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Abstract:

Many financial studies are based on the efficient capital markets hypothesis. In this context, testing the existence of this concept becomes an interesting field of study for the emerging capital market.

The aim of this paper is to enlighten the difficulties of portfolio construction in a capital market with institutional and structural deficiencies, like the Romanian one, and to propose an alternative approach to the problem. The main features of our analysis are an empirical test for the efficient market hypothesis in the Romanian capital market case.

The output of this approach could be resumed by the thesis that, even in a situation when the capital market is affected by severe dysfunctions, there is a possibility to build an "optimal" portfolio.

JEL Codes: G14, C32, C52
Key words: efficiency, prices, information

1. THE CONCEPTUAL FRAMEWORK: EFFICIENT CAPITAL MARKET HYPOTHESIS

The concept of efficiency was introduced in the late 1960s (FAMA [1969]) and the prevailing view prior to that time was that markets were inefficient. Inefficiency was commonly believed to exist in that period in United States and United Kingdom stock markets. Numerous researchers tried to test the efficiency of different markets. For example KENDALL [1953] suggested that changes in UK stock market prices were random. Later work by BREALEY AND DRYDEN and also CUNNINGHAM found that there were no significant dependences in price changes suggesting that UK stock market was weak form efficient. Other studies of capital markets (FIRTH [1976, 1979, and 1980]) have pointed a semi-strong form efficiency of the same market. KAM, BENTON AND MING-SHIUN PAN [1997] realized a much-extended study starting from a sample of eighteen capital markets trying to test the efficiency.

Generally speaking, informational efficiency of a capital market represents the capacity of security prices to reflect instantly and fully all-relevant available information affecting these securities. In other words this means that no excess return is possible to make in such an efficient market. For our purpose, it is important to identify the character of the efficiency of the allocation of the capital connected with this informational element.

According with Fama, depending on completeness and rapidity of incorporation of information in securities prices, there are three levels of informational efficiency:

- Weak form, in which the information set is just historical prices. The weak form efficiency is characterized by the instantly and fully reflection of all information regarding past history of securities prices in their current prices.
- Semi-strong form, characterized by the integration in prices of all the publicly available information (e.g., annual dividends or earnings announcements, etc.). The semi-strong form efficiency is the situation characterized by instantly and fully incorporation of all publicly available information related to securities in their prices.
- Strong form, concerned with the problem of investors or groups that have monopolistic access to any private information, could use it in order to obtain abnormal earnings. If it is

not possible, the market is efficient in the strong form. The strong form efficiency is an ideal and theoretical situation characterized by instantly and fully reflection of all information related to securities, public and private (those private are usually available only for insiders), in their prices.

The empirical evidences show that the random walk hypothesis is “almost approximately true”. More precisely, if the financial assets returns are partial predictable, both on the short time, and on the medium and long time, the degree of predictability is generally low comparative with the high volatility of these returns.

A random walk is a usual example of a non-stationary series:

$$y_t = y_{t-1} + \varepsilon_t$$

where ε_t is a casual perturbation with stationary character. The series yt present an upward variance in time, while its 1st difference is stationary because:

$$y_t - y_{t-1} = (1 - L)y_t = \varepsilon_t$$

2. METHODOLOGY AND RESULTS

In order to test for the EMH, we try to figure out if the BET-FI’s dynamic could be described as a random walk process:

$$r_t = \varepsilon_t$$

$$\varepsilon_t = \varepsilon_{t-1}$$

where rt is the return of the stock market index BET FI defined in a usual manner as:

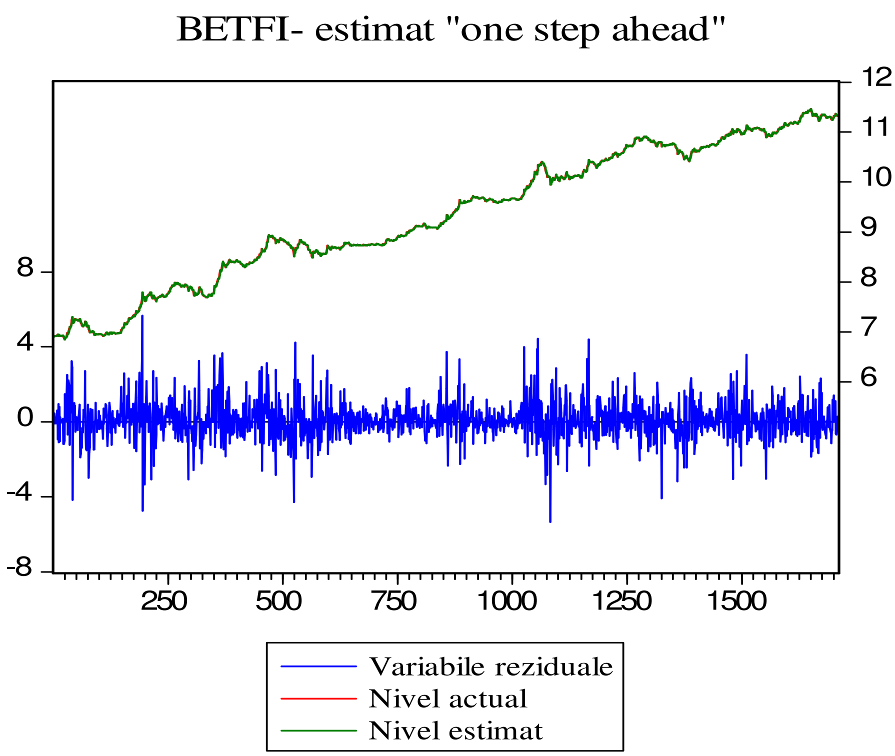
$$r_t = \log(\frac{BETFI_t}{BETFI_{t-1}}) * 100$$

and ε is the stationary random disturbance term.

