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A SIMPLE STRATEGY TO INVEST IN THE VIETNAMESE STOCKS FOR A MODEST PROFIT

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Abstract

Any small investor faces the eternal dilemma - Whether to park his/her hard earned money in the bank fixed deposits which may earn low interest but has no risk, or invest in the stock market which may provide a better return but comes with some risk of losing that money. Further, the small investors may lack resources to afford expensive and powerful analytical tools to get an edge in the market. So we have asked a simple question: With the publicly available market information, can a small investor devise a simple strategy to beat the bank fixed deposit rates?

This work presents a simple strategy where we observe an individual stock's volatility through the "spread" over each unit of time (defined as the interval of (min, max) per unit of time). This spread is a random variable having its own probability distribution, but we make no parametric assumption for this probability distribution.

A stock's inter percentile range length (IPRL) is then suitably and nonparametrically calculated based on a training sample of a number of n units of time preceding an intended transaction at a given unit time

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interval. For our study we have used one hour as our unit of time, and it is assumed that a stock's behavior in one time unit is independent of the others. Also, only one transaction is to be done per unit of time for an individual stock.

We have studied the overall performance of a portfolio of 26 Vietnamese stocks chosen from the list of Top VN 100 Stocks, and we have used the hourly data over $N = 1245$ hours spanning over all the 249 business days for the year 2023. For an individual stock, a bandwidth is created using the IPRL; if the price falls below the lower margin then stocks are bought, and they are sold if the price crosses the upper threshold. Results of our simulation study show our portfolio profit margin of 9.6% in one year, with an estimated standard error (SE) of 1.84%. This is better than the one-year fixed deposit interest rates in the reputed Vietnamese banks which stood approximately at 5% APY (annual percentage yield) by the end of 2023.

1. Introduction

Typically, when trading stocks, to achieve the desired profit, investors often have to use various investment strategies by combining technical indicators together. When most or all of the technical indicators used by the investor simultaneously indicate a "buy", "sell", or "hold" signal, the investor will take the corresponding action. To achieve high return, it is not enough to use simple technical indicators; more effective and often more complex indicators are needed. Understanding and using these complex technical indicators is often beyond the reach most of the retail investors, while using one or two simple technical indicators alone often does not yield high results or even may leads to losses. Some indicators commonly used by investors are RSI (Relative Strength Index), MACD (Moving Average Convergence Divergence), KDJ (A technical indicator consisting of three lines, %K, %D, and %J, used to identify overbought or oversold conditions in the market, where: %K is the main line of the Stochastic Oscillator; %D is a smoothed version of %K, often considered the signal line; %J is a line calculated from %K and %D, indicating overbought and oversold conditions more sharply), etc., but this may not be enough. To enhance trading efficiency, investors also need to rely on other information such as the company's financial status, price history, liquidity, the volume of open long or short positions, price action at different time frames, etc. All these factors affect the future price of a stock. So, is there a trading strategy that does not require understanding or using too many complex technical indicators but can still achieve better returns than the fixed deposit rate?

This experiment will demonstrate a simple trading strategy that can still achieve profits exceeding the fixed deposit interest rate offered by the local banks by merely observing the fluctuations of each stock over short periods combined with the RSI indicator, which is very intuitive and easy to use, to make decisions: do nothing, buy, or sell a certain amount of stock.

This experimental research uses historical price data of 26 stocks from the top 100 Vietnamese market stock (VN100). We believe that the stock market in 2020, 2021, and 2022 was still affected by the COVID-19 pandemic, so our strategy might not be accurately reflected when applied this simulation. The trading simulation is based on the hourly price history of 2023. The list of stocks and the method of selecting stocks for the portfolio will be presented below.

2 Theoretical Basis

2.1 RSI Indicator

The RSI (Relative StrengthIndex) indicator was developed by J. Welles Wilder Jr. and first published in the book "New Concepts in Technical Trading Systems" in 1978 [3]. RSI is a momentum indicator used in technical analysis to measure the speed and change of price movements. It helps identify overbought or oversold conditions in the market, based on a scale from 0 to 100. The commonly used levels to determine these conditions are: 70 (overbought), and, 30 (oversold). When $RSI > 70$, it means the market is overbought, or the stock is over valued and likely to decline sharply; at this point, we should sell our stocks. Conversely, when $RSI < 30$, it means the market is oversold, or the stock is undervalued and likely to increase; at this point, we can buy stocks.

