

Study

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The IMK's Model of the German Economy

A Structural Macro-Econometric Model

Estimated by Camille Logeay, Katja Rietzler, Sabine Stephan
and Rudolf Zwiener

Documentation by Katja Rietzler

Abstract

This IMK Study is a documentation of the IMK's macro-econometric model of the German economy. Currently the model includes 48 behavioural equations, which are usually specified as error-correction equations, and 61 definitions. The model is based on seasonally unadjusted quarterly national accounts data complemented by additional statistics and calculations of the IMK. Special features of the model include a more detailed representation of the German exports by destination (euro area, UK, USA, rest of the world) as well as a Keynesian employment function. The model is used both for economic policy simulations and forecasts.

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1. Introduction

The IMK's macro model is a structural econometric model of the German economy. It has been used for forecasts and policy simulations at the IMK for several years. During this time the models has often been modified¹. Like most macro models it is still work in progress and is likely to be modified further in the future. Thus this documentation provides an insight into the general model philosophy as well as the current state of affairs.

Whenever possible the equations of the model are specified as error-correction equations (Engle and Granger, 1987, Banerjee et al. 1998). Critical values for the coefficients of the error-correction terms are taken from Banerjee et al. (1998) as quoted by Hassler (2004).

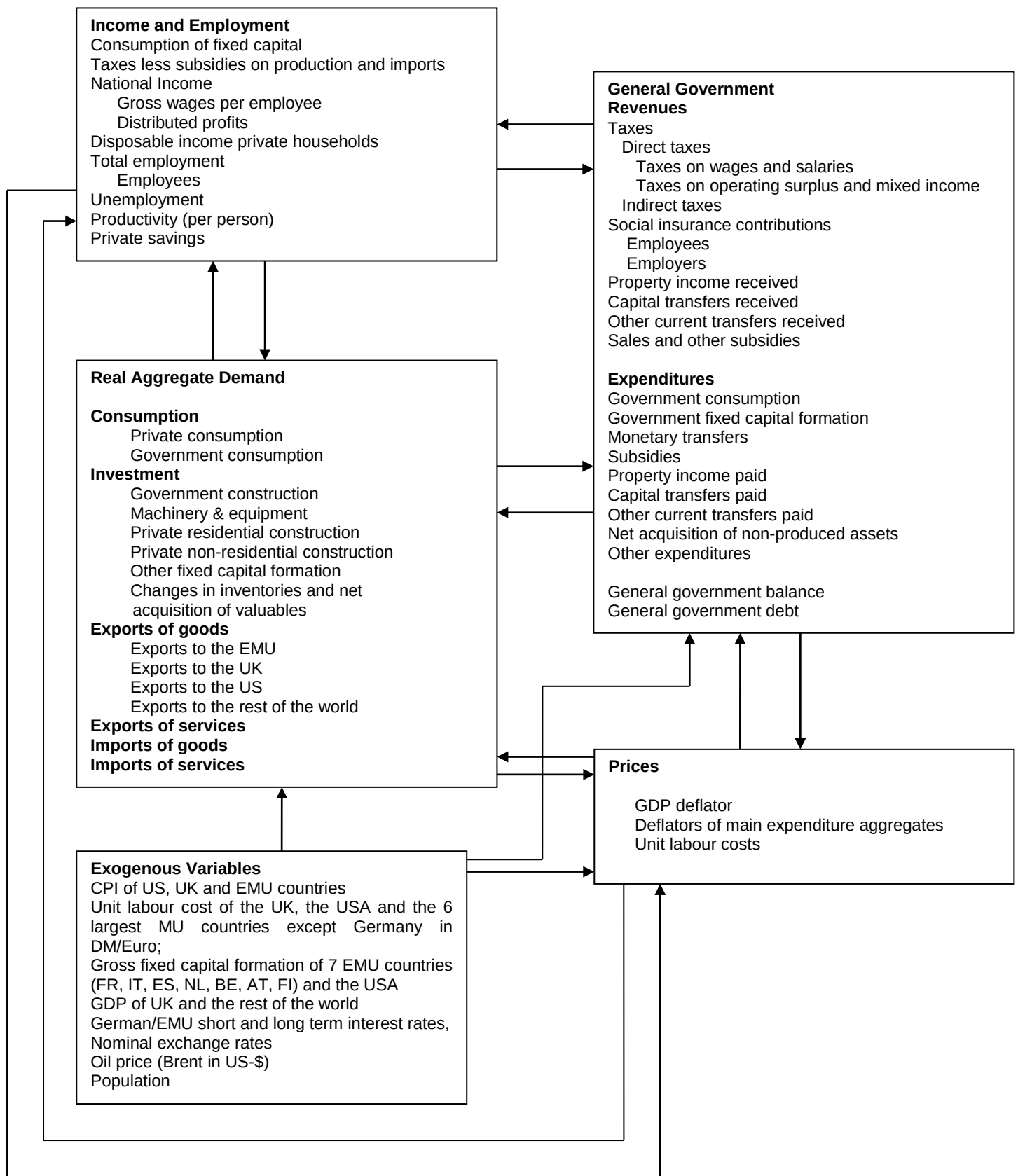
Economic theory plays a role especially for the long-run relationships. Generally the specifications of the model are guided by Keynesian theory. Besides the existence of nominal rigidities and market spillovers this also means that economic policy has long-term effects on the real economy and that unemployment may exist in the long run. Further, the employment function estimates the long-run relationship between productivity and the capital stock, whereas the real wage is of minor importance for employment.

Further, the properties of the time series play a central role. The IMK's macro model is estimated on the basis of seasonally unadjusted quarterly data. Generally, no restrictions are imposed with regard to homogeneity and no calibration is applied. There are only a few restrictions of coefficients.

The model uses highly aggregated national accounts data for the real aggregate demand, income and employment, the government sector and prices and exchange rates. There are 48 behavioural equations and 61 definitions. Unlike in most other macro models real exports of goods are regionally disaggregated for four regions (EMU, UK, US and the rest of the world). Interest rates, nominal exchange rates, population growth, foreign prices and foreign demand remain exogenous. Figure 1 on the next page provides an overview of the general structure of the IMK's macro model.

¹ The basic structure of the model is similar to that of a model built largely by the same authors at the DIW Berlin (Duong et al, 2005). However, numerous important equations, such as the employment equations have been changed completely.

Figure 1: Structure of the IMK Model



Source: IMK.

2. Model Data

2.1. Data Sources

The majority of time series used in the model are from the German national accounts provided by Destatis, the German statistical office. They are quarterly, seasonally unadjusted series. Data of other European economies are largely obtained from Eurostat. For countries outside the EU the OECD is the main data source. Table 99 in the Appendix provides a list of variables including the variable abbreviations, their explanations and sources. A substantial number of variables have been calculated by the IMK. This applies to the capital stock, real interest rates or the regional breakdown of exports (Stephan, 2002).

Revenues and expenditures of the general government are only partly available on a quarterly basis. Some series including total revenues and expenditures as well as interest payments of the government, property transfers have been temporarily disaggregated from half-yearly data with the help of Eurostat's software package ECOTRIM (Chow and Lin 1971, Barcellan, 1994). Indicator series were applied in the temporal disaggregation whenever possible.

Due to German reunification data for the period since 1991 cover the whole of Germany, whereas all data for earlier periods refer to West Germany. Thus, for the estimation of equations for the whole sample beginning in 1980 extensive use of dummy variables (step dummies in particular) has been made. In this documentation labels of step dummies begin with an S e.g. S91Q1. This step dummy is equal to zero from 1980 until the fourth quarter of 1990 and 1 from the first quarter of 1991 onwards. An I indicates an impulse dummy. It equals 1 in the respective quarter and zero otherwise, e.g. I91Q1. I92_94_99 is an exception to the rule. It equals 1 in the fourth quarter of 1992, in the first quarter of 1994 and in the first quarter of 1999 and zero otherwise. Variables z1, z2 and z3 are centred seasonal dummies.

2.2. Unit Root Tests

Most macroeconomic time series are integrated of order 1 or I(1). This is why many of the behavioural equations in the model are error-correction equations. To obtain an idea which variables can be combined in an error-correction equation, we have to know the stochastic properties of the series. For this purpose we run unit root tests before estimating. The augmented Dickey-Fuller (Dickey and Fuller, 1979) test is the norm. However, due to the German reunification, numerous time series show a clear structural break in 1991. For this reason the Perron test (Perron 1989, Perron and Vogelsang 1993) is applied in these cases.

The results of the unit root tests given in Table 1 and in Table 2 serve as a guideline. However, there are cases, when cointegration tests indicate that series, which - according to the unit root tests - have different stochastic properties, are cointegrated. In these cases theoretical considerations are also taken into account and the results of the estimation equation are given priority. Contradictions between the unit root tests and the estimated equations may also be due to different sample sizes. The unit root tests are performed in advance for the whole sample length. Thus, if a reduced sample is used in the estimation equation it may not be surprising that stochastic properties differ.

Most time series are $I(1)$, stationary with respect to a linear trend (TS) or $I(0)$. Series integrated of order 2 remain exceptions (some prices series or nominal series).

Table 1: Results of the Augmented Dickey-Fuller Tests

Variable	From	Deterministics	Lags	Test statistics	Result
LOG(CPI_DE)	1981Q2	c, t, s	1,4	-2.27 (-3.45)	$I(1)$
Δ LOG(CPI_DE)	1981Q2	c, s	1,2,3	-3.17 (-2.88)	
LOG(CPI_EWU)	1980Q4	c,t,s	2	-6.37 (-3.45)	TS
Δ LOG(CPI_EWU)	1981Q1	c,s	1,2	-2.98 (-2.88)	
LOG(CPI_UK)	1981Q2	c, s	1,4	-2.20 (-2.88)	$I(1)$
Δ LOG(CPI_UK)	1981Q2	s	1-3	-2.69 (-1.94)	
LOG(CPI_US)	1981Q1	c,t,s	1-3	-2.37 (-3.45)	$I(1)$
Δ LOG(CPI_US)	1981Q1	c,s	2,4	-6.34 (-2.88)	
DE_BGOV	1991Q3	c, s	1	-4.41 (-2.90)	$I(0)$
Δ DE_BGOV	1991Q4	s	1	-9.94 (-1.94)	
LOG(DE_CAPA)	1980Q2	c	0	-4.27 (-2.88)	$I(0)$
Δ LOG(DE_CAPA)	1980Q3	none	0	-12.94 (-1.94)	
LOG(DE_DBTGOV)	1991Q4	c,s	2	-1.94 (-2.90)	$I(1)$
Δ LOG(DE_DBTGOV)	1991Q4	s	1	-2.96 (-1.94)	
LOG(DE_EXPGOV)	1991Q3	c, t, s	1	-4.37 (-3.47)	TS
Δ LOG(DE_EXPGOV)	1991Q4	c, s	1	-10.05 (-2.90)	
LOG(DE_EXPOTH)	1991Q4	c,t,s	1,2	-2.87 (-3.47)	$I(1)$
Δ LOG(DE_EXPOTH)	1992q2	c,s	1-3	-8.14 (-2.90)	
LOG(DE_GYPROP)	1981Q2	c, s	1,3,4	-2.00 (-2.88)	$I(1)$
Δ LOG(DE_GYPROP)	1981Q2	s	1-3	-4.16 (-1.94)	
LOG(DE_ID00)	1981Q2	c, s	1,4	-1.49 (-2.88)	$I(1)$
Δ LOG(DE_ID00)	1981Q2	s	2,3	-16.47 (-1.94)	
LOG(DE_IGOV)	1992Q2	c, s	1,2,4	-1.91 (-2.90)	$I(1)$
Δ LOG(DE_IGOV)	1992Q2	s	1,3	-11.54 (-1.94)	
LOG(DE_IMEQ00)	1981Q2	c, t, s	2,4	-4.31 (-3.45)	TS
Δ LOG(DE_IMEQ00)	1981Q3	c, s	1,4	-5.91 (-2.89)	
LOG(DE_INTPAGOV)	1991Q2	c, s	none	-5.61 (-2.90)	$I(0)$
Δ LOG(DE_INTPAGOV)	1991Q3	s	none	-8.35 (-1.94)	

Variable	From	Deter- ministics	Lags	Test statistics	Result
DE_INV	1981Q2	c, s	3,4	-8.08 (-2.88)	I(0)
Δ DE_INV	1981Q1	s	1,2	-17.07 (-1.94)	
DE_INV00	1981Q2	c, s	1-4	-3.24 (-2.88)	I(0)
Δ DE_INV00	1981Q1	s	1,2	-18.03 (-1.94)	
LOG(DE_IOTH00)	1981Q2	c, t, s	4	-2.70 (-3.45)	I(1)
Δ LOG(DE_IOTH00)	1981Q2	c, s	1-3	-3.69 (-2.88)	
LOG(DE_M)	1980Q4	c, t, s	2	-3.55 (-3.45)	TS
Δ LOG(DE_M)	1981Q3	c,s	2,3,4	-10.18 (-2.89)	
LOG(DE_M00)	1981Q2	c,t,s	2,4	-4.20 (-3.45)	TS
Δ LOG(DE_M00)	1981Q3	c,s	4	-13.20 (-2.89)	
LOG(DE_MASSENEINK00)	1992Q2	c,s	4	-1.83 (-2.90)	I(1)
Δ LOG(DE_MASSENEINK00)	1992Q2	s	2,3	-9.40 (-1.94)	
LOG(DE_MASSENEINK)	1992Q2	c,t,s	4	-3.46 (-3.47)	I(1)/I(2)
Δ LOG(DE_MASSENEINK)	1992Q2	c, s	1-3	-2.89 (-2.90)	
LOG(DE_MG00)	1980Q4	c,t,s	2	-3.80 (-3.45)	TS
Δ LOG(DE_MG00)	1980Q3	c,s	none	-12.61 (-2.88)	
LOG(DE_MS00)	1981Q2	c,t,s	1-4	-1.75 (-3.45)	I(1)
Δ LOG(DE_MS00)	1981Q2	c,s	2,3	-21.22 (-2.88)	
DE_NETPRGOV	1991Q2	c	none	-9.13 (-2.90)	I(0)
Δ DE_NETPRGOV	1992Q1	none	1,2	-8.78 (1.94)	
LOG(DE_NEV_UK)	1980Q3	c	1	-1.76 (-2.88)	I(1)
Δ LOG(DE_NEV_UK)	1980Q3	none	none	-8.28 (-1.94)	
LOG(DE_NEV_US)	1980Q3	c	1	-1.71 (-2.88)	I(1)
Δ LOG(DE_NEV_US)	1980Q3	none	none	-8.18 (-1.94)	
LOG(DE_PCP00)	1981Q2	c,t	4	-4.47 (-3.45)	TS
Δ LOG(DE_PCP00)	1981Q2	c	3	-19.89 (-2.88)	
LOG(DE_PGCF00)	1981Q2	c, s	1,3,4	-1.68 (-2.88)	I(1)
Δ LOG(DE_PGCF00)	1981Q2	s	1-3	-4.49 (-1.94)	
LOG(DE_PICONGOV00)	1982Q2	c,t	1,2,4,6,8	-2.93 (-3.45)	I(2)
Δ LOG(DE_PICONGOV00)	1982Q3	c	1-3,5,8	-2.47 (-2.89)	
LOG(DE_PID00)	1982Q2	c,t	1,4,8	-2.73 (-3.45)	I(2)
Δ LOG(DE_PID00)	1982Q3	c	1-3,8	-2.25 (-2.89)	
LOG_DE_PIFC00)	1981Q2	c	4	-2.42 (-2.88)	I(2)
Δ LOG_DE_PIFC00)	1981Q2	none	1-3	-1.86 (-1.94)	
LOG(DE_PIFC_ID)	1981Q2	c	4	-2.74 (-2.88)	I(1)
Δ LOG(DE_PIFC_ID)	1981Q2	none	1-3	-2.40 (-1.94)	
LOG(DE_PINRB00)	1981Q2	c,t	4	-1.61 (-3.45)	I(1)
Δ LOG(DE_PINRB00)	1981Q2	c	3	-24.04 (-2.88)	
LOG(DE_PM00)	1981Q3	c	1,4,5	-2.52 (-2.89)	I(1)
Δ LOG(DE_PM00)	1981Q3	none	4	-8.80 (-1.94)	
LOG(DE_PMG00)	1980Q3	c	1	-2.79 (-2.88)	I(1)
Δ LOG(DE_PMG00)	1980Q3	none	none	-7.44 (-1.94)	
LOG(DE_PMGREL)	1980Q3	c, s	1	-1.30 (-2.88)	I(1)
Δ LOG(DE_PMGREL)	1980Q3	s	none	-7.09 (-1.94)	
LOG(DE_PMREL)	1981Q3	c, s	1,4,5	-1.90 (-2.89)	I(1)
Δ LOG(DE_PMREL)	1981Q3	s	4	-8.55 (-1.94)	

Variable	From	Deter- ministics	Lags	Test statistics	Result
LOG(DE_PMS00)	1981Q2	c,t,s	4	-2.85 (-3.45)	I(1)
Δ LOG(DE_PMS00)	1981Q3	c,s	2,3,4	-10.95 (-2.89)	
LOG(DE_PROTRGOV)	1991Q2	c,s	none	-7.90 (-2.90)	I(0)
Δ LOG(DE_PROTRGOV)	1992Q2	s	1-3	-7.51 (-1.94)	
LOG(DE_PX00)	1981Q3	c,t,s	1,4,5	-4.03 (-3.45)	TS
Δ LOG(DE_PX00)	1981Q3	c, s	4	-8.37 (-2.89)	
LOG(DE_PXG00)	1981Q3	c,t,s	1,2,5	-3.87 (-3.45)	TS
Δ LOG(DE_PXG00)	1981Q3	c,s	1,4	-5.98 (-2.89)	
LOG(DE_PXS00)	1980Q4	c,s	2	-3.85 (-2.88)	I(0)
Δ LOG(DE_PXS00)	1981Q2	s	2,3	-11.51 (-1.94)	
LOG(DE_RECPROTR)	1992Q2	c,s	1-4	-2.72 (-2.90)	I(1)
Δ LOG(DE_RECPROTR)	1992Q2	s	1-3	-8.13 (-1.94)	
LOG(DE_REEV_24_PTOTDEM)	1980Q4	c,s	1,2	-2.18 (-2.88)	I(1)
Δ LOG(DE_REEV_24_PTOTDEM)	1980Q4	s	1	-5.30 (-1.94)	
LOG(DE_REEV_56_CPI)	1981Q1	c,s	1,3	-2.40 (-2.88)	I(1)
Δ LOG(DE_REEV_56_CPI)	1981Q3	s	4	-8.98 (-1.94)	
LOG(DE_REVG0V)	1992Q2	c,t,s	3,4	-3.03 (-3.47)	I(1)
Δ LOG(DE_REVG0V)	1992Q2	c,s	1,2,3	-3.92 (-2.90)	
LOG(DE_REVYTRF)	1991Q4	c,s	2	-4.10 (-2.90)	I(0)
Δ LOG(DE_REVYTRF)	1991Q4	s	1	-8.71 (-1.94)	
DE_RL10Y	1981Q1	c,t	1-3	-3.39 (-3.45)	I(1)
Δ DE_RL10Y	1981Q2	c	1,3	-8.65 (-2.88)	
DE_RL10Y00	1981Q2	c, t	none	-5.01 (-3.45)	TS
Δ DE_RL10Y00	1981Q3	c	none	-10.67 (-2.89)	
DE_RS3M	1981Q2	c,t	1,4	-4.39 (-3.45)	TS
Δ DE_RS3M	1981Q1	c	2	-5.02 (-2.88)	
DE_RS3M00	1981Q3	c,t	1	-5.56 (-3.45)	TS
Δ DE_RS3M00	1981Q3	c	none	-10.13 (-2.88)	
LOG(DE_SALESSUB)	1992Q2	c,s	1,3,4	1.15 (-2.90)	I(1)
Δ LOG(DE_SALESSUB)	1992Q2	s	1-3	-3.39 (-1.94)	
DE_SAV_RATIO	1981Q2	c,s	2-4	-5.69 (-2.88)	I(0)
Δ DE_SAV_RATIO	1981Q2	s	2,3	-20.91 (-1.94)	
LOG(DE_SUBGOV)	1992Q2	c,s	1-4	-0.74 (-2.90)	I(1)
Δ LOG(DE_SUBGOV)	1992Q2	s	1,3	-15.71 (-1.94)	
LOG(DE_T)	1992Q2	c,t,s	4	-4.23 (-3.47)	TS
Δ LOG(DE_T)	1992Q4	c,s	4,5	-10.01 (-2.90)	
LOG(DE_TDIR)	1992Q3	c,t	1,3,4,5	-4.65 (-3.47)	TS
Δ LOG(DE_TDIR)	1992Q4	c	3,4,5	-6.67 (-2.90)	
LOG(DE_TDIREE)	1992Q3	c,s	1-5	-1.94 (-2.90)	I(1)
Δ LOG(DE_TDIREE)	1993Q1	s	2-4	-7.10 (-1.95)	
LOG(DE_TDIREM1)	1992Q4	c,t,s	1-2,4-6	-3.10 (-3.47)	I(1)
Δ LOG(DE_TDIREM1)	1992Q3	c,s	1,4	-6.57 (-2.90)	
LOG(DE_TIND)	1991Q3	c,t,s	1	-3.67 (-3.47)	TS
Δ LOG(DE_TIND)	1991Q3	c,s	none	-13.50 (-2.90)	
LOG(DE_TIND_TARIFFSA_SA)	1991Q2	c,t	1	-3.33 (-3.47)	I(1)
Δ LOG(DE_TIND_TARIFFSA_SA)	1991Q3	c	none	-13.78 (-2.90)	

