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Abstract

For most Eastern European countries that experienced former communist regimes, the EU accession and the use of European symbols – such as the EURO currency – represents both the integration into a strong and efficient economic system, but also the guarantee of a system based on real democratic values. Romania has been the first of this category of states, that has expressed the real and strong attachment for the European Union, its symbols and values. This paper wishes to analyze the key elements concerning Romania's accession to the EMU and finally the EURO adoption: Romania's actual macroeconomic situation, the situation of the real and nominal convergence to the accession criteria – in a fuzzy clustering approach in order to determine optimum sequencing of the Euro adoption and the envisaged official calendar for the EURO adoption.

Keywords: Romania; Euro; monetary convergence; fuzzy clustering

JEL codes: F33, F36, F47.

1. Introduction

The analysis of the recent macroeconomic indicators characterizing the general economic situation points out an improvement compared to the previous two years. Here we consider the inflation rate, the unemployment rate, the budget result, the national reserves (both foreign currency and gold) but also the country rating. As far as the nominal and real

convergence are concerned, the analysis is based on the two essential sets of criteria, with a special focus on a specific choice in the case of the real convergence due to the use of the fuzzy clustering analysis method employed in order to determine the „enlargement waves” for the EMU. Leaving from these data sets and from the specific fuzzy clustering methodology, Romania status is established in comparison to the other candidates to the EURO-zone membership. The candidate countries are thus placed into the so-called „clusters” or groups according to the fulfillment of the real convergence criteria earlier selected according to a personal point of view. The calendar of the EURO adoption by Romania also comprises the timing for the ERM II accession and approach in order to ensure an appropriate approach of the process. The final part of the paper consists in a critical analysis of the EURO adoption deadline envisaged by the National Bank based on the presented analysis

2. Romania’s macroeconomic condition

During recent years, Romania’s macroeconomic condition is improving. That is a fact proven by the statistics of the National Bank of Romania and by the National Institute for statistics, and most of these positive results have been achieved on the way and aiming the convergence to the Euro-zone. The last four years displayed a good track record in consolidating the macroeconomic stability while lowering inflation.

The GDP growth was of 7.7% in 2006 ,based on increases in final consumption by 11.5% (private consumption grew 12.6%) and in investment by 16.1%. The projection for 2007 is at a level of 6.5%.

The inflation significantly decreased from 8,6% (dec.2005/dec.2004) to 3,77% (apr.2007/apr.2006) in terms of the annual rate. In terms of the average annual rate, the inflation calculated as the CPI¹, significant improvements are also present – a lowering from 9,0% in 2005 to 6,56% in 2006.

Prudent fiscal and monetary policies supported the progress in macroeconomic stabilization and established the basis for robust economic growth. In 2006 the overall fiscal deficit was under the target of 1.5% of GDP. Fiscal policy has continued to support disinflation and to contain the current account deficit within a sustainable ceiling.

Starting with January 1, 2005, a major fiscal reform package was applied in Romania

¹ Consumer Price Index

following the adoption of the Government Emergency Ordinance No. 138/30.12.2004 (O.J. No. 1281/30.12.2004) for modifying and amending the Law No. 571/2003 regarding the Fiscal Code.

The most important measure is the introduction of a flat rate of 16% for corporate profit tax (as compared to 25% so far) and for personal income tax (as compared to a progressive tax system with rates ranging from 18% to 40%).

The main reasons for the new fiscal regime were the need to consolidate the foundations and mechanisms of the free market economy, to support the private entrepreneurship by creating a more favorable environment for investments and generally for business, to boost employment and to simplify the fiscal procedures. The tax relaxation was also necessary because the relatively high tax burden generated rigid developments in the past, hampering the restructuring of the domestic demand, while keeping hidden parts of the economy away from the national accounts.

Thus, the Fiscal balance for 2006 was -1.7% of GDP, and the forecasted and programmed rate for 2007 is -2.8% of GDP.

The monetary policy was tightened and bank supervision strengthened. The National Bank of Romania has continued to monitor credit growth and implement decisive measures to contain it as needed for both macroeconomic and prudential reasons. The National Bank will proceed with the full liberalization of the capital account and with the national currency denomination. The following elements act as main components of the new monetary policy strategy:

- direct inflation targeting (August 2005)
- full liberalisation of capital account and full
- convertibility of domestic currency (September 2006)
- redenomination of domestic currency (July 2005)
- completion of implementation of the Electronic Payment System (October 2005)

The current account deficit reached in 2006 about 10 bln. EUR, 44,8% higher than in 2005; (10,3% din PIB), 90,8% covered from foreign direct investments. At the same time, FDI² for 2006 reached 9,1 bln. EUR, 72,8% more than 2005.

