

# Trading Strategy based on Grey Clustering in Financial Bear Market

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## Abstract

In this research, we propose a new trend indicator - WDDF, in order to split the bear sectors of TAIEX. Besides, some technical indicators such as 6K, 5RSI and 6RWMS are employed to determine the risk levels by using the Whitening Functions. Finally, a series of feasible solutions with low risk and high profit would be developed by combining various short-term strategies for position control and then beat the market. That is, we can not only predict the market trend by modeling market behaviors, but also make profit steadily by applying some trading strategies.

**Keywords:** TX, Grey Clustering, Technical analysis

## 1. Overview

### 1.1 Research motive and background

In recent years, the domestic financial markets have been gradually opening up which results in diverse financial products. Investment targets also become various. Taiwan Futures Exchange (TAIFE) was thus established in 1997 and introduced Taiwan stock exchange capitalization weighted stock index futures (TX) in 1998 to satisfy the demands of financial markets. However, futures exchange reveals the characteristic of high leverage, and gaining or losing profits is accumulated in multiple. The trading strategy of related products of futures exchange is relatively complicated. Therefore, the investors who expect to obtain excess profit or avoid risks via futures must possess a set of trading strategies. Via the means of artificial intelligence and historical information, a set of trading strategies would be developed in this research which is suitable for Taiwan Futures. The research initially employs a new technology index to determine the short trend of the market and then proceeds with the operation of trading strategy in order to obtain profits.

### 1.2 Bearish Market

Among futures markets, bear market is constructed by a series of constant slumps. Each period of slump keeps on dip into red of the previous low. The bouncing tendency among them cannot break though the high point of the previous bouncing tendency. In other words, the high point and low point are getting lower. There are three stages with respect to this phenomenon: At the first stage, the price fails to advance up to high point for several times. However, the investors still have faith and generate great trade volume. At the second stage, the price slumps substantially which results in serious pressure of listing the company following the first stage. At the third stage, the bear market ensures passive situation. The considerably slumped price dips into transverse arrangement. This research focuses upon the band operation of bear market, especially large band which can control the short sale. The research totally complies with the principle of gaining more and losing less and combines two kinds of operational rules: short sale and offset.

### 1.3 Grey Clustering

Professor Teng Chu-lung's Grey System Theory mainly focuses upon incomplete messages in order to speculate the relationship among their factors [1][2]. Grey clustering observes several measurement metrics of the research targets and generally analyzes the categories of the targets. Generally speaking, the process can be divided as four steps [3]:

- (1) Setting up whitening value of cluster
- (2) Ensuring whitening function of grey cluster
- (3) Obtaining clustering weight
- (4) Obtaining clustering coefficient

Based upon the above method, this research divides the risks of short-term operation into high, medium and low levels and further complies with partial control in order to reach the goal of acquiring the profits.

## 2. Research method

### 2.1 New technical indicator WDDF(WRSI DUpD DUpPer Filter)

This research combines the analysis of technical indicator [4]-[6]. With experiment rules, it develops a new technical indicator WDDF which recognizes that the market is bear market.

$$FBI(n,m) = [(n-1) * EMA[mWRSI(t-1)] + mWRSI(t)] / n$$

If  $FBI(20,40) < 0$  then Bearish-market

FBI : Futures Bearish index

In the bear market, the saying of “managing the short sale instead of obtaining more profits” stands as the fixed principle. However, in fact, when bear market is confirmed, one tends to lose most of the profits of individual stock and index short sale [7]. During the process of confirming the bear market, it will generate various temporary or fake signals. It is considerably urgent to control the forming and ending time of the short sale. Therefore, our research establishes a rule base. According to these rules, the research proceeds with the screening of mixed signals.

