3. FOREIGN DIRECT INVESTMENT BASED ON COUNTRY RISK AND OTHER MACROECONOMIC FACTORS. ECONOMETRIC MODELS FOR ROMANIAN ECONOMY

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Abstract

The paper identifies several econometric models of Foreign Direct Investment focused on the country risk, which can also signal other macroeconomic indicators in Romania after 1996, according to World Bank and major rating agencies. The introduction presents the oscillation between micro- and macro-economic significance in conceptual interpretation, followed by a review of the literature. A methodology and database section provides the statistical support. The results consist in econometric models, parameterized in EViews. The modelling focused on Euromoney and Standard&Poor's country risk has proved to be competitive. The findings and conclusions amplify the importance of Foreign Direct Investment models, as a development factor even in times of recession, highlighting the increasing importance of the country risk signal.

Keywords: Foreign Direct Investment, country risk rating agency, econometric model, testing and validation

JEL Classification: C12, C22, E22, F21, F23, G24

1. Introduction

The conceptual content of Foreign Direct Investment (FDI) has expanded continuously, starting from the multiple forms created by the corporations that invest,

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or the various forms of control over the entities in which they invest, but has focused and unified with the ever more complex macro-investment processes in the globalized economy of the last two decades. Until World War I, the economy welfare came from outside, especially in the developed countries (e.g: over 35% of the UK economy), as a telling example of the actual multiplication process of direct investment, dedicated, qualified and delineated by FDI, which brings together organizational characteristics and features of the transnational business networks, with the emergence and development of transnational corporations (Winder, 2006). This early significance of FDI emphasizes the diversified spatial dominance and the gradual coverage of the developed and less developed international markets, with a focus on microeconomic impact. With the transition from the classical economic theory to the Keynesian and neoclassical theory, the economic behaviour as a whole has increased, as well as the importance of macroeconomics and its aggregates, which has turned FDI into an integrated concept in the process of business internationalization and, subsequently, into a major element of economic globalization. If in the interwar period the international investments were diversified continuously, between 1945 and 1960 the process became uniform, being dominated by the U.S., which had about ¾ of the value of FDI (including reinvested earnings).

In the new century, the signification of FDI has grown steadily and rapidly in global importance (according to *The Economist*, 24 February 2001, "FDI is globalisation in its most potent form"), on a par with an increase in the value and share of that phenomenon, which has come to represent currently over 20% of the world GDP.
Two decades ago, the FDI were conceptualized, in a synthetic manner, as "ownership of assets by a foreign resident, in order to control the use of these assets" (Krugman, 1989), but the phenomenon of homogenization conceptually and gradually replaced the concept of diversification and increase in shares. However, with the transition of former socialist economies in Central and Eastern Europe and, especially, the unprecedented development of the Chinese economy under the impact of international investment, the processes of rethinking FDI through the macroeconomic impact reappeared as a natural phenomenon. Reality confirms the two conceptual oscillations, FDI and the development of small businesses being the two key concepts of microeconomic growth in low-income economies; yet, also the FDI, this time including the net exports, have become the major elements of China's outstanding macroeconomic development. The dictionary definitions are still torn between the micro- and the macro-economic significance (see Table 1).

Table 1

Major and Opposite Alternatives in FDI Conceptualization

FDI definitions with a micro-economic impact	FDI definitions with a macro-economic impact
FDI occurs when an individual or firm acquires controlling interest in productive assets of another country. The New Palgrave Dictionary of Economics (http://www.dictionaryofeconomics.com/)	FDI stands for Foreign Direct Investment, a component of a country's national financial accounts. Foreign direct investment is investment of foreign assets into domestic structures, equipment, and organizations. (http://economics.about.com/)

FDI definitions with a micro-economic impact	FDI definitions with a macro-economic impact
FDI means an investment abroad, usually where the company being invested in is controlled by the foreign corporation. Investopedia (http://www.investopedia.com)	FDI is money from one country that is put into businesses in another country. Business English Dictionary (http://dictionary/business-english/)

FDI currently remain dependent on a very large number of factors, including restrictions on ownership and the different performance requirements, which are given priority in the economic theory; they take numerous concrete forms (from inputs to outputs, from horizontal to vertical, from mergers to procurement, etc.), and are permanently looking for advantages in the field of resources, markets, efficiency, strategic assets and credits. FDI's investor behaviour corollary is the statement that "fear is stronger than greed", which explains, in practical terms, the fact that FDI fall much faster than they grow, and the credible signal of the last decades has become, for them, the score of the country risk rating agencies.

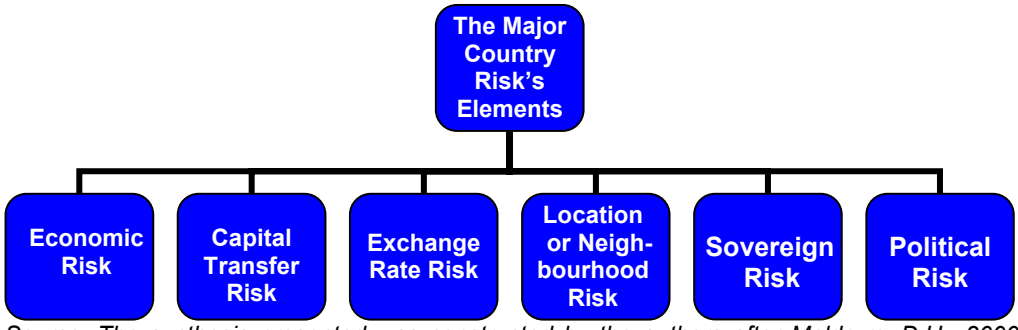
This paper falls into the category of the papers on econometric modelling, and its originality is conferred by emphasizing the role of country risk as a significant exogenous variable in the multi-factor models of FDI.

2. Economic and Econometric Literature Review

An initial review of economic literature concerns the country risk rating, and the main agencies which rate that risk. Economic literature on applied theory represents the major thematic source (Griffiths and Wall, 2011, Lipsey and Chrystal, 2011, etc.) for FDI as well. Country Risk Analysis (CRA) identifies the likelihood of this risk occurring, and specialized agencies duly rated its components. All these actions are centred on the idea that economic imbalances, of transfer of capital, exchange rate, location or neighbourhood, of sovereignty and political ones, increase the risk of investment and, in particular, that of FDI (see Figure 1).

Figure 1

The Major Country Risk's Elements



Source: The synthesis presented was constructed by the authors after Meldrum, D.H., 2000. Country Risk and Foreign Direct Investment. Business Economics, 35(1), pp.33-40.

