THREE INTERNATIONAL STATISTICAL INDICATORS AND THEIR FACTORIAL IMPACT ON THE MODELLING OF FOREIGN INVESTMENTS IN ROMANIA

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Abstract

The article provides a creative investigation into FDI, based on three major international statistical indicators of major signaling nature. Among the indicators of the country risk rating, Euromoney (ECR) was selected after successive evaluations. The second relevant statistical indicator, which was selected and validated, was the Corruption Perceptions Index (CPI) created by Transparency International, and the last one was the Economic Freedom Index (EFI), conducted by the Heritage Foundation. The article identifies the factorial impact of those three international statistical indicators in modelling the FDI volume, referring to these specific issues in the concrete case of Romania. The introduction presents the concept of investment alongside a series of international investment typologies. A section devoted to specialized literature lists the international investment theories and a number of derived modelling factors. In a necessary and succinct methodological section, the databases are also presented that were used as sources in the paper, and the discussion and analysis of the results, starting from a matrix of correlation of the development of FDI, facilitates the realization of a small number of more or less performing models and solutions. Finally, it was found that there is at least one model capable of providing a realistic FDI prognosis, starting from three international statistical indicators that give a sufficiently clear outline of a national economy, and parameterization temporally validates the predictive quality of the specific ISD model.

Key words: statistical indicator, factorial impact, correlation matrix, modelling, foreign direct investment (FDI)

Jel Codes: C32, E22, E27, F21, G11, O16, O41

Introducere

In the process of changing a certain amount of money, having a certain, definite value in a given time context, an investment is made with the intention of achieving higher income with a given uncertainty threshold, which brings along a probabilistically calculated risk, related to capitalizing on a particular technology, acquiring an immobilized / fixed asset, creating a
company, or spatially expanding a corporation, etc. The investment paradigm ensures the coexistence of the concept of investment with other inter-, trans- and multidisciplinary notions, in a true flexionary picture, which is expanding based on a common root, which constantly multiplies its meanings: investor, investment efficiency, investment volume, investment process, investment diversification and concentration, investment typology, disinvestment, etc.

Investment typology sees two major distinct areas: a) financial investments, which are made for the purpose of “obtaining interest, dividends, profits from the purchase of shares or other securities, the placement of money in banks, from the allocation of funds for the start-up of businesses” (Vasilescu, et al., 2000, p.13); b) capital investments, resulting from the acquisition of fixed assets, either through the construction of new technological lines, firms, etc., or by modernizing the old ones. Investments are also structured in relation to the relationship established between the issuer and the receiver of the international investment flow in: i) foreign portfolio investment (FPI) with a high migration potential, to which an unstable character is added, also known as “hot money” (Săvoiu, 2013, p. 77); ii) foreign direct investment (FDI) where a resident entity in a country has a long-standing interest in a company (or firm) resident in another country, and which, according to the IMF, emphasizes both the associated cross-border character and the role of the long-term economic interest (Duce, 2003).

Another structural vision of FDI distinguishes the following three components: a) direct equity participations (equity capital, or acquisitions of a company’s shares in another country); b) reinvested earnings (or the share of DI earnings, reinvested within the subsidiary where they were obtained); c) intra-company loans (or short or long-term loans between direct investors or parent and subsidiary units). The most commonly cited classification of FDI according to the investment method or in relation to the contribution to the development and renewal of economic assets in the recipient country, describes six distinct classes (Cistelecan, 2002, p. 449): a) greenfield investment, or investments initiated from “zero”, or investments from “blank”; b) brownfield investment, i.e. acquisition or concession by a company of existing production facilities in order to launch a new activity (more than 50% of tangible and intangible assets being made after takeover; c) acquisition of assets in another country; d) full or partial acquisitions or take-overs of companies; e) mergers with another company in a foreign country; f) participation with investment capital in setting up a joint venture, etc. In his eclectic theory, John Dunning also describes the diversity of investment theories through the behavioral reasons of investors, turning them into analytical factors, which have stratified FDI in four other major categories that target: a) the market; b) the resources
(efficient or available production factors); c) the efficiency of the activity (through economies of scale or common ownership); d) the assets of the nature of strategic investments (increasing the company’s advantages or reducing the advantages provided by the potential competitors).

