MACROECONOMETRIC MODEL FOR SLOVENIA

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Abstract

Slovenia entered the European Union in 2004 and was the first country of the ten new members to enter the Euro Area in 2007. As Slovenia was part of Communist Yugoslavia until 1991, the economic history of this country to some extent started after that date. This provides difficulties for attempts to discover empirical regularities to be exploited for forecasting and policy analysis. Nevertheless, in this paper, we describe a macroeconometric model for Slovenia, called SLOPOL6. It was estimated using most recent quarterly data and rests on up-to-date econometric methodology, including stationarity and cointegration analysis. The model has already been used successfully for simulations of alternative monetary and fiscal policy measures[1].

Key-words: *simulation and optimization experiments, policy analysis, econometric methodology*

JEL Classification: E24, E60

1. **Introduction**

May 1, 2004, Slovenia joined the European Union together with nine other countries, seven of which from Central and Eastern Europe. Although trade barriers were removed to a large extent already during the accession negotiations, participation in the EU is further fostering economic integration of the new member states with each others and with incumbent Union members. One important integration aspect concerns the monetary policy framework. From the first day of membership onwards, the new member countries have been participating in the European Economic and Monetary Union (EMU), albeit with a derogation. Being EMU members does not imply introducing the euro immediately. In order to have the right to adopt the common currency, the new EU member states are required to fulfill the convergence criteria set out in the Maastricht Treaty. In May 2006, both the European Commission and the European Central Bank decided that Slovenia fulfilled all relevant criteria. Thus, on 1 January 2007, Slovenia was the first of the new members to enter the Euro Area.

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This is remarkable as Slovenia so far is the only former Communist country having the euro as legal tender. Apart from monetary policy, an evaluation of fiscal policy is important for membership in the EMU as the country has to fulfill the requirements of the Stability and Growth Pact of the EMU.

As for other countries, it is desirable to have a tool for forecasting macroeconomic developments over the short and medium run and for evaluating alternative policies aiming at influencing the business cycle, at stabilizing unemployment and inflation and at enhancing growth and employment in Slovenia. A macroeconomic model is such a tool, especially if it is an econometric model based on sound theoretical foundations and estimated with real data of the economy under consideration. To build such a model, it is of crucial importance to have available a data base with sufficiently long time series to provide reliable estimates. For Slovenia, this provides a major problem as this country was part of Communist Yugoslavia until 1991 when it became an independent state and then was transformed into a parliamentary democracy with a market economy. Data before 1991 are based on Communist accounting rules and are not comparable to those of later years. Moreover, many data (especially those from national income accounting) are of dubious quality even for the first years of the transition process. Therefore estimations of behavioral equations for Slovenian aggregates have to rest on data starting around 1995. In order to get estimations with sufficient degrees of freedom, an econometric model for Slovenia has to use quarterly or – where available – monthly or higher-frequency data. Here we describe a quarterly macroeconometric model called SLOPOL6, which is a revised and updated version of a series of models we built since the late 1990s, with increasing degrees of sophistication and reliability. These models were used for various purposes of forecasting and especially evaluating alternative policies, where simulation and optimization experiments were conducted to arrive at politically relevant insights and policy recommendations (see, e.g., Neck et al. 2004).

2. **Variables of the econometric model slopol6**

SLOPOL6 (SLOvenian economic POLicy model, version no. 6) is a medium-sized macroeconometric model of the Slovenian economy. In its current version, it consists of 57 equations of which 21 are behavioral equations and 36 are identities. The former were estimated by ordinary least squares (OLS), using quarterly data for the period 1995:1 until 2005:4. Data for Slovenia were provided by the Slovenian Statistical Office, by the Institute of Macroeconomic Analyses and Development (IMAD), and by the Bank of Slovenia. Euro Area data were taken from the EUROSTAT database, except for the short-term interest rate in the Euro Area, which was extracted from the database of the German Bundesbank. In this Section, we describe the variables used in the model SLOPL6. All data are available from the authors upon request.

