A regional econometric model for Belgium

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Abstract:

The three regional economic research centers (SVR, IBSA and IWEPS) and the FPB constructed a regional econometric model: HERMREG. The first version of this model produces regional projections about GDP, value added, employment, wages and investments. HERMREG is developed to regionalise the national projections from HERMES. In this version, the main focus is on four key variables: value added, investments, employment and wages. The regionalisation is based on a combined shift-share-regression method. This paper presents the methodology and a short overview of the most recent regional projections.

Keywords: regional model, econometric model

1. Introduction

The Belgian state underwent some important institutional reforms in the previous decades. In these reforms, more and more power was transferred to the regions (the Brussels Capital Region, the Flemish Region and the Walloon Region). A regional economic model can support the decision making process at the regional level. Therefore, the three regions and the (national) Federal Planning Bureau started a project to develop a multiregional economic model named HERMREG.

The current version of HERMREG belongs to the class of macro-econometric top-down models, which are used to produce medium term projections. The model is linked with the national macrosectoral model HERMES, which is managed by the Federal Planning Bureau (HERMES is an acronym for Harmonised Econometric Research for Modelling Economic Systems, this model was introduced in several European countries.)[1] [2]. HERMES is mainly used to produce medium term economic forecasts (5-6 years ahead). Secondly, it is also used to analyse the economic impact of policy measures and external shocks.

In short, HERMREG regionalises the national medium term forecasts made by HERMES. In contrast with more classical approaches, in which exogenous regionalisation keys are applied, HERMREG uses endogenous regionalisation keys to distribute the national forecasts over the different regions. To this end, it combines two methods: a shift-share analysis and multivariate econometric regressions.

The first version of HERMREG is mainly focussed on four variables: value added, employment, investments and salaries. These variables are modelled on a sectoral and regional level using a top-down method. Regional projections of the following variables are available through HERMREG: gross domestic product, value added, employment (salaried and self-employment), net commuting flows, investments, wages, productivity and unemployment. These variables, except for GDP, unemployment and net commuting flows, are available for 13 branches.

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1 See Commission of the European Communities (1993).

2 For more details about HERMES, see e.g. Bossier et al (2000).

In this paper, HERMREG is used to disaggregate the national economic projections 2007-2012 which were published in May 2007. Hence, these projections are not up-to-date. They are based on information which was available in April 2007. The international scenario e.g. does not take into account the credit crisis, the continuous increase of the oil price and the appreciation of the euro[3].

This paper continues by discussing the methodology which was applied in HERMREG. Section 3 introduces the method used in HERMREG to compute confidence intervals. Section 4 then presents a summary of the regional projections 2007-2012. Section 5 concludes.

[3] New forecasts 2008-2013 will be published in May 2008.

2. Modelisation methodology

2.1. A (partial) shift-share decomposition

In HERMREG a simplified shift-share method is used to decompose regional growth numbers in two components: the national sectoral growth and a differential shift. Denote with $Y_{ij,t}$ the level of a certain variable (e.g. employment) in sector *i* and region *j* at time *t*. Let us introduce the following notation:

- $y_{ij,t} = (Y_{ij,t} - Y_{ij,t-1})/ Y_{ij,t-1}$, the growth of *Y* in sector *i* and region *j*,
- $\overline{y}_{i.,t} = (\overline{Y}_{i.,t} - \overline{Y}_{i.,t-1})/\overline{Y}_{i.,t}$, the national growth in sector *i*, with $\overline{Y}_{i.,t} = \sum_j Y_{ij,t}$,
- $\overline{y}_t = (\overline{Y}_t - \overline{Y}_{t-1})/\overline{Y}_t$, de national growth of *Y*, with $\overline{Y}_t = \sum_i \sum_j Y_{ij,t}$.

The (partial) shift-share decomposition applied in HERMREG can be written as follows:

(1) $$y_{ij,t} = s_{ij,t} + r_{ij,t} ,$$

with $s_{ij,t} = \overline{y}_{i.,t}$ the "sectoral component" and $r_{ij,t} = (y_{ij,t} - \overline{y}_{i.,t})$ the differential growth (or regional specific effect). The latter component concerns that part of regional growth which is not "explained", and of which the evolution could be attributed to regional characteristics.

From equation (1) it can already be seen how the regional projections are computed. The regional projections are the sum of the national sectoral growth projections ($\overline{y}_{i.,t}$) and the differential growth projections ($r_{ij,t}$). Projections of the first part in equation (1), i.e., $\overline{y}_{i.,t}$, are determined in the national model (HERMES). The second part, $r_{ij,t}$, is modelled via regression equations. These regression equations are then used to produce forecasts of $r_{ij,t}$. The differential shift is about the difference between regional sectoral growth and national sectoral growth, and could be explained by regional characteristics.