RSI is calculated by the formula:

$$RSI = 100\Big(1 - (1 + \frac{\text{Average Gain}}{\text{Average Loss}})^{-1}\Big) \tag{2.1}$$

In formula (2.1), Average Gain represents the average amount by which the price of the asset has increased over a specified period (e.g., the last n hours). It is computed by taking the average of all positive changes in the asset's price over the period; Average Loss represents the average amount by which the price of the asset has decreased over the specified period. It is calculated by averaging all negative changes in the asset's price during the period. Average Loss in the formula (2.1) always uses a positive value. RSI is initially calculated after 14 periods (14 trading days or 14 trading hours).

The RSI indicator is often used in conjunction with other indicators to identify signals and support trading decisions. Additionally, RSI can be used to identify divergence, when price and RSI move in opposite directions, which can signal a reversal of the current trend. However, determining divergence is quite technical and sometimes subjective, so we will not focus on this aspect of the RSI indicator here. The RSI indicator can be easily read on applications or trading platforms without requiring in-depth knowledge of the stock market.

2.2 IPRL Indicators

The IPRL (Inter Percentile Range Length) indicator is a stock characteristic which we have used in our study. IPRL is calculated based on the price history of the previous n time intervals, which we call the "training sample size", and it essentially captures the volatility of a stock.

For each stock, the value of IPRL is calculated as follows: We observe the stock price on an hourly basis. We have used one hour as our unit time interval. In each hour, we calculate the difference $(\max - \min)$ with max and min being the highest and lowest prices of the stock in the hour we are observing. We call the difference $(\max - \min)$ the spread. Let X_i be the spread at time unit i. Thus, by observing the price history of the previous n time units, we will obtain n values $\{X_1, X_2, \ldots, X_n\}$.

Let P_1 and P_2 be the lower tail and upper tail percentile values of the probability distribution of X_i's (which are assumed to be independent and identically distributed random variables). Specifically, P_1 and P_2 represent the values of X_i corresponding to the lower and upper tail probabilities, r_1 and r_2, respectively. In other words,

$$r_1 = P(X_i \leq P_1) \text{ and } r_2 = P(X_I \leq P_2)$$

We can say that $[P_1, P_2]$ is the subrange covering the middle $(r_2 - r_1) \times 100\%$ of the probability distribution of the spread of the stock. Figure 1 shows a diagram of the probability distribution of X_i with P_1 and P_2.

3. Portfolio Selection and Trading Strategygth

3.1 Portfolio Creation

Our portfolio consists of 26 stocks selected from the VN100 index, which represents the top 100 stocks traded on the Ho Chi Minh City Stock Exchange (HOSE) in Vietnam. The VN100 index encompasses the most prominent and liquid stocks, offering a comprehensive snapshot of the Vietnamese stock market's performance. By selecting stocks from this index, our portfolio seeks to leverage a wide range of market opportunities while maintaining a focus on high-quality, established companies. These stocks are chosen based on their substantial trading volume (more than 100,000 stocks/day) and a consistent upward price trend through out the year. The stocks we choose are in the energy, garment, construction, and food industries.

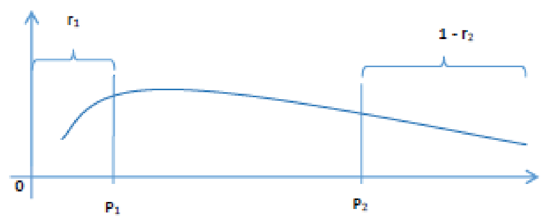

Figure 1: A diagram of the probability distribution of X_i with P_1 and P_2

In reality, when we start investing, we do not know whether stock prices will go up or down. Naturally, we will choose stocks that had good growth in the previous year (in this case, 2023) to invest in for the following year (2024), hoping that the stocks will continue to grow. We need to test whether the strategy we propose worked well for 2023 to be able to apply it in 2024.

3.2 Strategy

On the Vietnamese stock exchanges, we cannot buy stocks in any arbitrary quantity; we can only purchase them in units called blocks. 1 block equals 100 stocks. One of the structural parameters in our strategy is n_{bc} which represents the maximum consecutive purchases. In this experimental research, we do not make more than n_{bc} consecutive purchases until the next transaction is sale.

For any particular stock we define the following

OP_i=opening (or starting) price at time i.

CP_i = closing (or ending) price at time i.

Pf_i = profit at time i. If $Pf_i < 0$, then it implies a loss. We need to note that Pf_i is for a specific stock, not for the entire portfolio.

c = some suitable nonnegative value. It is one of the structural parameters.

