THE ACCURACY OF UNEMPLOYMENT RATE FORECASTS IN ROMANIA AND THE ACTUAL ECONOMIC CRISIS

Mihaela BRATU (SIMIONESCU)

Faculty of Cybernetics, Statistics and Economic Informatics
Academy of Economic Studies, Bucharest, Romania
mihaela_mb1@yahoo.com

***Abstract**: In this study, the problem of forecasts accuracy is analysed on three different forecasting horizons: during the actual economic crisis, in few years before the crisis and on a large horizon. The accuracy of the forecasts made by European Commission, National Commission for Prognosis (NCP) and Institute for Economic Forecasting (IEF) for unemployment rate in Romania is assessed. The most accurate predictions on the forecasting horizons 2001-2011 and 2009-2011 were provided by IEF and the less accurate by NCP. These results were gotten using U1 Theil's statistic and a new method that has not been used before in literature in this context. The multi-criteria ranking was applied to make a hierarchy of the institutions regarding the accuracy and five important accuracy measures were taken into account at the same time: mean errors, mean squared error, root mean squared error, U1 and U2 statistics of Theil. In few years before crisis (2006-2008) another hierarchy of institutions were gotten using the accuracy criterion: NCP, IEF and EC. The combined forecasts of institutions' predictions are the best strategy to improve the forecasts accuracy on overall and before the crisis. During the economic crisis IEF provided the most accurate predictions, the combined forecasts being a good strategy of improving only the forecasts made by NCP and EC using inversely MSE scheme and equally weighted scheme. The assessment and improvement of forecasts accuracy have an important contribution in growing the quality of decisional process.*

***Key words**:* forecasts, predictions, accuracy, multi-criteria ranking, combined forecasts, combining schemes.

JEL Classification Codes: E21, E27, C51, C53

1. INTRODUCTION

The evaluation of forecasts accuracy is necessary for establishing the decisional process. When more institutions in a country provide forecasts for the same macroeconomic variable, the deciders have to choose the one with the highest accuracy. The term of "accuracy" is put in correlation with the errors that affect the forecasting process, because only by hazard the predicted value of an indicator is exactly equal with its real value.

The original contribution of this research is related to the proposal of a new method of assessing the forecasts accuracy, taking into account more accuracy measures at the same time. The multi-criteria ranking let us make a classification of the institution according to more accuracy indicators.

On the other hand, the literature reports the necessity of improving the forecasts accuracy. We proposed as strategy of getting better predictions than the original ones the combined forecasts and we made comparisons with the original predictions to measure the degree of improvement.

2. LITERATURE

The forecasts accuracy evaluation is one of the current concerns of many researchers. One purpose of this assessment is related to the need of improving the predictions. The current economic and financial crisis emphasized the struggles of uncertainty reduction. The forecasts accuracy is a very large domain of research, an exhaustive presentation of it being impossible. But, some of the recent results will be described.

To assess the forecast accuracy, as well as their ordering, statisticians have developed several measures of accuracy. For comparisons between the MSE indicators of forecasts, Granger and Newbold proposed a statistic. Another statistic is presented by Diebold and Mariano (1995) for comparison of other quantitative measures of errors. Diebold and Mariano test proposed in 1995 a test to compare the accuracy of two forecasts under the null hypothesis that assumes no differences in accuracy. The test proposed by them was later improved by Ashley and Harvey, who developed a new statistic based on a bootstrap inference. Subsequently, Diebold and Christoffersen have developed a new way of measuring the accuracy while preserving the co-integration relation between variables.

Meese and Rogoff's paper, " Empirical exchange rate models of the seventies", remains the starting point for many researches on the comparing of accuracy and bias. Recent studies target accuracy analysis using as comparison criterion different models used in making predictions or the analysis of forecasted values for the same macroeconomic indicators registered in several countries.

Allan (2012) obtained a good accuracy for the OECD forecasts combined with outturn values of GDP growth for G7 countries between 1984 and 2010. The same author mentioned two groups of accuracy techniques used in assessing the predictions: quantitative forecasts accuracy statistics and qualitative accuracy methods.

Dovern and Weisser (2011) used a broad set of individual forecasts to analyze four macroeconomic variables in G7 countries. Analyzing accuracy, bias and forecasts efficiency, resulted large discrepancies between countries and also in the same country for different variables.