² Foreign Direct Investments

The following table presents a brief insight of Romania's most recent macroeconomic indicators.

Table 1 Macroeconomic Indicators

	2005	2006	2007 (estimations)
<i>Inflation (%)</i>	9.0	6.56	5.8
<i>GDP growth (%)</i>	4.1	7.7	6.5
<i>Current account deficit (%GDP)</i>	8.7	10.3	14
<i>Foreign direct investment(bln. EUR)</i>	5.2	9.1	7
<i>Fiscal balance (%GDP)</i>	-0.8	-1.7	-2.80
<i>International reserves(bln. EUR)</i>	18.3	22.9	23.2
<i>Rating</i>		S&P: from "positive" to "stable" due to political tensions Fitch: from BBB- to BBB Moody's: from A2 to A1 Japan Credit Rating Agency: from BBB- to BBB (for foreign currency credits)	

Source: National Bank of Romania

One of the main pillars of the Government economic program is consolidating the business environment. In this respect the following measures were announced: amending the Labor Code after having consulted the social partners (estimated end of process – July 2005); amending the law on Economic and Social Council and the Law on employers associations; introducing new measures for the SMEs set-up and development; continuing the process of decentralizing the public administration; enhancing the professional associations status .

These measures are complemented by a no tolerance attitude to corruption and fiscal evasion. The financial discipline, including the enforcement of the bankruptcy procedures, will be the main principle of the Government economic strategy.

3. Romania and the Convergence Process. A Relative Positioning Among Candidates

3.1 Nominal and Real Convergence

Thus, on the back-ground of the serious improvement in the macroeconomic situation of the country, Romania has also proven progress in the fulfillment of the nominal convergence – the Maastricht criteria.

The Maastricht criteria highlight a series of economic targets whose achievement in fact envisage both nominal and real convergence in the sense of the functioning of the monetary policy in order not to bring disfunctionalities inside the EMU. This set of criteria is also applicable to the actual candidates – from which Slovenia has won the top position and became a member of the Euro-zone from January 1st 2007. The purpose of this analysis to point out the extent in which the group of candidates is uniform from the point of view of the stability of the orientation.

First, we must study the degree of compliance with the criteria, and second the commitment to the Euro adoption process.

The following table presents a comparative situation of the nominal convergence criteria for the candidate countries to the accession to the Euro-zone.

Table 2 The Maastricht Criteria and the Candidates

	<i>Budget deficit (%GDP)</i>	<i>Debt (%GDP)</i>	<i>Exchange rate fluctuation (%/ -15%)</i>	<i>Inflation (%)</i>	<i>Interest rate</i>
	<i>2006</i>	<i>2006</i>	<i>2006</i>	<i>2006</i>	<i>2006</i>
<i>Bulgaria</i>	3.1	29.9	0.60	7.3	3.9
<i>Czech Republic</i>	-3,5	30.6	5.52	2.2	3.8
<i>Estonia</i>	2,6	34.0	0.00	4.3	4.7
<i>Hungary</i>	-10.1	67.5	10.59	3.5	7.1
<i>Latvia</i>	-1.0	10.7	1.00	6.7	3.9
<i>Lithuania</i>	-1.2	18.4	0.00	4.4	4.28
<i>Poland</i>	-2,2	42.4	7.98	1.2	5.2
<i>Romania</i>	-1,9	12.4	8.15	6.56	7.49
<i>Slovakia</i>	-3.4	33.1	10.75	4.3	4.3

Source: ECB, Romanian National Bank,

In order to make a brief, but consistent and relevant analysis of the real convergence we shall focus exclusively on the use of the real convergence indicator – the GDP per capita

in euros for all the candidates mentioned above, including Romania.

Table 3 The Real Convergence and the Candidate Countries

	<i>GDP per capita (PPS)</i>
	<i>2006</i>
<i>Bulgaria</i>	36
<i>Czech Republic</i>	76
<i>Estonia</i>	65
<i>Hungary</i>	63
<i>Latvia</i>	54
<i>Lithuania</i>	56
<i>Poland</i>	51
<i>Romania</i>	36
<i>Slovakia</i>	60
<i>Slovenia</i>	85

Source: ECB, Romanian National Bank,

These time series will be used as input for the fuzzy clustering algorithm in order to determine optimum sequencing for the accession to the Euro-zone.