The National Bank of Romania’s definition emphasizes that FDI also involves the significant presence of the investor’s managerial influence in the company where they invested at a level equal to at least 10% of the subscribed share capital (NBR, 2017). The limit set by the NBR for FDI is the same as that of the US Department of Commerce (Bernard, 2006), namely the acquisition of at least 10% of the voting shares, or the controlling share of an American company. The same percentage goes up in France to 20%, and in Germany to 25%, below these FDI values becoming practically FPI. The generalization of FDI conceptualization represents a complex process that brings together organizational aspects and features of transnational business networks, with the emergence and development of transnational corporations, and the FDI life cycle has been reduced from a maximum of five stages in the specific Japanese model (Kobayashi, 1985), which combined export from the country of origin to production in the host country, with integration into economic activities of the host country, coordination of regional activities, and even the development of logistics intended to conducting global activities, to a minimum of three phases in the model characteristic of the Eastern European countries, i.e. the emergence, growth and repatriation of profit (Brada & Tomšík, 2003).

The life cycle of FDI is exposed to three specific risk categories, where the investment becomes volatile and uncertain: “country risk, project risk, firm-specific risk” (Păun, Păun, 1999, p. 29). Country risk rating (or scoring) is a multidimensional factor that “interferes with the risk of direct investment and political risk” (Dudian, 1999) and constitutes an external signal to the investor market (Săvoiu, Popa, 2012a), finally becoming a useful indicator in substantiating the decisions of “transnational corporations or other foreign investment generators” (Isaic-Maniu, 2005, p. 107). Corruption and economic freedom, assessed through relevant international statistical indicators, can complement the country risk-oriented investment decision. This paper provides a creative investigation of FDI, starting from these three major international indicators of major signaling nature, in order to eventually identify their factorial impact in the FDI volume modelling, by particularizing those aspects in the specific case of Romania. After a brief conceptual introduction, there follows a brief section dedicated to international investment theories and derived modelling factors, initially materialized in a methodological section, and later in a section dealing with results and discussion, starting from a correlation matrix of FDI evolution, associated with some international
statistical indicators holding signaling power for external investors. A limited number of models conclude the article, and some final remarks point to performance solutions, perspectives and some limitations of the approach.

1. International statistical indicators that became indicators of FDI dynamics

The impact of FDI on the economy of the host country differs from one national economy to another, in relation to the concrete conditions existing at the educational, cultural, social, economic and political level, as well as the degree of previous foreign capital inflow. Both in Romania and in the other central and eastern European ex-socialist countries, FDI stimulus policies have been adopted, whose contribution to GDP has sometimes exceeded values of 8-10% against the background of a number of general strategies for EU membership. This article investigates some international statistical indicators with investment signal power for the Romanian economy, and it quantifies these international statistical indicators in a manner correlative with the fluctuating dynamics of FDI after 1996. A lot of researches have investigated the internationalization of business, and generated major theories of great impact in the development of modern economy. In a synthetical expression, such varied approaches can be structured in relation to their long-established character or tradition (Bîrsan, Mașca, 2012) and their factorial diversity (Săvoiu, Popa, 2012b), in two large classes of theories.

Thus, the first class of established or traditional theories of international trade can be succinctly exemplified by multiple solutions, from those of Adam Smith (1776) and David Ricardo (1817), by mans of the theories of absolute comparative advantage, and were relatively synthesized by Mihail Manoilescu in 1929, in his theory of the comparative advantage in a generalized scheme, going to various other well-established theoretizations, such as the H-O model, from Eli Heckscher (1919) and Bertil Ohlin (1933), or Walter Isard’s commercial gravity theory (1954), through the theory of Stephen Hymer’s monopoly advantage (1960), Charles Kindleberger’s theory of market imperfections (1969), and Richard Caves’s similar theory (1971), or the theory of monopolistic competition and the optimal product diversity of Avinash Dixit and Joseph Stiglitz (1977) and especially through John Dunning’s (2007) eclectic theory or O-L-I paradigm (ownership, location, internalization), etc.

The main theory concerning FDI, which actually has the highest degree of complexity and highlights the trans-, inter-, cross- and multifactorial nature of the economic phenomenon of foreign direct investment, remains the eclectic paradigm of John H. Dunning. In addition to integrating a wide range
of explanatory factors of FDI, from ownership, location, internationalization, to long-term foreign direct investment strategy, etc., Dunning’s theory sets the evolution of FDI in five stages, starting from the dynamics, weight and structure of the benefits in relation to the increase of the FDI inflows, and to strategies related to the FDI outflows, thus finally ensuring the input-output equilibrium. The transition economies of ex-socialist countries showed some particularities in terms of FDI stages, with emphasis on the large deficits expected in the final stages, in the perspective of the lack of the input-output equilibrium, according to the eclectic theory and temporal impact (Brada & Tomšík, 2003, p. 22).

