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A momentum trading approach to technical analysis of Dow Jones industrials

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Abstract

A momentum trading approach is presented to examine the Dow Jones industrial components for a period of about past 10 years (1992–2002). An analogy between the classical dynamics in physics and the stock trade dynamics is used with the momentum, $P = mv$, where the velocity (v) is a relative price change in a period (τ) and the inertial mass (m) is a normalized trade volume. Extrema in the momentum time series, i.e., the singularities in the driving force provide the signals for executing trades, minima with negative momentum to buy and maxima with positive momentum to sell. Trades are implemented using a momentum threshold (P_c). A range of periodic cycles ($\tau = 5$–240 days) in time series and trading momentum thresholds ($|P_c| = 0.01$–0.5) are considered and returns (maximum, minimum, accumulative, and average) are examined in detail on the historical DJI data for about a decade (1992–2002). Frequency of trade is generally higher with smaller periods with the high probability of higher returns at $|P_c| = 0.02$–0.1 for nearly all stocks in DJI.

1. Introduction

Technical analysis of moving averages and momentum based on the assumption of an efficient market is an important part of trading tools in major stock markets [1–6]. The hypothesis of pure random stock market is common in econometry [7] while it is not considered as explicitly in empirical finance. It is well known that the efficiency of the market varies and econophysics is an attempt to develop a better understanding

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of econo-dynamics [8–14]. Numerous variables affect the econo-dynamics and are reflected into the price index of the stock market. These variables include interest rates, sales signals for goods, consumer confidence, deficits, surplus, emergence of emerging tools and perceived potentials and breakthroughs, the evolving socio-economic dynamics, etc. [15], and probability of unexpected disasters (flood, earthquakes, accidents, etc.). A variety of practices are exercised in current stock market [1–3] with an enormous range of technical details some of which appear ad hoc and based on pure visual judgment of graphs and charts on the part of the analysts. Availability of data, statistics, and charts have led to a rather very fast dissemination of opinions with a long list of terminology for various indicators [1]. A scientific analysis, however, requires a systematic observation of trends and relates it to basic laws, fundamental or empirical.

In a series of papers, Ausloos and Ivanova [16–18] have recently investigated the stock price, active volume, moving averages, and presented an elegant analogy with the fundamental quantities of mechanical physics. For example, they extended the definition of the classical momentum, the average price change during the moving average period to a more technical footing by introducing the generalized momentum. Momentum is defined as $P = mv$, where mass (m) is the normalized volume transaction and velocity (v), the average rate of price change during the moving average period. Using the stock price of IBM for a decade (1990–2000), they pointed out sign of appropriate signals for the transactions. The analogy between the stock dynamics and the classical mechanics of particles' dynamics is an appealing concept to pursue. We would like to follow the same terminology with somewhat different definitions for mass, velocity, and momentum. A momentum trading approach is presented to analyze a sector represented by the Dow Jones industrial (DJI) stocks which may help understanding signals for selecting specific stocks from the DJI group. Method and definitions are presented in the next section followed by detailed analysis and conclusions.

2. Method

DJI consists of 30 blue chip companies (see Table 1) each with its specific price variations (time series). Returns (profit and loss) of all companies are analyzed for 10 years (1992–2002) if trades were executed during this period using the following momentum trading approach at appropriate time.

In order to examine the rate of price variation, one has to select the unit of time or the period (τ) in which the price change occurs. The period τ may vary, i.e., hours, days, months, etc., depending on short to long time (t) analysis. The average velocity w, the rate of price (p) change in unit time, i.e., over the period (τ) is generally defined as

$$w = p(t + \tau) - p(t) , \quad (1)$$

where τ can vary from short (weeks) to long (months) periods. The rate of price change (w) varies from one stock to another in an index group. In order to reduce the