Endogenous Variables

AGWN	Average gross wage per employee, nominal, SIT / quarter
AGWR	Average gross wage per employee, real
BUDGETREST	Balance of other, non-allocated government revenues and expenditures
CAN	Current account balance, real
CAGDP	Current account balance as percentage of real GDP
CAPR	Capital stock, real
CPI	Consumer price index
CR	Private household consumption, real
DEBT	Public debt level, nominal
DEBTGDP	Public debt level as percentage of nominal GDP
DEFGDP	Budget deficit as percentage of nominal GDP
DEFICITN	Budget deficit, nominal
DEMAND	Total final demand, real; *GDPR + IMPR*
EMP	Employment; 1,000 persons
EXR	Exports, real
GDPDEF	GDP deflator
GDPN	Gross domestic product, nominal
GDPR	Gross domestic product, real
GINVR	Public investment, real
GNFIN	Government consumption according to government financial statistics
GR	Government consumption, real
GRGDPR	Annual growth rate of real GDP
GRYPOT	Annual growth rate of potential GDP
ILONGR	Real long term interest rate
IMPR	Imports, real
INCCORP	Government revenues from corporate taxes, nominal
INCOME	Disposable income of private households, nominal
INCOMER	Disposable income of private households, real
INCTAX	Government revenues from total income taxes, nominal
INFL	CPI inflation rate
INTEREST	Payments on outstanding public debt
INVENTR	Inventory investment, real
INVR	Investment, real
LFORCE	Labor force; 1,000 persons
LTIRLN	Nominal long term interest rate
M3N	Money stock M3, nominal
M3R	Money stock M3, real
NAIRU	Inflation-stable rate of unemployment
NETWAGEN	Average net wage, nominal
NETWAGER	Average net wage, real
PERSINCTAX	Government revenues from personal income taxes, nominal
PRINVR	Private gross fixed capital formation, real

PROD	Labor productivity
SITEUR	Nominal exchange rate, SIT per euro
SITEURREAL	Real exchange rate between Slovenian tolar and euro
SOCCOMP	Employers' social security contributions, nominal
SOCEMP	Employees' social security contributions, nominal
SOCTOTAL	Total social security contributions, nominal
STIRLN	Nominal short term interest rate (policy instrument and determined in a Taylor-rule type equation in the case of flexible interest rates)
TREND_EMP	Trend employment (labor force minus "natural" unemployment)
UCC	User cost of capital
ULC	Unit labor costs
UN	Unemployment, 1,000 persons
UR	Unemployment rate, % of the labor force
UTIL	Capacity utilization rate
WEDGE	"Tax Wedge"; difference between average nominal gross and net wage per employee
YPOT	Potential GDP, real

Exogenous Variables, Not Controllable By Slovenian Policy-Makers

DEBTADJ	Possible adjustments to the stock of public debt
DEPR	Depreciation rate of the capital stock
DUM021	Dummy variable, 1 in the first quarter 2002, 0 otherwise
DUM05	Dummy variable, 1 in the year 2005, 0 otherwise
DUM992	Dummy variable, 1 in the second quarter 1999, 0 otherwise
DUM993	Dummy variable, 1 in the third quarter 1999, 0 otherwise
EUR10Y	Interest rate for 10 years government bonds in the euro area
EUR3M	Three-months interest rate in the euro area
GDPEUR12	Real GDP in the euro area
HICPEUR12	Harmonized index of consumer prices in the euro area
TIME	Linear time trend

Policy Variables

GINVN	Public investment, nominal
GN	Government consumption, nominal
INCTAXRATE	Average "tax" rate, including income tax and employees' social security contributions
SOCEMPRATE	Social security contribution rate for employees
TRANSFERSN	Transfers to private households, nominal

3. **Tests for stationarity of the time series**

Next, we report about the results of Augmented Dickey-Fuller tests (ADF), Phillips-Perron tests (PP) and Kwiatkowski-Phillips-Schmidt-Shin tests (KPSS) for stationarity. All variables except for interest rates and population were seasonally adjusted before testing. Variables which are unambiguously stationary according to these tests are denoted with a §, those which are unambiguously non-stationary are given a &. The decision on lag length was based on the Schwarz information criterion (SIC). We used the test model with a constant and without a deterministic trend.

Levels

Variable		ADF		PP		KPSS
	Lags (SIC) 0		Bandwidth 0		Bandwidth 5	
AGWN &		0.095		0.095		0.842***
AGWR &	0	–0.865	12	–1.089	5	0.844***
CAN §	0	–4.454***	3	–3.672***	4	0.141
CAGDP §	1	–2.013**	4	–3.814***	4	0.241
CAPR &	2	–0.036	5	1.819	5	0.821***
CN &	1	0.165	2	0.031	5	0.842***
CR &	1	–0.574	1	–1.413	5	0.848***
CPI &	1	–1.654	4	–1.032	5	0.838***
DEBT &	2	–0.955	31	–0.827	5	0.838***
DEBTGDP	3	–3.804***	17	–3.231**	5	0.707**
DEFGDP §	0	–7.625***	2	–7.649***	1	0.244
DEFICITN §	0	–7.443***	3	–7.421***	2	0.327
DEMAND &	1	1.057	5	1.127	5	0.840***
EMP &	0	1.039	2	0.798	5	0.790***
EXR &	0	1.948	5	2.538	5	0.832***
GDPDEF &	0	–1.069	2	–1.001	5	0.832***
GDPN &	1	0.310	4	0.540	5	0.834***
GDPR &	2	0.454	1	–0.423	5	0.847***
EUR10Y	1	–2.555	2	–2.857**	5	0.674**
EUR3M	1	–2.868**	3	–2.054	5	0.677**
GDPEUR12 &	1	–0.867	3	–1.002	5	0.825***
GINVN &	1	–0.314	7	0.781	5	0.842***
GINVR &	1	–1.126	4	–0.846	5	0.810***
GN &	0	1.213	2	1.157	5	0.839***
GR &	0	–1.094	5	–1.234	5	0.850***
HICPEUR12 &	0	2.360	5	2.142	5	0.841***
ILONGR	0	–2.790*	1	–2.771*	5	0.704**
IMPR &	1	1.239	5	1.527	5	0.830***
INCCORP &	3	1.644	42	0.886	5	0.806***
INCOME &	3	–1.747	4	–0.500	5	0.837***
INCOMER &	1	–1.701	2	–1.554	5	0.824***
INCTAX &	2	0.408	3	0.469	5	0.841***
INCTAXRATE &	2	–0.731	3	–1.918	5	0.832***
INFL &	0	–0.525	0	–0.525	5	0.571**
INTEREST &	2	–1.147	3	–1.118	5	0.800***
INVENTR §	1	–2.969**	2	–4.926***	3	0.099
INVR &	1	–1.129	5	–0.577	5	0.807***

