Chapter 5

Discussions and Conclusions

5.1   Discussions

5.1.1   Comparison between positive and zero mutation rate

The study does not imagine from the beginning that genetic algorithm without mutation will work better than one with mutation. Surprisingly, changing the mutation rate from positive rates to zero makes a huge difference on genetic algorithm's performance. The study found this result accidentally in the sensitivity analysis of the mutation rates. It keeps tracing the results of the algorithm replacing the positive mutation rates by the zero rate.

Good results from an algorithm without mutation are because the mutation usually changes number 0, which means "not buy" to be 1 which means "buy" randomly. If this happens at the wrong time, e.g. a day with high price, then the strategy cannot yield a lower cost than another strategy that is more careful to place number 1 in a day. It is apparent that good strategies are buying on only some days, not many days, to make good profit. Therefore, number 0 is preferable in the strategy than number 1. The less positions of mutation avoid the changing from number 0 to 1 unintentionally.

5.1.2   Comparison between XD dates in the first and second half of the year

XD dates in the first half of the year is superior to the second half by at least two reasons. First, almost all companies pay dividend in the first half of the year even though many of them also pay in the second half too. This attracts more investors to speculate the stock prices in this period more than in the second half. Second, the announcement of dividend payment and XD dates are made longer than in the second half. In the first half, the announcement is around 40 – 50 days before XD dates compared to 10 – 15 days in the second half. This longer period makes investors well prepared for the investment or speculation. With more bidding volumes

from more confident investors, then the price can rise more sharper in the this period than in the second half.

5.1.3 Comparison between 30, 40 and 50 days before the selling point

It is hypothesized that if the genetic algorithm is robust, then the results from the 30, 40 and 50 days before XD dates should not be different. For example, if the regime switching is at 25 days before XD dates, then all the three models should point out similarly that regime switching takes place at day 25.

The results do not confirm this hypothesis. Many solutions from data of 30, 40 and 50 days differ. However, it can be understood that the longer data allows an investor to find a better buying position that lies further from the XD dates. For example, when the model using data of 30 days found that day 25 is the regime switching but the model with data of 50 days may find another lower regime at day 46. This lower regime at day 46 can be lower than the lower regime found at day 25. Technically, it is the multiple regimes, containing more than one lower and one higher regime.

5.1.4 Best buying strategy of each stock

To make it more precise when mentioning the rate of return and to answer the questions when is appropriate to buy stocks before XD dates, this section will calculate the rate of return in equivalent to the annual rate of return. The calculation is the division of the return by average numbers of day that an investor will hold the stocks until selling them before XD dates. Then multiply the number by 260 working days.

The study will show only the investment strategies in the first half of the year. This is because the empirical results show that the first half is superior to the second half of the year. The second reason is that many companies pay dividend only once a year and in the first half of the year. Therefore, the investors will find almost all stocks to invest in this period of time. The third reason is that there are a lot of "no-signal", around 45% of all investment plans, in the second half of the year. Therefore, there may be no buying points that ensure the profit for investors in the second half.

Table 26 Average Buying time and average rate of return (equivalent to the annual
rate of return) of the stocks following the best investment strategy before
XD dates in the first half of the year

Stocks and investment plans	Average out-of-sample profit from the high performance strategies in the first half of the year with zero mutation rate (% per investment)	Average Buying days (Lagged days to buy stocks before selling day*)	Annual rate of return (% per year**)
ADVANC30	2.17	13.2	42.74
ADVANC40	1.43	22	16.90
ADVANC50	3.91	47.5	21.40
CPALL30	5.21	26	52.10
CPALL40	7.10	no signal	N/A
CPALL50	9.72	49	51.58
CPF30	5.02	25.5	51.18
CPF40	13.75	38	94.08
CPF50	17.02	no signal	N/A
IVL30	2.30	no signal	N/A
IVL40	25.35	no signal	N/A
IVL50	43.78	48	237.14
KBANK30	5.83	no signal	N/A
KBANK40	5.86	34.2	44.55
KBANK50	9.58	49	50.83
PTT30	2.96	15.5	49.65
PTT40	3.08	19	42.15
PTT50	3.09	21.8	36.85
SCC30	7.27	24.6	76.84
SCC40	7.60	26.2	75.42
SCC50	7.72	47	42.71
TCAP30	14.48	no signal	N/A
TCAP40	18.78	38.5	126.83
TCAP50	18.72	43.5	111.89

Note: *The selling day is the last day before XD dates.

