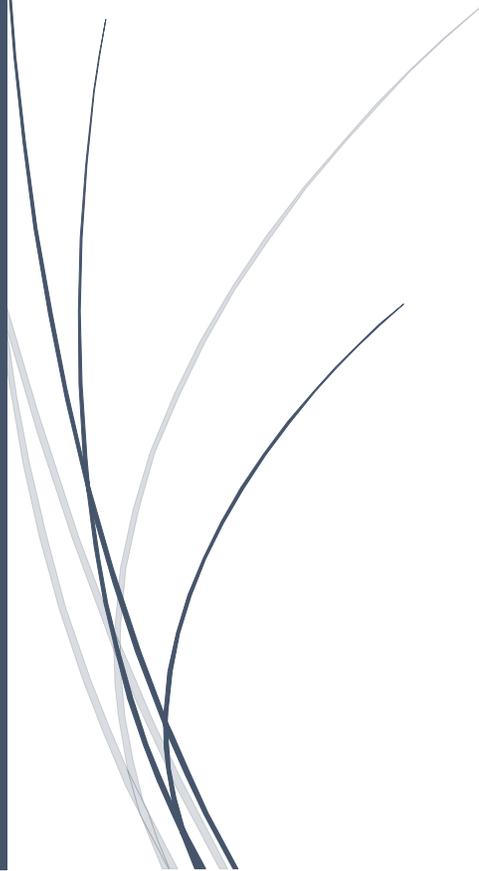




AceLight 2023

LIGHTING THE PATH TO PROFITABLE TRADING

A Step-by-Step Guide to Building a Trading Strategy
Verification Tool with VBA Macros



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DATA GLADIATOR

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BUILDING A SIMPLE TOOL TO VERIFY TRADING STRATEGIES, EVEN A KID CAN DO IT!

INTRODUCTION

Tom is one of my long-lost schoolmates. He has read many stock trading books, heard thousands of stock trading aces' stories, and learned a lot of stock trading strategies. He can recognize dozens of candlestick patterns, if not hundreds. Tom is a quick learner and very smart. He figured out some new trading strategies, and every strategy looked perfectly profitable. But when he tried to deploy these promising strategies to trade stocks, the results always disappointed him.

One day, Tom met me at another schoolmate's wedding, and I heard his story about stock trading. I asked him, "Did you run any backtesting for your trading strategies?"

Tom was surprised, "What the heck is backtesting?"

I was also surprised and said, "Then you must have ignored forward testing too, eh?"

Tom did not know the Forward Testing thing either. He complained that his father had asked him to study international relations instead of computer software, which caused him to know nothing about programming. After blaming everybody, Tom blamed me too, "And you, mate, you even refused to let me copy your coding homework in school. Now what have you got to say for yourself?"

My face was red, "Well, Tom, give me a chance to make it up, OK? I will write a small program for you. It can help you screen out those bad strategies, and you can adjust and modify it to create your unique strategies that really work."

Tom hesitated, "Sounds good, but I know nothing about programming. Those C, R, Java, Python, MATLAB always give me a headache."

I held his shoulder, "Forget those big brothers. If you are using Excel, as I'm sure you do, you can deal with a very easy coding thing, VBA."

"What does VBA mean?"

"Eh, a Very Basic Art. Just kidding. Don't be scared. It is really BASIC. If you can operate a smartphone, then you can deal with VBA. See? IF what what what, THEN what what what. That is VBA's language, just like using plain English to give a computer some instructions."

After a moment of hesitation, Tom finally agreed to give VBA a try. He spent countless hours experimenting with different parameters, testing various strategies, and analyzing the results. And you know what? He even went on to teach his father a thing or two about trading and investing.

And as for me, well, Tom's happiness made me feel proud and relieved at the same time. I had finally made it up to him for not letting him copy my coding homework in school.

Developing a trading strategy is only the first step towards achieving success in the financial markets. The next step is to verify if the strategy is profitable or not. This is where backtesting comes in. Back-testing is the process of applying a trading strategy to historical market data to see how it would have performed in the past. By doing this, you can get a good

idea of whether the strategy has the potential to make money in the future.

For any trading strategy, no matter how good it sounds, we must test it before using it in the real market and putting hard-earned money on the line. These tests include not only back-testing but also forward-testing. Without proper testing, trading will turn into guesswork or even worse, gambling. And if you're struggling to do it yourself, just remember: VBA is your friend.

In this handbook, we will walk you through the process of building a simple tool to verify your trading strategies' effectiveness, even if you don't have strong programming skills. All you need is basic knowledge of Excel and VBA (Visual Basic for Applications). We will use these tools to create a back-testing and forward-testing spreadsheet that you can use to test your trading strategies. This method and tool can be applied not only to stock trading but also to other financial instruments such as Forex, Options, Futures, Cryptocurrencies, and Bonds, among others.

