

# ABSTRACT

## SIMULATING FINANCIAL MARKETS USING ISING MODEL

Physicists use a two-state model (+1 and -1) called the Ising Model to study a variety of physical phenomena, including the behavior of magnetic materials. A material is broken up into a lattice of spins where it is then possible to model how each individual spin, as well as the entire lattice, is effected by different external and internal factors. We will adapt the same model to financial markets. By simplifying a market into a similar two-state model, we will treat each market agent or stockholder as a spin in the lattice. Each agent is able to buy (+1) or sell (-1). The agents will be influenced by their nearest neighbors as well as an overall magnetization of the market. Using computer software we were able to implement the modified Ising Model to create hypothetical stock data. In order to know if the computer simulations are correctly modeling what actually happens in the stock market, we will analyze characteristics found in actual stock data; namely a fat-tailed distribution of returns, slowly decaying autocorrelation of returns, and volatility clustering. The purpose of this research is to show that the Ising Model is able to effectively model financial markets and identify some of the key factors that influence financial markets. We will use data collected from the “**S&P 500**” stock over the past 30 years to cross analyze with the data created by the Ising Model