The second class of theories defined by factorial diversity brings together an equally wide range of solutions, from Edith Penrose’s (1959) growth theory, to Michael Posner’s (1961) technological divide theory, from Everett Rogers’s (1962) information dissemination theory, to Richard Cert & James March’s (1963) behavioral company theory, completed by Yair Aharoni (1966), from the theory of the life cycle of the product, or production cycle, structured by Raymond Vernon in innovation, growth, maturity and decline (1966), to Buckley and Casson’s (1976) theory of internationalization through the development of multinational companies, etc.

The variety of the models in this class of theories represents an assured amount of originality in the last decades, as well as a special interest in anticipating some economic developments. In relation to the signal transmitted by some relevant statistical indicators, which represented hypotheses of this paper in correlation with the dynamics of FDI, also in the case of Romania’s economy, one can mention some types of modern econometric models from the literature:

a) models that quantify the intensity of the correlation between FDI and the country risk rating as the major exogenous variable (Ramcharran, 1999; Meldrum, 2000), or coupled with other individuale social variables (Thomas, 2006), by ranking national economies (Vijayakumar, Rasheed, & Tondkar, 2009), by emphasizing regional variations (Lee and Rajan, 2011), anticipating crises (Roa, Garcia & Bonilla, 2009), or outlining the particularities of transitions and adhesions (Săvoiu et. al, 2013; Săvoiu and Țaicu, 2014);

b) models that describe a positive/negative relationship between corruption and FDI, with the increase in the impact or perception of corruption multiplying/demultiplying the amount of the investment (Habib & Zurawicki, 2002; Egger and Winner, 2006; Barassi, Zhou, 2012, Udenze, 2014);

c) models based on statistical indicators deriving from the broad concept of economic freedom generating GDP growth (Wells and Wint, 2000) or export flows (Greenaway and Kneller, 2007) or capable of delimiting risks
of economic instability (Jinjarak, 2007), or political instability (Kim, 2010), stimulating multinational corporations through national tax policies or the number and categories of taxes (Weichenrieder and Mintz, 2008), or favouring the interference of multinational corporations (Görg and Jabbour, 2009) and the health of the banking system (Ushijima, 2008), through interregional agreements (Davis, 2011), or even attempting to explain the dynamics of FDI through the value evolution of the economic freedom index (Bengoa, Sanchez-Robles, 2003; Quazi, 2007; Caetano and Caleiro, 2009; Rožāns, 2016).

2. Methodology and data sources

The last decades have confirmed the existence of an excessive variability of the factors that have had a significant impact on the dynamics of FDI, and, hence, a new creative trend has been born and amplified in the eclectic modelling of FDI by significant multiplication of exogenous variables.

Among the country risk rating indicators (Euromoney Country Risk Country Rating (ECR, Moody’s, S&P, Fitch), with FDI evolution signalling capability, ECR was selected after successive evaluations, but also taking into account that ECR characterizes the European area, and in its complex value calculation the average values of the other three variables is also included (Moody’s, S&P, Fitch). The overall logic of the Euromoney rating (ECR) is described by phrase the higher the ECR score, the more the country’s situation is theoretically and practically more favourable for FDI inflows. Euromoney’s (ECR) European country risk rating method analyzes and scores, through the scores established by about 5,000 experts, six categories of indicators, three types of qualitative risks, namely political risks (30%), economic performance (30%) and structural assessment (10%), as well as three other quantitative indicators, such as external debt (10%), credit ratings (10%) and access to finance through banks or capital markets (10%). It is also possible to determine the country’s average quality risk by combining political risks (43%), economic risks (43%) and structural risks (14%). In the logic of distinct signals (ECR in March, ECR in September, and the average ECR) three distinct values, yet close in terms of value, were built. Whoever tried to perform and interpret the rating or scoring, the most important aspect remains the rating dynamics of any national economy. A second indicator, statistically relevant of its signalling power, was the Corruption Perceptions Index (CPI), created by Transparency International (TI) in 1996. The CPI was selected and validated as a second major endogenous variable. The third indicator was considered to be the the Economic Freedom Index (EFI), by Heritage Foundation (HF) in 1994. EFI has been validated as a major explanatory variable able to provide data over a common time frame alongside the other indicators, between the years 1997 and 2015 (later expanded with a slight approximation, in 2016).
As there is no single data base containing these international statistics needed to quantify the correlations and modeling, we opted for several data sources: UNCTAD (http://unctadstat.unctad.org/wds/), Euromoney (http://www.euromoneycountryrisk.com/), Transparency International - TI (https://www.transparency.org/research/cpi/) and Heritage Foundation - HF (http://www.heritage.org/index/).

