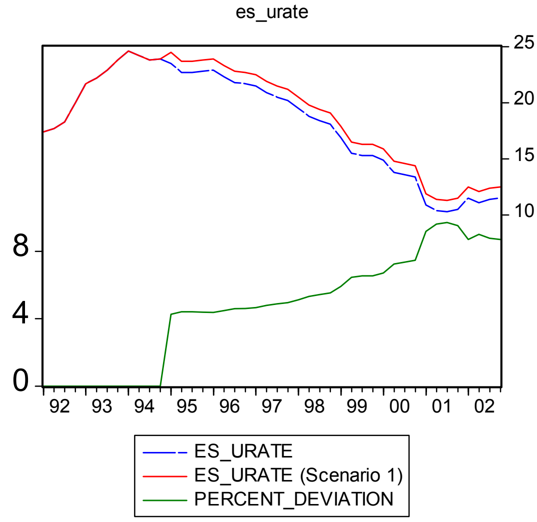
Residual tests	***Probability***	***Forecast evaluation (dynamic in-sample)***	
Normality test (Jarque-Bera)	0.443809	Root Mean Squared Error	183.5294
Serial Correlation LM test (lag 1)	0.188014	Mean Absolute Percent Error	0.862835
Serial Correlation LM test (lag 4)	0.222138	Theil inequality coefficient	0.005065
White's heteroscedasticity test	0.097198	Bias proportion	0.000158
RESET test (No. of fitted terms:1)	0.802863	Variance proportion	0.001019
ARCH LM test (lag 1)	0.311847	Covariance proportion	0.998823
ARCH LM test (lag 4)	0.774556		
Stability tests			
CUSUM test	0		
CUSUM sq. test	0		

[a] Number of quarters where the cumulative sum goes outside the area between the 5% critical lines.

Simulation properties of the equation:

1 percentage point increase in unemployment rate





A.3. Investment

Investment: machinery & equipment (at constant prices of 1995)

Dependent Variable: D(LOG(ES_IMEQ95))
Method: Least Squares
Date: 02/14/05 Time: 09:48
Sample(adjusted): 1981:1 2002:4
Included observations: 88 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.914620	0.758771	-2.523318	0.0137
Z1	-0.099297	0.020383	-4.871444	0.0000
Z2	-0.012309	0.012577	-0.978701	0.3309
Z3	-0.166324	0.019161	-8.680382	0.0000
Z1SD	-0.044889	0.014360	-3.126039	0.0025
Z2SD	-0.058938	0.015080	-3.908437	0.0002
Z3SD	-0.066562	0.015128	-4.399883	0.0000
SD9201(-1)	-0.046911	0.012946	-3.623751	0.0005
LOG(ES_IMEQ95(-1))	**-0.208475**	**0.049330**	**-4.226100**	**0.0001**
LOG(ES_GDP95(-1))	**0.338813**	**0.101025**	**3.353743**	**0.0013**
ES_LANG(-3)	**-0.004197**	**0.001630**	**-2.574054**	**0.0120**
D(LOG(ES_IMEQ95(-2)))	0.334778	0.096872	3.455857	0.0009
D(LOG(ES_IMEQ95(-3)))	0.273877	0.100174	2.734004	0.0078

R-squared	0.937344	Mean dependent var	0.009431
Adjusted R-squared	0.927319	S.D. dependent var	0.087686
S.E. of regression	0.023640	Akaike info criterion	-4.516179
Sum squared resid	0.041912	Schwarz criterion	-4.150209
Log likelihood	211.7119	F-statistic	93.50054
Durbin-Watson stat	2.000331	Prob(F-statistic)	0.000000

As in the case of Germany investment in machinery and equipment is explained by a demand variable and a cost variable. The demand side is reflected by gross domestic product. For modelling the cost of investment, we use the long-term nominal interest rate. These variables - as well as a step dummy to model a level shift -describe the long-run behaviour of investment into machinery and equipment.

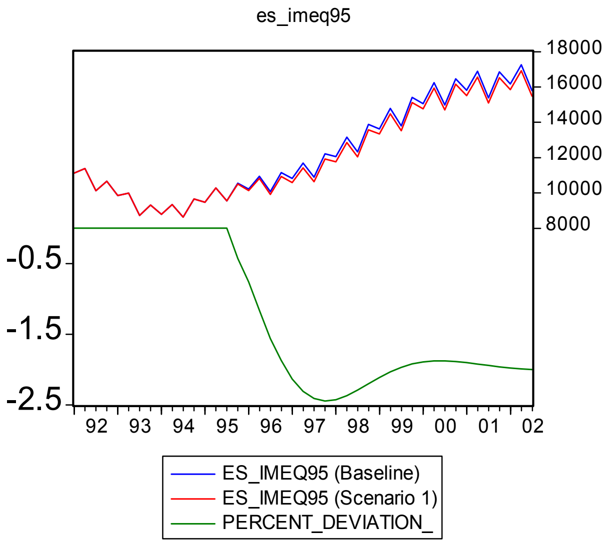
In the short run only lagged investment into machinery and equipment is important. As the seasonal pattern of investment changes, two sets of centred seasonal dummies are needed.

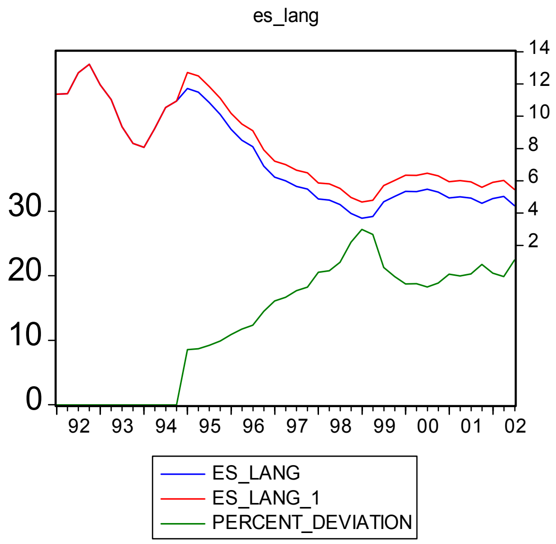
Residual tests	***Probability***	***Forecast evaluation (dynamic in-sample)***	
Normality test (Jarque-Bera)	0.658312	Root Mean Squared Error	531.3979
Serial Correlation LM test (lag 1)	0.974391	Mean Absolute Percent Error	3.823591
Serial Correlation LM test (lag 4)	0.546945	Theil inequality coefficient	0.024847
White's heteroscedasticity test	0.029735	Bias proportion	0.000900
RESET test (No. of fitted terms:1)	0.125388	Variance proportion	0.018706
ARCH LM test (lag 1)	0.103819	Covariance proportion	0.980393
ARCH LM test (lag 4)	0.040357		
Stability tests			
CUSUM test	0		
CUSUM sq. test	0		

[a] Number of quarters where the cumulative sum goes outside the area between the 5% critical lines.

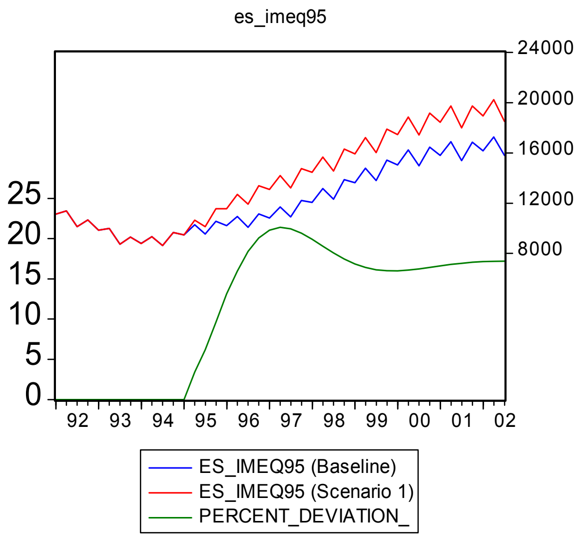
Simulation properties of the equation:

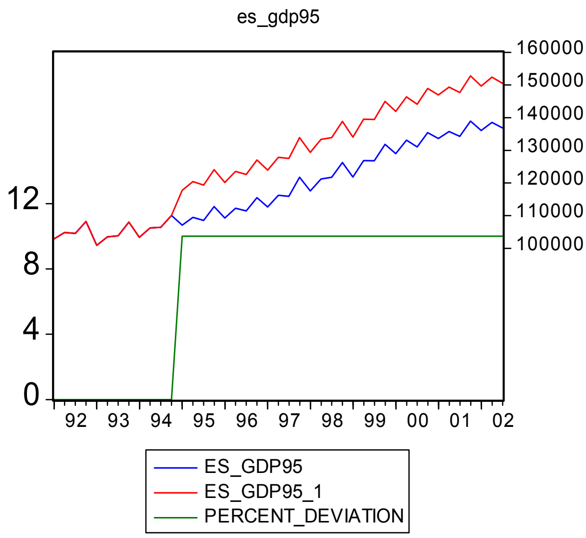
1 perc. point increase in long-term interest rate





10% increase in GDP





Investment in construction

Dependent Variable: D(LOG(ES_ICON95PR))
Method: Least Squares
Date: 02/01/05 Time: 16:14
Sample: 1986:1 2002:4
Included observations: 68

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.158971	0.742712	-1.560457	0.1245
Z1	-0.218312	0.007192	-30.35430	0.0000
Z2	-0.003793	0.007772	-0.488008	0.6275
Z3	-0.080894	0.007235	-11.18096	0.0000
LOG(ES_ICON95PR(-1))	**-0.220912**	**0.053337**	**-4.141803**	**0.0001**
LOG(ES_YDR(-1))	**0.294808**	**0.104588**	**2.818757**	**0.0067**
ES_LANG(-8)	**-0.008157**	**0.001232**	**-6.620342**	**0.0000**
SD9201(-1)	-0.040523	0.008858	-4.574869	0.0000
ID9501	0.068357	0.018102	3.776174	0.0004
D(LOG(ES_YDR(-2)))	-0.460101	0.096802	-4.752986	0.0000
D(ES_LANG(-2))	0.007291	0.003166	2.303143	0.0251
D(ES_LANG(-3))	-0.009878	0.003084	-3.202475	0.0023
D(ES_LANG(-7))	-0.009886	0.003126	-3.162404	0.0026
D(ES_LANG(-8))	0.008696	0.003239	2.685139	0.0096

R-squared	0.971182	Mean dependent var	0.014384
Adjusted R-squared	0.964244	S.D. dependent var	0.086373
S.E. of regression	0.016333	Akaike info criterion	-5.210074
Sum squared resid	0.014405	Schwarz criterion	-4.753117
Log likelihood	191.1425	F-statistic	139.9859
Durbin-Watson stat	2.011071	Prob(F-statistic)	0.000000

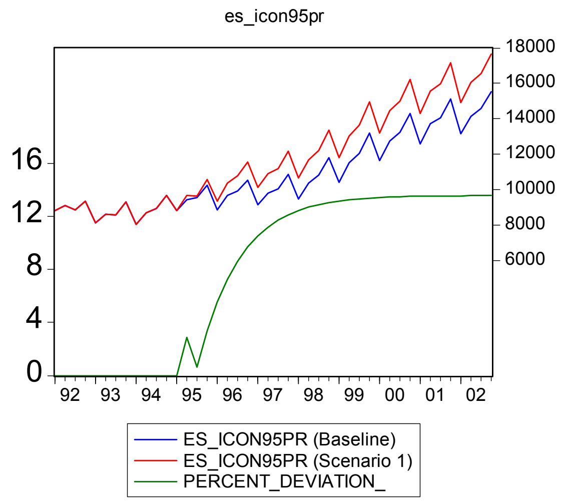
A large part of construction investment consists of housing. This is why real disposable income of households rather than GDP is chosen as an income variable. The long-term nominal interest rate also influences construction investment in the long run. The elasticity of construction investment with respect to income is above one. As in investment into machinery and equipment there is a level shift (1992) in construction investment.

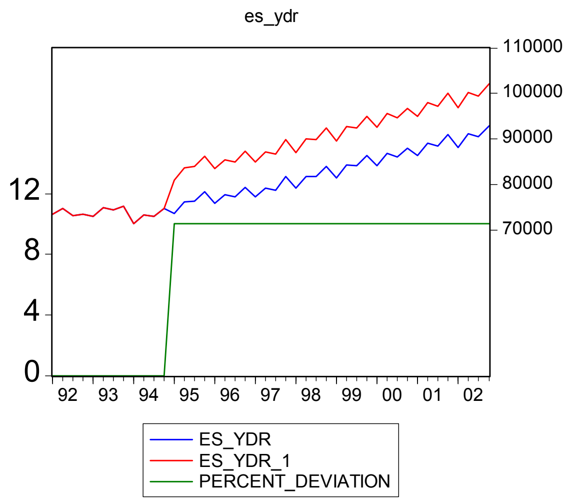
Residual tests	***Probability***	***Forecast evaluation (dynamic in-sample)***	
Normality test (Jarque-Bera)	0.263552	Root Mean Squared Error	261.8223
Serial Correlation LM test (lag 1)	0.854432	Mean Absolute Percent Error	2.689640
Serial Correlation LM test (lag 4)	0.003121	Theil inequality coefficient	0.013923
White's heteroscedasticity test	0.059452	Bias proportion	0.004232
RESET test (No. of fitted terms:1)	0.842685	Variance proportion	0.000012
ARCH LM test (lag 1)	0.328217	Covariance proportion	0.995756
ARCH LM test (lag 4)	0.003768		
Stability tests	0		
CUSUM test	0		
CUSUM sq. test			

[a] Number of quarters where the cumulative sum goes outside the area between the 5% critical lines.

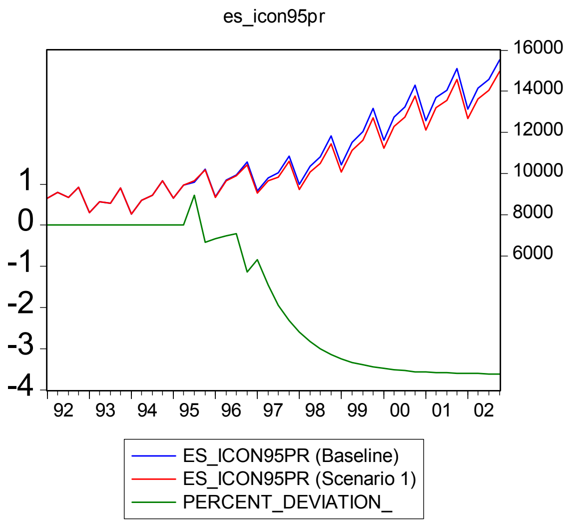
Simulation properties of the equation:

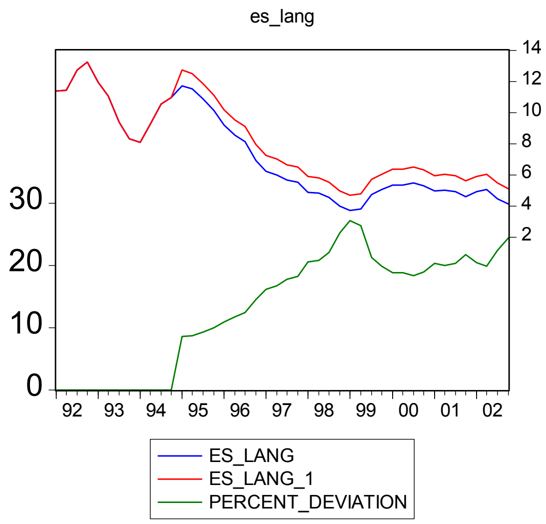
10% increase in real disposable income





1 percentage point increase in long-term interest rate





A.4. Export of Goods and Services

Spanish export of goods to the EMU at 1995 prices

Dependent Variable: D(LOG(ES_XG95EWU))
Method: Least Squares
Date: 05/28/04 Time: 20:53
Sample(adjusted): 1981:3 2002:4
Included observations: 86 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-21.58492	3.319349	-6.502757	0.0000
Z1	0.082054	0.043339	1.893307	0.0621
Z2	-0.024426	0.028653	-0.852502	0.3966
Z3	-0.163027	0.037179	-4.384961	0.0000
SD9901	-0.096430	0.023017	-4.189447	0.0001
LOG(ES_XG95EWU(-1))	**-0.599412**	**0.090869**	**-6.596405**	**0.0000**
LOG(ES_RAWEWU(-1))	**-0.614226**	**0.134274**	**-4.574423**	**0.0000**
LOG(EWUOES_DTOT(-1))	**2.102768**	**0.323873**	**6.492562**	**0.0000**
D(LOG(EWUOES_DTOT))	2.301727	0.542063	4.246236	0.0001
D(LOG(ES_RAWEWU(-5)))	-0.794631	0.248814	-3.193668	0.0020

R-squared	0.910170	Mean dependent var	0.024931
Adjusted R-squared	0.899532	S.D. dependent var	0.144666
S.E. of regression	0.045854	Akaike info criterion	-3.217756
Sum squared resid	0.159798	Schwarz criterion	-2.932367
Log likelihood	148.3635	F-statistic	85.56016
Durbin-Watson stat	1.984633	Prob(F-statistic)	0.000000

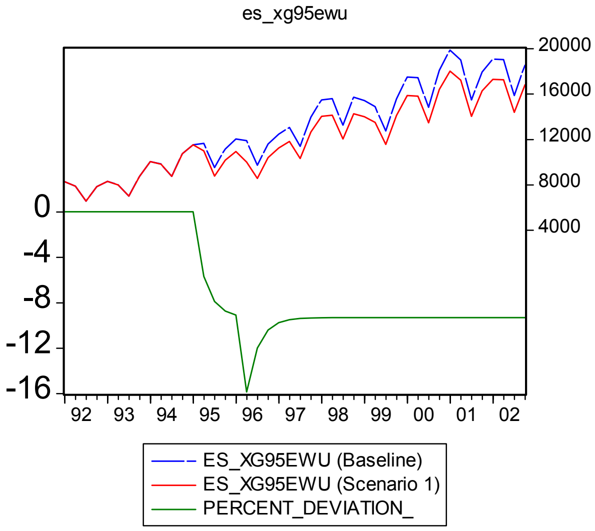
The euro area countries account for 60% of Spain’s exports. As the national accounts offer no regional disaggregation of exports, the modelling team computed their own data set. The methodology is described in the Appendix. Spain’s exports react very strongly to changes in total demand (consumption+investment+exports) of the euro area. Unlike German exports to the euro area Spanish exports to the euro area are not modelled with a trend. This results in a very high elasticity of exports with respect to demand. If a trend had been included the elasticity would still be higher than two. However, the specification would not be stable. The second variable which plays an important role for Spanish exports to the euro area in the long run is competitiveness, measured by the real effective exchange rate. The launch of the euro obviously means a significant structural break for Spain’s exports to the euro area. For the time being this is modelled with a step dummy.

