METHODOLOGICAL PROPOSAL FOR COMPILING THE ILO UNEMPLOYMENT WITH MONTHLY PERIODICITY

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Abstract

Development of methodology for deriving the monthly unemployment statistics directly from the quarterly Labour Force Survey (LFS) results by econometric modeling meets the requirements of insuring the information on short-term needed for employment policies, aiming to achieve the objectives of Europe 2020. Estimated monthly data series according to the methodology allow assessment of short-term trends in unemployment measured according to the criteria of the International Labour Organisation (ILO) in terms of comparability with European statistics.

***Key words**: concept, definition, employment, unemployment, method, algorithm, adjustment, estimation, forecasting*

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Presently, the official statistics calculate and disseminate 3 unemployment rates: (i) registered unemployment – with monthly periodicity, at NUTS3 (county) level, defined according to national legislation, provided by administrative sources – National Agency for Employment and Labour Force; (ii) ILO unemployment (according to International Labour Office criteria) – with quarterly periodicity (and as annual average), at NUTS 2 (region) level, defined according to International Labour Office (ILO) criteria, provided by statistical sources – Labour Force Survey (LFS), National institute of Statistics (INS); (iii) monthly "harmonized" unemployment - with monthly periodicity, at NUTS0 (country) level, defined according to ILO criteria, provided by statistical sources – LFS and estimation model. In order to provide input for short-term employment policy, the European Community Statistical Office (EUROSTAT) requested Member States to develop their own models to estimate the ILO unemployment by direct derivation of the results of quarterly Labour Force Survey (LFS), without using any other auxiliary variables derived from another data source.

ILO unemployed are the persons aged 15-74 years who simultaneously meet the following three conditions: (i) have no job, (ii) are available to start working in next two weeks, (iii) were actively seeking a job at any time during the last four weeks. ILO unemployment rate is the proportion of ILO unemployed in the total economically active population.

The methodology developed - is a variant of the Holt Method which exponentially smooths data series that show a linear trend. Algorithm of the methodology developed is as follows:

Step 0. Initial sample of LFS is divided into three sub-samples one for each month of the quarter and each monthly sub-sample is grossed-up separately, applying a reduced calibration scheme. To monthly gross-up the data provided by LFS, the following variables are used for calibration: population by sex and four age groups (less than 15, 15-24, 25-64, 65 and over), area of residence, regions (NUTS2 level) and total number of households. Thus, the monthly series of initial estimates are obtained.

Step 1. Based on primary data provided by the Labour Force Survey[1] $\hat{Y}_t$ estimators, were calculated using a variant of the Holt method that exponentially smooth data series that show a linear trend, given by the equation:

$$1.1. \qquad y_t = L_t + b_t t + e_t$$

where:

L_t and b_t represents the estimation of the time series at the moment t, obtained by exponential smoothing for level and trend.

L_t and b_t are modified according to recurrence relations:

$$1.2. \qquad L_t = \alpha y_t + (1-\alpha)(L_{t-2} + b_{t-2})$$

$$1.3. \qquad b_t = \beta(L_t - L_{t-2}) + (1-\beta)b_{t-2}$$

where:

1 Noted with HM Series

α, $0 < \alpha < 1$ - the *level smoothing factor*

β, $0 < \beta < 1$ - the *trend smoothing factor*.

The first equation corrects the L_t level with the trend of the previous b_{t-2} by adding it to the last value calculated, L_{t-2}. This approach helps to eliminate delays and get closer L_t to real current value. The second equation updates the trend by the difference between the last two calculated values.

The level smoothing factor and trend smoothing factor $\alpha, \beta \in [0,1]$ are generated using the forecast errors minimization condition. Usually these factors are determined from the condition of minimizing the mean squared forecast errors.

$$1.4. \qquad \frac{1}{T}\sum_{t=0}^{T-1}\left(Y_{t+1}-\hat{Y}_{t+1}\right)^2 = \frac{1}{T}\sum_{t=0}^{T-1}e_{t+1}^2 \to \min$$

where forecast error according to Hold method is:

$$1.5. \qquad e_{t+1} = Y_{t+1} - \hat{Y}_{t+1}$$

Note that the adjusted Holt method needs some initial estimation for L_1 şi b_1. Generally, in practice there is assumed $L_1=y_1$ and $b_1=0$ to set the initial level and trend. Also assuming $L_2=y_2$.

Initialization:

$$1.6. \qquad b_t = 0 \times \left(L_t - L_{t-2}\right) + (1-0)b_{t-2} = b_{t-2}$$

Through recurrence:

$$1.7. \qquad b_t = b_{t-2} = b_{t-3} = ... = b_1 = 0$$

(from the condition on initialization of the algorithm).

