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Hurst exponent behavior and assessment of the MENA stock markets efficiency

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ABSTRACT

In this paper, we test the evolving efficiency of MENA stock markets. Our empirical approach is founded on the behavior of the Hurst exponent over time. We computed the Hurst exponent using a rolling sample with a time window of 4 years. The empirical investigation has been conducted on the major Middle East and North African stock markets. The sample data covers in daily frequency the period (January 1997 to December 2007). Our empirical results show that all MENA stock returns exhibit long-range memory and certain markets are becoming more efficient. Ranking MENA stock markets by efficiency with our measures of long-range dependence have shown that Israel's, Turkey's and Egypt's markets are the less inefficient markets in this region. Furthermore, we have founded evidence of statistically significant rank correlation between the measure of long-range dependence and average trading costs, market capitalization and anti-self-dealing index, which suggests that these variables play a role in explaining these differences in the stage of inefficiency.

1. Introduction

In financial theory, the efficient market hypothesis (EMH) is highly controversial. This hypothesis is based on the idea that prices assets already reflect all known information. In its weak-form, the EMH

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stipulates that future prices cannot be predicted by analyzing the historical asset price. More explicitly, the WFEMH asserts that all past market prices are fully reflected in securities prices. Then, it is impossible to beat the market by using investment strategies based on historical share prices. More explicitly, the existence of autocorrelation between observations violates the WFEMH. However, if the short autocorrelation is accepted by defenders of the EMH, the long autocorrelation is widely rejected. Thus, there is a large body of the literature focused on the relationship between informational efficiency and long-range dependence. Empirical investigations have been conducted on both developed and emerging stock markets. They provided mixed evidence. Briefly speaking, we can range studies within two empirical approaches. The earlier studies including, Hiemstra and Jones (1997), Liu et al. (1999), Barkoulas et al. (2000), Grau-Garles (2001), and Henry (2002) are founded on a static efficiency for all the sample time series. As a result, a rejection of the WFEMH may reveal sub-periods in which the market is efficient. Then, the second approach is based on the study of changed level market efficiency over time. In fact, there are several factors that may cause several deviations in prices, such as unexpected events, limits to arbitrage, market imperfections and financial reforms. Even more, it is important to estimate an evolution efficiency approval of all changes in rules, regulations and technology markets. For this, many studies assessing stock market efficiency are introduced and important regularities between financial and physical data were down (Stanley et al., 1999; Plerou et al., 2000). Therefore, concepts and methods of statistical physics are increasingly being applied in economics.

The purpose of this paper is, therefore, to contribute to this literature by examining the behavior of efficiency of eleven MENA stock markets. We expect the assertion that the emerging stock markets are becoming less inefficient in these recent years due to the recent financial and institutional development. In this paper, we use the Hurst exponent behavior to study the long-range dependence of volatility's MENA stock markets over time. To our knowledge, this paper represents one of the first studies on Hurst exponent behavior and stock market informational efficiency in the context of MENA countries. All the previous studies were focused on developed and some emerging countries which did not include MENA equity markets.

The rest of the paper is structured as follows. In Section 2, we expose a brief review of previous studies. Our attention is focused on the literature that studies long-memory in MENA stock markets. In Section 3, we present the MENA stock markets tendency. Data description and methods are reported in Section 4. Empirical results are displayed in Section 5. The last section gives the summary and provides some concluding remarks.

2. Previous review

Several authors have proposed the Hurst exponent as a measure of stock market efficiency. More precisely, Grech and Mazur (2004) and Cajueiro and Tabak (2004a,b,c) are the first authors that have introduced the concept of the time-varying Hurst exponent to detect long time correlation in financial time series. Grech and Mazur (2004) applied this measure scaling exponent in a rolling window on the Dow Jones index and they argued that this exponent may be used to detect crisis. Moreover, Cajueiro and Tabak (2004a,b) have tested long-range dependence for eleven emerging countries and also for the US and Japan for the period running from January 1992 to December 2002. The authors suggested a rolling sample approach (with a window of four years) in order to analyze the dynamics of the Hurst exponent over time. Their results suggest that "Asian equity markets show greater inefficiency than those of Latin America (with the exception of Chile) and that developed market rank first in terms of efficiency" (Cajueiro and Tabak, 2004c, p. 349). In other study, Cajueiro and Tabak (2005) have implemented the same time-varying Hurst exponent approach to squared and absolute stock returns in order to rank efficiency of 11 emerging countries from Asia and Latin America for the period (1991–2004). Their findings suggest that Argentina, Chile, Indonesia, the Philippines, Malaysia, Taiwan and Thailand have a downward trend in the Hurst exponent while India displays an upward trend in this time period (Cajueiro and Tabak, 2005, p. 581). According to these authors, Asian stock markets seem to be more efficient than those of Latin America (Cajueiro and Tabak, 2005, p. 671). More recently, Cajueiro and Tabak (2006) analyzed the predictability in equity returns for the European transition markets. Employing the Hurst exponent, they found strong evidence of time varying long-range dependence in stock returns. Da Silva et al. (2007) implemented the time-varying