Suppose $X_{ij,t}$ is a vector containing different explanatory variables, which are used to model the differential shift:

(2) $$r_{ij,t} = X_{ij,t}\beta_{ij} + \varepsilon_{ij,t} \quad \forall j, \forall i$$

So, by using data from the past ($t=1,\ldots T$), a regression equation is estimated, resulting in:

(3) $$r_{ij,t} = X_{ij,t}\hat{\beta}_{ij} + \hat{\varepsilon}_{ij,t} \quad \forall j, \forall i$$

Now it is fairly easy to see how regional projections for $Y_{ij,T+k}$ ($k>0$) are constructed. The first part is easy, since these are merely the national sectoral growth projections produced by HERMES, say $\bar{y}_{i\cdot,T+k}$. Given projections for the explanatory variables $\hat{X}_{ij,T+k}$, the differential shift can also be forecasted:

(4) $$\hat{r}_{ij,T+k} = \hat{X}_{ij,T+k}\hat{\beta}_{ij}\ .$$

Summarising, the forecast of regional sectoral growth for branch *i* in region *j* for time period *T+k* equals:

(5) $$\hat{y}_{ij,T+k} = \bar{y}_{i.,T+1} + \hat{r}_{ij,T+k}\ .$$

2.2. Some econometric issues

Before the estimation procedure, all variables are tested for unit roots, initially by means of the augmented Dickey-Fuller test, and in case of doubt, also the Phillips-Perron test is implemented[4]. Non-stationary variables are used in first difference. Equation (6) is estimated using OLS, equation by equation.

The final equation for each variable is based on the following selection process. First of all, explanatory variables are only kept in the equation if they are significant at the 10%-level. To choose between different versions of equations, the (centred) R^2 and the Theil coefficient are used. The Theil coefficient is a

[4] All test results are available from the authors upon request.

measure of fit, which in fact equals a rescaled version of the root mean squared error:

$$\text{(6)} \qquad \text{Theil coef.} = \frac{\sqrt{\sum_{t=1}^{T} (\hat{y}_t - y_t)^2 / T}}{\sqrt{\sum_{t=1}^{T} \hat{y}_t^2 / T} + \sqrt{\sum_{t=1}^{T} y_t^2 / T}}.$$

In the numerator one finds the (in sample) root mean squared error. The denominator serves to scale the root mean squared error, such that the result always lies between 0 and 1. If the Theil coefficient equals 0, one has a perfect fit; the closer to one, the worse the fit.

All equations are tested for serial correlation using the Lagrange Multiplier test and the Ljung-Box Q-test. They are also tested for heteroskedasticity by White's heteroskedasticity test. If necessary, corrections are made[5].

Rather than basing the estimation on a theoretical model, the approach (to select the explanatory variables) is ad hoc and exploratory. The selection method can, to a large extent, be described as a general-to-specific modelling strategy (see e.g. Hendry (2000), although his research is more concerned with *automated* general-to-specific modelling strategies), i.e. one starts with an equation including all possible explanatory variables, from which one then eliminates the insignificant variables.

2.3. Explanatory variabeles

What follows is a short overview of the variables which are used in the regressions to model the differential growth rates of value added, investments, employment and wages. Of course, per equation only a small subset of this set is actually used.

- a constant,
- dummy's,
- lags of the differential growth of value added: DIFFj_QVOi(t-k),

[5] All test results are available from the authors upon request.

- lags of the regional value added growth rate in branch i: GROj_QVOi(t-k),
- lags of the national growth rate of value added in branch i: GROT_QVOi(t-k),
- lags of the national exports growth rate in branch i: GRO_QXOi(t-k),
- lags of the national productivity growth rate in branch i: GRO_PRODT_QVOi(t-k),
- lags of the regional productivity growth, GROj_PRODi(t-k),
- lags of the differential growth rate of investments in branch i: DIFFj_IOi(t-k),
- lags of the regional investments growth rate in branch i: GROj_IOi(t-k),
- lags of the national investments growth rate in branch i: GROT_IOi(t-k),
- lags of the index of regional investment specialisation in branch i: HINDEXij(t-k),
- lags of the regional growth rate of the (active) population: GROj_NPO(t-k) and GROj_NPA(t-k),
- the real long interest rate, RLBE(t);
- lags of the national capacity utilisation rate of branch i: QRi(t-k),
- lags of the differential growth of wage per employee, DIFFj_WBNFi(t-k),
- lags of the regional growth rate of wages (per employee) in sector i: GROj_WBNFi(t-k),
- lags of the national growth of wage per employee, GROT_WBNFi(t-k),
- lags of the differential salaried employment growth, DIFFj_NFi(t-k),
- lags of the regional employment growth, GROj_NFi(t-k),
- lags of the national growth rate of salaried employment in sector i: GROT_NFi(t-k),

where i stands for the region and j for the sector.