Variable	From	Deter- ministics	Lags	Test statistics	Result
LOG(DE_TINDSUB)	1992Q2	c,t,s	4	-5.12 (-3.47)	TS
Δ LOG(DE_TINDSUB)	1992Q2	c,s	1,3	-9.95 (-2.90)	
LOG(DE_TRFGOV)	1992Q2	c,s	4	-3.21 (-2.90)	I(0)
Δ LOG(DE_TRFGOV)	1992Q2	s	1-3	-2.92 (-1.94)	
LOG(DE_TRFGOV_PH)	1992Q2	c,s	4	-2.76 (-2.90)	I(1)
Δ LOG(DE_TRFGOV_PH)	1992Q2	s	1-3	-2.92 (-1.94)	
LOG(DE_TRSONGOV)	1992Q1	c,t,s	1-3	-3.15 (-3.47)	I(1)
Δ LOG(DE_TRSONGOV)	1992Q1	c,s	1,2	-9.62 (-2.90)	
LOG(DE_TSS)	1992Q2	c,s	1-4	-3.07 (-2.90)	I(0)
Δ LOG(DE_TSS)	1992Q3	s	1-4	-2.16 (-1.95)	
LOG(DE_TSSEE_TARIFFSA_SA)	1991Q2	c,t	none	-3.02 (-3.47)	I(1)
Δ LOG(DE_TSSEE_TARIFFSA_SA)	1991Q3	c	none	-10.61(-2.90)	
LOG(DE_TSSEM)	1992Q2	c,s	2,4	-3.46 (-2.90)	I(0)
Δ LOG(DE_TSSEM)	1992Q3	s	1-4	-2.10 (-1.95)	
LOG(DE_TSSEM_TARIFFSA_SA)	1992Q2	c	1,4	-1.76 (-2.90)	I(1)
Δ LOG(DE_TSSEM_TARIFFSA_SA)	1992Q2	none	1-3	-2.37 (-1.94)	
LOG(DE_TSSEM1_TARIFFSA_SA)	1982Q2	c	1,4	-1.72 (-2.89)	I(1)
Δ LOG(DE_TSSEM1_TARIFFSA_SA)	1981Q3	none	none	-13.83 (-1.94)	
LOG(DE_ULC00)	1981Q2	c,t,s	3,4	-4.08 (-3.45)	TS
Δ LOG(DE_ULC00)	1981Q2	c,s	2,3	-17.79 (-2.88)	
DE_UR	1981Q3	c,s	1,4,5	-2.82 (-2.89)	I(1)
Δ DE_UR	1981Q3	s	4	-5.98 (-1.94)	
DE_WAGESHARE	1981Q2	c,t,s	1,3,4	-3.54 (-3.45)	TS
Δ DE_WAGESHARE	1981Q2	c,s	2,3	-17.54 (-2.88)	
LOG(DE_WDYENT)	1992Q2	c,t,s	4	-4.62 (-3.47)	TS
Δ LOG(DE_WDYENT)	1992Q2	c,s	2,3	-13.71 (-2.90)	
LOG(DE_X)	1980Q2	c,t,s	none	-2.51 (-3.45)	I(1)
Δ LOG(DE_X)	1980Q3	c,s	none	-10.33 (-2.88)	
LOG(DE_X00)	1980Q2	c,t,s	none	-2.45 (-3.45)	I(1)
Δ LOG(DE_X00)	1980Q3	c,s	none	-11.04 (-2.88)	
LOG(DE_XG00)	1981Q3	c,s	5	-0.19 (-2.89)	I(1)
Δ LOG(DE_XG00)	1981Q3	s	4	-6.79 (-1.94)	
LOG(DE_XG00_EWU)	1980Q2	c,t,s	none	-2.28 (-3.45)	I(1)
Δ LOG(DE_XG00_EWU)	1981Q3	c,s	4	-10.20 (-2.89)	
LOG(DE_XG00_ROW)	1980Q2	c,t,s	none	-2.18 (-3.45)	I(1)
Δ LOG(DE_XG00_ROW)	1981Q3	c,s	4	-11.69 (-2.89)	
LOG(DE_XG00_UK)	1981Q2	c,t	1,4	-2.77 (-3.45)	I(1)
Δ LOG(DE_XG00_UK)	1981Q3	c	4	-14.53 (-2.89)	
LOG(DE_XG00_US)	1980Q4	c,s	2	-1.81 (-2.88)	I(1)
Δ LOG(DE_XG00_US)	1980Q4	s	1	-6.76 (-1.94)	
LOG(DE_XS00)	1980Q3	c,t,s	none	-3.05 (-3.45)	I(1)
Δ LOG(DE_XS00)	1980Q4	c,s	1	-10.69 (-2.88)	
LOG(DE_YPROGOV)	1992Q2	c	1-4	-0.98 (-2.90)	I(1)
Δ LOG(DE_YPROGOV)	1992Q3	none	1,3,4	-15.55 (-1.95)	
LOG(EWU_ODE_IFC00)	1981Q2	c,t,s	1,3,4	-3.20 (-3.45)	I(1)
Δ LOG(EWU_ODE_IFC00)	1981Q3	c,s	1-4	-2.94 (-2.89)	

Variable	From	Deter- ministics	Lags	Test statistics	Result
LOG(DE_EWU6_ULC)	1982Q2	c,s	3,4	-1.43 (-2.89)	I(1)
Δ LOG(DE_EWU6_ULC)	1982Q2	s	1-3	-2.98 (-1.94)	
LOG(OIL\$)	1981Q2	c	1-4	-0.23 (-2.88)	I(1)
Δ LOG(OIL\$)	1981Q2	none	1,3	-9.96 (-1.94)	
LOG(DE_ROW_GDP00)	1981Q3	c,t	2,5	-1.81 (-3.45)	I(1)
Δ LOG(DE_ROW_GDP00)	1981Q3	c	1,4	-6.06 (-2.89)	
LOG(UK_GDP05_SB)	1980Q3	c	1	-1.46 (-2.88)	I(1)
Δ LOG(UK_GDP05_SB)	1980Q4	none	1	-3.27 (-1.94)	
LOG(UK_ULC)	1981Q2	c, s	1-4	-1.18 (-2.88)	I(1)
Δ LOG(UK_ULC)	1981Q3	s	1-4	-2.46 (-1.94)	
LOG(US_IFC00)	1980Q3	c	1	-1.93 (-2.88)	I(1)
Δ LOG(US_IFC00)	1980Q3	none	none	-6.32 (-1.94)	
LOG(US_ULC)	1980Q4	c,t,s	2	-2.89 (-3.45)	I(1)
Δ LOG(US_ULC)	1980Q4	c,s	1	-5.92 (-2.88)	

Table 2: Results of the Perron Tests

Variable	Model	Test statistics	Result
LOG(DE_CAPITAL00)	Model C, $\lambda=0.3$	-2.03 (-4.17)	I(1)
LOG(DE_CFC)	Model C, $\lambda=0.3$	-3.56 (-4.17)	I(1)
LOG(DE_CGOV)	Model C, $\lambda=0.3$	-3.47 (-4.17)	I(1)
LOG(DE_CGOV00)	Model A, $\lambda=0.3$	-5.11 (-3.76)	TS
LOG(DE_COE)	Model C, $\lambda=0.3$	-5.25 (-4.17)	TS
LOG(DE_COEE)	Model C, $\lambda=0.3$	-5.25 (-4.17)	TS
LOG(DE_COEE00)	Model C, $\lambda=0.3$	-2.24 (-4.17)	I(1)
LOG(DE_CP)	Model C, $\lambda=0.3$	-2.55 (-4.17)	I(1)
LOG(DE_CP00)	Model C, $\lambda=0.3$	-2.92 (-4.17)	I(1)
LOG(DE_DISPY)	Model C, $\lambda=0.3$	-5.40 (-4.17)	TS
LOG(DE_DISPY00)	Model C, $\lambda=0.3$	-3.76 (-4.17)	I(1)
LOG(DE_EE)	Model C, $\lambda=0.3$	-3.51 (-4.17)	I(1)
LOG(DE_END00)	Model C, $\lambda=0.3$	-3.80 (-4.17)	I(1)
LOG(DE_ET)	Model A, $\lambda=0.3$	-3.36 (-3.76)	I(1)
LOG(DE_GCF00)	Model C, $\lambda=0.3$	-3.87 (-4.17)	I(1)
LOG(DE_GDP)	Model C, $\lambda=0.3$	-4.07 (-4.17)	I(1)
LOG(DE_GDP00)	Model C, $\lambda=0.3$	-4.22 (-4.17)	TS
LOG(DE_GWAGE)	Model C, $\lambda=0.3$	-5.32 (-4.17)	TS
LOG(DE_GWAGEE)	Model C, $\lambda=0.3$	-5.15 (-4.17)	TS
LOG(DE_GWAGEE00)	Model C, $\lambda=0.3$	-3.36 (-4.17)	I(1)
LOG(DE_ICONGOV00)	Model A, $\lambda=0.3$	-2.02 (-3.76)	I(1)
LOG(DE_IEND00)	Model C, $\lambda=0.3$	-3.75 (-4.17)	I(1)
LOG(DE_IFC)	Model C, $\lambda=0.3$	-3.45 (-4.17)	I(1)
LOG(DE_IFC00)	Model C, $\lambda=0.3$	-3.89 (-4.17)	I(1)
LOG(DE_INRB00)	Model C, $\lambda=0.3$	-2.33 (-4.17)	I(1)
LOG(DE_NEV_EWU)	Model B, $\lambda=0.6$	-4.46 (-3.94)	TS
LOG(DE_NWAGE)	Model C, $\lambda=0.3$	-4.48 (-4.17)	TS
LOG(DE_PCGOV00)	Model C, $\lambda=0.3$	-3.75 (-4.17)	I(1)
LOG(DE_PGDP00)	Model C, $\lambda=0.3$	-3.62 (-4.17)	I(1)
LOG(DE_PIMEQ00)	Model C, $\lambda=0.3$	-3.48 (-4.17)	I(1)

Variable	Model	Test statistics	Result
LOG(DE_PIOTH00)	Model C, $\lambda=0.3$	-2.52 (-4.17)	I(1)
LOG(DE_POPUL)	Model A, $\lambda=0.3$	-3.20 (-3.76)	I(1)
LOG(DE_PRODEE)	Model C, $\lambda=0.3$	-3.52 (-4.17)	I(1)
LOG(DE_PTOTDEM)	Model C, $\lambda=0.3$	-3.08 (-4.17)	I(1)
LOG(DE_TSSEE)	Model C, $\lambda=0.3$	-2.00 (-4.17)	I(1)
LOG(DE_TSSEM1)	Model C, $\lambda=0.3$	-2.96 (-4.17)	I(1)
LOG(DE_U)	Model A, $\lambda=0.3$	-4.27 (-3.76)	I(0)
LOG(DE_ULC)	Model C, $\lambda=0.3$	-3.63 (-4.17)	I(1)
DE_XM	Model A, $\lambda=0.3$	-4.02 (-3.76)	TS
DE_XM00	Model C, $\lambda=0.3$	-3.65 (-4.17)	I(1)

3. Model Equations

3.1. Behavioural Equations

3.1.1. Real Aggregate Demand

Private final consumption expenditure

In the long term private final consumption expenditures is explained by disposable income and the nominal short term interest rate. The wage share has some explanatory power in the short term serving as a proxy for the influence of income distribution on consumption and saving.

The t-value of the coefficient of the error correction term of -5.597 is highly significant (5 percent critical value: -3.69). The diagnostic tests indicate that the residuals are uncorrelated and homoskedastic.

Table 3: Estimation equation of $\Delta\text{LOG}(\text{DE_CP00})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_CP00})$				
Method: Least Squares				
Sample (adjusted): 1982Q2 2011Q4				
Included observations: 119 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\text{LOG}(\text{DE_CP00}(-1))$	-0.485	0.087	-5.597	0.000
$\text{LOG}(\text{DE_DISPY00}(-1))$	0.473	0.086	5.515	0.000
$\text{DE_RS3M}(-1)$	-0.002	0.001	-3.326	0.001
C	0.031	0.025	1.207	0.230
Z1	-0.072	0.010	-7.374	0.000
Z2	0.005	0.007	0.646	0.520
Z3	-0.009	0.005	-1.867	0.065
$\Delta(\text{DE_WAGESHARE}(-1))$	0.210	0.086	2.433	0.017
$\Delta\text{LOG}(\text{DE_CP00}(-1))+\Delta\text{LOG}(\text{DE_CP00}(-2))$	-0.091	0.025	-3.587	0.001
$\Delta\text{LOG}(\text{DE_CP00}(-4))$	0.186	0.034	5.424	0.000
$\Delta\text{LOG}(\text{DE_DISPY00}(-3))$	-0.104	0.027	-3.884	0.000
$\Delta\text{LOG}(\text{DE_DISPY00}(-5))$	-0.099	0.032	-3.093	0.003
$\Delta\text{LOG}(\text{DE_DISPY00}(-8))$	0.346	0.038	9.098	0.000
$\Delta(\text{DE_RS3M}(-1))$	0.006	0.002	3.041	0.003
I91Q1	0.244	0.010	23.601	0.000
I93Q1	-0.095	0.013	-7.574	0.000
I01Q1	0.026	0.010	2.592	0.011

Table 4: Diagnostics of estimation equation of $\Delta\text{LOG}(\text{DE_CP00})$

Adjusted R2	0.96
Residual tests	
Normality test (Jarque-Bera)	0.97
Serial correlation LM test (lag 1)	0.11
Serial correlation LM test (lag 4)	0.51
Serial correlation LM test (lag 8)	0.36
ARCH LM test (lag 1)	0.36
ARCH LM test (lag 4)	0.17
White's heteroskedasticity test	0.12
RESET test (h=2)	0.01
Stability tests	Number of observations outside error bands
CUSUM test	0
CUSUM of squares test	3

Government consumption expenditure

The long-term evolution of government consumption is explained by past real GDP excluding government consumption. Due to structural breaks two step dummies are included in the error correction term. With a t-value of -3.105 the coefficient of the error-correction term is not significant (5 percent critical value: -3.91)

Table 5: Estimation equation of $\Delta\text{LOG}(\text{DE_CGOV00})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_CGOV00})$				
Method: Least Squares				
Sample (adjusted): 1982Q2 2011Q4				
Included observations: 119 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\text{LOG}(\text{DE_CGOV00}(-1))$	-0.109	0.035	-3.105	0.003
$\text{LOG}(\text{DE_GDP00}(-8)-\text{DE_CGOV00}(-8))$	0.046	0.022	2.108	0.037
S91Q1	0.026	0.008	3.410	0.001
S09Q1	0.008	0.004	2.120	0.036
C	0.197	0.065	3.060	0.003
Z1	-0.037	0.006	-6.003	0.000
Z2	-0.024	0.004	-5.813	0.000
Z3	-0.018	0.004	-4.261	0.000
$\Delta\text{LOG}(\text{DE_GDP00}(-2))$	0.103	0.035	2.907	0.005
$\Delta\text{LOG}(\text{DE_CGOV00}(-4))$	0.598	0.067	8.908	0.000
$\Delta\text{LOG}(\text{DE_CGOV00}(-8))$	-0.154	0.044	-3.514	0.001
I89Q1	-0.034	0.009	-3.621	0.001
I90Q1	0.042	0.009	4.452	0.000
I91Q1	0.124	0.012	10.591	0.000
I92Q1	-0.102	0.014	-7.083	0.000
I95Q1	-0.050	0.009	-5.442	0.000

The diagnostic tests show that the residuals are well-behaved and the estimation is stable over the sample.

Table 6: Diagnostics of estimation equation of $\Delta\text{LOG}(\text{DE_CGOV00})$

Adjusted R2	0.94
Residual tests	
Normality test (Jarque-Bera)	0.51
Serial correlation LM test (lag 1)	0.34
Serial correlation LM test (lag 4)	0.52
Serial correlation LM test (lag 8)	0.13
ARCH LM test (lag 1)	0.94
ARCH LM test (lag 4)	0.76
White's heteroskedasticity test	0.29
RESET test (h=2)	0.11
Stability tests	Number of observations outside error bands
CUSUM test	0
CUSUM of squares test	0

Gross fixed capital formation: machinery and equipment**Table 7: Estimation equation of $\Delta\text{LOG}(\text{DE_IMEQ00})$**

Dependent Variable: $\Delta\text{LOG}(\text{DE_IMEQ00})$				
Method: Least Squares				
Sample (adjusted): 1982Q3 2011Q4				
Included observations: 118 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\text{LOG}(\text{DE_IMEQ00}(-1))$	-0.107	0.031	-3.422	0.001
$\text{LOG}(\text{DE_GDP00}(-1))+\text{DE_M00}(-1))$	0.056	0.030	1.873	0.064
$\text{DE_RL10Y}(-1)$	-0.010	0.002	-4.651	0.000
C	0.079	0.114	0.690	0.492
Z1	-0.387	0.033	-11.555	0.000
Z2	-0.052	0.033	-1.608	0.111
Z3	-0.108	0.039	-2.770	0.007
Z1*S91Q1	0.124	0.014	8.795	0.000
Z2*S91Q1	0.060	0.013	4.699	0.000
Z3*S91Q1	0.085	0.015	5.659	0.000
$\Delta\text{LOG}(\text{DE_CAPA})$	1.026	0.168	6.127	0.000
$\Delta\text{LOG}(\text{DE_ULC00}(-3))$ $+\Delta\text{LOG}(\text{DE_ULC00}(-6))$	-0.245	0.123	-1.986	0.050
$\Delta\text{LOG}(\text{DE_IMEQ00}(-2))$	0.288	0.053	5.399	0.000
$\Delta\text{LOG}(\text{DE_IMEQ00}(-3))$	-0.102	0.062	-1.656	0.101
$\Delta\text{LOG}(\text{DE_GDP00}(-3)+\text{DE_M00}(-3))$ $+\Delta\text{LOG}(\text{DE_GDP00}(-5)+\text{DE_M00}(-5))$	0.155	0.094	1.649	0.103
$\Delta(\text{DE_RL10Y}(-1)) + \Delta(\text{DE_RL10Y}(-5))$ $+\Delta(\text{DE_RL10Y}(-4)) + \Delta(\text{DE_RL10Y}(-9))$	0.016	0.004	3.553	0.001
I83Q1	0.036	0.021	1.705	0.092
I83Q2	0.045	0.021	2.099	0.039
I84Q2	-0.062	0.022	-2.857	0.005
I84Q3	0.122	0.022	5.545	0.000
I91Q1	0.113	0.023	4.827	0.000
I01Q2	-0.046	0.021	-2.233	0.028
I07Q4	0.057	0.021	2.764	0.007
I09Q1	-0.149	0.022	-6.836	0.000

In the long run investment into machinery and equipment is determined by total demand and the long-term nominal interest rate. The coefficient of the error-correction term is significant at the 10 percent level (10 percent critical value: -3.39, 5 percent critical value: -3.69).

The estimated equation passes all diagnostic tests.

Table 8: Diagnostics of estimation equation of $\Delta\text{LOG}(\text{DE_IMEQ00})$

Adjusted R2	0.99
Residual tests	
Normality test (Jarque-Bera)	0.84
Serial correlation LM test (lag 1)	0.85
Serial correlation LM test (lag 4)	0.47
Serial correlation LM test (lag 8)	0.47
ARCH LM test (lag 1)	0.21
ARCH LM test (lag 4)	0.46
White's heteroskedasticity test	0.75
RESET test (h=2)	0.95
Stability tests	Number of observations outside error bands
CUSUM test	0
CUSUM of squares test	0

Gross fixed capital formation: private residential construction

In the long term private residential construction is explained by the population, the real long-term interest rate and a step dummy. With a t-value of -7.298 the coefficient of the error-correction term is highly significant (5 percent critical value: -3.91).

Table 9: Estimation equation of $\Delta\text{LOG}(\text{DE_ID00})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_ID00})$				
Method: Least Squares				
Sample (adjusted): 1981Q4 2011Q4				
Included observations: 121 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(DE_ID00(-1))	-0.315	0.043	-7.298	0.000
LOG(DE_POPUL(-1))	0.463	0.077	6.015	0.000
DE_RL10Y00(-3)	-0.005	0.001	-3.409	0.001
S02Q1	-0.058	0.010	-5.644	0.000
C	-4.098	0.725	-5.653	0.000
Z1	-0.062	0.009	-6.591	0.000
Z2	0.148	0.021	6.970	0.000
Z3	0.080	0.010	8.329	0.000
$\Delta\text{LOG}(\text{DE_ID00}(-4))$	0.294	0.059	4.952	0.000
$\Delta\text{LOG}(\text{DE_PID00}(-1))$	-1.477	0.363	-4.070	0.000
I85Q1	-0.181	0.028	-6.496	0.000
I86Q1	-0.123	0.030	-4.145	0.000
I87Q1	-0.162	0.029	-5.578	0.000
I91Q1	0.125	0.029	4.366	0.000
I05Q1	-0.096	0.028	-3.458	0.001

Table 10: Diagnostics of estimation equation of $\Delta\text{LOG}(\text{DE_ID00})$

Adjusted R2	0.97
Residual tests	
Normality test (Jarque-Bera)	0.19
Serial correlation LM test (lag 1)	0.61
Serial correlation LM test (lag 4)	0.63
Serial correlation LM test (lag 8)	0.52
ARCH LM test (lag 1)	0.81
ARCH LM test (lag 4)	0.10
White's heteroskedasticity test	0.05
RESET test (h=2)	0.35
Stability tests	Number of observations outside error bands
CUSUM test	0
CUSUM of squares test	0

The estimation equation passes most diagnostic tests. There is some indication of heteroskedasticity.

Gross fixed capital formation: private non-residential construction

There is a highly significant long-term relationship between private non-residential construction and domestic final demand, although some structural changes in this relationship have to be modelled with dummy variables. With a t-statistic of -6.038 the coefficient of the error-correction term is highly significant (5 percent critical value: -3.91).

Table 11: Estimation equation of $\Delta\text{LOG}(\text{DE_INRB00})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_INRB00})$				
Method: Least Squares				
Sample (adjusted): 1981Q2 2011Q4				
Included observations: 123 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(DE_INRB00(-1))	-0.419	0.069	-6.038	0.000
LOG(DE_IEND00(-1))	0.471	0.084	5.608	0.000
S02Q1*LOG(@TREND)	-0.012	0.003	-3.618	0.001
1-S98Q1	0.097	0.018	5.262	0.000
C	-1.748	0.335	-5.218	0.000
Z1	-0.087	0.020	-4.336	0.000
Z2	0.146	0.030	4.960	0.000
Z3	0.061	0.016	3.682	0.000
I91Q1	0.174	0.036	4.857	0.000
Z1*S91Q1	0.052	0.022	2.401	0.018
Z2*S91Q1	-0.028	0.021	-1.331	0.186
Z3*S91Q1	0.011	0.019	0.604	0.547
$\Delta\text{LOG}(\text{DE_INRB00}(-4))$	0.296	0.065	4.565	0.000
I85Q1	-0.152	0.037	-4.097	0.000
I87Q1	-0.134	0.037	-3.608	0.001
I96Q1	-0.128	0.036	-3.541	0.001
I05Q1	-0.110	0.036	-3.063	0.003

Except for some heteroskedasticity the residuals are well-behaved and the estimation is stable over the sample period.

Table 12: Diagnostics of estimation equation of $\Delta\text{LOG}(\text{DE_INRB00})$

Adjusted R2	0.94
Residual tests	
Normality test (Jarque-Bera)	0.49
Serial correlation LM test (lag 1)	0.66
Serial correlation LM test (lag 4)	0.46
Serial correlation LM test (lag 8)	0.52
ARCH LM test (lag 1)	0.99
ARCH LM test (lag 4)	0.34
White's heteroskedasticity test	0.02
RESET test (h=2)	0.06
Stability tests	Number of observations outside error bands
CUSUM test	0
CUSUM of squares test	0

Other gross fixed capital formation

The long-term evolution of other gross fixed capital formation is explained by real exports and a linear trend starting in 1970. With a t-statistic of -4.225 the coefficient of the error-correction term is highly significant (5 percent critical value: -3.69).

Table 13: Estimation equation of $\Delta\text{LOG}(\text{DE_IOTH00})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_IOTH00})$				
Method: Least Squares				
Sample (adjusted): 1982Q2 2011Q4				
Included observations: 119 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\text{LOG}(\text{DE_IOTH00}(-1))$	-0.151	0.036	-4.225	0.000
$\text{LOG}(\text{DE_X00}(-1))$	0.034	0.014	2.363	0.020
$\text{LOG}(@\text{TREND}(1970:1))$	0.208	0.051	4.115	0.000
C	-0.935	0.226	-4.133	0.000
Z1	-0.058	0.011	-5.145	0.000
Z2	-0.025	0.005	-4.634	0.000
Z3	-0.034	0.007	-4.597	0.000
$\Delta\text{LOG}(\text{DE_IOTH00}(-4))$	0.576	0.080	7.197	0.000
$\Delta\text{LOG}(\text{DE_IOTH00}(-8))$	0.172	0.081	2.118	0.037
$\Delta\text{LOG}(\text{DE_X00}(-3))$	0.103	0.044	2.378	0.019
$\Delta\text{LOG}(\text{DE_X00}(-4))$	-0.114	0.045	-2.546	0.012
I86Q4	-0.066	0.018	-3.726	0.000

The specification passes all diagnostic tests at the 5 percent level.

Table 14: Diagnostics of estimation equation of $\Delta\text{LOG}(\text{DE_IOTH00})$

Adjusted R2	0.93
Residual tests	
Normality test (Jarque-Bera)	0.11
Serial correlation LM test (lag 1)	0.56
Serial correlation LM test (lag 4)	0.78
Serial correlation LM test (lag 8)	0.89
ARCH LM test (lag 1)	0.09
ARCH LM test (lag 4)	0.17
White's heteroskedasticity test	0.15
RESET test (h=2)	0.24
Stability tests	Number of observations outside error bands
CUSUM test	0
CUSUM of squares test	0

Changes in inventories and net acquisition of valuables

No error-correction equation is estimated, because the variable is stationary. It is explained by its own lagged observations and some deterministics, making it in fact an exogenous variable.