Most international institutions provide their own macroeconomic forecasts. It is interesting that many researchers compare the predictions of those institutions (Melander for European Commission, Vogel for OECD, Timmermann for IMF) with registered values and those of other international organizations, but it is omitted the comparison with official predictions of government.

Abreu (2011) evaluated the performance of macroeconomic forecasts made by IMF, European Commission and OECD and two private institutions (Consensus Economics and The Economist). The author analized the directional accuracy and the ability of predicting an eventual economic crisis.

In Netherlands, experts made predictions starting from the macroeconomic model used by the Netherlands Bureau for Economic Policy Analysis (CPB). For the period 1997-2008 was reconstructed the model of the experts macroeconomic variables evolution and it was compared with the base model. The conclusions of Franses, Kranendonk and Lanser (2011) were that the CPB model forecasts are in general biased and with a higher degree of accuracy.

Gorr (2009) showed that the univariate method of prediction is suitable for normal conditions of forecasting while using conventional measures for accuracy, but multivariate models are recommended for predicting exceptional conditions when ROC curve is used to measure accuracy.

Ruth (2008), using the empirical studies, obtained forecasts with a higher degree of accuracy for European macroeconomic variables by combining specific sub-groups predictions in comparison with forecasts based on a single model for the whole Union.

Heilemann and Stekler (2007) explain why macroeconomic forecast accuracy in the last 50 years in G7 has not improved. The first explanation refers to the critic brought to macro-econometrics models and to forecasting models, and the second one is related to the unrealistic expectations of forecast accuracy. Problems related to the forecasts bias, data quality, the forecast process, predicted indicators, the relationship between forecast accuracy and forecast horizon are analyzed.

3. COMPARISONS BETWEEN UNEMPLOYMENT FORECASTS MADE BY DIFFERENT INSTITUTIONS USING THE ACCURACY CRITERION

In this study we used the forecasted values of the annual registered unemployment rate made for Romania by European Commission, National Commission for Prognosis and Institute for Economic Forecasting. The forecasting horizon is 2001-2011. The objective is to assess the accuracy, the biasness and the efficiency of these predictions and determine the best institution with the highest performance.

Armstrong and Fildes (1995) showed that it is not sufficient to use a single measure of accuracy. Therefore, more accuracy indicators were computed for the three types of forecasts on the specified horizon.

To make comparisons between forecasts we propose to determine the hierarchy of institutions according to the accuracy of their forecasts using multi-criteria ranking.

Two methods of multi-criteria ranking (ranks method and the method of relative distance with respect to the maximal performance) are used in order to select the institution that provided the best forecasts on the horizon 2001-2011 taking into account at the same time all computed measures of accuracy. The multi-criteria ranking can be applied to make a hierarchy of institutions taking into account the performance of forecasts in all its dimensions: accuracy, unbiasedness and efficiency.

If we consider $\hat{X}_t(k)$ the predicted value after k periods from the origin time t, then the error at future time (t+k) is: $e_t(t+k)$. This is the difference between the registered value and the predicted one.

The indicators for evaluating the forecasts accuracy that will be taken into consideration when the multi-criteria ranking is used are:

- Root Mean Squared Error (RMSE)

$$RMSE = \sqrt{\frac{1}{n}\sum_{j=1}^{n} e_X^2(T_0 + j, k)} \tag{1}$$

- Mean error (ME)

$$ME = \frac{1}{n}\sum_{j=1}^{n} e_X(T_0 + j, k) \tag{2}$$

The sign of indicator value provides important information: if it has a positive value, then the current value of the variable was underestimated, which means expected average values too small. A negative value of the indicator shows expected values too high on average.

- Mean absolute error (MAE)

$$MAE = \frac{1}{n}\sum_{j=1}^{n} \left| \; e_X(T_0 + j, k) \; \right| \tag{3}$$

These measures of accuracy have some disadvantages. For example, RMSE is affected by outliers. Armstrong and Collopy stresses that these measures are not independent of the unit of measurement, unless if they are expressed as percentage. If we have two forecasts with the same mean absolute error, RMSE penalizes the one with the biggest errors.

