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# Determining Countries' Potentials for Successful Export of Luxurious and Banking Services

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***Abstract.*** ***Country's economic potential implies joint capability of the country's economy, its branches and enterprises to carry out production and economic activity, to create goods and services, to supply the demand of the population, to stimulate production and consumption development. Country's economic potential is defined by estimating different economic, social, ecological, scientific and technical, political and other criteria, which, as a rule, are interconnected and correlated. Each of these criteria includes heterogeneous set of economic, financial, social, political, juridical, educational, scientific and innovational, ecological, cultural and other factors, every single of which can consist of independent or indirectly correlated subfactors called indices or indicators. In this work we investigate the problem of estimating economic potentials of groups of countries according to their measurable economic, financial, social and other indicators in order to export bank and other luxurious services. The approach to solving the problem offered in this work is based on the apparat of the theory of inverse and ill-posed problems.***

***Keywords: economic attractiveness, export of service, mathematical model, inverse problem, stable solution.***

## I. INTRODUCTION

Country's economic potential is defined by estimating different economic, social, ecological, scientific and technical, political and other criteria, which, as a rule, are interconnected and correlated. Each of these criteria includes heterogeneous set of economic, financial, social, political, juridical, educational, scientific and innovational, ecological, cultural and other factors, every single of which can consist of independent or indirectly correlated subfactors called indices or indicators. For instance, ([1]), the factor of the level of attractiveness of running a business in a country consists of six independent indices; the factor of the level of democracy in a country also consists of six independent indices; the factor of global competitiveness of a country contains only one index called Global Competitiveness Index; the factor of corruption level in a country is defined by one to nine indices, among which there are both independent and indirectly correlated indices; the factor of the level of market relations and commercial infrastructure development contains at least five indices (depending on the region, where the investigated country is situated, and on the technique of estimation, the number of indices can reach seventeen); the factor of economic freedom of a country consists of seven to nine indices depending on the technique of estimation; the factor of global understanding of risks and conditions of running a business consists of six independent indices; the factor of the level of ecology and understanding of ecological risks in a country contains at least ten (depending on the region, where the investigated country is situated, and on the technique of estimation) independent and indirectly correlated indices; three indirectly correlated indices – index of literacy, index of longevity, index of life quality (actually, this index is often considered a separate factor containing many subfactors due to its significance) – describe the factor of human development of a country (this factor is often called Human Development Index); the demographic factor is described by one to five independent and indirectly correlated indices; the factor of the level of economic development of a country can contain up to twenty indices, the majority of which are indirectly correlated; etc.

Country's economic potential should be considered as a generic description of the level of economic, social and juridical development of the country (see [2]-[6] and respective references given in these). If we try to

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emphasize only the level of economic development of the country then this level includes two factors – economic resources and economic results of the country ([6]). Economic resources of a country, which are described by total volume, structure and quality, consist of all material assets, scientific, intellectual, informational and labor resources the country accumulated on its territory as well as abroad (including entrepreneurial ability and natural resources). Economic results of a country, which are described by total volume, structure, quality and technical level of production and services, make Gross domestic product (GDP), Gross national product (GNP), national income (NI), structures GDP, GNP and NI as well as physical amount of production of these types of goods which are the most significant for the country at this stage of history.

There exist many methods for estimation of country's economic potential, for example, method of sum of places, method of numerical scores, method of multidimensional mean, method "Pattern", method of multidimensional comparative analysis, different by the level of complexity methods of deterministic and stochastic factor analysis, big amount of methods of expert evaluation, etc. (see [2], [5]-[9] and respective references given in these). Analysis of the most popular of those shows that none of them allows to determine, for example, which indices have considerable effects (and how big they are) on economic potential of a specific country or group of countries with more or less identical subjective, economic, technological, social, political and other conditions in a specific period of time. In addition, these methods do not help to unambiguously and objectively determine how different same indices are in different countries, where the values of economic potential differ drastically or, on the contrary, are very close. In other words, all these extensively used methods do not allow to objectively distinguish influence of every economic, financial, social etc. index on economic potential both by time unit and for every country by different sets of indices. This means that unambiguous and objective partitioning of a group of investigated countries according to the popular methods is impossible (for instance, see the fundamental work [2]). The main reason of lack of relevant methods for unambiguous and objective estimation of country's economic potential, in our opinion, is subjectivity of methods for finding a priori not given weighted coefficients of indices (let us remind that weighted coefficient of an index describes its relative significance in overall evaluation). Authors of the present work are sure that the above mentioned subjectivity can be eliminated using the powerful apparat of the theory of inverse and ill-posed problems, which is successfully used in different problem of mathematical physics: at present, application of this apparat to economic analysis, particularly, to the problem of estimation of economic potential or economic attractiveness of a country, unfortunately, does not exist.