To model the differential growth rate of value added the most prevalent explanatory variables are lags of the dependent variable, the national growth of value added (per sector) and national export growth (per sector).The measure of fit, R^2, is for these equations larger than 70%, and also the Theil coefficient is not too high. Thus, both measures indicate a good fit. In general, we obtain a reasonable fit for the value added equations: the (unweighted) average R^2 is about 0.75 for both Brussels and Flanders, and about 0.73 for Wallonia.

Some general observations on the investment equations: first, the regressions yield very heterogeneous results across regions and branches. This indicates that the determinants of the differential growth rate are specific to regions and branches. Second, the estimations show that past values of the dependent variable are significant in a large number of equations, implying a very high degree of persistence of the underlying time series. Third, in more than 60 percent of the equations a national aggregate (the investment growth rate or value added growth rate) appears to be significant. Fourth, the cost of capital (RLBE) and capacity of utilization (QRi) appear statistically insignificant in almost all equations.

The variables which occur most in the equations for the differential growth of the wage per employee are the first and second lag of the independent variable itself (DIFFj_WBNFi(t-1) and DIFFj_WBNFi(t-2)), and the first lag of the national growth of the wage per employee (GROT_WBNFi(t-1)). Taking all lags of a variable together, the most used variables are: the differential growth of wages per employee (DIFFj_WBNFi), the differential growth of employment (DIFFj_NFi), the national growth of wages per employee (GROT_WBNFi) and the national productivity growth (GRO_PRODT_QVOi).

The two most frequent explanatory variables are the lags of the regional differential growth of salaried employment and the differential growth (or also the national growth rate) of value added. It is also interesting to note that the wage (per employee) is more often a significant determinant of the differential employment growth in Flanders and Wallonia than in Brussels.

The variables which occur most in the equations concerning the differential growth rate of self-employment are the first lag of the differential growth rate of total employment (DIFFj_NFi(t-1)), the second lag of the differential growth rate of wages (DIFFj_WBNFi(t-2)), and the first lag of the growth of the working age population (GROj_NPA(t-1)). We found also that the regional or national unemployment rate has a statistically significant impact on the differential shift of self-employment.

Commuting is an important economic phenomenon in Belgium. Commuting is interesting because it acts as a form of quasi-mobility of labour (people travel long or short distances rather than moving). In this way, commuting helps to facilitate regional adjustment to asymmetric shocks (such as an idiosyncratic fall in the demand for a region's product). It can also play an important role in reducing unemployment and income disparities between regions.

To take into account commuting in HERMREG, two equations for net commuting flows are estimated. The net commuting flow of a region is defined as the number of people of that region working in the two other regions minus the number of people of the two other regions working in the region. The commuting decision is modelled as depending on regional economic conditions in the destination regions, on regional economic conditions in the source region and by the past value of the net commuting flows.

2.4. Calibration of intermediate results

It is very unlikely that the forecasts produced as explained in section 2.1. are consistent with the national sectoral HERMES projections, that is for the variables which are in current prices or in number it holds, e.g. for $k = 1$, that

(7) $$\sum_j w_{ij,t} \hat{y}_{ij,t+1} \neq \bar{y}_{i.,t+1}, \text{ where } w_{ij,t} = Y_{ij,t} / Y_{i.,t}.$$

Or stated otherwise: the initial regional projections will not sum up to the national forecasts made by HERMES. For (7) to be an equality, the shift-share-regression projections are adapted. This is done in the following way. The initial growth projections of HERMREG, $\hat{y}_{ij,t+k}$, serve to calculate (provisional) values of the variable in level, i.e.

