

# To Study Trading Rules Using Biclustering in Financial Market

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**Abstract:** As capital growth increased, trading system plays important role in world. Technical analysis analyses price, volume, and market information. Price patterns and market trends are analyzed by technical analyst for investing capital in financial market and these patterns are useful to take right decisions for making investments. For taking such a decisions, it needs to analyze the price movement and provide trading rules to guide investors, so that they can take correct trading decisions. For analyzing and trading decisions, the paper proposes to implement Biclustering mining to discover effective trading rules that contain a combination of indicators from historical financial data series. Biclustering is a clustering algorithm because it clusters the data along the row and the column simultaneously in a 2-D data matrix. The trading rules can be divided in three trading actions (buy, sell, and no-action signals). For optimizing the trading rules we proposed particle swarm algorithm. By particle swarm algorithm we get optimized rules which help investors for investing finance in market and also take right actions.

**Keywords:** Biclustering, Particle Swarm, Trading Rules.

## I. INTRODUCTION

Data mining is the process of analyzing data from different views and summarizing it into useful information - information that can be used to grow revenue, cuts costs, or both. Data mining is one analytical tools for analyzing data. Data mining is also the process of finding patterns among large number of fields in large relational databases.

### 1.1 Overview of Stock Market

Accumulation of buyers and sellers of stocks is stock market. Trade in stock markets means the transfer for money of a stock from a seller to a buyer. It requires two parties to agree on a price. Participants in the stock market can be individual stock investors to huge traders investors, they can be anywhere in the world. Stock speculation is a risky and hard occupation because the price movement of the markets is unpredictable. A stock trader also conducts research and observes how financial markets perform. This is accomplished through industry specific technical analysis to track asset or corporate performance. Therefore, it is great benefit to analyze the price movement and provide trading rules to guide investors.

### 1.2 Trading rules

A critical part of any options of trading system is the trading rules. These rules define what to trade and what to not, regarding trading a particular strategy. The trading rules cover such things as:

What to trade - what stock

When to trade - under what conditions

When to enter a trade - any technical indicators for entry

When to exit a trade - rules that are locking in a profit or minimizing a loss.

## II. RELATED WORK

In the recent research, different techniques used for having result of stock market Qinghua Huang, Ting Wang, Dacheng Tao [1], this paper innovatively proposes the biclustering mining to discover effective technical trading patterns that contain a combination of indicators from historical financial data series.

J. J. Murphy [2], in this technical analysis aims at devising appropriate trading rules in the stock market. It studies the historical data, primarily price and volume, to forecast the direction of prices and make trading decisions based on the predictions.

Y. Cheng and G. M. Church [3], the term biclustering was first used in gene expression data analysis. An approach known as mean squared residue score (MSRS) was introduced to assess the coherence of the elements of a bicluster.

Q. Huang[4], In this paper they proposed biclustering algorithm to find a subset of indicator with different periodic parameters which produce similar profitability for subset of trading points from the historical time series in the stock market.

Ting-Liang Wang; Min Wang [5] a novel trading system is developed in this paper. The trading system combines particle swarm optimization based on clustering method and basic financial rules to discover the potential features of high frequency financial data.

## III. IMPLEMENTATION METHOD

### A. Biclustering Algorithm

Biclustering is one of the best clustering algorithms, because it clusters the data in 2-D data matrix i.e. data

along the row and the column simultaneously in a data matrix. Bi cluster will find semantic relationship between clusters, rows and columns. A sub-matrix with a coherent pattern in a data matrix is called bicluster.

**B. Particle Swarm Algorithm**

In particle swarm optimization (PSO) is a Optimization technique. In PSO, the potential solutions, called particles, goes through the problem space by following the current optimum particles. Each particle keeps track of its coordinates in the problem space which are correlated with the best solution (fitness) it has achieved so far. This value called pbest. "Best" values tracked by the particle swarm Optimizer are the best value, obtained so far by any particle in the closest of the particle. This location is called lbest. When a particle takes all the remaining particle as its closest particle from the space, the best value is a global best and is called gbest.