The data required for the 18 years were selected in a correlation matrix made thanks to the Eviews program package, by identifying the indicators closely correlated with the FDI dynamics, in keeping with the value of the correlation ratio (R), and then linear or linearized uni- and multifactorial type were chosen, which were relevant by R squared values and the F (Fisher) test.

3. Results and discussion

The evolution of FDI fluctuations in Romania (RO) compared to the European Union average (EU-28) shows relatively higher amplitudes over the past two decades, according to the indicial data recalculated in percentages (Figure 1):

Time similarities of the FDI indices in GDP in Romania (FDI_RO) and EU-28 (FDI_EU_28) between 1996 and 2015

Figure no. 1

Source: The data, in million US dollars (online at http://unctadstat.unctad.org/wds/TableViewer/tableView), were processed in Appendix 1 and expressed as a percentage by fixed base indices (1996 = 100). Software used: Eviews

Of the four trends described in Figure 1 (left graph), made according to the data processed by the authors in Appendix 1 (by transforming a set of absolute values into % indices), the clearer similarity of the FDI indices in Romania and EU-28, is, however, obvious, and a process of convergence in specific dynamics is identified, through which the wider gap of 3-4 years
(before Romania’s accession to the EU in 2007), is contracted to 1-2 years (post-accession).

The trends described above are equally visible structurally from the dynamics of FDI weights in gross capital formation (GCF) and GDP, according to the two graphs in Figure 2:

**Structural similarities of FDI weights in gross capital formation (CGF) and GDP in Romania (FDI\_GCF\_RO and FDI\_GDP\_RO) and in UE-28 (FDI\_CGF\_UE\_28 and FDI\_GDP\_UE\_28) between 1996 and 2015**

*Note: Structural data not available for 2015 in the above-mentioned source.

Both a classical investment convergence is confirmed, from the FDI perspective of the Romanian economy to the EU-28, a convergence of greater clarity, and a structural investment convergence, this time with a relatively larger gap than the former (especially in relation to domestic investment, which has significantly diminished in recent years in the national economy)
Developments in the absolute gap of FDI per capita between Romania and EU - 28, between 1996 and 2015

Figure no. 3

Over the past two decades, Romania has reached and slightly exceeded the FDI level of the EU-28 average, only in 2008, the year of the global financial recession, and although decreasing dramatically afterwards, in a specific inertial manner, it managed to place itself on an average value level of about 10 times higher compared to 1996 (Figure 3), which anticipates the duality of linear and linearized econometric models by logarithm age. A correlation matrix, presented in Table 1, hierarchizes the ECR variable as a major factor in a potential unifactorial modeling, and excludes CPI and EFI from such a hypothesis according to the intensity of the relationship quantified by the values of R:
Matrix of correlation of FDI variables with ECR, CPI and EFI

Table no. 1

<table>
<thead>
<tr>
<th></th>
<th>FDI</th>
<th>FDI/GCF</th>
<th>FDI/GDP</th>
<th>FDI per capita</th>
<th>Index FDI</th>
<th>ECR I March</th>
<th>ECR II September</th>
<th>Average ECR III</th>
<th>CPI</th>
<th>EFI</th>
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<tr>
<td>SER01</td>
<td>1.000000</td>
<td>0.427837</td>
<td>0.729062</td>
<td>0.999285</td>
<td>1.000000</td>
<td>0.000000</td>
<td>0.714036</td>
<td>0.702328</td>
<td>0.713778</td>
<td>0.099002</td>
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<td>0.427855</td>
<td>0.129983</td>
<td>0.139948</td>
<td>0.135830</td>
<td>0.099002</td>
<td>0.279783</td>
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<td>0.394197</td>
<td>0.404678</td>
<td>0.402393</td>
<td>0.466728</td>
<td>0.334905</td>
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<td>0.397448</td>
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<td>1.000000</td>
<td>0.999285</td>
<td>0.720265</td>
<td>0.707345</td>
<td>0.719458</td>
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<td>0.991955</td>
<td>0.991955</td>
<td>1.000000</td>
<td>0.321932</td>
</tr>
</tbody>
</table>

Software used: EViews

A linear unifactorial model that has, as an exogenous variable, ECR I March, and as an endogenous variable the volume of FDI of the form $\text{FDI}_i = \alpha + \beta \times \text{ECR I March}_i + \varepsilon_i$ passes the Fisher test (F statistic = 17.68308), but not the Durbin-Watson test, in relation to which it places itself in the zone of uncertainty, to the limit of positive autocorrelation (D-W stat = 1.289621), as shown in Table 2.