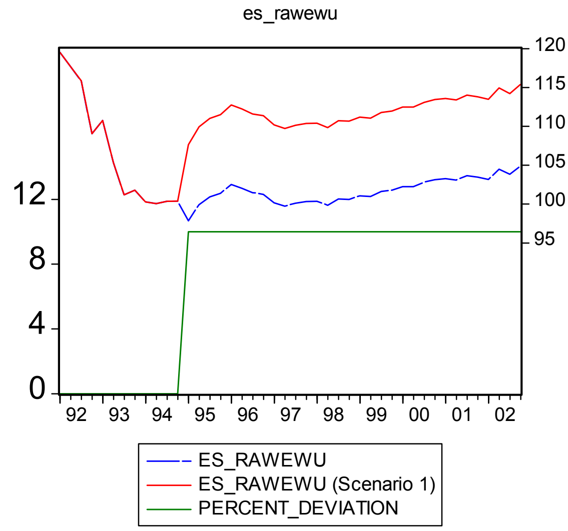
Residual tests	***Probability***	***Forecast evaluation (dynamic in-sample)***	
Normality test (Jarque-Bera)	0.498383	Root Mean Squared Error	527.2050
Serial Correlation LM test (lag 1)	0.980484	Mean Absolute Percent Error	3.704995
Serial Correlation LM test (lag 4)	0.842551	Theil inequality coefficient	0.025864
White's heteroscedasticity test	0.317332	Bias proportion	0.000012
RESET test (No. of fitted terms:1)	0.928107	Variance proportion	0.004530
ARCH LM test (lag 1)	0.872154	Covariance proportion	0.995458
ARCH LM test (lag 4)	0.654223		
Stability tests			
CUSUM test	0		
CUSUM sq. test	0		

[a] Number of quarters where the cumulative sum goes outside the area between the 5% critical lines.

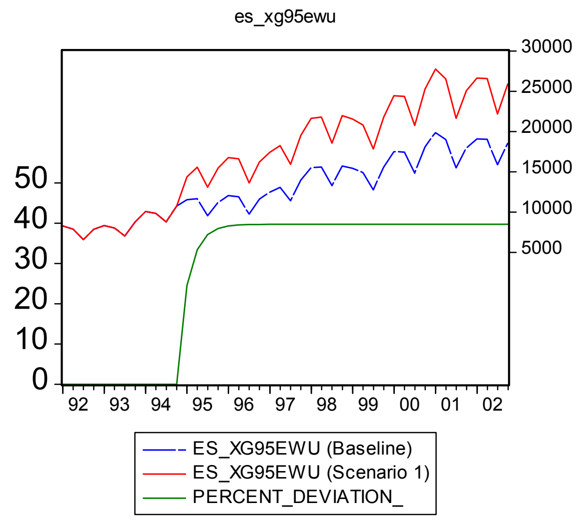
Simulation property of the equation:

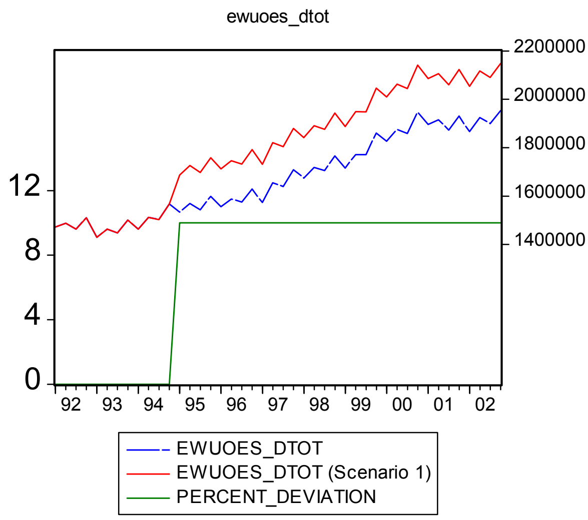
10% loss in price competitiveness





10% increase in total demand of Euro area (excluding Spain)





Spanish export of goods to the rest of European Union at 1995 prices

Dependent Variable: D(LOG(ES_XG95REU))
Method: Least Squares
Date: 05/17/04 Time: 16:28
Sample(adjusted): 1980:3 2002:4
Included observations: 90 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.699682	1.027962	6.517439	0.0000
Z1	-0.127816	0.041759	-3.060819	0.0030
Z2	0.065614	0.049416	1.327771	0.1879
Z3	-0.195926	0.026180	-7.483956	0.0000
LOG(ES_XG95REU(-1))	**-0.660874**	**0.091111**	**-7.253532**	**0.0000**
LOG(ES_NAWREU(-1))	**-0.571275**	**0.120417**	**-4.744146**	**0.0000**
@TREND	**0.013308**	**0.001876**	**7.092708**	**0.0000**
D(LOG(REU_DDTOT95(-1)))	2.740286	0.807888	3.391913	0.0011

R-squared	0.771210	Mean dependent var	0.022316
Adjusted R-squared	0.751680	S.D. dependent var	0.147504
S.E. of regression	0.073504	Akaike info criterion	-2.298268
Sum squared resid	0.443032	Schwarz criterion	-2.076063
Log likelihood	111.4221	F-statistic	39.48684
Durbin-Watson stat	2.016858	Prob(F-statistic)	0.000000

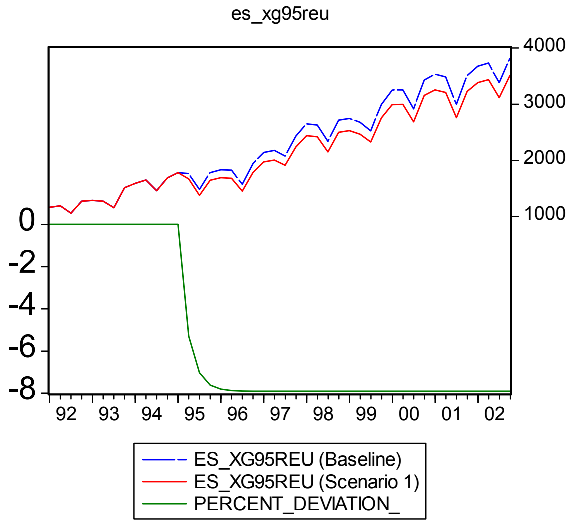
In the long run Spanish exports to the EU-15 countries outside the euro area are determined by the nominal effective exchange rate and a deterministic trend. Actual total demand of the countries seems to play a part only in the short run. The cointegrating relationship is highly significant and there are hardly any short-term dynamics.

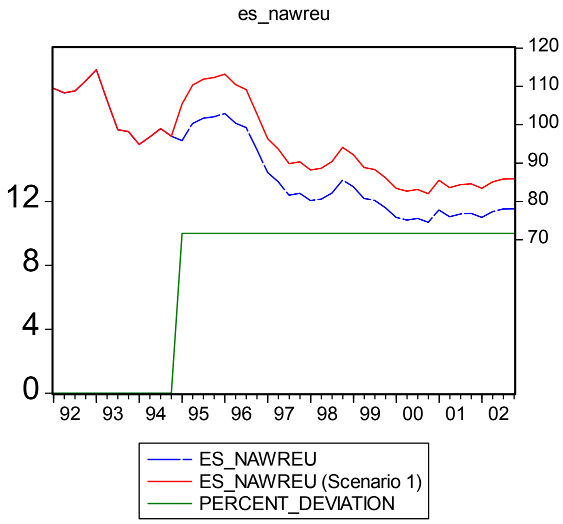
Residual tests	***Probability***	***Forecast evaluation (dynamic in-sample)***	
Normality test (Jarque-Bera)	0.745770	Root Mean Squared Error	100.4430
Serial Correlation LM test (lag 1)	0.727419	Mean Absolute Percent Error	5.765059
Serial Correlation LM test (lag 4)	0.670965	Theil inequality coefficient	0.027666
White's heteroscedasticity test	0.111923	Bias proportion	0.000524
RESET test (No. of fitted terms:1)	0.021540	Variance proportion	0.003416
ARCH LM test (lag 1)	0.445641	Covariance proportion	0.996060
ARCH LM test (lag 4)	0.014494		
Stability tests			
CUSUM test	0		
CUSUM sq. test	20 (1992:3-95:2 and 1996:2 – 98:1)		

[a] Number of quarters where the cumulative sum goes outside the area between the 5% critical lines.

Simulation property of the equation:

10 % increase in nominal external value (10% loss in the price competitiveness)





Spanish export of goods to the USA at 1995 prices

Dependent Variable: D(LOG(ES_XG95US))
Method: Least Squares
Date: 05/17/04 Time: 15:30
Sample(adjusted): 1981:2 2002:4
Included observations: 87 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-7.868033	1.121707	-7.014338	0.0000
Z1	-0.083205	0.027299	-3.047968	0.0032
Z2	-0.012969	0.025300	-0.512593	0.6097
Z3	-0.083916	0.026737	-3.138581	0.0024
LOG(ES_XG95US(-1))	**-0.804051**	**0.093502**	**-8.599250**	**0.0000**
LOG(ES_RAWUS(-1))	**-0.533789**	**0.078655**	**-6.786454**	**0.0000**
LOG(US_DTOT95(-1))	**1.082829**	**0.135337**	**8.000995**	**0.0000**
D(LOG(US_DTOT95(-1)))	4.649780	1.369255	3.395847	0.0011
D(LOG(US_DTOT95(-2)))	2.624781	1.425779	1.840945	0.0695
D(LOG(US_DTOT95(-4)))	3.213054	1.172761	2.739734	0.0077
D(LOG(ES_RAWUS(-1)))	0.509474	0.197265	2.582688	0.0117

R-squared	0.661772	Mean dependent var	0.018188
Adjusted R-squared	0.617268	S.D. dependent var	0.135208
S.E. of regression	0.083647	Akaike info criterion	-2.006725
Sum squared resid	0.531757	Schwarz criterion	-1.694944
Log likelihood	98.29255	F-statistic	14.87002
Durbin-Watson stat	1.995739	Prob(F-statistic)	0.000000

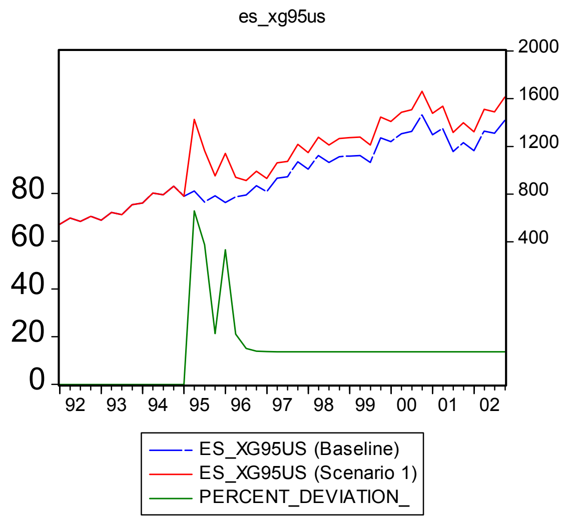
In the long run Spain's exports to the United States of America depend on the real effective exchange rate and total demand (consumption+investment+exports) of the US. Both demand and competitiveness play an important part in the short-run dynamics. The cointegrating relationship is highly significant.

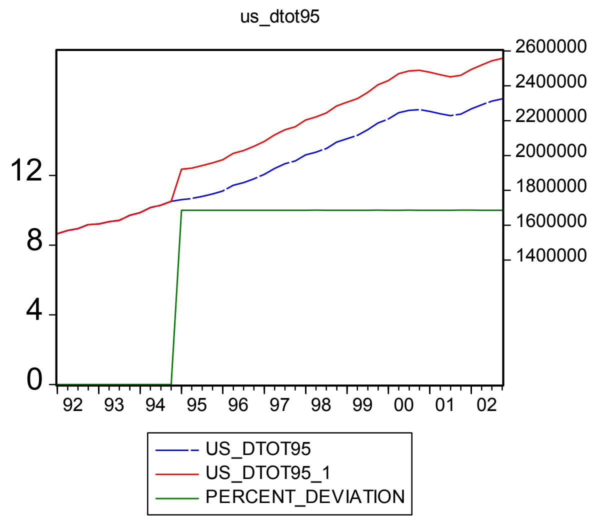
Residual tests	***Probability***	***Forecast evaluation (dynamic in-sample)***	
Normality test (Jarque-Bera)	0.427262	Root Mean Squared Error	60.79453
Serial Correlation LM test (lag 1)	0.834087	Mean Absolute Percent Error	6.333509
Serial Correlation LM test (lag 4)	0.330352	Theil inequality coefficient	0.036361
White's heteroscedasticity test	0.322693	Bias proportion	0.001063
RESET test (No. of fitted terms:1)	0.064919	Variance proportion	0.007549
ARCH LM test (lag 1)	0.147285	Covariance proportion	0.991388
ARCH LM test (lag 4)	0.381518		
Stability tests			
CUSUM test	1 (1992:3)		
CUSUM sq. test	0		

[a] Number of quarters where the cumulative sum goes outside the area between the 5% critical lines.