- (1) If  $FBI(40,20) \leq 20WRSI$  And  
Endprice < 60MAP then Bearish
- (2) If  $6DUpD \geq 3$  then Bullish
- (3) If  $10DUpPer < 0$  then Bearish
- (4) If  $12DUpPer > 0$  then Bullish
- (5) If  $[EndPrice(t) - EndPrice(t-1)] / EndPrice(t-1) < -0.035$  then Bullish

$$nDUpD = \sum_{t=n}^t UpDay(t)$$

$$nDUpPer = \frac{TSI(t) - TSI(t-n)}{TSI(t-n)}$$

$$Let \begin{cases} UpDay(t) = 1 & \text{if } DIF(t) > 0 \\ UpDay(t) = 0 & \text{if } DIF(t) < 0 \end{cases}$$

TSI: Taiwan Stock Index at time t

$DIF(t) = TSI(t) - TSI(t-1)$

## 2.2 Trading Strategies

The research uses two kind of trading strategies: tendency control and risk classification. The crucial factor of obtaining high returns in futures market is as follows: one must possess careful capital management, efficient trading means and the capacity of trading according to the suggestion of system. As long as the investors remain severe discipline and stabilize their emotion, they can successfully grip stable and long-term profits.

- (1) Tendency control: The research controls the short sale tendency of Large-Cap via WDDF.
- (2) Risk classification: Based upon Grey Clustering, the research divides the risks into high, medium and low levels.

The research regards technical indicators 6K, 5RSI and 5RWMS as cluster indicator[8]. Via Whitening Function of grey clustering, the risks are classified into high, medium and low levels. The responded

levels of short sale are low, medium and high levels as figure 1:

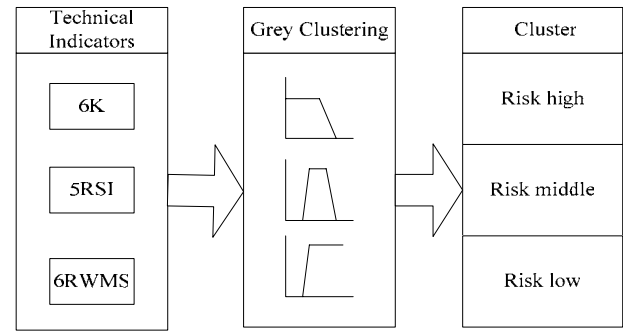


Fig. 1: Conceptual figure of risk control procedure

According to the signals, the research proceeds with partial control of bear market and offset.

### (a) Sell Strategy

The operational strategy based upon NGNA(no-gain-no-action)

1. If profit = 4% then Raise the price
2. If profit = 7% then Raise the price again

See figure 2:

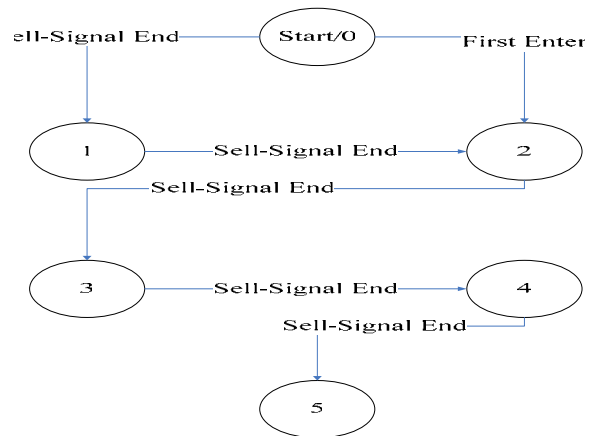


Fig.2: State figure of short sale

### (b) Clear Strategy

1. When the stock bounces 3% from the lowest, buy back
2. When the stock bounces 5% from the lowest, buy back
3. When the stock bounces 6% from the lowest, all offset

See figure 3:

