Applying "Dominated Rules" theory for a Better Result on Stock Market

Finding a Way to Make Profit on Vietnam Stock Exchange

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Abstract—getting money from the financial markets is always the subject for many scientists to follow. It is like "turning stone into gold" for the ancient alchemists. There are some old (published) investment models which are successful at their time, bring fortunes to their owners. However, up to these days, there are no system stand still along the time. Applying the strength of computer science, this paper proposes the theory of "Dominated rules" and explores a combination method of technical analysis and PSO algorithm to create a system, which can calibrate itself to overcome the unpredictability of the market.

Keywords—Stock Market, Vietnam, Auto-calibration, Dominated rules, algorithms, PSO, random walk, technical analysis.

I.   THEORICAL BASIS

A. The Q1 Theory of "Dominated rules"

Stock market is considered as chaotic system which includes many participated actors (personal traders, funds, government…). These actors will follow their different operational regulations (rules) to cause changing price (price action) on the market.

At the time t, we will have n actors working under m rules. One actor under one rule will make one price action. The sum of all price action will form the price of the stock at time t.

We have:

(1): $\quad A_i \xrightarrow{\text{Rule } j} \Delta P_{tij}$

With

Ai: one actor in the market

Rule j: the operational rule with Ai follows

Ptij: the price action (or the changing in price) by applying rulej on Ai

We also have

(2): $\quad P_t = \sum \Delta P_{tij}$

With Pt is the Price of the stock at time t.

According to (1), we can see Rulej as a function by t: f (t).

Apply to (2), we can have:

$$P_t = f_1 (t) + f_2 (t) + ….$$

The Q1 theory of "Dominated rules" said that:

> At t, price action will suffer the most significant impact from some rules f (t). Such rules is referred as "dominated rules".
>
> Additionally, these rules will change over time.

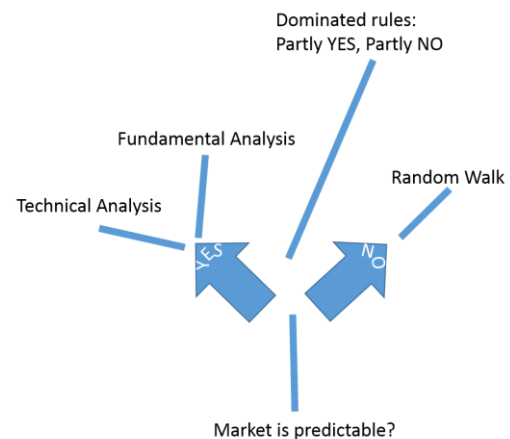### B. The View-Point of "Dominated Rules" theory on the stock market

Fig 1. View-point of "Dominated rules"

1)   Two main points of view on the stock market

a)   The market is predictable

This is the core principle of Technical Analysis (and Fundamental Analysis). History is likely to repeat itself regards to the price movements. The chart patterns in Technical Analysis are applied to analyze price movements based on historical price. This technic can be used to estimate that how price will move in the future. Additionally, there is a close relationship between the repetition of price movements and psychological market, and investors are predicted to react the same way to similar events happening in the future.

b) The market is unpredictable

One of the pioneers is "Random Walk" theory – Burton Malkiel. The core content of "Random Walk" theory:

- "Random Walk" theory supposes that the fluctuation of stock price is unable to predict. It means that all Technical Analysis, Fundamental Analysis and other analysis are meaningless.

- "Random Walk" theory is based on the foundation of perfect market. It means that all information reflects in market movements.

- However, by applying "Random Walk" theory, probability and algorithm, investors totally are able to win the market.

One of the most typical representation of this theory is the establishment of Passive Funds which are mainly operated by Index (for example: buy a basket of all companies following FTSE, and keep over the time). At this moment, these funds are growing popular and they are being successfully operated.

2) The view-point of "Dominated Rules"

a) History does not repeat:

What (price actions) happened in the past, does not mean that they will occur in the future. The volatility on stock market arises under the influence of many "rules" from many actors. The market only acts likely the past when the dominated rules in the past still existed.

