Efficient Market Hypothesis from the perspective of deep learning - An Indian context

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Abstract

1. Domain Background

Financial forecasting is a complex subject as pricing of an asset class depends on a number of factors. The main focus of this Capastone project is the analysis equity and derivatives pricing of Indian market using deep learning methods. The objective of this project is to conduct a thorough experimental analysis of the various financial theories like Efficient Market hypothesis, Adaptive Market hypothesis and Fractal theory in Indian context.

There has been quite a few economic theories about market pricing of which efficient market hypothesis(EMH) is the most accepted and widely practiced one[1]. EMH poses that all the available information is fully and instantly incorporated by the markets in its pricing. Thus any analysis, both technical and fundamental to predict the future direction of prices is fundamentally flawed. If any anomalous behaviour exists in the market which enables a market participant to profit, such patterns decay over time.

2. Problem Statement

A robust definition of EMH can be posed as below following Timmermann and Granger (2004) [2],

"A market is efficient with respect to the information set Ω_t, search technologies S_t, and forecasting models M_t, if it is impossible to make economic profits by trading on the basis of signals produced from forecasting model in M_t defined over predictor variables in the information set Ω_t and selected using a search technology in S_t."

There are three forms of efficient market hypothesis, weak form which proposes that the information set is limited to past price and its associated statistical parameters. In semi-strong form of EMH the past price of the trading instrument and also the publicly available information about the instrument is included in the information set and in strong form, the information set contains all the public and private information about the instrument.

While there have been many studies to test the EMH on the past data of stock and index prices using machine learning forecasting models, they are predominantly limited to US and European financial markets. The results of these experimental studies are mixed but few poses a challenge to EMH which demonstrates that there are predictable patterns exist in the past which enables a market participant to profit from.

3. Data Sets

The information set to be used is the index data of NIFTY 50 which is a weighed average of 50 Indian stocks and Bank Nifty, an index which represents the banking sector. The initial input data set which is attached contains 1min, 5 min and 10 min OHLC data of Nifty, Banknifty, State Bank of India and Reliance future contracts traded in National Stock Exchange(NSE), India.

4. Solution Statement

The study proposes to test the weak and semi-strong form of EMH and fractal theory in the Indian financial markets by constructing neural networks.

The search technology S_t is the higher Sharpe ratio which is the ratio of returns to risk. To test semi-strong from of EMH, the economics parameters like GDP, USDINR rate, interest rate will be used. The objective of the study is to check whether the market is efficient in the Indian context and to check if there any predictable patterns that exist for a long time in the financial markets.

Keywords: Deep learning, Financial time series, Machine learning

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