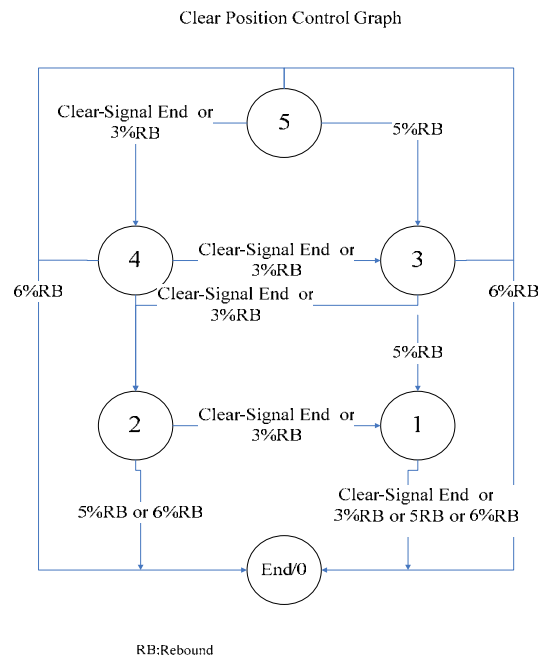


Fig. 3: State figure of offset

### 3. Experiment result

The research employs the Large-Cap information from 1996/10 to 2001/12 as training data, and the testing data is the Large-Cap information from 2002/1 to 2004/10. Figure 4 reveals four zones: (1) Large-Cap index (2) short sale signal (3) offset signal (4) WDDF signal. From figure 5, one can recognize that the large band of short sale can be controlled by the new technical indicator WDDF developed by our research. According to profit curve of the figure, table 1 and table 2, one can realize that total profit reaches 66%. There are totally 15 times of trading, and among them, there are 10 times in which one obtains the profits.



Fig. 4: Figure of signal

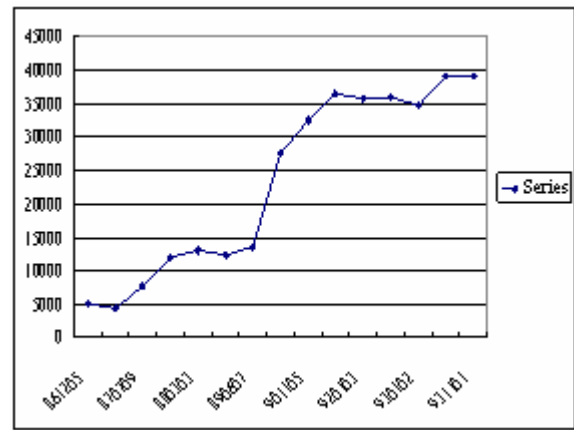


Fig. 5: Profit Curve

Table 1. Yearly Evaluation Table

Year	Highest	Lowest	Profit	Range	Profit/year
1996	7084	6357	0	727	0%
1997	10256	6789	5070	3467	146.20%
1998	9379	6220	6877	-3159	217.70%
1999	8711	5423	419	3288	12.70%
2000	10394	4556	1210	-5838	20.70%
2001	6198	3412	18969	-2786	680.90%
2002	6485	3846	3914	-2639	148.30%
2003	6182	4045	-514	2137	-24.10%
2004	7135	5255	3078	-1880	163.70%

Table 2. Evaluation Table

Simulation	851018~	avg win/avg loss	6.34
Date Range	931031	Profit Factor	12.69
Total Net Gain	39023	Total Net Profit%	504.05%
Gross Profit	42360	# of trades/Month	.1 次
Gross Loss	-3337	Average trade(win & loss)	2602
Percent profitable	66%	Average winning trade	4236
Largest consec. winning trade	24093	Average losing trade	-667.4
Largest consec. losing trade	-1147	Max consec. Winners	4
Total # of trades	15	Max consec. Losers	1
Total # of winning trades	10	GrossGain%	558.67%
Total # of losing trades	5	GrossLoss%	-54.62%

## 4. Conclusion

This paper combines two mechanisms for trend-based classification and risk clustering to construct a trading model which is suitable for bear market. Based upon the analysis of experiments, one can conclude as the following: First, WDDF can successfully split bearish market sectors. Second, we can use AI-based model to confirm trading points to obtain more profit with low risk. Finally, the research employs the method of trial-and-error to set up the parameters. In the prospective research, one can use the means such as Neural Network and Fuzzy system to search for the best combination of parameters.

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