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CONSTRUCTING THE ECONOMIC LEADING INDICATOR (ELI) FOR THE MOLDOVAN ECONOMY

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Summary: One of the main lessons learned after the economic crisis of 2009 has been the need to improve the Government capacities to anticipate, prevent and adequately manage the potential negative trends in the national economy. One of the main issues in this respect is related to availability of statistical data and their publishing lags. In order to help the Government and other institutions which constantly follow the economic trends to overcome these constraints, EXPERT-GRUP elaborated this Economic Leading Indicator (ELI) of the Moldovan economy. As the name implies, it aims to predict future fluctuations of the economy, based on carefully selected variables which are found to lead the business cycle. Hence, ELI could serve as a crucial analytical tool for decision makers for better understanding of the main trends of the Moldovan economy and to predict the future turning points. The importance of this indicator for economic policies implementation is even more imperative amid the current recessionary risks and high volatility mainly caused by the Eurozone sovereign debt crisis. ELI constructed by EXPERT-GRUP clearly reflects an economic growth slowdown registered over the last months. Moreover, it suggests that these trends will continue and even will aggravate with repercussions on the labor market, budgetary revenues and overall entrepreneurial activity.

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INTRODUCTION: WHY DO WE NEED AN ECONOMIC LEADING INDICATOR?

The main drawback of the statistical systems from most countries is that the data about Gross Domestic Product (GDP), which defines the business cycles, as well as many other important macroeconomic indicators, are published with significant lags and with a quarterly frequency. In Moldova, for example, the information about economy's overall performance for 2011 has been available only in the mid-March 2012. Taking into account the high macroeconomic volatility, both at a domestic and foreign level, such a lag of 2.5 months becomes quite challenging for the policy makers. It fuels the risks of undertaking delayed and/or inadequate policy actions for the current situation which is not immediately reflected in the official statistical data. Consequently, it limits the decision makers' possibilities to anticipate the economic fluctuations, such that, usually, the public policies follow rather than lead the business cycle. Hence, it generates significant efficiency losses for the decision making process, the most recent example being the crisis of 2009.

The Economic Leading Indicator (ELI) of the Moldovan economy, developed in this study, comes as a solution to the drawbacks mentioned above. It consists of several indicators which usually lead the business cycle, have monthly frequency and shorter release lags. Therefore, a well-constructed ELI in period t is highly correlated with GDP in time $t+n$, where n is the average number of months which define the predicting capacity of our indicator. For example, the ELI developed by OECD anticipates the business cycle with 6-9 months in advance.

Thus, the importance and necessity of such an indicator for the Moldovan economy is obvious, mainly due to the following advantages:

1. *Monthly frequency.* Unlike GDP and many other core macroeconomic indicators, ELI will be released each month. Hence, the government and other relevant institutions will learn much faster about the performance and trend of the Moldovan economy.
2. *Objective measurement of the economy's stance.* ELI is composed of a set of indicators which reflect domestic and foreign economic trends and economic agents' expectations. Following the OECD methodology, these indicators are aggregated using robust statistical methods, so that ELI objectively reveals the main trends of the Moldovan economy.
3. *Property to lead the business cycle.* Besides measuring the economy's stance, ELI can anticipate its future turning points. Thus, it can serve as a good analytical instrument for the decision makers for preventing future possible negative trends of the Moldovan economy.

METHODOLOGY

ELI was elaborated following OECD methodology¹ and adjusted to the available statistical data and the peculiarities of the Moldovan economy. This chapter will describe a step-by-step procedure of constructing ELI.

1. Selection of indicators. After analyzing the available monthly statistical data from the web-pages of the National Bureau of Statistics and the National Bank of Moldova, the following indicators were selected to be tested for their eligibility for ELI calculation (Table 1).