Table 15: Estimation equation of DE_INV00

Dependent Variable: DE_INV00				
Method: Least Squares				
Sample (adjusted): 1981Q2 2011Q4				
Included observations: 123 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.938	0.434	2.161	0.033
Z1*@TREND	0.041	0.024	1.693	0.093
Z2*@TREND	0.029	0.013	2.219	0.029
Z3*@TREND	-0.001	0.023	-0.038	0.970
DE_INV00(-1)	0.153	0.079	1.921	0.057
DE_INV00(-3)	-0.213	0.056	-3.781	0.000
DE_INV00(-4)	0.642	0.059	10.882	0.000
DE_INV00(-5)	-0.251	0.075	-3.342	0.001
I91Q1	12.753	2.592	4.920	0.000
I91Q2	6.732	2.759	2.440	0.016
I91Q3	9.136	2.688	3.399	0.001
I06Q4	-10.899	2.683	-4.063	0.000
I09Q2	-8.880	2.657	-3.343	0.001
S91Q1	1.449	0.558	2.598	0.011

The diagnostic tests indicate autoregressive conditional heteroskedasticity as well as limited stability over the sample period.

Table 16: Diagnostics of estimation equation of DE_INV00

Adjusted R2	0.93
Residual tests	
Normality test (Jarque-Bera)	0.65
Serial correlation LM test (lag 1)	0.87
Serial correlation LM test (lag 4)	0.84
Serial correlation LM test (lag 8)	0.59
ARCH LM test (lag 1)	0.68
ARCH LM test (lag 4)	0.00
White's heteroskedasticity test	0.45
RESET test (h=2)	0.92
Stability tests	Number of observations outside error bands
CUSUM test	0
CUSUM of squares test	24

Exports of goods to the euro area

In the long run real exports of goods to the euro area are explained by gross fixed capital formation in other euro area countries, the real exchange rate based on unit labour costs and a trend representing increasing economic integration. With a t-statistic of -8.174 the coefficient of the error-correction term is highly significant (5 percent critical value: -3.91)

Table 17: Estimation equation of $\Delta\text{LOG}(\text{DE_XG00_EWU})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_XG00_EWU})$				
Method: Least Squares				
Sample (adjusted): 1981Q2 2011Q4				
Included observations: 123 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\text{LOG}(\text{DE_XG00_EWU}(-1))$	-0.789	0.096	-8.174	0.000
$\text{LOG}(\text{EWU_ODE_IFC00}(-1))$	0.551	0.084	6.563	0.000
$\text{LOG}(\text{DE_NEV_EWU}(-1)*\text{DE_ULC}(-1)*100/\text{EWU6_ULC}(-1))$	-0.539	0.071	-7.577	0.000
@TREND	0.004	0.001	8.111	0.000
C	2.881	0.394	7.314	0.000
Z1	0.022	0.054	0.402	0.689
Z2	-0.062	0.016	-3.939	0.000
Z3	-0.029	0.050	-0.580	0.563
$\Delta\text{LOG}(\text{DE_XG00_EWU}(-1))$	0.154	0.089	1.732	0.086
$\Delta\text{LOG}(\text{DE_XG00_EWU}(-2))$	0.102	0.082	1.247	0.215
$\Delta\text{LOG}(\text{DE_XG00_EWU}(-4))$	0.189	0.079	2.399	0.018
$\Delta\text{LOG}(\text{EWU_ODE_IFC00})$	0.823	0.124	6.652	0.000
$\Delta\text{LOG}(\text{EWU_ODE_IFC00}(-1))$	0.389	0.146	2.668	0.009
$\Delta\text{LOG}(\text{EWU_ODE_IFC00}(-2))$	0.603	0.139	4.351	0.000
$\Delta\text{LOG}(\text{EWU_ODE_IFC00}(-3))$	0.324	0.137	2.356	0.020
$\Delta\text{LOG}(\text{DE_NEV_EWU}*\text{DE_ULC}*100/\text{EWU6_ULC})$	-0.427	0.134	-3.176	0.002

The specification passes all diagnostic tests. The residuals are well-behaved and the estimated equation is stable over the sample period.

Table 18: Diagnostics of estimation equation of $\Delta\text{LOG}(\text{DE_XG00_EWU})$

Adjusted R2	0.85
Residual tests	
Normality test (Jarque-Bera)	0.17
Serial correlation LM test (lag 1)	0.05
Serial correlation LM test (lag 4)	0.29
Serial correlation LM test (lag 8)	0.55
ARCH LM test (lag 1)	0.55
ARCH LM test (lag 4)	0.76
White's heteroskedasticity test	0.99
RESET test (h=2)	0.31
Stability tests	Number of observations outside error bands
CUSUM test	0
CUSUM of squares test	0

Exports of goods to the United Kingdom

German exports to the UK are explained by UK GDP and the real exchange rate based on unit labour costs. With a t-statistic of -5.922 the coefficient of the error-correction term is highly significant (5 percent critical value: -3.69).

In the estimation of the short run dynamics some insignificant variables were not eliminated, because this would have led to autocorrelation in the residuals.

Table 19: Estimation equation of $\Delta\text{LOG}(\text{DE_XG00_UK})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_XG00_UK})$				
Method: Least Squares				
Sample (adjusted): 1981Q2 2011Q4				
Included observations: 123 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(DE_XG00_UK(-1))	-0.399	0.067	-5.922	0.000
LOG(UK_GDP05_SB(-1))	0.656	0.119	5.505	0.000
LOG(DE_NEV_UK(-1)*DE_ULC(-1)*100/UK_ULC(-1))	-0.115	0.033	-3.515	0.001
C	-1.440	0.350	-4.112	0.000
$\Delta\text{LOG}(\text{UK_GDP05_SB})$	2.463	0.668	3.684	0.000
$\Delta\text{LOG}(\text{UK_GDP05_SB}(-1))$	1.286	0.731	1.760	0.081
$\Delta\text{LOG}(\text{UK_GDP05_SB}(-3))$	1.504	0.680	2.212	0.029
$\Delta\text{LOG}(\text{DE_XG00_UK}(-1))$	-0.328	0.088	-3.731	0.000
$\Delta\text{LOG}(\text{DE_XG00_UK}(-3))$	-0.136	0.084	-1.610	0.110
$\Delta\text{LOG}(\text{DE_XG00_UK}(-2))$	-0.093	0.087	-1.066	0.289
$\Delta\text{LOG}(\text{DE_XG00_UK}(-4))$	0.122	0.079	1.550	0.124
$\Delta\text{LOG}(\text{DE_NEV_UK*DE_ULC*100/UK_ULC})$	-0.183	0.045	-4.048	0.000
$\Delta\text{LOG}(\text{DE_NEV_UK}(-1)*\text{DE_ULC}(-1)*100/\text{UK_ULC}(-1))$	-0.071	0.048	-1.481	0.142
$\Delta\text{LOG}(\text{DE_NEV_UK}(-2)*\text{DE_ULC}(-2)*100/\text{UK_ULC}(-2))$	-0.097	0.046	-2.132	0.035
$\Delta\text{LOG}(\text{DE_NEV_UK}(-3)*\text{DE_ULC}(-3)*100/\text{UK_ULC}(-3))$	-0.126	0.045	-2.802	0.006

The residuals are well-behaved and the estimation equation is stable over the sample period.

Table 20: Estimation equation of $\Delta\text{LOG}(\text{DE_XG00_UK})$

Adjusted R2	0.49
Residual tests	
Normality test (Jarque-Bera)	0.45
Serial correlation LM test (lag 1)	0.26
Serial correlation LM test (lag 4)	0.09
Serial correlation LM test (lag 8)	0.34
ARCH LM test (lag 1)	0.61
ARCH LM test (lag 4)	0.78
White's heteroskedasticity test	0.17
RESET test (h=2)	0.31
Stability tests	outside error bands
CUSUM test	0
CUSUM of squares test	0

Exports of goods to the United States of America

German exports of goods to the USA are determined in the long run by US gross fixed capital formation, the real exchange rate based on unit labour costs and a trend. With a t-statistic of -5.691 error-correction coefficient is highly significant (5 percent critical value: -3.91)

Table 21: Estimation equation of $\Delta\text{LOG}(\text{DE_XG00_US})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_XG00_US})$				
Method: Least Squares				
Sample (adjusted): 1981Q3 2011Q4				
Included observations: 122 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(DE_XG00_US(-1))	-0.322	0.057	-5.691	0.000
LOG(US_IFC00(-1))	0.235	0.081	2.919	0.004
LOG(DE_NEV_US(-1) *DE_ULC(-1) *100/US_ULC(-1))	-0.337	0.046	-7.391	0.000
@TREND	0.002	0.000	4.945	0.000
C	0.850	0.241	3.526	0.001
Z1	-0.078	0.029	-2.642	0.010
Z2	-0.096	0.019	-5.059	0.000
Z3	-0.063	0.019	-3.277	0.001
$\Delta\text{LOG}(\text{DE_XG00_US}(-1))$	-0.277	0.070	-3.937	0.000
$\Delta\text{LOG}(\text{DE_XG00_US}(-2))$	-0.181	0.081	-2.243	0.027
$\Delta\text{LOG}(\text{DE_XG00_US}(-3))$	-0.244	0.070	-3.491	0.001
$\Delta\text{LOG}(\text{DE_XG00_US}(-5))$	-0.184	0.064	-2.891	0.005
$\Delta\text{LOG}(\text{US_IFC00})$	1.241	0.269	4.616	0.000
$\Delta\text{LOG}(\text{US_IFC00}(-2))$	1.426	0.344	4.148	0.000
$\Delta\text{LOG}(\text{US_IFC00}(-4))$	0.635	0.296	2.147	0.034
$\Delta\text{LOG}(\text{DE_NEV_US} * \text{DE_ULC} * 100 / \text{US_ULC})$	-0.264	0.089	-2.949	0.004
I84Q2	-0.190	0.050	-3.807	0.000

The specification passes all diagnostic tests.

Table 22: Diagnostics of estimation equation of $\Delta\text{LOG}(\text{DE_XG00_US})$

Adjusted R2	0.70
Residual tests	
Normality test (Jarque-Bera)	0.84
Serial correlation LM test (lag 1)	0.16
Serial correlation LM test (lag 4)	0.17
Serial correlation LM test (lag 8)	0.27
ARCH LM test (lag 1)	0.66
ARCH LM test (lag 4)	0.28
White's heteroskedasticity test	0.63
RESET test (h=2)	0.84
Stability tests	Number of observations outside error bands
CUSUM test	0
CUSUM of squares test	0

Exports of goods to the rest of the world

The long-term evolution of exports to the rest of the world is explained by real GDP in the rest of the world and the real effective exchange rate in terms of the CPI vis-à-vis 56 countries. With a t-statistic of -5.064 the error-correction coefficient is highly significant (5 percent critical value: -3.69). Short-run dynamics of exports of goods to the rest of the world are determined by foreign demand.

Table 23: Estimation equation of $\Delta\text{LOG}(\text{DE_XG00_ROW})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_XG00_ROW})$				
Method: Least Squares				
Sample: 1988Q1 2011Q4				
Included observations: 96				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(DE_XG00_ROW(-1))	-0.430	0.085	-5.064	0.000
LOG(ROW_GDP00(-1))	0.914	0.185	4.944	0.000
LOG(DE_REEV_56_CPI(-1))	-0.395	0.124	-3.180	0.002
C	-0.719	0.610	-1.179	0.242
Z1	-0.099	0.014	-7.183	0.000
Z2	-0.027	0.013	-1.991	0.050
Z3	-0.018	0.013	-1.409	0.163
$\Delta\text{LOG}(\text{ROW_GDP00})$	1.291	0.747	1.730	0.087
$\Delta\text{LOG}(\text{ROW_GDP00}(-1))$	2.446	0.701	3.487	0.001
$\Delta\text{LOG}(\text{ROW_GDP00}(-5))$	1.604	0.719	2.231	0.028
I90Q4	0.186	0.048	3.849	0.000
I91Q1	-0.117	0.053	-2.222	0.029

The residuals pass all diagnostic tests and the specification is stable over the sample period.

Table 24: Diagnostics of estimation equation of $\Delta\text{LOG}(\text{DE_XG00_ROW})$

Adjusted R2	0.67
Residual tests	
Normality test (Jarque-Bera)	0.23
Serial correlation LM test (lag 1)	0.73
Serial correlation LM test (lag 4)	0.29
Serial correlation LM test (lag 8)	0.53
ARCH LM test (lag 1)	0.72
ARCH LM test (lag 4)	0.70
White's heteroskedasticity test	0.43
RESET test (h=2)	0.49
Stability tests	Number of observations outside error bands
CUSUM test	0
CUSUM of squares test	0

Exports of services

Exports of services include a large number of services which are somehow connected to exports of goods such as transport or insurance. Therefore it is not surprising that long-term service exports are linked to goods exports. The t-statistic of -4.495 indicates that the error-correction coefficient is highly significant (5 percent critical value: -3.41). The real effective exchange rate vis-à-vis 24 countries (based on the total demand deflator) plays an important role for the short-term dynamics.

Table 25: Estimation equation of $\Delta\text{LOG}(\text{DE_XS00})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_XS00})$				
Method: Least Squares				
Sample (adjusted): 1981Q4 2011Q4				
Included observations: 121 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\text{LOG}(\text{DE_XS00}(-1))$	-0.234	0.052	-4.495	0.000
$\text{LOG}(\text{DE_XG00}(-1))$	0.233	0.050	4.636	0.000
C	-0.397	0.090	-4.431	0.000
Z1	-0.155	0.016	-9.767	0.000
Z2	-0.048	0.014	-3.378	0.001
Z3	-0.023	0.015	-1.542	0.126
$\Delta\text{LOG}(\text{DE_XS00}(-1))$	-0.248	0.051	-4.839	0.000
$\Delta\text{LOG}(\text{DE_XG00}(-4))$	-0.206	0.112	-1.836	0.069
$\Delta\text{LOG}(\text{DE_REEV_24_PTOTDEM})$	-0.714	0.322	-2.216	0.029
$\Delta\text{LOG}(\text{DE_REEV_24_PTOTDEM}(-1))$	-1.096	0.313	-3.501	0.001
$\Delta\text{LOG}(\text{DE_REEV_24_PTOTDEM}(-3))$	0.681	0.315	2.159	0.033
$\Delta\text{LOG}(\text{DE_REEV_24_PTOTDEM}(-6))$	-0.527	0.279	-1.890	0.062
I90Q1	0.181	0.043	4.259	0.000
I90Q3	0.380	0.043	8.834	0.000
I90Q4	0.234	0.049	4.774	0.000
I91Q1	-0.450	0.048	-9.421	0.000
I99Q1	-0.199	0.043	-4.595	0.000
I01Q4	0.177	0.043	4.114	0.000

The diagnostics reveal some serial correlation, which could not be eliminated despite the inclusion of lagged dependent variables.

Table 26: Diagnostics of estimation equation of $\Delta\text{LOG}(\text{DE_XS00})$

Adjusted R2	0.88
Residual tests	
Normality test (Jarque-Bera)	0.64
Serial correlation LM test (lag 1)	0.09
Serial correlation LM test (lag 4)	0.02
Serial correlation LM test (lag 8)	0.15
ARCH LM test (lag 1)	0.33
ARCH LM test (lag 4)	0.18
White's heteroskedasticity test	0.30
RESET test (h=2)	0.13
Stability tests	Number of observations outside error bands
CUSUM test	0
CUSUM of squares test	0

Imports of goods

Table 27: Estimation equation of $\Delta\text{LOG}(\text{DE_MG00})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_MG00})$				
Method: Least Squares				
Sample (adjusted): 1981Q3 2011Q4				
Included observations: 122 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\text{LOG}(\text{DE_MG00}(-1))$	-0.468	0.075	-6.224	0.000
$\text{LOG}(\text{DE_PMGREL}(-1))$	-0.206	0.037	-5.618	0.000
$\text{LOG}(\text{DE_XG00}(-1))$	0.277	0.043	6.407	0.000
$\text{LOG}(\text{DE_IMEQ00}(-1))$	0.126	0.037	3.396	0.001
$(\text{S91Q1}) * \text{@TREND}$	0.001	0.000	4.504	0.000
C	1.283	0.219	5.863	0.000
Z1	-0.043	0.025	-1.720	0.088
Z2	-0.029	0.015	-1.955	0.053
Z3	-0.071	0.023	-3.080	0.003
$\Delta\text{LOG}(\text{DE_XG00})$	0.410	0.059	6.968	0.000
$\Delta\text{LOG}(\text{DE_XG00}(-3))$	-0.140	0.058	-2.400	0.018
$\Delta\text{LOG}(\text{DE_XG00}(-5))$	-0.104	0.055	-1.894	0.061
$\Delta\text{LOG}(\text{DE_CP00}(-1))$	0.265	0.067	3.984	0.000
$\Delta\text{LOG}(\text{DE_IMEQ00})$	0.182	0.054	3.379	0.001
$\Delta\text{LOG}(\text{DE_IMEQ00}(-3))$	0.185	0.055	3.341	0.001
$\Delta\text{LOG}(\text{DE_MG00}(-2))$	0.111	0.059	1.869	0.064
I93Q1	-0.084	0.022	-3.810	0.000
I05Q1	-0.066	0.021	-3.147	0.002

In the long run imports of goods depend on the prices of imported goods relative to the domestic price level, exports of goods and investment into machinery and equipment. They rise with increasing economic integration, which is represented by a trend beginning in 1991 in this equation. The error-

correction coefficient is highly significant with a t-statistic of -6.224 (5 percent critical value: -4.12). In the short run changes of private consumption also play a role.

The residuals are well-behaved and the specification is stable over the forecast period.

Table 28: Diagnostics of estimation equation of $\Delta\text{LOG}(\text{DE_MG00})$

Adjusted R2	0.83
Residual tests	
Normality test (Jarque-Bera)	0.29
Serial correlation LM test (lag 1)	0.76
Serial correlation LM test (lag 4)	0.17
Serial correlation LM test (lag 8)	0.17
ARCH LM test (lag 1)	0.31
ARCH LM test (lag 4)	0.29
White's heteroskedasticity test	0.27
RESET test (h=2)	0.73
Stability tests	Number of observations outside error bands
CUSUM test	0
CUSUM of squares test	0

Imports of services

In the long run real imports of services, which include expenditures of German tourists abroad, are explained by real disposable income. The t-statistic of the error-correction coefficient is not very significant (5 percent critical value: -3.41, 10 percent critical value: -3.13).

Table 29: Estimation equation of $\Delta\text{LOG}(\text{DE_MS00})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_MS00})$				
Method: Least Squares				
Sample (adjusted): 1981Q2 2011Q4				
Included observations: 123 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\text{LOG}(\text{DE_MS00}(-1))$	-0.054	0.018	-3.094	0.003
$\text{LOG}(\text{DE_DISPY00}(-1))$	0.095	0.030	3.185	0.002
C	-0.345	0.117	-2.946	0.004
Z1	-0.005	0.024	-0.197	0.844
Z2	0.052	0.031	1.692	0.093
Z3	0.115	0.025	4.528	0.000
$\Delta\text{LOG}(\text{DE_MS00}(-1))$	-0.336	0.083	-4.063	0.000
$\Delta\text{LOG}(\text{DE_MS00}(-2))$	-0.252	0.084	-3.002	0.003
$\Delta\text{LOG}(\text{DE_MS00}(-3))$	-0.248	0.085	-2.908	0.004
$\Delta\text{LOG}(\text{DE_MS00}(-4))$	0.292	0.085	3.445	0.001
$\Delta\text{LOG}(\text{DE_DISPY00}(-3))$	0.199	0.093	2.140	0.035
$\Delta\text{LOG}(\text{DE_DISPY00}(-4))$	-0.276	0.094	-2.947	0.004

There is some higher order autocorrelation in the residuals as well as some autoregressive conditional heteroskedasticity. Thus, the specification is not optimal.

Table 30: Diagnostics of estimation equation of $\Delta\text{LOG}(\text{DE_MS00})$

Adjusted R2	0.96
Residual tests	
Normality test (Jarque-Bera)	0.43
Serial correlation LM test (lag 1)	0.80
Serial correlation LM test (lag 4)	0.08
Serial correlation LM test (lag 8)	0.07
ARCH LM test (lag 1)	0.76
ARCH LM test (lag 4)	0.05
White's heteroskedasticity test	0.60
RESET test (h=2)	0.02
Stability tests	Number of observations outside error bands
CUSUM test	0
CUSUM of squares test	4

3.1.2.Prices and Exchange Rates

Private consumption deflator

In the long term the private consumption deflator is explained by unit labour costs, the price level (CPI) in the euro area and the oil price in euro terms. The error-correction coefficient is highly significant with a t-statistic of -7.250 (5 percent critical value: -3.91).

Table 31: Estimation equation of $\Delta\text{LOG}(\text{DE_PCP00})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_PCP00})$ Method: Least Squares Sample: 1982Q1 2011Q4 Included observations: 120				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\text{LOG}(\text{DE_PCP00}(-1))$	-0.159	0.022	-7.250	0.000
$\text{LOG}(\text{DE_ULC}(-1))$	0.040	0.011	3.605	0.001
$\text{LOG}(\text{CPI_EWU}(-1))$	0.079	0.011	7.201	0.000
$\text{LOG}(\text{OIL\$}(-1)/\text{DE_NEV_US}(-1)/100)$	0.003	0.001	2.295	0.024
C	0.406	0.074	5.514	0.000
Z1	-0.024	0.005	-5.234	0.000
Z2	-0.010	0.002	-4.795	0.000
Z3	-0.009	0.002	-4.146	0.000
$\Delta\text{LOG}(\text{DE_PCP00}(-4))$	0.131	0.025	5.173	0.000
$\Delta\text{LOG}(\text{DE_PM00})$	0.086	0.020	4.345	0.000
$\Delta\text{LOG}(\text{DE_PM00}(-1))$	-0.107	0.018	-5.952	0.000
$\Delta\text{LOG}(\text{DE_ULC}(-4))$	-0.064	0.018	-3.643	0.000
$\Delta\text{LOG}(\text{CPI_EWU})$	0.535	0.084	6.338	0.000
$\Delta\text{LOG}(\text{CPI_EWU}(-1))$	0.423	0.089	4.744	0.000
I91Q1	-0.050	0.003	-15.935	0.000

The specification passes all diagnostic tests.

Table 32: Diagnostics of Estimation equation of $\Delta\text{LOG}(\text{DE_PCP00})$

Adjusted R2	0.86
Residual tests	
Normality test (Jarque-Bera)	0.25
Serial correlation LM test (lag 1)	0.95
Serial correlation LM test (lag 4)	0.42
Serial correlation LM test (lag 8)	0.60
ARCH LM test (lag 1)	0.62
ARCH LM test (lag 4)	0.34
White's heteroskedasticity test	0.13
RESET test (h=2)	0.25
Stability tests	Number of observations outside error bands
CUSUM test	0
CUSUM of squares test	0

Government consumption deflator

The government consumption deflator is determined by the wage level and the GDP deflator in the long run. A step dummy is included in the error-correction term to account for German reunification. With a t-statistic of -7.798 the error-correction coefficient is highly significant (5 percent critical value: -3.91).

Table 33: Estimation equation of $\Delta\text{LOG}(\text{DE_PCGOV00})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_PCGOV00})$				
Method: Least Squares				
Sample (adjusted): 1982Q2 2011Q4				
Included observations: 119 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(DE_PCGOV00(-1))	-0.610	0.078	-7.798	0.000
LOG(DE_GWAGE(-1))	0.192	0.029	6.574	0.000
LOG(DE_PGDP00(-1))	0.273	0.069	3.943	0.000
S91Q1	-0.040	0.006	-6.214	0.000
C	0.548	0.112	4.908	0.000
Z1	-0.041	0.010	-4.086	0.000
Z2	-0.017	0.006	-2.752	0.007
Z3	-0.007	0.009	-0.842	0.402
Z1*(1-S91Q1)	-0.017	0.006	-2.726	0.008
Z2*(1-S91Q1)	-0.013	0.005	-2.528	0.013
Z3*(1-S91Q1)	-0.005	0.006	-0.852	0.396
$\Delta\text{LOG}(\text{DE_PCGOV00}(-3))$	-0.131	0.050	-2.607	0.011
$\Delta\text{LOG}(\text{DE_PCGOV00}(-4))$	0.387	0.078	4.969	0.000
$\Delta\text{LOG}(\text{DE_PCGOV00}(-8))$	0.157	0.066	2.395	0.018
I91Q2	0.038	0.009	4.013	0.000
I92Q2	-0.020	0.009	-2.168	0.033
I92Q3	0.031	0.009	3.616	0.001

The specification passes all diagnostic tests.