Then:

$$1.8. \qquad L_t = \alpha y_t + (1-\alpha)L_{t-2}$$

The result consists in monthly series of forecasted estimates.

Step 2. To obtain an idea about the results of the proposed method, these estimations were compared with the benchmarked data series. Let Y_t' be the prediction time series that is:

$$1.9. \qquad Y'_t = \alpha \hat{Y}_{t-2} + (1-\alpha)Y_{t-1}^{hmb}$$

where Y_t^{hmb} represents the benchmarked data series, given by equation:

$$1.10. \qquad Y_t^{hmb} = \hat{Y}_t \times Y_Q^b / \overline{\hat{Y}_Q}$$

where:

Y_Q^b - represents the quarterly average of the reference data series (LFS quarterly values), and

$\overline{\hat{Y}_Q}$ - represents the quarterly average of the Holt' estimation series.

The output of the algorithm is now written as Y'_{t+m}, to forecast future values of *y series* at time *t+h, h>0* based on the raw data up to time *t*. Thus, the forecast for the moment h will be calculated according to:

$$1.11. \qquad Y'_{t+h} = \alpha \hat{Y}_{t+h-2} + (1-\alpha) Y^{hmb}_{t+h-1}$$

Following this algorithm, the forecast for the first next period (h=1) is:

$$1.12. \qquad Y'_{t+1} = \alpha \hat{Y}_{t-1} + (1-\alpha) Y^{hmb}_{t}$$

The result obtained: monthly series of final estimates in non-seasonally adjusted form.

Step 3. Beside the monthly series (number of unemployed persons and unemployment rate) adjusted for level and trend (non-seasonally adjusted series), seasonally adjusted (thus, removing the effect of seasonal variations) and trend (which represent the series from which, both, the seasonal and irregular effects, were removed) series are also calculated.

Seasonal adjustment was performed using DEMETRA software (TRAMO/ SEARTS method), which also estimates the calendar effect (Orthodox Easter, leap year and other national holidays) and identifies and corrects the outliers (occasional transitory or permanent changes in level).

The estimation of unobserved components: trend-cycle, seasonal and irregular component was made with SEATS program based on ARIMA models.

Seasonally adjusted series was obtained by removing the seasonal component from the original data. Trend was obtained by removing the irregular component from the seasonally adjusted series.

Final result obtained: monthly series on final estimates in non-seasonal adjusted, seasonal-adjusted and trend forms.

Dissemination of data estimated

Main indicators obtained are:

- Number of ILO unemployed – total (15-74 years) by sex and age groups (15-24 years and 25-74 years), and
- ILO unemployment rate – total (15-74 years) by sex and age groups (15-24 years and 25-74 years).

Beside the monthly series (number of unemployed persons and unemployment rate) adjusted for level and trend (non-seasonally adjusted series), seasonally adjusted (thus, removing the effect of seasonal variations) and trend (which represent the series from which, both, the seasonal and irregular effects, were removed) series are also calculated. Thus, monthly series are built and disseminated in 3 forms:

- non-seasonally adjusted,
- seasonally adjusted,
- trend

Because of the small number of cases of observation, the reliability of estimates for the indicators corresponding to the category of young people (age group

15-24 years) is extremely low, the series obtained showing a high degree of volatility. Therefore, the indicators corresponding to the category "youth" are not disseminated.

The first release of data was performed on 1-st of August 2011 - press release - with monthly data series for:

• January 2004 - March 2011 - as benchmarked values;

• April, May, June 2011 – as predicted values.

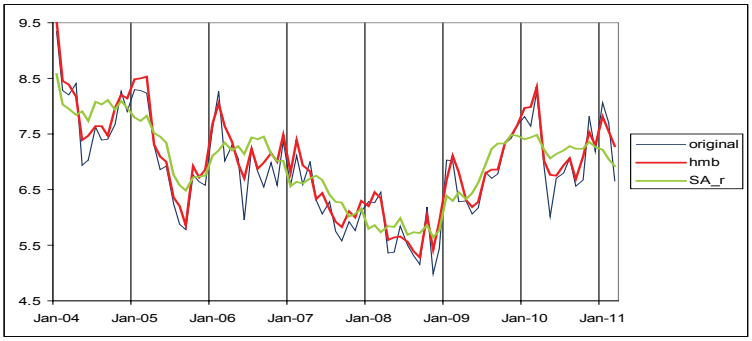
Revision policy of estimated (predicted) series:

• quarterly, after finalizing quarterly result from LFS, by benchmarking (e.g.: in May the estimates for January, February and March are revised and April is released as forecasted values).