History never repeats because of the set of rules (including dominated rules and non – dominated rules) that appeared in a time will never be similar with the set of rules in other times.

b) What happen on stock market are only pseudo – random

The price volatility occurring at one time is caused by all rules existing at that time caused. Additionally, since the investors are unqualified to recognize all rules, they see that price volatility is random. If human is able to see the actions of all actors, causes and consequences (rules) affecting to market at one time, price volatility is completely predictable.

However, whether human is completely unqualified to understand all rules on market at one time, they could follow the traces of "dominated rules" in order to predict nearly accurate at that time.

To be specific: one dominated rule: "if the information of a listed company is issued negatively, the stock price will more likely be decreased". Sept-2016, Samsung warned globally its customers not to use Note 7 mobile phone because of the risk of it catching fire. If an investor get the information as soon as it published, he can quickly go short on the company's shares to take profit. As a result of the rule, Samsung had lost £ 11 billion of its shares after the information released.

C. One approach to investing on stock market with "Dominated Rule" theory

According to the theory, the market will behave nearly the same as the past while the dominated rules still not change. So, we can make a hypothesis that in a short period of time, the dominated rules should not change much. If an investor only focus on short periods of time, he can simulate what happenned the short past to take profit.

Since the Price at time t is purely the sum of all ΔP_{tij}, it will exist a function F (t) performing price action synthesis under the influence of dominated rule at that moment. This function is considered as "distinct characteristic" of stock in order to create price action. At a time, we may find a function ω wich is close to F.

The investor can follow the strategy bellow (will call "auto-calibration strategy" or A.C afterward) to form a system:

1) Create function ω:
Choosing a technical analysis (T.A) tool (indicators, osccillators), creating a trading system which allows to execute buying and selling orders.

2) Estimate how close of function ω to the stock's "distinct characteristic":

- Find the near-close parameters: using back test to find which parameters allow ω to get most profit in the past. The back test's period should be short, since what's the project want to find is tracing the "dominated rules" a time. "Dominated rules" will be changed, if the test's period is too long, it may fail to trace.

- Forward test the parameters to make sure that ω still right at the time.

3) Calibrate after a working time:
Do step 2 again after a period of time, to see if we will keep ω or change it since the "distinct characteristic" was changed.

II. EXPERIMENT
According to the above approach, an expriment will be applied on Vietnam Stock Market with the use of PSO Evolutionary algorithm to find ω's parameters.

A. Vietnam stock market introduction

The Vietnam stock exchange is a rather small and new market. Starting from 2000, the market capitalization at March 2018 is more than 80 billion US Dollars (Ho Chi Minh Stock Exchange - HOSE + Hanoi Stock Exchange - HASTC) in comparing with 19.6 trillion of NYSE or 4.27 trillion of Shanghai SE (stockmarketclock, March 2018).

1) Some highlight characteristics of the Vietnam market

a) The market of private investors:

According to Vietnam Securities Depository (VSD), up to 31/3/2018 the number of private investors' accounts have overwhelmed compared to institutional investors' accounts, with 2,000,313 accounts in comparison with 11,651 accounts (99.42% as opposed to 0.58%).

Most private investors do not trade by computer system. They trade with their own private analysis. There are (officially) no public framework for computer systems to trade automatically. Which means the market price is changed mostly by human decisions. Thus, the subject (Vietnam Market) will not "act" such fast as market with participating of different computer trading systems.

b) The T+2 rule:

T+2 is the amount of time which investors must hold stock at least 3 days. For example, after matching orders on Monday, investors must wait until on Wednesday is T+2, stock will appear at customers' account and on Thursday investors have a right to sell their stock and the rule is also similar to the process of selling stock and waiting money back to the account.

c) No short selling and the 7% cap/10% cap for price changing:

Short-selling has not been accepted in the Vietnam stock market by Ministry of Finance. At Ho Chi Minh Stock Exchange – HOSE, the stock price is merely accepted to range the maximum of 7%, while at Hanoi Stock Exchange – HASTC, stock price is also accepted to range the maximum of 10%.