Table 34: Diagnostics of Estimation equation of $\Delta\text{LOG}(\text{DE_PCGOV00})$

Adjusted R2	0.99
Residual tests	
Normality test (Jarque-Bera)	0.93
Serial correlation LM test (lag 1)	0.69
Serial correlation LM test (lag 4)	0.49
Serial correlation LM test (lag 8)	0.10
ARCH LM test (lag 1)	0.18
ARCH LM test (lag 4)	0.21
White's heteroskedasticity test	0.51
RESET test (h=2)	0.17
Stability tests	
Number of observations outside error bands	
CUSUM test	0
CUSUM of squares test	0

Deflator of investment into machinery and equipment

As no cointegrating relationship was found which could explain the long-term evolution of the deflator of investment into machinery and equipment, the variable was estimated in levels with its own lagged observations as well as coincident and lagged observations of unit labour costs and the import deflator.

Table 35: Estimation equation of LOG(DE_PIMEQ00)

Dependent Variable: LOG(DE_PIMEQ00)				
Method: Least Squares				
Sample (adjusted): 1981Q3 2011Q4				
Included observations: 122 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.094	0.060	-1.569	0.120
Z1	0.015	0.003	4.802	0.000
Z2	0.031	0.005	6.808	0.000
Z3	-0.002	0.003	-0.729	0.468
(1-S91Q1)*Z1	-0.017	0.003	-5.240	0.000
(1-S91Q1)*Z2	-0.022	0.004	-5.813	0.000
(1-S91Q1)*Z3	0.012	0.004	3.242	0.002
Z1*S05Q1	0.020	0.003	6.737	0.000
Z2*S05Q1	0.009	0.003	3.050	0.003
Z3*S05Q1	0.010	0.003	3.476	0.001
LOG(DE_PIMEQ00(-1))	0.647	0.081	7.970	0.000
LOG(DE_PIMEQ00(-2))	0.348	0.081	4.289	0.000
LOG(DE_ULC)	0.035	0.016	2.275	0.025
LOG(DE_ULC(-6))	-0.075	0.013	-5.610	0.000
LOG(DE_PMG00)	0.121	0.024	5.139	0.000
LOG(DE_PMG00(-1))	-0.102	0.023	-4.474	0.000
I91Q1	0.113	0.004	25.710	0.000
I91Q2	0.037	0.010	3.734	0.000
I00Q2	0.014	0.004	3.255	0.002

Apart from some heteroskedasticity the residuals are well-behaved and the specification can be assumed to be stable over the sample period.

Table 36: Diagnostics of estimation equation of LOG(DE_PIMEQ00)

Adjusted R2	0.998
Residual tests	
Normality test (Jarque-Bera)	0.64
Serial correlation LM test (lag 1)	0.78
Serial correlation LM test (lag 4)	0.44
Serial correlation LM test (lag 8)	0.47
ARCH LM test (lag 1)	0.89
ARCH LM test (lag 4)	0.03
White's heteroskedasticity test	0.01
RESET test (h=2)	0.58
Stability tests	Number of observations outside error bands
CUSUM test	0
CUSUM of squares test	0

Deflator of private residential construction investment

A long-run relationship has been established between the deflator of private residential construction and the deflator of private non-residential construction. However, the t-statistic of the error-correction coefficient is significant only at the 10 percent level (-3.13; 5 percent critical value: -3.41).

Table 37: Estimation equation of $\Delta\text{LOG}(\text{DE_PID00})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_PID00})$ Method: Least Squares Sample: 1982Q1 2011Q4 Included observations: 120				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\text{LOG}(\text{DE_PID00}(-1))$	-0.143	0.045	-3.165	0.002
$\text{LOG}(\text{DE_PINRB00}(-1))$	0.153	0.050	3.045	0.003
C	-0.046	0.026	-1.798	0.075
Z1	-0.010	0.002	-3.979	0.000
Z2	0.013	0.002	6.171	0.000
Z3	-0.004	0.002	-1.539	0.127
Z1*S91Q1	0.014	0.003	5.126	0.000
Z2*S91Q1	-0.011	0.002	-4.444	0.000
Z3*S91Q1	0.005	0.003	1.784	0.077
$\Delta\text{LOG}(\text{DE_PID00}(-2))$	0.119	0.069	1.729	0.087
$\Delta\text{LOG}(\text{DE_PINRB00}(-1))$	0.268	0.065	4.100	0.000
$\Delta\text{LOG}(\text{DE_PINRB00}(-7))$	0.087	0.025	3.458	0.001
I90Q1	0.017	0.004	4.163	0.000
I91Q2	0.021	0.004	5.442	0.000
I07Q1	0.028	0.004	7.036	0.000

The specification does not pass all diagnostic tests. There is heteroskedasticity in the residuals and the CUSUM of squares test points to instability.

Table 38: Diagnostics of Estimation equation of $\Delta\text{LOG}(\text{DE_PID00})$

Adjusted R2	0.73
Residual tests	
Normality test (Jarque-Bera)	0.54
Serial correlation LM test (lag 1)	0.06
Serial correlation LM test (lag 4)	0.15
Serial correlation LM test (lag 8)	0.20
ARCH LM test (lag 1)	0.03
ARCH LM test (lag 4)	0.02
White's heteroskedasticity test	0.05
RESET test (h=2)	0.53
Stability tests	Number of observations outside error bands
CUSUM test	0
CUSUM of squares test	24

Deflator of private non-residential construction investment

The deflator of private non-residential construction investment is explained by capacity utilisation and a trend. Two step dummies are included. It has proved rather difficult to estimate the investment deflators using variables of the model. Strictly speaking the variables used here (which are of different order of integration) should not be used in one error-correction term, but the equation proved the best of a number of alternatives.

Table 39: Estimation equation of $\Delta\text{LOG}(\text{DE_PINRB00})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_PINRB00})$				
Method: Least Squares				
Sample: 1982Q1 2011Q4				
Included observations: 120				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(DE_PINRB00(-1))	-0.053	0.013	-4.154	0.000
LOG(DE_CAPA(-1))	0.049	0.012	4.186	0.000
@TREND*(S91Q1-1)	0.000	0.000	-2.667	0.009
S91Q1	0.020	0.005	3.737	0.000
S05Q1	0.008	0.002	3.914	0.000
Z1*S91Q1	0.024	0.003	7.685	0.000
Z2*S91Q1	-0.010	0.003	-3.984	0.000
Z3*S91Q1	0.011	0.003	3.266	0.002
$\Delta\text{LOG}(\text{DE_PINRB00}(-1))$	0.365	0.077	4.758	0.000
$\Delta\text{LOG}(\text{DE_ULC}(-1))$	-0.115	0.012	-9.616	0.000
$\Delta\text{LOG}(\text{DE_ULC}(-3))$	-0.026	0.011	-2.438	0.017
$\Delta\text{LOG}(\text{DE_CAPA}(-2))$	0.077	0.038	2.032	0.045
I90Q1	0.018	0.005	3.318	0.001
I91Q1	-0.014	0.006	-2.543	0.012

The residuals pass the diagnostic tests with the exception of White's heteroskedasticity test and the CUSUM of squares test.

Table 40: Diagnostics of estimation equation of $\Delta\text{LOG}(\text{DE_PINRB00})$

Adjusted R2	0.58
Residual tests	
Normality test (Jarque-Bera)	0.19
Serial correlation LM test (lag 1)	0.60
Serial correlation LM test (lag 4)	0.15
Serial correlation LM test (lag 8)	0.39
ARCH LM test (lag 1)	0.11
ARCH LM test (lag 4)	0.52
White's heteroskedasticity test	0.00
RESET test (h=2)	0.76
Stability tests	Number of observations outside error bands
CUSUM test	0
CUSUM of squares test	52

Deflator of government construction investment

No cointegrating relationship could be found to explain the government construction deflator. It is therefore estimated in levels being explained by its past observations as well as the coincident and lagged observations of the deflator of private non-residential construction.

Table 41: Estimation equation of LOG(DE_PICONGOV00)

Dependent Variable: LOG(DE_PICONGOV00)				
Method: Least Squares				
Sample (adjusted): 1981Q2 2011Q4				
Included observations: 123 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.010	0.009	-1.035	0.303
LOG(DE_PICONGOV00(-1))	0.816	0.043	19.194	0.000
LOG(DE_PICONGOV00(-4))	0.179	0.053	3.342	0.001
LOG(DE_PICONGOV00(-5))	-0.192	0.049	-3.872	0.000
LOG(DE_PINRB00)	0.823	0.053	15.649	0.000
LOG(DE_PINRB00(-1))	-0.637	0.066	-9.658	0.000
LOG(DE_PINRB00(-3))	0.071	0.024	2.982	0.004
LOG(DE_PINRB00(-5))	-0.057	0.019	-3.012	0.003

The specification passes all diagnostic tests at the 5 percent level.

Table 42: Diagnostics of estimation equation of LOG(DE_PICONGOV00)

Adjusted R2	0.9996
Residual tests	
Normality test (Jarque-Bera)	0.85
Serial correlation LM test (lag 1)	0.09
Serial correlation LM test (lag 4)	0.36
Serial correlation LM test (lag 8)	0.61
ARCH LM test (lag 1)	0.85
ARCH LM test (lag 4)	0.39
White's heteroskedasticity test	0.13
RESET test (h=2)	0.09
Number of observations outside error bands	Number of observations outside error bands
CUSUM test	0
CUSUM of squares test	0

Deflator of other gross fixed capital formation

Despite an insignificant error-correction coefficient the deflator of other gross fixed capital formation has been estimated in an error-correction equation including the deflator of investment in machinery and equipment and a broken trend. The equation shows a satisfactory in-sample forecast performance and is the best option among several alternatives.

Table 43: Estimation equation of $\Delta\text{LOG}(\text{DE_PIOTH00})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_PIOTH00})$ Method: Least Squares Sample: 1982Q2 2011Q4 Included observations: 119				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\text{LOG}(\text{DE_PIOTH00}(-1))$	-0.113	0.039	-2.872	0.005
$\text{LOG}(\text{DE_PIMEQ00}(-1))$	0.101	0.030	3.400	0.001
@TREND	0.000	0.000	-2.986	0.004
$(1-\text{S94Q1})*\text{@TREND}$	0.000	0.000	-2.248	0.027
C	0.093	0.077	1.208	0.230
Z1	0.002	0.003	0.624	0.534
Z2	-0.011	0.002	-4.424	0.000
Z3	0.000	0.002	-0.139	0.890
$\Delta\text{LOG}(\text{DE_PIOTH00}(-4))$	0.142	0.061	2.302	0.023
$\Delta\text{LOG}(\text{DE_PM00}(-4))$	0.118	0.047	2.531	0.013
$\Delta\text{LOG}(\text{DE_PIMEQ00})$	0.645	0.062	10.338	0.000
I82Q4	-0.039	0.009	-4.217	0.000
I83Q1	0.049	0.009	5.155	0.000

The specification does not pass all diagnostic tests. There is some higher order autocorrelation as well as heteroskedasticity in the residuals.

Table 44: Diagnostics of estimation equation of $\Delta\text{LOG}(\text{DE_PIOTH00})$

Adjusted R2	0.68
Residual tests	
Normality test (Jarque-Bera)	0.30
Serial correlation LM test (lag 1)	0.20
Serial correlation LM test (lag 4)	0.00
Serial correlation LM test (lag 8)	0.00
ARCH LM test (lag 1)	0.30
ARCH LM test (lag 4)	0.01
White's heteroskedasticity test	0.08
RESET test (h=2)	0.44
Stability tests	Number of observations outside error bands
CUSUM test	0
CUSUM of squares test	0

Deflator of exports of goods

In the long run the deflator of exports of goods is explained by import prices, German unit labour costs and unit labour costs in the major EMU countries (excluding Germany) in euro (proxy for production costs of foreign competitors). The assumption that German exporters do not only take their own costs into account, but also those of their competitors is known as pricing to market. With a t-statistic of -4.21 the error-correction coefficient is significant (5 percent critical value: -3.91).

Table 45: Estimation equation of $\Delta\text{LOG}(\text{DE_PXG00})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_PXG00})$				
Method: Least Squares				
Sample: 1988Q1 2011Q4				
Included observations: 96				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\text{LOG}(\text{DE_PXG00}(-1))$	-0.195	0.046	-4.214	0.000
$\text{LOG}(\text{DE_ULC}(-1))$	0.035	0.014	2.608	0.011
$\text{LOG}(\text{EWU6_ULC}(-1)/\text{DE_NEV_EWU}(-1))$	0.012	0.004	3.068	0.003
$\text{LOG}(\text{DE_PMG00}(-1))$	0.084	0.022	3.797	0.000
C	0.544	0.145	3.740	0.000
Z1	-0.001	0.003	-0.491	0.625
Z2	0.007	0.001	5.666	0.000
Z3	0.003	0.003	1.037	0.303
$\Delta\text{LOG}(\text{DE_PXG00}(-2))$	-0.103	0.060	-1.715	0.090
$\Delta\text{LOG}(\text{DE_PMG00})$	0.273	0.020	13.629	0.000
$\Delta\text{LOG}(\text{DE_PMG00}(-1))$	0.050	0.021	2.345	0.022
$\Delta\text{LOG}(\text{DE_PMG00}(-2))$	0.064	0.028	2.277	0.026
$\Delta\text{LOG}(\text{EWU6_ULC}(-2)/\text{DE_NEV_EWU}(-2))$	-0.061	0.020	-3.000	0.004
$\Delta\text{LOG}(\text{EWU6_ULC}(-3)/\text{DE_NEV_EWU}(-3))$	-0.075	0.020	-3.681	0.000
$\Delta(\text{S91Q1})$	-0.020	0.003	-6.629	0.000
$\Delta(\text{S91Q2})$	0.021	0.003	6.781	0.000
I95Q1	0.006	0.003	2.174	0.033

The specification passes all diagnostic tests at the 5 percent level.

Table 46: Diagnostics of estimation equation of $\Delta\text{LOG}(\text{DE_PXG00})$

Adjusted R2	0.88
Residual tests	
Normality test (Jarque-Bera)	0.79
Serial correlation LM test (lag 1)	0.62
Serial correlation LM test (lag 4)	0.55
Serial correlation LM test (lag 8)	0.26
ARCH LM test (lag 1)	0.20
ARCH LM test (lag 4)	0.23
White's heteroskedasticity test	0.09
RESET test (h=2)	0.24
Stability tests	Number of observations outside error bands
CUSUM test	0
CUSUM of squares test	0

Deflator of exports of services

In the long term the deflator of exports of services is determined by unit labour costs. With a t-statistic of -3.401 the error-correction coefficient is significant at the 5 percent level (-3.19).

Table 47: Estimation equation of $\Delta\text{LOG}(\text{DE_PXS00})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_PXS00})$				
Method: Least Squares				
Sample (adjusted): 1981Q4 2011Q4				
Included observations: 121 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(DE_PXS00(-1))	-0.110	0.032	-3.401	0.001
LOG(DE_ULC(-1))	0.088	0.035	2.492	0.014
C	0.564	0.170	3.311	0.001
Z1	-0.069	0.018	-3.804	0.000
Z2	-0.018	0.007	-2.555	0.012
Z3	-0.025	0.008	-3.074	0.003
$\Delta\text{LOG}(\text{DE_PXS00}(-2))$	-0.163	0.079	-2.066	0.041
$\Delta\text{LOG}(\text{DE_PXS00}(-4))$	0.208	0.082	2.528	0.013
$\Delta\text{LOG}(\text{DE_PXS00}(-6))$	-0.218	0.078	-2.791	0.006
$\Delta\text{LOG}(\text{DE_ULC}(-4))$	-0.202	0.069	-2.941	0.004
I90Q3	0.028	0.012	2.247	0.027
I02Q3	0.042	0.013	3.244	0.002
I03Q1	-0.073	0.013	-5.539	0.000

The residuals are not normally distributed, which is due to two outliers in the first two quarters of 2009. These are due to the financial and economic crisis and are deliberately kept.

Table 48: Diagnostics of estimation equation of $\Delta\text{LOG}(\text{DE_PXS00})$

Adjusted R2	0.57
Residual tests	
Normality test (Jarque-Bera)	0.00
Serial correlation LM test (lag 1)	0.49
Serial correlation LM test (lag 4)	0.38
Serial correlation LM test (lag 8)	0.19
ARCH LM test (lag 1)	0.00
ARCH LM test (lag 4)	0.00
White's heteroskedasticity test	0.24
RESET test (h=2)	0.25
Stability tests	Number of observations outside error bands
CUSUM test	0
CUSUM of squares test	0

Deflator of imports of goods

An error-correction equation has been estimated for the deflator of imports of goods. In the long run the latter is explained by the foreign price level in euro terms, the oil price in euro terms and a trend. With a t-statistic of -3.309 the error-correction coefficient is not significant (5 percent critical value: -3.91).

Table 49: Estimation equation of $\Delta\text{LOG}(\text{DE_PMG00})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_PMG00})$				
Method: Least Squares				
Sample: 1982Q1 2011Q4				
Included observations: 120				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\text{LOG}(\text{DE_PMG00}(-1))$	-0.146	0.044	-3.309	0.001
$\text{LOG}(\text{DE_PTOTDEM}(-1)/\text{DE_REEV_24_PTOTDEM}(-1))$	0.050	0.030	1.700	0.092
$\text{LOG}(\text{OIL}\$(-1)/\text{DE_NEV_US}(-1))$	0.015	0.004	3.598	0.001
@TREND	0.000	0.000	-2.651	0.009
C	0.722	0.219	3.302	0.001
Z1	0.018	0.003	6.156	0.000
Z2	0.010	0.003	3.920	0.000
Z3	0.001	0.003	0.549	0.584
$\Delta\text{LOG}(\text{DE_PMG00}(-3))$	0.133	0.048	2.793	0.006
$\Delta\text{LOG}(\text{DE_PTOTDEM}/\text{DE_REEV_24_PTOTDEM})$	0.568	0.065	8.692	0.000
$\Delta\text{LOG}(\text{DE_PTOTDEM}(-2)/\text{DE_REEV_24_PTOTDEM}(-2))$	0.120	0.062	1.930	0.056
$\Delta\text{LOG}(\text{OIL}\$/\text{DE_NEV_US})$	0.035	0.006	5.490	0.000
$\Delta\text{LOG}(\text{OIL}\$(-1)/\text{DE_NEV_US}(-1))$	0.044	0.006	6.959	0.000
$\Delta\text{LOG}(\text{OIL}\$(-2)/\text{DE_NEV_US}(-2))$	-0.010	0.006	-1.549	0.125
$\Delta\text{LOG}(\text{OIL}\$(-6)/\text{DE_NEV_US}(-6))$	-0.010	0.006	-1.651	0.102
I95Q1	0.037	0.009	4.070	0.000

Except for White's heteroskedasticity test the specification passes all diagnostic tests at the 5 percent level.

Table 50: Diagnostics of estimation equation of $\Delta\text{LOG}(\text{DE_PMG00})$

Adjusted R2	0.79
Residual tests	
Normality test (Jarque-Bera)	0.20
Serial correlation LM test (lag 1)	0.70
Serial correlation LM test (lag 4)	0.30
Serial correlation LM test (lag 8)	0.13
ARCH LM test (lag 1)	0.67
ARCH LM test (lag 4)	0.45
White's heteroskedasticity test	0.01
RESET test (h=2)	0.08
Stability tests	Number of observations outside error bands
CUSUM test	0
CUSUM of squares test	0

Deflator of imports of services

No cointegrating relationship could be established for the deflator of imports of services. It has thus been estimated using its own lagged observations as well as lagged observations of the foreign price level in euro terms. The effects of German unification are accounted for with a step dummy.

Table 51: Estimation equation of $\Delta\text{LOG}(\text{DE_PMS000})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_PMS000})$				
Method: Least Squares				
Sample (adjusted): 1981Q4 2011Q4				
Included observations: 121 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.010	0.002	4.203	0.000
$\Delta\text{LOG}(\text{DE_PMS00}(-1))$	-0.129	0.092	-1.403	0.163
$\Delta\text{LOG}(\text{DE_PMS00}(-2))$	-0.285	0.095	-2.988	0.004
$\Delta\text{LOG}(\text{DE_PMS00}(-3))$	-0.340	0.086	-3.944	0.000
$\Delta\text{LOG}(\text{DE_PMS00}(-4))$	0.378	0.076	4.958	0.000
$\Delta\text{LOG}(\text{DE_PMS00}(-5))$	-0.216	0.082	-2.624	0.010
$\Delta\text{LOG}(\text{DE_PMS00}(-6))$	-0.136	0.083	-1.629	0.106
$\Delta\text{LOG}(\text{DE_PTOTDEM}(-2)/\text{DE_REEV_24_PTOTDEM}(-2))$	0.119	0.059	2.027	0.045
$\Delta\text{LOG}(\text{DE_PTOTDEM}(-3)/\text{DE_REEV_24_PTOTDEM}(-3))$	0.149	0.059	2.534	0.013
S91Q1	-0.008	0.002	-3.149	0.002

The specification passes all tests except for White's heteroskedasticity test and the ARCH LM test for lag 4.

Table 52: Diagnostics of estimation equation of $\Delta\text{LOG}(\text{DE_PMS000})$

Adjusted R2	0.55
Residual tests	
Normality test (Jarque-Bera)	0.81
Serial correlation LM test (lag 1)	0.85
Serial correlation LM test (lag 4)	0.91
Serial correlation LM test (lag 8)	0.97
ARCH LM test (lag 1)	0.51
ARCH LM test (lag 4)	0.01
White's heteroskedasticity test	0.04
RESET test (h=2)	0.74
Stability tests	Number of observations outside error bands
CUSUM test	0
CUSUM of squares test	0

Consumer price index

The consumer price index covers a similar range of products and services as the private consumption deflator. Whereas the private consumption deflator is a Paasche index, the CPI is a Laspeyres index. This difference can be modelled by adding a trend. The private consumption deflator has a level shift, which is absent in the CPI. Thus a step dummy has to be included in the cointegration relationship. The t-statistic of the error-correction coefficient is highly significant (5 % critical value: -3.91).

Table 53: Estimation equation of LOG(CPI_DE)

Dependent Variable: LOG(CPI_DE)				
Method: Least Squares				
Sample (adjusted): 1981Q2 2011Q4				
Included observations: 123 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(CPI_DE(-1))	-0.138	0.033	-4.123	0.000
LOG(DE_PCP00(-1))	0.103	0.043	2.407	0.018
S91Q1	0.008	0.002	4.135	0.000
@TREND	0.000	0.000	2.858	0.005
C	0.134	0.095	1.411	0.161
Z1	0.004	0.001	4.388	0.000
Z2	0.002	0.001	3.037	0.003
Z3	0.000	0.001	-0.142	0.888
Δ LOG(CPI_DE(-2))	0.272	0.068	3.973	0.000
Δ LOG(CPI_DE(-4))	0.255	0.067	3.805	0.000
Δ LOG(DE_PCP00(-3))	-0.126	0.038	-3.338	0.001
Δ LOG(OIL\$)	0.011	0.002	6.795	0.000
I91Q3	0.011	0.003	3.547	0.001
I93Q1	0.016	0.003	5.818	0.000

The residuals of the estimation are generally well-behaved. However, the null hypothesis of no autoregressive conditional heteroskedasticity can be rejected at the 10% level (in fact: 8%). The specification is stable over the sample period.

Table 54: Diagnostics of estimation equation of LOG(CPI_DE)

Adjusted R2	
Residual tests	
Normality test (Jarque-Bera)	0.71
Serial correlation LM test (lag 1)	0.47
Serial correlation LM test (lag 4)	0.65
Serial correlation LM test (lag 8)	0.16
ARCH LM test (lag 1)	0.08
ARCH LM test (lag 4)	0.33
White's heteroskedasticity test	0.98
RESET test (h=2)	0.70
Stability tests	
CUSUM test	0
CUSUM of squares test	0

outside error bands

3.1.3. Income and Employment

Consumption of fixed capital

There is a stable long-run relationship between consumption of fixed capital and the nominal capital stock calculated as the product of the real capital stock and the deflator of private non-residential capital formation. There are numerous outliers and the seasonal patterns change repeatedly.