In this work we investigate the problem of estimation of economic potentials of groups of countries according to their measurable economic, financial, social etc. indices in order to export bank and other luxurious to these countries. We construct a mathematical model of the considered problem and develop an iteration method which allows finding solution of the constructed model. In addition to it, we carry out a computing experiment ([10]), which implements the constructed model: in this experiment the initial data are values of 30 indices of 8 Central and Eastern Europe's countries for years 2012-2014.

## II. STATEMENT OF THE INVESTIGATED PROBLEM AND ITS MATHEMATICAL MODEL

### *A. Verbal statement of the investigated problem*

In this section it is assumed that during $n$ years we estimate $k$ economic, financial, social etc. indices of $m$ countries, and that in $i$-th year each of k indices of the $j$-th investigated country is estimated by one number $a_{i,j}$, which integrally describes many factors which directly or indirectly influence these indices. It is required to:

- determine countries' economic potentials and rank the investigated countries according to the package of found economic potentials;
- determine "Degree of favorability of the year" for every year for all indices together as well as for each of them separately;
- rank the years by "Degree of favourability of the year" and by "Degree of succession of the year";
- to detect influence of "Degree of succession of the year" on economic potentials of the investigated countries.

Before we go to the mathematical model of just formulated problem, let's make the following assumptions on the values of the initial indices $\left\{a_{i,j}\right\}_{i=\overline{1,n}}^{j=\overline{1,m}}$ : some indices $a_{i,j}$ can be equal to zero or negative numbers and then, likewise in the theory of zero-sum matrix games zero and negative elements of payoff array are transformed into strictly positive numbers, in our problem we will transform zero and negative indices into positive numbers. It can always be done, for example, by increasing every element $a_{i,j}$ by one number, for instance, by $\left|\min\limits_{\substack{i=\overline{1,n}\\ j=\overline{1,m}}}\left\{a_{i,j}\right\}\right|+1$, i.e. instead of initial values of indices $\left\{a_{i,j}\right\}_{i=\overline{1,n}}^{j=\overline{1,m}}$ we will have new values

$$\left\{\hat{a}_{i,j}\right\}_{i=\overline{1,n}}^{j=\overline{1,m}} \overset{def}{\equiv} \left\{ a_{i,j} + \left| \min_{\substack{i=\overline{1,n}\\ j=\overline{1,m}}} \left\{a_{i,j}\right\} \right| + 1 \geq 1 \right\}_{i=\overline{1,n}}^{j=\overline{1,m}} . \quad (1)$$

Obviously, after this operation we receive a problem which is equivalent to the original one. That is why rom now onwards, without loss of generality, we will consider that for $\forall\left(i=\overline{1,n};\ j=\overline{1,m}\right)$ holds true $a_{i,j}>0$. Let us show another way of securing positiveness of indices. Its essence consists in a special standardization of values of initial indices $\left\{a_{i,j}\right\}_{i=\overline{1,n}}^{j=\overline{1,m}}$ using the formula

$$\hat{a}_{i,j} = \frac{a_{i,j}}{\Delta_i} - \delta_{i,j}, \qquad (2)$$

where $\Delta_i \overset{def}{\equiv} \sup_{j=\overline{1,m}}\left\{a_{i,j}\right\} - \inf_{j=\overline{1,m}}\left\{a_{i,j}\right\}$ stands for $i$ -th saltus/leap; $\delta_{i,j} \overset{def}{\equiv} \frac{\Delta_i - \varepsilon \cdot a_{i,j}}{\varepsilon \cdot \Delta_i}$ $\left(0<\forall\varepsilon \ll 1\right)$ means oscillation. Also it is obvious that this procedure creates new package of standardized positive data $\left\{\hat{a}_{i,j}\right\}_{i=\overline{1,n}}^{j=\overline{1,m}}$, where $0<\varepsilon \leq \hat{a}_{i,j} \leq 1+\varepsilon.$