It should be noticed that the financial sector of the Bucharest Stock Exchange (BVB), reflected in the BET-FI index, is dynamic taking into account the registered evolutions and is attractive both for the individual and the institutional investors. This first sector index of the BVB offers to the investors a synthetic image about the evolution of the quotations of the shares issued by the financial investment companies that are transferred on the regulated market administrated by the BVB. Taking into account how the BET-FI index is calculated, it is an index of prices ponderated with the capitalizing of the "free float” of the companies that are part of it.

The random walk test for logarithm values of the stock market index BET FI tends to suggest that the hypothesis of “informational efficiency” in its weak form is confirmed.

	Final level	Root MSE	z-Statistic	Probability
ε	11.33175	0.023105	490.4528	0.0000
Credibility function (log)	4001.555	Akaike informational criteria Schwarz informational criteria Hannan-Quinn informational criteria		-4.684491 -4.681304 -4.683311



This global analyze must be detailed in order to identify the eventual structural changes that took place in the analyzed period of time. The importance of such a detailed analyze consists in the fact that a measure of the institutional, structural and functional degree of maturity of a market consists in the distribution of the market indexes as much as possible according to the „normal" distribution model: if the resemblance in the distribution of the market indexes to the „normal" distribution is profound, then one could say that the analysed market reached a more profound maturity of its specific mechanisms. A useful strategy in this direction is to follow the bellow steps:

1) Build an „asymmetry index" (IA_t) for example according to the following equation:

$$IA_t = \frac{1}{N} * \frac{(skew_t)^2 + (kurt_t - 3)^2}{9}$$

where „N" is the number that ate used to calculate the distribution parameters Skewness and Kurtosis;

2) Apply a test of „structural rupture" to this index in order to identify the sub-periods where the structural changes occur.

Using N=250, a sub-period of one year of transactions and using the Chow test on 6 such sub-periods on the „asymmetry index" built on the closing values of the BET-FI, we get the following results:

Chow's Breakpoint Test

F-statistic	1.815199	Probability	0.092541
(Log) Credibility function	10.90179	Probability	0.091459

Both reported values allow us to eliminate the zero hypothesis of the absence of structural changes in the proposed index during the analyze horizon of time (31/10/2000-12/10/2007), Therefore, we can presume that the distribution of the BET-FI index changed, under the impact of a certain process of functional consolidation without over-passing a certain "critical point".

In order to identify the position of the financial sector in respect to other sectors and in respect to the whole market, it is useful to perform a co-integrated analysis between the BET-FI index and the other indexes of the market (BET and BET-C). The JOHANSEN co integration test's results for the analyzed period are as follows:

1. The JOHANSEN co integration test for BET-FI / BET (deterministic quadratic trend in data- constant and in the co integration relations – linear trend in VAR)

Trace Test

Number of co integration relations	Eigenvalue	Trace Statistic	0.05 Critical Value	Probability**
None *	0.013122	24.28621	18.39771	0.0067
1 at the most	0.001068	1.817309	3.841466	0.1776

The Trace Test indicates a co integration relation for a trash-hold of probability of 0.05
* indicates the rejection of the hypothesis for a trash-hold of 0.05
** Values p MacKinnon-Haug-Michelis (1999)

Maximum Eigenvalue Test

Number of co integration relations	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Probability**
None *	0.013122	22.46890	17.14769	0.0077
1 at the most	0.001068	1.817309	3.841466	0.1776

The Max-eigenvalue Test indicates a co integration relation for a trash-hold of probability of 0.05
* indicates the rejection of the hypothesis for a trash-hold of 0.05
** Values p MacKinnon-Haug-Michelis (1999)

2. The JOHANSEN co integration test for BET-FI / BETC (without a deterministic trend in the data – without constant and trend in the co integration relations – without trend in VAR)

Trace Test

Number of co integration relations	Eigenvalue	Trace Statistic	0.05 Critical Value	Probability**
None *	0.127269	106.1659	12.32090	0.0001
1 at the most	0.002648	2.028101	4.129906	0.1820

The Trace Test indicates a co integration relation for a trash-hold of probability of 0.05
* indicates the rejection of the hypothesis for a trash-hold of 0.05
** Values p MacKinnon-Haug-Michelis (1999)