TABLE 1. DESCRIPTION OF STATISTICAL INDICATORS USED FOR CONSTRUCTING ELI

Nr.	Variable	Description	Source
1	Total exports, mil. USD	Reveals the economy's stance of the main trading partners of Moldova. Due to its opened character, the Moldovan economy is very sensible to foreign demand which may generate business cycle turning points ² .	www.statistica.md
2	Average wage from the real sector, MDL	The wages may include the information about the macroeconomic expectations of employers.	www.statistica.md
3	Money in circulation (monetary aggregate M0), mil. MDL	It serves as a good proxy for the aggregate consumption and, respectively, for population's expectations (e.g. worsening of expectations may fuel people's propensity to save for the rainy days and to shrink the consumption).	www.bnm.md
4	New bank credits in national and foreign currency, mil. MDL	Reveals the macroeconomic expectations of firms and banks. Thus, amid high uncertainty or bad expectations the banks turn to be more reluctant about lending. Additionally, the firms postpone their investment plans, which cools down the demand for bank loans.	www.bnm.md
5	Banking spread (the difference between average lending and deposit rates), p.p.	Measures the risk premiums included by banks into the lending rates, which tend to increase amid worsening expectations.	www.bnm.md
6	Provisions for loan losses / total bank credits, %	It measures the quality of banks' loan portfolios. We consider this indicator more appropriate than the share of non-performing loans (NPL) in total credits	www.bnm.md

¹ OECD (2008): „Handbook on Constructing Composite Indicators”, available at:

<http://www.oecd.org/dataoecd/37/42/42495745.pdf>

² A. Lupușor, A. Babin, A. Popa (2012): „Cât de vulnerabilă este economia moldovenească la șocurile economice externe? Prognoze pentru 2012”, Expert-Grup, <http://expert-grup.org/?go=biblioteca&n=265>

		since it also takes into account the structure of NPL and bank's expectations for potential losses.	
7	Money transfers from abroad for individuals, mil. MDL	Reveals the expectations of employers and the situation on the regional labor market, with a clear impact on aggregate consumption and economic growth.	www.bnm.md

Depending on statistical data availability the time span 2008:1 – 2011:12 will be used, which includes periods of economic slowdown, recession, recovery and maturing economic growth.

2. Indicators' normalization. In order to make them comparable, all indicators were transformed from their absolute values into annual growth rates.

3. Selecting the most convenient indicators and exclusion of the redundant ones. It will be based on several statistical procedures which will help to identify the variables which are mostly consistent with the business cycle fluctuations and those which can be excluded to achieve parsimony. Thus, the *Coefficient Cronbach Alpha (C-alpha)*³ will be employed, which is usually used for estimation of internal consistency of different sets of variables used within various models of surveys. Hence, a high C-alpha denotes the fact that the selected variables measure well their univariate construct. In our case, it means that our indicators are consistent and relevant for constructing the final Economic Leading Indicator. More details on interpretation and estimation of the *Coefficient Cronbach Alpha* can be found in the OECD user methodological guide which served as the main source for constructing the ELI⁴.

C-alpha for the normalized variables mentioned in table 1 is equal to 0.84, which is well above the minimum conventionally acceptable limit of 0.6 or 0.7. Hence, the selected indicators seem to be relevant for our purpose. However, in order to achieve parsimony and avoid constructing a "variable rich, but information poor" indicator, we will test which variables contribute positively and which negatively to the overall consistence of the set. For this purpose, we will calculate the coefficient C-alpha each time when we exclude one variable from the set. Thus, if the coefficient increased rather than decreases after omitting a certain variable, it can be considered redundant for the construction of the composite indicator (Table 2).

³ Cronbach L. J. (1951): „Coefficient alpha and the internal structure of tests”, Psychometrika, Vol. 16, pp. 297-334.

⁴ OECD (2008): „Handbook on Constructing Composite Indicators”, available at: <http://www.oecd.org/dataoecd/37/42/42495745.pdf>

TABLE 1. CRONBACH ALPHA COEFFICIENT CALCULATED AFTER EXCLUDING EACH VARIABLE FROM THE SET

No.	Variable Name	C-alpha
1	Exports	0.81
2	Money in circulation	0.83
3	Bank credits	0.82
4	Banking spread	0.83
5	Loan loss provisions	0.82
6	Money transfers from abroad	0.78
7	Average wage in the real sector	0.85

Source: author calculations

We can notice that the exclusion of the first 6 variables makes C-alpha coefficient to decrease in comparison with the initial level of 0.84, which confirms their positive contribution to the overall consistence of the dataset. At the same time, after excluding the average wage the coefficient increases, meaning that this variable is redundant and should be taken into consideration when computing the composite index.