*B. Mathematical model*

The offered mathematical model of the above formulated problem has the following form:

$$\begin{cases} x_j = p \cdot \sum_{i=1}^{n} w_i \cdot \hat{x}_{i,j}, \ \ \forall j=\overline{1,m}; \\ w_i = w_{\max} - ss \cdot \sum_{j=1}^{m} \left|\hat{x}_{i,j} - x_j\right|, \ \ \forall i=\overline{1,n}, \end{cases} \qquad (3)$$

where

– $\left\{\hat{x}_{i,j}\right\}_{i=\overline{1,n}}^{j=\overline{1,m}}$ is the result of standardization of initial indices according to any known procedure, for example, according to the formula (2), or the formula

$$\hat{x}_{i,j} = \frac{a_{i,j} - \min_{i=\overline{1,m}}\left\{a_{i,j}\right\}}{\max_{i=\overline{1,m}}\left\{a_{i,j}\right\} - \min_{i=\overline{1,m}}\left\{a_{i,j}\right\}},$$

or the formula $\hat{x}_{i,j} = \frac{a_{i,j} - m_j}{\sigma_j}$,

in which $m_j$ denotes average deviation of $j$ -th index, and $\sigma_j$ denotes mean-square deviation of $j$ -th index;

– $x_j$ is the desired economic potential of $j$ -th country;

– vector $x=\left(x_1,...,x_m\right)^T$ is the desired ranking of the investigated countries by the values of standardized indices $\left\{\hat{x}_{i,j}\right\}$ during $n$ years;

– parameter $w_i$ is the desired "Degree of favorability of the year" for $i$- th year;

– vector $w=\left(w_1,...,w_n\right)^T$ is the desired "Degree of influence of years' favorability";

– parameter $w_{\max} \overset{def}{\equiv} \max_{i=\overline{1,n}}\left\{w_i\right\}$ is maximal possible estimate "Degree of favorability of the year" by all years: this parameter also is unknown, because $w_i$ $\left(i=\overline{1,n}\right)$ are unknown;

– parameter $ss$ is "Sensitivity switch", which means sensitivity coefficient of the model (1) to the package "Degree of succession of the year", i.e. sentivity of (1) to residual $\sum_{j=1}^{m}\left|\hat{x}_{i,j}-x_j\right|$; obviously, for $ss=0$ the model (1) becomes a model, using which the decision-maker makes his decision concerning countries' rankings by their economic potentials by the way of reduction of values of standardized indices during $n$ years without taking into account their correlation in every year; when the coefficient $ss$ in the model (1) increases, increases also significance of correlation of standardized indices' values during $n$ years for decision making concerning rankings of countries according to their economic potentials.

– parameter $p>0$ is a controlled parameter and it plays the role of proportionality coefficient of the desired economic potential for each of the investigated countries to the weighted sum of standardized indices of all investigated countries. This controlled parameter is chosen arbitrarily, for example, it can be equal to the number of investigated countries, that is $p=m$.

## III. DEVELOPMENT OF ITERATION ALGORITHM FOR SOLVING THE CONSTRUCTED MATHEMATICAL MODEL

In order to solve the constructed mathematical model (1), first of all, let's rewrite it in a compact matrix form. To do this, we introduce a matrix $X_{\text{Residual}}$ of resudials of size $n \times m,$ defines as $X_{\text{Residual}} \overset{def}{\equiv} \left\{\left|\hat{x}_{i,j}-x_j\right|\right\}_{i=\overline{1,n}}^{j=\overline{1,m}}$. Also, we introduce a constant vector $W_{\max} \overset{def}{\equiv} \left(\underbrace{w_{\max},...,w_{\max}}_{n}\right)^T$ of size $n \times 1,$

and a matrix $X \overset{def}{\equiv} \left\{ \hat{x}_{i,j} \right\}_{i=\overline{1,n}}^{j=\overline{1,m}}$ of size $n \times m$, whose meaning is obvious. Then the model (1) allows the following matrix notation with parameter $ss$:

$$\begin{cases} x = p \cdot X^T w; \\ w = W_{\max} - ss \cdot X_{\text{Residual}} I, \end{cases} \tag{3}$$

where $I$ denotes column vector of size $m \times 1$, consisting only of units.