Now that Very Basic Art is here. And I hope you can like it just like Tom does. He told me: “Mate, now I know what VBA mean. It means - a Very Beautiful Art.”

In short, no more guesswork or gambling since today! Building a simple tool by an easy method, you would be trading based on solid evidence. Throw the crystal ball away, win or lose, let data tell!



CHAPTER 1: GETTING STARTED WITH EXCEL AND VBA

Excel is a spreadsheet application that is widely used in the finance industry. It allows you to store and manipulate data, perform calculations, and create charts and graphs. In this chapter, we will cover the basics of Excel that you need to know to build a back-testing spreadsheet.

Microsoft Excel is a widely used software application for creating spreadsheets and performing calculations. It is a part of the Microsoft Office suite of productivity software, which also includes Microsoft Word, PowerPoint, and other programs. Microsoft Office is one of the most popular software suites in the world, and it is used by millions of people for both personal and business purposes, everyday. In fact, it's so ubiquitous that it's practically become a household name, with many people referring to any office software as "Microsoft Office," whether it's made by Microsoft or not.

For example, let's calculate the SMA for a stock's prices or index with Excel.

SMA stands for Simple Moving Average and is a commonly used technical analysis indicator. It is a lagging indicator and provides a smoothed average of the price over a certain period of time, often used by traders to identify trends and to help determine buy and sell signals. The formula for calculating the SMA is:

$$\text{SMA} = \text{Sum of Closing Prices for a period} / \text{Number of periods}$$

In Excel, it looks like this:

	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
	Value	Trades	Value	Date	Open	High	Low	Close	Volume	Action	Cost/Income	SMA			
1															
2	5	Total		2020-03-24	31.82	34.25	31.60	33.67	343428000			28.74			
3	2	Long		2020-03-23	28.91	29.47	27.37	28.95	246817500			27.75			
4	12	Long %		2020-03-20	29.21	31.80	28.50	28.50	424282500			27.89			
5	26	Short		2020-03-19	24.98	30.13	23.90	28.51	452932500			29.48			
6	9	Short %		2020-03-18	25.93	28.99	23.37	24.08	356793000			31.25			
7	3	Stop Loss		2020-03-17	29.33	31.46	26.40	28.58	359919000			34.89			
8	0.0	SL %		2020-03-16	31.30	32.99	29.48	29.67	307342500			29.15			
9		Take Profit		2020-03-13	39.67	40.50	33.47	36.44	339604500			23.22			
10	14	TP %		2020-03-12	38.73	39.63	36.42	37.37	283636500			15.93			
11	3			2020-03-11	42.68	43.57	40.87	42.28	199837500			8.46			

To calculate the 5-day SMA, you would add up the closing prices of the last 5 days and then divide by 5. To calculate the 10-day SMA, you would add up the closing prices of the last 10 days and then divide by 10.

Excel has many formulas to help users with almost every calculation in a blink. To calculate the 5-day SMA, the formula

$$SMA = \text{Sum of Closing Prices for a period} / \text{Number of periods}$$

will be turned into Excel's language like this:

```
=SUM(OFFSET(L2,0,0,$B$2,1))/5
```

The cell B2 stores the period (in this case, it is 5), and the cell L2 stores the Close Price. The final result will be stored in cell P2, and so on. We can have another simpler formula to do this job:

```
=AVERAGE(OFFSET(L2,0,0,$B$2,1))
```

In addition to the formulas available in Excel worksheets, Excel also provides users with a powerful tool for more customized calculations and actions. This tool is known as VBA, or Visual Basic for Applications. With VBA, users can write code to automate tasks, perform complex calculations, and create custom functions to suit their specific needs. VBA allows for greater flexibility and control over Excel's features and functionality, making it a valuable tool for advanced users and programmers.

The most important and interesting thing is: VBA is an integral part of Microsoft Excel, and you don't need to install it separately as you would with other programming languages such as Python. This is because VBA is a built-in programming language that is designed specifically for Excel and other Microsoft Office applications. This means that anyone who has Microsoft Office installed on their computer already has access to VBA and can start using it right away. With VBA, users can automate repetitive tasks, create custom functions, and build complex applications within Excel, all without the need for any additional installations or software.

If you are using Microsoft Office, you don't need to pay any extra fees for VBA. With VBA, users can write their own Macros and functions to automate repetitive tasks, create custom functions and procedures, manipulate and analyze data in ways that are not available through standard Excel functions, and even create user interfaces for their spreadsheets.

The term "Macro" is derived from "Macrosimulation", which originally referred to computer programs used for economic forecasting and analysis. In VBA and Excel, a Macro refers to a set of instructions or commands that can be executed automatically to perform a specific task and improve efficiency.