4. Aggregation of variables and computing the Economic Leading Indicator. The first 6 variables from table 2 will be used for constructing the final composite index. For this purpose we will use the Factor Analysis by the Principle Components Method⁵. In this way we could identify the variables with bigger and smaller contribution to the overall dataset variation. As a result, we could estimate the shares of each variable in the final composite index. This procedure follows the OECD methodology and implies the following steps:

1. Estimation of the Principle Components and Eigen values (Table 3):

TABLE 2. PRINCIPLE COMPONENTS, EIGEN VALUES AND THEIR SHARES OF EXPLAINED VARIATIONS

Principle component	Eigen value	The share of explained variation	Cumulative share of explained variation
1	3.4518	57.5306	57.5306
2	1.5641	26.0684	83.5990
3	0.4527	7.5448	91.1438
4	0.3310	5.5161	96.6599
5	0.1497	2.4950	99.1549
6	0.0507	0.8451	100.0000

Source: author calculations

We can notice that the number of principles components is equal to the number of variables used for computing the composite index, mentioned in Table 2, except for the average wage is proved to be statistically redundant. Conventionally, we chose the first 2 principle components, as their Eigen values exceed unity. Hence, our selection explains 83.6% of total variations in the dataset.

⁵ OECD (2008): „Handbook on Constructing Composite Indicators”, available at: <http://www.oecd.org/dataoecd/37/42/42495745.pdf>

2. Estimation of correlation coefficients of each variable with each principle component (Table 4).

TABLE 4. THE CORRELATION COEFFICIENTS AND FACTOR ANALYSIS OF PRINCIPLE COMPONENTS ROTATED ACCORDING TO VARIMAX METHOD

Number of variable	Factor 1	Factor 2	Factor 1 \wedge^2	Factor 2 \wedge^2	Factor 1 \wedge^2 ⁶ , normalized	Factor 2 \wedge^2 , normalized
Credits	0.6002	-0.575	0.3602	0.3306	0.1382	0.1372
Exports	0.9408	0.1224	0.8851	0.015	0.3395	0.0062
Money in circulation	0.8925	-0.1859	0.7966	0.0346	0.3056	0.0143
Provisions for loan losses	0.0268	-0.9188	0.0007	0.8442	0.0003	0.3504
Remittances	0.1616	-0.9706	0.0261	0.9421	0.0100	0.3910
Banking spread	0.7336	-0.4926	0.5382	0.2427	0.1382	0.1372
Share of total variation	0.4345	0.4015				

Source: author calculations

Now we calculate the correlation of each variable used for constructing the composite index with the principles components (factor 1 and factor 2) selected in the previous step. Thus, a higher coefficient reveals a bigger contribution of a given indicator to the variations of the entire dataset. Based on this information we can apply different shares to each variable for estimation of ELI. This procedure is more efficient in comparison with a simple aggregation because it allows applying different rather than equal weights to each variable depending on its contribution to composite index's variance.

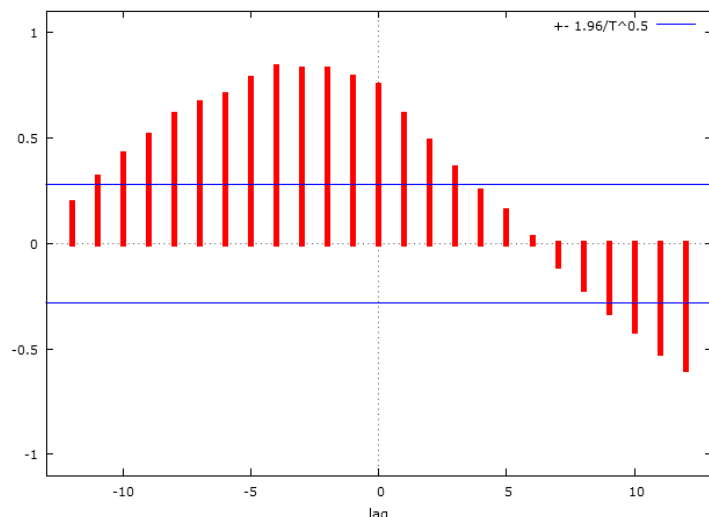
3. *Computing the sub-indicators.* As we have selected the first 2 principle components, the Economic Leading Indicator will be composed of 2 sub-indicators. They will be computed by multiplying the correlation coefficient of each variable, which are squared and scaled to unity, with each of the first 2 principle components (Table 4).