In the model (3) the unknown are vectors $x$ and $w$, and in order to find them we offer the following iterative process:

$$\begin{cases} x^0 = I; \; w^0 = W_{\max}; \\ x^{l+1} = p \cdot \dfrac{X^T w^l}{\sum\limits_{i=1}^{m} \left| \sum\limits_{j=1}^{n} \hat{x}_{i,j} \cdot w_j^l \right|}, \quad \forall l = 0,1,\ldots; \\ w^{l+1} = W_{\max} - ss \cdot X_{\text{Residual}}^{l+1} I, \quad \forall l = 0,1,\ldots; \end{cases} \tag{4}$$

Remark 1. The offered iterative process (4) is, generally speaking, somewhat incorrect as we a priori assume that we know $W_{\max}$, while this does not obligatory correspond to the truth and restricts power of the (1) (and (3)): in the model (1) $w_i$ $\left(i = \overline{1,n}\right)$ are the desired unknown elements, thus, constant $w_{\max} \overset{def}{\equiv} \max\limits_{i=\overline{1,n}} \left\{ w_i \right\}$ cannot be a priori known, which makes unknown also $W_{\max}$. In the offered iterative process (4), whose aim is to find the desired elements $\left\{ x_1,\ldots,x_m; w_1,\ldots,w_n \right\}$ from the model (1) (or (3)), a priori is assumed that we know the vector

$$W_{\max} \overset{def}{\equiv} \left( \underbrace{\max_{i=\overline{1,n}} \left\{ w_i \right\},\ldots,\max_{i=\overline{1,n}} \left\{ w_i \right\}}_{n} \right)^T.$$

That is exactly why values of found by the iterative process (4) elements $\left\{ x_1,\ldots,x_m; w_1,\ldots,w_n \right\}$ can differ from the real values, i.e. from the values we get from the model (1) (or (3)) not by use of the iterative process (4), but by use of any other algorithm which does not have the above mentioned assumption about us a priori $W_{\max}$.

Now let's investigate convergence of the iterative process (4). Let's separately consider cases $ss = 0$ and $ss \in (0,1]$. For $ss = 0$ the iterative process (4) does converge. Indeed, in this case we have:

$$\begin{cases} x^0 = I; \quad w^0 = w^{l+1} = W_{\max}; \\ x^{l+1} = p \cdot \dfrac{X^T \cdot W_{\max}}{\sum\limits_{i=1}^{n} \left| \sum\limits_{j=1}^{m} \hat{x}_{i,j} \cdot W_{\max j} \right|}, \end{cases}$$

where $W_{\max j}$ means $j$-th coordinate of the vector $W_{\max}$ Then we can write:

$$\lim_{l \to \infty} x^{l+1} = \lim_{l \to \infty} \frac{p \cdot X^T \cdot W_{\max}}{\sum\limits_{i=1}^{n} \left| \sum\limits_{j=1}^{m} \hat{x}_{i,j} \cdot W_{\max j} \right|} = \frac{p \cdot X^T \cdot W_{\max}}{\sum\limits_{i=1}^{n} \left| \sum\limits_{j=1}^{m} \hat{x}_{i,j} \cdot W_{\max j} \right|} = x,$$

which confirms convergence of the iterative process (4) for $ss = 0$.

Now, as all discrete functions which participate in the iterative process are continuous by parameter $ss$, it is not difficult to see that the iterative process (4) does converge for $ss \in (0,1]$ unconditionally. Indeed, from (4) we get recurrent function

$$x^{l+1} = p \cdot \frac{X^T \cdot w^l}{\sum\limits_{i=1}^{n} \left| \sum\limits_{j=1}^{m} \hat{x}_{i,j} \cdot \left( W_{\max} - ss \cdot X_{\textbf{Residual}}^{l} \cdot I \right) \right|},$$