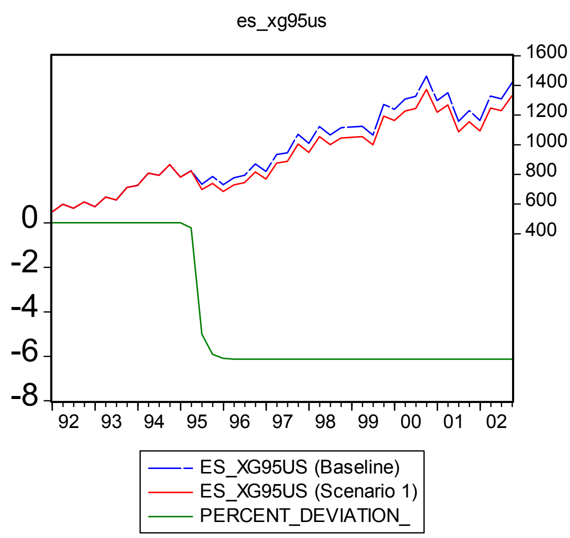
Simulation property of the equation:

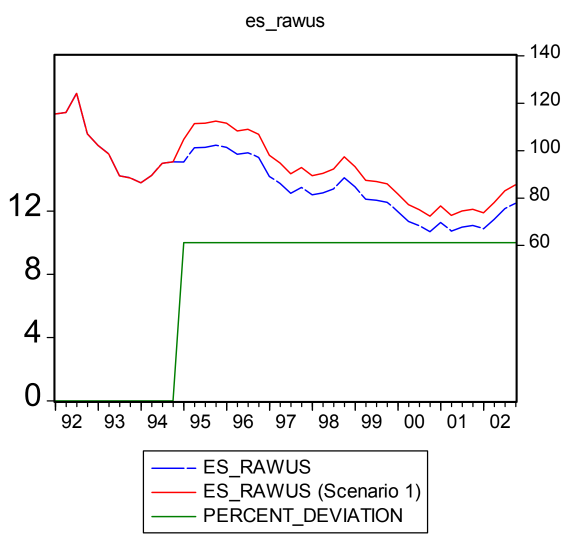
10 % increase in total demand in USA





10% loss in price competitiveness





Spanish export of goods to the rest of the world at 1995 prices

Dependent Variable: D(LOG(ES_XG95ROW))
Method: Least Squares
Date: 04/20/04 Time: 16:59
Sample(adjusted): 1980:2 2002:4
Included observations: 91 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-6.501065	1.143500	-5.685235	0.0000
Z1	-0.080828	0.026137	-3.092459	0.0027
Z2	-0.059870	0.024664	-2.427423	0.0174
Z3	-0.138393	0.024759	-5.589572	0.0000
KT8601I	-0.012975	0.003723	-3.484976	0.0008
SD8601	-0.548172	0.095356	-5.748714	0.0000
LOG(ES_XG95ROW(-1))	**-0.494540**	**0.085943**	**-5.754244**	**0.0000**
LOG(ROW_GDP(-1))	**1.757924**	**0.294000**	**5.979338**	**0.0000**
LOG(ES_RAW(-1))	**-0.667786**	**0.222004**	**-3.007986**	**0.0035**

R-squared	0.554780	Mean dependent var	0.014933
Adjusted R-squared	0.511343	S.D. dependent var	0.115832
S.E. of regression	0.080971	Akaike info criterion	-2.095782
Sum squared resid	0.537621	Schwarz criterion	-1.847455
Log likelihood	104.3581	F-statistic	12.77230
Durbin-Watson stat	2.034977	Prob(F-statistic)	0.000000

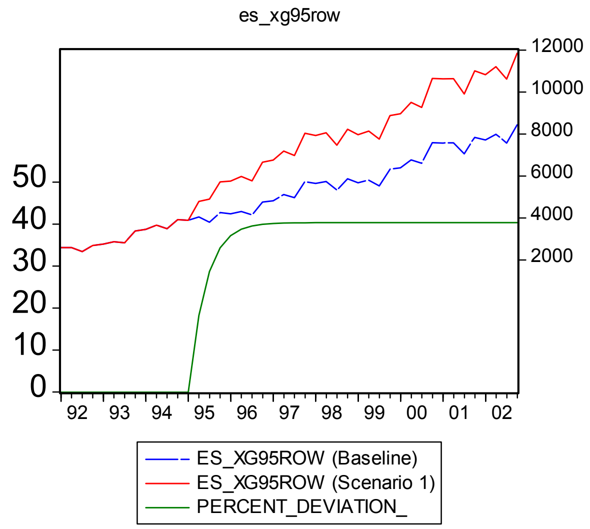
Modelling Spanish exports to the rest of the world proves difficult. There seems to have been a serious structural break at EU entry of Spain in 1986, which is captured by a step dummy and a broken trend. There are no satisfactory data sources for world demand or the real effective exchange rate vis-à-vis the countries outside the EU and the US. GDP of the rest of the world has been obtained by subtracting the annual GDP of the EU-15 and the US from the IMF's figures for world GDP. This annual data has been disaggregated into quarters. However, world GDP is only a rough guess and the annual data become available with a considerable delay. Thus, ROW_GDP is probably not much better than a simple trend. The overall real effective exchange rate includes the EU-15 as well as the US and is therefore a bad measure for Spain's competitiveness in the *rest of the world*. However, as many currencies are somehow tied to the US dollar or the euro, it seems acceptable to use the overall real exchange rate in the equation. As the share of most countries outside the EU-15 in Spain's exports is below 1%, the extra effort of constructing an index for the real effective exchange rate vis-à-vis the rest of the world would be much higher than the extra benefit. Obviously, exports to the rest of the world are driven entirely by long-run factors. There are no short-term dynamics in the equation. Nevertheless, the residuals are well-behaved.

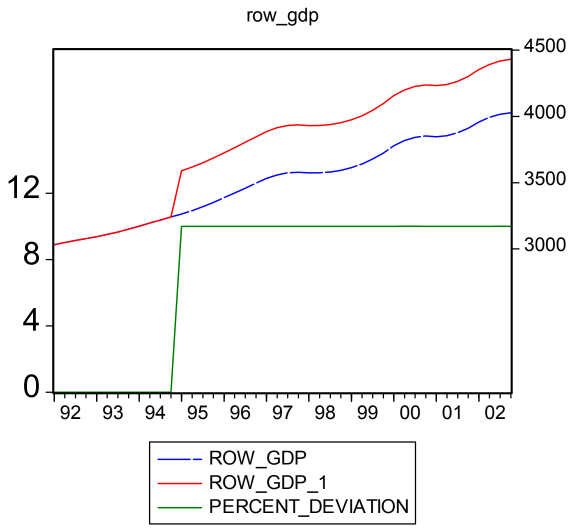
Residual tests	***Probability***	***Forecast evaluation (dynamic in-sample)***	
Normality test (Jarque-Bera)	0.692858	Root Mean Squared Error	348.1795
Serial Correlation LM test (lag 1)	0.709540	Mean Absolute Percent Error	7.731063
Serial Correlation LM test (lag 4)	0.287263	Theil inequality coefficient	0.041656
White's heteroscedasticity test	0.115496	Bias proportion	0.001374
RESET test (No. of fitted terms:1)	0.156622	Variance proportion	0.007570
ARCH LM test (lag 1)	0.467680	Covariance proportion	0.991056
ARCH LM test (lag 4)	0.236606		
Stability tests			
CUSUM test[a]	10 (1993:1-95:2)		
CUSUM^2 test[a]	4 (1987:1-87:3 +1994:4)		

[a] Number of quarters where the cumulative sum goes outside the area between the 5% critical lines.

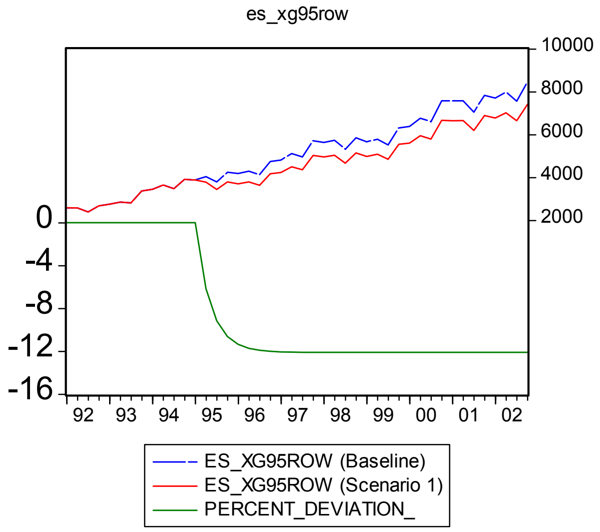
Simulation property of the equation:

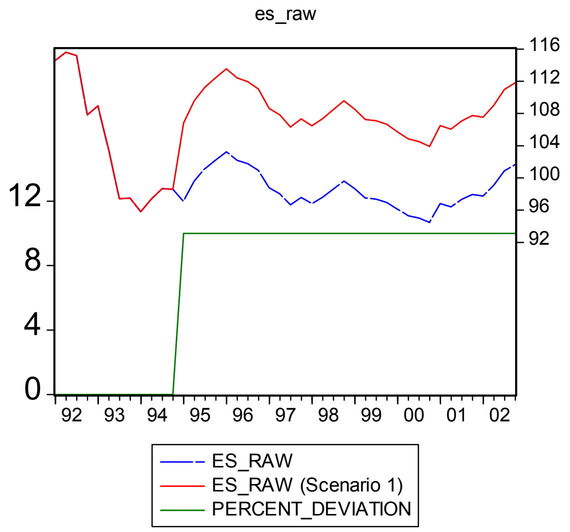
10% increase in total GDP of rest of the world





10% loss in price competitiveness





Spanish export of services at 1995 prices

Dependent Variable: D(LOG(ES_XS95))
Method: Least Squares
Date: 05/13/04 Time: 16:52
Sample: 1986:1 2000:4
Included observations: 60

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.000267	0.388875	2.572206	0.0131
Z1	-0.182039	0.056916	-3.198384	0.0024
Z2	-0.024157	0.063550	-0.380119	0.7055
Z3	0.101012	0.060425	1.671694	0.1008
SD9301	-0.031570	0.014784	-2.135374	0.0377
LOG(ES_XS95(-1))	**-0.154233**	**0.047479**	**-3.248458**	**0.0021**
LOG(ES_XG95(-1))	**0.126351**	**0.035308**	**3.578490**	**0.0008**
LOG(ES_RAW(-1))	**-0.175873**	**0.063648**	**-2.763233**	**0.0080**
D(LOG(ES_XS95(-1)))	-0.365434	0.108373	-3.372016	0.0014
D(LOG(ES_XS95(-4)))	0.662017	0.118281	5.596990	0.0000

R-squared	0.990073	Mean dependent var	0.015463
Adjusted R-squared	0.988286	S.D. dependent var	0.205183
S.E. of regression	0.022207	Akaike info criterion	-4.625782
Sum squared resid	0.024658	Schwarz criterion	-4.276724
Log likelihood	148.7735	F-statistic	554.0756
Durbin-Watson stat	1.915786	Prob(F-statistic)	0.000000

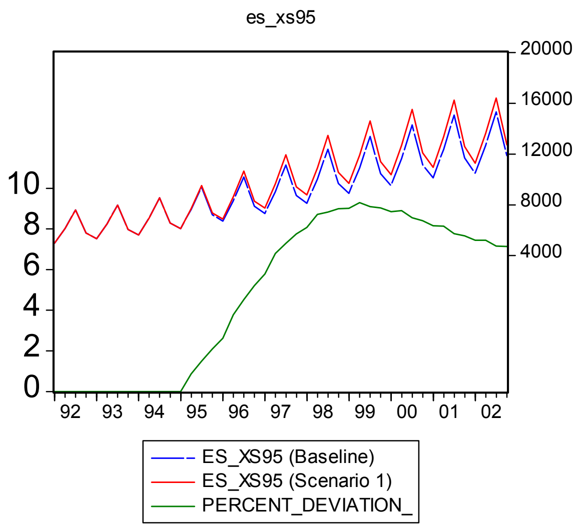
Although Spain is a well-known destination for tourism, the share of tourism in Spain's exports of services is already below 50% and declining. As in other countries, services connected to exports of goods, such as transport, are becoming more important. This is why exports of goods are one of the major explaining variables in the equation above. As there no regional breakdown of services is available, it is impossible to find an appropriate foreign demand variable. Besides exports, competitiveness plays a decisive role. However, it has to be taken into account, that the cointegrating relationship is not statistically significant. Nevertheless, it has been accepted, because the signs are correct and the estimated elasticities make sense. In the short run only lagged exports of services are important.

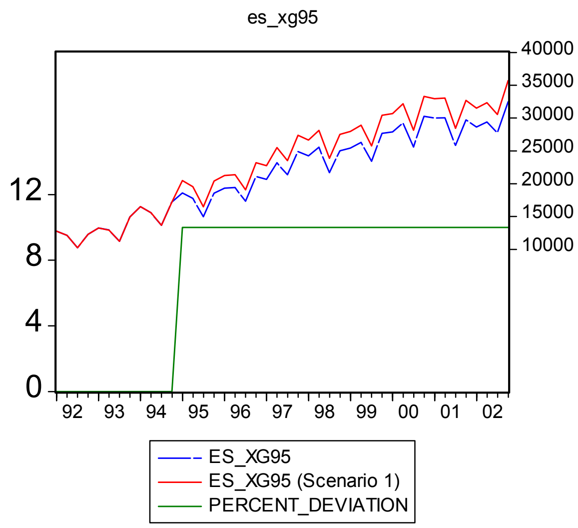
Residual tests	***Probability***	***Forecast evaluation (dynamic in-sample)***	
Normality test (Jarque-Bera)	0.976282	Root Mean Squared Error	293.3389
Serial Correlation LM test (lag 1)	0.898699	Mean Absolute Percent Error	2.942435
Serial Correlation LM test (lag 4)	0.182788	Theil inequality coefficient	0.018619
White's heteroscedasticity test	0.014392	Bias proportion	0.009919
RESET test (No. of fitted terms:1)	0.028419	Variance proportion	0.063123
ARCH LM test (lag 1)	0.001038	Covariance proportion	0.926958
ARCH LM test (lag 4)	0.004215		
Stability tests			
CUSUM test[a]	0		
$CUSUM^2$ test[a]	22 (1992:2-97:3)		

[a] Number of quarters where the cumulative sum goes outside the area between the 5% critical lines.

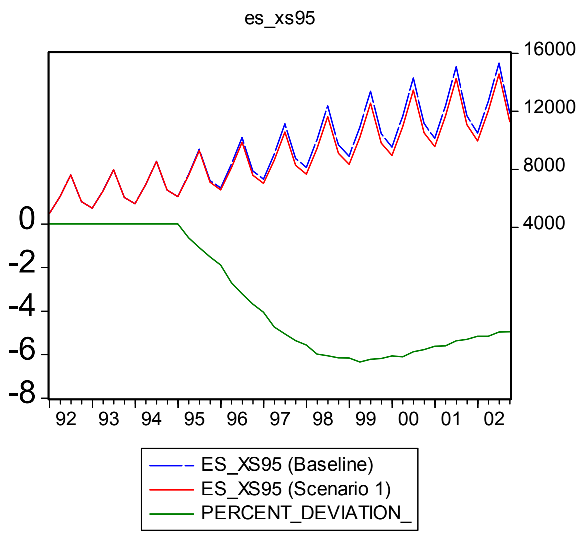
Simulation property of the equation:

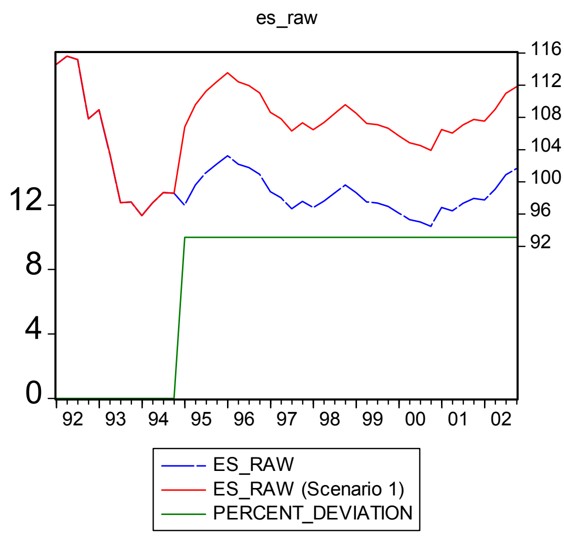
10% increase in export of goods





10% loss in price competitiveness





A.5. Import of Goods and Services

Spanish import of goods and services at 1995 prices

Dependent Variable: D(LOG(ES_M95))
Method: Least Squares
Date: 06/07/04 Time: 15:16
Sample: 1981:2 2002:4
Included observations: 87

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(ES_M95(-1))	**-0.372379**	**0.065678**	**-5.669785**	**0.0000**
LOG(ES_X95(-1)+ES_IMEQ95(-1))	**0.378227**	**0.071552**	**5.286074**	**0.0000**
LOG(ES_PGDPPM(-1))	**0.279459**	**0.050156**	**5.571759**	**0.0000**
C	-1.450061	0.291769	-4.969900	0.0000
Z1	-0.044909	0.016325	-2.750921	0.0074
Z2	-0.021806	0.011812	-1.846058	0.0688
Z3	-0.100786	0.021353	-4.720105	0.0000
ID8601	-0.135956	0.030864	-4.405063	0.0000
ID9204	-0.102516	0.031019	-3.304971	0.0015
D(LOG(ES_M95(-4)))	0.278015	0.081246	3.421877	0.0010
D(LOG(ES_X95(-1)+ES_IMEQ95(-1)))	-0.248401	0.100221	-2.478542	0.0154

R-squared	0.884726	Mean dependent var	0.022576
Adjusted R-squared	0.869558	S.D. dependent var	0.081245
S.E. of regression	0.029343	Akaike info criterion	-4.101820
Sum squared resid	0.065437	Schwarz criterion	-3.790038
Log likelihood	189.4292	F-statistic	58.32981
Durbin-Watson stat	1.787888	Prob(F-statistic)	0.000000

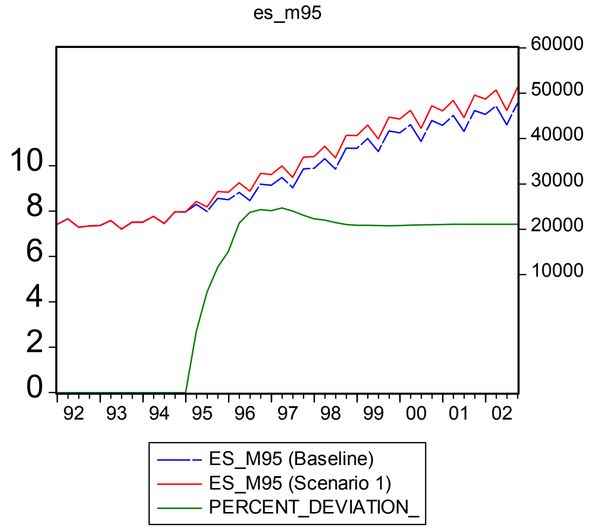
In the long Spanish imports of goods and services are determined by the two aggregates, which depend most strongly on imported inputs (exports and investment into machinery and equipment at constant prices of 1995) as well as the domestic price level relative to the import price level (ES_PGDPPM = ES_PGDP/ES_PM). The elasticity of imports with respect to exports and investment into machinery and equipment is roughly one. This means that in the case of an increase of these domestic aggregates by 1%, imports rise by the same rate. The elasticity of the price ratio is slightly lower. The cointegrating relationship between the three variables is highly significant. Two impulse dummies are needed to remove outliers. These may be connected to Spain's EU entry in 1986 and the start of the European Single Market in 1992.