This general applicative approach is completed by rating agencies, which restructure and weight differently the risks described, including other categories of risks, as well. Thus, the major sources of international literature consist in the calculation methodologies of the international rating agencies, especially the main American agencies, namely Moody's (http://www.moodys.com/), S&P (http://www.standardpoor.com/) and Fitch–IBCA (http://www.fitchratings.com/), as well as of other agencies from other continents. There are several methods, from the IRMA method, or "business environment risk index " (BERI), the theory accepted by a majority, ending with the firm value theory, where the value of a national economy, no less than that of a company, is given by the amount of debts, etc.; the theory is strongly challenged by the sovereign debt crisis; all of the above aim to evaluate and rank country risk. For example, the Euromoney agency makes use of its own method, defined by the scores established by experts for a total of six categories of risk, three qualitative, namely political (30%), economic performance (30%), and structural evaluation (10%), and other three quantitative categories: the risk of external debt (10%), credit ratings (10%), and the risk concerning access to financing through banks or capital markets (10%). The country average quality risk can be determined, by combining political risks (43%), economic risks (43%), and structural risks (14%). Euromoney publishes both an overall and a partial score, as in the example given for Romania at the end of 2011 (see Table 2):

Table 2

Detailed Country Risk Score Awarded by Euromoney

Romania expert scores	
Average score	48.83
Economic assessment	50.87
Political assessment	47.95
Structural assessment	45.28
Last updated: On December 15, 2011	
Other data scores	
Access to capital	61.70
Credit ratings	41.70
Debt indicators	69.90
Last updated: On December 15, 2011	

Source: http://www.euromoneycountryrisk.com/Countries/Romania/Overview.

The national literature on the country risk concept pursues, in terms of concepts, the two significations, the micro- and macro-economic ones, but is affected by two critical aspects: either the rankings are exclusively qualitative, or they are kept confidential, from methodological point of view or in the complete definition of the scores and ratings. Country risk is also emphasized in a mixed, micro-economic definition, derived from the macro-economic meaning, in the humorous saying, "no company can get a risk rating or grade better than that of the country of whose economic territory it is part of" (Lăzărescu, 2000, p. 7). In an evaluation of the main contributions by Romanian authors, with strict reference to Romania's country risk rating, one may notice that their number is relatively small (Păun and Păun, 1999; Dudian, 1999; Lăzărescu, 2000; Munteanu and Horobeț, 2003; Isaic-Maniu, 2005; Săvoiu, 2010).

The structure of the total risk of a total direct or indirect foreign investment remains deeply influenced by the country risk and dynamics of its rating, or the country risk rating. "The investments abroad have a number of associated risks, which often differ considerably from those related to purely national projects, and here are reunited mainly macro-risks of an economic nature, as well as the political risks, global risks, regional risks, regulatory institutional risks, economic policy risks, risks of a competitive nature, risks concerning access to resources, monetary or exchange rate risks" (Munteanu and Horobeț, 2003, pp. 548-549). The opinions of the theorists converge, explicitly or not, to the existing an inherent correlation between the country risk and FDI. Thus, "at the country level, firms that invest abroad must take into account two main risks: country risk and transfer risk; country risk is generated by the joint action of a different number of factors that are economic, political or social in nature" (Păun and Păun, 1999, p. 23).

"In the particular case of an international business, and especially ISD as a higher form, there are at least three major sources of risk that generate specific categories of risks to which the investment is exposed simultaneously: country risk, project risk, company specific risk" (Păun and Păun, 1999, p. 28-29). Country risk, as a "multi-dimensional concept, interferes with direct investment risk and political risk" (Dudian, 1999, p. 5), which "adds to the overall economic interdependencies the external signal transmitted to the investors by the generalized country risk" (Săvoiu and Crăciuneanu, 2010, p.115). In practical matters, the evaluation and the analysis of country risk are "useful in grounding the decisions that trans-national corporation and other generators of foreign investment make in the investment area" (Isaic-Maniu, 2005, p.107). Country risk assessment for FDI synthetically consists in selecting a number of relevant indicators, followed by placing the individual variables on a scale, completed by calculating the score as a mere sum of the points awarded (Isaic-Maniu, 2005, p.132), and presupposes rigorously going through several stages: a) good information on the current political and economic situation in the host country, b) analyzing the risk factors, and coming up with the system of indicators; c) constructing the country matrix by mathematically modelling the system of indicators; d) calculation of country risk index; e) formulating, based on the country risk index, of a number of strategic alternatives that should also include elements of risk management (identifying the probability for the risk factors to materialize, and the components of risk, and appropriate protection measures).The major objectives of the rating or grading system of country risk are to distinguish the low-risk and the high-risk countries, or those of unacceptable risk. The rating/grading scales vary from one agency to another (see Table 3), and, although they are not explicitly detailed quantitatively, but only qualitatively, estimates can be obtained for the levels or stages of risk by determining the average value of the leap from one stage to another (specific to agencies).

FDI see a diversification in content in keeping with the economic activity. For example, in the industry, FDI "represent the transfer of an industrial package, which includes industrial capital, technologies, methods of industrial organization, managerial expertise, marketing knowledge that allow the investor to exercise the right of control over investment" (Negrițoiu, 1996, p. 53).

Table 3

Rating Scales Used, and Solutions to Estimate the Percentage Score per Scale

Rating agency			Rating characteristics
Moody's=20 scales[1]	S&P =22scales[2]	Fitch = 22 scales	
High or medium investment grade - the highest reliability - low risk			
Aaa = 100	AAA = 100	AAA = 100	Prime
Aa1 = 95	AA+ = 95.45	AA+ = 95.45	High grade
Aa2 = 90	AA = 90.90	AA = 90.90	High grade
Aa3 = 85	AA- = 86.35	AA- = 86.35	High grade
A1 = 80	A+ = 81.80	A+ = 81.80	Upper medium grade
A2 = 75	A = 77.25	A = 77.25	Upper medium grade
A3 = 70	A- = 72.70	A- = 72.70	Upper medium grade
Baa1 = 65	BBB+ = 68.15	BBB+ = 68.15	Lower medium grade
Baa2 = 60	BBB = 63.60	BBB = 63.60	Lower medium grade
Baa3 = 55	BBB- = 59.05	BBB- = 59.05	Lower medium grade
Speculative investment grade - low credibility - speculative risk			
Ba1 = 50	BB+ = 54.50	BB+ = 54.50	Non-investment grade - speculative
Ba2 = 45	BB = 49.95	BB = 49.95	Non-investment grade - speculative
Ba3 = 40	BB- = 45.40	BB- = 45.40	Non-investment grade - speculative
B1 = 35	B+ = 40.85	B+ = 40.85	Highly speculative
B2 = 30	B = 36.30	B = 36.30	Highly speculative
B3 = 25	B- = 31.75	B- = 31.75	Highly speculative
Extremely speculative investment grade - substantial risk (unacceptable)			
Caa1= 20	CCC+ = 27.20	CCC = 27.20	Substantial risk
Caa2= 15	CCC = 22.65		Extremely speculative
Caa3= 10	CCC- = 18.10		In default with little prospect for recovery
Ca = 5	CC = 13.55	CC = 22.65	In default with little prospect for recovery
	C = 9.00	C = 18.10	In default with little prospect for recovery
		DDD = 13.55	Non recovery
		DD = 9.00	Non recovery
	D = 4.50	D = 4.50	Non recovery

Note: The estimates belong to the authors, and ensure transfer of the scale from being qualitative to being quantitative. As one may see, the steps/levels on the S&P and Fitch scales correspond up to substantial risk.

