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Short communication

SEGMENTED MARKET EFFICIENCY HYPOTHESIS

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ABSTRACT

The present study puts forward the question why inefficiency is observed in the early periods of the existence of the developing markets. A possible hypothesis which might shed light on this problem is that these markets are segmentally (limitedly) efficient. The purpose of this paper is to propose a definition, and a model, and to suggest tests of segmented market efficiency. The empirical results from tests on the Bulgarian Stock Exchange (BSE) show that the probability the market to have been efficient in its early stages is not insignificant.

Keywords: EMH, market, efficiency, segmentation, JEL Classifications: G14.

INTRODUCTION

The change of the political systems in the former centrally planned economies and the consequent establishment of the institutions regulating market relations gave some impetus on the investigation of the market efficiency of these new institutions. Earlier studies of market efficiency results in skeptical views upon their efficiency while studies covering more recent periods suggest positive results. The tests covering evolving efficiency also show some tendency for change from inefficiency to efficiency [1]. A significant mark of the conventional studies is, however, that the efficiency tests are performed on a presumably homogeneous markets. The hypothesis of this study is that the markets are segmented in given institutional and investor preferences. Consequently, a theoretical model that takes into account such preferences is needed. The aim of this paper is to propose such a model and to suggest tests of *segmented* market efficiency. The importance of proving or not proving the existence of segmented market efficiency would show if it is possible to make unreasonably high return from trading on undeveloped or weakly developed markets.

RESULTS AND DISCUSSION

Types of efficiency

The broadly accepted definition of market efficiency follows Fama [2], according to whom three fundamental types of efficiency can be differentiated that describe the price changes as a reaction to different in their scope information sets. According to the weak form of efficiency, which is also within the aims of this paper, the information set covers only the historical values of the prices. Within the framework of the semi-strong efficiency hypothesis the set covers the whole publicly available information and the strong form of efficiency adds to that private information. The market efficiency hypothesis claims that in each given time the market price is the real (fair) price and unreasonable return conditional to an information set depending on the form of efficiency cannot be achieved. The market inefficiency is often explained by the low liquidity of the marketed assets as well as with the low market capitalization of the companies, i.e. a simultaneous low participation of the individual and the financial investors on the one hand and of the listed companies on the other. Another explanation from an institutional point of view is the low development of the stock exchanges themselves as an arena for dealing with assets.

Theoretical model

Let a given market is described by the market index I, where I is calculated by:

$$I_t = I_{t-1} \frac{\sum_{i=1}^{n} Q_{i,t} P_{i,t}}{\sum_{i=1}^{n} Q_{i,t-1} P_{i,t-1}} \qquad (1)$$

where Q is the number of assets and P is the price of acquisition of a unit of the i^{th} asset at moment t. Let r_t =

$I_t / I_{t-1} = O_t(I_t, I_{t-1})$ be the return of the index. Then if the market is devided to K different segment an index I^k can be constructed for each of the segments (k = 1...k), and the return of the market can be described by the set:

$$\Pi_t^k = \frac{I_t^k}{I_{t-1}^k} \quad (2)$$

Assuming that O^k are independent and identically distributed random variables it is valid that:

$$\Pi_t = \alpha_t + \sum_{k=1}^{K} \beta_t^k \Pi_t^k + \upsilon_t \quad (3)$$

where υ is a Gaussian random variable.

From the upper reasoning the following definition can be put forward:

Definition 1: If there are k market segment, then the market is efficient if all k segments are simultaneously efficient. The efficiency of a limited number of segment defines a limited (segmented) market efficiency.

In this way we can get on the one hand a joint efficiency test which is more powerful that the conventional tests. On the other hand it is a test for limited efficiency applicable for markets where only a small number of investors and/or liquid assets are present.

Empirical tests

For the purposes of the current study historical data for the index SOFIX published by the Bulgarian Stock Exchange (BSE), Sofia at a daily base for the period 03.11.2000 – 07.04.2006 is used. Firstly, a Ljung-Box [3] autocorrelation test is applied on the set. This test, although not as much powerful as the commonly used in the financial literature MacKinlay-Lo test [4], is sufficient for our purposes. When used with the moving window [5] procedure, the tests gives a visual output for the market efficiency. Fig. 1 shows the autocorrelation of the return from the index. It is clearly seen that the autocorrelation during the earlier periods reaches almost 30 %. Such characteristics have also the early periods of the stock exchanges in Central Europe [6]. Let us now using (3) break the return of the early period to k different random portfolios. The period to be investigated is the first 50 market sessions which is also the frequency of the moving window. For high values of k this Monte Carlo-like simulation, shows what is the probability that at least one market segment is efficient in the sense of the weak from of the market efficiency hypothesis, while the market is inefficient as a whole. In this case the probability is almost 57 % which is also the probability that in the early period of its existence the stock exchange has been segmentally efficient.

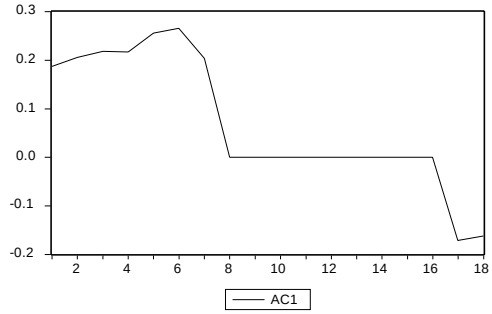

Fig. 1. First lag autocorrelation AC of the return from the index. For p < 5 %, AC=0

CONCLUSIONS

The present study analyses the question why inefficiency is observed in the developing markets in the early periods of their existence. A possible hypothesis which might shed light on this problem is that these markets are segmentally (limitedly) efficient. In this sense the empirical results from BSE show that the probability the market to have been efficient in its early stages is not insignificant. This result, although impressive is not sufficient by itself for more detailed inferences. A subject of further studies would be the use of different segment[1] models, the construction of specific indices as well as investigation of possible evolving efficiency of originally inefficient segments. In a broader view, the use of the segmented market efficiency hypothesis can provide better understanding of the functioning of the developing institutions as a whole.

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