A common practice is to compare the forecast errors with those based on a random-walk. "Naïve model" method assumes that the variable value in the next period is equal to the one recorded at actual moment. Theil proposed the calculation of U statistic that takes into account both changes in the negative and the positive sense of an indicator:

U Theil's statistic can be computed in two variants, specified also by the Australian Tresorery.

The following notations are used:

a- the registered results

p- the predicted results

t- reference time

e- the error (e=a-p)

n- number of time periods

$$U_1 = \frac{\sqrt{\sum_{t=1}^{n}(a_t - p_t)^2}}{\sqrt{\sum_{t=1}^{n} a_t^2} + \sqrt{\sum_{t=1}^{n} p_t^2}} \tag{4}$$

A value close to zero for U_1 implies a higher accuracy.

$$U_2 = \sqrt{\frac{\sum_{t=1}^{n-1}\left(\frac{p_{t+1} - a_{t+1}}{a_t}\right)^2}{\sum_{t=1}^{n-1}\left(\frac{a_{t+1} - a_t}{a_t}\right)^2}} \tag{5}$$

If U_2=1=> there are not differences in terms of accuracy between the two forecasts to compare

If U_2<1=> the forecast to compare has a higher degree of accuracy than the naive one

If U_2>1=> the forecast to compare has a lower degree of accuracy than the naive one

Table 1: The accuracy of forecasts made by European Commission, National Commission for Prognosis and Institute for Economic Forecasting for the unemployment rate in Romania (2001-2011)

ACCURACY MEASURE	INSTITUTION		
	European Commission (EC)	National Commission for Prognosis (NCP)	Institute for Economic Forecasting (IEF)
ME	-0.5455	-0.5636	-0.7273
MAE	1.2364	1.6364	1.0909
RMSE	1.4948	1.7633	1.3052
U1	0.1066	0.1240	0.0920
U2	1.1575	1.0966	0.9977

Source: own computations using Excel

According to all accuracy indicators for forecasts made on the horizon 2001-2011, excepting the mean error, the Institute for Economic Forecasting that used Dobrescu macromodel, provided the most accurate predictions for the unemployment rate. Only the forecasts of this institution outperformed the naïve predictions based on the random walk. The negative values of the mean error imply too high in average predicted values for all institutions. The less accurate forecasts are made by the National Commission for Prognosis.

We are interested to see the forecasts accuracy during the actual financial and economic crisis and the accuracy in pre-crisis period. In Romania the crisis started in 2009, so the accuracy will be assessed on the forecasting horizon 2009-2011(in **Table 3**) and before the crisis during 2006-2008 (in **Table 2**).

Table 2: The accuracy of forecasts made by European Commission, National Commission for Prognosis and Institute for Economic Forecasting for the unemployment rate in Romania (2006-2008)

ACCURACY MEASURE	INSTITUTION		
	European Commission (EC)	National Commission for Prognosis (NCP)	Institute for Economic Forecasting (IEF)
ME	-1.9	-0.1333	-1.7
MAE	1.9	1.2	1.7
RMSE	1.9070	1.4353	1.7369
U1	0.1705	0.1518	0.1579
U2	0.3943	0.4920	0.4477

Source: own computations using Excel

In pre-crisis period, the best forecasts were provided by NCP, the institutions with the lowest value for U1. The NCP predictions have the lowest values for the other indicators (ME, RMSE and MAE). The negative values for ME indicators show that all the institutions overestimated the unemployment rate. The multi-criteria ranking methods and U1 will give the same hierarchy of institutions: NCP, IEF and EC.

Table 3: The accuracy of forecasts made by European Commission, National Commission for Prognosis and Institute for Economic Forecasting for the unemployment rate in Romania (2009-2011)

ACCURACY MEASURE	INSTITUTION		
	European Commission (EC)	National Commission for Prognosis (NCP)	Institute for Economic Forecasting (IEF)
ME	-1.1333	1.0333	-0.3667
MAE	1.333333333	1.833333333	0.966666667
RMSE	1.6713	1.8877	1.2179
U1	0.1018	0.1319	0.0777
U2	1.0931	1.4908	1.4698

Source: own computations using Excel

Surprisingly, the U1 indicators shows a higher degree of accuracy in crisis period. But the U2 measure indicates that the forecasts during the crisis are not better than the naive ones, while in pre-crisis years the predictions based on random walk were less accurate. Excepting U2, all

the other accuracy indicators registered lower values during the crisis for EC and IEF. This means that the two institutions anticipated well the crisis effects, because it started in 2008 in USA and at mid 2007 in Euroa Area. This time NCP underestimated the unemployment rate and provided the higher values for all the accuracy measures. The IEF provided the most accurate predictions during the crisis, this result being gotten even if we apply the multi-criteria ranking.