Table 55: Estimation equation of LOG(DE_CFC)

Dependent variable: DLOG(DE_CFC) Method: Least squares Sample: 1983Q1 2011Q4 Included observations: 116				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(DE_CFC(-1))				
-LOG(DE_CAPITAL00(-1)*DE_PIFC_ID(-1)/100)	-0.012	0.002	-5.776	0.000
Z1	0.004	0.004	1.095	0.276
Z2	0.017	0.003	5.623	0.000
Z3	-0.014	0.004	-3.664	0.000
I91Q1	0.084	0.003	27.328	0.000
(1-S91Q1)*Z1	-0.023	0.003	-7.845	0.000
(1-S91Q1)*Z2	0.002	0.002	0.964	0.337
(1-S91Q1)*Z3	0.008	0.003	2.802	0.006
ΔLOG(DE_CFC(-2))	0.081	0.031	2.569	0.012
ΔLOG(DE_CFC(-6))	0.072	0.032	2.298	0.024
ΔLOG(DE_IFC(-1))	0.033	0.008	4.007	0.000
ΔLOG(DE_IFC(-3))	0.035	0.008	4.186	0.000
ΔLOG(DE_IFC(-4))	0.018	0.009	2.059	0.042
ΔLOG(DE_IFC(-5))	0.041	0.009	4.735	0.000
ΔLOG(DE_IFC(-6))	0.032	0.009	3.626	0.001
S07Q1*Z1	0.014	0.002	6.452	0.000
S07Q1*Z2	0.005	0.002	2.368	0.020
S07Q1*Z3	0.006	0.002	2.665	0.009
I07Q1	0.013	0.003	4.015	0.000
I90Q1	0.020	0.003	6.266	0.000
I89Q1	0.014	0.003	4.655	0.000

The residuals can be assumed to be uncorrelated and homoskedastic. The specification is stable over the estimation period.

Table 56: Diagnostics of estimation equation of LOG(DE_CFC)

Adjusted R2	0.95
Residual tests	
Normality test (Jarque-Bera)	0.47
Serial correlation LM test (lag 1)	0.60
Serial correlation LM test (lag 4)	0.20
Serial correlation LM test (lag 8)	0.54
ARCH LM test (lag 1)	0.34
ARCH LM test (lag 4)	0.65
White's heteroskedasticity test	0.84
RESET test (h=2)	0.00
Stability tests	Number of observations outside error bands
CUSUM test	0
CUSUM of squares test	0

Taxes less subsidies on production and income

To a large extent taxes less subsidies on production and income consist of VAT. This is why a cointegrating relationship is established between this variable and the product of the average indirect tax rate and nominal private consumption as well as a trend. With a t-statistic of -5.081 the error-correction coefficient is highly significant (5 percent critical value: -3.69).

Table 57: Estimation equation of $\Delta\text{LOG}(\text{DE_TINDSUB})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_TINDSUB})$				
Method: Least Squares				
Sample (adjusted): 1993Q1 2011Q4				
Included observations: 76 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(DE_TINDSUB(-1))	-0.552	0.109	-5.081	0.000
LOG(DE_TIND_TARIFFSA_SA(-1) *DE_CP(-1))	0.556	0.134	4.148	0.000
@TREND	0.001	0.001	1.883	0.064
C	-2.748	0.816	-3.367	0.001
Z1	0.013	0.025	0.529	0.599
Z2	0.061	0.016	3.859	0.000
Z3	0.042	0.018	2.317	0.024
S96Q4*Z1	-0.023	0.017	-1.353	0.181
S96Q4*Z2	0.009	0.016	0.604	0.548
S96Q4*Z3	-0.012	0.017	-0.718	0.476
$\Delta\text{LOG}(\text{DE_TIND_TARIFFSA_SA})$	1.163	0.088	13.209	0.000
$\Delta\text{LOG}(\text{DE_TINDSUB}(-4))$	0.294	0.081	3.637	0.001
$\Delta\text{LOG}(\text{DE_TIND_TARIFFSA_SA}(-4) * \text{DE_CP}(-4))$	-0.310	0.106	-2.938	0.005
$\Delta\text{LOG}(\text{DE_TIND_TARIFFSA_SA}(-7) * \text{DE_CP}(-7))$	-0.128	0.074	-1.738	0.087

There is some indication of heteroskedasticity and the specification is not completely stable over the sample period.

Table 58: Diagnostics of estimation equation of $\Delta\text{LOG}(\text{DE_TINDSUB})$

Adjusted R2	0.86
Residual tests	
Normality test (Jarque-Bera)	0.81
Serial correlation LM test (lag 1)	0.67
Serial correlation LM test (lag 4)	0.57
Serial correlation LM test (lag 8)	0.70
ARCH LM test (lag 1)	0.38
ARCH LM test (lag 4)	0.09
White's heteroskedasticity test	0.03
RESET test (h=2)	0.46
Stability tests	Number of observations outside error bands
CUSUM test	0
CUSUM of squares test	8

Gross wage per employee

The main explaining variables are the GDP deflator (with a restricted coefficient), productivity and the unemployment rate. As there are several structural breaks, which are partly due to German reunification, some of the variables have been multiplied with step dummies. With a t-statistic of -3.557 the error-correction coefficient is not significant. Nevertheless, the equation is being used as the coefficients and elasticities seem sensible and there is no superior alternative.

Table 59: Estimation equation of $\Delta \text{LOG}(\text{DE_GWAGEE})$

Dependent Variable: $\Delta \text{LOG}(\text{DE_GWAGEE})$				
Method: Least Squares				
Sample (adjusted): 1981Q4 2011Q4				
Included observations: 121 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\text{LOG}(\text{DE_GWAGEE}(-1)) - \text{LOG}(\text{DE_PGDP00}(-1))$	-0.210	0.059	-3.557	0.001
$\text{LOG}(\text{DE_PRODEE}(-1))$	0.137	0.046	2.960	0.004
$\text{DE_UR}(-1)/100$	-0.398	0.092	-4.311	0.000
S91Q1	0.723	0.305	2.369	0.020
$\text{LOG}(\text{DE_PRODEE}(-1)) * \text{S91Q1}$	-0.074	0.032	-2.327	0.022
$(\text{DE_UR}(-1)/100) * \text{S94Q1}$	-0.205	0.040	-5.117	0.000
C	-0.379	0.279	-1.358	0.178
Z1	-0.198	0.013	-15.314	0.000
Z2	-0.003	0.012	-0.270	0.788
Z3	-0.154	0.018	-8.505	0.000
$\Delta \text{LOG}(\text{DE_GWAGEE}(-2))$	-0.498	0.060	-8.300	0.000
$\Delta \text{LOG}(\text{DE_GWAGEE}(-3))$	-0.317	0.056	-5.664	0.000
$\Delta \text{LOG}(\text{DE_GWAGEE}(-6))$	-0.171	0.034	-4.977	0.000
$\Delta \text{LOG}(\text{DE_PGDP00}(-1))$	-0.782	0.146	-5.370	0.000
$\Delta \text{LOG}(\text{DE_PRODEE}(-1))$	-0.246	0.044	-5.656	0.000
$\Delta \text{LOG}(\text{DE_PRODEE}(-3))$	-0.143	0.045	-3.214	0.002
$\Delta \text{LOG}(\text{DE_PRODEE}(-5))$	-0.098	0.029	-3.353	0.001
$\Delta(\text{DE_UR}(-2)/100)$	0.622	0.277	2.242	0.027
I91Q1	-0.179	0.007	-23.910	0.000
$\text{I91Q1}(-1)$	-0.073	0.012	-6.070	0.000
$\text{I91Q1}(-2)$	-0.070	0.013	-5.258	0.000
$\text{I91Q1}(-3)$	-0.061	0.013	-4.782	0.000
I84Q1	0.027	0.007	3.824	0.000
I84Q2	-0.042	0.007	-6.160	0.000
DUMMY_KA	0.000	0.000	-5.388	0.000

The RESET test points to some type of specification error, but otherwise the specification passes the diagnostic tests.

Table 60: Diagnostics of estimation equation of $\Delta\text{LOG}(\text{DE_GWAGEE})$

Adjusted R2	
Residual tests	
Normality test (Jarque-Bera)	0.83
Serial correlation LM test (lag 1)	0.46
Serial correlation LM test (lag 4)	0.14
Serial correlation LM test (lag 8)	0.27
ARCH LM test (lag 1)	0.75
ARCH LM test (lag 4)	0.24
White's heteroskedasticity test	0.09
RESET test (h=2)	0.00
Stability tests	Number of observations outside error bands
CUSUM test	0
CUSUM of squares test	0

Employees

In the long-run the number of employees is explained by the impact of the capital stock (adjusted for technical progress using a modified trend) on productivity. A step dummy is included to account for the level shift due to German reunification. With a t-statistic of -5.954 the error-correction coefficient is highly significant (5 percent critical value: -3.69).

Table 61: Estimation equation of $\Delta\text{LOG}(\text{DE_EE})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_EE})$				
Method: Least Squares				
Sample (adjusted): 1981Q2 2011Q4				
Included observations: 123 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\text{LOG}(\text{DE_EE}(-1)) - \text{LOG}(\text{DE_GDP00}(-1))$	-0.099	0.017	-5.954	0.000
$\text{LOG}(\text{DE_CAPITAL00}(-1) + 50 \cdot (100 + (\text{T80})))$	-0.065	0.011	-5.738	0.000
S91Q1	0.015	0.003	4.970	0.000
C	1.026	0.172	5.962	0.000
Z1	-0.009	0.003	-2.930	0.004
Z2	0.007	0.002	4.286	0.000
Z3	0.004	0.002	2.885	0.005
S91Q1*Z1	-0.001	0.002	-0.556	0.579
S91Q1*Z2	-0.004	0.002	-2.779	0.007
S91Q1*Z3	-0.004	0.002	-2.007	0.047
$\Delta\text{LOG}(\text{DE_EE}(-1)) + \Delta\text{LOG}(\text{DE_EE}(-2))$	0.086	0.046	1.896	0.061
$\Delta\text{LOG}(\text{DE_EE}(-4))$	0.410	0.071	5.796	0.000
$\Delta\text{LOG}(\text{DE_GDP00})$	0.074	0.021	3.471	0.001
$\Delta\text{LOG}(\text{DE_CAPITAL00}(-1))$	-0.255	0.106	-2.402	0.018
$\Delta\text{LOG}(\text{DE_CAPITAL00}(-2))$	-0.236	0.101	-2.344	0.021
I90Q1	0.013	0.003	4.254	0.000
I91Q1	0.289	0.006	50.816	0.000
I91Q1(-4)	-0.130	0.023	-5.559	0.000
DUMMY_KA(-4)	0.000	0.000	3.079	0.003

The specification passes all diagnostic tests at the 5 percent level.

Table 62: Diagnostics of Estimation equation of $\Delta\text{LOG}(\text{DE_EE})$

Adjusted R2	0.99
Residual tests	
Normality test (Jarque-Bera)	0.88
Serial correlation LM test (lag 1)	0.16
Serial correlation LM test (lag 4)	0.19
Serial correlation LM test (lag 8)	0.48
ARCH LM test (lag 1)	0.51
ARCH LM test (lag 4)	0.26
White's heteroskedasticity test	0.08
RESET test (h=2)	0.77
Stability tests	Number of observations outside error bands
CUSUM test	0
CUSUM of squares test	0

Total employment

As total employment is mostly made up of employees the same variables are used for the estimation of the long-term relationship in the estimation equation of total employment. Again the error-correction coefficient is highly significant: -6.139 (5 percent critical value: -3.69).

Table 63: Estimation equation of $\Delta\text{LOG}(\text{DE_ET})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_ET})$				
Method: Least Squares				
Sample (adjusted): 1981Q2 2011Q4				
Included observations: 123 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\text{LOG}(\text{DE_ET}(-1)) - \text{LOG}(\text{DE_GDP00}(-1))$	-0.089	0.014	-6.139	0.000
$\text{LOG}(\text{DE_CAPITAL00}(-1) + 50 * (100 + (\text{T80})))$	-0.055	0.009	-5.867	0.000
S91Q1	0.011	0.002	4.865	0.000
C	0.902	0.147	6.151	0.000
Z1	-0.010	0.003	-3.328	0.001
Z2	0.007	0.001	4.764	0.000
Z3	0.004	0.001	3.217	0.002
S91Q1*Z1	0.000	0.002	-0.226	0.821
S91Q1*Z2	-0.003	0.001	-2.501	0.014
S91Q1*Z3	-0.003	0.002	-1.975	0.051
$\Delta\text{LOG}(\text{DE_ET}(-1)) + \Delta\text{LOG}(\text{DE_ET}(-2))$	0.099	0.044	2.222	0.029
$\Delta\text{LOG}(\text{DE_ET}(-4))$	0.371	0.071	5.190	0.000
$\Delta\text{LOG}(\text{DE_GDP00})$	0.062	0.019	3.269	0.002
$\Delta\text{LOG}(\text{DE_CAPITAL00}(-1))$	-0.269	0.098	-2.749	0.007
$\Delta\text{LOG}(\text{DE_CAPITAL00}(-2))$	-0.253	0.093	-2.729	0.008
I90Q1	0.011	0.003	4.087	0.000
I91Q1	0.278	0.005	57.105	0.000
I91Q1(-4)	-0.112	0.022	-4.999	0.000
DUMMY_KA(-4)	0.000	0.000	3.151	0.002

The specification passes all diagnostic tests.

Table 64: Diagnostics of estimation equation of $\Delta\text{LOG}(\text{DE_ET})$

Adjusted R2	0.99
Residual tests	
Normality test (Jarque-Bera)	0.69
Serial correlation LM test (lag 1)	0.32
Serial correlation LM test (lag 4)	0.31
Serial correlation LM test (lag 8)	0.63
ARCH LM test (lag 1)	0.44
ARCH LM test (lag 4)	0.53
White's heteroskedasticity test	0.28
RESET test (h=2)	0.77
Stability tests	outside error bands
CUSUM test	0
CUSUM of squares test	0

Unemployment

There is an inverse long-term relationship between employment and unemployment. Some structural changes are accounted for by step dummies. With a t-statistic of -6.717 the error-correction coefficient is highly significant (5 percent critical value: -3.74).

Table 65: Estimation equation of $\Delta(\text{DE_U})$

Dependent Variable: $\Delta(\text{DE_U})$				
Method: Least Squares				
Sample (adjusted): 1981Q2 2011Q4				
Included observations: 123 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
DE_U(-1)	-0.088	0.013	-6.717	0.000
DE_EE(-1)	-0.027	0.006	-4.230	0.000
S91Q1	452.583	68.480	6.609	0.000
S06Q1	-58.329	20.802	-2.804	0.006
C	832.453	149.439	5.571	0.000
Z1	146.905	48.855	3.007	0.003
Z2	-408.881	40.875	-10.003	0.000
Z3	-10.883	35.002	-0.311	0.757
Z1*S91Q1	324.004	49.216	6.583	0.000
Z2*S91Q1	82.828	38.917	2.128	0.036
Z3*S91Q1	140.700	42.365	3.321	0.001
$\Delta(\text{DE_U}(-1))$	0.413	0.070	5.874	0.000
$\Delta(\text{DE_EE}(-1))$	-0.018	0.007	-2.458	0.016
$\Delta\text{LOG}(\text{DE_GDP00}(-4))$	-1157.427	363.500	-3.184	0.002
I05Q1	555.800	69.305	8.020	0.000
I05Q2	-213.482	80.722	-2.645	0.009

The CUSUM of squares test indicates some instability. Otherwise the specification passes all diagnostic tests at the 5 percent level.

Table 66: Diagnostics of estimation equation of $\Delta(\text{DE_U})$

Adjusted R2	0.94
Residual tests	
Normality test (Jarque-Bera)	0.24
Serial correlation LM test (lag 1)	0.17
Serial correlation LM test (lag 4)	0.18
Serial correlation LM test (lag 8)	0.26
ARCH LM test (lag 1)	0.18
ARCH LM test (lag 4)	0.75
White's heteroskedasticity test	0.09
RESET test (h=2)	0.87
Stability tests	Number of observations outside error bands
CUSUM test	0
CUSUM of squares test	5

Distributed profits

In the long term distributed profits are explained by operating surplus and mixed income less direct taxes on operating surplus and mixed income and a trend beginning in 1970. Although the error-correction coefficient is not significant this specification is adhered to because it makes economic sense and there is no viable alternative.

Table 67: Estimation equation of $\Delta\text{LOG}(\text{DE_WDYENT})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_WDYENT})$				
Method: Least Squares				
Sample (adjusted): 1992Q2 2011Q4				
Included observations: 79 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(DE_WDYENT(-1))	-0.302	0.104	-2.917	0.005
LOG(DE_GYPROP(-1)-DE_TDIREM1(-1))	0.139	0.066	2.129	0.037
@TREND(1970:1)	0.001	0.001	2.061	0.043
C	0.541	0.307	1.761	0.083
Z1	0.005	0.042	0.121	0.904
Z2	0.066	0.030	2.228	0.029
Z3	-0.017	0.036	-0.484	0.630
$\Delta\text{LOG}(\text{DE_GYPROP}-\text{DE_TDIREM1})$	0.380	0.068	5.569	0.000
$\Delta\text{LOG}(\text{DE_GYPROP}(-2)-\text{DE_TDIREM1}(-2))$ $+\Delta\text{LOG}(\text{DE_GYPROP}(-3)-\text{DE_TDIREM1}(-3))$	0.112	0.054	2.096	0.040
$\Delta\text{LOG}(\text{DE_WDYENT}(-1))$	-0.149	0.093	-1.608	0.113
$\Delta\text{LOG}(\text{DE_WDYENT}(-2))$	-0.212	0.087	-2.448	0.017
$\Delta\text{LOG}(\text{DE_WDYENT}(-4)-\text{DE_RES_WDYENT}(-4))$	0.382	0.075	5.085	0.000

The residuals are well-behaved. There may be some heteroskedasticity in the residuals. The specification is stable over the sample period.

Table 68: Diagnostics of estimation equation of $\Delta\text{LOG}(\text{DE_WDYENT})$

Adjusted R2	0.94
Residual tests	
Normality test (Jarque-Bera)	0.65
Serial correlation LM test (lag 1)	0.37
Serial correlation LM test (lag 4)	0.38
Serial correlation LM test (lag 8)	0.62
ARCH LM test (lag 1)	0.40
ARCH LM test (lag 4)	0.53
White's heteroskedasticity test	0.06
RESET test (h=2)	0.17
Stability tests	outside error bands
CUSUM test	0
CUSUM of squares test	0

Monetary transfers received by households

An error-correction equation has been estimated for monetary transfers received by households. Their long-term behaviour is explained by wages and salaries, a step dummy and a trend. With a t-statistic of -4.851 the error-correction coefficient is highly significant (5 percent critical value: -3.91).

Table 69: Estimation equation of $\Delta\text{LOG}(\text{DE_TRFGOV_PH})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_TRFGOV_PH})$				
Method: Least Squares				
Sample (adjusted): 1992Q2 2011Q4				
Included observations: 79 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(DE_TRFGOV_PH(-1))	-0.266	0.055	-4.851	0.000
LOG(DE_GWAGEE(-1))	0.248	0.090	2.754	0.008
LOG(@TREND)	0.068	0.032	2.164	0.034
S06Q2	-0.017	0.006	-3.084	0.003
C	-1.249	0.652	-1.914	0.060
Z1	-0.015	0.011	-1.369	0.176
Z2	0.011	0.011	0.986	0.328
Z3	-0.037	0.019	-1.939	0.057
$\Delta\text{LOG}(\text{DE_TRFGOV_PH}(-4))$	0.167	0.089	1.877	0.065
$\Delta\text{LOG}(\text{DE_GWAGEE}(-2))$	-0.200	0.102	-1.953	0.055
I09Q1-I08Q4	0.025	0.007	3.342	0.001
I09Q2	0.033	0.011	3.058	0.003

The residuals are generally well-behaved and the specification is stable. However, the RESET test indicates some form of misspecification.

Table 70: Diagnostics of estimation equation of $\Delta\text{LOG}(\text{DE_TRFGOV_PH})$

Adjusted R2	0.77
Residual tests	
Normality test (Jarque-Bera)	0.84
Serial correlation LM test (lag 1)	0.66
Serial correlation LM test (lag 4)	0.35
Serial correlation LM test (lag 8)	0.52
ARCH LM test (lag 1)	0.48
ARCH LM test (lag 4)	0.39
White's heteroskedasticity test	0.24
RESET test (h=2)	0.00
Stability tests	outside error bands
CUSUM test	0
CUSUM of squares test	0

3.1.4. General Government

3.1.4.1. Expenditures

Unlike the other government expenditure aggregates nominal government expenditure is not estimated directly. Instead it is calculated as the product of real government consumption and the government consumption deflator divided by 100. Definitions are presented in section 3.2.5. All other government expenditures are estimated. The equations are presented below.

Monetary transfers

Like monetary transfers received by households monetary transfers paid by the government move in line with wages and salaries in the long run. The error-correction coefficient is significant exhibiting a t-statistic of -3.569 (5 percent critical value: -3.41). Unemployment plays a role only for the short-term dynamics.

Table 71: Estimation equation of $\Delta\text{LOG}(\text{DE_TRFGOV})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_TRFGOV})$ Method: Least Squares Sample (adjusted): 1991Q4 2011Q4 Included observations: 81 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\text{LOG}(\text{DE_TRFGOV}(-1))$	-0.093	0.026	-3.569	0.001
$\text{LOG}(\text{DE_GWAGEE}(-5))$	0.088	0.044	2.006	0.049
C	-0.343	0.280	-1.225	0.225
Z1	-0.067	0.016	-4.037	0.000
Z2	0.035	0.018	1.951	0.055
Z3	-0.043	0.014	-3.002	0.004
$\Delta\text{LOG}(\text{DE_U})$	0.176	0.044	4.012	0.000
$\Delta\text{LOG}(\text{DE_TRFGOV}(-1)) + \Delta\text{LOG}(\text{DE_TRFGOV}(-2))$	-0.171	0.064	-2.673	0.009
$\Delta\text{LOG}(\text{DE_GWAGEE}(-1))$	0.388	0.095	4.096	0.000
$\Delta\text{LOG}(\text{DE_GWAGEE}(-3))$	0.210	0.049	4.316	0.000
I09Q2	0.031	0.011	2.886	0.005

The specification passes all diagnostic tests. The residuals are well-behaved and the estimation equation is stable over the sample period.

Table 72: Diagnostics of estimation equation of $\Delta\text{LOG}(\text{DE_TRFGOV})$

Adjusted R2	0.86
Residual tests	
Normality test (Jarque-Bera)	0.79
Serial correlation LM test (lag 1)	0.81
Serial correlation LM test (lag 4)	0.78
Serial correlation LM test (lag 8)	0.65
ARCH LM test (lag 1)	0.91
ARCH LM test (lag 4)	0.77
White's heteroskedasticity test	0.66
RESET test (h=2)	0.10
Stability tests	outside error bands
CUSUM test	0
CUSUM of squares test	0

Property income paid

Property income paid comprises the government's interest payments on debt. A cointegrating relationship has been established between property income paid and the product of government debt and the long-term interest rate divided by 100. With a t-statistic of -6.200 the error-correction coefficient is highly significant (5 percent critical value: -3.19).

Table 73: Estimation equation of $\Delta\text{LOG}(\text{DE_INTPAGOV})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_INTPAGOV})$				
Method: Least Squares				
Sample (adjusted): 1991Q3 2011Q4				
Included observations: 82 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(DE_INTPAGOV(-1))	-0.194	0.031	-6.200	0.000
LOG(DE_DBTGOV(-1)*DE_RL10Y(-1)/100)	0.058	0.026	2.191	0.032
C	0.305	0.099	3.082	0.003
Z1	-0.014	0.008	-1.797	0.076
Z2	0.006	0.008	0.827	0.411
Z3	-0.009	0.008	-1.145	0.256
$\Delta\text{LOG}(\text{DE_INTPAGOV}(-1))$	-0.170	0.094	-1.817	0.073
I11Q1	0.092	0.025	3.662	0.001

Except for White's heteroskedasticity test the specification passes all diagnostic tests.