(8) $$\hat{Y}_{ij,t+1} = (1 + \hat{y}_{ij,t+1}) Y_{ij,t} \quad \text{and,}$$

(9) $$\hat{Y}_{ij,t+k} = (1 + \hat{y}_{ij,t+k}) \hat{Y}_{ij,t+k-1} \quad \text{for } k > 1.$$

The following step consists of using these level projections to calculate the weight of each region *j* in a certain branch *i*,

(10) $$\hat{w}_{ij,t+k} = \frac{\hat{Y}_{ij,t+k}}{\hat{Y}_{i.,t+k}} \quad \text{with} \quad \sum_j \hat{w}_{ij,t+k} = 1.$$

Ultimately, the final step consists of applying these weights to the national sectoral projections of HERMES, $\overline{Y}_{i.,t+k}$, to compute the final regional sectoral projections (in level):

(11) $$\tilde{Y}_{ij,t+k} = \hat{w}_{ij,t+k}\overline{Y}_{i.,t+k}.$$

Thus, in short, HERMREG is used to compute endogenous weights to regionalise the national HERMES projections. Now, the regional projections, $\tilde{Y}_{ij,t+k}$, sum up to their national counterpart, $\overline{Y}_{i.,t+k}$ (or equivalently, equation (7) is now an equality).

For the series which are expressed in chained prices, another calibration method is necessary, since these series are non-additive. Here a correction is applied directly to the growth numbers. The corrected growth numbers, $\tilde{y}_{ij,t}$, are the solution of the following system (for *t=T+k*, *k>0*):

(12) $$\begin{cases} \overline{y}_{i.,t} = \tilde{y}_{i1,t}v_{i1,t-1} + \tilde{y}_{i2,t}v_{i2,t-1} + \tilde{y}_{i3,t}v_{i3,t-1} \\ (1+\tilde{y}_{i1,t}) = \gamma_{i1,t}(1+\tilde{y}_{i3,t}) \\ (1+\tilde{y}_{i2,t}) = \gamma_{i2,t}(1+\tilde{y}_{i3,t}) \end{cases},$$

with

$$v_{ij,t} = \frac{\tilde{Y}^c_{ij,t}}{\overline{Y}^c_{i.,t}}, \qquad \gamma_{ij,t} = \frac{(1+\hat{y}_{ij,t})}{(1+\overline{y}_{i.,t})},$$

$\overline{y}_{i.,t}$ the national sectoral growth (in sector *i*) as forecasted by HERMED, $\hat{y}_{ij,t}$ the non-calibrated forecasted growth of variable *Y* (in chained prices)[6] and $\tilde{Y}^c_{ij,t}$ the calibrated level of variable *Y* in current prices (sector *i*, region *j*)[7].

[6] To be clear : these are the initial results which follow from the method explained in 2.1 (equation (5)).

[7] $\tilde{Y}^c_{ij,t}$ differs from $Y_{ij,t}$ in two aspects : the former is expressed in current prices (hence the superscript *c*, from *current*), while the latter is expressed in volume (or chained prices). Moreover, the tilde indicates that the former variable is already calibrated (using the method for series in current prices).

Solving system (12) gives the following solutions for each sector *i* and for *t=T+k*, *k>0*:

$$(13)\qquad \begin{cases} \tilde{y}_{i1,t} = \gamma_{i1,t} - 1 + \gamma_{i1,t}\tilde{y}_{i3,t} \\ \tilde{y}_{i2,t} = \gamma_{i2,t} - 1 + \gamma_{i2,t}\tilde{y}_{i3,t} \\ \tilde{y}_{i3,t} = \dfrac{\bar{y}_{i.,t} - (\gamma_{i1,t} - 1)v_{i1,t-1} - (\gamma_{i2,t} - 1)v_{i2,t-1}}{\gamma_{i1,t}v_{i1,t-1} + \gamma_{i2,t}v_{i2,t-1} + \gamma_{i3,t}v_{i3,t-1}} \end{cases}$$

These growth numbers, which are now consistent with the national growth numbers are then used to construct series in chained prices.

3. Confidence intervals

Remind that the regional projections are based on the following equation:

(5) $$\hat{y}_{ij,T+k} = \bar{y}_{i.,T+k} + \hat{r}_{ij,T+k}$$

It is the differential growth rate, $r_{ij,t}$, which is modelled in HERMREG:

(2) $$r_{ij,t} = X_{ij,t}\beta_{ij} + \varepsilon_{ij,t} \quad ,$$

where $X_{ij,t}$ is a vector of explanatory variables, a β_{ij} parameter vector and $\varepsilon_{ij,t}$ is the error term. Estimation of these equations results in:

(3) $$r_{ij,t} = X_{ij,t}\hat{\beta}_{ij} + \hat{\varepsilon}_{ij,t} \quad ,$$

where the heads indicate that the values are estimated (rather than their true values). Given projections of the explanatory variables, (deterministic) projections[8] of the differential growth rate are easily obtained as follows:

(4) $$\hat{r}_{ij,T+k} = \hat{X}_{ij,T+k}\hat{\beta}_{ij} ,$$

which are then to be used in (5) to obtain regional economic projections.