Ranks method application supposes several steps:

1. Ranks are assigned to each value of an accuracy indicator (the value that indicates the best accuracy receives the rank 1);

The statistical units are the four institutions that made forecasts. The rank for each institution is denoted by: $(r_{i_{ind_j}})$, i=1,2,3 and ind_j –accuracy indicator j. We chose 5 indicators: mean error, mean absolute error, root mean squared error, U1 and U2.

2. If the ranks assigned to each institution are sum up, the score to each of them is computed.

$S_{i=\sum_{j=1}^{5}(r_{i_{ind_j}})}$, i=1,2,3 (6)

3. The institution with the lowest score has the highest performance and it will get the final rank 1.

Table 4: The ranks of institutions according to the accuracy measures for the predictions during 2001-2011 (ranks method)

ACCURACY MEASURE	INSTITUTION		
	European Commission	National Commission for Prognosis	Institute for Economic Forecasting
ME	1	2	3
MAE	2	3	1
RMSE	2	3	1
U1	2	3	1
U2	3	2	1
Sum of ranks	10	13	7
Final ranks	2	3	1

Source: own computations using Excel

The results of the ranks method are the same as those provided by most accuracy measures, especially U1 used in making comparisons between forecasts. Actually, if all the calculated accuracy indicators are taken into account at the same time, the following hierarchy was gotten: Institute for Economic Forecasting, European Commission and National Commission for Prognosis.

The method of relative distance with respect to the maximal performance is the second way of ranking.

For each accuracy indicator the distance of each statistical unit (institution) with respect to the one with the best performance is computed. The distance is calculated as a relative indicator of coordination:

$$d_{i_{ind_j}} = \frac{ind_i^j}{\{\min abs(ind_i^j)_{i=1,..,4}}, \text{ i=1,2,3 and j=1,2,..,5} \quad (7)$$

The relative distance computed for each institution is a ratio, where the denominator is the best value for the accuracy indicator for all institutions.

The geometric mean for the distances of each institution is calculated, its significance being the average relative distance for institution i.

$$\overline{d_i} = \sqrt[s]{\prod_{j=1}^{5} d_{i_{ind_j}}}, \text{ i=1,2,3} \quad (8)$$

According to the values of average relative distances, the final ranks are assigned. The institution with the lowest average relative distance will take the rank 1. The position (location) of each institution with respect to the one with the best performance is computed as: its average relative distance over the lowest average relative distance.

$$loc_i^{\%} = \frac{\overline{d_i}}{\min(d_i)_{i=\overline{1,4}}} \cdot 100 \quad (9)$$

Table 5: The ranks of institutions according to the accuracy measures for the predictions made in the period 2001-2011 (method of relative distance with respect to the best institution)

ACCURACY MEASURE	European Commission	National Commission for Prognosis	Institute for Economic Forecasting
ME	1	1.0332	1.3333
MAE	1.1334	1.5000	1
RMSE	1.1453	1.3510	1
U1	1.1587	1.3478	1
U2	1.1602	1.0991	1
Average relative distance	1.1178	1.2541	1.0592
Ranks	2	3	1
Location (%)	105.5286	118.3964	100

Source: own computations using Excel

The method of relative distance with respect to the best institution gave the same results as the previous methods. The lowest average relative distance was registered by the Institute for Economic Forecasting (1.0592).

The Diebold-Mariano test (DM test) is utilized to check if two forecasts have the same accuracy. The following steps are applied:

✓ The difference between the squared errors of forecasts (e^{*2}) to compare and the squared errors of reference forecasts (e^{*2}): $d_{t,t} = (e_{t,t}^{*2}) - (e_{t,t}^{*2})$ (10)

✓ The following model is estimated: $d_{t,t} = a + \varepsilon_t$ (11)

✓ We test if "a" differs from zero, where the null hypothesis is that a=0 (equal forecasts). A p-value less than 0.05 implies the rejection of the null hypothesis for a probability of 95% in guaranteeing the results.