Table 74: Diagnostics of estimation equation of $\Delta\text{LOG}(\text{DE_INTPAGOV})$

Adjusted R2	0.40
Residual tests	
Normality test (Jarque-Bera)	0.39
Serial correlation LM test (lag 1)	0.27
Serial correlation LM test (lag 4)	0.55
Serial correlation LM test (lag 8)	0.73
ARCH LM test (lag 1)	0.90
ARCH LM test (lag 4)	0.27
White's heteroskedasticity test	0.00
RESET test (h=2)	0.64
Stability tests	outside error bands
CUSUM test	0
CUSUM of squares test	0

Other current transfers paid

Other current transfers are explained only by a trend and the lagged dependent variable. There are some outliers. It proved impossible to explain this variable using only other variables of the model. Thus, essentially the variable remains exogenous.

Table 75: Estimation equation of $\text{LOG}(\text{DE_TRSONGOV})$

Dependent Variable: $\text{LOG}(\text{DE_TRSONGOV})$				
Method: Least Squares				
Sample (adjusted): 1992Q1 2011Q4				
Included observations: 80 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.965	0.122	7.919	0.000
Z1	0.064	0.027	2.406	0.019
Z2	-0.028	0.028	-0.981	0.330
Z3	0.039	0.027	1.481	0.143
@TREND	0.007	0.001	8.966	0.000
$\text{LOG}(\text{DE_TRSONGOV}(-4))$	0.286	0.080	3.564	0.001
I93Q4	0.322	0.084	3.827	0.000
I00Q4	0.284	0.083	3.413	0.001
I09Q4	0.275	0.084	3.275	0.002

Except for the RESET test the specification passes all diagnostic tests.

Table 76: Diagnostics of estimation equation of LOG(DE_TRSONGOV)

Adjusted R2	0.89
Residual tests	
Normality test (Jarque-Bera)	0.52
Serial correlation LM test (lag 1)	0.10
Serial correlation LM test (lag 4)	0.18
Serial correlation LM test (lag 8)	0.16
ARCH LM test (lag 1)	0.40
ARCH LM test (lag 4)	0.46
White's heteroskedasticity test	0.60
RESET test (h=2)	0.01
Stability tests	outside error bands
CUSUM test	0
CUSUM of squares test	0

Capital transfers paid

This variable is I(0). Therefore no attempts were made to estimate an error-correction equation. In addition the variable seems totally uncorrelated with any other model variable. It is thus explained only by lagged observations and deterministics.

Table 77: Estimation equation of LOG(DE_PROTRGOV)

Dependent Variable: LOG(DE_PROTRGOV)				
Method: Least Squares				
Sample (adjusted): 1991Q3 2011Q4				
Included observations: 82 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.017	0.163	12.397	0.000
Z1	-0.163	0.075	-2.179	0.033
Z2	-0.527	0.088	-5.998	0.000
Z3	-0.496	0.081	-6.095	0.000
@TREND	0.004	0.001	3.203	0.002
LOG(DE_PROTRGOV(-2))	-0.200	0.078	-2.564	0.012
I95Q1	2.671	0.237	11.283	0.000
I95Q3	1.919	0.316	6.077	0.000
I10Q3	1.734	0.239	7.259	0.000

Due to the limited availability of suitable variables it has proved impossible to estimate an equation that passes all diagnostic tests. Auto-correlation and heteroskedasticity could not be avoided.

Table 78: Diagnostics of estimation equation of LOG(DE_PROTRGOV)

Adjusted R2	0.81
Residual tests	
Normality test (Jarque-Bera)	0.43
Serial correlation LM test (lag 1)	0.70
Serial correlation LM test (lag 4)	0.00
Serial correlation LM test (lag 8)	0.00
ARCH LM test (lag 1)	0.14
ARCH LM test (lag 4)	0.00
White's heteroskedasticity test	0.00
RESET test (h=2)	0.55
Stability tests	outside error bands
CUSUM test	0
CUSUM of squares test	7

Net acquisition of non-produced assets

This variable is I(0). Therefore no attempts were made to estimate an error-correction equation. In addition the variable seems totally uncorrelated with any other model variable. It is thus explained only by lagged observations and deterministics.

Table 79: Estimation equation of DE_NETPRGOV

Dependent Variable: DE_NETPRGOV				
Method: Least Squares				
Sample (adjusted): 1991Q2 2011Q4				
Included observations: 83 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.364	0.009	-41.627	0.000
Z1	0.145	0.022	6.574	0.000
Z2	0.149	0.022	6.749	0.000
Z3	0.104	0.022	4.740	0.000
(1-S95Q1)*@TREND	0.001	0.000	3.461	0.001
DE_NETPRGOV(-1)	-0.002	0.001	-1.233	0.222
I00Q3	-50.773	0.072	-709.156	0.000
I10Q2	-4.359	0.072	-60.892	0.000

Except for the RESET test the estimation equation passes all specification tests. The residuals are uncorrelated and can be assumed to be homoskedastic. The specification is stable over the sample period.

Table 80: Diagnostics of estimation equation of DE_NETPRGOV

Adjusted R2	0.9999
Residual tests	
Normality test (Jarque-Bera)	0.12
Serial correlation LM test (lag 1)	0.12
Serial correlation LM test (lag 4)	0.17
Serial correlation LM test (lag 8)	0.52
ARCH LM test (lag 1)	0.96
ARCH LM test (lag 4)	0.22
White's heteroskedasticity test	0.28
RESET test (h=2)	0.03
Stability tests	outside error bands
CUSUM test	0
CUSUM of squares test	0

Other expenditures

Other expenditures are also explained by past observations and deterministics.

Table 81: Estimation equation of LOG(DE_EXPOTH)

Dependent Variable: LOG(DE_EXPOTH)				
Method: Least Squares				
Sample (adjusted): 1993Q1 2011Q4				
Included observations: 76 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.230	0.099	2.314	0.024
Z1	-0.319	0.049	-6.554	0.000
Z2	-0.237	0.045	-5.315	0.000
Z3	-0.070	0.045	-1.551	0.126
LOG(DE_EXPOTH(-1))	0.384	0.087	4.411	0.000
LOG(DE_EXPOTH(-3))	0.111	0.050	2.196	0.032
LOG(DE_EXPOTH(-4))	0.122	0.051	2.381	0.021
LOG(DE_EXPOTH(-7))	0.104	0.050	2.079	0.042
LOG(DE_EXPOTH(-8))	0.105	0.051	2.067	0.043
I95Q1	0.623	0.087	7.153	0.000
I95Q2	-1.550	0.099	-15.624	0.000
I95Q3	0.418	0.143	2.932	0.005
I00Q3	-0.395	0.088	-4.510	0.000
I00Q4	0.478	0.093	5.147	0.000
S05Q1	0.144	0.045	3.155	0.003
I11Q1	0.198	0.093	2.127	0.038

There is some indication of higher order autocorrelation. The specification is stable and the residuals are homoskedastic.

Table 82: Diagnostics of estimation equation of LOG(DE_EXPOTH)

Adjusted R2	0.96
Residual tests	
Normality test (Jarque-Bera)	0.61
Serial correlation LM test (lag 1)	0.76
Serial correlation LM test (lag 4)	0.00
Serial correlation LM test (lag 8)	0.00
ARCH LM test (lag 1)	0.89
ARCH LM test (lag 4)	0.89
White's heteroskedasticity test	0.79
RESET test (h=2)	0.08
Stability tests	outside error bands
CUSUM test	0
CUSUM of squares test	0

3.1.4.2. Revenues

Social contributions from employees and from employers are calculated from gross wages and salaries and the seasonally adjusted average contribution rates (for the documentation of the definition see section 3.2.5 below).

Indirect taxes

Most indirect taxes are closely connected to nominal private consumption. This is why a cointegrating relationship has been established between indirect taxes and nominal private consumption multiplied by the average seasonally adjusted indirect tax rate. With a t-statistic of -3.785 the error-correction coefficient is significant (5 percent critical value: -3.41).

Table 83: Estimation equation of $\Delta\text{LOG}(\text{DE_TIND})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_TIND})$				
Method: Least Squares				
Sample (adjusted): 1991Q3 2011Q4				
Included observations: 82 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(DE_TIND(-1))	-0.670	0.177	-3.785	0.000
LOG(DE_TIND_TARIFFSA_SA(-1) *DE_CP00(-1)*DE_PCP00(-1)/100)	0.652	0.178	3.667	0.001
C	-2.919	0.823	-3.547	0.001
Z1	-0.036	0.009	-3.794	0.000
Z2	-0.031	0.011	-2.725	0.008
Z3	-0.045	0.007	-6.094	0.000
S96Q4*Z1	0.006	0.010	0.575	0.567
S96Q4*Z2	0.040	0.009	4.555	0.000
S96Q4*Z3	0.043	0.008	5.134	0.000
$\Delta\text{LOG}(\text{DE_TIND_TARIFFSA_SA})$	1.005	0.056	17.822	0.000
$\Delta\text{LOG}(\text{DE_TIND}(-1))$	-0.445	0.096	-4.638	0.000
$\Delta\text{LOG}(\text{DE_TIND_TARIFFSA_SA}(-1))$	0.469	0.108	4.353	0.000
I08Q4	-0.026	0.012	-2.109	0.039

The residuals show some higher-order autocorrelation as well as heteroskedasticity. Further the specification is not completely stable over the sample.

Table 84: Diagnostics of estimation equation of $\Delta\text{LOG}(\text{DE_TIND})$

Adjusted R2	0.89
Residual tests	
Normality test (Jarque-Bera)	0.76
Serial correlation LM test (lag 1)	0.45
Serial correlation LM test (lag 4)	0.03
Serial correlation LM test (lag 8)	0.06
ARCH LM test (lag 1)	0.93
ARCH LM test (lag 4)	0.15
White's heteroskedasticity test	0.05
RESET test (h=2)	0.38
Stability tests	outside error bands
CUSUM test	0
CUSUM of squares test	7

Direct taxes on wages and salaries

The long-term evolution of direct taxes on wages and salaries is explained by gross wages and salaries per employee, the number of employees and a step dummy accounting for tax reform at the turn of the millennium.

Table 85: Estimation equation of $\Delta\text{LOG}(\text{DE_TDIREE})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_TDIREE})$				
Method: Least Squares				
Sample: 1982Q2 2011Q4				
Included observations: 119				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(DE_TDIREE(-1))	-0.273	0.056	-4.889	0.000
LOG(DE_GWAGEE(-1))	0.353	0.077	4.589	0.000
LOG(DE_EE(-1))	0.221	0.064	3.462	0.001
S00Q1	-0.029	0.008	-3.458	0.001
C	-4.392	0.973	-4.516	0.000
Z1	-0.083	0.043	-1.906	0.060
Z2	-0.087	0.039	-2.231	0.028
Z3	-0.130	0.044	-2.928	0.004
$\Delta\text{LOG}(\text{DE_TDIREE}(-1))$	0.213	0.085	2.515	0.013
$\Delta\text{LOG}(\text{DE_TDIREE}(-3))$	-0.182	0.059	-3.069	0.003
$\Delta\text{LOG}(\text{DE_TDIREE}(-4))$	0.625	0.057	11.013	0.000
$\Delta\text{LOG}(\text{DE_EE}(-1))$	-0.301	0.157	-1.916	0.058
$\Delta\text{LOG}(\text{DE_GWAGEE}(-1))$	-0.915	0.249	-3.672	0.000
$\Delta\text{LOG}(\text{DE_GWAGEE}(-2))$	-0.517	0.122	-4.229	0.000
I90Q1	-0.116	0.026	-4.563	0.000

Except for White's heteroskedasticity test the specification passes all diagnostic tests.

Table 86: Diagnostics of estimation equation of $\Delta\text{LOG}(\text{DE_TDIREE})$

Adjusted R2	0.99
Residual tests	
Normality test (Jarque-Bera)	0.53
Serial correlation LM test (lag 1)	0.29
Serial correlation LM test (lag 4)	0.82
Serial correlation LM test (lag 8)	0.93
ARCH LM test (lag 1)	0.52
ARCH LM test (lag 4)	0.47
White's heteroskedasticity test	0.01
RESET test (h=2)	0.38
Stability tests	outside error bands
CUSUM test	0
CUSUM of squares test	0

Direct taxes on operating surplus and mixed income

In the long term direct taxes on operating surplus and mixed income depend on operating surplus and mixed income. With a t-statistic of -4.071 the error-correction coefficient is highly significant (5 percent critical value: -3.69).

Table 87: Estimation equation of $\Delta\text{LOG}(\text{DE_TDIREM1})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_TDIREM1})$				
Method: Least Squares				
Sample (adjusted): 1992Q4 2011Q4				
Included observations: 77 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(DE_TDIREM1(-1))	-0.151	0.037	-4.071	0.000
LOG(DE_GYPROP(-1))	0.165	0.045	3.689	0.001
C	-0.315	0.144	-2.194	0.032
Z1	-0.040	0.042	-0.944	0.349
Z2	-0.021	0.019	-1.109	0.272
Z3	-0.118	0.057	-2.092	0.041
$\Delta\text{LOG}(\text{DE_TDIREM1}(-1))$	0.694	0.094	7.353	0.000
$\Delta\text{LOG}(\text{DE_TDIREM1}(-2))$	-0.344	0.093	-3.686	0.001
$\Delta\text{LOG}(\text{DE_TDIREM1}(-4))$	0.790	0.093	8.507	0.000
$\Delta\text{LOG}(\text{DE_TDIREM1}(-5))$	-0.446	0.110	-4.051	0.000
$\Delta\text{LOG}(\text{DE_TDIREM1}(-6))$	0.340	0.109	3.132	0.003
$\Delta\text{LOG}(\text{DE_GYPROP}(-7))$	-0.205	0.105	-1.946	0.056
$\Delta(\text{DE_RS3M}(-3))$	-0.043	0.013	-3.283	0.002
I95Q1	-0.124	0.041	-2.996	0.004

The residuals are well-behaved and the specification is stable over the sample. All diagnostic tests are passed.

Table 88: Diagnostics of estimation equation of $\Delta\text{LOG}(\text{DE_TDIREM1})$

Adjusted R2	0.88
Residual tests	
Normality test (Jarque-Bera)	0.16
Serial correlation LM test (lag 1)	0.81
Serial correlation LM test (lag 4)	0.99
Serial correlation LM test (lag 8)	0.29
ARCH LM test (lag 1)	0.97
ARCH LM test (lag 4)	0.91
White's heteroskedasticity test	0.91
RESET test (h=2)	0.41
Stability tests	outside error bands
CUSUM test	0
CUSUM of squares test	0

Property income received

Property income receive is also estimated as an error-correction equation. There is a long-run relationship between property income received, the nominal short-term interest rate and a linear trend. The error-correction coefficient is highly significant exhibiting a t-statistic of -5.175 compared to the 5 percent critical value of -3.69.

Table 89: Estimation equation of $\Delta\text{LOG}(\text{DE_YPROGOV})$

Dependent Variable: $\Delta\text{LOG}(\text{DE_YPROGOV})$				
Method: Least Squares				
Sample (adjusted): 1991Q3 2011Q4				
Included observations: 82 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(DE_YPROGOV(-1))	-0.489	0.094	-5.175	0.000
@TREND	0.003	0.001	3.076	0.003
DE_RS3M(-1)	0.031	0.012	2.583	0.012
C	0.330	0.149	2.217	0.030
Z1	-0.043	0.093	-0.461	0.646
Z2	1.109	0.083	13.429	0.000
Z3	-0.065	0.139	-0.468	0.642
Z1*S05Q1	0.649	0.111	5.839	0.000
Z2*S05Q1	-0.982	0.108	-9.069	0.000
Z3*S05Q1	-0.064	0.164	-0.391	0.697
$\Delta\text{LOG}(\text{DE_YPROGOV}(-1))$	-0.245	0.083	-2.941	0.004
I04Q2	-1.013	0.149	-6.817	0.000
I05Q1	-0.681	0.153	-4.456	0.000

The CUSUM of squares test indicates some instability. Otherwise the specification passes all diagnostic tests.

Table 90: Diagnostics of estimation equation of $\Delta\text{LOG}(\text{DE_YPROGOV})$

Adjusted R2	0.95
Residual tests	
Normality test (Jarque-Bera)	0.21
Serial correlation LM test (lag 1)	0.35
Serial correlation LM test (lag 4)	0.23
Serial correlation LM test (lag 8)	0.11
ARCH LM test (lag 1)	0.87
ARCH LM test (lag 4)	0.23
White's heteroskedasticity test	0.80
RESET test (h=2)	0.13
Stability tests	outside error bands
CUSUM test	0
CUSUM of squares test	11

Other current transfers received

Other current transfers received cannot be explained by any other variable of the model. Rather the variable is estimated using lagged observations and deterministics. There are also numerous outliers. In fact, the variable remains exogenous.

Table 91: Estimation equation of DE_REVYTRF

Dependent Variable: DE_REVYTRF				
Method: Least Squares				
Sample (adjusted): 1991Q2 2011Q4				
Included observations: 83 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.243	0.291	4.272	0.000
Z1	-0.600	0.094	-6.374	0.000
Z2	-0.485	0.087	-5.562	0.000
Z3	-0.275	0.088	-3.131	0.003
@TREND	0.004	0.001	2.451	0.017
DE_REVYTRF(-1)	0.586	0.089	6.616	0.000
I92Q3	0.661	0.286	2.315	0.024
I04Q4	1.748	0.287	6.098	0.000
I05Q1	2.010	0.340	5.909	0.000
I05Q2	-1.738	0.408	-4.258	0.000
I09Q1	-0.468	0.287	-1.633	0.107

The serial correlation LM test indicates higher-order autocorrelation and the specification is not completely stable over the sample.

Table 92: Diagnostics of estimation equation of DE_REVYTRF

Adjusted R2	0.81
Residual tests	
Normality test (Jarque-Bera)	0.44
Serial correlation LM test (lag 1)	0.72
Serial correlation LM test (lag 4)	0.02
Serial correlation LM test (lag 8)	0.04
ARCH LM test (lag 1)	0.74
ARCH LM test (lag 4)	0.67
White's heteroskedasticity test	0.78
RESET test (h=2)	0.99
Stability tests	outside error bands
CUSUM test	0
CUSUM of squares test	4

Capital transfers received

Being I(0) capital transfers received are estimated in log-levels. Explaining variables are limited to the lagged dependent variable and deterministics. The specification passes all diagnostic tests except for the RESET test.

Table 93: Estimation equation of LOG(DE_RECPROTR)

Dependent Variable: LOG(DE_RECPROTR)				
Method: Least Squares				
Sample (adjusted): 1992Q1 2011Q4				
Included observations: 80 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.301	0.298	-4.371	0.000
Z1	-0.069	0.042	-1.629	0.108
Z2	-0.176	0.046	-3.853	0.000
Z3	-0.116	0.043	-2.673	0.009
LOG(@TREND)	0.422	0.076	5.562	0.000
I95Q1	0.939	0.136	6.897	0.000
LOG(DE_RECPROTR(-4))	0.226	0.084	2.686	0.009

Table 94: Diagnostics of estimation equation of LOG(DE_RECPROTR)

Adjusted R2	0.70
Residual tests	
Normality test (Jarque-Bera)	0.40
Serial correlation LM test (lag 1)	0.67
Serial correlation LM test (lag 4)	0.98
Serial correlation LM test (lag 8)	0.66
ARCH LM test (lag 1)	0.66
ARCH LM test (lag 4)	0.29
White's heteroskedasticity test	0.28
RESET test (h=2)	0.00
Stability tests	outside error bands
CUSUM test	0
CUSUM of squares test	0

Sales and other subsidies

cannot be explained by any other variable of the model. Rather the variable is estimated using lagged observations and deterministics. Thus, in fact, the variable remains exogenous.

Table 95: Estimation equation of DE_SALESSUB

Dependent Variable: DE_SALESSUB				
Method: Least Squares				
Sample (adjusted): 1992Q2 2011Q4				
Included observations: 79 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.172	0.180	-0.958	0.342
Z1	-1.096	0.330	-3.319	0.001
Z2	-0.007	0.164	-0.045	0.964
Z3	-0.086	0.313	-0.274	0.785
DE_SALESSUB(-1)	0.899	0.066	13.631	0.000
DE_SALESSUB(-3)	-0.155	0.081	-1.909	0.060
DE_SALESSUB(-4)	0.790	0.090	8.821	0.000
DE_SALESSUB(-5)	-0.512	0.083	-6.192	0.000
I04Q2	-0.659	0.235	-2.808	0.007
I11Q1	0.699	0.242	2.889	0.005

The CUSUM of squares test points to some instability. Otherwise the specification passes all diagnostic tests.

Table 96: Diagnostics of estimation equation of DE_SALESSUB

Adjusted R2	0.99
Residual tests	
Normality test (Jarque-Bera)	0.99
Serial correlation LM test (lag 1)	0.86
Serial correlation LM test (lag 4)	0.53
Serial correlation LM test (lag 8)	0.39
ARCH LM test (lag 1)	0.99
ARCH LM test (lag 4)	0.63
White's heteroskedasticity test	0.45
RESET test (h=2)	0.66
Stability tests	outside error bands
CUSUM test	0
CUSUM of squares test	2

3.1.5. Other variables

Nominal changes in inventories and net acquisitions of valuables

The variable is $I(0)$. Therefore an error-correction equation is not appropriate. Changes in inventories and net acquisitions of valuables are explained by past observations, the coincident change of total demand and deterministics.

Table 97: Estimation equation of DE_INV

Dependent Variable: DE_INV				
Method: Least Squares				
Sample (adjusted): 1981Q1 2011Q4				
Included observations: 124 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.158	0.299	-0.527	0.599
Z1	14.892	2.089	7.129	0.000
Z2	3.997	1.270	3.147	0.002
Z3	10.404	1.612	6.454	0.000
DE_INV(-1)	0.281	0.073	3.845	0.000
DE_INV(-4)	0.511	0.071	7.158	0.000
S91Q1*Z1	6.859	1.653	4.149	0.000
S91Q1*Z2	-2.182	1.511	-1.444	0.152
S91Q1*Z3	3.067	1.657	1.851	0.067
$\Delta(\text{DE_GDP} + \text{DE_M})$	0.066	0.025	2.641	0.010
I06Q4	-9.938	2.671	-3.720	0.000
I09Q2	-11.760	2.712	-4.336	0.000
I09Q2(2)	3.756	2.849	1.318	0.190

Except for White's heteroskedasticity test the specification passes all diagnostic tests at the 5 percent level. However, the probability of first order autocorrelation is close to 5 percent.