In the stochastic simulation method, which is used here to calculate the confidence intervals, a residual term is added to each of these equations in order to introduce some uncertainty in the model solution. The residual terms are drawn from a normal distribution thereby using the sample mean (which is close to zero obviously) and sample variance of the residuals $\hat{\varepsilon}_{ij,t}$ of each estimated equation (3)[9]. So, in the stochastic solution procedure, the projected regional sectoral growth rate does not equal (5) but

(14) $$\hat{y}^{s}_{ij,T+k} = \bar{y}_{i.,T+k} + \hat{r}^{s}_{ij,T+k} + e^{s}_{ij,T+k} ,$$

[8] In a deterministic projection, one takes the expected value of an equation. Hence, the error term drops, since its expected value equals zero (by construction).

[9] This is a working hypothesis. In reality, of course, the error terms do not follow a normal distribution. A better (semi-parametric) approach would be to draw the residuals directly from the estimated residuals from each equation.

where $\hat{y}^s_{ij,T+k}$ is a stochastic projection, $e^s_{ij,T+k}$ is drawn from the above described normal distribution (and $\hat{r}^s_{ij,T+k}$ results from the application of this procedure[10]). To reduce sampling variation this step is repeated many times (say *S*). Thus, we then have *S* values of $\hat{y}^s_{ij,T+k}$ (s = 1,…*S*). Using the empirical distribution of these $\hat{y}^s_{ij,T+k}$, confidence bounds are readily found. To obtain a $(1-\alpha)100\%$ confidence bound one just takes the lower and upper $\alpha/2$ quantiles of the empirical distribution function. Here, *S* was set equal to 100000 and α equals 5%.

[10] Due to the addition of the residual, $\hat{r}^s_{ij,T+k}$ is not equal to $\hat{r}_{ij,T+k}$, since it depends on lags of itself and of other endogenous variables.

4. Regional projections 2006-2012

4.1. International scenario

The following tables present the international and national scenario which was set up in April 2007.

Table 1: Principal national and international hypotheses

						Averages		
	2005	2006	2007	2008	2009-2012	1986-1995	1996-2005	2006-2012
1. Potential exportmarkets for Belgium (growth rate)	6,4	8,7	7,3	7,2	6,7	6,4	6,4	7,1
GDP eurozone	1,5	2,8	2,3	2,3	2,0	2,5	2,1	2,2
GDP United States	3,2	3,3	2,2	2,7	2,7	2,8	3,3	2,7
2. International prices in euro (growth rate)								
Export of goods and services without energy	2,2	3,2	0,9	0,7	1,3	-1,8	0,6	1,4
Import of goods and services without energy	1,3	2,8	0,7	0,8	1,3	-1,5	0,2	1,3
Import of energy	42,4	18,7	-9,9	0,8	1,3	-8,8	16,9	2,1
3. Oil price (Brent, USD) (1)	54,4	65,1	61,0	61,9	65,2	17,9	27,0	63,3
4. Exchange rate (level) (1)								
EUR in USD (*100)	124,4	125,6	130,5	131,4	131,4	114,9	109,9	130,5
5. Interest rate (level) (1)								
Short term (3 months)								
Eurozone	2,2	3,1	4,0	4,0	3,8	-	-	3,8
United States	3,5	5,2	5,3	5,0	4,7	6,2	4,0	4,9
Long term (10 year)								
Eurozone	3,4	3,8	4,2	4,3	4,5	-	4,9	4,3
United States	4,3	4,8	4,8	4,8	5,4	7,6	5,2	5,1
6. Inflation								
Eurozone	2,2	2,2	2,1	1,9	1,7	3,9	2,0	1,9
United States	2,9	3,1	2,3	2,1	1,9	3,3	2,0	2,1
7. Labour force								
Difference (in thousands)	41,1	29,1	30,2	28,0	22,3	31,0	41,1	25,2
8. Activity rate (in percent) (1)	72,3	72,2	72,3	72,4	73,6	65,9	70,6	72,8

(1) For the years 2009-2012, the value at the end of the period (2012) is given, rather than the average value.