which may have a point of break only if the denominator equals zero, i.e. $\sum\limits_{i=1}^{n} \left| \sum\limits_{j=1}^{m} \hat{x}_{i,j} \cdot \left( W_{\max} - ss \cdot X_{\textbf{Residual}}^{l} \cdot I \right) \right| = 0.$ On the other hand, according to the conditions of use of the mathematical model (1), elements of the initial matrix of estimates $X$ must be strictly positive, i.e. $\hat{x}_{i,j} > 0 \;\; \forall i = \overline{1,n}, \; \forall j = \overline{1,m}.$ Thus, the condition of existence of break point of function $x^{l+1}$ is the condition $W_{\max} - ss \cdot X_{\text{Residual}}^{l} \cdot I = 0.$ As deviation of $w_i$ from $w_{\max}$ is proportional to the sum of residuals between rankings of the investigated countries and estimates of $k$ parameters, we can write $w^{l+1} - W_{\max} = -ss \cdot X_{\textbf{Residual}}^{l+1} \cdot I.$ Obviously, $w^{l+1} - W_{\max} < 0$ for $\forall l = 0, 1, 2, \ldots$ Consequently, $ss = \dfrac{w^{l+1} - W_{\max}}{-X_{\text{Residual}}^{l+1} \cdot I} > 0,$ which is true only for $w_i^{l+1} > 0.$ That is why, function $x^{l+1}$ has no points of break, i.e. $W_{\max} - ss \cdot X_{\textbf{Residual}}^{l} \cdot I \neq 0.$ In other words, we can write

$$\lim_{l\to\infty} x^{l+1} = \lim_{l\to\infty} \frac{p \cdot X^T \cdot w^l}{\sum_{i=1}^{n} \left| \sum_{j=1}^{m} \hat{x}_{i,j} \cdot \left( W_{\max} - ss \cdot X^l_{\mathrm{Residual}} \cdot I \right) \right|} = x,$$

which finishes the proof of unconditional convergence of the iterative process (4) for $ss \in (0,1]$.

The questions concerning stability and convergence rate of the iterative process (4) are not investigated in this work.

Remark 2. As we can see from the model (3) and iterative process (4), the dependence of components of vector $w$ from the sensitivity coefficient $ss$ has a more complicated nature than the dependence of vector $x$ from the parameter $p$. The value of sensitivity coefficient $ss \in (0,1]$ can also be chosen arbitrarily, but it must secure fulfilment of conditions $w_i^{l+1} > 0$ for $\forall \left( i = \overline{1,n};\ l \in \{0\} \cup \mathbb{N} \right)$.

## IV. RESULTS OF COMPUTING EXPERIMENT

### *A. Choice of the group of countries and time interval, selection of necessary indices*

In this section the computing experiment ([10]) is described. As the investigated countries were chosen 8 countries of Central and Eastern Europe: Republic of Bulgaria, Republic of Croatia, Czech Republic, Hungary, Romania, Republic of Serbia, Slovak Republic, Republic of Slovenia; as the investigated time interval was chosen the interval [2012, 2014]; as the economic indices were chosen 30 economic, financial, social, demographic etc. indices: P1 – Population size of country (thousands); P2 – Population size of largest cities (thousands); P3 – Population of the largest urban agglomeration in the range of >200 000 (thousands); P4 – Urbanization (thousands); P5 – Number of adults (thousands); P6 – Total wealth (billion EUR); P7 – Wealth per adult (EUR); P8 – Wealth of adults in the range of ≤10 000 EUR (percentage); P9 – Wealth of adults in the range of 10 000 ÷ 100 000 EUR (percentage); P10 – Wealth of adults in the range of 100 000 ÷ 1 000 000 EUR (percentage); P11 – Wealth of adults in the range of >1 000 000 EUR (percentage); P12 – Gini index; P13 – GDP (billion EUR); P14 – Growth rate in Real GDP (percentage); P15 – GDP (at purchasing power parity) per capita (EUR); P16 – Unemployment rate published by the EU Labour Force Survey (percentage); P17 – Consumer prices per annum (percentage); P18 – Foreign direct investment (FDI) net inflows (million EUR); P19 – Exchange rate stability; P20 – Ease of doing business index (+1 for position); P21 – Economic Development Board (EDB)/ Paying Taxes (EUR); P22 – Economic Development Board (EDB)/Tax Burden (percentage); P23 – Economic Development Board (EDB)/Trading Across Borders (position); P24 – Corruption Perceptions Index (CPI); P25 – Credit rating (0÷100); P26 – Net international investment position (billion EUR); P27 – Capital flight (CF) (million EUR); P28 – Quality of Life Index; P29 – Offshore concentration defined on indirect indications (+1 for each indication); P30 – Ratio of financial and non-financial wealth.