VBA is a well-established tool with a low probability of errors during installation and usage. Compared to other complex software, VBA does not require technical maintenance from users, as Microsoft will handle it. This makes VBA a hassle-free and user-friendly tool for users.

For example, with VBA, users can create a custom function that calculates a complex mathematical formula, automate data entry by creating a form that users can fill out, and create interactive dashboards that display and update data in real-time.

VBA is a powerful tool, but it does require some programming knowledge to use effectively. However, there are many resources available online to help users learn VBA, including tutorials, forums, and even complete courses.

The syntax of VBA is similar to other programming languages, such as C++, Java, and Python. But it is much easier than those big guys. It consists of a set of statements that are executed in order, and these statements can include conditional statements (if-then-else), loops (for-next, do-while), and procedures (subroutines and functions).

For example, if we decide to make a trading strategy like this:

When the 10-day SMA goes up across the 100-day SMA, then open Long position (Buy), while the short term SMA goes down across the long term SMA, then open Short position (Sell).

In VBA, we can write the Signal Generation part as:

```
Private Sub Signals()
```

```
Private LongOK, ShortOK As Boolean
```

```
Private BuyPrice, SellPrice As Double
```

```
Dim Trigger, SMA10day, SMA100day As Double
```

```
Dim Candle As Long 'Candle means current candlestick
```

```
Trigger = [B8].Value 'an action standard is stored in cell B8
```

'SMA10day is calculated by formula and stored in column P

'SMA100day is calculated by formula and stored in column Q

If (Cells(Candle + 1, "P").Value - Cells(Candle + 1, "Q").Value) < 0 And _

(Cells(Candle, "P").Value - Cells(Candle, "Q").Value) / Cells(Candle, "Q").Value > Trigger Then

'The "Candle + 1" means one stick before current candlestick. The short term SMA is stored in column P, long term SMA is stored in column Q. This "If;- Then" is talking about: one day ago, the short term SMA was lower than the long term SMA, but today the short term SMA is higher than the long term SMA and crosses above the long term SMA at a certain point, the difference is bigger than the Trigger, then the Long signal goes to OK.

LongOK = True

Exit Sub

End If

If (Cells(Candle + 1, "P").Value - Cells(Candle + 1, "Q").Value) > 0 And _

*(Cells(Candle, "P").Value - Cells(Candle, "Q").Value) / Cells(Candle, "Q").Value < -1 * Trigger Then*

'The "Candle + 1" means one stick before current candlestick. The short term SMA is stored in column P, long term SMA is stored in column Q. This "If;- Then" is talking about: one day ago, the short term SMA was higher than the long term SMA, but today the short term SMA is lower than the long term SMA and crosses below the long term SMA at a certain point, the difference is bigger than the Trigger, then the Short signal goes to OK.

ShortOK = True

Exit Sub

End If

```

'Open Long

If LongOK = True And ShortOK = False Then

Call OpenLong    'execute a subroutine to Open a Long position (Buying)

        Cells(Candle, "N").Value = "Buy/Open @ " & BuyPrice

End If

'Open Short

If ShortOK = True And LongOK = False Then

Call OpenShort  'execute a subroutine to Open a Short position (Selling)

        Cells(Candle, "N").Value = "Sell/Open @ " & SellPrice

End If

End Sub

```

See? It is very easy to understand, eh? Everybody can do it. Of course, this Signal Generation procedure is just one small part of a whole VBA back-testing program. We have included it here for demonstration purposes only.

In summary, VBA is a powerful tool that can be used to extend the capabilities of Excel and automate repetitive tasks, making it a valuable asset for anyone who works with large amounts of data. And surprisingly, it looks like born for building a simple back-testing tool which can verify

your trading strategies, no matter trading stocks or FOREX, if you are a fan of technical analysis methodology.

Congratulations, you've made it this far! If you're feeling overwhelmed, don't worry, just remember that Excel and VBA are like a pair of shoes - it takes some time to break them in, but once you do, they'll be a perfect fit. And who knows, maybe one day you'll look back at this chapter and laugh at how clueless you once were. Until then, keep practicing and remember, with great power comes great responsibility...and even greater spreadsheets!



CHAPTER 2: WHAT IS BACKTESTING AND WHY IS IT SO IMPORTANT

Back-testing is essential in stock trading because it allows you to evaluate the performance of a trading strategy based on historical market data. By back-testing a trading strategy, you can determine how well it would have performed in the past, which can give you an idea of how well it is likely to perform in the future.

Back-testing can also help you identify any flaws or weaknesses in your trading strategy. For example, if your strategy performs poorly during certain market conditions, you can modify it to improve its performance in those conditions.

In addition, back-testing can help you set realistic expectations for your trading strategy. By evaluating its performance over a long period, you can get a good idea of the average returns and drawdowns you can expect from the strategy. This can help you avoid overestimating the potential profits of your strategy and taking on too much risk.