Sources: The table was processed after Lăzărescu (2000), Moody's (http://www.moodys.com/), S&P (http://www.standardpoor.com/), and Fitch-IBCA (http://www fitchratings.com/).

The factor that makes them homogeneous is the fact that FDI are undertaken and implemented by corporations only when they have advantages that can be exploited more efficiently, providing greater yield outside a national economy, which involves a

high level of economic development of the country source of FDI. FDI have a major impact on the macroeconomy, starting from the investment position, and ending in the balance of payments, visible especially in trade flows; however, it also extends to cases of "significant capital outflows, or diversion of flows from other potential investors" (Dăianu and Vrânceanu, 2002, p.188).

A second trend is related to specific modelling of investment phenomena, defined as complex processes aiming at forecasting, and the retrospective analysis of the econometric models of FDI identifies a very varied typology:

a) the class of theoretical models derived from the economic conceptualization of FDI, combining the Aliber model, where FDI occur as a consequence of the currency zones that divide the world economy (Aliber, 1910), the Kindleberger model, generated by the theory of perfect competition markets (Kindleberger, 1969), the Calvet model, supported by the theory of perfect market competition (Calvet, 1981, Cantwell, 1988; Lizando, 1991), the Kojiama model, shaped under the impact of a group of theories on FDI, motivated by liquidity, as well as other classical models of FDI influenced by the differences in capital formation rate (interest difference);

b) the class of classical statistical models, focusing on the correlation between FDI and economic growth, consisting of the Keynes model, described by a certain inclination of the activity towards consumption, the equilibrium level of which depends on the urge for investment, Clarke's theoretical model, based on the accelerator of investments in relation to income, Harrod-Domar model, where income is replaced by the production capacity realized through new investment, Solow model, focused on technical innovation or the Solow "residual", which succeeds, in econometric terms, to redefine the economic balance through equalizing the rate of employed population growth and the rate of the fixed capital;

c) the class of classical theoretical structural models of FDI, bringing together Leontief's static and dynamic model, or the balance of relationships among sectors, and Lange's dynamic model, which expresses the theoretical links between the production to be achieved, the investment rate and the size of investment fund, both theoretically, and practically – where the relationship is inverse, namely that structure and volume of production determine investment, etc.

d) the class of modern eclectic and restructured models (after R squared) of FDI, which identifies four distinct categories: focusing on indicators selected as value determination, focusing on statistical ranked rates, based on selected structural indicators (shares of GDP, and other structural indicators), and especially eclectic models (diversified in the spirit of the Stopford&Strange models, 1991; Porter, 1992, Dunning, 1993).

The last class holds the largest share in the number of models, built after identifying a key factor, initially generating single-factor models, later expanded into works that focus on a fundamental correlation between FDI and corruption (Habib and Zurawicki, 2002), FDI and public institutions (Ali, Fiess and MacDonald, 2010), FDI and economic development (Ali, 2005), FDI and public investment (Masliy and Pytel, 2008), FDI and infrastructure (Jakl *et al*., 2011), FDI and transport (Khadaroo and Seetanah, 2010), FDI and industry (Alfaro and Charlton, 2009), FDI and inter-regional agreements (Davis, 2011), FDI and exports (Ekholm, Forslid and Markusen, 2007),

FDI and the risk for the country of destination to belong to a mostly underdeveloped continent (Njawaya *et al*., 2011), FDI and inflation (Sayek, 2009), FDI and resources (Kretzschmar, Kirchner and Sharifzyanova, 2010), FDI and trade costs (Francis, Zheng and Mukherji, 2009), FDI and environmental taxes (De Santis and Stähler, 2009), FDI and regional military conflicts (Quan Li, 2008), FDI and industrial performance (Bitzer and Görg, 2009), FDI and international trade together with regional security (Dixit, 2011), FDI and multinational corporations (Görg and Jabbour, 2009), FDI and the soundness of the banking system (Ushijima, 2008), FDI and economic growth encouraged by law or legal regulations (Busse and Groizard, 2008), and, last but not least, FDI and various risk categories aggregated in country risk. Mapping of all factors represents a practical impossibility in econometric modelling, since nearly all original models start from a significant single-factor hypothesis. The iterative selection of the exogenous variables starts in those models related to the hypothesis of a significant correlation between FDI and the various risk categories aggregated in country risk, especially after 1999, then they fade in relative terms in order to detail methods, to discriminate a major risk, or to study it, regionally or globally, under the impact of crisis and recession. *According to the authors of this paper, the FDI models focusing on the country risk will multiply rapidly in the coming years, with the expansion of the importance of sovereign risk and the share of external debt in European and international economy.*

The models in which risk is the major exogenous variable of FDI are however rare as compared to the others described above; the first is built on empirical evidence and uses regression analysis, identifying a strong intensity between FDI and aggregate country risk (Ramcharrana, 1999), the next is evaluated from a database and more general information (Meldrum, 2000), and a third stresses and selects political risk as a determinant factor of investment stability, along with some measurable social dimensions (Thomas, 2006). Two models, which are more recent, select the U.S. economy, after studying over 100 national economies, as holding a high intensity of the correlation between FDI and country risk assessment (Vijayakumar, Rasheed, and Tondkar, 2009) or are concerned with regional issues of modelling (Lee and Rajan, 2011). Parallel trends underline the need to improve the accuracy of country risk assessment by means of new techniques and methods, using hybrid neural networks, logit models, or discriminating cluster analyses (Yim and Mitchell, 2005), noting, methodologically and accidentally, the importance of the link between FDI and country risk, or seek to increase the role of the variable country risk in anticipating crises (Roa, García and Bonilla, 2009), the correlation with FDI being derived and not a priority. *The present paper focuses on Romania as an area of FDI input area, drawing on the results of four rating agencies (three from the U.S., and one European), and periodizing information in strict relation to their availability between 1996 and 2010.*

3. Data Sources and Methodology

With no unique data base containing representative macroeconomic indicators and country risk assessments simultaneously, which could provide direct comparability and which modelling requires through its unified methodological character, among the various existing databases (NIS, Eurostat, CIA, World Bank etc.) the option was made

for the World Bank database (http://data.worldbank.org/), and the databases of the U.S. rating agencies Moody's (http://www.moodys.com/), S&P (http://www.standardpoor.com/) and Fitch-IBCA (http://www.fitchratings.com/) and, last but not least, the Euromoney Agency (http://www.euromoneycountryrisk.com/).