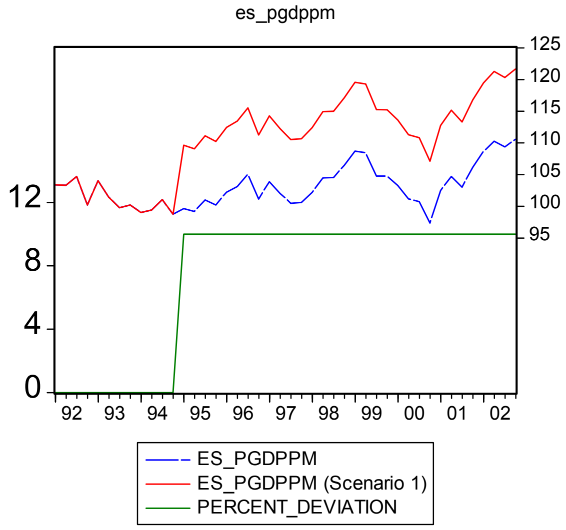
Residual tests	***Probability***	***Forecast evaluation***	
Normality test (Jarque-Bera)	0.714754	Root Mean Squared Error	827.3571
Serial Correlation LM test (lag 1)	0.449866	Mean Absolute Percent Error	3.023933
Serial Correlation LM test (lag 4)	0.616516	Theil inequality coefficient	0.016298
White's heteroscedasticity test	0.374431	Bias proportion	0.000196
RESET test (No. of fitted terms:1)	0.217060	Variance proportion	0.005806
ARCH LM test (lag 1)	0.480355	Covariance proportion	0.993997
ARCH LM test (lag 4)	0.968618		
Stability tests			
CUSUM test[a]	0		
$CUSUM^2$ test[a]	0		

[a] Number of quarters where the cumulative sum goes outside the area between the 5% critical lines.

Simulation property of the equation

10 % increase in ratio of GDP deflator over import prices





B. Prices, Exchange Rates and Interest Rates

B.1 Price Index: Private Consumption

Price Index: Private consumption expenditure (1995=100)

Dependent Variable: D(LOG(ES_PC))
Method: Least Squares
Date: 05/17/04 Time: 14:13
Sample(adjusted): 1982:1 2002:4
Included observations: 84 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.549823	0.103758	5.299086	0.0000
Z1	0.002297	0.002126	1.079968	0.2840
Z2	0.003915	0.002173	1.801613	0.0760
Z3	0.000474	0.002181	0.217269	0.8286
Z1SD	-0.018114	0.006864	-2.639048	0.0103
Z2SD	0.073272	0.010510	6.971896	0.0000
Z3SD	0.048676	0.004454	10.92851	0.0000
@TREND	**0.001479**	**0.000562**	**2.631689**	**0.0105**
KT9201	-0.000846	0.000355	-2.384830	0.0199
LOG(ES_PC(-1))	**-0.155584**	**0.030804**	**-5.050688**	**0.0000**
LOG(ES_ULC(-1))	**0.056372**	**0.020279**	**2.779892**	**0.0070**
LOG(ES_PM(-1))	**0.026375**	**0.009132**	**2.888335**	**0.0052**
D(LOG(ES_PC(-1)))	0.222931	0.102306	2.179073	0.0328
D(LOG(ES_PC(-7)))	-0.144636	0.048546	-2.979359	0.0040
D(LOG(ES_ULC(-3)))	0.046003	0.020488	2.245316	0.0280
D(LOG(ES_PM(-5)))	-0.042180	0.021209	-1.988822	0.0507

R-squared	0.978210	Mean dependent var	0.013932
Adjusted R-squared	0.973403	S.D. dependent var	0.028138
S.E. of regression	0.004589	Akaike info criterion	-7.760749
Sum squared resid	0.001432	Schwarz criterion	-7.297736
Log likelihood	341.9514	F-statistic	203.5120
Durbin-Watson stat	2.135551	Prob(F-statistic)	0.000000

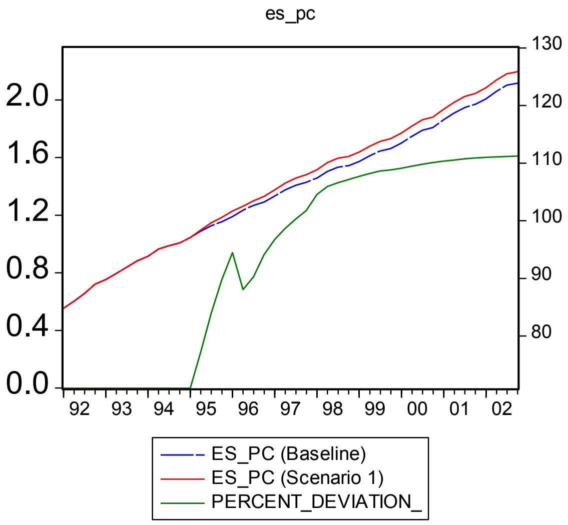
The consumption deflator is one of the most problematic series in the model. On the one hand the ADF-test reports that the series is I(2), on the other hand it seems to be cointegrated with wages, which – according to the Perron test – are trend stationary. The abrupt disappearance of the seasonal pattern in the series points to problems in the compilation of the national accounts data as it seems rather unlikely that a change in the economy should have provoked such a sudden change in the seasonal fluctuations of the price level. The only way to deal with such data problems is to model deterministics accordingly. In the case of the consumption deflator this means including two sets of seasonal dummies as well as a broken trend. The variables, which explain the long-run behaviour of the consumption deflator, are unit labour cost and import prices. The adjustment coefficient points to a strong cointegrating relationship, but it has to be taken into account, that the critical value is quite high in absolute terms (5%: -4.12) and the additional deterministics indicate that key explaining variables may be missing.

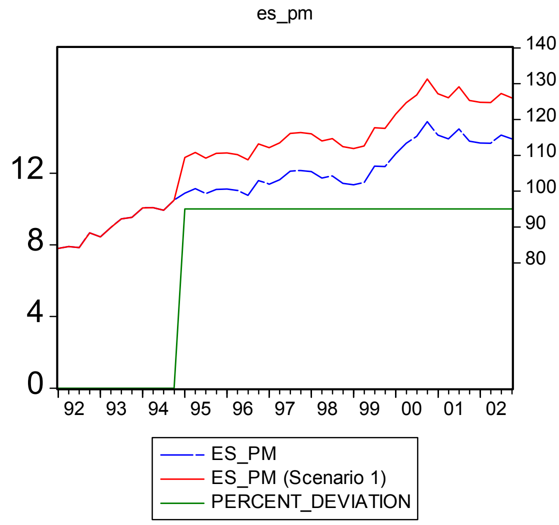
Residual tests	*Probability*	*Forecast evaluation (dynamic in-sample)*	
Normality test (Jarque-Bera)	0.448167	Root Mean Squared Error	0.636552
Serial Correlation LM test (lag 1)	0.252496	Mean Absolute Percent Error	0.610993
Serial Correlation LM test (lag 4)	0.605828	Theil inequality coefficient	0.003619
White's heteroscedasticity test	0.023607	Bias proportion	0.000502
RESET test (No. of fitted terms:1)	0.042812	Variance proportion	0.002656
ARCH LM test (lag 1)	0.307887	Covariance proportion	0.996842
ARCH LM test (lag 4)	0.223611		
Stability tests			
CUSUM test[a]	0		
$CUSUM^2$ test[a]	0		

[a] Number of quarters where the cumulative sum goes outside the area between the 5% critical lines.

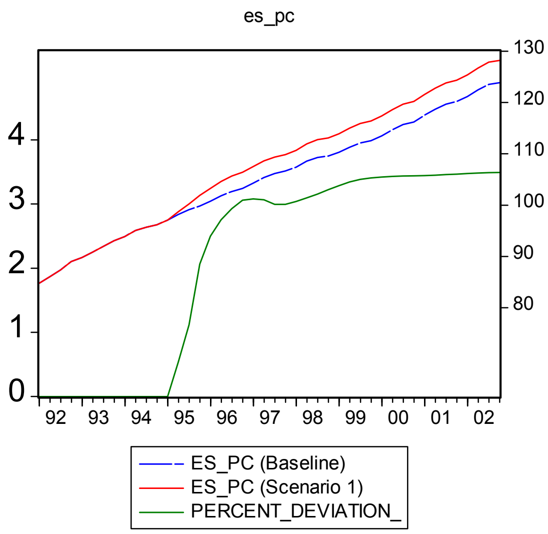
Simulation property of the equation:

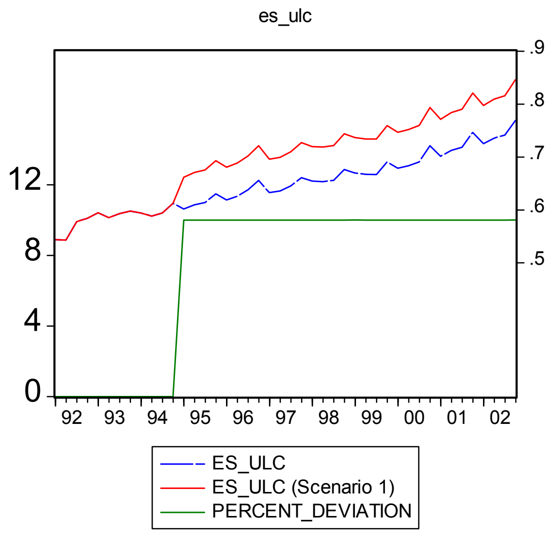
Simulation 1: Effect of 10% permanent increase in import prices





Simulation 2: Effect of 10% permanent increase in unit labour costs





Private consumption index

Dependent Variable: D(LOG(ES_CPI))
Method: Least Squares
Date: 05/19/04 Time: 16:30
Sample(adjusted): 1980:2 2003:1
Included observations: 92 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.130762	0.008689	15.04883	0.0000
Z1SD	**0.010947**	**0.002390**	**4.579600**	**0.0000**
Z2SD	**0.009321**	**0.004706**	**1.980648**	**0.0508**
Z3SD	**0.009138**	**0.002724**	**3.354725**	**0.0012**
LOG(ES_CPI(-1))	**-0.202089**	**0.055766**	**-3.623878**	**0.0005**
LOG(ES_PC(-1))	**0.175722**	**0.054424**	**3.228789**	**0.0018**

R-squared	0.769842	Mean dependent var	0.015230
Adjusted R-squared	0.756461	S.D. dependent var	0.010482
S.E. of regression	0.005173	Akaike info criterion	-7.627885
Sum squared resid	0.002301	Schwarz criterion	-7.463421
Log likelihood	356.8827	F-statistic	57.53133
Durbin-Watson stat	1.821511	Prob(F-statistic)	0.000000

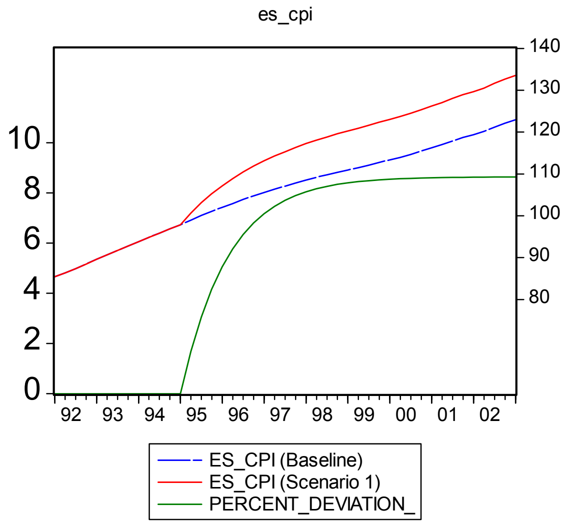
The consumer price index is very closely related with the consumption deflator. Whereas the consumption deflator is a Paasche index, the consumer price index is a Laspeyeres index, which means that the base year's weights of individual goods in the index are kept constant over time. However, as both cover roughly the same goods they still share a common stochastic trend, in other words they are cointegrated. As the CPI shows no seasonal pattern, whereas there is an abrupt disappearance of the seasonal pattern in the consumption deflator, we need seasonal dummies multiplied by a step dummy (Z1SD, Z2SD, Z3SD) to model the difference. The CPI is explained exclusively by the long-run relationship. The cointegrating relationship is confirmed by the significant adjustment coefficient: t-value –3.62 (5%-critical value: -3.41).

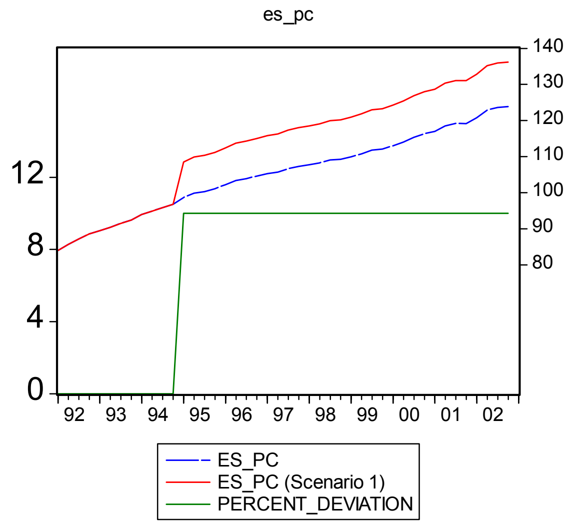
Residual tests	***Probability***	***Forecast evaluation (dynamic in-sample)***	
Normality test (Jarque-Bera)	0.387095	Root Mean Squared Error	0.883127
Serial Correlation LM test (lag 1)	0.440070	Mean Absolute Percent Error	0.816348
Serial Correlation LM test (lag 4)	0.118022	Theil inequality coefficient	0.005150
White's heteroscedasticity test	0.155719	Bias proportion	0.001653
RESET test (No. of fitted terms:1)	0.938207	Variance proportion	0.008728
ARCH LM test (lag 1)	0.668276	Covariance proportion	0.989619
ARCH LM test (lag 4)	0.208617		
Stability tests			
CUSUM test[a]	0		
CUSUM^2 test[a]	0		

[a] Number of quarters where the cumulative sum goes outside the area between the 5% critical lines.

