Beauty of financial time series
Artificial insymmetrization patterns of stock market indices

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Abstract

AIP qualitative method of discrimination of a dynamical system among stochastic noise, deterministic noise or deterministic function is applied to three stock market indices to identify similarities and discrepancies between developed and emergent markets when some expectations for extraordinary profits are present. © 2001 Elsevier Science B.V. All rights reserved.

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1. Introduction

In the following we concentrate on time series corresponding to NYSE Composite, NASDAQ Composite and WIG indices of stock markets. The first two of them, NYSE and NASDAQ, are worldwide known indices of New York market while WIG is an index of the Polish stock market. The choice of indices for this study is motivated by the observation in Ref. [1] that Easter European indices are different from others since they do not follow log-periodic power-law development. The log-periodic signatures decorating an average power-law development have been identified for the major

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financial markets of the world, i.e., the stock markets of Wall Street, Tokyo and Hong Kong [2,3]. Moreover, the log-periodic signatures are also present on emerging markets like Latin-American markets or Asian tiger markets [1]. However, the same cannot be said about the East European stock markets. It is even stated that their indices do not resemble the logic of other stock markets [1]. However, it is also noted that stock markets around the world are influenced by dominating trends of Wall Street. But the suggested dependence between markets would not necessarily be detected by standard correlation measures.

In the following we propose to study correlation by Artificial Insymmetrization Patterns, AIP in short. The method, known also as symmetrized dot patterns, was introduced by Pickover to take advantage of the fact that symmetry, color and redundancy of dot patterns are useful in the visual detection and memorization of patterns by any human analyst [4]. Many of the works with AIPs are in the field of speech waveforms and animal vocalization [5]. The method has been successfully applied in representing heart sounds also. It has appeared that there are patterns that successfully discriminate normal, meaning healthy, from pathological cardiac sounds [4,6].

We start our empirical study with NYSE data to obtain a view of a well-developed mature market. Polish stock market—Warsaw Stock Exchange—celebrates its tenth birthday this year. WIG is the main index of this market and it is calculated as a total return of the weighted sum of market capitalization (a portfolio of the index) of all stocks from the main market. Every three months the portfolio is revised. New stocks that entered the market in last three months are added and the portfolio is corrected to ensure that participation of stocks of a single industry does not exceed 30% of the whole market capitalization.

Moreover, we take NASDAQ data into consideration since NASDAQ mainly consists of stocks related to the so-called "New Economy", i.e., the Internet, computer hardware and software, etc. Investors could expect an enormous future earnings due to the increase of the sale of Internet technology and computer-related products [7]. The Polish stock market could be also viewed as an opportunity for extraordinary profits. Here, the profits could arise from transformation of the economic system in Poland.

Our preliminary empirical study of WIG time series was aimed at properties of distribution of returns [8]. Following Mantegna and Stanley [9,10], we have estimated features of WIG time series such as persistency, the index of a Lévy distribution and its breakdown when rare events are considered. The characteristics obtained are typical when compared to the analogical features known for other stock markets [11,12].

This presentation is organized as follows: In Section 2 we introduce the AIP transformation together with some qualitative scale that will be useful in further estimates. Section 3 starts by introducing stock markets indices and then we show AIP patterns resulting from them. Here we also discuss the hypothesis about log-periodic power-law development. In the last section we propose to consider AIP method as a first step in the study of correlations of both short- and long-term time scale.