RECENT EVOLUTIONS OF THE ROMANIAN CAPITAL MARKET IN THE CONTEXT OF FINANCIAL CRISIS

PhD Professor PhD Bogdan Dima, West University of Timişoara, bogdandima2001@gmail.com
PhD Lecturer PhD Aurora Murgea, West University of Timişoara, auroramurgea@gmail.com
PhD Professor Gabriel Marilen Pirtea, West University of Timişoara, marilen.pirtea@gmail.com

ABSTRACT: The favorable institutional and functional evolution of the Romanian capital market was break out by the negative consequences of the financial crisis. Thus, the objective of this paper is to analyze the current evolutions and to identify some of the crisis' pathology characteristics. Some conclusions are drawn and some further research directions are indicated.

Keywords: Romanian capital market, financial crisis, Quandt-Andrews test, BET, BET-C, BET-FI

JEL Codes: G10,G15

1. Introduction

A lot of other researchers have supported the idea that the financial markets are intrinsically unstable (see Skott,P[1995], Kregel,J.A.[1998], Schroeder,S[2003]). In the stable growth phases riskier investment practices and shakier financial structures will develop. Partly for this reason we are passing the sixth major readjustment of the financial system over the past 21 years. In 1987, we saw the equity market crash and rebound; in the early 1990's, the junk bond market collapsed and shrunk; at the same time, the real estate market unraveled and then eventually re-spooled; in 1998, the Asian currency crisis descended and then lifted; and, of course, the Internet economy fell back to earth in the first years of this decade before a parachute eventually opened. Also a crises started in a part of a world due to the globalization of the financial markets rapidly contagions the other markets (see Frankel and Schmukler [1998].As noticed by Obstfeld and Taylor in 2004 "at the turn of the twenty first century the merits of international integration are under more forceful attach than at the anything since the 1940's. The risks of global financial integration outweigh the benefits".

In December 2007 a study by Păun, Braşoveanu and Muşatescu [2007, 86] concludes that: „The indicator ARA calculated for the Romanian capital market indicates a decreasing risk aversion. This evolution could be explained by a higher efficiency of this market (especially at institutional and regulatory level), a higher experience of the Romanian investors and increasing investment opportunities, an increase in the income level that generated a higher interest for risky assets and a different attitude towards risks". But this evaluation should be reformulated in the context of the global financial crisis and of the market reaction to the increase in the uncertainty about future evolutions. Thus, the objective of this paper is to analyze the current evolutions and to identify some of the crisis' pathology characteristics. Some conclusions are drawn and some further research directions are indicated.

2. The Romanian capital market in the shadow of the crisis

The contradictory news from the American economy has lead to high volatilities in all capital markets including Romanian's one. If one looks at the main causes of the volatility in the last decade (a strong emotional status which overwhelms the main stream of the investors due to the existence of some positive factors – sentiments of euphoria, joy, greed – or some negative factors – sentiments of apathy, risk aversion, fear or even panic; the globalization of the capital markets) and

analyses the last crises evolution is easy to notice the presence of both main factor of volatility and of course of their results.

The global overview of the Romanian capital market indexes reflects:

- An "auto-sustainable" downward trend for the market prices starting with August 2007;
- A tendency for increase in the market *intrinsic volatility* as an expression of the unbalanced **bid/ask** ratio due to the increase of uncertainty in the transactional environment.

More detailed information could be provided by the general statistic properties of the indexes as they are captured by their histograms (Graphic 2).