Simulation property of the equation:

10% increase in private consumption expenditure





B.2. Price Index: Government Consumption

Government consumption price index

Dependent Variable: D(LOG(ES_PCGOV))
Method: Least Squares
Date: 05/18/04 Time: 14:56
Sample(adjusted): 1981:2 2002:4
Included observations: 87 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.305910	0.065829	-4.647025	0.0000
Z1	-0.002473	0.002768	-0.893481	0.3748
Z2	-0.004716	0.001838	-2.566084	0.0125
Z3	-0.007084	0.002427	-2.919340	0.0048
Z1SD	**0.016793**	**0.004020**	**4.177600**	**0.0001**
Z2SD	**-0.003124**	**0.003594**	**-0.869237**	**0.3878**
Z3SD	**0.014940**	**0.003369**	**4.435080**	**0.0000**
LOG(ES_PCGOV(-1))	**-0.143270**	**0.023682**	**-6.049633**	**0.0000**
LOG(ES_GYEEE(-1))	**0.115769**	**0.020449**	**5.661401**	**0.0000**
SD9301	**-0.011934**	**0.001595**	**-7.481814**	**0.0000**
ID8301	0.020458	0.004140	4.940954	0.0000
ID8701	-0.019900	0.003840	-5.181707	0.0000
ID8801	-0.018728	0.003864	-4.847293	0.0000
ID9201	0.017061	0.004255	4.009897	0.0002
ID9501	0.015739	0.003798	4.143601	0.0001
ID9701	-0.017045	0.003787	-4.500952	0.0000
D(LOG(ES_PCGOV(-2)))	0.137423	0.052293	2.627960	0.0106
D(LOG(ES_GYEEE(-2)))	0.031049	0.019929	1.557961	0.1239
D(LOG(ES_GYEEE(-4)))	-0.130312	0.017522	-7.436950	0.0000

R-squared	0.983055	Mean dependent var	0.013909
Adjusted R-squared	0.978569	S.D. dependent var	0.024377
S.E. of regression	0.003569	Akaike info criterion	-8.242915
Sum squared resid	0.000866	Schwarz criterion	-7.704383
Log likelihood	377.5668	F-statistic	219.1627
Durbin-Watson stat	2.034899	Prob(F-statistic)	0.000000

Wages and salaries account for the largest part of government consumption. Therefore it is not surprising that the deflator of government consumption is largely determined by compensation per employee. A level shift of compensation per employee in 1993 requires the inclusion of a step dummy. There are quite a few outliers, which are modelled by impulse dummies.

Residual tests	***Probability***	***Forecast evaluation (dynamic in-sample)***	
Normality test (Jarque-Bera)	0.901065	Root Mean Squared Error	0.508968
Serial Correlation LM test (lag 1)	0.732344	Mean Absolute Percent Error	0.458884
Serial Correlation LM test (lag 4)	0.272126	Theil inequality coefficient	0.002932
White's heteroscedasticity test	0.401299	Bias proportion	0.009411
RESET test (No. of fitted terms:1)	0.000000	Variance proportion	0.001014
ARCH LM test (lag 1)	0.269411	Covariance proportion	0.989575
ARCH LM test (lag 4)	0.306091		
Stability tests			
CUSUM test[a]	0		
$CUSUM^2$ test[a]	0		

[a] Number of quarters where the cumulative sum goes outside the area between the 5% critical lines.

B.3. Price Index: Gross Capital Formation

Gross capital formation price index

Dependent Variable: D(LOG(ES_PIC))
Method: Least Squares
Date: 02/17/05 Time: 11:38
Sample(adjusted): 1981:1 2002:4
Included observations: 88 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.569707	0.232993	-2.445167	0.0169
Z1	0.081089	0.018809	4.311203	0.0001
Z2	0.004824	0.011980	0.402682	0.6884
Z3	0.107775	0.018778	5.739332	0.0000
Z1SD	-0.001539	0.024798	-0.062050	0.9507
Z2SD	-0.034081	0.033058	-1.030933	0.3060
Z3SD	-0.088556	0.026310	-3.365840	0.0012
LOG(ES_PIC(-1))	**-0.511700**	**0.094773**	**-5.399222**	**0.0000**
LOG(ES_GYEEE(-1))	**0.350821**	**0.078072**	**4.493581**	**0.0000**
SD9201	-0.039891	0.013925	-2.864643	0.0054
SD9901	0.036945	0.008461	4.366638	0.0000
D(LOG(ES_PIC(-2)))	-0.343409	0.078295	-4.386062	0.0000
D(LOG(ES_PIC(-3)))	-0.236192	0.072377	-3.263365	0.0017
D(LOG(ES_GYEEE(-1)))	-0.451548	0.121103	-3.728633	0.0004
D(LOG(ES_GYEEE(-3)))	-0.565062	0.110571	-5.110414	0.0000

R-squared	0.968480	Mean dependent var	0.014940
Adjusted R-squared	0.962435	S.D. dependent var	0.118903
S.E. of regression	0.023045	Akaike info criterion	-4.548677
Sum squared resid	0.038769	Schwarz criterion	-4.126404
Log likelihood	215.1418	F-statistic	160.2141
Durbin-Watson stat	2.097977	Prob(F-statistic)	0.000000

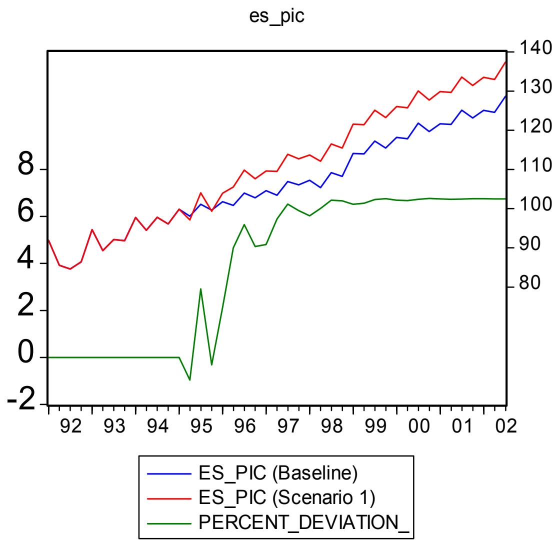
The investment deflator covers total capital formation including the change of stocks. Like its sub-indices it is extremely difficult to model. Wages seem to play some part, but there are considerable structural breaks. The 1999 step dummy actually stands for the sudden increase in house prices, which caused the construction deflator to rise more steeply after 1999. There might be some additional variables, which could describe the housing market. However, it would be difficult to make them endogenous in the model. In the end the problem would thus only be shifted to another variable.

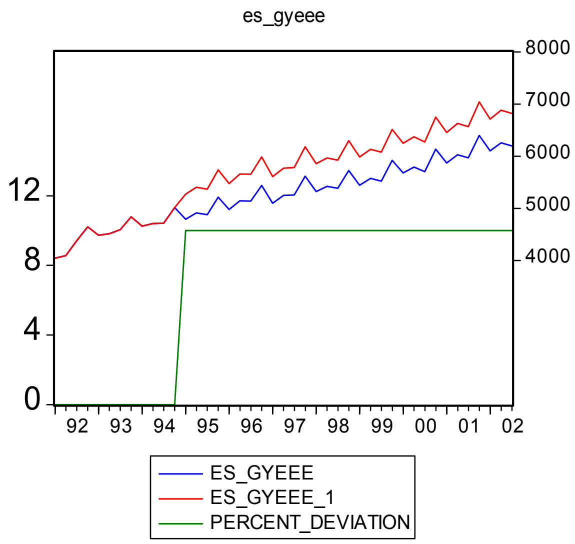
Residual tests	***Probability***	***Forecast evaluation (dynamic in-sample)***	
Normality test (Jarque-Bera)	0.211091	Root Mean Squared Error	1.997133
Serial Correlation LM test (lag 1)	0.343118	Mean Absolute Percent Error	1.861776
Serial Correlation LM test (lag 4)	0.712472	Theil inequality coefficient	0.011262
White's heteroscedasticity test	0.644703	Bias proportion	0.000827
RESET test (No. of fitted terms:1)	0.100875	Variance proportion	0.001194
ARCH LM test (lag 1)	0.425849	Covariance proportion	0.997979
ARCH LM test (lag 4)	0.103864		
Stability tests			
CUSUM test[a]	0		
$CUSUM^2$ test[a]	0		

[a] Number of quarters where the cumulative sum goes outside the area between the 5% critical lines.

Simulation property of the equation:

10% increase in compensation of employees per person





B.4. Price Index: Export

Export price index

Dependent Variable: D(LOG(ES_PX))
Method: Least Squares
Date: 06/06/04 Time: 02:02
Sample: 1980:2 2002:4
Included observations: 91

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(ES_PX(-1))	**-0.281003**	**0.070220**	**-4.001750**	**0.0001**
LOG(ES_PM(-1))	**0.098785**	**0.029699**	**3.326251**	**0.0013**
LOG(ES_PGDP(-1))	**0.149707**	**0.042844**	**3.494232**	**0.0008**
C	0.154980	0.044519	3.481241	0.0008
Z1	-0.007214	0.006370	-1.132341	0.2608
Z2	0.006061	0.006329	0.957633	0.3411
Z3	-0.007580	0.006361	-1.191720	0.2369
Z1SD	**-0.000200**	**0.008930**	**-0.022344**	**0.9822**
Z2SD	**-0.045433**	**0.008867**	**-5.123733**	**0.0000**
Z3SD	**-0.050585**	**0.008766**	**-5.770306**	**0.0000**

R-squared	0.693114	Mean dependent var	0.012300
Adjusted R-squared	0.659016	S.D. dependent var	0.025403
S.E. of regression	0.014834	Akaike info criterion	-5.480433
Sum squared resid	0.017824	Schwarz criterion	-5.204514
Log likelihood	259.3597	F-statistic	20.32688
Durbin-Watson stat	1.904732	Prob(F-statistic)	0.000000

The export deflator is modelled in a rather parsimonious way. Obviously only long-run relationships seem to determine the export price level. The key variables are the import price level (as exports highly depend on imported inputs) and the GDP deflator. Changing seasonal patterns have to be modelled by two sets of seasonal dummies: centred seasonal dummies (Z1,Z2,Z3) and seasonal dummies multiplied by step dummy (Z1SD, Z2SD, Z3SD).

Residual tests	***Probability***	***Forecast evaluation (dynamic in-sample)***	
Normality test (Jarque-Bera)	0.489058	Root Mean Squared Error	1.591121
Serial Correlation LM test (lag 1)	0.832372	Mean Absolute Percent Error	1.500415
Serial Correlation LM test (lag 4)	0.870604	Theil inequality coefficient	0.009111
White's heteroscedasticity test	0.035903	Bias proportion	0.006524
RESET test (No. of fitted terms:1)	0.000124	Variance proportion	0.005328
ARCH LM test (lag 1)	0.156348	Covariance proportion	0.988147
ARCH LM test (lag 4)	0.534609		
Stability tests			
CUSUM test[a]	0		
CUSUM^2 test[a]	2(98:2-98:3)		

[a] Number of quarters where the cumulative sum goes outside the area between the 5% critical lines.

B.5. Price Index: Import Prices

Price index of imports

Dependent Variable: D(LOG(ES_PM))
Method: Least Squares
Date: 03/04/05 Time: 11:02
Sample(adjusted): 1988:2 2002:4
Included observations: 59 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.320708	0.116774	2.746388	0.0084
LOG(ES_PM(-1))	**-0.450110**	**0.082832**	**-5.434029**	**0.0000**
LOG(ES_EU7_PC(-1)*ECU(-1))	**0.116256**	**0.024915**	**4.666150**	**0.0000**
LOG(USD(-1))	**0.128497**	**0.031713**	**4.051901**	**0.0002**
D(LOG(ES_PM(-1)))	-0.215297	0.102449	-2.101513	0.0408
D(LOG(OIL$(-1)*USD(-1)))	0.061848	0.013916	4.444320	0.0001
D(LOG(OIL$(-3)*USD(-3)))	0.036615	0.013596	2.693089	0.0097
D(LOG(OIL$(-4)*USD(-4)))	0.035962	0.013604	2.643526	0.0110
D(LOG(USD))	0.184069	0.042306	4.350880	0.0001
D(LOG(USD(-1)))	-0.152077	0.046601	-3.263353	0.0020

R-squared	0.646091	Mean dependent var	0.004671
Adjusted R-squared	0.581087	S.D. dependent var	0.021343
S.E. of regression	0.013814	Akaike info criterion	-5.573045
Sum squared resid	0.009350	Schwarz criterion	-5.220920
Log likelihood	174.4048	F-statistic	9.939302
Durbin-Watson stat	2.072537	Prob(F-statistic)	0.000000

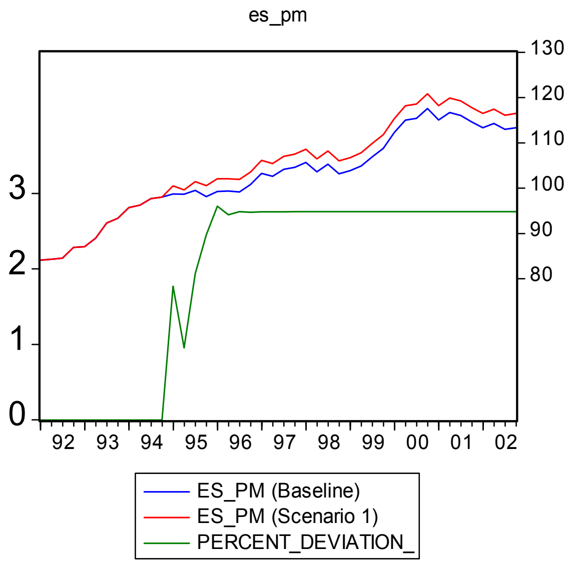
The import price deflator is explained by the price level in the other major euro area countries multiplied by the exchange rate. In the original version of the equation the CPI in the euro area countries had been chosen as price variable. In the multi-country model it has been replaced by the consumption deflator, which is closely related to the CPI, because the latter is not modelled for all countries. In addition the US dollar has a similar influence on the import price level. The oil price converted to the national currency is only relevant in the short run. The contemporaneous change of the US dollar exchange rate and its first lag also exert a significant short term influence.

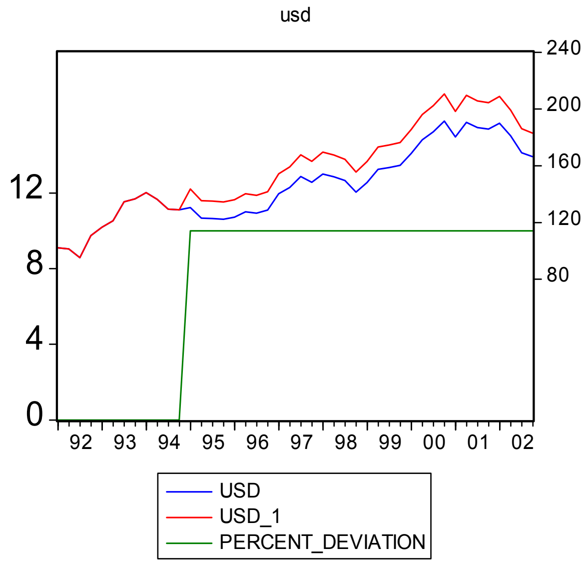
Residual tests	***Probability***	***Forecast evaluation (dynamic in-sample)***	
Normality test (Jarque-Bera)	0.527522	Root Mean Squared Error	1.329645
Serial Correlation LM test (lag 1)	0.490977	Mean Absolute Percent Error	1.079107
Serial Correlation LM test (lag 4)	0.426509	Theil inequality coefficient	0.006714
White's heteroscedasticity test	0.579972	Bias proportion	0.000770
RESET test (No. of fitted terms:1)	0.693208	Variance proportion	0.000391
ARCH LM test (lag 1)	0.347883	Covariance proportion	0.998839
ARCH LM test (lag 4)	0.874559		
Stability tests	0		
CUSUM test	0		
CUSUM sq. test			

[a] Number of quarters where the cumulative sum goes outside the area between the 5% critical lines.