Table 2: Principal macroeconomic results of the national projection

	2005	2006	2007	2008	2009-2012	Averages 1986-1995	1996-2005	2006-2012
1. Demand and production (chained 2000 euros, growth rate)								
Private consumption expenditure	0,9	2,4	2,0	1,5	1,8	2,3	1,7	1,9
Government consumption expenditure	-0,6	0,9	2,3	2,7	1,9	1,4	1,8	1,9
Gross fixed capital formation	4,0	4,1	2,9	2,8	2,6	4,2	3,0	2,9
Total domestic demand	1,6	3,1	2,2	2,0	1,9	2,4	2,0	2,2
Exports of goods and services	2,8	3,7	6,4	5,7	5,5	5,0	4,2	5,4
Total final demand	2,1	3,4	4,2	3,8	3,7	3,4	3,0	3,8
Imports of goods and services	3,5	3,8	6,4	5,7	5,6	5,4	4,1	5,4
GDP	1,1	3,0	2,3	2,2	2,1	2,3	2,1	2,2
GDP (current prices)	3,1	4,9	4,6	4,2	4,0	5,2	3,7	4,3
2. Prices								
Private consumption deflator	2,9	2,3	1,8	1,9	1,9	2,1	1,8	1,9
GDP deflator	2,0	1,8	2,2	2,0	1,9	2,8	1,6	2,0
3. Employment and unemployment								
Employment, in thousands (1)	4212,2	4256,3	4303,4	4343,7	4482,6	3812,1	4066,6	4377,3
- difference in %	1,0	1,0	1,1	0,9	0,8	0,6	0,9	0,9
Unemployment rate (FPB definition) (1)	14,3	13,9	13,5	13,2	12,0	12,3	13,8	12,9

(1) For the years 2009-2012, the value at the end of the period (2012) is given, rather than the average value.

4.2. Principal macroeconomic regional projections

In 2006, the three Belgian regions saw a clear revival of their economic activity. The economic growth of the Flemish Region was the largest: 3,3% (value added), against 2,4% in both the Walloon and Brussels Capital Region[11]. In 2007, economic growth would have dropped a little: 2,2% in Brussels, 2,4% in Flanders and 2,3% in Wallonia. For 2008, this projection is rather optimistic, since the (national) projection was closed in April 2007, and so the effects of the credit crisis and the increasing oil prices have not been taken fully into account. GDP would increase with 1,7% in Brussels, 2,4% in Flanders, and 1,9% in Wallonia. For the last years of the projection period, the Flemish economic growth would stabilise around 2,2%, while in Brussels economic growth would be around 1,9% and in Wallonia around 1,8%.

[11] On the 21th of April 2008, the offical regional accounts for 2006 were released. These more or less confirm the projected growth rates: 3,3% in Flanders, 2,2% in Brussels and 2,0% in Wallonia (value added, in volume).

Table 3: Principal macroeconomic results of the regional projection

	2005	2006	2007	2008	2009-2012	Averages 1986-1995	Averages 1996-2005	Averages 2006-2012
1. Gross domestic product, volume (1)								
Belgium	1,1	3,0	2,3	2,2	2,1	2,3	2,1	2,2
Brussels Capital Region	1,6	2,4	2,2	1,7	1,9	1,3	2,2	2,0
Flemish Region	1,0	3,4	2,4	2,4	2,2	3,1	2,2	2,4
Walloon Region	0,7	2,4	2,2	1,9	1,8	2,3	1,7	2,0
2. Gross value added, volume (1)								
Belgium	1,1	2,9	2,3	2,2	2,1	2,3	2,0	2,3
Brussels Capital Region	1,6	2,4	2,2	1,7	2,0	1,1	2,1	2,0
Flemish Region	1,1	3,3	2,4	2,4	2,3	2,8	2,1	2,5
Walloon Region	0,8	2,4	2,3	2,0	1,9	2,1	1,6	2,0
3. Gross fixed capital formation (1) (2)								
Belgium	4,3	4,0	2,8	3,6	3,1	3,5	3,4	3,2
Brussels Capital Region	-1,9	9,8	-2,6	4,4	1,6	1,3	2,4	2,6
Flemish Region	5,8	1,5	3,9	2,0	3,4	4,5	3,8	3,0
Walloon Region	5,5	6,1	3,9	7,3	3,1	3,6	3,4	4,3
4. Real productivity per head (market branches) (1)								
Belgium	-0,2	1,8	1,1	1,2	1,3	1,8	1,2	1,3
Brussels Capital Region	1,2	2,8	1,7	1,3	1,8	1,8	1,6	1,8
Flemish Region	-0,2	1,8	0,9	1,2	1,2	1,8	1,3	1,3
Walloon Region	-1,0	1,2	1,1	1,0	1,1	2,1	0,9	1,1
5. Real wagecosts per head (market branches) (1)								
Belgium	-1,6	-0,2	0,0	0,4	1,5	2,3	0,4	0,9
Brussels Capital Region	-1,4	0,2	0,9	0,1	1,5	2,4	0,5	1,0
Flemish Region	-1,5	-0,1	-0,1	0,5	1,5	2,6	0,6	0,9
Walloon Region	-1,7	-0,4	-0,2	0,3	1,4	1,8	0,2	0,8