4. *The aggregation of the final index.* The composite index is obtained as a weighted average of the sub-indicators computed in the previous step, where the weights are the shares of explained variation of the first 2 principle components in total variation of the dataset (0.4345 and 0.4015).

5. *Testing the capacity of ELI to lead the business cycle.* For this purpose we calculate the covariance matrix between newly computed index and the Index of Industrial Production (IIP) which is used as a proxy for GDP. Thus, we can note that the highest correlation coefficient is obtained between IIP in period t and ELI in period $t-4$. It means that the current evolutions in our Economic Leading Indicator anticipate the business cycle fluctuations on average with 4 months in advance (Chart 1).

⁶ Ponderat după valoarea maximă de 83,6%

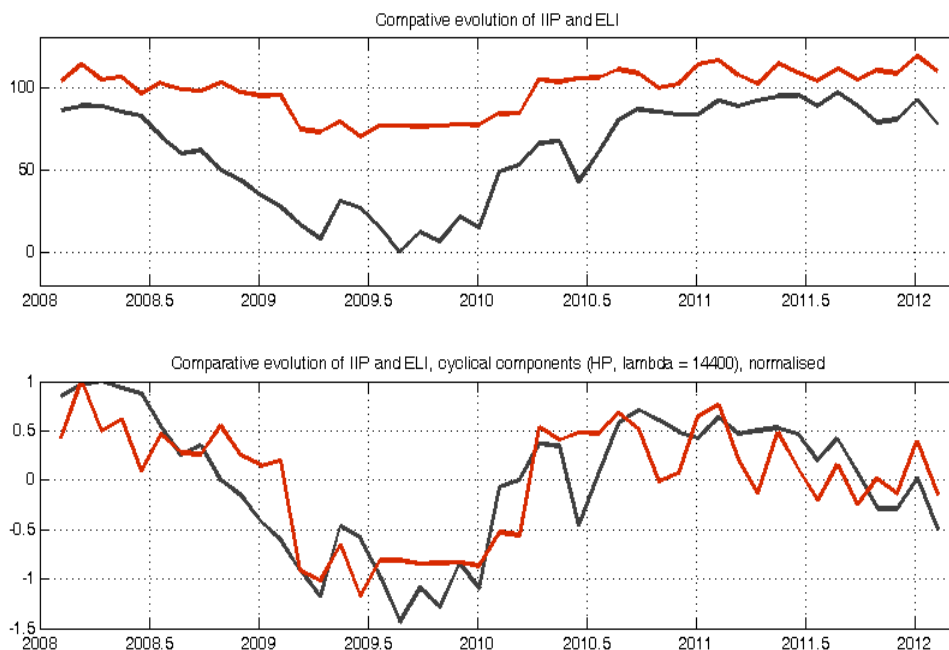
CHART 1. CORRELATION BETWEEN IIP AND LAGGED ELI



Source: author calculations

The leading property of ELI is confirmed by the high correlation between the current IIP and the Economic Leading Indicator shifted back with 4 months. The chart 2 denotes a high correlation both between the absolute values (0.88) and the cyclical components of IIP and ELI (0.8) estimated with HP filter (lambda = 14400). During the economic crisis of 2009 ELI had a much higher volatility, mainly due to sharp increase in the banking spread worsening of loan portfolios quality.