A proper periodization imposed the solution of quantifying by means of the U.S. dollar, giving up the manner of expressing value in Euros, sufficiently justified in terms of dominant volume of direct foreign investments of the EU countries, and the need to compare FDI globally, basically explaining how the only adequate date source was found, namely that of the World Bank and its expanded system of indicators, at the expense of Eurostat and NIS, which used to provide a partial coverage of the phenomenon. Relative indicators (indices and rates), and structural indicators were used in addition to value indicators, rebuilding the databases in order to increase the statistical accuracy of econometric modelling. The option for expressing in prices of a central year (see Table 4) after 1990 was natural (2000 prices, expressed in U.S. dollars - constant 2000 U.S. dollars), and the construction of a special price updating index ($Index_{2000}$) by inflationary calculation of the previous years, and deflationary calculation of the subsequent years, had recourse to the U.S. dollar inflation rate.

Table 4

The Evolution of Net Direct Foreign Investment Flows into Romania, after 1990 (Procedure of Ensuring Value Comparableness of Data Concerning FDI)

Year	FDI, net (BoP, current U.S. dollars)	FDI net inflows (BoP, current U.S. dollars)	Inflation rate %	CPI %	Index 2000	FDI, net (constant 2000 U.S. dollars)	FDI net inflows (constant 2000 U.S. dollars)
1991	37,000,000	40,000,000	4.2	104.2	1.279424671	47,338,713	51,176,987
1992	73,000,000	77,000,000	3.0	103.0	1.227865477	89,634,180	94,545,642
1993	87,000,000	94,000,000	3.0	103.0	1.192092010	103,712,005	112,056,649
1994	341,000,000	341,000,000	2.6	102.6	1.157370884	394,663,471	394,663,471
1995	417,000,000	419,000,000	2.8	102.8	1.128041797	470,393,429	472,649,513
1996	263,000,000	263,000,000	2.9	102.9	1.097316923	288,594,351	288,594,351
1997	1,224,000,000	1,215,000,000	2.3	102.3	1.066391568	1,305,263,279	1,295,665,756
1998	2,040,000,000	2,031,000,000	1.6	101.6	1.038352	2,118,238,080	2,108,892,912
1999	1,025,000,000	1,041,000,000	2.2	102.2	1.022	1,047,550,000	1,063,902,000
2000	1,048,000,000	1,037,000,000	3.4	103.4	1	1,048,000,000	1,037,000,000
2001	1,174,000,000	1,157,000,000	2.8	102.8	0.9727626459	1,142,023,346	1,125,486,381
2002	1,128,000,000	1,144,000,000	1.6	101.6	0.9574435491	1,079,996,323	1,095,315,420
2003	1,805,000,000	1,844,000,000	2.3	102.3	0.9359174478	1,689,330,993	1,725,831,774
2004	6,373,000,000	6,443,000,000	2.7	102.7	0.9113120232	5,807,791,524	5,871,636,255
2005	6,512,280,000	6,482,160,000	3.4	103.4	0.8813462507	5,739,326,785	5,713,027,412
2006	10,971,010,000	11,393,430,000	3.2	103.2	0.8540176848	9,369,428,020	9,730,190,711
2007	9,647,000,000	9,925,000,000	2.9	102.9	0.8299491592	8,006,519,539	8,237,245,405
2008	13,606,000,000	13,883,000,000	3.8	103.8	0.7995656639	10,878,890,420	11,100,370,110
2009	4,934,000,000	4,846,000,000	-0.4	99,6	0.8027767710	3,960,900,588	3,890,256232
2010	3,263,000,000	3,453,000,000	1.6	101.6	0.7901346171	2,578,209,256	2,728,334,833

Source: The data extracted from http://data.worldbank.org/data were rendered comparable through a discount rate, which the authors constructed from the index of U.S. dollar inflation.

Taking FDI as an example, the procedure was applied to several factors considered to be explanatory, thereby constituting a first database for modelling the phenomenon of FDI by means of value indicators with respect to FDI in Romania, in the EU or worldwide. The data base for the external signal of the country risk rating started from the rating of the three major credit U.S. rating agencies, namely Moody's, Standard & Poor's and Fitch, then adding Euromoney (see Table 5), which summarizes in its evaluation European thought (European investors are dominant in FDI entered to Romania).

Table 5

The Evolution of Country Risk Rating and Rating Index in Romania, after 1996, According to the First Three American Agencies (Reviewed in %), and Euromoney

Year	Country risk rating in Romania* (reviewed according to the scale and hierarchy)			Country risk rating index in Romania (Previous year = 100%)			Country risk rating in Romania–Euromoney (ECR)			
	Moody's	S&P'S	Fitch	Moody's	S&P'S	Fitch	A variant - annual average	B Variant Rating IX Month	C Variant Rating III Month	Index of C Variant III Month
1996	35	45.40	45.40	-	-	-	52.34	53.11	51.95	-
1997	35	45.40	45.40	100.0	100.0	100.0	52.00	52.96	51.65	99.4
1998	40	40.85	40.85	114.3	90.0	90.0	50.72	46.25	46.25	89.6
1999	25	40.85	31.75	62.5	100.0	77.7	38.13	36.85	36.28	78.4
2000	25	40.85	31.75	100.0	100.0	100.0	35.25	36.62	33.80	93.2
2001	25	36.30	36.30	100.0	88.9	114.3	40.17	40.50	41.14	121.7
2002	35	40.85	45.40	140.0	112.5	125.1	44.00	46.46	43.53	105.8
2003	40	49.95	45.40	122.3	122.3	100.0	47.46	49.76	46.25	106.2
2004	40	54.50	49.95	100.0	109.1	110.0	50.50	52.18	49.62	107.3
2005	50	59.05	59.05	108.3	108.3	118.2	51.54	50.61	51.95	104.7
2006	55	59.05	63.60	100.0	100.0	107.7	53.12	54.52	53.22	102.5
2007	55	59.05	63.60	100.0	100.0	100.0	56.40	57.12	56.55	106.3
2008	55	54.50	63.60	92.3	92.3	100.0	57.66	58.33	57.39	101.5
2009	55	54.50	54.50	100.0	100.0	85.7	56.00	55.00	55.88	97.4
2010	55	54.50	54.50	100.0	100.0	100.0	52.42	53.52	50.82	90.9
2011	55	54.50	59.05	100.0	100.0	108.3	50.72	51.51	49.09	96.6