**Calculation by (Average out-of-sample profit/Average buying days)×260 working days

***Mutation rate is zero

All the eight stocks are profitable for the investment before XD dates
in the first half of the year. Good stocks for the short-term investment which an
investor will buy and hold the stocks around 15 days until the selling day before XD
dates, are ADVANC and PTT. For medium-term investment, 16 days to 30 days are

CPALL and SCC. The stocks for the long-run investment that an investor must buy more than 30 days prior to the XD dates are CPF, IVL, KBANK and TCAP.

The rate of return is attractive with more than one hundred percent per year in two stocks, IVL and TCAP. CPF yields the return almost up to 100 percent. SCC is also good for the investment with its 76 percent of the return. Other stocks yield around 50 percent. For all stocks, the annual rate of return is around 76 percent. The average buying days are around 31 days before the selling day.

Table 27 Summary of best strategies for buying stocks before XD dates in the
first half of the year

Stocks	Average buying days before selling day*	Duration of holding the stocks until the selling day	Annual rate of return (% per year**)
ADVANC	13.2	Short	42.74
CPALL	26	Medium	52.10
CPF	38	Long	94.08
IVL	48	Long	237.14
KBANK	49	Long	50.83
PTT	15.5	Short	49.65
SCC	24.6	Medium	76.84
TCAP	38.5	Long	126.83
All stocks	31.2		76.89***

Note: *The selling day is the last day before XD dates.

**Calculation by (Average out-of-sample profit / average buying days) $\times$ 260 days

*** Geometric mean

5.1.5 Performance of genetic algorithm for detection of regime switching

Sudtasan and Suriya (2012) found in the detection of regime switching before the year end that the performance of genetic algorithm is low, around 37% of the highest potential profit. This study breaks this record when finding the performance of 62% when applying the algorithm with zero mutation in the first half of the year.

The most influential reason why the study achieves such a higher performance is that the zero mutation rate. When applying the rate of 0.30, the performance is around 37% which is quite similar to the work of Sudtasan and Suriya;

their work applied the mutation rate of 0.50. Then it can be seen that the performance is affected enormously by the different mutation rates.

5.2 Conclusions

This study applies genetic algorithm to detect regime switching of eight stock prices before XD dates both in the first half and second half of the year in the Stock Exchange of Thailand.

It reveals that regime switching does exist for stock prices before XD dates only in the first half of the year. For the second half of the year, the switching can be seen but not as clear as in the first half.

XD dates in the first half of the year are more attractive than those in the second half in terms of its highest potential profit, the clear buying signals for all eight stocks and the yields that can be made by following the strategies suggested by genetic algorithm.

The study found that genetic algorithm without mutation performs better than one with mutation. Then it traces the model without mutation and found best strategies for stock investment before XD dates especially in the first half of the year. It discovers that ADVANC and PTT are good for short-term investment within 15 days before XD dates. It reveals that CPALL and SCC are appropriate for the medium-term investment, 16 – 30 days before XD dates. Moreover, CPF, IVL, KBANK and TCAP are potential for the longer than 31 days of the investment.

The rates of return of the investment strategies are impressive when calculated in the equivalence of the annual rate. More than half of the eight stocks yield more than fifty percent of the return per year.

The performance of the genetic algorithm is quite good. The model with zero mutation rate that is applied to the data in the first half of the year can extract 62% of the highest potential profit. Increasing the rate to be positive reduces the performance probably by half. However, even though the yield of the second half of the year is lower than in the first half, the performances of genetic algorithm with zero mutation rate are quite similarly in both periods. The algorithm extracts around 62% of the highest potential profit without the influence of how much profit that is available in each period.