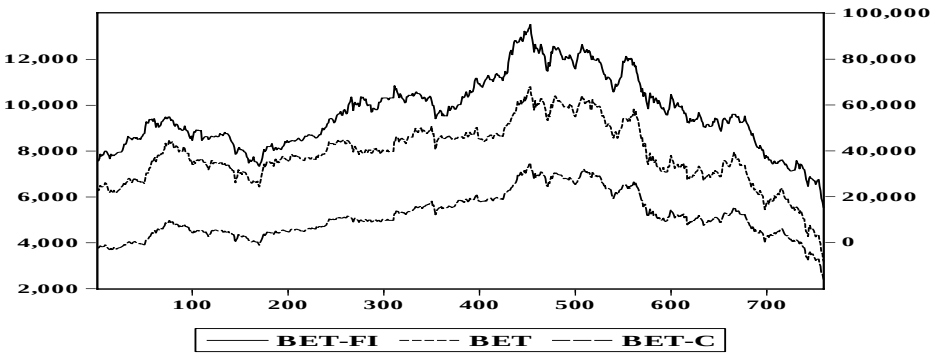


Fig. No. 1 – Recent evolutions of the Romanian capital market indexes

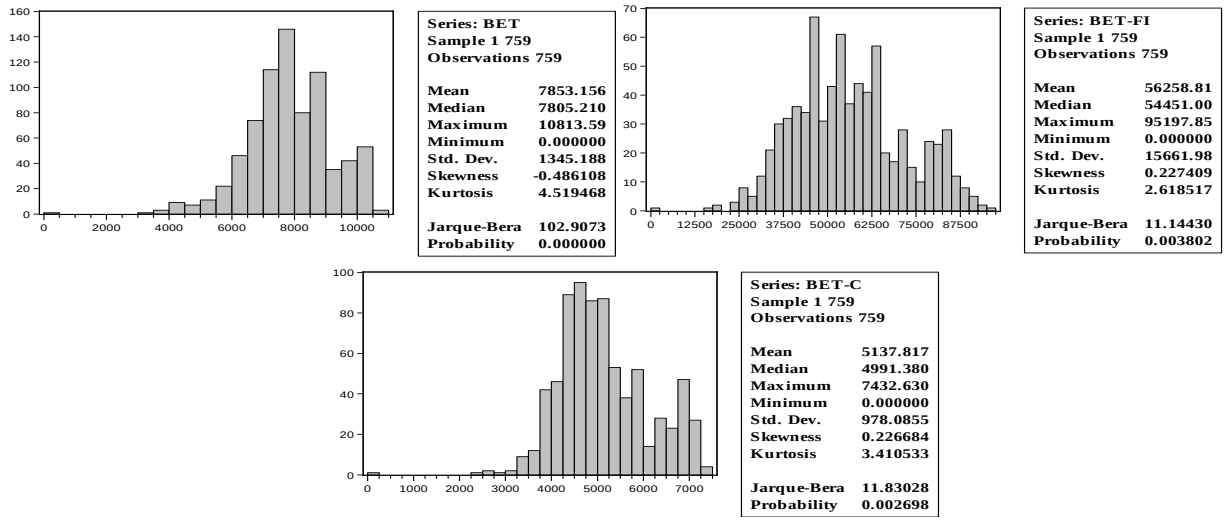


Fig. No. 2 –General statistics for market indexes

The analysis of these properties enlightens:

- A non-normal distribution as a consequence of a *non-informational efficient* (at least in a "strong" sense) market evolution;
- An important level of volatility (measured for instance by the variance coefficient- the ratio between the standard deviation and the mean) (higher for BET-FI) and lower for BET-C;
- A relative reduced capacity to absorb the exogenous shocks (as these are captured by the "spikes" in distribution).

Since the issue of a „close to normal" distribution is a pre-critical condition for the „market efficiency" analysis there are required more analytical empirical distribution tests:

Table No.1

Empirical distribution tests for indexes

Empirical Distribution Test for BET

Hypothesis: Normal

Sample: 1 759

Included observations: 759

Method	Value	Adj. Value	Probability
Lilliefors (D)	0.046908	NA	0.0004
Cramer-von Mises (W2)	0.347612	0.347841	0.0001
Watson (U2)	0.330806	0.331023	0.0001
Anderson-Darling (A2)	2.634030	2.636643	0.0000

Method: Maximum Likelihood – degree of freedom corrected (Exact Solution)

Parameter	Value	Std. Error	z-Statistic	Prob.
MU	7853.156	48.82721	160.8356	0.0000
SIGMA	1345.188	34.54882	38.93584	0.0000

Log likelihood	-6544.529	Mean dependent var.	7853.156
No. of Coefficients	2	S.D. dependent var.	1345.188

Empirical Distribution Test for BET-C

Hypothesis: Normal

Sample: 1 759

Included observations: 759

Method	Value	Adj. Value	Probability
Lilliefors (D)	0.087680	NA	0.0000
Cramer-von Mises (W2)	1.517064	1.518063	0.0000
Watson (U2)	1.359193	1.360089	0.0000
Anderson-Darling (A2)	9.403168	9.412496	0.0000

Method: Maximum Likelihood – degree of freedom corrected (Exact Solution)

Parameter	Value	Std. Error	z-Statistic	Prob.
MU	5137.817	35.50225	144.7181	0.0000
SIGMA	978.0855	25.12044	38.93584	0.0000