*Note *: The rating of the agencies was recalculated on a percentage scale of 20 steps ranging from 0 to 100% for Moody's, and 22 steps for the S&P, respectively Fitch, according to the number and hierarchy of the ratings declared methodology by each agency.*
*Source: Moody's (http://www.moodys.com/), S&P (*http://www.standardpoor.com/*), Fitch–IBCA (http://www.fitchratings.com/) and Euromoney (*http://www.euromoneycountryrisk.com/*).*

4. Results and Discussions

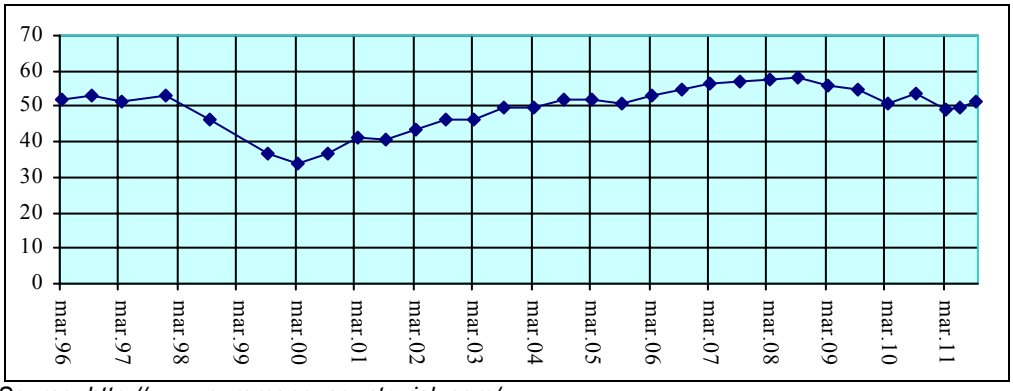
Country risk rating affects the investment decision, and is correlated with the expected profits significantly, which is assumed and subsequently also verified; the rating agencies enjoy credibility and adequately capture the impact of relevant macroeconomic variables adequately, generating a distribution of FDI congruous with

the recognized competitiveness of economies seeking more profitable investment. The country risk analysis is based on financial performance synthesized by several economic indicators: liquidity (the ratio of export entries to the debt level, the ratio of the country's currency reserves to imports, etc.), profitability (GDP growth, export growth, and increase in the income per capita, etc.), and the debt structure (matching the total external debt to be recovered and the exports index, and the ratio of external debt to gross domestic product, etc.). The vital importance of the political factors in country risk analysis is obvious in the permanent inclusion of three directions of assessment: a) change in government regime, i.e. the frequency of changes in political leadership, b) political legitimacy, i.e. the extent to which the economic process is democratic or authoritarian; c) armed conflict, i.e. the period when the country is engaged in warfare, or armed conflicts. There is also a large number of general factors, which include poor management of the economy and corruption, which can significantly change FDI, not only directly, but also indirectly, or correlated (high corruption levels can sometimes encourage increased FDI, and a low level of corruption can also generate the same effect, if one carefully considers certain impact limits, such as the term of investment, the term of profit repatriation, etc.).

Econometric modelling of FDI in accordance with country risk rating was considered an interesting hypothesis, which is to be validated or not by the Romanian economy. A graphic presenattion of Romania's rating after 1996 confirms such an assumption, being available over a limited time, actually since 1997, when FDI became internationally comparable, exceeding one billion dollars (see Figure 1).

Figure 1

Dynamics of Romania's Country Risk Rating according to the Euromoney Agency



Source: http://www.euromoneycountryrisk.com/.

The econometric models were constructed from the series of data on FDI in Romania, between 1996 and 2010, according to the World Bank, the Moody's, S & P, Fitch and Euromoney agencies. The first econometric model of FDI, focused on country risk, is obtained by means of analyses and methodologies from the Weekly Bulletin on the Euromoney website, that is through access to the historical database allowed by Chilli Wutte (*with due grateful acknowledgements*). The final part of the larger determination belongs to the FDI net inflows series, and occurs in relation to the C variant of

Romania's country risk rating (nearing the strong level of the intensity of the correlation ratio R= $\sqrt{R^2}$ = 0.71). Unfortunately, for reasons of statistical construction of uniform and level comparable indices an additional term of the series was necessarily lost as compared to the number of those in the restricted series, so basically we get only 13 terms, between 1998 and 2010 (see Table 6).

Table 6

Correlation Matrix of Net FDI Indices and Net Inflows, and the Net Inflow FDI Share in the GDP, with the Variants of Euromoney Country Risk Rating (ECR) in Romania, between 1998 and 2010

	Index of FDI, net (previous year=100%)	Index of FDI, net inflows (previous year=100%)	FDI net inflows (% din PIB)	ECR ROMANIA A Variant - annual average	ECR ROMANIA B Variant Rating IX Month	ECR ROMANIA C Variant Rating III Month	Index of C Variant III Month
	SER01	SER02	SER03	SER04	SER05	SER06	SER07
SER01	1.000000	0.999290	0.639831	0.127059	0.176272	0.100116	0.320111
SER02	0.999290	1.000000	0.644398	0.132396	0.183654	0.104641	0.316564
SER03	0.639831	0.644398	1.000000	0.522809	0.526907	0.539899	0.240649
SER04	0.127059	0.132396	0.522809	1.000000	0.966732	0.983553	0.134525
SER05	0.176272	0.183654	0.526907	0.966732	1.000000	0.976949	0.248827
SER06	0.100116	0.104641	0.539899	0.983553	0.976949	1.000000	0.254926
SER07	0.320111	0.316564	0.240649	0.134525	0.248827	0.254926	1.000000

Source: The data were collected by the authors with permission of the ECR team for variants B and C, from the http://www.euromoneycountryrisk.com/, and the calculations were made only for variant A. The calculation of the index for 1997 (the first year when FDI reached a volume of several billion dollars) has shortened the length of data series by a year. Software used: EViews.