2) Conclusion on research subject

After the characteristics of Vietnam Stock Market, we can see that Vietnam stock market is a suitable object to conduct the research for these following reasons:

- The scale of market is small enough. The number of participants are mainly private investors, making decisions depend on human's feelings and it does not rely on computer algorithm. Additionally, no institutions are large enough to dominate market. Thus, no actors are able to create for their own dominated laws in long term.

- "T+2", not allower for short-selling, and cap ranging from 7% - 10% makes the market to be less likely to fluctuate in a short term, so abnormal changes which are far different from the other will be easily tracked.

B. PSO Evolutionary algorithm

With the need of finding the near-close parameters for ω, there are many mathematical caculations need to be done, even with the strong computers. Sometimes, it makes computing process to be impossible. Thanks to the evolutionary algorithm, the number of calculations is cut down the most, which makes our process to find ω be possible again.

1) Description

According to Dr. Eberhart and Dr. Kennedy (1995), Particle Swarm Optimization – PSO was defined that a population which is mainly based on the method of stochastic optimization. This technique was developed from swarm intelligence and it is observed from the behavioral movement of bird flocking and fish schooling. This theory means that during finding food, the birds tend to choose following the flock or scattered distribution before determining the food location. In the process of finding food, there is one bird which has a good ability of smelling food and it will support to hunt and inform to other birds as soon as searching a potential food resource. If it finds good information, it will announce this good information to bird flocking where food resource is found and the flock of bird will immediately move to food resource. Therefore, there is a close relationship between PSO and bird swarm, in this circumstance, the factor of bird's movement to food location means that there is a good progress in swarm solutions, good information means that solutions for swarm is in optimistic situation and food resource is the most optimistic outcomes for the whole issue. Thanks to each individual's cooperation, optimistic solutions is successfully executed by PSO algorithm. This model shows a coherent combination among particles and it can successfully solve complicated optimistic issues.

2) Algorithm

- Generate particles swarm in the search space.

- A fitness is appropriate with each particle.

- Particles' moving rely on their own experience and that of swarm.

- Based on cooperation among particles, they are possible to have a convergence.

There are four positions (A, B, C, D) in the fig.2 bellow, if we follow A, it will show the best performance of the particle. In the case of following B position, we will receive the best performance of the swarm. Another case is that if we choose to follow C position, it will illustrate the point which is approached to the current velocity. Lastly, we can create a D position by combining three positions namely A, B and C.
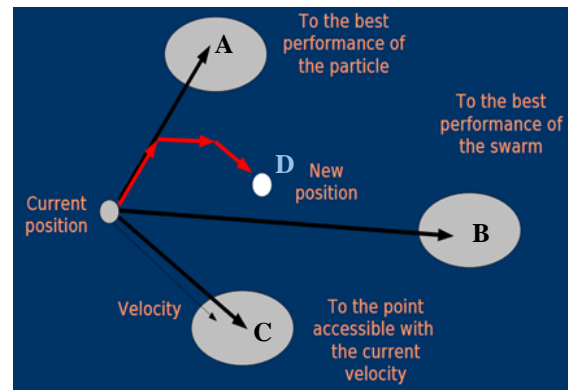

Fig.2: The description of PSO evolutionary algorithm model
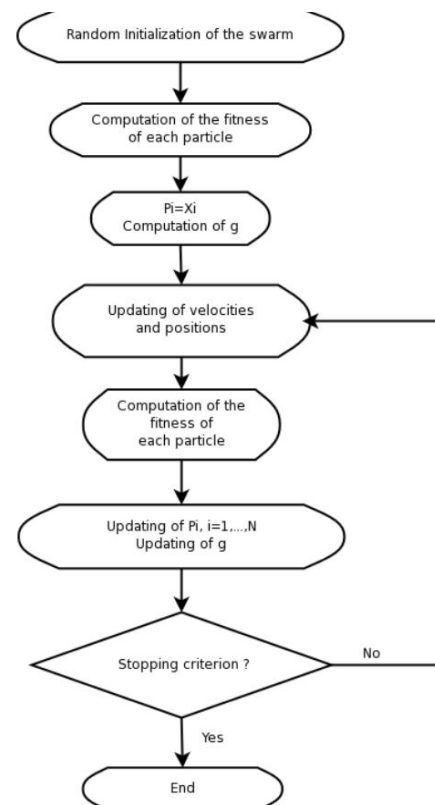
The Fig.3 describe specific steps of PSO algorithm

Fig 3: Steps of PSO evolutionary algorithm model

C. Experiment

1) Function ω

As the project's purpose is to verify "Dominated rules" theory, we take a simple algorithm with MACD for function ω.