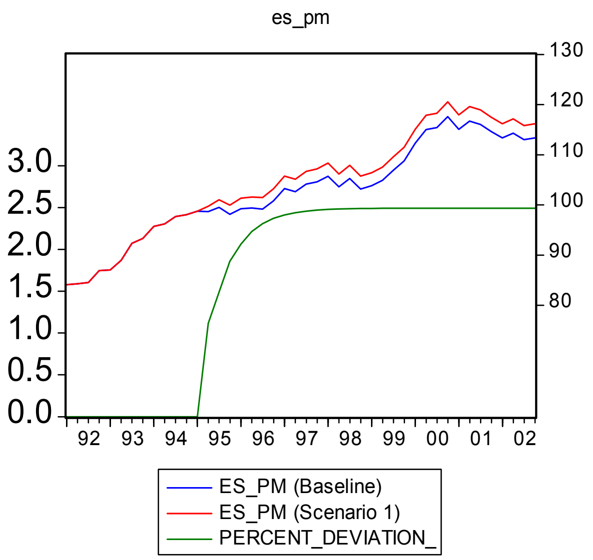
Simulation properties of the equation:

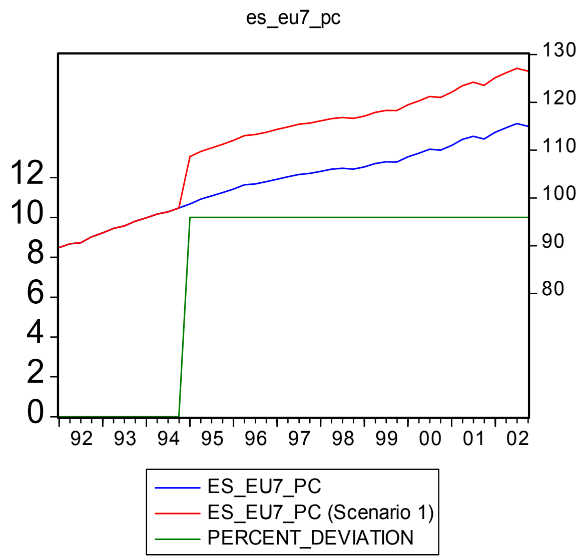
10% increase in Exchange rate of Peseta vs US dollar:





10% increase in ES_EU_PC:





C. Income and Employment

C.1. Compensation of Employees

Compensation of employees (per person)

Dependent Variable: D(LOG(ES_GYEEE))
Method: Least Squares
Date: 05/31/04 Time: 16:57
Sample(adjusted): 1986:1 2002:4
Included observations: 68 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.962670	0.176833	5.443949	0.0000
Z1	-0.032799	0.007529	-4.356187	0.0001
Z2	-0.021951	0.004163	-5.273559	0.0000
Z3	-0.012032	0.007549	-1.593906	0.1170
Z1SD	-0.034078	0.007626	-4.468471	0.0000
Z2SD	-0.020773	0.008752	-2.373478	0.0214
Z3SD	0.038849	0.007904	4.914880	0.0000
KT9201	-0.001270	0.000400	-3.174964	0.0025
@TREND	**0.001656**	**0.000725**	**2.284469**	**0.0265**
D(SD9201(-2))	0.036111	0.007462	4.839183	0.0000
D(SD9201(-4))	0.022363	0.006531	3.424283	0.0012
LOG(ES_GYEEE(-1)	**-0.278317**	**0.040964**	**-6.794161**	**0.0000**
LOG(ES_CPI(-1))	**0.288377**	**0.073076**	**3.946241**	**0.0002**
D(LOG(ES_GYEEE(-3))	-0.131193	0.045762	-2.866842	0.0060
D(LOG(ES_GYEEE(-4))	0.422359	0.051589	8.187029	0.0000
D(LOG(ES_PRODET(-2)))	0.257954	0.079173	3.258117	0.0020

R-squared	0.993432	Mean dependent var	0.013167
Adjusted R-squared	0.991537	S.D. dependent var	0.063700
S.E. of regression	0.005860	Akaike info criterion	-7.238997
Sum squared resid	0.001786	Schwarz criterion	-6.716760
Log likelihood	262.1259	F-statistic	524.3156
Durbin-Watson stat	1.965658	Prob(F-statistic)	0.000000

Due to indexation clauses, which applied to more than 70 % of all collective agreements in 2001, prices have a strong influence on the wage level. Although a relatively small percentage of workers are organised in unions, the bargaining outcome is automatically extended to 90 % of all employees. Thus, the wage level is determined by the employed insiders. This is why the level of unemployment does not appear in the wage equation. A broken trend has to be added to model a change in the trend slope of compensation per employee. Productivity only plays a part in the short-run dynamics.

Residual tests	***Probability***	***Forecast evaluation (dynamic in-sample)***	
Normality test (Jarque-Bera)	0.070169	Root Mean Squared Error	28.62858
Serial Correlation LM test (lag 1)	0.978886	Mean Absolute Percent Error	0.517360
Serial Correlation LM test (lag 4)	0.105059	Theil inequality coefficient	0.003047
White's heteroscedasticity test	0.583227	Bias proportion	0.000365
RESET test (No. of fitted terms:1)	0.382418	Variance proportion	0.000024
ARCH LM test (lag 1)	0.148704	Covariance proportion	0.999611
ARCH LM test (lag 4)	0.571462		
Stability tests			
CUSUM test[a]	0		
$CUSUM^2$ test[a]	0		

[a] Number of quarters where the cumulative sum goes outside the area between the 5% critical lines.

C.2. Employment

Employees

(Domestic concept, in 1000)

Dependent Variable: D(LOG(ES_EE))
Method: Least Squares
Date: 05/12/04 Time: 13:01
Sample(adjusted): 1986:1 2002:4
Included observations: 68 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.284651	0.082987	-3.430085	0.0011
Z1	-0.013894	0.005477	-2.537009	0.0139
Z2	0.007370	0.002668	2.762184	0.0077
Z3	-0.006177	0.004637	-1.332283	0.1881
SD9201	**-0.015805**	**0.003139**	**-5.035686**	**0.0000**
LOG(ES_EE(-1))	**-0.194767**	**0.039984**	**-4.871095**	**0.0000**
LOG(ES_GDP95(-1))	**0.182558**	**0.037076**	**4.923906**	**0.0000**
D(LOG(ES_RWEE(-2)))	-0.097065	0.030058	-3.229247	0.0021
D(LOG(ES_RWEE(-4)))	-0.083099	0.031882	-2.606431	0.0117
D(LOG(ES_EE(-1)))	0.371633	0.095570	3.888590	0.0003
D(LOG(ES_GDP95(-1)))	-0.134891	0.055246	-2.441655	0.0177

R-squared	0.804763	Mean dependent var	0.006447
Adjusted R-squared	0.770511	S.D. dependent var	0.008566
S.E. of regression	0.004104	Akaike info criterion	-8.006776
Sum squared resid	0.000960	Schwarz criterion	-7.647738
Log likelihood	283.2304	F-statistic	23.49536
Durbin-Watson stat	1.956899	Prob(F-statistic)	0.000000

In the long run only gross domestic product determines the level of employment in Spain. If GDP rises by 1%, employment increases by 0.94%. Thus, the employment threshold is quite low in Spain, which is also reflected by weak productivity increases. Unlike in Germany the real wage has no long-run influence on employment in Spain. As the real wage has hardly changed since the beginning of the 1990s this is hardly surprising. However, wage dynamics exert some influence in the short run. Again, a step dummy is necessary to model a level shift in 1992.

Residual tests	***Probability***	***Forecast evaluation (dynamic in-sample)***	
Normality test (Jarque-Bera)	0.883374	Root Mean Squared Error	82.57739
Serial Correlation LM test (lag 1)	0.994938	Mean Absolute Percent Error	0.562961
Serial Correlation LM test (lag 4)	0.842124	Theil inequality coefficient	0.003613
White's heteroscedasticity test	0.178375	Bias proportion	0.003480
RESET test (No. of fitted terms:1)	0.916642	Variance proportion	0.022382
ARCH LM test (lag 1)	0.215923	Covariance proportion	0.974137
ARCH LM test (lag 4)	0.612974		
Stability tests			
CUSUM test[a]	0		
CUSUM^2 test[a]	0		

[a] Number of quarters where the cumulative sum goes outside the area between the 5% critical lines.

Self Employed Persons
(domestic concept, in 1000)

Dependent Variable: LOG(ES_ES)
Method: Least Squares
Date: 05/19/04 Time: 13:05
Sample(adjusted): 1981:2 2002:4
Included observations: 87 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.270628	0.528119	4.299462	0.0000
Z1SD	-0.042118	0.006467	-6.512798	0.0000
Z2SD	-0.012917	0.006670	-1.936673	0.0565
Z3SD	-0.006349	0.007181	-0.884165	0.3794
LOG(ES_ES(-1))	**0.714426**	**0.066313**	**10.77355**	**0.0000**
KT9404	0.000500	0.000129	3.861091	0.0002
D(LOG(ES_ES(-1)))	0.190789	0.103405	1.845061	0.0689
D(LOG(ES_ES(-2)))	0.209574	0.106196	1.973469	0.0520
D(LOG(ES_GDP95(-3)))	0.284336	0.064220	4.427546	0.0000
D(LOG(ES_GDP95(-4)))	0.169196	0.064726	2.614048	0.0108

R-squared	0.939556	Mean dependent var	7.890749
Adjusted R-squared	0.932491	S.D. dependent var	0.035984
S.E. of regression	0.009350	Akaike info criterion	-6.399179
Sum squared resid	0.006731	Schwarz criterion	-6.115741
Log likelihood	288.3643	F-statistic	132.9890
Durbin-Watson stat	2.172430	Prob(F-statistic)	0.000000

The number of self-employed persons follows a falling trend until 1994 and subsequently fluctuates around a constant. The total masks diverging trends in the individual industries. Whereas self-employment has decreased steadily in agriculture, it rises quickly in services. However, further disaggregation is not desirable for such a small model. Therefore, the broken trend is accepted for the time being, keeping in mind, that the self-employed accounted for less than 16% of total employment at the end of the estimation period.

Residual tests	***Probability***	***Forecast evaluation (dynamic in-sample)***	
Normality test (Jarque-Bera)	0.107043	Root Mean Squared Error	36.94178
Serial Correlation LM test (lag 1)	0.021185	Mean Absolute Percent Error	1.090144
Serial Correlation LM test (lag 4)	0.146092	Theil inequality coefficient	0.006904
White's heteroscedasticity test	0.012774	Bias proportion	0.000821
RESET test (No. of fitted terms:1)	0.918275	Variance proportion	0.063032
ARCH LM test (lag 1)	0.399647	Covariance proportion	0.936148
ARCH LM test (lag 4)	0.393873		
Stability tests			
CUSUM test[a]	0		
$CUSUM^2$ test[a]	8 (1992:4-94:3)		

[a] Number of quarters where the cumulative sum goes outside the area between the 5% critical lines.

Definitions

ewuoes_dtot = eu8_gdp95 - es_gdp95 + de_m95 * 1000 + fr_m95 + it_m95 + nl_m95 + be_m95 + at_m95 + fi_m95 + gr_m95 + pt_m95 + ie_m95 + gr_gdp95 + pt_gdp95 + ie_gdp95

es_gyee = es_gyeee * es_ee / 1000

es_y = es_gyee + es_osmin + es_trr - es_sc - es_td

es_et = es_ee + es_es

es_ep = es_et + es_u

es_urate = es_u / es_ep * 100

es_y95 = es_y / (es_pc / 100)

es_c = es_c95 * (es_pc / 100)

es_raw = es_restrow * es_cpi

es_nawus = 100 / usd * 124.599224

es_rawus = es_nawus * es_cpi / us_cpi

es_eu7_pc = (de_c + fr_c + it_c + nl_c + be_c + at_c + fi_c) / (de_c95 + fr_c95 + it_c95 + nl_c95 + be_c95 + at_c95 + fi_c95) * 100

es_rawewu = es_nawewu / es_eu7_pc * es_cpi

es_nawreu = es_erdk^(dk_wtx / 100) * es_erse^(se_wtx / 100) * es_eruk^(uk_wtx / 100)
es_xg95 = es_xg95ewu + es_xg95reu + es_xg95us + es_xg95row

es_x95 = es_xg95 + es_xs95

es_ic95 = es_icon95 + es_imeq95 + es_is95

es_gdp95 = es_c95 + es_cgov95 + es_ic95 + es_is95 + es_x95 - es_m95

es_prodet = es_gdp95 / es_et * 1000

es_ulc = es_gyeee / es_prodet

es_ulc_test = es_gyee / es_gdp95

es_cgov = es_cgov95 * (es_pcgov / 100)

es_ic = es_ic95 * (es_pic / 100)

es_x = es_x95 * (es_px / 100)

es_m = es_m95 * (es_pm / 100)

es_gdp = es_c + es_cgov + es_ifc + es_is + es_x - es_m

es_pgdp = es_gdp / es_gdp95 * 100

es_pgdppm = es_pgdp / es_pm * 100

es_spread = es_lang - es_3m

IV. Documentation

A. Variables and Data Sources

Abbreviation	Explanation	Source
AT_CPI	Austrian consumer price index	OECD
AT_WTX	Weight of Austria in Spain's goods exports	Rietzler (based on IMF data)
BE_CPI	Belgian consumer price index	OECD
BE_WTX	Weight of Belgium in Spain's goods exports	Rietzler (based on IMF data)
ES_CFC	Spain: consumption of fixed capital	Rietzler (based on OECD data)
ES_CGOV	Spain: government consumption expenditure (current pr.)	INE
ES_CGOV95	Spain: government consumption expenditure (constant pr.)	INE
ES_GYEE	Spain: compensation of employees	INE
ES_C	Spain: private consumption expenditure (current pr.)	INE
ES_C95	Spain: private consumption expenditure (constant pr.)	INE
ES_CPI	Spain: consumer price index	OECD
ES_CPIEWU	Weighted average consumer price index of EMU excl. Spain	Rietzler (based on OECD data, weights: IMF data)
DE_CPI	German consumer price index	OECD
DE_WTX	Weight of Germany in Spain's goods exports	Rietzler (based on IMF data)
DK_CPI	Danish consumer price index	OECD
DK_WTX	Weight of Denmark in Spain's goods exports	Rietzler (based on IMF data)
ECU	Pesetas per ECU	Rietzler (based on Bundesbank data)
ES_EE	Spain: employees	INE
ES_EP	Spain: labour force (total employment + unemployed)	INE
ES_ERAT	Nominal external value of the Peseta vis-à-vis the Austrian Schilling (index)	Rietzler (based on Bundesbank data)
ES_ERBE	Nominal external value of the Peseta vis-à-vis the Belgian franc (index)	Rietzler (based on Bundesbank data)
ES_ERDE	Nominal external value of the Peseta vis-à-vis the Deutsche Mark (index)	Rietzler (based on Bundesbank data)
ES_ERDK	Nominal external value of the Peseta vis-à-vis the Dänish krone (index)	Rietzler (based on Bundesbank data)
ES_ERFI	Nominal external value of the Peseta vis-à-vis the Finmark (index)	Rietzler (based on Bundesbank data)
ES_ERFR	Nominal external value of the Peseta vis-à-vis the French franc (index)	Rietzler (based on Bundesbank data)
ES_ERGR	Nominal external value of the Peseta vis-à-vis the Greek drachma (index)	Rietzler (based on Bundesbank data)
ES_ERIE	Nominal external value of the Peseta vis-à-vis the Irish pound (index)	Rietzler (based on Bundesbank data)
ES_ERIT	Nominal external value of the Peseta vis-à-vis the Italian lira (index)	Rietzler (based on Bundesbank data)
ES_ERNL	Nominal external value of the Peseta vis-à-vis the Dutch guilder (index)	Rietzler (based on Bundesbank data)

Abbreviation	Explanation	Source
ES_ERPT	Nominal external value of the Peseta vis-à-vis the Portuguese escudo (index)	Rietzler (based on Bundesbank data)
ES_ERSE	Nominal external value of the Peseta vis-à-vis the Swedish krona (index)	Rietzler (based on Bundesbank data)
ES_ERUK	Nominal external value of the Peseta vis-à-vis the pound sterling (index)	Rietzler (based on Bundesbank data)
ES_ES	Spain: self-employed	INE
ES_ET	Spain: total employment (es_es+es_ee)	INE
EWUOES_DTOT	Euro area excluding Spain: total demand (GDP+imports at constant prices)	Rietzler (based on data from Eurostat, EC, OECD)
FI_CPI	Finland: consumer price index	OECD
FI_WTX	Weight of Finland in Spanish exports of goods	Rietzler (based on IMF data)
FR_CPI	France: consumer price index	OECD
FR_WTX	Weight of France in Spanish exports of goods	Rietzler (based on IMF data)
ES_GDP	Spain: GDP at current prices	INE
ES_GDP95	Spain: GDP at constant prices	INE
GR_CPI	Greece: consumer price index	OECD
GR_WTX	Weight of Greece in Spanish exports of goods	Rietzler (based on IMF data)
ES_IC	Spain: gross capital formation incl. change of stocks etc. (current pr.)	INE
ES_IC95	Spain: gross capital formation incl. change of stocks etc. (constant pr.)	INE
ES_ICON95PU	Spain: government gross fixed cap. formation: construction (constant pr.)	Rietzler (based on INE and OECD data)
ES_ICON95PR	Spain: private gross fixed cap. formation: construction (constant pr.)	Rietzler (based on INE and OECD data)
IE_CPI	Ireland: consumer price index	OECD
IE_WTX	Weight of Ireland in Spanish exports of goods	Rietzler (based on IMF data)
IMEQ95	Spain: gross fixed cap. formation: machinery, equipment, others (constant pr.)	INE
IS95	Spain: change of stocks and net acquisition of valuables (constant pr.)	INE
IT_CPI	Italy: consumer price index	OECD
IT_WTX	Weight of Italy in Spanish exports of goods	Rietzler (based on IMF data)
ES_M	Spain: Exports of goods and services (current prices)	INE
ES_M95	Spain: Exports of goods and services (constant prices)	INE
ES_NAWREU	Spain: Nominal effective exchange rate vis-à-vis the EU15 outside EMU (index)	Rietzler (based on data from Bundesbank, IMF)
ES_NAWUS	Spain: Nominal external value of the Peseta vis-à-vis the US dollar (index)	Rietzler (based on Bundesbank data)
ES_LANG	Spain: long-term interest rates	OECD
NL_CPI	Netherlands: consumer price index	OECD
NL_WTX	Weight of the Netherlands in Spanish exports of goods	Rietzler (based on IMF data)
IBOR_3M	Spain: 3 month interbank rate (from 1999: euro area)	OECD, ECB