CHART 3. COMPARATIVE DYNAMICS OF IPI IN PERIOD T AND ELI IN PERIOD T-4

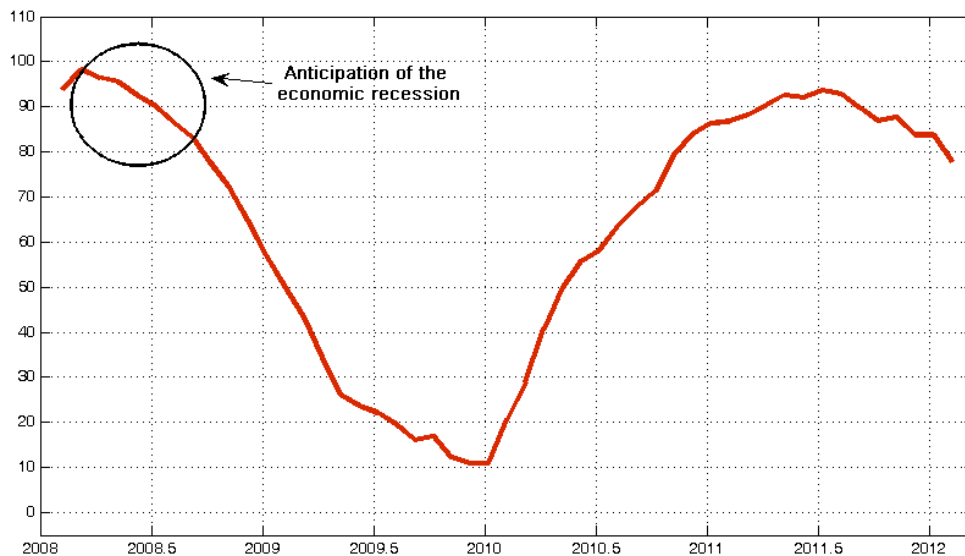


Source: author calculations

The leading capacity of ELI is, also, confirmed by its clear decline registered at the beginning of 2008, when, the official statistical indicators could not reveal the recessionary risks. In

this way, ELI could serve as a reliable warning indicator, anticipating the economic downturn from 2009 (Chart 3). At the same time, we can notice that, currently, it sends new warning signals at it predicts an economic growth slowdown.

CHART 4. EVOLUTION OF THE ECONOMIC LEADING INDICATOR, 2008-2012 (JANUARY)



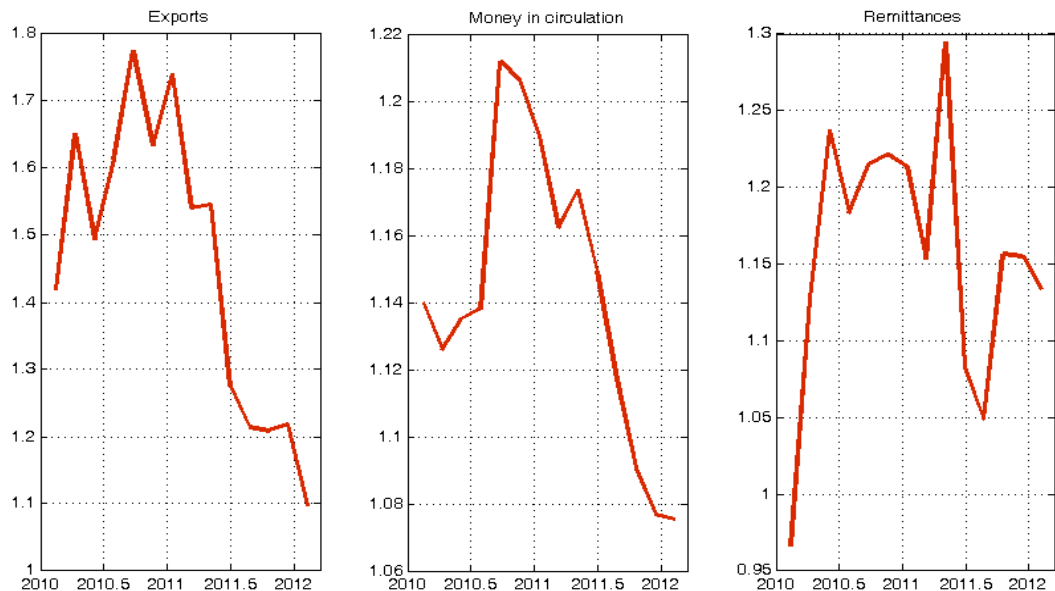
Source: author calculations

SHOULD WE BE CONCERNED ABOUT THE RECENT TRENDS FROM THE MOLDOVAN ECONOMY

A recent EXPERT-GRUP report⁷ revealed the strong vulnerability of the Moldovan economy to foreign shocks, especially to those coming from European Union. Hence, the repercussions of the current Eurozone sovereign debt should be obvious, the main transmission channels being the cooling of foreign demand and tensions on the EU labor market. As a result, we can notice the growth slowdown in exports, remittances and money in circulation (Chart 4). Moreover, in December 2011, IIP declined by 3.7%, while in January 2012 – by 4.2%, in comparison with the same month of the previous year. The transportation sector suffers an even stronger recession, with a 6.9% decrease in transported goods in December 2011, 11.8% in January 2012 and 39.2% in February 2012, in comparison with the same month of the previous year.