3.2 A Fuzzy Clustering Approach of the Euro-Zone Accession Sequencing

According to the English Oxford dictionary, the word “fuzzy” means „blurry, unclear, vague, misty, bleary, indistinct”, yet it should be considered rather as a technical adjective. More precisely, the fuzzy systems are to be very precisely defined. Generally, we wish to point out the fact that even if the phenomena characterized by the fuzzy systems theory are misty, the theory itself is very exact. The key question is how do we transform human knowledge into a mathematical formula? A fuzzy system does that. In order to understand the way this transformation is achieved, we must know first what fuzzy systems are. They are systems based on knowledge or rules. The core of such a system is the set of “if – then” rules. An “if-then” rule is a statement whose elements are characterized by continuous membership functions.

The analysis based on fuzzy logics and systems is somewhat superior to the classical mathematics, from the economic modeling point of view. From the perspective of the monetary union it offers the opportunity to place the candidates to the euro adoption in so called clusters as a consequence of the use of a fuzzy clustering algorithm, in which the values of the variables are represented by certain convergence criteria. If classical mathematical logic is useful for certitude situations, the fuzzy analysis offers the opportunity of a more realistic and appropriate approach in connection to the real evolution of the economic phenomena.

Even if generated by sets of rigorous mathematic relations and data sets, the fuzzy analysis allows a more profound insight, and in this case the grouping of the candidates into homogenous clusters, beyond the simple mathematic values.

The fuzzy clustering analysis is a technique belonging to the field of pattern recognition and has been successfully used in different disciplines, including most recent – economics. This paper wishes to model the optimum timing and sequencing concerning the candidates adoption of the EURO.

The method is applied in order to point out the similarities of the economic structures leaving from data concerning the candidate states to the euro adoption, and in order to accomplish an optimum grouping into homogenous clusters. This is accomplished using the main sets of data offered by the monetary convergence criteria.

The fuzzy algorithm is the one of Kaufman și Rousseuw (1990) and it may be shortly described as following. The data set consists of n objects (states) and p variables (the monetary convergence criteria) and we note $X_{np} = \{x_1, x_2, x_3 \dots x_n\}$ where each $x_i = \{x_{i1}, x_{i2}, \dots x_{ip}\}$. Every variable is standardized with median zero and the standard deviation 1 in order to treat them as similar influences in the structure's determination. The dis-similarity coefficient between two countries is defined as the Euclidian distance between two points.

$$d(i, j) = \sqrt{\sum_{k=1}^p (x_{ki} - x_{kj})^2} \quad (1)$$

The algorithm is used in order to minimize the C function defined as following:

$$C = \sum_{v=1}^k \frac{\sum_{i,j=1}^n u_{iv}^2 u_{jv}^2 d(i, j)}{2 \sum_{j=1}^n u_{jv}^2} \quad (2)$$

where

$$u_{iv} \geq 0 \quad \text{for } i=1, \dots, n ; v=1, \dots, n$$

$$\sum_v u_{iv} = 1 \quad \text{for } i=1, \dots, n$$

Where u_{iv} is the unknown membership coefficient of the object (country) i to the cluster v and k the number of clusters the data is partitioned into.

This algorithm results into a coefficients' array $U_{n \times k}$, where the sum of the elements on the row equals 1, thus showing the membership degree of the object to the cluster. If one of the coefficients is very high, then we may say that there is a very high degree of certainty that the object belongs to that certain cluster.

In order to analyze the accuracy of the data partitioning we use several statistic elements. One is the normalized Dunn partitioning coefficient (Boreiko 2002):

$$F_k = \frac{\frac{k}{n} * \sum_{i=1}^n \sum_{v=1}^k u_{iv}^2 - 1}{k - 1} \quad (3)$$

That varies from 1 (showing that the data is correctly partitioned) to 0 (showing the exact opposite). The coefficient is 1 only if for every object we have a coefficient that equals 1, and the rest are 0, and 0 when all the membership coefficients are $1/k$.

An other useful element is the silhouette for each cluster and for all the data, the silhouette for each cluster is defined as:

$$s(i) = \frac{b(i) - a(i)}{\max(a(i), b(i))} \quad (4)$$

Where $a(i)$ is the average dissimilarity between all objects of the same cluster, and $b(i)$ is the minimum of the average dissimilarities from all the other objects of a cluster, for all clusters.