LFORCE &	0	0.306	2	–0.229	4	0.718**
LTIRLN &	1	–0.417	1	–2.649*	5	0.747***
M3N &	0	0.259	5	0.144	5	0.831***
M3R &	0	–1.250	4	–1.300	5	0.834***
NAIRU &	18	0.261	3	0.482	5	0.800***
NETWAGEN &	0	0.265	3	0.308	5	0.841***
NETWAGER &	0	–0.553	7	–0.173	5	0.838***
PERSINCTAX &	2	–0.987	7	–0.963	5	0.832***
POP &	3	–0.412	2	–0.131	5	0.636**
PRINVR &	1	–1.223	2	–0.853	5	0.799***
PROD &	1	–1.691	1	–1.903	5	0.836***
SITEUR &	3	–2.579	3	–2.080	5	0.832***
SITEURREAL &	4	–2.112	2	–1.605	5	0.606**
SOCCOMP &	0	3.568	4	4.469	5	0.778***
SOCEMP &	2	0.696	17	0.729	5	0.845***
SOCEMPRATE §	0	–4.240***	3	–4.229***	3	0.133
SOCTOTAL &	0	3.209	3	3.723	5	0.833***
STIRLN &	4	–1.910	2	–2.904*	5	0.758***

Variable	ADF		PP		KPSS
	Lags (SIC)		Bandwidth	Bandwidth	
TRANSFERSN &	0	–0.448	1	–0.462	5	0.839***
TREND_EMP &	0	–1.005	1	0.937	5	0.817***
UCC	0	–2.790*	1	–2.771*	5	0.704**
ULC &	0	–0.312	0	–0.312	5	0.837***
UN &	1	–0.593	3	–0.315	5	0.746***
UR &	0	0.316	3	–0.017	5	0.762***
UTIL §	1	–3.889***	4	–4.817***	5	0.333
WEDGE &	2	–0.932	35	–1.576	5	0.841***
YPOT &	0	4.052	3	3.203	5	0.839***

First Differences

Variable	ADF		PP		KPSS
	Lags (SIC) 0		Bandwidth 4	Bandwidth 0	
AGWN §		–5.010***		–4.977***		0.172
AGWR §	0	–5.982***	11	–6.481***	10	0.169
CAN §	0	–11.015***	9	–14.202***	7	0.094
CAGDP §	0	–11.923***	11	–16.463***	11	0.159
CAPR	1	–2.292	0	–2.740*	5	0.453*
CAPR, 2nd diff. §	0	–10.407***	1	–10.223***	4	0.154
CN §	2	–8.637***	2	–8.865***	2	0.115
CR §	0	–8.034***	4	–8.982***	1	0.101
CPI §	0	–4.311***	3	–4.408***	4	0.240
DEBT §	1	–7.752***	18	–12.795***	34	0.383*
DEBTGDP §	2	–5.682***	14	–8.940***	16	0.400*
DEFGDP §	2	–8.571***	31	–35.378***	16	0.211
DEFICITN §	2	–8.221***	41	–37.986***	19	0.226
DEMAND §	0	–12.001***	2	–12.683***	4	0.207