For trading in time unit $(i+1)$, we used the following strategy: we observe the opening price and closing price at time i

$$-\text{If } CP_i < (OP_i - IPRL/c) \text{ and } RSI < 30: \text{ buy } k_b \text{ blocks.} \tag{1}$$

$$-\text{If } CP_i > (OP_i - IPRL/c) \text{ and } RSI > 70, \text{then follow the following}: \tag{2}$$

If the total asset at time-i is greater than or equal the total asset at time-(i - 1): (3)

If $Pf_{i-1} > 0$: sell all the blocks we have. (4)

If $Pf_{i-1} \leq 0$: sell at most k_s blocks. (5)

Before we get into this strategy, we need to make it clear that: we believe that when the price fluctuation of a stock in one unit of time exceeds the normal price fluctuation in the previous n units of time, it is a sign to buy or sell because the price is likely to return and fall into the normal price range in the previous time units. Similarly, when the spread of a stock in one unit of time exceeds the normal spread (that is, the spreads whose values usually belong to the range $[P_1, P_2]$) in the previous n units of time, it is a sign to buy or sell. So, the conditions from (1) to (5) can be explained as follows:

- Condition (1): when $CP_i < (OP_i - IPRL/c)$, that means the price is quite low compared to the opening price, therefore, it is likely to increase again in the near future. That means we should buy stock at this point of time. Moreover, when $RSI < 30$, that is also a sign to buy. Combining these two signs, we will buy more stocks.

- Condition (2): Similar to condition (1), these two signs suggest that we should sell the stocks. However, we will not sell immediately; instead, we need to consider a few other conditions to decide how many stocks to sell as shown in conditions (3), (4), and (5).

- Condition (3) means that the stock price at time-i has increased compared to the stock price at time-(i-1), which means that our assets have increased. This condition is to maximize profit (in case we are making profit) or minimize loss (in case we are making loss) when we decide to sell.

- Condition (4) means that we had a positive profit at time-(i - 1) (although that profit may be very small), combined with condition (4) means we obtained a bigger profit at time-i compared to the profit at time-(i - 1). To save this profit and prevent the price from going down at time-(i + 1), we will sell all the blocks to ensure that we are actually keeping the real money.

- Condition (5): $Pf_{i-1} \leq 0$ means we are losing at time-(i - 1). So, even if condition (3) is satisfied, it is not certain that we have positive profit at time-i, so we should not sell all the stocks we have but we still sell at most k_s blocks to get a change to buy more stocks at time-(i + 2) (if we bought n_{bc} times at previous units of time, then we cannot buy more stocks at time-(i + 2) and may miss the opportunity to buy stocks at a low price if we do not sell at time-(i + 1)).

It should be noted that we decide to buy, sell, or do nothing right after knowing the closing price at the time-i, which means this transaction (if any) is executed at the time-(i + 1), immediately after the end of time-i.

4. Simulation Results

Data from 2023, covering 1245 time units over 245 days, was used for simulation. Each stock was allocated an investment of 300 million VND. The percentage profit (PP) is calculated as follows:

$$PP = \Big(\frac{\text{ending portfolio value} - \text{beginning portfolio value}}{\text{beginning portfolio value}}\Big) \times 100\%)$$

where the initial portfolio value is 300 million VND * 26 stocks. The final portfolio value is the sum of cash and the market value of the stock blocks. A negative percentage indicates a loss.

We tested various combinations of the structural parameters, including:
k_b=[1,2,3,4,5,6]
k_s=[1,2,3,4,5,6]
n = [45,50,55,60,65,70,75,80]
r_1=[0.1,0.15,0.2,0.25,0.3,0.35,0.4]
r_2=[0.6,0.65,0.7,0.75,0.8,0.85,0.9]
n_{bc}=[3,4,5,6,7,8]
where n_{bc} is the number of consecutive purchases, meaning the number of times we buy stocks consecutively without any sales in between. For example, $n_{bc} = 3$ means that if we bought consecutively 3 times, we would stop buying until the next sale.

We also apply what is called transaction fee and personal income tax. In the Vietnamese stock market, the fee for a single buy or sell transaction ranges from 0.15% to 0.35%, and the personal income tax for each sale is 0.1% of the transaction value. Here, the trading fee we choose for each of transaction is 0.35%.

The best results came from the parameters with the following values:

n_{bc}	k_b	k_s	n	r_1	r_2
5	1	5	45	0.1	0.75
5	1	5	45	0.15	0.75
5	1	6	45	0.15	0.75
5	1	6	45	0.1	0.75

The above parameter sets yield a PP of 9.6%. This result was purely based on our simple strategy, without any insider knowledge of the companies' financial or business health.