The following variables are computed: d1, d2 and d3 to make comparisons between EC and NCP forecasts, EC and IEF predictions, respectively NCP and IEF expectations. All the parameters are zero from statistical point of view, so there are not significant differences between the forecasts provided by the three institutions in terms of accuracy. The regression models are estimated in EViews and the results are presented in ***Appendix 1***. So, the accuracy test showed that there are not significant differences between the forecasts provided by the three institutions. If we take into account the results based on accuracy indicators and those of the DM test, we conclude the best predictions are those of IEF, followed by EC and NCP, but the differences between the unemployment rate forecasts are not too big.

By applying qualitative tests for directional accuracy we check if there is a correct prediction of the change. A test of independence between the effective values and the direction of change can be applied in this situation, the null hypothesis showing the independence. A probability less than 0.05 implies the rejection of null hypothesis. All the asymptotic significances are greater than 0.05, according to ***Appendix 2***, fact that makes us to conclude that the directional changes in the outturn are independent from the predictions.

We can conclude that we have different hierarchies depending on the forecasting horizon. The results are systematized in the following table (**Table 6**).

Table 6: The hierarchy of institutions depending on the forecasting horizon and the accuracy criterion

Forecasting horizon	Hierarchy of institutions according to accuracy criterion
2001-2011	IEF, EC and NCP
2006-2008 (pre-crisis period)	NCP, IEF and EC
2009-2011 (crisis period)	IEF, EC and NCP

As the table shows the same hierarchy was gotten for pre-crisis period and for overall period. In the few years before the crisis NCP succeeded in providing the forecast with best accuracy for the unemployment rate. The IEF seems to adapt more quickly to the changes in the economic environment, making a better anticipation of the economic crisis, despite the assumptions made in literature regarding the failure of Dobrescu macromodel in predicting the actual economic crisis.

4. COMBINED FORECASTS TO IMPROVE THE ACCURACY OF UNEMPLOYMENT RATE PREDICTIONS

Bratu (2012) utilized some strategies to improve the forecasts accuracy (combined predictions, regressions models, historical errors method, application of filters and exponential smoothing techniques).

The combined forecasts are another possible strategy of getting more accurate predictions. The most utilized combination approaches are:

- optimal combination (OPT);
- equal-weights-scheme (EW);
- inverse MSE weighting scheme (INV).

Bates and Granger (1969) started from two forecasts f1;t and f2;t, for the same variable Xt, derived h periods ago. If the forecasts are unbiased, the error is calculated as: $e_{i,t} = X_{i,t} - f_{i,t}$. The errors follow a normal distribution of parameters 0 and σ_i^2. If ρ is the correlation between the errors, then their covariance is $\sigma_{12} = \rho \cdot \sigma_1 \cdot \sigma_2$. The linear combination of the two predictions is a weighted average: $c_t = m \cdot f_{1t} + (1-m) \cdot f_{2t}$.The error of the combined forecast is: $e_{c,t} = m \cdot e_{1t} + (1-m) \cdot e_{2t}$.The mean of the combined forecast is zero and the variance is:

$\sigma_c^2 = m^2 \cdot \sigma_1^2 + (1-m)^2 \cdot \sigma_{2t}^2 + 2 \cdot m \cdot (1-m) \cdot \sigma_{12}$. By minimizing the error variance, the optimal value for m is determined (m_{opt}):

$$m_{opt} = \frac{\sigma_2^2 - \sigma_{12}}{\sigma_1^2 + \sigma_2^2 - 2 \cdot \sigma_{12}} \quad (12)$$

The individual forecasts are inversely weighted to their relative mean squared forecast error (MSE) resulting INV. In this case, the inverse weight (m_{inv}) is:

$$m_{inv} = \frac{\sigma_2^2}{\sigma_1^2 + \sigma_2^2} \quad (13)$$

Equally weighted combined predictions (EW) are gotten when the same weights are given to all models.