• Annually, re-estimation of the model used for seasonal adjustment may impose the revision of the series for the entire year for the seasonally adjusted form.

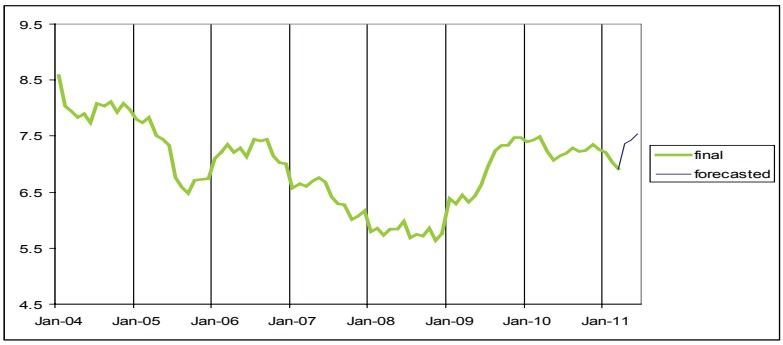
Presentation - as example - of few key findings:
Unemployment rate - total 15-74 years - during period January 2004 - March 2011 - original series, series estimated using Holt method (hmb) and seasonally adjusted series (SA_r)

Figure 1



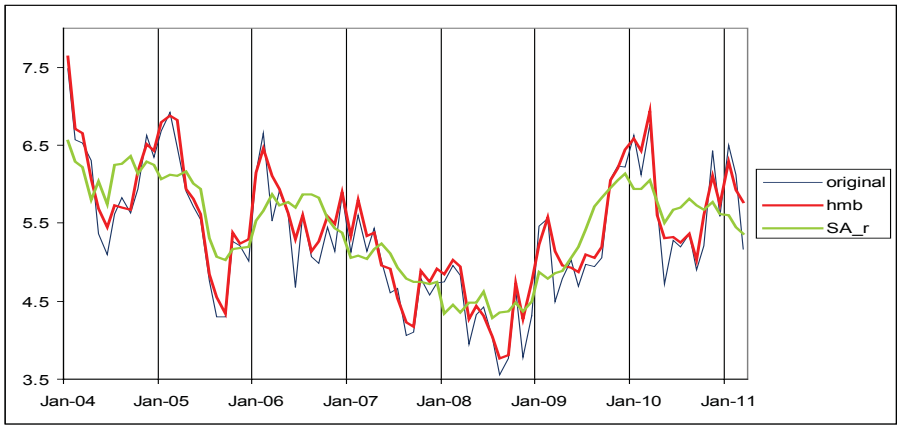
Unemployment rate - total 15-74 years - during period January 2004 - March 2011 and forecast for period April – June 2011 - seasonally adjusted series

Figure 2



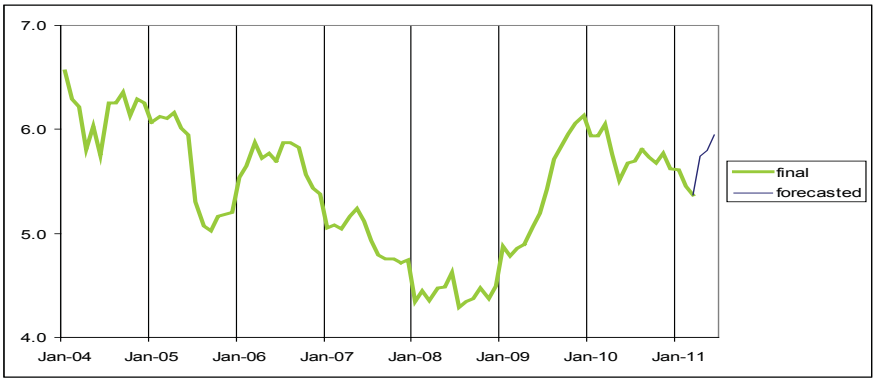
Unemployment rate - adults aged 25-74 - during period January 2004 - March 2011 - original series, series estimated using Holt method (hmb) and seasonally adjusted series (SA_r)