Remark 3. It is necessary to mention that this set of 30 indices does not claim to be "the fullest and absolutely true" set, having which is necessary and sufficient to estimate customer segment of the investigated countries of Central and Eastern Europe in order to carry out potential export of bank and other luxurious services. In other words, authors of this work admit that respective specialists (for example, specialists in investment and financial services) may not agree with the choice of exactly this list of indices and may offer a more adequate list, which could seriously differ from the one we offer. However, it is worth noting that authors of this work have chosen 30 indices out of 43 economic, financial, social, demographic, political, educational etc. indices (extensively used by The World Bank and other transnational organizations of relevant profile), beforehand analyzing their "suitability" in our investigation – estimation of economic potential of a group of countries for possible export of bank and other financial luxurious services to these countries.

Remark 4. Indices P8, P12, P16, P19, P20, as opposed to other 25 indices, have the following property: big value of each of them causes smaller economic potential for export of bank and other luxurious services.

Remark 5. Before implementing the necessary procedure of standardization to all 30 indices, we used the following simple scaling to the indices P8, P12, P16, P19, P20 and P26:

– the values of indices P8, P12, P16, P20 are scaled according to the rule $\tilde{a}_{ij} = 100 - a_{ij}$;
– the values of index P19 are scaled according to the rule $\tilde{a}_{ij} = 1.1 - a_{ij}$;
– the values of index P26 are scaled according to the rule $\tilde{a}_{ij} = -a_{ij}$.

This scaling, obviously, conserves distributional similarity of these 6 indices, however it allows to eliminate the inverse proportionality of these 6 indices to the potential of export of bank services.

Remark 6. As method of standardization of initial values of all 30 indices we chose the formula (2), which implies implementation of the mathematical model (1), (2) both for finding economic potentials of the 8 investigated countries and for finding the weighted coefficients of 30 indices.

### *B. Results*

The results (in brief) of the conducted computing experiment are reflected below. Let's note that as the initial data the real values of P1-P30 indices ([1]) for 8 above-listed countries in three years (2012-2014) are taken.

Table 1.
The ratings and the economic potentials of the investigated 8 countries

| Country | Abridged results | |
|---|---|---|
| | Rating | Economic potential |
| Republic of Bulgaria | 7 | 2.986 |
| Republic of Croatia | 6 | 3.230 |
| Czech Republic | 1 | 5.359 |
| Hungary | 2 | 4.303 |
| Romania | 5 | 3.474 |
| Republic of Serbia | 8 | 2.542 |
| Slovak Republic | 4 | 3.879 |
| Republic of Slovenia | 3 | 4.225 |

Table 2.
The ratings of the years by the found potentials' power

| Ordered rating | Year | Value of rating |
|---|---|---|
| 1 | 2012 | 9982.33295056359 |
| 2 | 2013 | 9982.80211546073 |
| 3 | 2014 | 9983.07377612381 |

Table 3.
Years-averaged standardized weighting coefficients values of indices

| Index | Weight | Index | Weight |
|---|---|---|---|
| P1 | 0.401 | P16 | 0.2862 |
| P2 | 0.3345 | P17 | 0.5536 |
| P3 | 1.1 | P18 | 0.7475 |
| P4 | 0.2878 | P19 | 0.2768 |
| P5 | 0.3347 | P20 | 0.4571 |
| P6 | 0.6591 | P21 | 0.3833 |
| P7 | 0.6294 | P22 | 0.3363 |
| P8 | 0.3605 | P23 | 0.386 |
| P9 | 0.4164 | P24 | 0.5681 |
| P10 | 0.9553 | P25 | 0.542 |
| P11 | 1.1 | P26 | 0.4783 |
| P12 | 0.5578 | P27 | 0.2944 |
| P13 | 0.4987 | P28 | 0.3921 |
| P14 | 0.4081 | P29 | 0.3223 |
| P15 | 0.3744 | P30 | 0.303 |

## V. CONCLUSION

In this work we investigate the problem of estimation of economic potentials of a group of countries by their measurable economic, financial, social etc. indices with the aim of export of bank and other luxurious services to these countries. In the work, in order to solve the assigned problem, we offer (and justify) a qualitatively other approach based on the apparat of the theory of inverse and ill-posed problems and differing from the traditional approaches, where a priori not given weighted coefficients of the measurable indices are set by the use of additional information, which, from the point of view of mathematical rigor, in no way can claim to be objective: for example, by the use of surveys among involved experts and other subjective procedures.

It is important to emphasize that our approach allows not only to find the desired economic potentials of the countries, but also the weighted coefficients of all indices without any subjective assumptions and additional information, using only value of indices, which form our initial data.

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