The system will buy when MACD go-up its signal line, sell when MACD go-down its average signal line.

```
mfast = Optimize( "MACD Fast", 12, 8, 16, 1 );
mslow = Optimize("MACD Slow", 26, 17, 30, 1 );
sigavg = Optimize( "Signal average", 9, 2, 20, 1 );


Buy = Cross( MACD( mfast, mslow ) , Signal( mfast, mslow, sigavg ) );
Sell = Cross( Signal( mfast, mslow, sigavg ), MACD( mfast, mslow ) );
```

Parameters will be: the fast period of MACD, the slow period of MACD, and the period of average signal line (mfast, mslow and sigavg).

2) Auto calibration algorithm (AC):

a) Study on price action on 1 year before (year α) to get the best parameter for this year. It means that in this year, these parameters will make our function ω closest to the "charateristic" F (t)

b) Take these parameters for ω and run for 1 next year (year β) to see wheter its work good or not. If the system works well, means that the "rules" not change much, else there are some changes happened.

c) Repeat step a, untill all years tested.

In the experiment, Auto calibration algorithm will be conducted experiment in the period of 10 years from 2008 to 2017. In this 10 years, the first year – 2008 (from 1/1/2008 to 31/12/2008) will be used to create input data. Thus, the experiment data will be available in 9 years from 2009 to 2017.

3) Result

On figure 4, there are 3 different experement result:

- Trading system with Auto calibration algorithm.

- Pure trading system without Auto calibration algorithm: MACD as described, with fix mfast = 12, mslow = 26, sigavg = 9 (standard inputs from T.A).
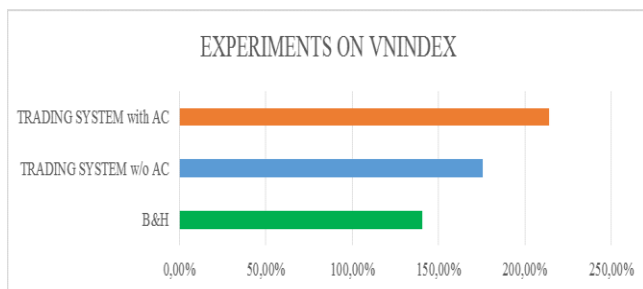
- Simple Buy&Hold.

Fig.4: Experiment on Vnindex

Over the period 2008-2017, if the system starting with 100% money, it will inscrease the position to

- Buy & Hold: 140%

- Without AUTO-CALIBRATION: 175%

- With AUTO-CALIBRATION: 213%

After the experiment's result, it's easy to see that trading with A.C is out performs the trading without and the "buy & hold" way.

III. CONCLUSION

"Dominated Rules" theory is able to be applied to explain the market as well as make the theoretical basis for computer algorithms later, to avoid using "blind" of computer strength, leading to the fact that algorithms cause the random result which is coincident with rules at one time, only work efficiently at a certain time.

Recently, paper has only used two algorithms and it has not profoundly discovered about dominated rules on the market yet. However, the results has been very optimistic. In the future, it is likely to appear many better algorithms which highly adapt with market and they definitely bring a higher profit for their owner.

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	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
TRADING SYSTEM without AUTO-CALIBRATION	79,45%	1,71%	3,07%	12,22%	12,54%	15,90%	17,40%	8,30%	24,90%	175,49%
TRADING SYSTEM with AUTO-CALIBRATION	110,40%	0,30%	4,70%	20,40%	8,90%	16,20%	21,30%	3,60%	28,10%	213,90%
BUY&HOLD	57,90%	-6,26%	-27,66%	17,41%	17,45%	13,60%	17,10%	16,10%	34,90%	140,53%