The U Theil's statistics were computed for the combined forecasts based on the three schemes, the results being shown in the following table (**Table 7**):

Table 7: The accuracy of combined forecasts for unemployment rate (2001-2011)

Accuracy indicator	EC+NCP forecasts	EC+IEF forecasts	NCP+IEF forecasts
U1 (optimal scheme)	**0.0846**	**0.0666**	0.1254
U2 (optimal scheme)	**0.9867**	**0.7130**	1.1063
U1 (inverse MSE scheme)	**0.0864**	**0.0553**	**0.1105**
U2 (inverse MSE scheme)	1.0026	**0.5888**	1.0116
U1 (equally weighted scheme)	**0.0861**	**0.0739**	**0.0888**
U2 (equally weighted scheme)	**0.9207**	**0.7933**	**0.9134**

Author's computations using Excel

The combined forecasts proved to be a good strategy of improving the accuracy when EC and NCP forecasts, respectively EC and IEF predictions are combined using OPT and INV schemes. Only if equally weighted scheme is utilized we got better forecasts for the combined predictions of NCP and IEF. The most accurate forecasts are those resulted from combining EC

and IEF expectations. All the combined predictions are better than the naïve ones excepting those of NCP and IEF using OPT scheme.

We tested if the combined forecasts are a good strategy of getting better forecasts in pre-crisis period and during the crisis. The results are presented in **Table 8** and **Table 9**.

Table 8: The accuracy of combined forecasts for unemployment rate (2006-2008)

Accuracy indicator	EC+NCP forecasts	EC+IEF forecasts	NCP+IEF forecasts
U1 (optimal scheme)	0.0877	0.2426	0.0823
U2 (optimal scheme)	1.3903	1.0410	1.4318
U1 (inverse MSE scheme)	0.0872	0.0999	0.0824
U2 (inverse MSE scheme)	1.3574	1.5877	1.4115
U1 (equally weighted scheme)	0.0996	0.0842	0.0918
U2 (equally weighted scheme)	1.5073	1.5651	1.5199

Author's computations using Excel

All the combined predictions are less accurate than the naïve forecasts in pre-crisis period, but a great improvement in accuracy was made. Excepting the combined forecasts of EC and IEF using OPT scheme, all the forecasts are more accurate than the ones made independently by the three institutions.

Table 9: The accuracy of combined forecasts for unemployment rate (2009-2011)

Accuracy indicator	EC+NCP forecasts	EC+IEF forecasts	NCP+IEF forecasts
U1 (optimal scheme)	0.1212	0.1560	0.1738
U2 (optimal scheme)	0.9457	1.3833	0.6926
U1 (inverse MSE scheme)	0.0988	0.1209	0.0919
U2 (inverse MSE scheme)	1.1237	1.5339	1.2004
U1 (equally weighted scheme)	0.0898	0.0905	0.0878
U2 (equally weighted scheme)	1.4375	1.5862	1.4451

Author's computations using Excel

Only in some cases the combined predictions are better than those made by IEF: the combined forecasts based on equally weighted scheme, the combined predictions of EC and NCP, respectively NCP and IEF when INV scheme is used. None of the combined forecasts outperformed the predictions made by IEF during the crisis. Excepting the combined forecasts of EC and NPC using OPT scheme, all the other predictions are less accurate than the naïve ones.

5. CONCLUSIONS

In addition to economic analysis, the elaboration of forecasts is an essential aspect that conducts the way of developing the activity al macroeconomic level. But any forecast must be accompanied by macroeconomic explanations of its accuracy. The purpose of this evaluation is related to different aspects: the improvement of the model on which the forecast was based, adjustment of gouverment policies, the planning of results. Basically, accuracy evaluation in this context refers directly to the degree of trust confered to the prediction. Although the literature on forecasting methods and techniques used in describing the evolution of an economic phenomenon is particularly rich, surprisingly, few researchers have dealt with the methods used to improve the measurement of forecast uncertainty. The aspect is important, because the macroeconomic predictions must not be easily accepted, taking into account the negative consequences of macroeconomic forecasts failures, consequences that affect the state policies. The decisions of economic policy are based on these forecasts. Hence, there is an evident interest of improving their accuracy.

