



A spin model for the dynamical behavior of the financial market

Ranasinghe P. K. C. Malmini

Department of Mathematics, University of Sri Jayewardenepura, Nugegoda,
Sri Lanka

Correspondence: malmini@sjp.ac.lk

Abstract. A semi-empirical statistical physics model for the dynamical behavior of stock prices in Sri Lankan financial market was analyzed. In this model, the time evolution of a collective set of stock prices was analyzed using the Hamiltonian of a nearest neighbor Ising model. Monte Carlo simulations were performed and resultant stylized features of the corresponding system were discussed.

Keywords: Spin model, Time series, Stock market, Stylized features.

1. INTRODUCTION

There has been much recent work applying physics concepts and methods to the study of financial time series(Mantegna and Stanley 2000, Fischer 1991, Mandelbrot 1982). In particular, several empirical studies have determined the scale-invariant behavior of the distribution of price changes, the long-range correlation in the absolute value of returns, stock market crashes(Mantegna 2000, Gopakrishnan, Meyer 1999, Wedagedara 2006). In this paper we mainly focus on the time evolution of a collective set of stock prices(Maskawa 2000) in Sri Lankan stock market as a case study.

We consider the statistics of the sign of price changes. The time series of price changes are coded into a sequence of up and down Ising spins. Table 1 shows a sample of the coding procedure for virtual data of All Share Price Index and of Milanka Price Index in Colombo Stock Market respectively.

Let y_i be the price of the i^{th} sample. The i^{th} price change is defined as $Z_i = y_i - y_{i-1}$ and i^{th} code is