Log likelihood	-6302.643	Mean dependent var.	5137.817
No. of Coefficients	2	S.D. dependent var.	978.0855

Empirical Distribution Test for BET-FI

Hypothesis: Normal

Sample: 1 759

Included observations: 759

Method	Value	Adj. Value	Probability
Lilliefors (D)	0.053780	NA	0.0000

Cramer-von Mises (W2)	0.546312	0.546671	0.0000
Watson (U2)	0.478665	0.478981	0.0000
Anderson-Darling (A2)	3.893072	3.896935	0.0000

Method: Maximum Likelihood – degree of freedom corrected (Exact Solution)

Parameter	Value	Std. Error	z-Statistic	Prob.
MU	56258.81	568.4938	98.96117	0.0000
SIGMA	15661.98	402.2509	38.93584	0.0000

Log likelihood	-8407.649	Mean dependent var.	56258.81
No. of Coefficients	2	S.D. dependent var.	15661.98

It could be noticed the fact that these tests rejects for all the indexes the null of a "normal" distribution. Or, since a larger "gap" between the empirical distribution and the "normal" one could be seen as a measure of the market' informational dysfunctions, it could be conclude that for the considered time span the Romanian capital market does not behave as an "efficient" one. Of course, such a conclusion is too general. So, in order to capture the shifting in the distribution shape it is necessary to employ a *distribution index* for instance one as:

$$ID_t = \frac{\left(skew\left(\underset{j=t-k\ldots t}{Index_j} \right) \right)^2 + \left(kurt\left(\underset{j=t-k\ldots t}{Index_j} \right) - 3 \right)^2}{9} \qquad (1)$$

where $skew, kurt$ are a measure of asymmetry of the distribution of the series around its mean (the Skewness of a symmetric distribution, such as the normal distribution, is zero, positive Skewness means that the distribution has a *long right tail* and negative Skewness implies that the distribution has a *long left tail*) and respectively a measure of the "peakedness" or "flatness" of the distribution of the series (the Kurtosis of the normal distribution is 3;if the kurtosis exceeds 3, the distribution is "peaked" –*leptokurtic*- relative to the normal and if the Kurtosis is less than 3, the distribution is "flat" –*platykurtic*- relative to the normal one).

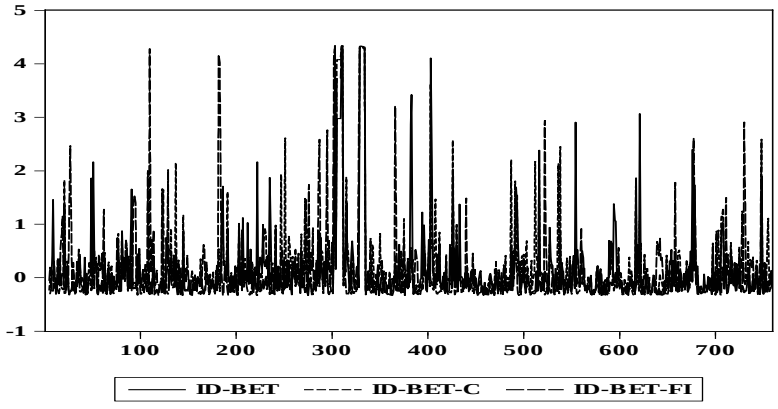


Fig. No. 3 – The distribution indexes

The *distribution indexes* display some important extreme points. Their existence could indicate the areas of "structural changes". Such areas could be better delimited by the dynamic of

the market volatility.

For estimating the *intrinsic volatility* two *proxies* are involved (Graphic 4):

1. **A volatility measure based on "High-Low" difference** (I_{H-L}) defined as:

$$I_{tH-L} = \frac{(H_t - L_t)}{\left(\max_{i \in [t-k\ t]}(H_i) - \min_{i \in [t-k\ t]}(L_i) \right)} * 100 \qquad (2)$$

with k exogenous selected.

2. **A volatility measure based on standard deviation** (I_{σ^2}) **computed as:**

$$I_{t\sigma^2} = \frac{\sigma^2_{tX}}{\sigma^2_{C_i,\ i=[t-k\ t]}} * 100 \qquad (3)$$

where σ^2_X is the standard deviation of the $X_t = \lfloor O_t\ H_t\ L_t\ C_t \rfloor$ vector formed by the *Open, High, Low, Close* current prices and σ^2_C is the standard deviation of the *Close* prices over a $[t-k\ t]$ observation period.

Also for "structural points" areas detection is interesting to delimitate more accurate the sub-periods with individual evolution of the indexes patterns.