EMP §	0	–5.392***	2	–5.417***	3	0.235
EXR	0	–6.342***	2	–6.346***	0	0.484**
GDPDEF §	0	–6.014***	3	–6.014***	2	0.228
GDPN §	0	–8.909***	4	–8.781***	4	0.226
GDPR §	1	–7.046***	1	–11.026***	0	0.026
EUR10Y §	2	–4.250***	2	–4.196***	3	0.307
EUR3M §	2	–3.774***	2	–3.860***	3	0.147
GDPEUR12 §	0	–3.538**	0	–3.538**	4	0.189
GINVN §	0	–8.783***	18	–17.223***	8	0.240
GINVR §	0	–8.922***	15	–15.151***	11	0.169
GN §	0	–6.224***	1	–6.224***	2	0.332
GR §	0	–20.327***	3	–19.921***	7	0.185
HICPEUR12	2	–1.334	5	–6.414***	5	0.397*
ILONGR §	0	–5.341***	5	–5.297***	5	0.251
IMPR §	0	–11.771***	2	–12.264***	4	0.304
INCCORP §	2	–6.175***	30	–16.908***	28	0.352*
INCOME §	2	–2.696*	4	–7.954***	4	0.158
INCOMER §	0	–8.854***	3	–8.742***	3	0.180
INCTAX §	1	–8.038***	4	–14.938***	3	0.104
INCTAXRATE §	1	–8.939***	18	–38.496***	11	0.124
INFL §	0	–6.324***	1	–6.295***	2	0.117
INTEREST §	1	–9.341***	4	–14.501***	2	0.091
INVENTR §	0	–11.701***	5	–12.952***	12	0.144
INVR §	0	–10.080***	3	–10.611***	5	0.102
LFORCE §	0	–4.742***	0	–4.742***	2	0.171
LTIRLN §	0	–10.031***	1	–9.420***	9	0.208
M3N §	2	–1.898	5	–6.858***	5	0.142
M3R §	0	–7.333***	4	–7.284***	4	0.164

Variable	ADF		PP			KPSS
	Lags (SIC)		Bandwidth			Bandwidth
NAIRU §	15	–3.413**	3	–7.203***	3	0.362*
NETWAGEN §	0	–6.985***	3	–7.002***	3	0.106
NETWAGER §	0	–7.289***	7	–8.737***	7	0.090
PERSINCTAX §	1	–7.850***	16	–22.007***	21	0.306
POP §	1	–4.285***	4	–3.530**	2	0.213
PRINVR §	0	–10.287***	1	–10.682***	1	0.058
PROD §	0	–10.496***	1	–10.828***	2	0.279
SITEUR §	2	–2.615*	3	–5.163***	1	0.386*
SITEURREAL §	2	–3.655***	1	–6.369***	7	0.094
SOCCOMP	0	–5.224***	4	–5.450***	4	0.598**
SOCEMP §	1	–6.886***	14	–10.982***	17	0.224
SOCEMPRATE §	0	–7.036***	8	–8.870***	9	0.175
SOCTOTAL	0	–5.632***	3	–5.759***	4	0.577**
STIRLN §	0	–9.934***	1	–9.284***	10	0.267
TRANSFERSN §	0	–8.967***	1	–9.049***	1	0.076
TREND EMP §	0	–5.668***	2	–5.690***	2	0.235
UCC §	0	–5.341***	5	–5.297***	5	0.251
ULC §	0	–7.134***	1	–7.141***	1	0.091
UN §	0	–4.137***	0	–4.137***	3	0.168
UR §	0	–4.555***	2	–4.554***	3	0.200
UTIL	1	–6.262***	3	–10.308***	3	0.568**
WEDGE §	0	–9.054***	12	–12.015***	25	0.402*
YPOT	0	–3.968***	3	–3.957***	4	0.557**

Thus it turns out that most level variables are I(1). We also tested for cointegration between those time series where we suspected long-run relations to hold. In those cases where cointegration seemed to be present, we used error-correction models as dynamic specifications for these relations while estimations in levels or first differences were tried when tests indicated absence of long-run relations between stationary or I(1) variables, respectively. In the following, we show the results of successful cointegration tests for the behavioral equations finally adopted. *, **, *** means that the null hypothesis (ADF and Phillips-Perron: no stationarity of the residuals; KPSS: stationarity of the residuals) can be rejected at the 10, 5, 1 percent level of significance, respectively.

Tests For Cointegration – Tests For Stationarity Of Residuals Of The Equations

Equation Phillips-Perron	ADF		KPSS
Potential GDP (production function)	–4.197***	–4.199***	0.139
Private consumption	–7.142***	–7.122***	0.087
Fixed capital formation	–3.877***	–3.558**	0.086
Inventory investment	–8.606***	–8.380***	0.086
Equation	ADF	Phillips-Perron	KPSS
Exports	–4.988***	–4.896***	0.148
Imports	–6.826***	–6.820***	0.108
Employment	–3.565**	–3.619***	0.065
Labor supply	–6.384***	–6.384***	0.123
Wage rate	–4.937***	–4.814***	0.071
Consumer price index	–3.740***	–5.049***	0.059
GDP deflator	–5.928***	–5.918***	0.310
Real money demand	–5.906***	–5.935***	0.122
Short-term interest rate (flex. exchange rate)	–2.791***	–2.897***	0.158
Short-term interest rate (fixed exchange rate)	–5.057***	–3.460***	0.323
Long-term interest rate	–2.412**	–2.587**	0.227
Exchange rate	–3.565**	–5.373***	0.155
Soc. sec. contr. by companies	–5.455***	–6.483***	0.103
Corporate taxes	–5.388***	–5.393***	0.136
Balance of other government exp. and rev.	–6.196***	–6.475***	0.125
Interest payments on public debt	–6.002***	–6.038***	0.192
Government consumption	–4.735***	–4.739***	0.114