CHART 4. ANNUAL GROWTH OF EXPORTS, MONEY IN CIRCULATION AND REMITTANCES, %

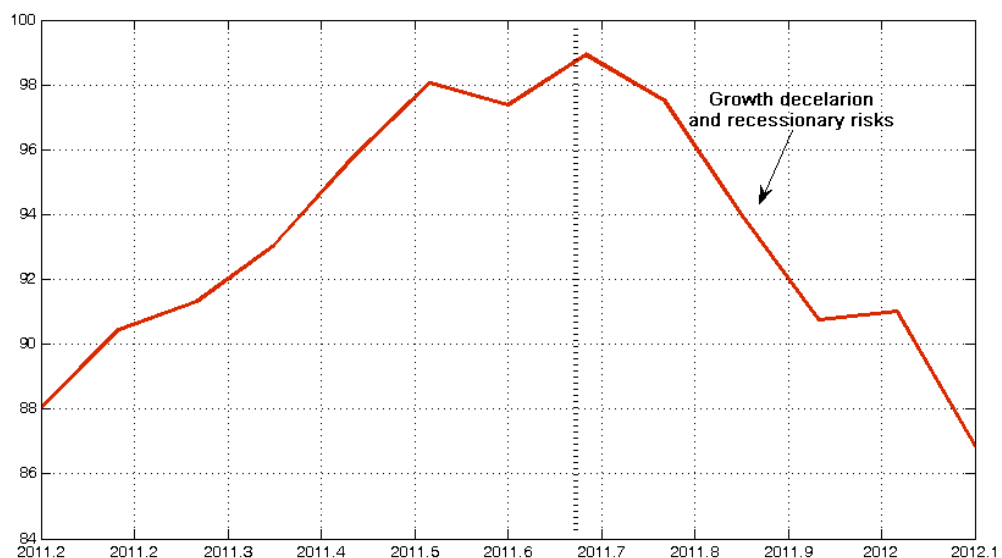
⁷ A. Lupușor, A. Babin, A. Popa (2012): „Cât de vulnerabilă este economia moldovenească la șocurile economice externe? Prognoze pentru 2012”, Expert-Grup, <http://expert-grup.org/?go=biblioteca&n=265>



Source: author calculations based on data from NBS and NBM

These trends are reflected by the dynamics of our Economic Leading Indicator over the last months. Thus, the chart 5 denotes that after a robust recovery during 2010 and growth stabilization during the 1st semester of 2011, at the end of the previous year the indicator registered started to decline. Thus, by the end of January it reverted to the level of 2010, which serves as a new warning signal for policy makers regarding the risks of economic growth slowdown.

CHART 5. EVOLUTION OF THE ECONOMIC LEADING INDICATOR OF THE MOLDOVAN ECONOMY⁸



Source: author calculations

⁸ The time series was filtered using moving average for 5 consecutive months

In conclusion, following ELI dynamics, over the last months the Moldovan economy significantly slowed down its growth on the grounds of difficulties faced by many economic sectors. The main concerns are related to the high probability that these trends will continue in the next months, being fueled by the high volatility and uncertainty on the foreign markets, which negatively affects the demand for Moldovan exports and remittances' inflows. These phenomena are reflected in the evolution of EXPERT-GRUP Economic Leading Indicator computed for the Moldovan economy, which suggests that these trends are likely to continue in the next months, with negative repercussions on domestic labor market, budgetary revenues and overall entrepreneurial activity.

EXPERT-GRUP este un centru analitic independent din Republica Moldova, a cărui misiune este de încuraja gândirea liberă și netrivială, fapt ce va permite instituției să fie un lider în furnizarea unor analize economice obiective și să promoveze în mod eficient idei și soluții inovatoare pentru problemele economice cu care se confruntă Republica Moldova în procesul transformării economice, dezvoltării societale și integrării europene. Date de contact: MD-2012, Moldova, Chișinău, str. Columna 133, oficiul 1; telefon: 930014, fax: 211599, email: info@expert-grup.org, web: www.expert-grup.org