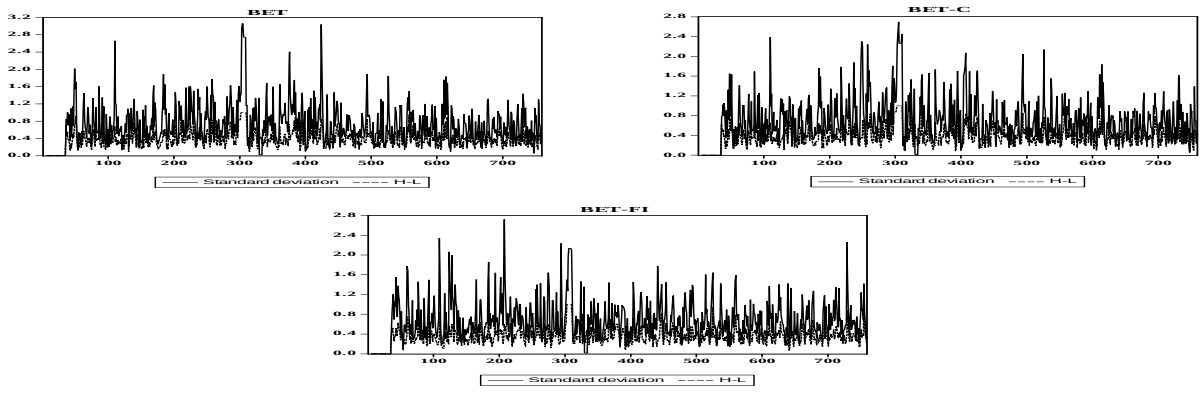
As a first step, the behavior of the indexes is described inside as framework of an *ARMA* equation:

$$y_t = \alpha_1 y_{t-1} + \alpha_2 MA_{4_t} \qquad (4)$$

where $MA_{6_t} = \frac{1}{6}\sum_{k=t-6}^{t} y_k$

For estimating the probability of "structural breaking points" the equation parameters stability over the observation sample is analyzed by involving a specific test.

The *Quandt-Andrews Breakpoint Test* tests for one or more unknown structural breakpoints in the sample for a specified equation. The idea behind the *Quandt-Andrews test* is that a single *Chow Breakpoint Test* is performed at every observation between two observations, τ_1 and τ_2. The k test statistics from those *Chow* tests are then summarized into one test statistic for a test against the null hypothesis of no breakpoints between τ_1 and τ_2 .



Graphic. no. 4-The market volatility

The individual test statistics can be summarized into three different statistics: the *Sup or Maximum* statistic, the *Exp Statistic*, and the *Ave* statistic (see [Andrews, 1993] and [Andrews and

Ploberger, 1994]).

The results look like follows:

Table No.2

The *Quandt-Andrews Breakpoint Test* for indexes

I. BET index

Quandt-Andrews unknown breakpoint test
Null Hypothesis: No breakpoints within trimmed data
Equation Sample: 2 759
Test Sample: 115 644
Number of breaks compared: 530

Statistic	Value	Prob.
Maximum LR F-statistic (Obs. 329)	410.5320	0.0000
Exp LR F-statistic	199.7509	1.0000
Ave LR F-statistic	2.738921	0.2173

Note: probabilities calculated using Hansen's (1997) method

II. BET-C index

Quandt-Andrews unknown breakpoint test
Null Hypothesis: No breakpoints within trimmed data
Equation Sample: 2 759
Test Sample: 115 644
Number of breaks compared: 530

Statistic	Value	Prob.
Maximum LR F-statistic (Obs. 329)	412.6560	0.0000
Exp LR F-statistic	200.9003	1.0000
Ave LR F-statistic	2.742237	0.2167

Note: probabilities calculated using Hansen's (1997) method

III. BET-FI index

Quandt-Andrews unknown breakpoint test
Null Hypothesis: No breakpoints within trimmed data

Equation Sample: 2 759
Test Sample: 115 644
Number of breaks compared: 530

Statistic	Value	Prob.
Maximum LR F-statistic (Obs. 329)	259.0599	0.0000
Exp LR F-statistic	124.3206	1.0000
Ave LR F-statistic	1.856996	0.4299

Note: probabilities calculated using Hansen's (1997) method

Despite some differences between these tests, overall they suggest that the null of "no breakpoints" could be rejected for all the three indexes. Even more these tend to designate February 2007 as a major structural changes area.