4. **Model equations**

The model combines Keynesian and neoclassical elements. The former determine the short and medium run solutions in the sense that the model is demand driven and persistent disequilibria in the goods and labor markets are possible. The supply side incorporates neoclassical features. Almost all behavioral equations are specified in error correction form, except for the equations determining the exchange rate, the interest rates, changes in inventories, the NAIRU and potential GDP. In this section, the behavioral equations are first described very briefly. The model equations are then presented in detail. For a more extensive discussion of an earlier version, see Weyerstrass et al. (2001).

Consumption of private households is explained by disposable income and by the real long-term interest rate, the latter reflecting wealth effects. Investment is

derived from profit maximization of firms. Real gross fixed capital formation is thus influenced by total final demand and by the user cost of capital (the real long-term interest rate plus the depreciation rate of the capital stock). Real exports of goods and services are a function of the real exchange rate and of foreign demand for Slovenian goods and services. As the aggregate Euro Area is by far Slovenia's largest trading partner, accounting for about 60 percent of Slovenian foreign trade, the other 12 Euro Area countries approximate the rest of the world[1]. Therefore, foreign demand is measured by Euro Area real GDP, and only the exchange rate between the Slovenian currency tolar and the euro is considered. Slovenian real imports of goods and services depend on final domestic demand. A significant influence of the real exchange rate on imports was not supported by the data.

Money demand depends on real GDP and on the short-term interest rate. The long-term interest rate is linked to the short-term rate in a term structure equation. In addition, the long-term interest rate in Slovenia depends on its Euro Area counterpart, reflecting Slovenia's integration in the European capital market. The exchange rate equation rests on considerations of the uncovered interest parity and the purchasing power parity theories: the nominal exchange rate between the Slovenian tolar and the euro depends on the interest differential between Slovenia and the Euro Area and on the ratio of the price levels of both countries/regions.

Labor demand (actual employment) is influenced by real GDP and by unit labor cost, where the latter are defined as the ratio of the nominal gross wage and labor productivity. Labor productivity is defined as real GDP per employee. Labor supply depends on the real net wage and on real GDP. The latter influence is to approximate the "discouraged worker effect": in an economic downturn, increasing unemployment discourages people from actively seeking employment. On the other hand, in an upturn, improving labor market conditions encourage more people to enter the labor market. The wage rate is determined by the price level, the unemployment rate, labor productivity, and the tax wedge on labor income, the latter being defined as the sum of income taxes and employees' social security contributions. Consumer prices depend on domestic and international factors. The former are made up by unit labor costs. Imported inflation is approximated by the nominal exchange rate of the Slovenian tolar vis-à-vis the euro. This specification shall account for the fact that a depreciation of the domestic currency raises import prices. The GDP deflator is linked to the consumer price index.

Potential output, which is determined by a Cobb-Douglas production function with constant returns to scale, depends on trend employment, the capital stock, and autonomous technical progress. Trend employment is defined as the labor force minus natural unemployment. The NAIRU (or inflation-stable unemployment rate) is modeled by first applying a band-pass filter to the actual unemployment rate in order to extract the trend. In the simulations, the NAIRU is then modeled as an AR(8)-process.

Government expenditures and revenues are linked to economic policy instruments and to the economic situation in Slovenia, which is approximated by GDP at current prices. Revenues from personal income taxes and from employees' social security contributions are determined by multiplying the tax rate and the social security contribution rate, respectively, by the number of employees and by the average gross wage per employee. In a behavioral equation, corporate income taxes are explained by GDP. Interest payments on public debt depend on the

In the estimation period, Slovenia did not belong to the Euro Area.

The debt level and the long-term interest rate. The difference between the remaining government revenues and expenditures is explained by the lagged debt level. This specification shall approximate a fiscal rule according to which the primary budget surplus is increased if debt rose in the previous period. Such a rule shall guarantee long run fiscal sustainability by preventing an ever increasing debt level. Government consumption and investment as well as transfers to private households are regarded as policy instruments. The budget deficit is given by the difference between total government expenditures and revenues.

Behavioral Equations

R^2 is the adjusted coefficient of determination, DW is the Durbin Watson statistic; t-statistics are given in parentheses below coefficients.