The abnormality of evolution during the recession (see Table 7) and the non-typical investment impact in Romania's pre- and post-accession period do not allow for models focused on strongly connected (single-factor or many-factor) ECR, the following preliminary models can be selected out of the average intensity ones (having a correlation ratio over 0.5):

Table 7

The Net Inflow FDI Share in the GDP, Focusing on Romania's ECR Country Risk Rating, from 1998 to 2010

1	The net inflow FDI share in the $GDP_i = \alpha + \beta \times$ ECR variant $C_i + u_i$
2	The net inflow FDI share in the $GDP_i = \alpha + \beta \times$ ECR variant $B_i + u_i$
3	The net inflow FDI share in the $GDP_i = \alpha + \beta \times$ ECR variant $A_i + u_i$
4	Log (The net inflow FDI share in the GDP_i) = $\alpha + \beta \times$ log (ECR variant A_i) + $\gamma \times$ log (ECR variant B_i) + $\delta \times$ log (ECR variant C_i) $+u_i \varepsilon_i$
5	Log (The net inflow FDI share in the GDP_i) = $\alpha + [\beta \times$ log (ECR variant B_i) + $\gamma \times$log (ECR variantC_i)]/2 $+u_i \varepsilon_i$

Note: The ECR variants, denoted by A, B, C, are described in Table 5.

These econometric models are displayed alternately in two specified versions (Table 8), with the corresponding estimate of parameters in relation to the length of analyzed data series, and used as a database (consisting of 13 terms):

Table 8

Structural Models of Net Inflow FDI Share in the GDP, focusing on Romania's ECR Country Risk Rating, Specified and Parameterized

	Specified and parameterized models*
1	The net inflow FDI share in the GDP_i = -3.682259+0.175322 × ECR variant C_i + ε_i
2	The net inflow FDI share in the GDP_i = -3.990544 + 0.177471× ECR variant B_i + ε_i
3	The net inflow FDI share in the GDP_i = -3.929272 + 0.177433 × ECR variant A_i + ε_i
4	Log (The net inflow FDI share in the GDP_i) = -4.511517 + 0.338111 × log (ECR variant A_i) -1.438059 × log (ECR variant B_i) + 2.648162× log (ECR variant C_i) +ε_i
5	Log (The net inflow FDI share in the GDP_i) = -4.425098 + [-2.786927× log (ECR variant B_i) + 5.841186 × log (ECR variant C_i)]/2 +ε_i

** Note: The ECR variants, denoted by A, B, C, are described in Table 5.*

Most of the discussion so far has had a dominant component of statistical thinking, necessary but not sufficient in econometric modelling. Identifying factorial determinations, measuring and building their hierarchy with a view to choosing certain modelling factors over others in relation to the R-squared value, is never enough. Classical statistical regression, whether single or multiple, in order to be only apparent, is always followed by successive testing of the models, and, as a result of their validation, the economic correlations can become viable econometric models, following a rigorously described and scheduled process, which cannot lack statistical tests (Durbin-Watson is an argument, more important even than the value of R-squared, while the test "t", "F" etc., may cancel models that are apparently correctly specified). For the restricted series, the model proposed as the optimal structural model, which includes Romania's country risk rating, alongside savings share in the global GDP is (Table 9):

Table 9

Optimum Econometric Model, Based on Euromoney Country Risk Rating

The net inflow FDI share in the GDP_i = α+ β × Savings share in the global GDP_i($WGDP_i$) + γ ×ECR variant C_i + ε_i
The net inflow FDI share in the GDP_i = -32.82166 + 1.299426 × Savings share in the global GDP_i($WGDP_i$) + 0.207089 × ECR variant C_i+ ε_i

This last model is defined as part of the data presented in Appendix 1, and was obtained from carefully selecting the relevant factors in the models of structural class of FDI, as being an optimal solution between the number of factors and the final determination (Table 10).

Table 10

Model Parameterization and Testing Using the Software Package EViews

Dependent Variable: FDI share in the GDP_i - Method: Least Squares Sample: 1998 2010				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-32.82166	7.386695	-4.443349	0.0012
WGDP	1.299426	0.309634	4.196651	0.0018
ECRvariantA	0.207089	0.052565	3.939656	0.0028
R-squared	0.743404	Mean dependent var		4.715385
Adjusted R-squared	0.692085	S.D. dependent var		2.460300
S.E. of regression	1.365223	Akaike info criterion		3.659687
Sum squared resid	18.63834	Schwarz criterion		3.790060
Log likelihood	-20.78797	F-statistic		14.48589
Durbin-Watson stat	2.263559	Prob(F-statistic)		0.001112

Software used: EViews.

This model has a small number of factors, and successfully passes the Durbin-Watson test (here applied in a forced manner to a number of terms smaller than 15) with the value d = 2.263559 ($d_2 < d < 4 - d_2 \Rightarrow$ errors are independent, i.e. 1.26074 < 2.263559 <2.73926 for the new values d_1 = 0.61624 and d_2=1.26074, these values are taken from <*http://www.stanford.edu/~clint/bench/dw01a.htm*> ensuring a determination defined by the set of R-squared = 0.743404, which translates into a level of the correlation ratio of 0.8622, i.e. a strong intensity of quite a lean and efficient model. Thus it is confirmed that the errors or the values of the residual variable are independent, or uncorrelated in the analyzed model, and test F of value 14.48589 validates the model; the value of that F-statistic or Fcalculated is significantly different from any Ftheoretical (α,v1,v2) for 13-term database (volume sample n = 13). The same approach, centring on FDI as a structural indicator, can be expanded in number of terms to 14, by making use of the ratings of the Moody's, S&P, Fitch and Euromoney agencies simultaneously, and expanding the exogenous variables and the size of a correlation matrix (Table11).

Several other interesting econometric models (see Tables 12 and 13) can be selected for the variant of the 14-term data series, where the rating established by the U.S. agencies significantly contributes to the final determination (actually, the score of the S&P and Fitch agencies is best correlated with the FDI volume in Romania between 1996 and 2010, while all the variables described by rating indices fail to describe intensities acceptable for modelling).