(1) growth rate in %

(2) excl. investments in housing

Table 4: Labour market: results of the regional projection

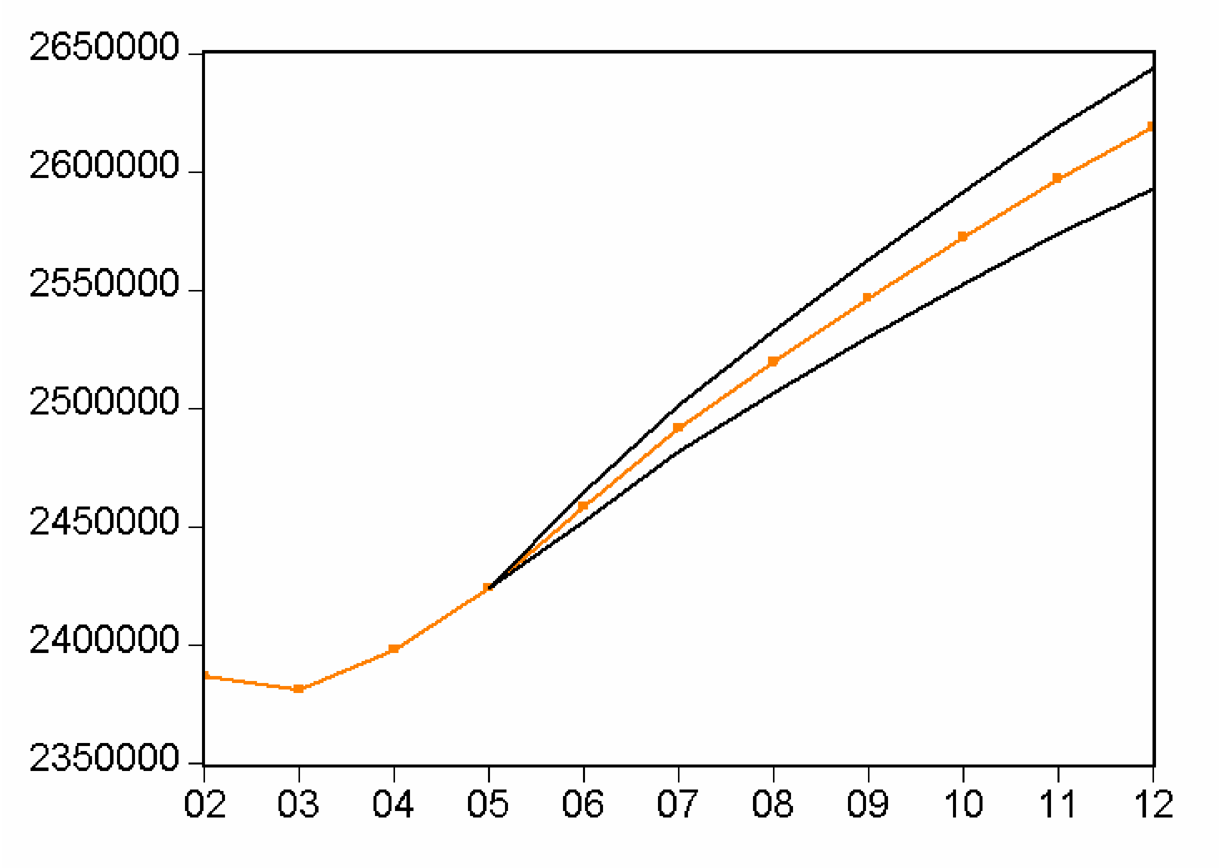
	2005	2006	2007	2008	2009-2012	Averages 1986-1995	Averages 1996-2005	Averages 2006-2012
1. Employment								
1.1. Employment, in thousands (1)								
Belgium	4212,2	4256,3	4303,4	4343,7	4482,6	3812,1	4066,6	4377,3
Brussels Capital Region	657,2	655,8	658,5	661,0	668,1	625,5	639,3	663,0