In our study, we assessed the unemployment forecasts performance for the predictions provided during 2001-2011 by three institutions: European Commission, National Commission for Prognosis and Institute of Economic Forecasting. The best accuracy is provided by IEF, followed by EC and NCP. This hierarchy resulted from the application of the multi-criteria ranking, but also from the measurement of accuracy indicators, as U1, used in making comparisons between forecasts. The same hierarchy was gotten during the crisis period, while in the few years before it

The combined forecasts using the three classical schemes are a good strategy of improving the accuracy, most of the combined predictions being better than the initial ones. In crisis period only some of the combined forecasts are better than the NCP and EC ones, none of them succeeded in outperforming the IEF predictions. Before the crisis the combined predictions are a very good way of improving almost all the forecasts made by the three institutions.

The forecasts accuracy should be a priority for the public that uses these predictions in underlying the decisional process. The combined forecasts are a very good strategy of getting improvements in accuracy for the unemployment rate predictions.

REFERENCES

1. Abreu I., *International organisations' vs. private analysts' forecasts: an Evaluation*, Banco de Portugal, 2011 article available at: http://www.bportugal.pt/en-US/BdP%20Publications%20Research/wp201120.pdf
2. Allan G., *Evaluating the usefulness of forecasts of relative growth*, Strathclyde, Discussion Papers in Economics, No. 12-14, 2012
3. Armstrong, J. S., Fildes, R., *On the selection of Error Measures for Comparisons Among Forecasting Methods*, Journal of Forecasting, 14, pp. 67-71, 1995
4. Bates, J., Granger C. W. J. (1969), The Combination of Forecasts, *Operations Research Quarterly*, 20(4), pp. 451-468, 1969
5. Bratu M., *"Strategies to Improve the Accuracy of Macroeconomic Forecasts in USA",* LAP LAMBERT Academic Publishing, ISBN-10: 3848403196, ISBN-13: 978-3848403196, 2012
6. Diebold, F.X., Mariano, R., *Comparing Predictive Accuracy*, Journal of Business and Economic Statistics, 13, pp. 253-265, 1995
7. Dovern, J. and Weisser J., *Accuracy, unbiasedness and efficiency of professional macroeconomic forecasts: An empirical comparison for the G7*, International Journal of Forecasting, 27 (2), pp. 452-465, 2011
8. Franses, P.H. , McAleer, M., Legerstee, R., *Evaluating Macroeconomic Forecasts: A Concise Review of Some Recent Developments,* Working paper/ Department of Economics and Finance, University of Cantenbury, *2012*

9. Gorr, W. L., *Forecast accuracy measures for exception reporting using receiver operating characteristic curves*, International Journal of Forecasting, Volum 25, Issue 1, pp. 48-61, 2009
10. Heilemann, U., Stekler, H., *Introduction to "The future of macroeconomic forecasting"*, International Journal of Forecasting, 23(2), pp. 159-165, 2007
11. Ruth, K, *Macroeconomic forecasting in the EMU: Does disaggregate modeling improve forecast accuracy ?*, Journal of Policy Modeling, Volume 30, Issue 3,pp. 417-429, 2008

APPENDIX 1
The results of Diebold-Mariano test in EViews

Dependent Variable: D1
Method: Least Squares
Date: 11/22/12 Time: 13:02
Sample: 2001 2011
Included observations: 11

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.874545	1.187738	-0.736312	0.4785

Dependent Variable: D2
Method: Least Squares
Date: 11/22/12 Time: 13:02
Sample: 2001 2011
Included observations: 11

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.530909	0.624816	0.849704	0.4154
Log likelihood	-23.09927		Durbin-Watson stat	1.521367

Dependent Variable: D3
Method: Least Squares
Date: 11/22/12 Time: 13:03
Sample: 2001 2011
Included observations: 11

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.405455	0.886219	1.585900	0.1438

APPENDIX 2
The results of tests for directional accuracy

Test Statistics

	ur	Ec
Chi-Square	.818[a]	1.273[b]
Df	9	8
Asymp. Sig.	1.000	.996

Test Statistics

	ur	Ief
Chi-Square	818[a]	1.273[b]
Df	9	8
Asymp. Sig.	1.000	.996

Test Statistics		
	ur	Ncp
Chi-Square	.818[a]	.000[b]
Df	9	10
Asymp. Sig.	1.000	1.000