Then, when $s(i)$ is close to 1, the object is correctly classified in the cluster where it can be found. A closer value to 0 indicates the ambiguity concerning the decision to place an object in a certain cluster. The negative values indicate the incorrect classification. The corresponding averages for each cluster, and for all the data considered indicate the accuracy degree of the data partitioning on clusters and overall.

The results generated by the application of the above algorithm for the data series used as input, are two coefficients matrices that represent according to the value of the coefficients the optimum grouping on clusters for the candidates to the euro accession.

Table 4 The Coefficients' Matrix for the Simulation on the Maastricht Criteria Data

<i>Bulgaria</i>	0.846931	0.153069
<i>Cehia</i>	0.679411	0.320589
<i>Estonia</i>	0.962170	0.037830
<i>Ungaria</i>	0.215308	0.784692
<i>Letonia</i>	0.841366	0.158634

<i>Lituania</i>	0.945801	0.054199
<i>Polonia</i>	0.291603	0.708397
<i>România</i>	0.288764	0.711236
<i>Slovacia</i>	0.294511	0.705489

Source: own calculations

Dunn = 0,653659 Silhouette = 0,505765

Coefficients point out to the following partitioning into clusters: an optimum number of two clusters – the first (best performance) – Estonia, Czech Republic, Lithuania, Latvia, and Bulgaria (with a slight better condition due to the monetary board) the second – Romania, Poland, Hungary, Slovakia.

The second indicator of the real convergence – the GDP per capita in PPS generates a new set of coefficients as the out-put of the fuzzy algorithm³.

Table 4 The Coefficients' Matrix for the Simulation on the Real Convergence Indicator Data

<i>Bulgaria</i>	0.920120	0.079880
<i>Cehia</i>	0.124993	0.875007
<i>Estonia</i>	0.002317	0.997164
<i>Ungaria</i>	0.002836	0.997683
<i>Letonia</i>	0.512656	0.487344
<i>Lituania</i>	0.316734	0.683266
<i>Polonia</i>	0.787649	0.212351
<i>România</i>	0.920120	0.079880
<i>Slovacia</i>	0.060592	0.939408

Source: own calculations

Dunn = 0.871455

Silhouette = 0.736229

For the case of the partitioning based on the data for the real convergence indicator, simulations encountered the following results: - the optimum data partitioning is for four clusters – the best performance for the Czech Republic followed by, Estonia and Hungary, the third cluster includes Latvia, Lithuania and Poland and the last Bulgaria and Romania with lowest levels of GDP per capita.

4. The Euro Adoption Calendar

The Euro adoption involves the participation, for at least two years to the ERM II exchange rate mechanism, in which the national currency will have to present high stability against the Euro, but the Euro adoption is not a must.

Here we can easily identify two crucial decisions: - the moment of the accession to the

³ Supported by a software application in C++

ERM II and the duration of the participation to this mechanism.

In respect of this matter, the recommendations of the European Commission and of the European Central Bank are for the entry to the ERM II to be made after the accession to the EU, which Romania has already done, and for the duration of the membership not to exceed the usual two years interval. This involves a very good preparation of the actual entering in the ERM II, and the fact that the convergence criteria should be fulfilled in a sustainable manner.

Preparations for the ERM II include:

- sustainable des-inflation (consolidation of low inflation)
- development of long term capital markets and interest rates convergence
- sustainable exchange rate (relative stability of the Leu exchange rate under free convertibility around the long term equilibrium level)
- structural reforms accomplishment.

The foreseen accession to the ERM II by Romania is placed in time for 2012 in order to ensure total nominal convergence and significant progress in the real convergence. The Euro adoption moment is projected to the 2014 time horizon.

The following table presents a comparative time table for the Euro adoption by few of the latest members of the EU.