Maximum Eigenvalue Test

Number of co integration relations	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Probability**
None *	0.127269	104.1378	11.22480	0.0001
1 at the most	0.002648	2.028101	4.129906	0.1820

The Max-eigenvalue Test indicates a co integration relation for a trash-hold of probability of 0.05
* indicates the rejection of the hypothesis for a trash-hold of 0.05
** Values p MacKinnon-Haug-Michelis (1999)

The cointegration analysis can be completed by taking into account the registered spread between the indexes. More exactly, the more this spread can be described more adequately as a random walk, the more we can presume that the co integration relation is more intense:

$$spread_t = \varepsilon_t$$
$$\varepsilon_t = \alpha + \varepsilon_{t-1} + \delta_t$$

1. Spread BET/ BET-FI
Method: Maximum likelihood (Marquardt)

	Coefficient	Standard error	z-Statistic	Prob.
α	-43.00442	17.49834	-2.457629	0.0140
	Final State	Root MSE	z-Statistic	Prob.
ε	-73919.91	718.8817	-102.8263	0.0000

2. Spread BETC/ BET-FI
Method: Maximum likelihood (Marquardt)

	Coefficient	Standard error	z-Statistic	Prob.
α	-43.00442	17.79165	2.417113	0.0156
	Final State	Root MSE	z-Statistic	Prob.
ε	-46918.95	22005.30	2.132166	0.0330

By analyzing these results, we can conclude that the existence of a co integration relation is suggested for both pairs of indexes but the empirical form of this relation is different. More exactly, the connection between BET-FI and BET-C seams to be simpler in respect to the one that prevails in the relation with BET where the mediating factors complicate the correlations that exist between the indexes.

Another aspect that needs to be taken into account regards the evolutions that took place in the intraday volatility of the BET-FI index, evolutions that are susceptible to show the "short-term" changes that took place in the way the index' components were transitioned. A way of reflecting this volatility can be represented by the "designing" of a "volatility indicator":

$$Vol_i = \sum_{i=i}^{K} \frac{H_i - L_i}{C_i}$$

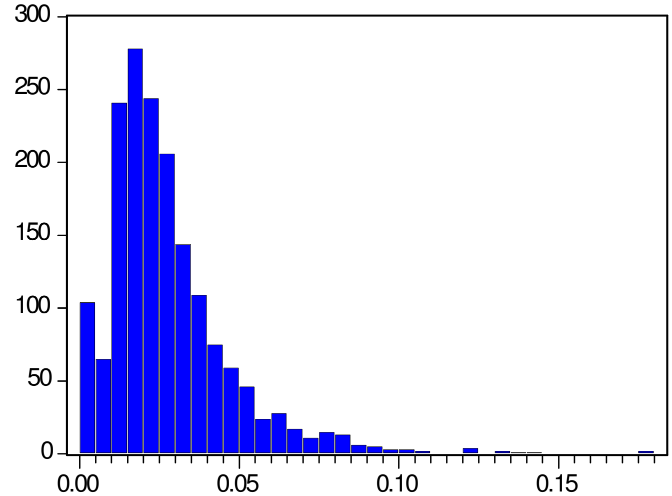
where H, L represent the maximum (minimum) level of the index during the day and C represents the closing value of the index.

The reason for designing such an indicator is simple: the bigger the registered difference between the minimum value and the maximum value of the index during a day is, the more entitled we are to suppose that the price of the shares included in the index' structure have a bigger magnitude of the daily values. In order to see the "short term" dynamics, we do a summing up of the differences that have as reference a "short transitioning cycle".

So, by setting $K = 6$ we get the following properties of the volatility index for the analyzed period:

Graph 1

The histogram of the volatility index' values



Serie: Indice de volatilitate	
Observatii: 1708	
Medie	0.027653
Mediana	0.023171
Maximum	0.179252
Minimum	0.000000
Abatere standard	0.019774
Skewness	2.022023
Kurtosis	10.57298
Jarque-Bera	5245.288
Probabilitate	0.000000

3.FINAL REMARKS

The description of the *EMH* is "in the line of literature". But there is nothing more. Or, the Romanian case could enlighten the difficulties to treat the operational and informational efficiency in the condition of a "turbulent" capital market, in a non entire crystallized stage of development, with (relative) important and quickly changes in structures and mechanisms, asymmetric and imperfect information, non-accurate rules of functioning and not well-contoured support institutions.

The analyze done in the present paper suggests the following aspects: the financial sector of the market reflected by the BET-FI index can be described „up to a point" as being „informational efficient" (in the weak way of the concept), but the assembly of the weak characteristics does not fully respect the demands raised by such a characterization; the existing connections between the BET-FI index and the other indexes are relatively significant but present certain differences as a result of the sector asymmetry registered in the Bucharest Stock Exchange;

Taking into account all of these results, we can conclude that the financial sector is a dynamic one and has registered important evolutions in the analyzed period. Still, these evolutions cannot characterize a "maturating process" completely finalized.

More generally, it is necessary to build a more accurate description of: 1) expectations; 2) prices mechanisms; 3) effects of institutional imperfections, in order to depict a clearer image of an evolving capital market.

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