Table 11

Correlation Matrix of the Net Inflow FDI Share in the GDP with the Variants of Romania's ECR (Euromoney Country Risk) Rating, from 1996 to 2010

	FDI net inflows (%	GDP Growth rate (previous year=100%	EU Gross savings (% of GDP)	World Gross savings (% of GDP)	Unem-ploy-ment rate (%)	Moody's rating reviewed in %	S&P rating reviewed in %	Fitch rating reviewed in %	Index of Moody's rating reviewed in %	Index of S&P rating reviewed in %	Index of Fitch rating reviewed in %
	SER03	SER08	SER09	SER10	SER11	SER12	SER13	SER14	SER15	SER16	SER17
SER03	1.000000	0.539350	0.562913	0.516813	-0.649969	0.377480	0.640672	0.460396	-0.100422	-0.032081	0.236695
SER08	0.539350	1.000000	0.456398	0.257113	-0.593241	0.007637	0.191845	0.015707	0.129846	0.221195	0.600563
SER09	0.562913	0.456398	1.000000	0.914512	-0.218435	-0.117361	0.099586	-0.020589	-0.090733	-0.156984	0.159953
SER10	0.516813	0.257113	0.914512	1.000000	-0.035392	-0.198727	0.060683	-0.124690	-0.197987	-0.213011	0.081718
SER11	-0.649969	-0.593241	-0.218435	-0.035392	1.000000	-0.637617	-0.796446	-0.728263	-0.155919	-0.137736	-0.391092
SER12	0.377480	0.007637	-0.117361	-0.198727	-0.637617	1.000000	0.891356	0.951578	-0.363830	-0.158825	-0.368191
SER13	0.640672	0.191845	0.099586	0.060683	-0.796446	0.891356	1.000000	0.906512	-0.255500	-0.243078	-0.074998
SER14	0.460396	0.015707	-0.020589	-0.124690	-0.728263	0.951578	0.906512	1.000000	-0.166673	-0.101463	-0.259797
SER15	-0.100422	0.129846	-0.090733	-0.197987	-0.155919	-0.363830	-0.255500	-0.166673	1.000000	0.463613	0.636740
SER16	-0.032081	0.221195	-0.156984	-0.213011	-0.137736	-0.158825	-0.243078	-0.101463	0.463613	1.000000	0.304979
SER17	0.236695	0.600563	0.159953	0.081718	-0.391092	-0.368191	-0.074998	-0.259797	0.636740	0.304979	1.000000

Software used: EViews.

Table 12

Structural Theoretical Models of the Net Inflow FDI Share in the GDP, Focusing on Romania's Country Risk Score (CRS) from 1997 to 2010

1	The net FDI inflow share in the GDP_i = α+ β × GDP Growth $rate_i$ + γ × EU $savings_i$ + δ × Unemployment $rate_i$ + θ × S&P rating CR_i + u_i
2	The net FDI inflow share in the GDP_i = α+ β × GDP Growth $rate_i$ + γ × Savings share in the global GDP_i($WGDP_i$) + δ × Unemployment $rate_i$ + θ × Fitch rating CR_i + u_i
3	The net FDI inflow share in the GDP_i = α+ β × GDP Growth $rate_i$ + γ × Savings share in the global GDP_i($WGDP_i$) + δ × S&P rating CR_i + u_i
4	The net FDI inflow share in the GDP_i = α+ β × EU $savings_i$ + γ × S&P rating CR_i +u_i
5	Log (The net FDI inflow share in the GDP_i) = α+ [β × log (EU $savings_i$) + γ × log (S&P rating CR_i)]/2 +u_i

Specification and parameterization materialize the new set of structural econometric models for the 14-term intermediate series.

Table 13

Structural Theoretical Models of the Net Inflow FDI Share in the GDP, Focusing on Romania's Country Risk Score (CRS), from 1997 to 2010, Specified and Parameterized

	Specified and parameterized models*
1	The net FDI inflow share in the GDP_i = -24.58697+ 0.142618 × GDP Growth $rate_i$ + 0.881299 × EU $savings_i$ + 0.171526×Unemployment $rate_i$ + 0.199211× S&P rating CR_i+ ε_i
2	The net FDI inflow share in the GDP_i = -18.0564+ 0.14098× GDP Growth $rate_i$ +0.88955 × Savings share in the global GDP_i($WGDP_i$) - 0.130393 × Unemployment $rate_i$ + 0.08971 × Fitch rating CR_i + ε_i
3	The net FDI inflow share in the GDP_i = -19.47693+ 0.139842× GDP Growth $rate_i$ + 0.739328 × Savings share in the global GDP_i($WGDP_i$) + 0.163845× S&P rating CR_i + ε_i
4	The net FDI inflow share in the GDP_i = -27.65951+ 1.173013 × EU $savings_i$ + 0.174937 × S&P rating CR_i +ε_i
5	Log (The net FDI inflow share in the GDP_i) = -21.72138+ [10.91588 × log (EU $savings_i$) + 3.471608 × log (S&P rating CR_i)]/2 +ε_i

Software used: EViews.

Out of this new set, the Durbin-Watson test and the F test validate two models; see Table 14 and Appendix 2.

Table 14

Optimum Econometric Models Based on the Country Risk Score of S&P

1	The net FDI inflow share in the GDP_i = -19.47693+ 0.139842× GDP Growth $rate_i$ + 0.739328 × Savings share in the global GDP_i($WGDP_i$) + 0.163845× S&P rating CR_i + ε_i
2	The net FDI inflow share in the GDP_i = -27.65951+ 1.173013 × EU $savings_i$ + 0.174937 × S&P rating CR_i +ε_i

The first is a maximum optimum multi-factor model (R squared and number of factors at maximal values, and validation through final testing, where Durbin-Watson = 2.031165 iar F-statistic = 9.416331), and the second one, a minimal optimal multi-

factor model (R squared, maximum, minimum number of factors, and validation through final testing, where Durbin-Watson = 1.707082 and F-statistic = 10.77544).

5. Concluding Remarks

Some final remarks close the modelling approach to investment focused on country risk rating, and illustrated by FDI in Romania. In the complex process of econometric modelling more than 70 macroeconomic variables have been analyzed, expressed by indicators of value, both relative (ratios and rates) and structural (through quotas/shares, mainly in the GDP), excluding the indicators of country risk score. The main restrictions that had to be overcome were related to ensuring comparability, selecting only one fairly substantial database for macroeconomic indicators, and building a database for the country rating by statistically converting qualitative information into quantitative information, to opting for two types of data sets or series (of 13 and 14 terms), due to the construction of indices and the different order of magnitude of FDI values, relatively homogeneous since 1997. Modelling has turned to account quite different sets of indicators, and the fact that there was a tendency to confrontation between the models centred on strictly hierarchical factors (in keeping with R squared) and those based on strictly different factors (strictly eclectic models) led to the compromise option between the number of factors and the potentiality of their multicollinearity in the model. The econometric modelling assured the comparability criteria and tested the stability for the optimum models (Appendix 2).

An economic interpretation of the econometric output of the optimum econometric models, but especially of the values and signs of the coefficients is really useful, underlying the direct correlation between country risk ratings (ECR Moody's, S&P, Fitch) and the net FDI inflow share in the GDP.