We used 300 million VND per stock to ensure that every transaction had enough money to execute, with the purpose of evaluating the effectiveness of the strategy. If we run the simulation with 5, 10, 15, 20, 25, 30 million VND per stock, the PP is 13.60%, 10.56%, 9.84%, 9.33%, 9.66%, and 9.86%, respectively. These results are very suitable for small investors who do not have much money.

4.2 Simulation Results

We ran simulations with 84,672 combinations of structural parameters.

We selected some combinations that gave the best profit to run bootstrap sampling 10,000 times for each (bootstrap sampling will be explained in more detail in section 5). The results are shown below: results from testing different combinations of parameters are shown in Table 1; results from running the bootstrap sampling are shown in Table 2 with $n_bc = 5$ which gave the best result compared to other values of n_bc; and trading results from one of the best combinations are shown in Table 3.2

No	n_{bc}	k_b	k_s	n	r_1	r_2	PP
1	5	1	5	45	0.1	0.75	9.6
2	5	1	6	45	0.1	0.75	9.6
3	5	1	5	45	0.15	0.75	9.6
4	5	1	6	45	0.15	0.75	9.6
5	4	1	5	45	0.15	0.75	9.54
6	4	1	4	45	0.15	0.75	9.54
7	4	1	6	45	0.15	0.75	9.54
8	4	1	5	45	0.1	0.75	9.53
9	4	1	6	45	0.1	0.75	9.53
10	4	1	4	45	0.1	0.75	9.53
84668	8	3	5	55	0.1	0.9	2.57
84669	8	3	4	55	0.1	0.9	2.57
84670	8	1	5	55	0.1	0.9	2.54
84671	7	1	6	55	0.1	0.9	2.5
84672	8	1	6	55	0.1	0.9	2.42

Table 1: Some simulation results with different parameter sets

In the first row of Table 1, the value 9.6 in the column named "PP" means that we achieved a profit of 9.6% with the parameter set $n_{bc} = 5, k_b = 1, k_s = 5, n = 45, r_1 = 0.1, r_2 = 0.75$.

No	k_b	k_s	n	r_1	r_2	Y	Z	$Z - Y$	$Z + Y$
1	1	5	45	0.15	0.75	1.84	9.6	7.76	11.44
2	1	5	45	0.1	0.75	1.87	9.6	7.73	11.47
3	1	6	45	0.15	0.75	1.88	9.6	7.72	11.48
4	1	6	45	0.1	0.75	1.88	9.6	7.72	11.48
5	1	4	45	0.15	0.75	1.85	9.3	7.45	11.15
6	1	4	45	0.1	0.75	1.88	9.29	7.42	11.17

Table 2: Some results from running the bootstrap

The first row of Table 2 shows the result from running bootstrap sampling with parameter set $n_{bc} = 5, k_b = 1, k_s = 5, n = 45, r_1 = 0.15, r_2 = 0.7$. The values 1.84 at column named "Y" is the standard error (which will be mention in section 5), the value 9.6 at column named "Z" is the PP obtained from running simulations on real data. The values at "Z - Y" column is the minimum profit that can be expected if things turn out less favorable than average, and the values at "Z + Y" column is the maximum profit that can be expected if things turn out less favorable than average.

In Table 3, each value in the column named "PP when holding" represents the profit we can obtain if we buy the stocks at the beginning of the year and sell them at the end of the year. Traders call this the "buy-and-hold method". As we can see, we experienced both gains and losses across various stocks. Some stocks yielded a higher PP with this strategy compared to a buy-and-hold approach from the start, while others produced a lower PP than the buy-and hold method. Overall, we achieved a PP of 9.6%. We also used this strategy to run simulations with the stock price history in 2024. So far (half of the year), the PP is 4.67%.

5. Bootstrap Sampling to calculate the standard error

In our study we have used $N = 1245$ hours as our N time units to apply the trading strategy. The best case scenario, as shown in Table 1, shows the profit margin of PP = 9.6% at the end of the study period (the year of 2023). But this profit margin is subject to change for reasons beyond our control, such as the market volatility. So, to measure the amount of variability in our profit margin, we need to come up with an approximate standard error (SE). The exact standard error can be known only if such a study can be carried out years after year over many number of years which is not possible for us. Therefore, the bootstrap method [2] comes as a useful tool to approximate the SE of our profit margin PP.