Unifactorial model

$\text{ISD}_i = -15535.74 + 409.8860 \times \text{ECR I March}_i + \varepsilon_i$

Table no. 2

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-15535.74</td>
<td>4733.020</td>
<td>-3.282416</td>
<td>0.0044</td>
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<tr>
<td>ECR martie</td>
<td>409.8860</td>
<td>97.47295</td>
<td>4.205126</td>
<td>0.0006</td>
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</tbody>
</table>

R-squared: 0.509848 Mean dependent var: 4208.684
Adjusted R-squared: 0.481015 S.D. dependent var: 3607.184
S.E. of regression: 2598.638 Akaike info criterion: 18.66266
Sum squared resid: 0.13E+08 Schwarz criterion: 18.76208
Log likelihood: -175.2953 F-statistic: 17.68308
Durbin-Watson stat: 1.289621 Prob(F-statistic): 0.000595

Software used: EViews
A multifactorial model that also includes CPI and EFI, in addition to ECR March I, is a validated model, and a model applicable to forecasts, passing the F and D-W tests, the latter test at the independence error limit, according to the data in Table 3.

Multifactorial model

$$\text{FDI}_t = -18177.68 + 393.1943 \times \text{ECR March}_t - 3144.518 \times \text{CPI}_t + 252.0605 \times \text{EIF}_t + \epsilon_t$$

Table no. 3

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
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<td>ECR march</td>
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<td>114.5069</td>
<td>3.433805</td>
<td>0.0037</td>
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<tr>
<td>CPI</td>
<td>-3144.518</td>
<td>2379.243</td>
<td>-1.321646</td>
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<td>EFI</td>
<td>252.0605</td>
<td>244.1769</td>
<td>1.032287</td>
<td>0.3183</td>
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</table>

R-squared 0.564907
Mean dependent var 4208.684
S.D. dependent var 3607.184
Akaike info criterion 18.75403
Schwarz criterion 18.95286
F-statistic 6.491787
Prob(F-statistic) 0.004951

The multifactorial model, linearized by logarithmage, has a much higher determinant coefficient ($R^2$ or Rsquared = 0.704562), yet it maintains the indecision state in terms of error independence (D-W = 1.11).
**Linearized multifactorial model**

\[
\log(\text{FDI}_i) = 1.787251 + 0.090573 \times \text{ECR March}_i - 0.665607 \times \text{CPI}_i + 0.073352 \times \text{EFI}_i + \epsilon_i
\]

**Table no. 4**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
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<td>ECR March</td>
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<td>CPI</td>
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<td>EFI</td>
<td>0.073352</td>
<td>0.045241</td>
<td>1.621361</td>
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R-squared     | 0.704562     | Mean dependent var | 8.030659 |
Adjusted R-squared | 0.645474 | S.D. dependent var | 0.811062 |
S.E. of regression | 0.482923 | Akaike info criterion | 1.566744 |
Sum squared resid | 3.498218 | Schwarz criterion | 1.765574 |
Log likelihood | -10.88407   | Durbin-Watson stat | 1.110727 |

Software used: EViews

Finally, there is at least one model able to offer a realistic FDI prognosis, starting from three relevant international indices such as ECR, CPI and EFI.

**4. Conclusions**

The integration, into an original econometric model of FDI in Romania, of the three international statistical indicators, such as the Euromoney country rating (ECR), the perception of corruption (CPI) and economic freedom (EFI) as exogenous variables, represents a necessary and pragmatic activity of mid- and long-term forecasting, an also a compromise dictated by the existence of a limited number of statistically comparable data sets. Country risk, corruption perceptions and economic freedom provide a sufficiently clear outline of the image of a national economy, and parameterization temporally validates the predictive quality of the specific FDI model. An economic fact related to the efficiency of FDI, it points out that foreign investors leave the host country with an obviously higher capital than the one they had before coming, yet it is equally natural that this process also occurs in Romania, leaving, however, a certainly much more competitive national economy, less corrupt, or perceived as such, and with a higher degree of economic freedom.
Bibliography


APPENDIX NO 1

<table>
<thead>
<tr>
<th>Year</th>
<th>FDI Mill. US dollars - current prices</th>
<th>FDI Indices in %</th>
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<td>1996</td>
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Data source: [http://unctadstat.unctad.org/wds/TableViewer/tableView](http://unctadstat.unctad.org/wds/TableViewer/tableView)