Table 5. Euro Adoption Calendar

<i>Country</i>	<i>EU accession</i>	<i>ERM II entrance (aim)</i>	<i>Euro adoption</i>
<i>Cyprus</i>	2004	may 2005	2008
<i>Malta</i>	2004	may 2005	2008
<i>Poland</i>	2004	To be established	To be established
<i>Czech Republic</i>	2004	To be established	2012*
<i>Slovakia</i>	2004	November 2005	2009
<i>Hungary</i>	2004	To be established	2011*
<i>Romania</i>	2007	2012	2014

Source: National Bank of Romania

5. Conclusions

Based on the macroeconomic data presented, and on the simulation made, the conclusions offered by this study may be resumed to the fact that Romania has made progress. But that is not all, apart from the progress in the macroeconomic indicators, and from the serious engagement to structural reforms, the economic status and position must not be treated in an isolated manner. That is why the present study leaves from the general macroeconomic situation and makes a comparative analysis for the Romanian case amongst the other candidates to the accession to the Euro-zone. This accession, will probably consist, as recent timetables show in certain “enlargement waves”, and thus the absolute economic performance is not enough, we need to also consider the relative one. From this point of view, Romania still has a rather insufficient performance and position compared to the other candidates. Even if the nominal convergence shows real improvement, Romania is still in the less performing cluster, and the real convergence indicator still shows important delays in catching up with the Euro-zone GDP per capita.

References

- [1] **ARTIS**, M.J., Zang, W., International Business Cycle and the ERM: is there a European Business Cycle?, 1995, CEPR discussion paper, no 1191
- [2] **BARR**, D., F. Breedon and D. Miles, 2003. Life on the Outside: Conditions and Prospects Outside Euroland, Economic Policy, October
- [3] **BIACINO** L. and Simonelli M. R., "The internal rate of return of fuzzy cash-flow", Rivista di Matematica per le Scienze Economiche e Sociali, 2 (1991)
- [4] **BOREIKO**, D., EMU and Accession Countries: Fuzzy Cluster Analysis of Membership, Central Bank of Chile Working Papers, no.189, 2002, p.4
- [5] **BUCKLEY** J. J., The fuzzy mathematics of finance, Fuzzy Sets and Systems, v.21 n.3, p.257-273, March 1, 1987
- [6] **BUCKLEY** James J., Solving fuzzy equations in economics and finance, Fuzzy Sets and Systems, v.48 n.3,
- [7] **BUN**, M. and F. Klaassen, 2002. Has the Euro Increased Trade? Tinbergen Institute Discussion Paper.
- [8] **CALZI** M. L., Towards a general setting for the fuzzy mathematics of finance, Fuzzy Sets and Systems, v.35 n.3
- [9] **DE GRAUWE**, P., 1988. Exchange Rate Variability and the Slowdown in Growth of

International Trade. IMF Staff Papers

- [10] **DE GRAWE**, P., - Economics of the Monetary Union, Oxford University Press, Oxford, 2005, p.80
- [11] **DE NARDIS**, S. and C. Vicarelli,2003. The Impact of the Euro on Trade. The (Early) Effect Is Not So Large. European Network of Economic Policy Research Institutes
- [12] **DERRIG** R. A. and Ostaszewski K., "Fuzzy techniques of pattern recognition in risk and claim classification", J. of Risk and Insurance62 (1995)
- [13] **EMERSON**, M., D. Gros, Al. Italianer et al., 1992. One Market, One Money - An Evaluation of the Potential Benefits and Costs of Forming an Economic and Monetary Union, Oxford University Press
- [14] **ISAK** Gath and Amir B. Geva. Unsupervised Optimal Fuzzy Clustering. TPAMI, 11(7):773-781, 1989.
- [15] **KAUFMANN**, "Fuzzy subsets applications in O.R. and management", in Fuzzy Set Theory and Applications, eds. A. Jones, A. Kaufmann and H.-J. Zimmermann (Reidel, Dordrecht, 1986)
- [16] **MANDANI**, E.H., "Application of Fuzzy Algorithms for Control of Simple Dynamic Plant", Proc. IEE, vol. 121, no. 12, December 1974.
- [17] **RAGHU** Krishnapuram, Olfa Nasraoui, and Hichem Frigui. The Fuzzy C Spherical Shells Algorithm: A New Approach. TNN, 3(5):663--670, 1992.
- [18] **ROSE**, A., One Money, One Market: The Effect of Common Currencies on Trade. Economic Policy 0(30), 2000, p. 7-33
- [19] **TANASIE**, A., Euro – Economic Impact on an European Level, Ed. Universitaria Craiova, 2007-10-05
- [20] **TANASIE**, A., Challenges of the EU and EURO Enlargement – The Romanian Case – International Journal of Business Management and Economics, vol.nr.1, no.1, Martie 2005, ISSN 1306-1097, pag. 97-108