**C. System Architecture**

**SYSTEM ARCHITECTURE**

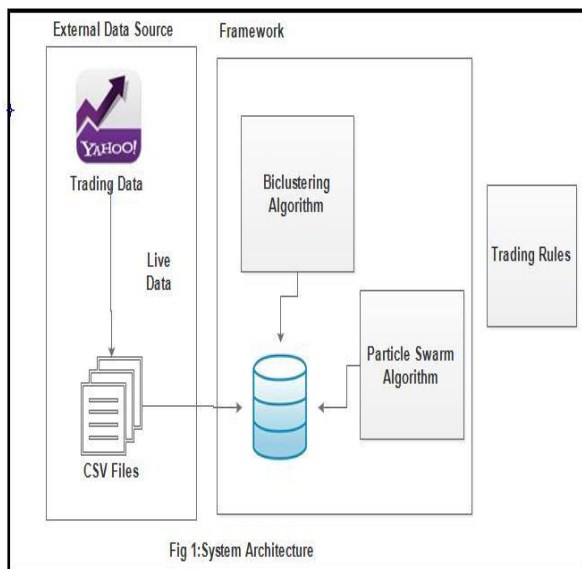


Fig 1: System Architecture

As shown in the figure, the system architecture is divided in two parts (a) External Data source is used to retrieve real time or historical stock data .(b)Framework in this there are biclustering algorithm and Particle swarm algorithm(c)Trading Rules.

Implementation of system as follows:

**Step 1: Input Data Preparation**

Data is retrieve from the external source i.e. Yahoo Finance. For financial composite index, data matrix is constructed using historical data where rows correspond to trading days and columns correspond to technical indicators with different durations. Six technical indicators are chosen for this paper to form the data matrix. They are the Simple Moving Average (SMA), the Relative Vigor

Index (RVI), the Chaikin Money Flow (CMF), COMERICA (CMA), and On-Balance Volume (OBV). With different time lengths associated with each indicator. Table 1 shows the technical indicators with the different periodic parameters adopted in this paper.

TABLE 1

INDICATORS	PERIOD
SMA	7
SMA	15
SMA	30
RVI	10
CMF	21
CMA	
EMF	2
EMF	8
OBV	

Each Column corresponds to single Technical Indicator

	RVI(10)	CMF(21)	SMA(15)	SMA(30)	.....	EMA(8)
02-09-2016						
01-09-2016						
29-07-2016						
	:	:	:	:	:	:
	:	:	:	:	:	:
11-03-1999						

DATA MATRIX

Fig2: Data matrix, each row corresponds to trading day and column correspond to technical indicators.

Since the financial market is dynamic so it motivates to find future return value (FRV) [1] which represents price movement.

**Step 2: Discovery of Biclusters**

We search for biclusters from data matrix that are result of the trading rules. For this we propose biclustering algorithm:

Step1: find similar elements in single column .An agglomerative HC Algorithm is initially performed on each column of data matrix. Threshold is predetermined to measure similarity of elements of each column of data matrix. The detected clusters from all columns are treated as biclusters.

Step 2: Expand each bicluster along the column direction. We process each column one by one .A new column can be added to Bicluster if the newly formed sub matrix satisfies the criterion of MSRS[3].this procedure repeat until bicluster contains one column.

**Step 3: Classification of bicluster**

A bicluster is translated into trading rule .Three types of trading actions occur in stock market, i.e. Buy, Sell, No action. So we classify trading rules into trading set:

- (1) Buy signal set
- (2) sell signal set
- (3) no-action set

To make trading decision we have to know maximum support [1].we get valid trading rules when support is maximum than predefined threshold.

**Step 4: Optimized of trading rules**

For optimizing of trading rules we use Particle swarm Algorithm. Here we generate random particles and calculate FRV of each particle, it checks whether FRV is greater than threshold if it is than that particle is taken and if the FRV is less than threshold then particles are again randomized. Thus we get optimized rules by using the particle swarm algorithm.

**IV. EXPERIMENTAL RESULTS**

Experimental result were conducted on a4GHz PC with an Intel Core i3 CPU. For the trading rules, the execution time varies with the sizes of the dataset. The algorithm is programmed using JAVA.