Figure 3



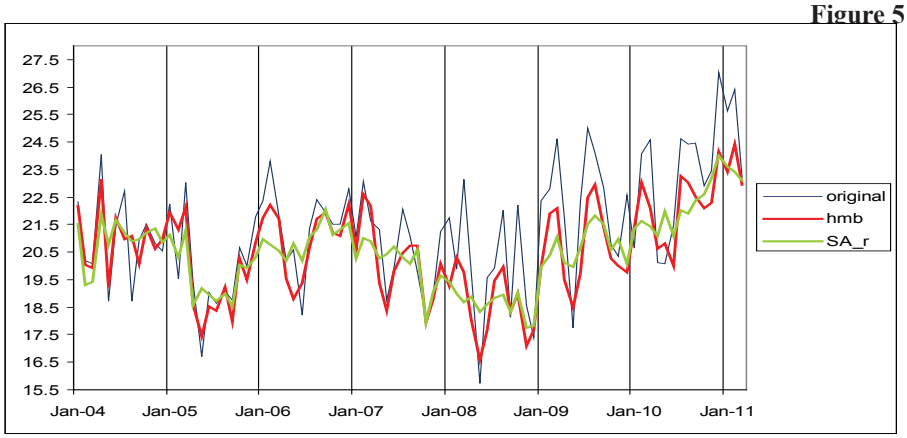
Unemployment rate - adults aged 25-74 - during period January 2004 - March 2011 and forecast for period April – June 2011 - seasonally adjusted series

Figure 4



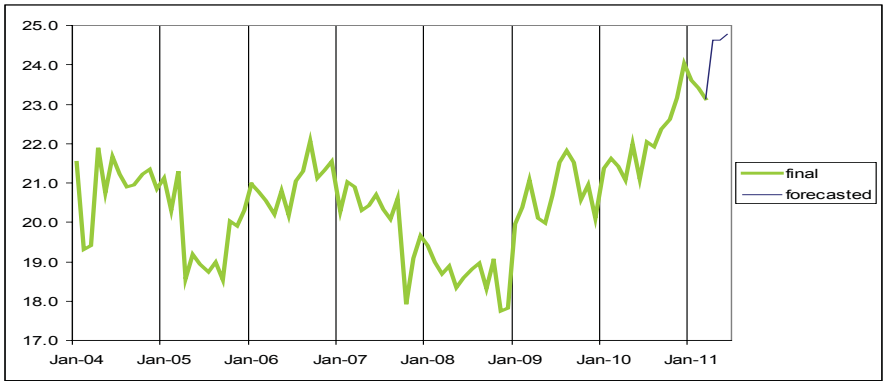
Unemployment rate - youth aged 15-24 - during period January 2004 - March 2011 - original series, series estimated using Holt method (hmb) and seasonally adjusted series (SA_r)

Figure 5



Unemployment rate - youth aged 15-24 - during period January 2004 - March 2011 and forecast for period April – June 2011 - seasonally adjusted series

Figure 6



Conclusions

Econometric models provide formulations and assumptions on variables subject to forecast, reflecting the orientation of the behavior of the studied phenomenon.

Limits due to the forecast model are:

• existence of the forecast errors, defined as the difference between estimates and real values of the raw series; the model impose the minimization of these errors by the condition that mean of squares of forecast errors to be minimal;

• deviations between forecasted values and values of the reference series (benchmark) due to their dependence on the trend of the previous period, and factors that can act unpredictably over economic environment. These deviations are larger in the case of youth aged 15-24 unemployment data series, the differences being exacerbated by the volatility of the series for this segment of the population.

Bibliography

- Brockwell, P.J. and Davis, R.A. - Introduction to Time Series and Forecasting, Second edition, 2002

- Holt., C.C, Forecasting seasonals and trends by exponentially weighted moving averages - Journal of Economic and Social Measurement, 2004, ISSN 1875-8932 (Online) http://iospress.metapress.com/content/pyu1rk484x1kb1qq/

- Pierse, R.G., Lecture 9: Smoothing Methods, ECO2029 Economic Forecasting http://www.shs.surrey.ac.uk/economics/rpierse/ec451/bf9.pdf

- European Commission Eurostat, Directorate F: Social Statistics and Information Society, Unit F-2: Labour market, working documents http://circa.europa.eu/Members/irc/dsis/employ/library?l=/&vm=detailed&sb=Title:

- Unemployment statistics *(Doc.: Eurostat/D1/LAMAS/11/05)*

- Harmonised monthly unemployment rates (Doc.: *Eurostat/F2/LAMAS/ 07 /06)*

- Harmonised monthly unemployment rates (Doc.: *Eurostat/F2/LAMAS/ 01 /07)*

- Monthly unemployment (Doc.: *Eurostat/F2/LAMAS/ 12 /08*)

- Feasibility study on flash estimates of monthly unemployment rates using EU sampling on weekly LFS samples (*Doc.: Eurostat/F2/LAMAS/ 32b /08)*

- Revised methodology for the calculation of monthly unemployment rates (*Doc.: Eurostat/F2/LAMAS/ 32a /08)*

- Institutul National de Statistică (INS) România, metadata database http://colectaredate.insse.ro/metadata/public.htm?locale=ro