To perform a backtest, you need to:

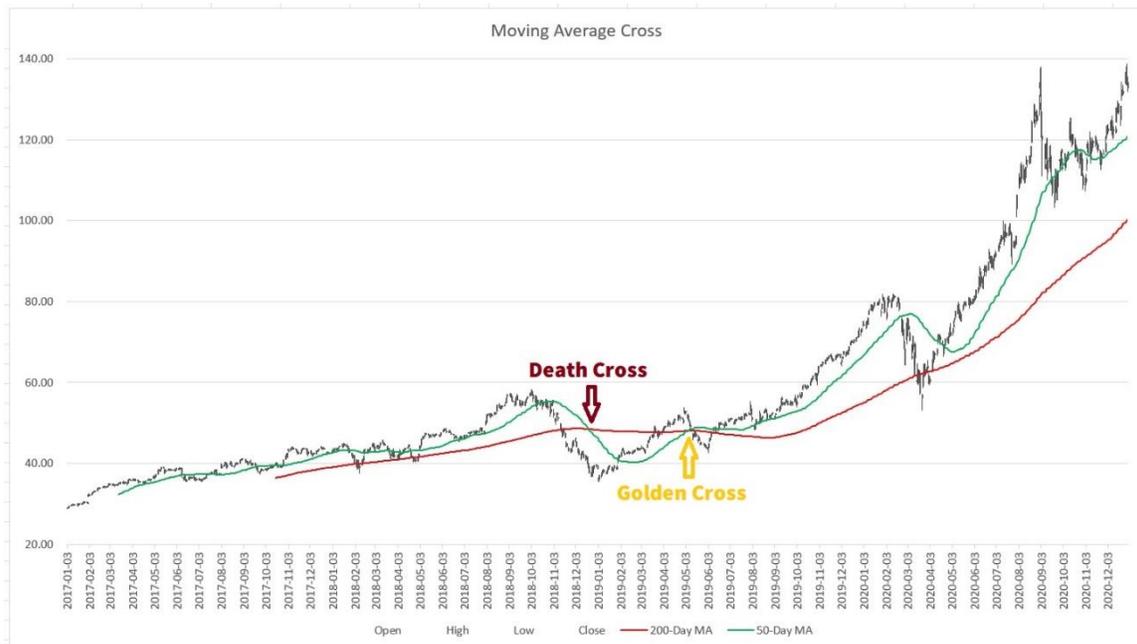
Define the rules of the trading strategy: This involves specifying the entry and exit conditions of the strategy, such as when to buy or sell a stock based on certain technical indicators.

Gather historical market data: This involves collecting price data for the securities you are interested in over the period you want to backtest.

Apply the trading strategy to the historical data: This involves simulating the trades that would have been made by the strategy at each point in time based on the historical market data.

Evaluate the results: This involves analyzing the performance of the strategy in terms of its profitability, risk, and other performance metrics.

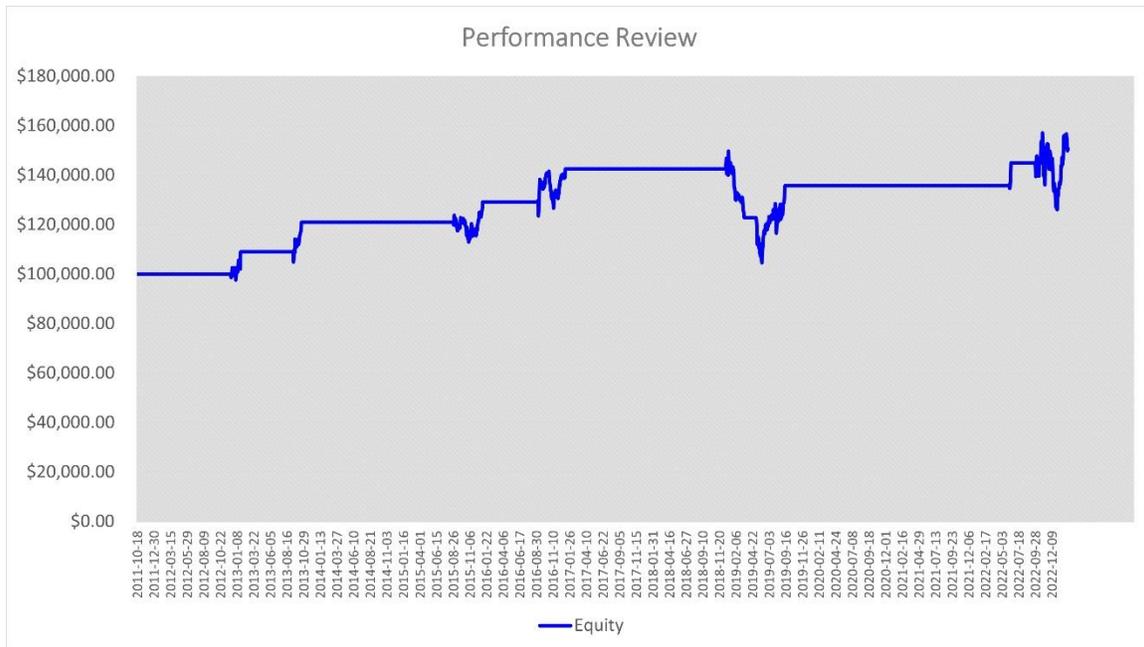
Let's consider an example of how back-testing works in practice. Suppose you want to develop a simple trading strategy for a particular stock. Your strategy involves buying the stock whenever its 50-day moving average crosses above its 200-day moving average (a so-called 'Golden Cross'), and selling the stock whenever the opposite occurs (known as a 'Death Cross'), as shown in the chart below.