TABLE 2

DATASET OF COMPANIES OF STOCKS

Activity Sector	Company	Symbol
Engineering Sector	Wipro	WIPRO
IT Sector	Infosys	INFY
IT Sector	Cognizant Technology Solutions Corporation	CTSH
Industry Sector	Whirlpool Corporation	WHR
Indian Banking Sector	Housing Development Finance Corporation	HDFC
IT Sector	HCL Technology	HCLTECH
IT Sector	Tata Consultancy	TCS
Oil & Gas	Bharat Petroleum Corporation Ltd	BPCL

The TABLE 2 is dataset which is (downloaded from Yahoo Finance [6]) available data. All historical data consists of the opening price, the highest price, the lowest price, the closing price, and the adjacent value for each trading day. We have implemented ten independent runs for each dataset by biclustering algorithm and particle swarm algorithm and graphed the profits gained by particle swarm algorithm than biclustering algorithm.

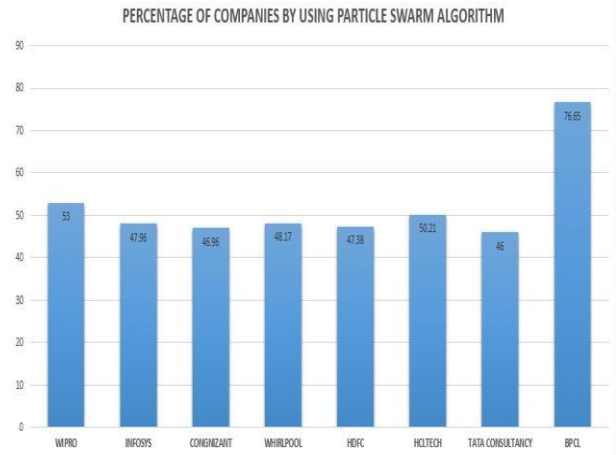


Fig3: graph representation of profit improved by particle swarm algorithm.

Graph demonstrates that the average profits made by the Particle swarm algorithm are better than those made by the Biclustering algorithm on all indices. Where Wipro (53%), Infosys (47%),

Cognizant (45.96), Whirlpool (48.17), HDFC (47.38), HCL technology (50.12%), Tata Consultancy (46 %), BPCL (76.65%).

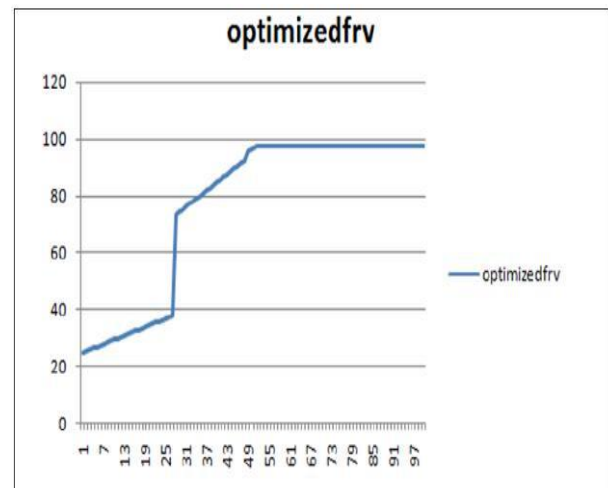


FIG: 4 Optimized Future Return Value.

In this fig: 4 we can see the Future return value is getting optimized by iteration by iteration by particle swarm algorithm.

**V. CONCLUSION**

In this paper, we have use a novel trading method BIC-PARTICLE method to discover trading rules based on a combination of technical indicators in financial markets. Six active technical indicators (EMA, CMA, OBV, SMA, RVI, and CMF) with different time span parameters and future returns are incorporated to form a data matrix. The biclustering algorithm is designed to discover the bicluster with constant column in data matrix. The detected trading

rules are regarded as buy, sell, no action signals. The Particle swarm algorithm is used for getting optimized trading rules. The results demonstrate that our method significantly outperforms its counterparts.

## VI. FUTURE SCOPE

Furthermore, the implemented method is a framework that can be extended to add more technical indicators, different time spans and trading terms, which makes it a general and flexible model for investors in various financial markets. The intelligent learning algorithms (e.g., multi objective GP [7] or particle swarm optimization algorithm) will be applied to find the optimal parameters With respect to the metrics of profit ratings. If the data is constant then we recognize the pattern.

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## BIOGRAPHIES



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