Potential output

log(YPOT) = - 0.839136 + 0.648102 * *log(TREND_EMP)* + (1 - 0.648102) * *log(CAPR)* + 0.004365 * TIME

log(GDPR) = - 0.839136 + 0.648102 * *log(EMP)* + (1 - 0.648102) * *log(CAPR)* + 0.004365 * *TIME*

(-2.548920) (3.625960) (3.625960) (3.339869)

R^2 = 0.986289 DW = 0.801470

NAIRU

D(NAIRU) = - 0.044581 - 0.283872 * *D(NAIRU(–1))* + 0.387325 * *D(NAIRU(-3))* + 0.281913 * *D(NAIRU(-4))*

(-1.124953) (-1.856249) (2.335843) (1.845909)

+ 0.496290 * *D(NAIRU(-5))* - 0.276744 * *D(NAIRU(–8))*

(3.380917) (-1.814794)

R^2 = 0.395800 DW = 2.376885

Consumption of private households

log(CR/CR(–1)) = 0.359946 + 0.375626 * *log(INCOMER / INCOMER*(–1)) - 0.293998 * log(*CR*(–1))

(1.542137) (4.390582) (-3.586244)

+ 0.199217 * *log(INCOMER(–*1)) -0.002379 * *ILONGR*(–1*)* + 0.032129 * *DUM992*

(2.575871) (-2.415892) (4.291727)

- 0.041086 * *DUM993*

(-4.896282)

R^2 = 0.825881 DW = 2.262197

Gross fixed capital formation

log(*PRINVR* / *PRINVR*(–4)) = 0.547377 + 1.677160 * log(*DEMAND* / *DEMAND*(–4)) – 0.582231 * log(*PRINVR*(–4))

(0.572847) (5.306386) (–4.372626)

+ 0.385862 * log(*DEMAND*(–4)) – 0.133517 * log(*UCC*(–4))

(2.114335) (–2.100554)

R^2 = 0.781110 DW = 0.960741

Inventory investment

INVENTR = 6.756782 + 0.613727 * *INVENTR*(–1*)* - 0.531997 * *D(GDPR-INVENTR)*

(4.902811) (4.301567) (-4.923027)

R^2 = 0.416334 DW = 2.424885

Exports of goods and services

log (*EXR* / *EXR*(–4)) = – 19.2466 + 0.314805 * log(*EXR*(–1) / *EXR*(–5)) (–3.2646) (2.512399)

+ 2.379488 * log (*GDPEUR12* / *GDPEUR12*(–4)) (4.236104)

+ 1.451913 * log(*SITEURREAL*(–4)/ *SITEURREAL*(–8)) (3.34502)

– 0.2386 * (log(*EXR*(–4)) + 1.439955 * log(*GDPEUR12*(–4)) (–1.95847) (2.96063)

+ 1.843658 * log(*SITEURREAL*(–4)) (3.03146)

R^2 = 0.679354 DW = 1.582236

Imports of goods and services

log(*IMPR* / *IMPR*(–1)) = – 1.743142 + 1.882760 * log(*DEMAND* / *DEMAND*(–1)) – 0.447201 * log(*IMPR*(–1)) (–4.490866) (28.51655) (–4.281792)

+ 0.631109 * log(*DEMAND*(–1)) (4.363494)

R^2 = 0.967468 DW = 2.029496

Employment

log(*EMP* / *EMP*(–4)) = 2.000938 + 0.339420 * log (*EMP*(–2) / *EMP*(–6)) + 0.271201 * log(*GDPR* / *GDPR*(–4)) (1.592327) (2.785268)(2.200591)

– 0.652660 * log(*EMP*(–4)) + 0.386212 * log(*GDPR*(–4)) – 0.122940 * log(*ULC*(–4))

(–3.686853) (5.041517) (–2.556979)

R^2 = 0.796073 DW = 1.066295

Labor supply

log(*LFORCE* / *LFORCE*(–4)) = 6.102313 + 0.638838 * log(*LFORCE*(–1) / *LFORCE*(–5))

(7.199566) (9.491211)

+ 0.142518* log(*NETWAGER* / *NETWAGER*(–4)) (6.081654)

– 1.00027 * log(*LFORCE*(–4)) + 0.107418 * log(*NETWAGER*(–4)) (–7.38534) (7.393059)

R^2 = 0.906754 DW = 2.069466

Wage rate

log(*AGWN* / *AGWN*(–4)) = 0.082167 + 0.432615 * log(*AGWN*(–1) / *AGWN*(–5)) + 0.446809 * log (*CPI* / *CPI*(–4))
(0.226989) (4.616714) (3.392647)

– 0.554777 * log((*AGWN*(–4) / *CPI*(–4))) + 0.249325 * log (*PROD*(–4))
(–5.577310) (2.522555)

– 0.007189 * *UR*(–1) + 0.074054 * log(*WEDGE*(–1) / *WEDGE*(–5))
(–2.521480) (1.878302)

R^2 = 0.943467 DW = 1.615415

Consumer price index

log(*CPI* / *CPI*(–4)) = – 0.70481 + 0.293566 * log(*CPI*(–1) / *CPI*(–5)) + 0.149449 * log(*ULC* / *ULC*(–4))
(–2.34034) (3.145323) (2.76944)