Table 98: Diagnostics of estimation equation of DE_INV

Adjusted R2	0.94
Residual tests	
Normality test (Jarque-Bera)	0.67
Serial correlation LM test (lag 1)	0.06
Serial correlation LM test (lag 4)	0.18
Serial correlation LM test (lag 8)	0.20
ARCH LM test (lag 1)	0.72
ARCH LM test (lag 4)	0.52
White's heteroskedasticity test	0.00
RESET test (h=2)	0.06
Stability tests	outside error bands
CUSUM test	0
CUSUM of squares test	65

3.2. Definitions

3.2.1. Real GDP

de_gdp00 = (1 - s91q1agg) * (de_cp00 + de_cg00 + de_gcf00 + de_x00 - de_m00) + @nan(s91q1agg * ((@movav(de_pcp00(-1), 4) * s1 + @movav(de_pcp00(-2), 4) * s2 + @movav(de_pcp00(-3), 4) * s3 + @movav(de_pcp00(-4), 4) * s4) / (@movav(de_pgdp00(-1), 4) * s1 + @movav(de_pgdp00(-2), 4) * s2 + @movav(de_pgdp00(-3), 4) * s3 + @movav(de_pgdp00(-4), 4) * s4) * de_cp00 + (@movav(de_pcgov00(-1), 4) * s1 + @movav(de_pcgov00(-2), 4) * s2 + @movav(de_pcgov00(-3), 4) * s3 + @movav(de_pcgov00(-4), 4) * s4) / (@movav(de_pgdp00(-1), 4) * s1 + @movav(de_pgdp00(-2), 4) * s2 + @movav(de_pgdp00(-3), 4) * s3 + @movav(de_pgdp00(-4), 4) * s4) * de_cg00 + (@movav(de_pgcf00(-1), 4) * s1 + @movav(de_pgcf00(-2), 4) * s2 + @movav(de_pgcf00(-3), 4) * s3 + @movav(de_pgcf00(-4), 4) * s4) / (@movav(de_pgdp00(-1), 4) * s1 + @movav(de_pgdp00(-2), 4) * s2 + @movav(de_pgdp00(-3), 4) * s3 + @movav(de_pgdp00(-4), 4) * s4) * de_gcf00 + (@movav(de_px00(-1), 4) * s1 + @movav(de_px00(-2), 4) * s2 + @movav(de_px00(-3), 4) * s3 + @movav(de_px00(-4), 4) * s4) / (@movav(de_pgdp00(-1), 4) * s1 + @movav(de_pgdp00(-2), 4) * s2 + @movav(de_pgdp00(-3), 4) * s3 + @movav(de_pgdp00(-4), 4) * s4) * de_x00 - (@movav(de_pm00(-1), 4) * s1 + @movav(de_pm00(-2), 4) * s2 + @movav(de_pm00(-3), 4) * s3 + @movav(de_pm00(-4), 4) * s4) / (@movav(de_pgdp00(-1), 4) * s1 + @movav(de_pgdp00(-2), 4) * s2 + @movav(de_pgdp00(-3), 4) * s3 + @movav(de_pgdp00(-4), 4) * s4) * de_m00), 0)

de_ifc00 = (1 - s91q1agg) * (de_imeq00 + de_inrb00 + de_id00 + de_icongov00 + de_ioth00) + @nan(s91q1agg * ((@movav(de_pimeq00(-1), 4) * s1 + @movav(de_pimeq00(-2), 4) * s2 + @movav(de_pimeq00(-3), 4) * s3 + @movav(de_pimeq00(-4), 4) * s4) / (@movav(de_pifc00(-1), 4) * s1 + @movav(de_pifc00(-2), 4) * s2 + @movav(de_pifc00(-3), 4) * s3 + @movav(de_pifc00(-4), 4) * s4) * de_imeq00 + (@movav(de_picongov00(-1), 4) * s1 + @movav(de_picongov00(-2), 4) * s2 + @movav(de_picongov00(-3), 4) * s3 + @movav(de_picongov00(-4), 4) * s4) / (@movav(de_pifc00(-1), 4) * s1 + @movav(de_pifc00(-2), 4) * s2 + @movav(de_pifc00(-3), 4) * s3 + @movav(de_pifc00(-4), 4) * s4) * de_icongov00 + (@movav(de_pioth00(-1), 4) * s1 + @movav(de_pioth00(-2), 4) * s2 + @movav(de_pioth00(-3), 4) * s3 + @movav(de_pioth00(-4), 4) * s4) / (@movav(de_pifc00(-1), 4) * s1 + @movav(de_pifc00(-2), 4) * s2 + @movav(de_pifc00(-3), 4) * s3 + @movav(de_pifc00(-4), 4) * s4) * de_ioth00 + (@movav(de_pinrb00(-1), 4) * s1 + @movav(de_pinrb00(-2), 4) * s2 + @movav(de_pinrb00(-3), 4) * s3 + @movav(de_pinrb00(-4), 4) * s4) / (@movav(de_pifc00(-1), 4) * s1 + @movav(de_pifc00(-2), 4) * s2 + @movav(de_pifc00(-3), 4) * s3 + @movav(de_pifc00(-4), 4) * s4) * de_inrb00 + (@movav(de_pid00(-1), 4) * s1 + @movav(de_pid00(-2), 4) * s2 + @movav(de_pid00(-3), 4) * s3 + @movav(de_pid00(-4), 4) * s4) / (@movav(de_pifc00(-1), 4) * s1 + @movav(de_pifc00(-2), 4) * s2 + @movav(de_pifc00(-3), 4) * s3 + @movav(de_pifc00(-4), 4) * s4) * de_id00), 0)

de_x00 = (1 - s91q1agg) * (de_xg00 + de_xs00) + @nan(s91q1agg * ((@movav(de_pxg00(-1), 4) * s1 + @movav(de_pxg00(-2), 4) * s2 + @movav(de_pxg00(-3), 4) * s3 + @movav(de_pxg00(-4), 4) * s4) / (@movav(de_px00(-1), 4) * s1 + @movav(de_px00(-2), 4) * s2 + @movav(de_px00(-3), 4) * s3 + @movav(de_px00(-4), 4) * s4) * de_xg00 + (@movav(de_pxs00(-1), 4) * s1 + @movav(de_pxs00(-2), 4) * s2 + @movav(de_pxs00(-3), 4) * s3 + @movav(de_pxs00(-4), 4) * s4) / (@movav(de_px00(-1), 4) * s1 + @movav(de_px00(-2), 4) * s2 + @movav(de_px00(-3), 4) * s3 + @movav(de_px00(-4), 4) * s4) * de_xs00), 0)

de_m00 = (1 - s91q1agg) * (de_mg00 + de_ms00) + @nan(s91q1agg * ((@movav(de_pmg00(-1), 4) * s1 + @movav(de_pmg00(-2), 4) * s2 + @movav(de_pmg00(-3), 4) * s3 + @movav(de_pmg00(-4), 4) * s4) / (@movav(de_pm00(-1), 4) * s1 + @movav(de_pm00(-2), 4) * s2 + @movav(de_pm00(-3), 4) * s3 + @movav(de_pm00(-4), 4) * s4) * de_mg00 + (@movav(de_pms00(-1), 4) * s1 + @movav(de_pms00(-2), 4) * s2 + @movav(de_pms00(-3), 4) * s3 + @movav(de_pms00(-4), 4) * s4) / (@movav(de_pm00(-1), 4) * s1 + @movav(de_pm00(-2), 4) * s2 + @movav(de_pm00(-3), 4) * s3 + @movav(de_pm00(-4), 4) * s4) * de_ms00), 0)

de_xm00 = de_x00 - de_m00

de_xg00 = de_xg00_ewu + de_xg00_us + de_xg00_uk + de_xg00_row

de_gcf00 = de_ifc00 + de_inv00

de_iend00 = de_gdp00 + de_m00 - de_x00

de_end00 = de_gdp00 + de_m00

3.2.2. Nominal GDP

$$\text{de_gdp} = (\text{de_pcp00} * \text{de_cp00} / 100 + \text{de_pcgov00} * \text{de_cgov00} / 100 + \text{de_pifc00} * \text{de_ifc00} / 100 + \text{de_inv} + \text{de_px00} * \text{de_x00} / 100 - \text{de_pm00} * \text{de_m00} / 100)$$

$$\text{de_cp} = \text{de_cp00} * \text{de_pcp00} / 100$$

$$\text{de_cgov} = \text{de_pcgov00} * \text{de_cgov00} / 100$$

$$\text{de_ifc} = \text{de_imeq00} * \text{de_pimeq00} / 100 + \text{de_id00} * \text{de_pid00} / 100 + \text{de_inrb00} * \text{de_pinrb00} / 100 + \text{de_icongov00} * \text{de_picongov00} / 100 + \text{de_ioth00} * \text{de_pioth00} / 100$$

$$\text{de_x} = (\text{de_xg00} * \text{de_pxg00}) / 100 + (\text{de_xs00} * \text{de_pxs00}) / 100$$

$$\text{de_m} = (\text{de_mg00} * \text{de_pmg00}) / 100 + (\text{de_ms00} * \text{de_pms00}) / 100$$

$$\text{de_xm} = \text{de_x} - \text{de_m}$$

3.2.3. Prices

$$\text{de_pgdp00} = \text{de_gdp} / \text{de_gdp00} * 100$$

$$\text{de_pifc00} = \text{de_ifc} / \text{de_ifc00} * 100$$

$$\text{de_pifc_id} = (\text{de_ifc} - \text{de_id00} * \text{de_pid00} / 100) / (\text{de_ifc00} - \text{de_id00}) * 100$$

$$\text{de_pgcf00} = (\text{de_ifc} + \text{de_inv}) / (\text{de_ifc00} + \text{de_inv00}) * 100$$

$$\text{de_px00} = \text{de_x} / \text{de_x00} * 100$$

$$\text{de_pm00} = \text{de_m} / \text{de_m00} * 100$$

$$\text{de_pmgrel} = \text{de_pmg00} / \text{de_ptotdem} * 100$$

$$\text{de_pmrel} = \text{de_pm00} / \text{de_ptotdem} * 100$$

$$\text{de_ptotdem} = (\text{de_gdp} + \text{de_m}) / (\text{de_gdp00} + \text{de_m00}) * 100$$

3.2.4. Wages and income

$$\text{de_wageshare} = \text{de_coe} / (\text{de_coe} + \text{de_gyprop})$$

$$\text{de_coe} = \text{de_gwage} + \text{de_tssem1}$$

$$\text{de_coee} = \text{de_coe} / \text{de_ee} * 1000000$$

$$\text{de_coee00} = \text{de_coee} / \text{de_pgdp00} * 100$$

$$\text{de_gwage} = (\text{de_gwagee} * \text{de_ee}) / 1000000$$

$$\text{de_gwagee00} = \text{de_gwagee} / \text{de_pgdp00} * 100$$

$$\text{de_ulc} = (\text{de_coe}) / \text{de_gdp00}$$

$$\text{de_ulc00} = \text{de_ulc} / \text{de_pgdp00} * 100$$

$$\text{de_dispy} = \text{de_nwage} + \text{de_trfgov_ph} + \text{de_wdyent}$$

$$\text{de_dispy00} = (\text{de_dispy} / \text{de_pcp00}) * 100$$

$$\text{de_y} = \text{de_gdp} - \text{de_tindsub} - \text{de_cfc}$$

$$\text{de_gyprop} = \text{de_y} - \text{de_coe}$$

$$\text{de_nwage} = \text{de_gwage} - \text{de_tdiree} - \text{de_tssee}$$

$$\text{de_masseneink} = \text{de_nwage} + \text{de_trfgov_ph}$$

$$\text{de_masseink00} = \text{de_masseneink} / \text{de_pcp00} * 100$$

3.2.5. General government

$$\text{de_tdir} = \text{de_tdiree} + \text{de_tdirem1}$$

$$\text{de_t} = \text{de_tdir} + \text{de_tind}$$

$$\text{de_tssem1} = \text{de_gwage} * \text{de_tssem1_tariffsa_sa} / 100$$

$$\text{de_tssem} = \text{de_gwage} * \text{de_tssem_tariffsa_sa} / 100$$

$$\text{de_tssee} = \text{de_gwage} * \text{de_tssee_tariffsa_sa} / 100$$

$$\text{de_tss} = \text{de_tssee} + \text{de_tssem}$$

$$\text{de_revgov} = \text{de_t} + \text{de_tss} + \text{de_yprogov} + \text{de_revytrf} + \text{de_recprotr} + \text{de_salessub}$$

$$\text{de_expgov} = \text{de_cgov} + \text{de_intpagov} + \text{de_trfgov} + \text{de_protrgov} + \text{de_igov} + \text{de_subgov} + \text{de_trsongov} + \text{de_netprgov} + \text{de_expoth}$$

$$\text{de_bgov} = \text{de_revgov} - \text{de_expgov}$$

$$\text{deficit_gdp_ratio} = \text{de_bgov} / \text{de_gdp} * 100$$

$$\text{de_dbtgov} = \text{de_dbtgov}(-1) - \text{de_bgov}$$

$$\text{dbt_gdp_ratio} = \text{de_dbtgov} / (\text{de_gdp} + \text{de_gdp}(-1) + \text{de_gdp}(-2) + \text{de_gdp}(-3)) * 100$$

3.2.6. Other variables

$$\text{de_capital00} = \text{de_capital00}(-1) + \text{de_imeq00} + \text{de_inrb00} + \text{de_icongov00} + \text{de_ioth00} - \text{de_cfc} / \text{de_pifc_id} * 100 * .76 + \text{i91q1} * 681$$

$$\text{de_ur} = (\text{de_u}) / (\text{de_et} + \text{de_u}) * 100$$

$$\text{de_prodee} = \text{de_gdp00} / \text{de_ee} * 1000000$$

$$\text{de_capa} = (\text{de_gdp00} / \text{de_gdp00t}) * 100$$

$$\text{de_rl10y00} = \text{de_rl10y} - (\text{de_pcp00} / \text{de_pcp00}(-4) - 1) * 100$$

$$\text{de_rs3m00} = \text{de_rs3m} - (\text{de_pcp00} / \text{de_pcp00}(-4) - 1) * 100$$

$$\text{de_sav_ratio} = 100 - \text{de_cp} / \text{de_dispy} * 100$$

$$\text{de_reev_24_ptotdem} = \text{de_apeuro_24_ptotdem} * \text{de_ptotdem} / 100$$

$$\text{de_reev_56_cpi} = \text{de_apeuro_56_cpi} * \text{cpi_de} / 100$$

4. Simulations

Four standard simulations have been carried out to illustrate the effects of alternative shocks to the German economy:

- a) Increase of nominal government investment by € 1 billion per quarter. Real government construction investment (DE_ICONGOV00) is also increased by € 1 billion per quarter and deflated by the respective price index).
- b) Increase of wages and salaries per employee by a constant amount corresponding to 1% at the start of the simulation period. Wages are kept exogenous in the simulation.
- c) Increase of US real gross fixed capital formation by € 10 billion per quarter.
- d) Increase of euro area (excluding Germany) real gross fixed capital formation by € 10 billion per quarter.

The simulation period begins in the first quarter of 2002 and ends in the fourth quarter of 2011. The figures below illustrate the deviations from the baseline for each scenario.

- a) In the case of the government investment shock the multiplier reaches almost 2 at the peak, but subsequently declines to about 1.3 in the long run due to price and employment effects. The effect on the budget balance is negative during the whole simulation period as some expenditure items also increase with GDP, but there is a partial self-financing effect during several years (Figure 2).
- b) A permanent wage increase of the given size temporarily increases real GDP and employment. However, the longer run effect is slightly negative due to the loss in price competitiveness resulting in lower exports. The price level increases permanently. The effect on the budget balance turns negative at the end of the simulation period (Figure 3).
- c) Via increased exports the increase of US demand has a strong and permanent effect on real GDP and employment. Due to the negative effect of capital accumulation on the latter the permanent increase in employment is lower than the peak reached after about four years. There is a substantial positive effect on the budget balance (Figure 4).
- d) An increase of euro area demand of a similar size has a much stronger effect on the German economy as exports to the euro area account for a much larger share of total exports. There is a considerable long-term increase in real GDP as well as employment. The budget balance improves substantially.

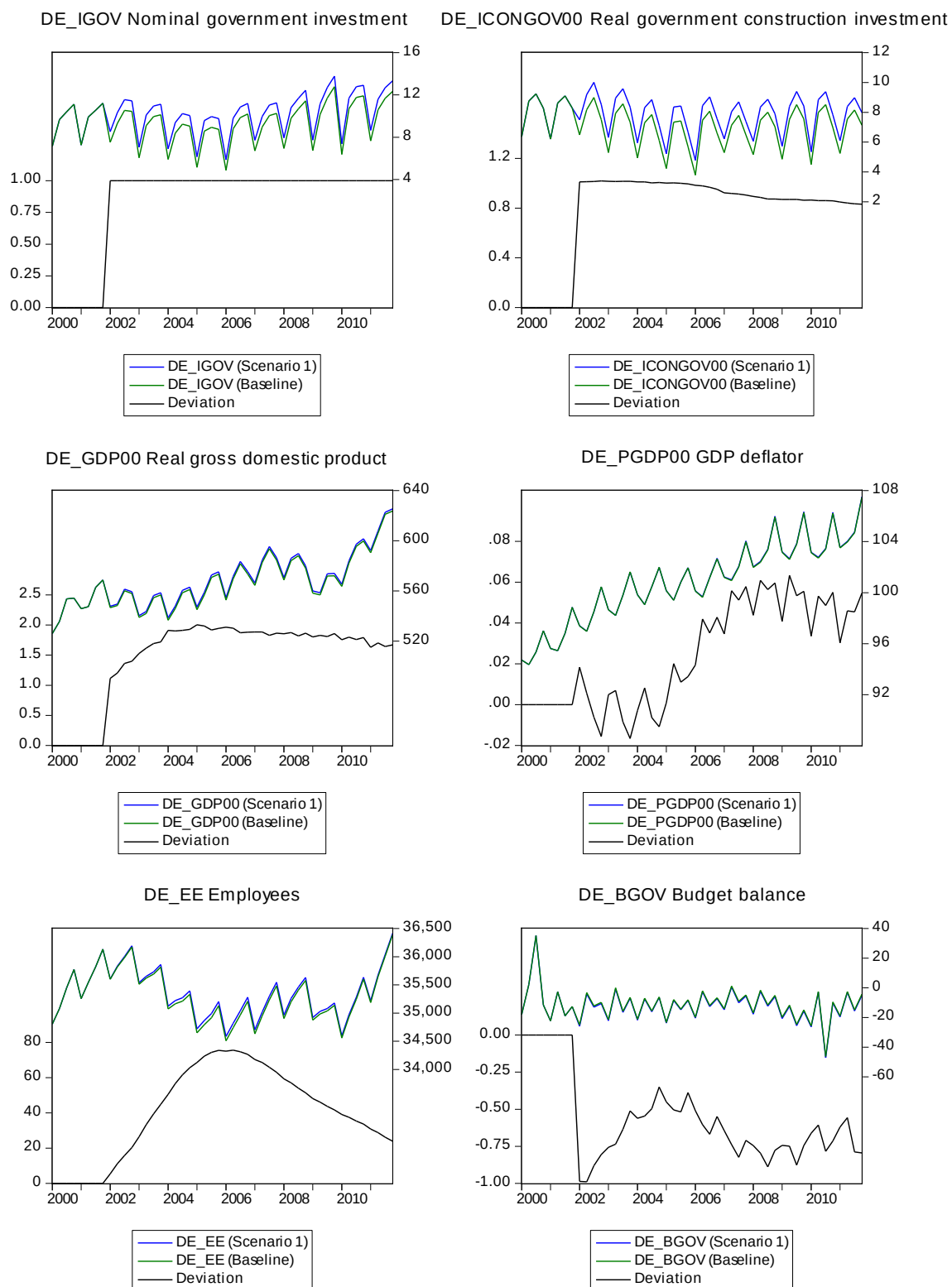
Figure 2: Simulation of an increase in government investment

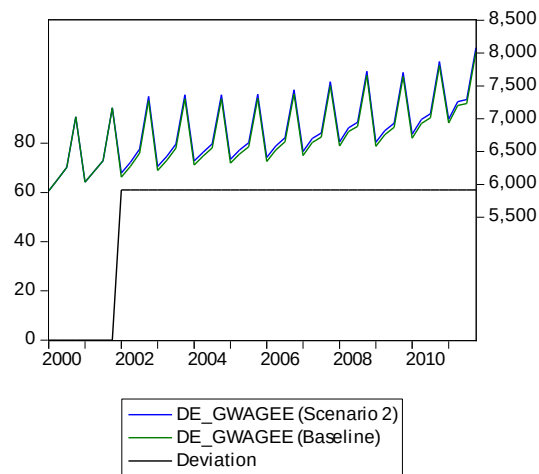
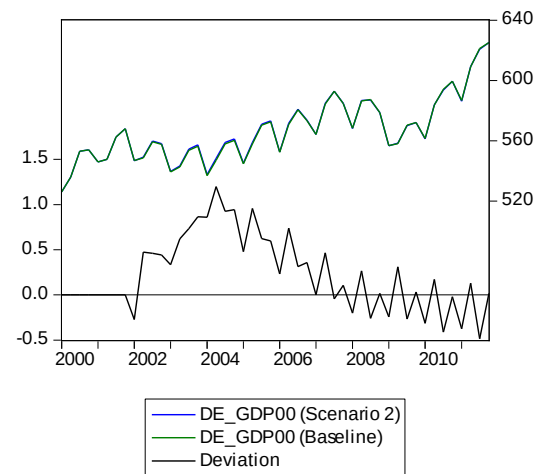
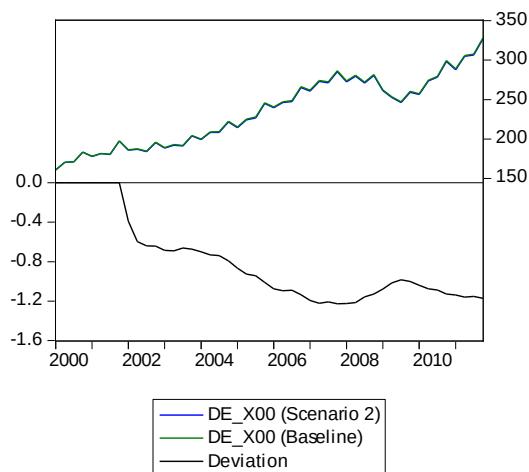
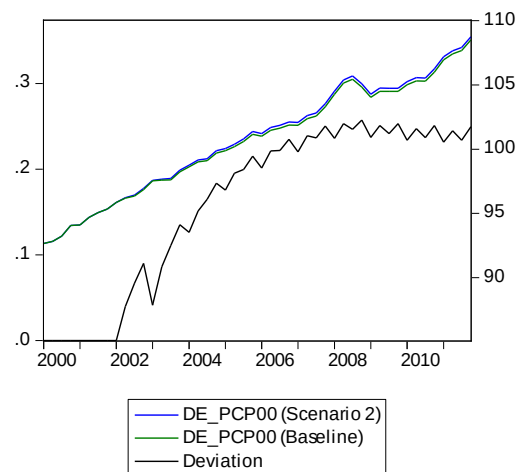
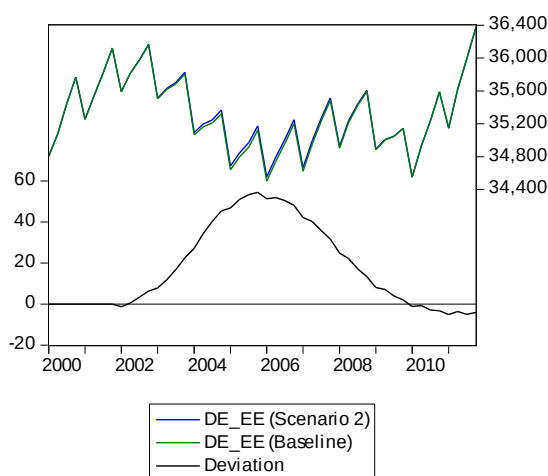
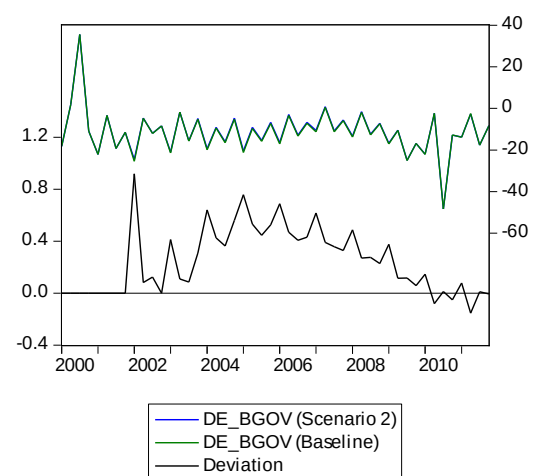
Figure 3: Simulation of a wage increase**DE_GWAGEE Gross wages and salaries per employee****DE_GDP00 Real gross domestic product****DE_X00 Real exports****DE_PCP00 Private consumption deflator****DE_EE Employees****DE_BGOV Budget balance**