To back-test this strategy, you would need to gather historical price data for the stock and calculate its 50-day and 200-day moving averages at each point in time. You would then simulate trades using the trading strategy and calculate the profit or loss that would have been made at each point in time.

For example, we can create a VBA macro to perform back-testing for the "Two Moving Average Lines Cross" trading strategy. Do you remember the "10-day SMA and 100-day SMA" strategy code we mentioned in Chapter 1? We can modify it, change the short term SMA to 50-day, and the long term

SMA to 200-day. Let's take AAPL (Apple Inc.'s stock symbol) as an example. After downloading AAPL's historical data (2011-01-03 ~ 2023-02-23) and running the VBA program, we will get a result like this:

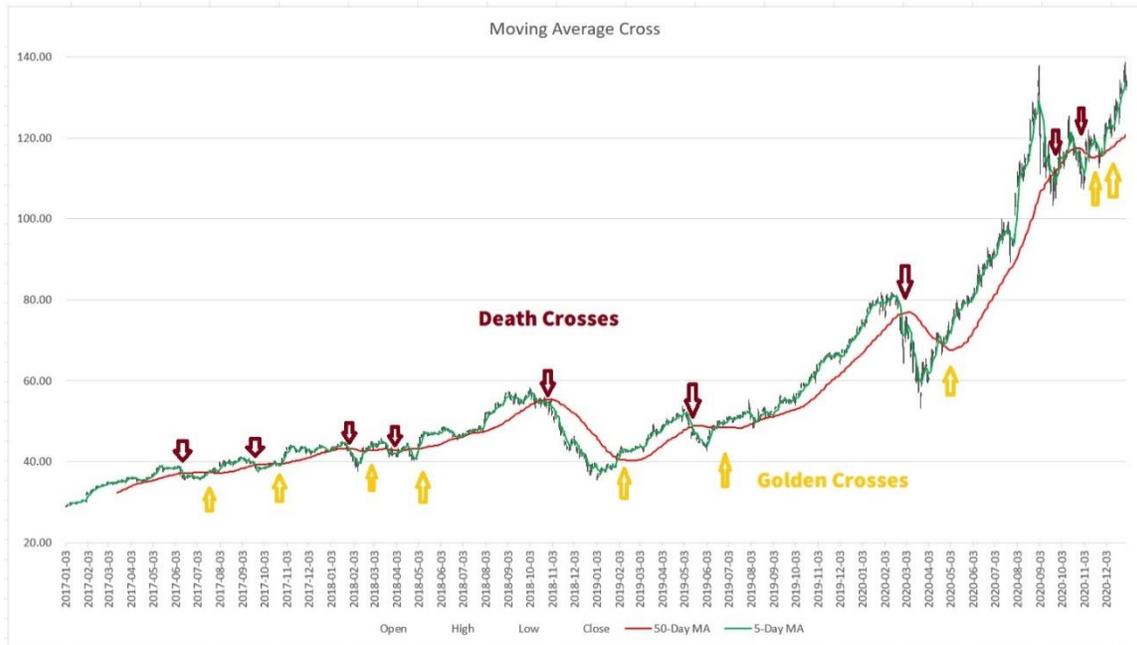


The result may not seem impressive, eh? The trading strategy looks perfect, the company is famous and strong. But when we deploy this trading strategy, the result is just so-so. This case shows why a back-test can protect us from guesswork and mystery, and a simple VBA program can save us a lot of time and money.