+ 1.495533 * log(*HICPEUR12/ HICPEUR12*(–4)) – 0.44142 * log(*CPI*(–4))
(5.249042) (–5.55076)

+ 0.396769 * log(*ULC*(–4)) + 0.41625 * log(*UTIL*(–4))
(4.72042) (5.577107)

R^2 = 0.960395 DW = 1.42735

GDP deflator

log(*GDPDEF* / *GDPDEF*(–4)) = 0.216883 + 0.516409 * log(*GDPDEF*(–1) / *GDPDEF*(–5))
(2.6838) (5.3777)

+ 0.734706 * log(*CPI* / *CPI*(–4)) – 0.361865 * log(*GDPDEF*(–4) / *CPI*(–4))
(5.851895) (–2.836337)

R^2 = 0.844573 DW = 1.606334

Real money demand

log(M3R / M3R(-4)) = - 2.10635 + 0.538002 * log(*M3R*(–1) / *M3R(-5))* - 0.031762 * *(STIRLN / STIRLN(-4))*
(-2.50222) (4.537744) (-1.408705)

- 0.405264 * log(*M3R*(-4)) + 0.820429 * *log(GDPR(-4))*
(-3.516973) (3.132024)

R^2 = 0.721868 DW = 1.969595

Long term interest rate

(*LTIRLN* – *LTIRLN*(–4)) = 1.006125 * (*STIRLN* – *STIRLN*(–4)) + 0.419646 * (*EUR10Y* – *EUR10Y*(–4))
(26.49522) (2.035559)

– 0.539421 * *LTIRLN*(–4) + 0.597430 * *STIRLN*(–4)
(–3.248753) (3.227697)

R^2 = 0.963106 DW = 0.538018

Short term interest rate

(*STIRLN* – *STIRLN*(–4)) = 1.292312 * *INFL* + 0.418398 * (*GRGDPR* – *GRYPOT*)

(10.55622) (2.220118)

– 0.905898 * (*STIRLN*(–4) – *EUR3M*(–4))

(–11.96319)

R^2 = 0.797275 DW = 0.684259

Exchange rate

(SITEUR / 100) = 0.212657 - 0.001893 * *(LTIRLN - EUR10Y)* + 2.184844 * *(CPI / HICPEUR12)*

(5.46069) (-2.027690) (61.08336)

R^2 = 0.996093 DW = 0.895409

Social security contributions by companies

log(*SOCCOMP* / *SOCCOMP*(–4)) = – 0.527861 + 0.538986 * log(*SOCEMP* / *SOCEMP*(–4))

(–6.497854) (6.649808)

– 0.547033 * log(*SOCCOMP*(–4)) + 0.620918 * log(*SOCEMP*(–4))

(–10.49479) (13.81405)

+ 0.245643 * *DUM05*

(14.53665)

R^2 = 0.941112 DW = 1.823315

Corporate taxes

log(*INCCORP* / *INCCORP*(–4)) = – 7.144794 + 0.169314 * log(*INCCORP*(–1) / *INCCORP*(–5))

(–6.187364) (2.102092)

– 0.747633 * log (*INCCORP*(–4)) + 1.331591 * log(*GDPN*(–4))

(–8.024657) (6.701796)

– 0.654201 * *DUM992*

(–6.812059)

R^2 = 0.808315 DW = 1.744074

Balance of other government revenues and expenditures

log(*BUDGETREST* / *BUDGETREST*(–4)) = – 0.501472 + 1.031814 * log(*DEBT* / *DEBT*(–4))

(–0.940508) (2.476841)

– 0.934227 * log(*BUDGETREST*(–4)) + 0.783257 * log(*DEBT*(–4))

(–7.272604) (5.762485)

– 0.413477 * *DUM021*

(–4.426783)

R^2 = 0.715886 DW = 2.032736

Interest payments on government debt

(*INTEREST – INTEREST*(–1)) = – 7.689128 – 1.049878 * (*INTEREST*(–1)) + 0.018931 * (*DEBT*(–1))

(–1.948023) (–6.077313) (5.341489)

+ 0.292619 * *LTIRLN*(–1)

(2.178987)

R^2 = 0.507888 DW = 1.949515

Government consumption according to financial account

log(*GNFIN* / *GNFIN*(–4))= 0.053910 + 1.145092 * log(*GN* / *GN*(–4) – 0.612290 * log(*GNFIN*(–4))

(0.423991) (5.166543) (–3.868434)

+ 0.583018 * log(*GN*(–4))

(3.649542)

R^2 = 0.713945 DW = 1.470469

Short term interest rate in model version with fixed exchange rates

(*STIRLN – STIRLN*(–4)) = 1.319104 + 0.998259 * (*EUR3M – EUR3M*(–4)) + 0.523320 * (*SITEUR – SITEUR*(–4))