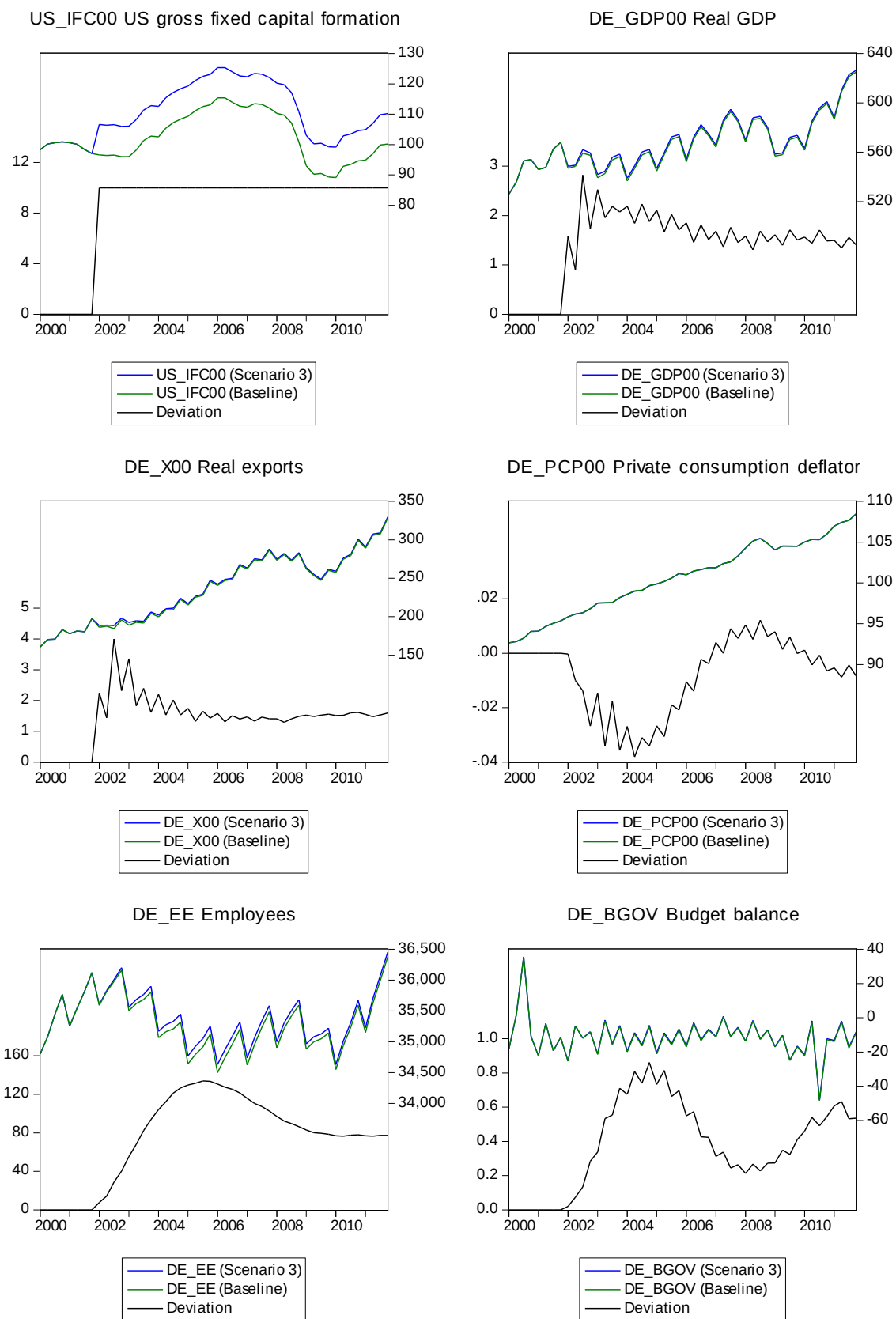
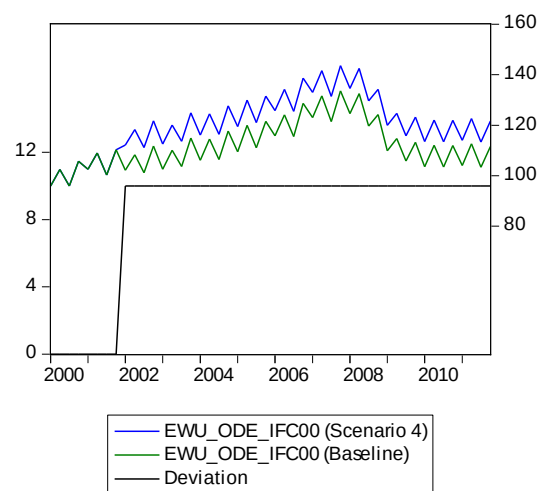
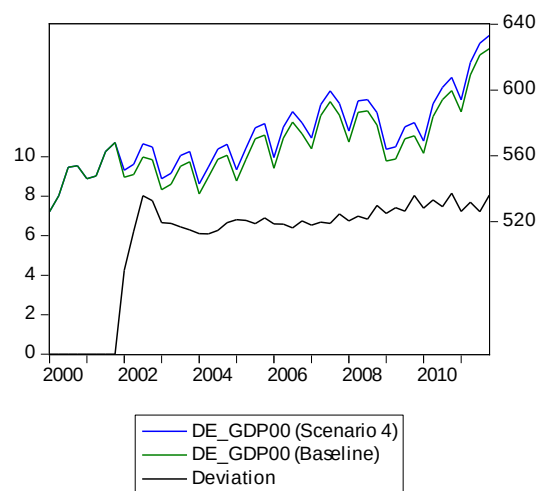
Figure 4: Simulation of an increase of US gross fixed capital formation

Figure 5: Simulation of an increase of EMU gross fixed capital formation

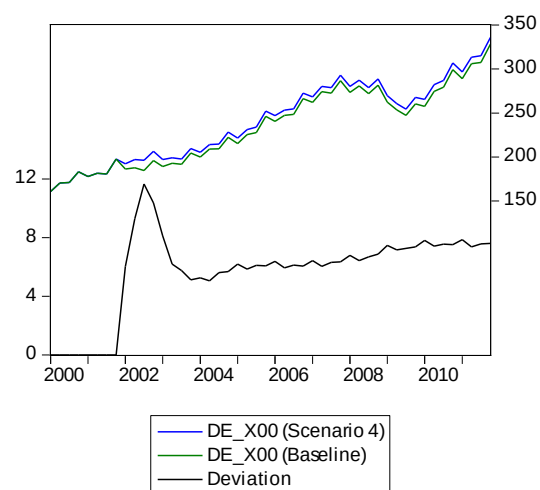
EWU_ODE_IFC00 Gross fixed capital formation of the euro area excluding Germany



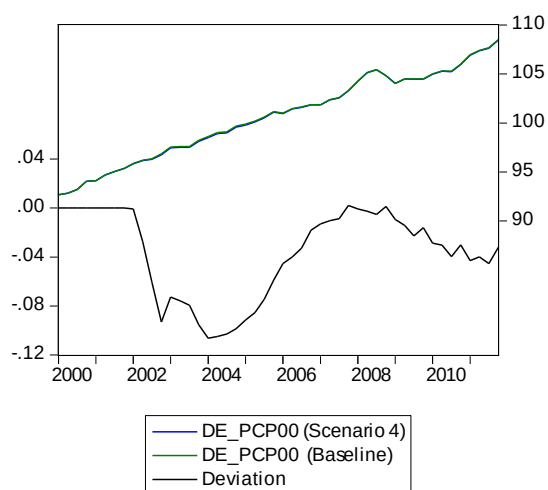
DE_GDP00 Real GDP



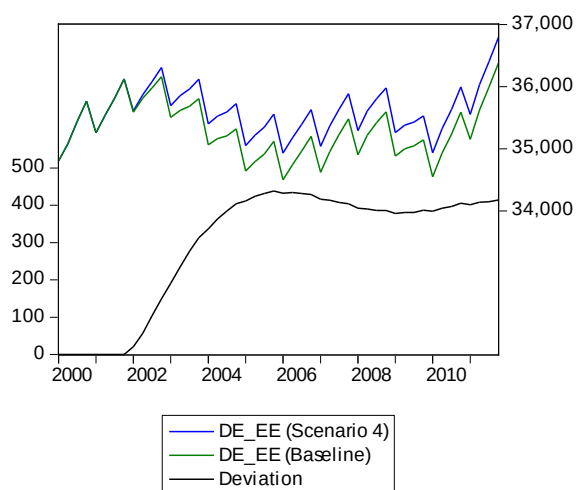
DE_X00 Real exports



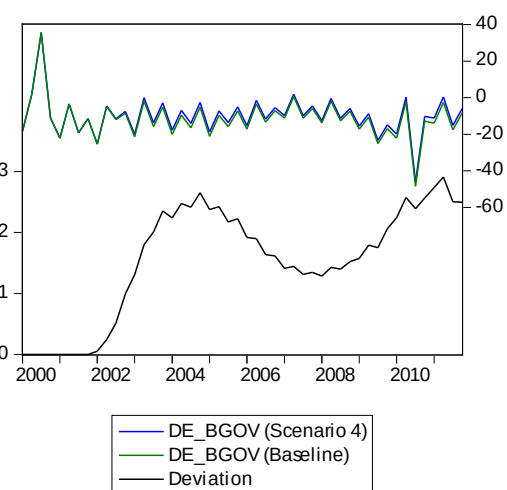
DE_PCP00 Private consumption deflator



DE_EE Employees



DE_BGOV Budget balance



5. Conclusion

The IMK's macroeconometric model of the German economy has been used for the IMK's forecasts as well as policy simulations for several years now. During this time individual equations have been re-estimated frequently and will be re-estimated again whenever new data become available. Thus, the current specifications are not sacrosanct and this documentation is merely a snapshot of the state of the model in the summer of 2012. Despite frequent re-estimations the general structure and model philosophy have remained more or less the same over the years.

Generally, the model is highly aggregated and rather compact. It allows addressing a large number of macroeconomic issues, but has limitations. For specific interests additional equations and variables are therefore added temporarily. For example, the model was amended by a module for the pension system to analyse the effects of pension reform on macroeconomic stability (Meinhardt et al. 2009). This may be repeated in the case of other specific policy issues.

Next steps will concentrate on the role of income distribution for private consumption expenditure. With the availability of quarterly data for the government sector some more substantial revisions of the respective equations may also become necessary.

References

- Banerjee, A., J. Dolado, and R. Mestre (1998): Error-correction mechanism tests for cointegration in a single-equation framework," *Journal of Time Series Analysis*, 19, 267-283.
- Barcellan, R. (1994): -ECOTRIM: a Program for Temporal Disaggregation of Time Series," Paper presented at the joint INSEE and Eurostat Quarterly National Accounts Workshop in Paris on December 5th and 6th, 1994.
- Chow, G., and A. Lin (1971): Best linear unbiased interpolation, distribution and extrapolation of time series by related series," *The Review of Economics and Statistics*, (53), 372-375.
- Duong, M.H., Logeay, C., Stephan, S., Yahnych, S., Zwiener, R. (2005): Modelling European Business Cycles (EBC Model): A Macroeconometric Model of Germany ; Version March 2005, DIW Berlin, Data Documentation 5.
- Dickey, D., and W. Fuller (1979): Distribution of the Estimators for Autoregressive Time Series with a Unit Root," *Journal of the American Statistical Association*, 74, 427-431.
- Enders, W. (2004): *Applied Econometric Time Series*. Wiley, second edition.
- Engle, R., and C. Granger (1987): Co-integration and error-correction: Representation, estimation and testing," *Econometrica*, 55(2), 251-276.
- Hassler, U. (2004): Leitfaden zum Testen und Schätzen von Kointegration," in *Arbeiten mit ökonometrischen Modellen*, ed. by W. Gaab, U. Heilemann, and J. Wolters, pp. 85-115. Physica-Verlag, Heidelberg.
- Lütkepohl, H. (2004): Univariate Time Series Analysis," in *Applied Time Series Econometrics*, ed. by H. Lütkepohl, and M. Krätzig, pp. 8-85. Cambridge University Press.
- Meinhardt, V., Rietzler, K. and Zwiener, R. (2009): Konjunktur und Rentenversicherung – gegenseitige Abhängigkeiten und mögliche Veränderungen durch diskretionäre Maßnahmen, *IMK Studies* 3/2009, Düsseldorf;
- Perron, P. (1989): The Great Crash, the Oil Price Shock, and the Unit Root Hypothesis," *Econometrica*, 57(6), 1361-1401.
- Perron, P., and T. Vogelsang (1993): Erratum," *Econometrica*, 61(1), 248-250.
- Ramsey, J. (1969): Tests for specification errors in classical linear least-squares regression analysis," *Journal of the Royal Statistical Society*, 31, 350-371.
- Stephan, S. (2002): German exports to the euro area," *DIW Discussion Papers*, No. 286.
- Stephan, S. (2005a): Pricing-to-Market Effects in Foreign Trade Prices," *IMK Working Paper*, No. 7/2005.
- Stephan, S. (2005b): Sind deutsche Warenimport preisunelastisch? Neue Antworten auf ein altes "Puzzle" .
- Stock, J. (1987): Asymptotic properties of least squares estimators of cointegrating vectors," *Econometrica*, 55(5), 1035-1056.
- Tödter, K.-H. (2005): Umstellung der deutschen VGR auf Vorjahrespreisbasis Konzept und Konsequenzen für die aktuelle Wirtschaftsanalyse sowie die ökonometrische Modellierung," *Diskussionspapier, Reihe 1: Volkswirtschaftliche Studien*, No. 31/2005.
- White, H. (1980): A heteroskedastic-consistent covariance matrix estimator and a direct test for heteroskedasticity," *Econometrica*, 48, 817-838.

Appendix: Variables of the model

Table 99: List of variables

Abbreviation	Explanation	Source
CPI_DE	Consumer price index, Germany	OECD
CPI_EWU	Consumer price index, euro area	OECD
CPI_UK	Consumer price index, United Kingdom	OECD
CPI_US	Consumer price index, United States of America	OECD
DBT_GDP_RATIO	Debt to GDP ratio	IMK calculations
DE_APEURO_24_PTOTDEM	Foreign price level (total demand) of 24 countries in euro terms	IMK calculations
DE_APEURO_56_CPI	Foreign price level (cpi) of 56 countries in euro terms	IMK calculations
DE_BGOV	Government budget balance	Destatis, IMK
DE_CAPA	Capacity utilisation	IMK estimate
DE_CAPITAL00	Capital stock, in real terms, reference year 2005	IMK calculation
DE_CFC	Consumption of fixed capital	Destatis
DE_CGOV	Government consumption, nominal	Destatis
DE_CGOV00	Government consumption, in real terms, reference year 2005	Destatis
DE_COE	Compensation of employees	Destatis
DE_COEE	Compensation per employee	IMK calculation
DE_COEE00	Compensation per employee, in real terms, reference year 2005	IMK calculation
DE_CP	Private consumption, nominal	Destatis
DE_CP00	Private consumption, in real terms, reference year 2005	Destatis
DE_DBTGOV	Government gross debt	Destatis
DE_DISPY	Disposable income of households and NPISH, nominal	Destatis
DE_DISPY00	Disposable income of households and NPISH, in real terms, reference year 2005	Destatis
DE_EE	Employees	Destatis
DE_END00	Total final demand, in real terms, reference year 2005	IMK calculation
DE_ET	Employment	Destatis
DE_EXPGOV	Government expenditure	Destatis
DE_EXPOTH	Other government expenditures	Destatis, IMK calculation
DE_GCF00	Gross capital formation, in real terms, reference year 2005	Destatis
DE_GDP	Gross domestic product, nominal	Destatis
DE_GDP00	Gross domestic product, in real terms, reference year 2005	Destatis
DE_GDP00T	Trend of real GDP	IMK estimate
DE_GWAGE	Gross wages and salaries	Destatis
DE_GWAGEE	Gross wage per employee	IMK calculation
DE_GWAGEE00	Real gross wage per employee, reference year 2005	IMK calculation
DE_GYPROP	Operating surplus and mixed income	Destatis
DE_ICONGOV00	Gross fixed capital formation of the government, in real terms, reference year 2005	Destatis

Abbreviation	Explanation	Source
DE_ID00	Gross fixed capital formation: residential construction of private sector, in real terms, reference year 2005	Destatis
DE_IEND00	Total final domestic demand (DE_END00 less exports), in real terms, reference year 2005	IMK calculation
DE_IFC	Gross fixed capital formation, nominal	Destatis
DE_IFC00	Gross fixed capital formation, in real terms, reference year 2005	Destatis
DE_IGOV	Gross fixed capital formation: government	Destatis
DE_IMEQ00	Gross fixed capital formation: machinery and equipment, in real terms, reference year 2005	Destatis
DE_INRB00	Gross fixed capital formation: non-residential construction of private sector, in real terms, reference year 2005	Destatis
DE_INTPAGOV	Property income paid, government (i.e. interest payments)	Destatis
DE_INV	Changes in inventories and net acquisitions of valuables, nominal	Destatis
DE_INV00	Changes in inventories and net acquisitions of valuables, in real terms, reference year 2005	Destatis
DE_IOTH00	Gross fixed capital formation: other products, in real terms, reference year 2005	Destatis
DE_M	Imports of goods and services, nominal	Destatis
DE_M00	Imports of goods and services, in real terms, reference year 2005	Destatis
DE_MASSEINK00	Mass income, in real terms, reference year 2005	Destatis
DE_MASSEINEINK	Mass income, nominal	Destatis
DE_MG00	Imports of goods, in real terms, reference year 2005	Destatis
DE_MS00	Imports of services, in real terms, reference year 2005	Destatis
DE_NETPRGOV	Government: net increase of valuables	
DE_NEV_EWU	Nominal effective exchange rate vis-à-vis euro area countries	IMK calculation
DE_NEV_UK	Nominal effective exchange rate vis-à-vis the United Kingdom	IMK calculation
DE_NEV_US	Nominal effective exchange rate vis-à-vis the United States of America	IMK calculation
DE_NWAGE	Net wages and salaries	Destatis
DE_PCGOV00	Government consumption deflator; index: 2005=100	Destatis
DE_PCP00	Private consumption deflator; index: 2005=100	Destatis
DE_PGCF00	Deflator of gross capital formation; index: 2005=100	Destatis
DE_PGDP00	GDP deflator; index: 2005=100	Destatis
DE_PICONGOV00	Deflator of gross fixed capital formation: government construction; index: 2005=100	Destatis

Abbreviation	Explanation	Source
DE_PID00	Deflator of gross fixed capital formation: private residential construction; index: 2005=100	Destatis
DE_PIFC00	Deflator of gross fixed capital formation: total; index: 2005=100	Destatis
DE_PIFC_ID	Deflator of gross fixed capital formation (excluding residential construction); index: 2005=100	Destatis
DE_PIMEQ00	Deflator of gross fixed capital formation: machinery and equipment; index: 2005=100	Destatis
DE_PINRB00	Deflator of gross fixed capital formation: private non-residential construction; index: 2005=100	Destatis
DE_PIOTH00	Deflator of gross fixed capital formation: other products; index: 2005=100	Destatis
DE_PM00	Deflator of imports of goods and services; index: 2005=100	Destatis
DE_PMG00	Deflator of imports of goods; index: 2005=100	Destatis
DE_PMGREL	Price level of goods imports relative to domestic price level	IMK calculation
DE_PMREL	Price level of imports relative to domestic price level; index: 2005=100	IMK calculation
DE_PMS00	Deflator of imports of services; index: 2005=100	Destatis
DE_POPUL	Population	Destatis
DE_PRODEE	Productivity per employee	IMK calculation
DE_PROTRGOV	Property transfers paid by the government	Destatis, IMK calculations
DE_PTOTDEM	Deflator of total demand	Destatis
DE_PX00	Deflator of exports of goods and services; index: 2005=100	Destatis
DE_PXG00	Deflator of exports of goods; index: 2005=100	Destatis
DE_PXS00	Deflator of exports of services; index: 2005=100	Destatis
DE_RECPROTR	Property transfers received by the government	Destatis, IMK calculations
DE_REEV_24_PTOTDEM	Real effective exchange rate vis-à-vis 24 industrialised countries (price index: deflator of total demand)	Deutsche Bundesbank
DE_REEV_56_CPI	Real effective exchange rate vis-à-vis 56 countries (price index: consumer price index)	Deutsche Bundesbank
DE_REVGOV	Government revenue	Destatis, IMK calculations
DE_REVYTRF	Other current transfers received by the government from the other sectors	Destatis, IMK calculations
DE_RL10Y	Nominal long term interest rate (10 years)	Deutsche Bundesbank
DE_RL10Y00	Real long term interest rate (10 years)	Deutsche Bundesbank
DE_RS3M	Nominal short term interest rate (3 months, money market rate)	IMK calculation
DE_RS3M00	Real short term interest rate (3 months, money market rate)	IMK calculation
DE_SALESSUB	Sales and other revenues of the	Destatis, IMK calculations

Abbreviation	Explanation	Source
	government	
DE_SAV_RATIO	Household savings ratio	Destatis
DE_SUBGOV	Government subsidies	Destatis, IMK calculations
DE_T	Taxes paid to the government	Destatis, IMK calculations
DE_TDIR	Direct taxes	Destatis, IMK calculations
DE_TDIREE	Taxes on income and wealth paid by employees	Destatis
DE_TDIREM1	Taxes on income and wealth paid by employers and self-employed households	Destatis, IMK calculations
DE_TIND	Taxes on production and imports	Destatis
DE_TIND_TARIFFSA_SA	Seasonally adjusted indirect tax rate	IMK calculations
DE_TINDSUB	Taxes less subsidies on production and imports	Destatis
DE_TRFGOV	Monetary government transfers paid by the government	Destatis, IMK calculations
DE_TRFGOV_PH	Monetary government transfers received by households	Destatis
DE_TRSONGOV	Other current transfers paid by the government	Destatis, IMK calculations
DE_TSS	Social contributions paid to the government	Destatis, IMK calculations
DE_TSSEE	Social contributions paid by employees	Destatis
DE_TSSEE_TARIFFSA_SA	Employees' social security contribution rate (seasonally adjusted)	IMK calculations
DE_TSSEM	Social contributions paid by employers	Destatis, IMK calculations
DE_TSSEM1	Employers' social contributions	Destatis, IMK calculations
DE_TSSEM1_TARIFFSA_SA	Employers' social contribution rate (seasonally adjusted, difference between compensation of employees and gross wages and salaries)	IMK calculations
DE_TSSEM_TARIFFSA_SA	Employers' social contribution rate (seasonally adjusted, government accounts)	IMK calculations
DE_U	Unemployed persons (thousands)	Destatis
DE_ULC	Unit labour cost	IMK calculation
DE_ULC00	Real unit labour cost	IMK calculation
DE_UR	Unemployment rate	Destatis
DE_WAGESHARE	Wage share (as a fraction of 1)	IMK calculation
DE_WDYENT	Distributed profits	IMK calculation
DE_X	Exports of goods and services, nominal	Destatis
DE_X00	Exports of goods and services, in real terms, reference year 2005	Destatis
DE_XG00	Exports of goods, in real terms, reference year 2005	Destatis
DE_XG00_EWU	Exports of goods to the euro area, in real terms, reference year 2005	Destatis
DE_XG00_ROW	Exports of goods to the rest of the world, in real terms, reference year 2005	Destatis
DE_XG00_UK	Exports of goods to the UK, in real terms, reference year 2005	Destatis

Abbreviation	Explanation	Source
DE_XG00_US	Exports of goods to the United States, in real terms, reference year 2005	Destatis
DE_XM	Net exports, nominal	Destatis
DE_XM00	Net exports, in real terms, reference year 2005	IMK calculation
DE_XS00	Exports of services, in real terms, reference year 2005	Destatis
DE_Y	National income	Destatis
DE_YPROGOV	Property income received by the government	Destatis, IMK calculations
DEFICIT_GDP_RATIO	Budget balance in % of GDP	Destatis, IMK calculations
EWU6_ULC	Unit labour cost of 6 euro area countries	IMK calculation based on Eurostat data
EWU_ODE_IFC00	Real gross fixed capital formation of EMU excluding Germany; index: 2000=100	IMK calculation based on Eurostat data
OIL\$	Oil price in USD	IMF, EIA
ROW_GDP00	Real GDP of the Rest of the world; index: 2000=100	World Bank, IMK calculations
UK_GDP05_SB	UK GDP, in real terms; index: 2005=100	Eurostat
UK_ULC	Unit labour cost UK	IMK calculation based on Eurostat data
US_IFC00	Gross fixed capital formation of the United States, in real terms; index: 2000=100	OECD
US_ULC	Unit labour cost, USA	OECD

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