Abbreviation	Explanation	Source
OIL$	Oil price (Brent) in US dollars	IMF
ES_OSMIN	Spain: Net operating surplus and mixed income	Rietzler (based on data from OECD, INE)
ES_PC	Spain: private consumption deflator	INE
ES_PCGOV	Spain: government consumption deflator	INE
ES_PGDP	Spain: GDP deflator	INE
ES_PGDPPM	Spain: ratio of GDP deflator over import prices	INE
ES_PIC	Spain: deflator of gross capital formation	INE
ES_PM	Spain: import price deflator	INE
ES_PRODET	Spain: productivity (es_gdp/es_et)	INE
PT_CPI	Portugal: consumer price index	OECD
PT_WTX	Weight of Portugal in Spanish exports of goods	Rietzler (based on IMF data)
ES_PVAT	Spain: relative price level: Spain/Austria (CPI)	Rietzler (based on OECD data)
ES_PVBE	Spain: relative price level: Spain/Belgium (CPI)	Rietzler (based on OECD data)
ES_PVDE	Spain: relative price level: Spain/Germany (CPI)	Rietzler (based on OECD data)
ES_PVDK	Spain: relative price level: Spain/Denmark(CPI)	Rietzler (based on OECD data)
ES_PVFI	Spain: relative price level: Spain/Finland (CPI)	Rietzler (based on OECD data)
ES_PVFR	Spain: relative price level: Spain/France (CPI)	Rietzler (based on OECD data)
ES_PVGR	Spain: relative price level: Spain/Greece (CPI)	Rietzler (based on OECD data)
ES_PVIE	Spain: relative price level: Spain/Ireland (CPI)	Rietzler (based on OECD data)
ES_PVIT	Spain: relative price level: Spain/Italy (CPI)	Rietzler (based on OECD data)
ES_PVNL	Spain: relative price level: Spain/Netherlands (CPI)	Rietzler (based on OECD data)
ES_PVPT	Spain: relative price level: Spain/Portugal (CPI)	Rietzler (based on OECD data)
ES_PVSE	Spain: relative price level: Spain/Sweden (CPI)	Rietzler (based on OECD data)
ES_PVUK	Spain: relative price level: Spain/UK (CPI)	Rietzler (based on OECD data)
ES_PX	Spain: export price index	INE
ES_RAW	Spain: real effective exchange rate	OECD
ES_RAWAT	Spain: real effective exchange rate of the Peseta vis-à-vis the Austrian Schilling	Rietzler (based on data from Bundesbank, OECD)
ES_RAWBE	Spain: real effective exchange rate of the Peseta vis-à-vis the Belgian franc	Rietzler (based on data from Bundesbank, OECD)
ES_RAWDE	Spain: real effective exchange rate of the Peseta vis-à-vis the Deutsche Mark	Rietzler (based on data from Bundesbank, OECD)
ES_RAWDK	Spain: real effective exchange rate of the Peseta vis-à-vis the Dänish krone	Rietzler (based on data from Bundesbank, OECD)

Abbreviation	Explanation	Source
ES_RAWEWU	Spain: real effective exchange rate of the Peseta vis-à-vis euro area currencies	Rietzler (based on data from Bundesbank, OECD, IMF)
ES_RAWFI	Spain: real effective exchange rate of the Peseta vis-à-vis the Finmark	Rietzler (based on data from Bundesbank, OECD)
ES_RAWFR	Spain: real effective exchange rate of the Peseta vis-à-vis the French franc	Rietzler (based on data from Bundesbank, OECD)
ES_RAWGR	Spain: real effective exchange rate of the Peseta vis-à-vis the Greek drachma	Rietzler (based on data from Bundesbank, OECD)
ES_RAWIE	Spain: real effective exchange rate of the Peseta vis-à-vis the Irish pound	Rietzler (based on data from Bundesbank, OECD)
ES_RAWIT	Spain: real effective exchange rate of the Peseta vis-à-vis the Italian lira	Rietzler (based on data from Bundesbank, OECD)
ES_RAWNL	Spain: real effective exchange rate of the Peseta vis-à-vis the Dutch guilder	Rietzler (based on data from Bundesbank, OECD)
ES_RAWPT	Spain: real effective exchange rate of the Peseta vis-à-vis the Portuguese escudo	Rietzler (based on data from Bundesbank, OECD)
ES_RAWSE	Spain: real effective exchange rate of the Peseta vis-à-vis the Swedish krona	Rietzler (based on data from Bundesbank, OECD)
ES_RAWUK	Spain: real effective exchange rate of the Peseta vis-à-vis the pound sterling	Rietzler (based on data from Bundesbank, OECD)
ES_RAWUS	Spain: real effective exchange rate of the Peseta vis-à-vis the US dollar	Rietzler (based on data from Bundesbank, OECD)
ES_RESTROW	= reel effective exchange rate/ es_cpi	Rietzler (based on OECD data)
REU_DTOT95	EU-15 outside EMU: total demand at constant prices	Rietzler (based on data from Eurostat, Bundesbank)
ROW_GDP	Rest of the world : gross domestic product at constant pr.	Rietzler based on IMF data
ES_RWEE	Real wage (deflated with private consumption deflator)	Rietzler (based on INE data)
ES_RWEEPGDP	Real wage (deflated with GDP deflator)	Rietzler (based on INE data)
ES_SC	Social security contributions of households	Rietzler (based on data from OECD, INE)
SE_CPI	Sweden: consumer price index	OECD
SE_WTX	Weight of Sweden in Spanish exports of goods	Rietzler (based on IMF data)
SPREAD	ES_LANG-ES_3m	Rietzler (based on data from OECD, ECB)
ES_TD	Direct taxes paid by households	Rietzler (based on data from OECD, INE)
ES_TIND	Taxes less subsidies on production and imports	Rietzler (based on data from OECD, INE)
ES_TRR	Transfers received by households	Rietzler (based on data from OECD, INE)

Abbreviation	Explanation	Source
ES_U	Spain: unemployed persons	Rietzler (based on data from OECD, INE)
ES_URATE	Spain: unemployment rate (%)	Rietzler (based on data from OECD, INE)
ES_ULC	Spain: unit labour cost (es_gyeee/es_prodet)	Rietzler (based on INE data)
ES_UR1	Spain: unemployment rate (decimals)	OECD in % /100
ES_GYEEE	Spain: compensation of employees per employee	INE
ES_X	Spain: exports of goods and services (current prices)	INE
ES_X95	Spain: exports of goods and services (constant prices)	INE
ES_XG95	Spain: exports of goods (constant prices)	INE
ES_XG95EWU	Spain: exports of goods to the EMU (constant prices)	Rietzler (based on data from INE, IMF)
ES_XG95REU	Spain: exports of goods to the EU-15 outside EMU (constant prices)	Rietzler (based on data from INE, IMF)
ES_XG95ROW	Spain: exports of goods to the rest of the world (constant prices)	Rietzler (based on data from INE, IMF)
ES_XG95US	Spain: exports of goods to the United States of America (constant prices)	Rietzler (based on data from INE, IMF)
ES_XS95	Spain: exports of services (constant prices)	INE
UK_CPI	UK: consumer price index	OECD
UK_WTX	Weight of the UK in Spanish exports of goods	Rietzler (based on IMF data)
US_CPI	USA: consumer price index	OECD
US_DTOT95	USA: total demand at constant prices (=GDP+imports)	Eurostat
USD	Exchange rate of the Peseta vis-à-vis the US dollar	Bundesbank
YD	Spain: disposable income of households (current prices)	Rietzler (based on data from OECD, INE)
YDR	Spain: disposable income of households (constant prices)	Rietzler (based on data from OECD, INE)
Z1	centred seasonal dummy variable	Generated in EVIEWS
Z2	centred seasonal dummy variable	Generated in EVIEWS
Z3	centred seasonal dummy variable	Generated in EVIEWS
Z1SD	centred seasonal dummy variable multiplied by step dummy SD9201i	Generated in EVIEWS
Z2SD	centred seasonal dummy variable multiplied by step dummy SD9201i	Generated in EVIEWS
Z3SD	centred seasonal dummy variable multiplied by step dummy SD9201i	Generated in EVIEWS
ID8301	Impulse dummy: = 1 in 1983Q1 and nrnd*0.00001 otherwise	Generated in EVIEWS
ID8601	Impulse dummy: = 1 in 1986Q1 and nrnd*0.00001 otherwise	Generated in EVIEWS
ID8701	Impulse dummy: = 1 in 1987Q1 and nrnd*0.00001 otherwise	Generated in EVIEWS
ID8801	Impulse dummy: = 1 in 1988Q1 and nrnd*0.00001 otherwise	Generated in EVIEWS
ID9201	Impulse dummy: = 1 in 1992Q1 and nrnd*0.00001 otherwise	Generated in EVIEWS
ID9204	Impulse dummy: = 1 in 1992Q4 and nrnd*0.00001 otherwise	Generated in EVIEWS
ID9501	Impulse dummy: = 1 in 1995Q1 and nrnd*0.00001 otherwise	Generated in EVIEWS
ID9701	Impulse dummy: = 1 in 1997Q1 and nrnd*0.00001 otherwise	Generated in EVIEWS
ID9702	Impulse dummy: = 1 in 1997Q2 and nrnd*0.00001 otherwise	Generated in EVIEWS

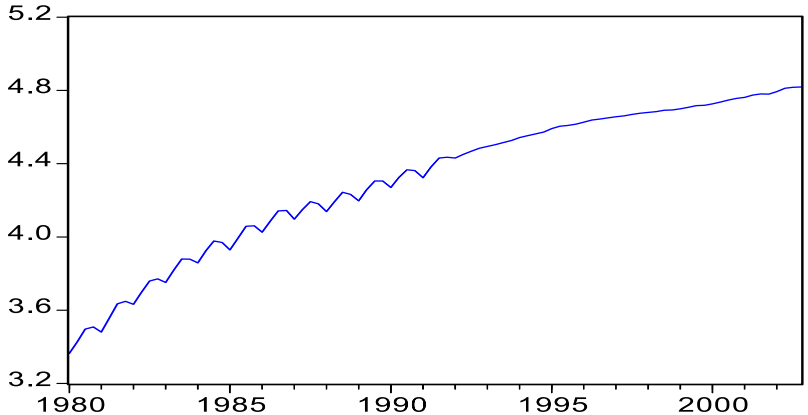
Abbreviation	**Explanation**	**Source**
SD0101	step dummy: =0.00001*nrnd until 2000Q4, =1 afterwards	Generated in EVIEWS
SD8601	step dummy: =0.00001*nrnd until 1985Q4, =1 afterwards	Generated in EVIEWS
SD9101	step dummy: =0.00001*nrnd until 1990Q4, =1 afterwards	Generated in EVIEWS
SD9201	step dummy: =0.00001*nrnd until 1991Q4, =1 afterwards	Generated in EVIEWS
SD9201i	step dummy: = 1 until 1991Q4 and 0.0001*nrnd afterwards	Generated in EVIEWS
SD9301	step dummy: =0.00001*nrnd until 1992Q4, =1 afterwards	Generated in EVIEWS
SD9901	step dummy: =0.00001*nrnd until 1998Q4, =1 afterwards	Generated in EVIEWS
KT8601i	Broken trend: negative trend until 1985Q4, 0.00001*nrnd afterwards	Generated in EVIEWS
KT9201	Broken trend: 0.00001*nrnd until 1991Q4, positive trend afterwards	Generated in EVIEWS
KT9404	Broken trend: negative trend until 1994Q3, 0.00001*nrnd afterwards	Generated in EVIEWS

General comments to ADF unit root tests for Spain.

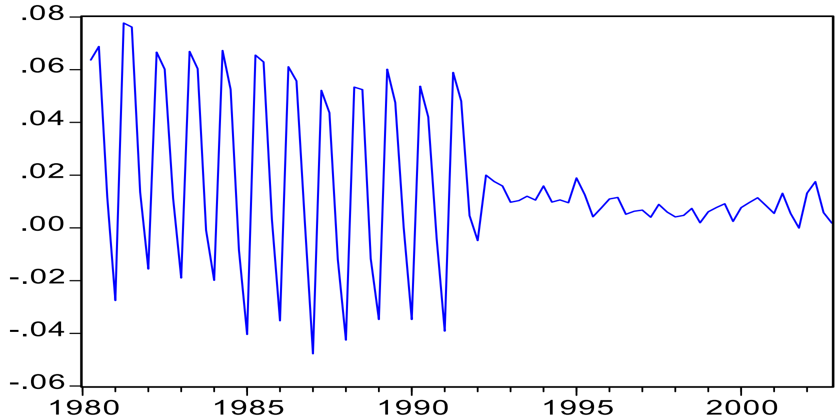
All series were tested in a form they enter respective equations.

Lag selection: starting lag length was set to 8. Whenever the data allowed, we tried to eliminate the lags which were not significant, starting from longest lags, including of which in regression was not suggested by information criteria. This was done only in cases where lag elimination didn't affect quality of the model (e.g. causing autocorrelation in residuals).

Deterministic terms: due to the poor quality of the data, extra deterministic terms had to be included. All the series of the type shown below were tested both with extra deterministic terms (seasonal dummies times difference of shift dummy s9201 and unity) and without. If inclusion of dummy terms didn't affect the results the simpler models were preferred. However when testing in differences one always had to stick to a more complicated model due to the fact that changing seasonal pattern has a large impact on variance of the process. Inclusion of additional deterministic terms allowed us to overcome this problem.



Log of private consumption deflator



Dlog of private consumption deflator

When the eye-ball econometrics told we should include e.g. trend into regression and t-statistics reported that we shouldn't, the approach of Donaldo, Jenkinson and Sosvilla-Rivero (1990) was used to test for the presense of deterministic terms.