Another interesting question that arise in the study of the three indexes as market' descriptors, is the question of the relationships between their reaction to endogenous / exogenous shocks. For instance, it could be noticed the fact that both measures of their volatility are co-integrated. This fact could be enlightened by employing a JOHANSEN co-integration test as follows:

Tabel No.3

JOHANSEN cointegration tests for volatility measures
(linear deterministic trend in data; intercept but no trend in co-integration equations and in test VAR)

I. For H-L measure

Unrestricted Co-integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.197550	353.3817	29.68	35.65
At most 1 **	0.153262	188.5373	15.41	20.04
At most 2 **	0.081814	63.93085	3.76	6.65

Trace test indicates 3 co-integrating equation(s) at both 5% and 1% levels
*(**) denotes rejection of the hypothesis at the 5%(1%) level

Unrestricted Co-integration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.197550	164.8444	20.97	25.52
At most 1 **	0.153262	124.6064	14.07	18.63
At most 2 **	0.081814	63.93085	3.76	6.65

Max-eigenvalue test indicates 3 co-integrating equation(s) at both 5% and 1% levels
*(**) denotes rejection of the hypothesis at the 5%(1%) level

II. For standard deviation measure

Unrestricted Co-integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.149916	283.1647	29.79707	0.0001
At most 1 *	0.123160	161.5121	15.49471	0.0001
At most 2 *	0.080758	63.07018	3.841466	0.0000

Trace test indicates 3 co-integrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Co-integration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**

None *	0.149916	121.6527	21.13162	0.0001
At most 1 *	0.123160	98.44190	14.26460	0.0000
At most 2 *	0.080758	63.07018	3.841466	0.0000

Max-eigenvalue test indicates 3 co-integrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Both *Maximum Eigenvalue* and *Trace* tests indicate the existence of 3 co-integrating equations meaning that the reciprocal relations between indexes volatility could be clearly evidenced for the analysis period.

3.Conclusions and further research

The proposed analysis draw the image of the Romanian capital market as a typical emergent one, with some differences between the market indexes as it concerns the timing of the reactions to different kind of shocks, but with a strong base connection between them and enlighten the fact that the effects of the international financial crisis was started to appear from the last part of 2007. In order to develop a more consistent picture is minimally necessary to identify: a) the contagion mechanisms and b) the structural, functional and institutional effects exercised by the current global context.

References:

1. Andrews, D. W. K.,*Tests for Parameter Instability and Structural Change With Unknown Change Point*, Econometrica, 61(4), 821–856,1993
2. Andrews, D. W. K. and Ploberger W., *Optimal Tests When a Nuisance Parameter is Present Only Under the Alternative*, Econometrica, 62(6), 1383–1414,1994
3. Choudhry, Taufiq and Lin, Lu, *Common Stochastic Trends Among Far East Stock Prices: Effects of the Asian Financial Crisis*, EFMA 2004 Basel Meetings Paper.
4. Frankel,J.A,Schmukler,S.L – *Crisis, Contagion and Country Funds: Effects on East Asia and Latin America, posted on: http://econ.worldbank.org/files/24699_Crises,_contagion,_country_funds_revised.pdf*
5. Kregel,A –*Yes, it did happen again –a Minsky crisis happened in Asia,* Jerome Levy Economics Institute Working Papers, no.234,1998
6. Obstfeld,M.,Taylor,A.M –Global Capital Markets. Integration, Crisis and Growth (Japan-US Center UFJ Bank Monographs and International Financial Markets), Chambridge Press, 2004
7. Wan Mansor, M., and Marlinda, A, *Interdependence Among the Asian Pacific Stock Market During the Asian Financial Crisis*, ICFAI Journal of Applied Economics, Vol. 6, No. 5, 2007
8. Mueller, A., *What's Behind the Financial Market Crisis? ,* Ludwig von Mises Institute, Articles, http://mises.org/story/3111, 9/18/2008
9. Păun C.,Braşoveanu I.,Muşetescu R.,- *Absolute risk aversion on the Romanian capital market*, Romanian Journal of Economic Forecasting, 4/2007,p. 77-86
10. Skott,P –*Financial innovation, deregulation and Minsky cycles*, in Epstein, G, Gintis, H.M.:Macroeconomic Policy after the Conservative Era , Cambridge University Press, 1995
11. Schroeder,S.-*A Minskian analysis of financial crisis in developing countries,* University of Bremen, Bremen Contributions to institutional and Social Economics, no.50/2003