

The Propagation Process of Financial Investment Emotion with Double Time Delay under Impulse Interference

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Abstract: This article puts forward the double pulse delay investor sentiment spread model, using the stroboscopic map of discrete system, prove the existence of periodic solution, by impulsive differential inequalities proved the global asymptotic stability of the emotional balance, use comparison principle prove persistent rumors of impulsive differential equation, analyses the threshold delay affect mood, finally, the numerical simulation results, the result confirms my analysis very well.

Keywords: Financial Investment; Emotional Communication; Pulse Interference; Double Delay; Persistence

1. Introduction

Investor sentiment is one of the research emphases in behavioral finance. It is generally believed that the stock market is the barometer of China's macro economy. Similarly, investor sentiment can be compared to the weathervane of the stock market. In real trading situations, investors make decisions not only based on some simple established facts and obvious information, but also rely on their own intuition, others' comments, other investors' opinions and psychological activities to make the final decision. Therefore in the behavioral finance theory of investor sentiment by educational world attention, more and more investor sentiment volatility can affect the stock market share price volatility and trading main body of the trading strategy, under this background, combining the actual operation condition of our country stock market, investor sentiment was discussed thoroughly in our country stock market and the impact of income whether for investors or the government regulators have far-reaching significance. This paper considers the emotional transmission process based on the models of infectious disease and rumor transmission.

2. Literature Review

Previously, Li and Ma [1] discussed the influence of government punishment and individual sensitivity on rumor propagation and took into account some rumors related to hot events. The results showed that increasing the severity of government punishment and individual sensitivity could effectively control rumor propagation. [2] believes that compared with educated people, uneducated people have a great chance to receive the information. He investigated the influence of education level on the final scale of the rumor, and concluded that the more educated people inside, the smaller the final scale of the rumor. [3] considered the global asymptotic stability of neutral inertial BAM neural network with time-varying delay. Using the theory of variation and homomorphism, a suitable lyapunov functional is proposed. Based on the matrix equation, the delay correlation sufficient conditions for the existence and global asymptotic stability of a class of neutral inertial BAM neural networks are established. [4] established a rumor propagation model considering the proportion of the wise in the crowd, believing that the velocity of rumor propagation is a variable that changes with time in our model.

[5] extended the SIR information propagation model to analyze the influence of network structure on rumor propagation when considering group propagation, and studied the basic reproduction times of rumor propagation in the model, indicating that rumor propagation with larger groups is more effective than with more groups. In the small world network, [6] studied a rumor propagation model that considered the change of forgetting rate over time. The larger the initial forgetting rate or the faster the forgetting rate, the smaller

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the final size of rumor propagation. The numerical solution also shows that the final scale of rumor propagation is much larger under the variable forgetting rate than under the constant forgetting rate. [7] studied the influence of rumor control measures on rumor propagation through numerical simulation, and proposed the method of crisis management. [8] proposed a dynamic model of rumor propagation I2SR, considering that each communicator in the network rotates between high active state and low active state according to a certain probability. Considering that exposed nodes can become removed nodes at a rate, [9] presented a new SEIR model of rumor propagation on heterogeneous networks. [10] proposed I2S2R rumor propagation model with general correlation function in homogeneous network and I2S2R rumor propagation model in heterogeneous network. The dynamic model of rumor propagation I2S2R is established in homogeneous networks, and the free equilibrium problem is discussed by taking two general correlation functions into consideration.

[11] considered the different attitudes of individuals to rumor propagation, analyzed the local and global stability, balance and rumor existence balance of rumors, and found that those who hesitated to spread rumors had a positive impact on rumor propagation. [12] proposed a time-delayed SEIRS epidemic model with changes in pulse inoculation and total population size. The results show that short - time or large - pulse vaccination rate is a sufficient condition for disease eradication. [13] proposed a non-markov model to describe the complex contagion adopted by a sensitive node that must take into account social reinforcement from different levels and neighbors. [14] study the kinetics of double the spread of rumors and at the same time, this paper introduces the two double rumor spreading model: DSIR model and C - DSIR model. Provided by the state vector expressions and double rumors spread mechanism, introduced a select parameters θ to express differences attractive, results show that the new rumors the start time of the closer it gets to the best of time, so the more strongly they depend on each other. By analyzing the characteristics and modes of rumor propagation with forgetting effect, [15] established a class of SIRS rumor propagation model with time delay in scale-free network environment, and calculated the basic regeneration number in the propagation process. [16] studied the stability and Hopf branch of a SEIR pollution-infectious disease model with time delay, saturated infection rate and saturated treatment function, and analyzed the local stability of disease-free equilibrium and endemic disease equilibrium by means of eigenvalue theory and routh-hurwitz criterion. Meanwhile, the delay is taken as the branch parameter to obtain the conditions for the existence of Hopf branch. [17] systematically sorted out several classical models of infectious diseases and derived several methods for the basic regeneration number of infectious diseases models.

[18] studied the threshold dynamics of a random time-delay SIR epidemic model with immunization, and obtained sufficient conditions for the extinction and persistence of the pandemic. [19] expressed concern about the asymptotic nature of transient immunity in the stochastic delayed SIR epidemic model, and obtained the threshold between the average persistence of epidemic and extinction. [20] studied the effects of vaccine immunization and out-group migration on the transmission behavior of SIR infectious diseases. [21] proposed a novel SIR model, in which both delayed infection and non-uniform transmission are considered as two factors influencing the disease transmission behavior.

However, considering the pulsed interference of external information on investor sentiment, as well as the double delay of disseminators and resisters, no comprehensive research has been conducted. Here, we will solve these problems to find out more influential factors affecting the spread of investor sentiment.

3. Model Description

Based on the original SIR rumor spread, the former takes into account the different attitudes to the spread of the disease, which will be divided into groups (E) the ignorant people who don't understand (for), (I) communicators (accept rumors spread information and to the people around), and the resistance (R) (know rumours but refused to surrounding people spreading rumours) here for emotional communication in the process of financial investment investors can be divided into three categories of people: did not receive some kind of mood of the person (S) that is susceptible people; the person who receives an emotion and transmits it (I) is the transmitter; the person who refuses to spread the emotion (R) is the person who resists it. In the traditional rumor propagation model, time delay is added:

(1) In the process of communication, communicators(I) have propagation time delay δ due to delayed communication or information transmission speed.