B. Augmented Dickey-Fuller unit root Tests

Sample 1980:1 – 2002:4	Levels			First Differences			
Variables	**Specification**	**Lags**	**Teststatistik**	**Specification**	**Lags**	**Teststatistik**	**Order of Integration**
Log(ES_CGOV95)	C, trend, Z1,Z2,Z3	1-7	-1,78	z1*(sd9201-1) z2*(sd9201-1) z3*(sd9201-1)	1,2,3,5,6	-3,33*	I(1)
Log(ES_CPI)	C, trend	1,2,3,4,7	-3,35**	C	1-8	-3,14***	I(1)
Log(ES_ES)	C, Z1,Z2,Z3	1-8	-1,09	C,Z1,Z2,Z3	1-5	-5,25***	I(1)
Log(ES_GDP)	C, trend, Z1,Z2,Z3	1-4	-2,32	z1*(sd9201-1) z2*(sd9201-1) z3*(sd9201-1) I9004	1-8	-1,86**	I(1)
Log(ES_GDP95)	C, trend, Z1,Z2,Z3	1-6	-3,24**	C,Z1,Z2,Z3	1-3	-3,29*	I(1)
Log(ES_GYEEE)	C, trend, Z1,Z2,Z3	1-6	-0,94	z1*(sd9201-1) z2*(sd9201-1) z3*(sd9201-1)	1-6	-2,10*	I(1)
Log(ES_GYEEE95)	C, trend, Z1,Z2,Z3	1-8	-1,78	z1*(sd9201-1) z2*(sd9201-1) z3*(sd9201-1)	1-6	-3,16*	I(1)
Log(ES_ICON)	C, trend, Z1,Z2,Z3	1-4	-2,39	C,Z1,Z2,Z3, I9202	1-4	-3,18*	I(1)

* Significant at 5% rejection level of the Dickey-Fuller Tests statistics
** Significant at 10% rejection level of the Dickey-Fuller Tests statistics
*** Significant at 1% rejection level of the Dickey-Fuller Tests statistics

Sample 1980:1 – 2002:4	Levels			First Differences			
Variables	Specification	Lags	Teststatistik	Specification	Lags	Teststatistik	Order of Integration
Log(ES_IMEQ95)	C, trend, z1 z2 z3	1-8	-3,09	z1 z2 z3	1-4	-2,20*	I(1)
ES_LANG	C, trend	1-8	-2,66	-	3,5,6	-5,71***	I(1)
Log(ES_M95)	C, trend, z1 z2 z3	1-8	-3.22*	C, z1 z2 z3	1-5	-3,22*	I(1)
Log(ES_NAWREU)	C	1	-1,78	-	1-4	-5,00***	I(1)
Log(ES_PC)	C z1*(sd9201-1) z2*(sd9201-1) z3*(sd9201-1)	1-8	-2,46	z1*(sd9201-1) z2*(sd9201-1) z3*(sd9201-1)	1-8	-2,26*	I(1)
Log(ES_PCGOV)	C, trend, z1 z2 z3, I8701, I9201, I9701	1-8	-2,42	z1*(sd9201-1) z2*(sd9201-1) z3*(sd9201-1) I8701, I9201, I9701	1-7	-1,98*	I(1)
Log(ES_PGDP)	C, trend, z1 z2 z3	1-8	-2,40	z1 z2 z3	1-7	-2,41*	I(1)
Log(ES_PGDPPM)	C	1-4	-1,65	-	1-3	-3,35***	I(1)
Log(ES_PICON)	C, trend	3,4,5	-2,94	-	1,2,3,5	-1,71**	I(1)
Log(ES_PIMEQ)	C, trend, z1 z2 z3	1-8	-4,18***	-	-	-	I(0)
Log(ES_PM)	C, trend	1,3,4	-2,86	-	1,2,3	-3,57***	I(1)

* Significant at 5% rejection level of the Dickey-Fuller Tests statistics
** Significant at 10% rejection level of the Dickey-Fuller Tests statistics
*** Significant at 1% rejection level of the Dickey-Fuller Tests statistics

Sample 1980:1 – 2002:4	Niveau			First Differences			
Variables	**Specification**	**Lags**	**Teststatistik**	**Specification**	**Lags**	**Teststatistik**	**Order of Integration**
Log(ES_PX)	C, trend	1-6	-3,21**	-	1,2,3,5	-2,19*	I(1)
Log(ES_RAW)	C	1-4	-1,52	-	1-4	-3,54***	I(1)
Log(ES_RAWEWU)	C	1,2	-2,1	-	1-4	-3,67***	I(1)
Log(ES_RAWUS)	C	1-4	-2,07	-	1,2,3	-3,78***	I(1)
Log(ES_U)	C z1z2 z3	1,2,3	-2,01	-	1-8	-2,08*	I(1)
Log(ES_ULC)	C z1z2 z3	1-3	-1,75	z1*(sd9201-1) z2*(sd9201-1) z3*(sd9201-1)	1-3	-2,18*	I(1)
ES_URATE	C	1-7	-2,07	-	2,3,4	-2,39*	I(1)
Log(ES_X95)	C, trend, z1 z2 z3	1-4	-1,34	C, z1 z2 z3	1-4	-3,99***	I(1)
Log(ES_XG95EWU)	C, trend, z1 z2 z3	1-4	-1,63	C, z1 z2 z3	1-4	-5,0***	I(1)
Log(ES_XG95REU)	C, trend, z1 z2 z3	1-4	-2,01	C, z1 z2 z3	1-4	-5.00**	I(1)
Log(ES_XG95ROW)	z1 z2 z3	1,2	2,05	C	-	-12,6***	I(1)

* Significant at 5% rejection level of the Dickey-Fuller Tests statistics
** Significant at 10% rejection level of the Dickey-Fuller Tests statistics
*** Significant at 1% rejection level of the Dickey-Fuller Tests statistics

Sample 1980:1 – 2002:4	Niveau			First Differences			
Variables	**Specification**	**Lags**	**Teststatistik**	**Specification**	**Lags**	**Teststatistik**	**Order of Integration**
Log(ES_XG95US)	C, trend, z1 z2 z3	1	-2,25	z1 z2 z3	1,3	-5,28***	I(1)
Log(EWUOES_DTOT)	C, trend, z1 z2 z3	1-6	-3,04	C, z1 z2 z3	1-6	-3,46***	I(1)
Log(OIL$)	C	1,2,3	-2,99*	-	-	-	I(0)
Log(REU_DDTOT95)	C, trend, z1 z2 z3	1,2	-2,54	C, z1 z2 z3	2,3	-4,97***	I(1)
Log(USD)	C	1	-2,52	-	-	-6,57***	I(1)

* Significant at 5% rejection level of the Dickey-Fuller Tests statistics
** Significant at 10% rejection level of the Dickey-Fuller Tests statistics
*** Significant at 1% rejection level of the Dickey-Fuller Tests statistics

Sample 1986:1 – 2002:4	Levels			First Differences			
Variables	**Specification**	**Lags**	**Teststatistik**	**Specification**	**Lags**	**Teststatistik**	**Order of Integration**
Log(ES_C95)	C, trend, z1 z2 z3	1-4	-2,98	C, z1 z2 z3	1-3	-2,08	I(2)
Log(ES_CPI)	C	1-4	-2,15	-	1-3	-1,46	I(2)
Log(ES_EE)	C, trend, z1 z2 z3	1-8	-3.98*	-	-	-	I(0)
Log(ES_GDP95)	C, trend, z1 z2 z3	1-5	-2,73	C, z1 z2 z3	1-4	-2,04	I(2)
Log(ES_GYEEE)	C z1*(sd9201-1) z2*(sd9201-1) z3*(sd9201-1)	1-4	-1,73	z1*(sd9201-1) z2*(sd9201-1) z3*(sd9201-1)	1-3	-1,42	I(2)
Log(ES_IMEQ95)	C, trend, z1 z2 z3	1-4	-2,57	z1 z2 z3	1-4	-2,26*	I(1)
ES_LANG	C, trend	1-7	-2,78	C	1-3	-2,65*	I(1)
Log(ES_RAW)	C	1-5	-2,91	-	-	-6,31***	I(1)
Log(ES_RWEE)	C, z1 z2 z3	1-4	-1,67	-	1-3	-2,53	I(1)
ES_URATE	C, trend, z1 z2 z3	1,3,4	-2,35	-	1-8	-1,97*	I(1)
Log(ES_XG95)	C, trend, z1 z2 z3	1-4	-3,34**	C, z1 z2 z3	1-3	-3,89***	I(1)

* Significant at 5% rejection level of the Dickey-Fuller Tests statistics
** Significant at 10% rejection level of the Dickey-Fuller Tests statistics
*** Significant at 1% rejection level of the Dickey-Fuller Tests statistics

Sample 1986:1 – 2002:4	Levels			First Differences			
Variables	**Specification**	**Lags**	**Teststatistik**	**Specification**	**Lags**	**Teststatistik**	**Order of Integration**
Log(ES_XS95)	C, trend, z1 z2 z3	1-4	-2,06	C, z1 z2 z3	1-3	-1,34	I(2)
Log(ES_YDR)	C, trend, z1 z2 z3	1,4	-2,66	C, z1 z2 z3	2,3	-11,03***	I(1)
Log(ES_ICON95PR)	C, trend, z1 z2 z3	3,4	-2,99	C, z1 z2 z3	-	-6,15***	I(1)
Sample 1988:1 – 2002:4							
Log(ES_EE)	C, trend, z1 z2 z3	1-8	-3,11	-	1	-2,13	I(2)
Log(ES_EU7_PC)	C, trend, z1 z2 z3	1-4	-2,57	C, z1 z2 z3	1-7	-1,01	I(2)
Log(ES_PM)	C, trend, z1 z2 z3	1-4	-4,56***	-	-	-	I(0)
Log(ES_PRODET)	z1 z2 z3	1-3	4,64	C	1-6	-4,02***	I(1)
Log(OIL$)	C, trend	1-3	-4,53***	-	-	-	I(0)

* Significant at 5% rejection level of the Dickey-Fuller Tests statistics
** Significant at 10% rejection level of the Dickey-Fuller Tests statistics
*** Significant at 1% rejection level of the Dickey-Fuller Tests statistics

Temporal Disaggregation of Annual Data:

Disposable Income of Households

Most of the series used in the model are available from official statistical sources with monthly or quarterly frequency. However, this does not apply to disposable income of households. The INE
offers only annual data from 1995 onwards within the framework of the European System of Accounts 1995 (ESA 1995). The Organisation for Economic Cooperation and Development (OECD) has extrapolated this series backwards until 1980 on the basis of the European System of Accounts 1979 (ESA79). To obtain quarterly data a method of temporal disaggregation must be adopted by the author. The most appropriate approach is the method of Chow and Lin (1971) as it is incorporated into ECOTRIM, a software package developed by Eurostat and applied in Eurostat's estimation of EU-12 and EU-15 aggregates (Barcellan, 1996). The idea is to use an indicator series in the inter- and extrapolation of annual time series. For a series like disposable income, which is the total of several sub-aggregates there are two possible approaches: a direct one and an indirect one. Whereas the former would mean temporal disaggregation of disposable income with just one appropriate indicator series, the latter would derive quarterly disposable income as the total of the temporally disaggregated sub-series. This approach is followed here.

As disposable income is composed of several very different series from compensation of employees to transfers from the government, it is sensible to temporally disaggregate these sub-series using a different indicator series each time. Fortunately, the subseries accounting for the largest share of disposable income (i.e. compensation of employees) is provided by the statistical office on a quarterly bases and thus does not have to be estimated.

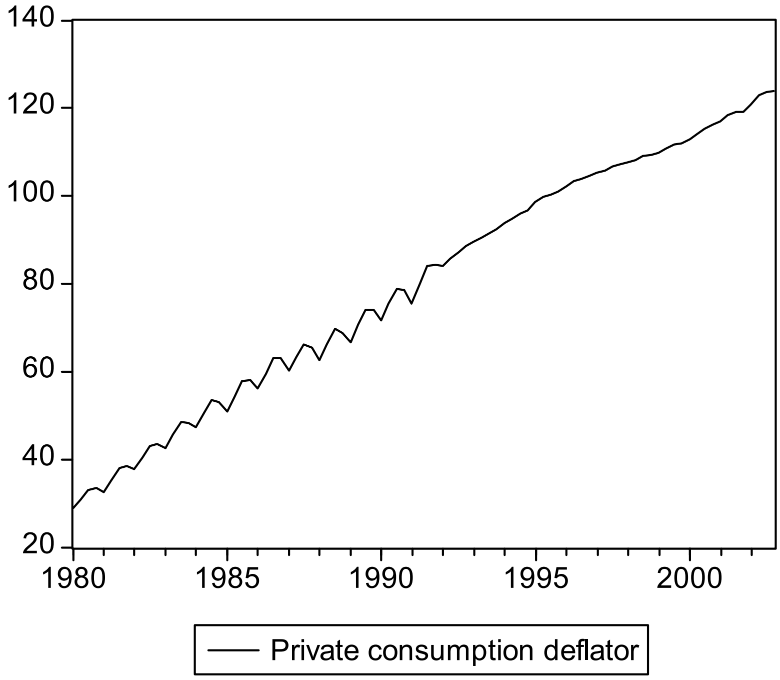
As the whole model of which the consumption function forms a vital part is estimated with the seasonally unadjusted quarterly national accounts data, it is desirable that the quarterly disposable income series to be constructed should equally show a plausible seasonal pattern. Thus, a simple temporal disaggregation without indicator series is generally ruled out, because it would produce some kind of a trend-cycle component of the respective series. This seems acceptable only in cases, where no seasonal pattern is expected or, when no appropriate indicator is available as in the case of social transfers. It has to be emphasised that within the framework of national accounts it has to be ensured that subseries add up.

	Annual series	Indicator series	In % of F (average 1980-2002)
A	Compensation of employees	- (Quarterly series exists)	73.6
+ B	Property income and other income (net)	Operating surplus and mixed income (gross)	37.6
+ C	Social transfers	No indicator	30.8
- D	Direct taxes	Compensation of employees	-10.9
- E	Social security contributions	Compensation of employees	-31.1
= F	Disposable income of households	- (Total of subseries)	100

The Table above gives an overview of the sub-series of disposable income and the indicator series used. All annual data were taken from the OECD Economic Outlook 73. For periods for which INE data exist these are identical. Indicator series were taken from the INE's quarterly national accounts[1].

As the annual data is given, the long-run properties of the quarterly series cannot be distorted by the process of temporal disaggregation. However, the short-term dynamics will be affected by the choice of indicators or the choice between the direct and the indirect approach.

To obtain real disposable household income nominal disposable income is deflated by the the private consumption deflator. The latter is calculated as the quotient of nominal over real private final consumption expenditure[2] multiplied by 100. The use of the private consumption deflator produces some statistical problems, which become obvious at the sight of the series.



The series shows strong seasonal fluctuations until the end of 1991. Then, suddenly, the seasonal pattern vanishes. Most probably this reflects problems in the compilation of national accounts data according to the European System of Accounts 1995 (ESA95) rather than an abrupt change in the economy. The consequence of the use of this series for deflation is that real disposable income of households equally shows a changing seasonal pattern. This problem could only be overcome by changing either nominal or real private consumption. As both series are official data, however, such an approach is rejected.

Strictly speaking quarterly disposable income is an estimate. Does this mean that critical values in the estimation of the consumption function have to be different? A strong argument against the application of adjusted critical values is the fact that the quarterly series is produced with an approach very similar to that of statistical offices. In the end all data are "estimates". The INE also uses temporal disaggregation as conceived by Chow and Lin for the

1 These were published for the period until 2002 fourth quarter in early 2003.

[2] In both cases the official quarterly national accounts data from the Spanish National Statistical Institute, INE, were used for the period from 1980 until 2002.

production of all raw quarterly national accounts data[3]. Thus, the estimate of real disposable income here is quite similar to what the INE might have produced. An additional argument may be that the series has not been estimated freely as the annual figures are given.

Government construction investment

In its Economic Outlook (No. 74) the OECD publishes an annual time series of the government investment volume. This aggregate includes both construction and machinery and equipment. In most countries the share of construction in government investment is above 80 %. As no detailed breakdown of govenment investment is available from 1980 onwards it is asumed that the government invests only into construction, which in the case of Spain, which receives considerable funds for infrastructure investment from Brussels, is all the more plausible. The quarterly series is derived in the following way. The annual government investment is subtracted from the annual total construcion. The difference yields private construction investment, which – fluctuating between 60 and 85 % of total construction investment – is the larger aggregate. Therefore it is sensible to apply the temporal disaggregation method to private construction investment using total construction investment as an indicator series. Quarterly government construction is then obtained as the difference between total (quarterly) construction investment and private (quarterly) investment.

[3] For details see Quilis (2001).

Regional Disaggregation of Spanish Exports

For the model the quarterly national accounts have been chosen as a consistent data framework. Consistency of the data set is the sine qua non in macroeconometric modelling. If the information of other data sources outside the national accounts is to be used, it has to be made consistent with the quarterly national accounts. This task has become much easier with the introduction of the ESA 1995, which also brought national accounts data more in line with balance of payments and government financial statistics. Thus, in the case of exports, total nominal exports of goods as given in the national accounts hardly differ from trade statistics.

For the macroeconometric model of the Spanish economy this means that the *nominal* exports in million euros can be broken down by destinations using the (variable) weights of the respective countries/regions in the trade statistics, which are published by the Spanish Ministry of the Economy (among others). The regions of interest are: the euro area, the rest of the EU-15 (i.e.UK, Sweden, Denmark), the United States of America and the rest of the world.

Some difficulties arrise, when the exports *in real terms* are to be derived. For this purpose, the *nominal* series would have to be deflated with the relevant price index. However, there are no export price indices *by destination*. It is therefore assumed that the individual deflators are identical with the deflator of total exports of goods. In several respects this assumption is problematic:

1) The assumption implies that the prices of exports to the different regions depend only on domestic prices in Spain, i.e. there are no pricing-to-market strategies.
2) Even if 1) were true, the price indices would still be different due to the different weights of individual goods in the exports to each region.

The author has chosen this approach despite its drawbacks, because there is no superior alternative. The estimation results appear quite plausible. In particular, demand variables of the respective regions as well as the respective real effective exchange rates of the Peseta seem to explain the regionally disaggregated real export series quite well, which suggests, that the share of a specific region in Spain's real exports is not too different from its share in nominal exports.

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