(1.360326) (2.901757)(7.518843)

– 0.587592 * (*STIRLN*(–4) – *EUR3M*(–4))

(–7.106245) R^2 = 0.748326 DW = 0.960985

Identities

GR	= *GN* / *GDPDEF* * 100
AGWR	= *AGWN* / *CPI* * 100
CAN	= *EXR* * *GDPDEF* / 100 – *IMPR* * *GDPDEF* / 100
CAGDP	= *CAN* / *GDPN* * 100
ILONGR	= *LTIRLN – INFL*
GRGDPR	= *GDPR* / *GDPR*(–4) * 100 – 100
GRYPOT	= (*YPOT* / *YPOT*(–4) – 1) * 100
PROD	= *GDPR* / *EMP* * 100
ULC	= *AGWN* / *PROD*
UN	= *LFORCE – EMP*
UR	= *UN* / *LFORCE* * 100
DEMAND	= *INVR* + *INVENTR* + *CR* + *GR* + *EXR*
M3N	= *M3R* * *CPI* / 100
SITEURREAL	= *SITEUR* * *HICPEUR12* / *CPI*
INCOME	= *GDPN* + *TRANSFERSN – INCTAX – SOCTOTAL*
INCOMER	= *INCOME / CPI* * 100
INFL	= (*CPI* / *CPI*(–4) – 1) * 100
UCC	= *ILONGR* + 2.7
PERSINCTAX	= *INCTAXRATE* * (*AGWN* * *EMP* / 1000) / 100
SOCEMP	= *SOCEMPRATE* * (*AGWN* * *EMP* / 1000) / 100

WEDGE	= *AGWN* * (*INCTAXRATE* / 100 + *SOCEMPRATE* / 100)
NETWAGEN	= *AGWN* – *WEDGE*
NETWAGER	= *NETWAGEN* / *CPI* * 100
SOCTOTAL	= *SOCCOMP* + *SOCEMP*
INCTAX	= *PERSINCTAX* + *INCCORP*
CAPR	= (1 – *DEPR* / 100) * *CAPR*(–1) + *INVR*
GDPR	= *CR* + *GR* + *INVR* + *INVENTR* + *EXR* – *IMPR*
GDPN	= *GDPR* * *GDPDEF* / 100
TREND_EMP	= *LFORCE* * (1 – *NAIRU* / 100)
UTIL	= *GDPR* / *YPOT* * 100
DEFICITN	= *GNFIN* + *GINVN* + *TRANSFERSN* + *INTEREST* – *SOCTOTAL*– *INCTAX* – *BUDGETREST*
DEFGDP	= *DEFICITN* / *GDPN* * 100
DEBT	= *DEBT*(–1) + *DEFICITN* + *DEBTADJ*
DEBTGDP	= *DEBT* / (*GDPN* + *GDPN*(–1) + *GDPN*(–2) + *GDPN*(–3)) * 100
GINVR	= *GINVN* / *GDPDEF* * 100
INVR	= *PRINVR* + *GINVR*

Conclusion

The model SLOPOL6 as described in the previous Section was obtained after a series of steps in a trial-and-error process, following the general-to-specific methodology initiated by David Hendry and associates (see, e.g., Hendry 1995). We also conducted simulations of the model (both static and dynamic) with historical values of

(non-controllable and policy) exogenous variables over the period of estimation and found reasonable tracking quality for most variables with respect to trends and turning points. This encourages us to use the model (even more than its predecessors) for policy analysis.

So far, we used SLOPOL6 for simulation analyses to answer two questions: First, we asked whether Slovenia's choice of participating in the exchange rate mechanism of the European Monetary System II (ERM-II) soon after EU accession was the best strategy in terms of the macroeconomic performance (Weyerstrass and Neck 2007a). We found that a better overall economic performance could have been achieved under a crawling peg regime allowing a depreciation of the Slovenian tolar before introducing the euro in 2007. The worst policy results were obtained when the exchange rate was totally fixed at an early stage of EMU integration. Moreover, we showed that the labor market performance could be significantly improved by cutting income taxes and social security contribution rates.

The second application of SLOPOL6 examines which macroeconomic effects can be expected from Slovenia's adoption of the euro as legal tender (Weyerstrass and Neck 2007b). It was shown that Euro Area accession might bring about temporarily higher real GDP growth, a permanently higher GDP level, more employment, temporarily lower inflation and a permanently lower price level. On the other hand, both public finances and

the current account might deteriorate. Hence, in contrast to the path towards abandoning the national currency tolar for the euro, which posed problems of adjustment, the (mostly supply-side) effects of the eventual Slovenian membership in the Euro Area will have mainly advantages for the Slovenia economy. These insights were obtained with the help of the SLOPOL6 macroeconometric model, and we are convinced that it can also be used to deal with other economic policy problems for Slovenia.

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