	2005	2006	2007	2008	2009-2012	Averages 1986-1995	1996-2005	2006-2012
Flemish Region	2424,3	2458,7	2491,8	2519,8	2618,8	2134,0	2337,7	2543,5
Walloon Region	1130,7	1141,8	1153,2	1162,9	1195,8	1052,7	1089,7	1170,7
1.3. Growth rate, in percent								
Belgium	1,0	1,0	1,1	0,9	0,8	0,6	0,9	0,9
Brussels Capital Region	0,4	-0,2	0,4	0,4	0,3	-0,2	0,7	0,2
Flemish Region	1,1	1,4	1,3	1,1	1,0	1,1	0,9	1,1
Walloon Region	1,1	1,0	1,0	0,8	0,7	0,2	0,8	0,8
3. Net commuting flows (1)								
Belgium	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Brussels Capital Region	-304,0	-303,5	-301,9	-299,7	-287,6	-293,4	-309,4	-296,3
Flemish Region	178,4	178,2	175,4	172,1	156,5	187,1	187,0	167,9
Walloon Region	125,6	125,3	126,6	127,7	131,1	106,3	122,4	128,4
4. Working population (1)								
Belgium	4263,3	4307,5	4354,9	4395,3	4534,5	3856,9	4116,2	4428,9
Brussels Capital Region	367,6	366,7	371,1	375,8	395,0	342,5	343,2	381,2
Flemish Region	2617,6	2651,7	2682,1	2706,9	2790,4	2336,4	2538,8	2726,5
Walloon Region	1278,1	1289,0	1301,7	1312,6	1349,1	1178,0	1234,2	1321,2
5. Employment rate (1)								
Belgium	62,0	62,2	62,5	62,9	64,8	57,8	60,9	63,4
Brussels Capital Region	54,7	54,1	54,7	55,2	57,6	54,7	53,6	55,9
Flemish Region	65,7	66,1	66,6	67,0	69,3	59,9	64,3	67,6
Walloon Region	57,5	57,5	57,6	57,8	59,0	54,8	56,8	58,1
6. Unemployment (2)								
6.1. Unemployment, in thousands (1)								
Belgium	710,4	695,4	678,1	665,7	615,7	543,1	656,5	655,0
Brussels Capital Region	106,9	108,8	105,5	101,6	88,2	63,7	93,2	97,8
Flemish Region	299,2	276,8	260,8	249,2	203,1	269,7	286,8	239,0
Walloon Region	304,2	309,8	311,8	314,9	324,4	209,7	276,6	318,2
6.4 Unemployment rate (1)								
Belgium	14,3	13,9	13,5	13,2	12,0	12,3	13,8	12,9
Brussels Capital Region	22,5	22,9	22,1	21,3	18,3	15,7	21,3	20,4
Flemish Region	10,3	9,5	8,9	8,4	6,8	10,3	10,2	8,1
Walloon Region	19,2	19,4	19,3	19,4	19,4	15,1	18,3	19,4

(1) For the years 2009-2012, the value at the end of the period (2012) is given, rather than the average value.

(2) FPB definition, i.e.including older unemployed people, whom do not have to report themselves as job-seekers.

Figure 1: Confidence intervals for the Flemish employment projections



5. Conclusion

The Belgian state underwent some important institutional reforms in the previous decades. In these reforms, more and more power was transferred to the regions (the Brussels Capital Region, the Flemish Region and the Walloon Region). HERMREG is developped in order to facilitate the decision making proces at the regional level.

This first version of HERMREG is a top-down macro-econometric model used to construct medium term projections (6 years ahead). The model is linked with a national model, such that the regional forecasts remain coherent with the national projections.

In short, HERMREG regionalises the national medium term forecasts made by HERMES. The model therefore uses (implicit) endogenous regionalisation keys to distribute the national forecasts over the different regions. The methodology is a combination of a (partial) shift-share analysis and regression analysis.

At the moment HERMREG mainly focuses on four variables: value added, employment, investments and salaries. These variables are modelled on a sectoral and regional level. Regional projections of the following variables are available through HERMREG: gross domestic product, value added, employment (salaried and self-employment), net commuting flows, investments, wages, productivity and unemployment. These variables, except for GDP, unemployment and net commuting flows, are available for 13 branches.

To give the user an idea about the uncertainty surrounding projections, one can publish confidence intervals for the forecasts. In HERMREG confidence intervals are produced using a stochastic simulation procedure.

A short overview of the first projections made with HERMREG makes clear that it is expected that the Flemish Region would continue to perform better than the other Belgian regions. These projections are, however, not up-to-date (they do not take into account the credit crisis and the continuous increase of the oil price).

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