Suppose the $N = 1245$ hours are numbered as $S' = \{H_1, H_2, ..., H_N\}$. Take a random sample of size $N = 1245$ with replacement from S', and let this collection be $S^* = \{H_1^*, H_2^*., ..., H_N^*\}$ is the bootstrap sample. Pretending that S^* as our yearly collection of time units for the year 2023, we carry out our trading strategy as before on S^* and let the resultant profit margin be P^*.

Continue the above resampling mechanism B times. In the b^{th} replication, $1 \leq b \leq B$, let the profit margin be P^* (Essentially, $P_1^*, P_2^*, ..., P_b^*$ are just B copies based on that many bootstrap samples taken from S'). Also, P_b^* replicates PP based on B bootstrap samples from S'. The SE of PP is now computed as:

No	Ticker	Invested amount (VND)	Total asset on exchange (VND)	PP	PP when holding
1	BTP	6437452.5	9646710	49.85	-1.2
2	NAF	5223217.5	7700000	47.42	17.93
3	CNG	10691123.92	14559032.5	36.18	28.14
4	VSH	17250165	22400000	29.85	29.85
5	TMP	27004185	34050000	26.09	0.87
6	TBC	16598782.5	19661125	18.45	14.47
7	PC1	11029771.16	12940381.53	17.32	30.56
8	LSS	1078179.582	1240902.915	15.09	-4.66
9	PPC	2965342.5	3255285	9.78	-0.52
10	DBC	3095797.5	3323197.5	7.35	-11.49
11	SBA	12242700	12950000	5.78	-15.38
12	CHP	11926597.5	12545342.5	5.19	6.07
13	DRL	32095790	32900000	2.51	-18
14	SHP	14355067.5	14484525	0.9	8.5
15	HNG	0	0	0	0
16	GAS	0	0	0	0
17	SJD	0	0	0	0
18	PVD	0	0	0	0
19	TV2	19036395	19014050	-0.12	58.85
20	PVT	2403838.877	2400000.24	-1.16	-0.16
21	BAF	9229490.871	9123672.156	-1.15	38.39
22	PLX	18715275	18391862.5	-1.73	-7.83
23	S4A	17315520	16800000	-2.98	-22.38
24	VTO	963360	910882.5	-5.45	-1.39
25	SMB	20672100	19437815	-5.97	-28.41
26	STK	9198822.085	7660372.5	-16.72	-15.37

Table 3: Result from the best combination: $n_{bc} = 5$, $k_b = 1$, $k_s = 5$, $n = 45$, $r_1 = 0.15$, $r_2 = 0.7$

$$SE = \Big(\sum_{b=1}^{B} \frac{(P_b^* = \bar{P^*})^2}{B}\Big)^{\frac{1}{2}}, \text{where } \bar{P^*} = \Big(\sum_{b=1}^{B} \frac{P_b^*}{B}\Big)$$

6 Concluding Remarks

In this study, we developed a simple trading strategy that combines the RSI indicator with the IPRL indicator to achieve better than the fixed deposit rates. By applying this strategy to a selected portfolio of 26 stocks from the VN100, we achieved a PP of 9.6% in 2023. The strategy also yielded promising results when applied to the stock price history of 2024, with a PP of 4.67% for the first half of the year.

In future studies, we plan to expand our research in several ways:

- Combining with other indicators: We will explore the integration of additional technical indicators to enhance the robustness and profitability of our trading strategy.

- Trying different portfolios: We aim to test our strategy on various portfolios to assess its generalizability and performance across different market conditions and stock selections.

- Adjusting the strategy: We will make slight adjustments to the strategy parameters to optimize and potentially achieve higher profits.

- Varying fund allocation: We will experiment with varying the fund allocation for each company stock to identify the most effective investment distribution.

- Automating the trading process: Implementing automated trading systems will allow for more efficient execution of the strategy and better handling of market dynamics.

Additionally, we explored a parametric approach using training samples based on $n = 45$ time points $(X_1, X_2, ..., X_{45})$. Initially, we fitted suitable positively skewed parametric models like Gamma, Weibull, and Lognormal. However, we found that the non-parametric approach of estimating r_1 and r_2 yielded better PP results, demonstrating the superiority of this method in our context.

Overall, our findings indicate that the proposed simple trading strategy is effective and can be a valuable tool for small investors. As a future extension of this work we hope to expand this simple trading mechanism for stocks other than those 26 considered in this study, and we need to fine-tune this mechanism further by varying some structural parameters which were held constant in this study.

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