We should add some final considerations concerning these multi-factor models, which are centred on statistical indicators subject to procedures intended to ensure comparability of data:

a) a summary multicollinearity analysis excluded many of the variables in the multi-factor models studied, and indicated that models focusing solely on one category of indicators concerning the prices (inflation, deflator GDP, etc.) in macro-aggregates (gross savings, real interest rate, gross national expenditure, exports and imports of goods and services, gross capital formation, etc.), and also from different areas (national, European Community, world) have lower ratios of determination, and the territorial indicators of different levels of aggregation are self-correlated, which confirms the fact that both the economy and the investment process have been strongly globalized over the last 13-14 years;

b) the factor diversity of modelling as explanatory economic phenomenology, conditions or expresses a relationship proportional to the performance of the model, i.e. a suitable factor diversity generates better determination, and including the country risk score has proved relevant: the iterative leap from the single-factor model, focused on ECR S&P, represents major evidence in this regard;

c) as a paradox resulting from the variable analysis, prior to the modelling, one may find that some trends in the Romanian economy between 1996 and 2010 can no longer be found, on medium term, in the global ones, or are deeply offset in relation to

global trends (FDI to global GDP, FDI to global gross capital formation, etc.), as highlighted, among other things, by the inverse relationship of some investment variables in Romania, analyzed in relation to world dynamics.
d) models that have already become classic were not used (by linking FDI with complex indices, such as corruption or economic freedom index, instead an original model was preferred, confirmed anew by the latest post-global-recession tendencies, focused on ECR Moody's, S&P, Fitch country risk rating or score, out of which ECR and S&P emerged as relevant, and they were also the ones that could finally be found in the three models selected as validated. They were actually proposed for FDI forecasts in Romania, in accordance with their competitiveness; from testing heteroskedasticity to testing the normality of the residual series generated by the three models proposed, validation confirmed their qualities.
This paper contains the first theoretical assumption in the Romanian economic literature about the existence of the econometric model of FDI focused on country risk rating for the less developed economies.The performance of the econometric model of FDI focused on country risk rating is confirmed in Romania, between 1996 and 2010, and the prospect of future applications increases the significance of this factor in determining the amount of FDI.

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Appendix 1

Optimal Models, Parameterized and Tested with the Software Package EViews

A. Optimum Multi-Factor Maximal Model

Dependent Variable: The net FDI inflow share in the GDP_i Method: Least Squares Sample: 1997 2010				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-19.47693	6.978087	-2.791155	0.0191
GDPGrowthrate	0.139842	0.071926	1.944247	0.0805
WGDP	0.739328	0.310692	2.379621	0.0386
S&PratingCR	0.163845	0.048814	3.356498	0.0073
R-squared	0.738555	Mean dependent var		4.621429
Adjusted R-squared	0.660122	S.D. dependent var		2.389779
S.E. of regression	1.393219	Akaike info criterion		3.736067
Sum squared resid	19.41059	Schwarz criterion		3.918655
Log likelihood	-22.15247	F-statistic		9.416331
Durbin-Watson stat	2.031165	Prob(F-statistic)		0.002924

B. Optimum Multi-Factor Minimal Model

Dependent Variable: The net FDI inflow share in the GDP_i Method: Least Squares Sample: 1997 2010				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-27.65951	8.449746	-3.273413	0.0074
EU savings	1.173013	0.409883	2.861824	0.0155
S&PratingCR	0.174937	0.052188	3.352079	0.0065
R-squared	0.662067	Mean dependent var		4.621429
Adjusted R-squared	0.600625	S.D. dependent var		2.389779
S.E. of regression	1.510247	Akaike info criterion		3.849833
Sum squared resid	25.08932	Schwarz criterion		3.986774
Log likelihood	-23.94883	F-statistic		10.77544
Durbin-Watson stat	1.707082	Prob(F-statistic)		0.002562

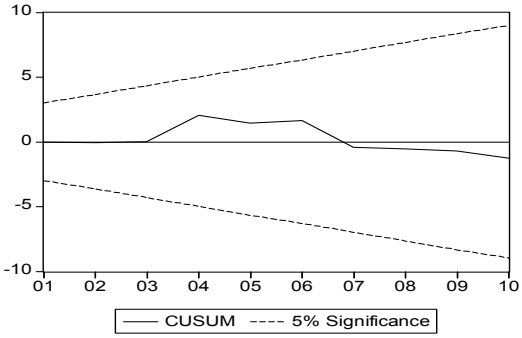
C. Logarithmic Optimum Multi-Factor Model

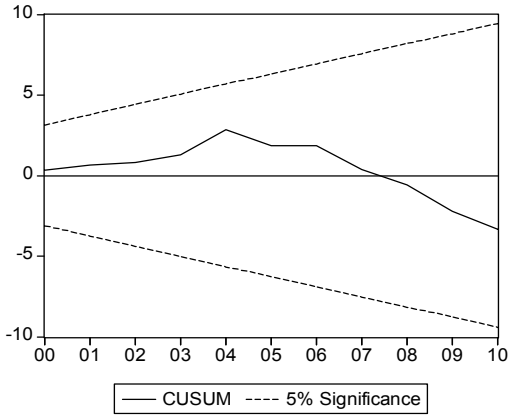
Dependent Variable: LOG(The net FDI inflow share in the GDP_i) Method: Least Squares Sample:1997 2010				
LOG(The net inflow FDI share in the GDP_i)=C(1)+(C(2)*LOG(EU $savings_i$)+C(3)*LOG((S&P$ratingCR_i$))/2				
	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-21.72138	4.740764	-4.581831	0.0008
C(2)	10.91588	2.994011	3.645905	0.0038
C(3)	3.471608	0.925211	3.752234	0.0032
R-squared	0.726374	Mean dependent var		1.414521
Adjusted R-squared	0.676624	S.D. dependent var		0.491897
S.E. of regression	0.279723	Akaike info criterion		0.477376
Sum squared resid	0.860695	Schwarz criterion		0.614317
Log likelihood	-0.341634	Durbin-Watson stat		1.535766

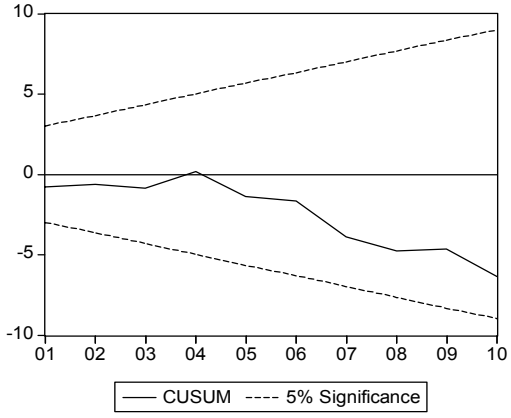
Software used: EViews

Appendix 2

Cusum Tests for Optimum Models in Tables 9 and 14







Note: The cumulative amount of the recursive error does not go outside the two critical lines.