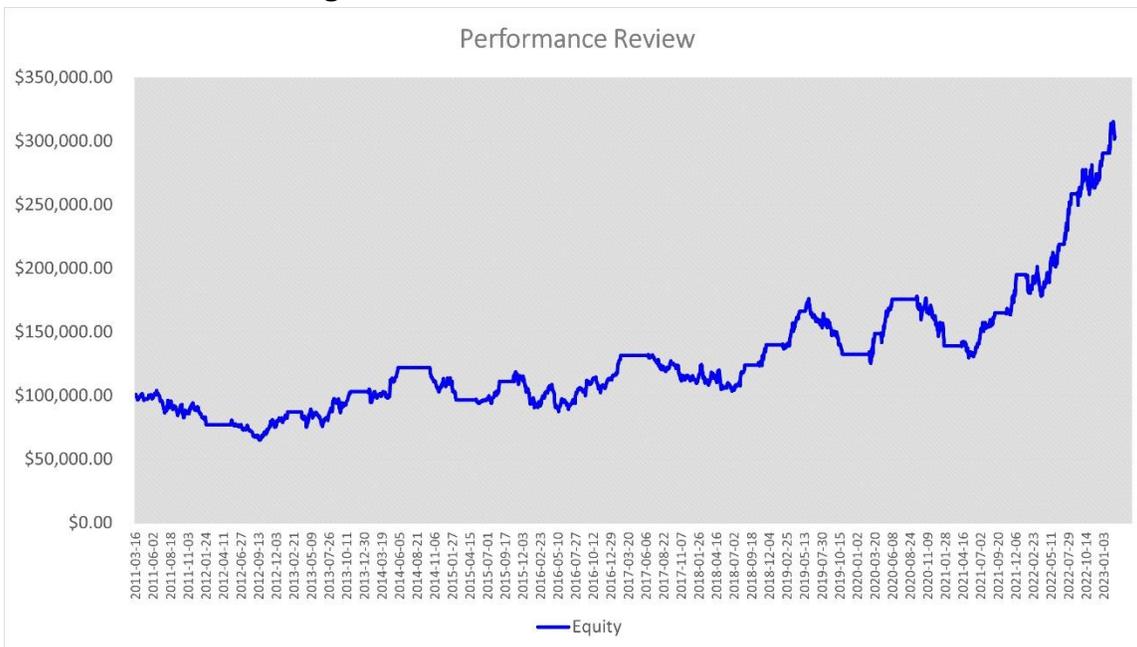
After performing the backtest, you would evaluate the results to determine if the strategy is profitable and if it meets your risk and performance criteria. For example, you might evaluate the strategy based on metrics such as the average annual return, maximum drawdown, and Sharpe ratio.

If the results are satisfactory, you perhaps can use the strategy to make trades in real-time. If the results are not satisfactory, you may need to refine the strategy or develop a new one altogether.

Let's go back to the 'Two Moving Average Lines Cross' trading strategy, and adjust the parameters by setting the short-term SMA to 5 days and the long-term SMA to 50 days. This will increase the chances of executing the strategy. The chart will look like the one below:



Run the VBA Macro again.



Look at the results above, much better, right? Let's dive into the details:

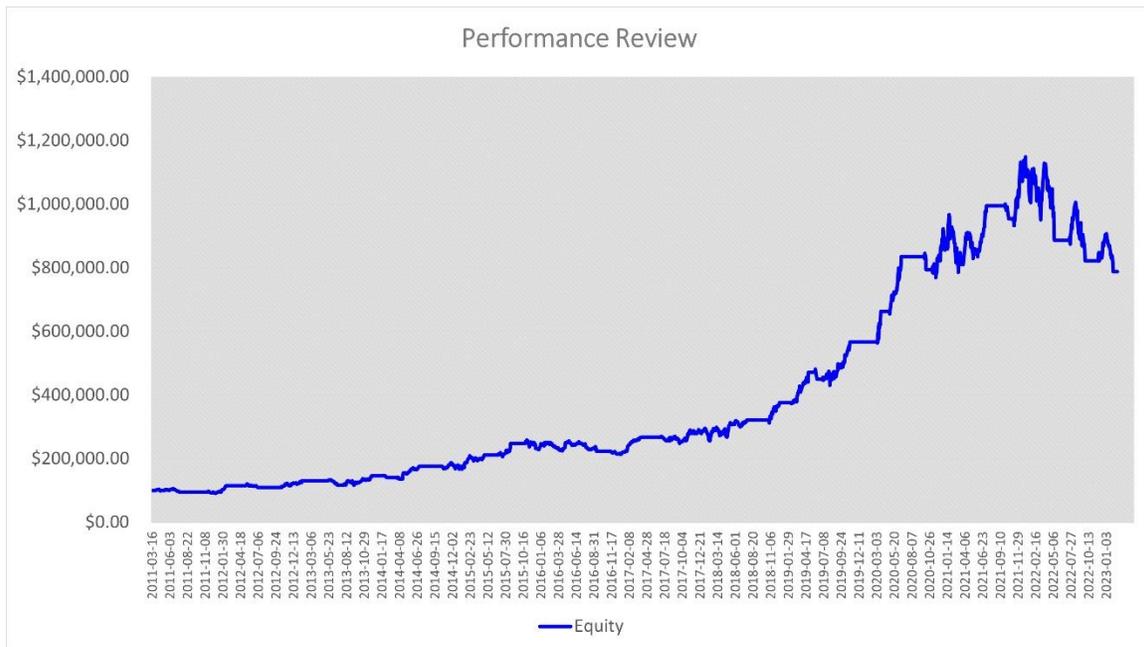
Parameters	Value	Trades	Value	Date	Open	High	Low	Close	Volume	Action
Short Term SMA	5	Total	21	2023-02-23	150.09	150.34	147.42	149.40	46705421	
BB Standard Deviations	2	Long	10	2023-02-22	148.87	149.95	147.16	148.91	50828522	
MACD Fast	12	Long %	47.62%	2023-02-21	150.20	151.29	148.40	148.48	62154122	
MACD Slow	26	Short	11	2023-02-17	152.35	153.00	150.85	152.55	58753236	
MACD Signal	9	Short %	52.38%	2023-02-16	153.51	156.33	153.35	153.71	66914188	
Expiration	2	Stop Loss	5	2023-02-15	153.11	155.50	152.88	155.33	65573800	
Momentum	0.1	SL %	23.81%	2023-02-14	152.12	153.77	150.87	153.20	57805592	
Stochastic Oscillator Period	14	Take Profit	15	2023-02-13	150.95	154.26	150.92	153.85	61806499	
Slow Stoch %D	3	TP %	71.43%	2023-02-10	149.46	151.34	149.22	151.01	57409100	
Full Stoch SMA	3			2023-02-09	153.78	154.33	150.42	150.87	56007100	
Take Profit %	18.0	Average Rate of Progress %		2023-02-08	153.88	154.58	151.17	151.92	64120100	
Stop Loss %	30.0	Average Remaining Time (Min.)		2023-02-07	150.64	155.23	150.64	154.65	83322800	
Training Set %	70.0%			2023-02-06	152.57	153.10	150.78	151.73	69858300	
Total Period	3056	Average Turnover Period	145.5	2023-02-03	148.03	157.38	147.83	154.50	154279900	
Principal	\$100,000.00			2023-02-02	148.90	151.18	148.17	150.82	118339000	
Stock Sum	2031			2023-02-01	143.97	146.61	141.32	145.43	77683600	
Cash	\$13.72			2023-01-31	142.70	144.34	142.28	144.29	65874500	
Annual ROI	9.59%			2023-01-30	144.96	145.55	142.85	143.00	64015300	
Net Equity	\$303,445.12			2023-01-27	143.16	147.23	143.08	145.93	70492800	
Net Rate of Gain/Loss	203.45%			2023-01-26	143.17	144.25	141.90	143.96	54105100	Buy/Open 2031 @ 143.07
				2023-01-25	140.89	142.43	138.81	141.86	65799300	Long OK 2048 @ 141.86
				2023-01-24	140.31	143.16	140.30	142.53	66435100	
				2023-01-23	138.12	143.32	137.90	141.11	81760300	
Start	2023-02-25 18:19:32			2023-01-20	135.28	138.02	134.22	137.87	79972200	
Finish	2023-02-25 18:57:04			2023-01-19	134.08	136.25	133.77	135.27	58280400	
				2023-01-18	136.82	138.61	135.03	135.21	69672800	
RSI Period	14			2023-01-17	134.83	137.29	134.13	135.94	63646600	
Long Term SMA	50			2023-01-13	132.03	134.92	131.86	134.76	57758000	
Serial Number	1131			2023-01-12	133.89	134.26	131.44	133.41	71379900	
				2023-01-11	131.25	133.51	130.46	133.49	69458900	
Original Annual ROI	23.31%			2023-01-10	130.26	131.26	128.12	130.73	63896200	

The theoretical Annual ROI (Return on Investment) is 9.59%, which is higher than the average Annual Growth Rate of the S&P 500 index (around 7%). See the difference? With the same trading strategy, same target, and same time period, just changing some parameters can lead to significant differences in the result. If you do this manually, it may take several days, if not weeks. However, by using VBA, it only takes several minutes or hours. Conducting a backtest, it may seem like playing a game of numbers. However, without it, we risk facing Life-or-Death situations in real trading.

An Annual Return on Investment of around 10% is decent, OK but not a “WOW!” yet. Compared to Warren Buffett's average ROI of 18~19% per year, there is much more room for improvement in the trading strategy. The process of improving the strategy can be full of interesting discoveries and surprises. We will continue to share more back-testing details in the following chapters. For example, if we change the short-term SMA to 20 days and set the long-term SMA to 50 days, like this:

Parameters	Value	Trades	Value	Date	Open	High	Low	Close	Volume	Action
Short Term SMA	20	Total	31	2023-02-23	150.09	150.34	147.42	149.40	46705421	
BB Standard Deviations	2	Long	14	2023-02-22	148.87	149.95	147.16	148.91	50828522	
MACD Fast	12	Long %	45.16%	2023-02-21	150.20	151.29	148.40	148.48	62164122	
MACD Slow	26	Short	17	2023-02-17	152.35	153.00	150.85	152.55	58753236	
MACD Signal	9	Short %	54.84%	2023-02-16	153.51	156.33	153.35	153.71	66914188	
Expiration	2	Stop Loss	17	2023-02-15	153.11	155.50	152.88	155.33	65573800	
Momentum	0.0	SL %	54.84%	2023-02-14	152.12	153.77	150.87	153.20	57805692	
		Take Profit	14	2023-02-13	150.95	154.26	150.92	153.85	61806499	
		TP %	45.16%	2023-02-10	149.46	151.34	149.22	151.01	57409100	
Stochastic Oscillator Period	14			2023-02-09	153.78	154.33	150.42	150.87	56007100	
Slow Stoch %D	3			2023-02-08	153.88	154.58	151.17	151.92	64120100	
Full Stoch SMA	3	Approx. Rate of Progress %		2023-02-07	150.64	155.23	150.64	154.65	83322800	
Take Profit %	25.0	Approx. Remaining Time (Min.)		2023-02-06	152.57	153.10	150.78	151.73	69858300	
Stop Loss %	6.0			2023-02-03	148.03	157.38	147.83	154.50	154279900	SL/Buy/Close 3703 @ 157.13
				2023-02-02	148.90	151.18	148.17	150.82	118339000	Warning: SL Buy @ 156.88
Training Set %	70.0%			2023-02-01	143.97	146.61	141.32	145.43	77663600	
Total Period	3056	Average Turnover Period	98.6	2023-01-31	142.70	144.34	142.28	144.29	65874500	
Principal	\$100,000.00			2023-01-30	144.96	145.55	142.85	143.00	64015300	
Stock Sum	0			2023-01-27	143.16	147.23	143.08	145.93	70492900	
Cash	\$788,316.34			2023-01-26	143.17	144.25	141.90	143.96	54105100	
Annual ROI	18.56%			2023-01-25	140.89	142.43	138.81	141.86	65799300	
Net Equity	\$788,316.34			2023-01-24	140.31	143.16	140.30	142.53	66435100	
Net Rate of Gain/Loss	688.32%			2023-01-23	138.12	143.32	137.90	141.11	81760300	
				2023-01-20	135.28	138.02	134.22	137.87	79972200	
Start	2023-02-25 11:51:35			2023-01-19	134.08	136.25	133.77	135.27	58280400	
Finish	2023-02-26 00:54:19			2023-01-18	136.82	138.61	135.03	135.21	69672800	
				2023-01-17	134.83	137.29	134.13	135.94	63646600	
RSI Period	14			2023-01-13	132.03	134.92	131.66	134.76	57758000	
Long Term SMA	50			2023-01-12	133.88	134.26	131.44	133.41	71379600	
Serial Number	1693			2023-01-11	131.25	133.51	130.46	133.49	69458900	
				2023-01-10	130.26	131.26	128.12	130.73	63896200	
Original Annual ROI	23.31%									

We can double the ROI to 18%, which is neck-and-neck with Warren Buffett's performance, as shown in the chart below:



Now, back-testing brings us a small "WOW!", doesn't it? Eh? In the following chapters, we will explain the details of every part of VBA Macros which deploy different trading strategies for different targets. For different targets, the weapon has different results. Different stocks may

respond differently to various trading strategies. Without proper back-testing and tool, you will never know which stock is sensitive to which trading strategy.

There are several backtesting platforms available; however, if you want to take control of all the steps and understand what is happening in every stage of the backtest, we recommend you set up your own backtesting system and build your own backtest tools. This will help you be more confident. That is why we make these [tools](#). Stay tuned.

In summary, back-testing is an essential step in developing and evaluating trading strategies. It allows you to test a strategy on historical market data and determine its performance and potential profitability. Back-testing helps traders make informed decisions and avoid costly mistakes when investing in the stock market. Without it, you would have no way of knowing whether your strategy is likely to be profitable or not, and you would be trading based on guesswork and intuition, or even worse as gamble, rather than solid evidence.

As you can see, the difference between a profitable trading strategy and a losing one can be as small as a few parameter tweaks. In fact, some might say that trading is just like cooking: you need to adjust the recipe until it tastes just right. And if you're really good, you can make something that's not only tasty but also nutritious. So go ahead, put on your chef hat and start back-testing your trading strategies. Who knows, you might just cook up the next big thing in the stock market!



CHAPTER 3: DATA ANALYSIS WITH EXCEL

To build a back-testing spreadsheet, you will need to import historical data into Excel. In this chapter, we will cover the process of importing data from external sources and how to clean and transform the data for analysis.

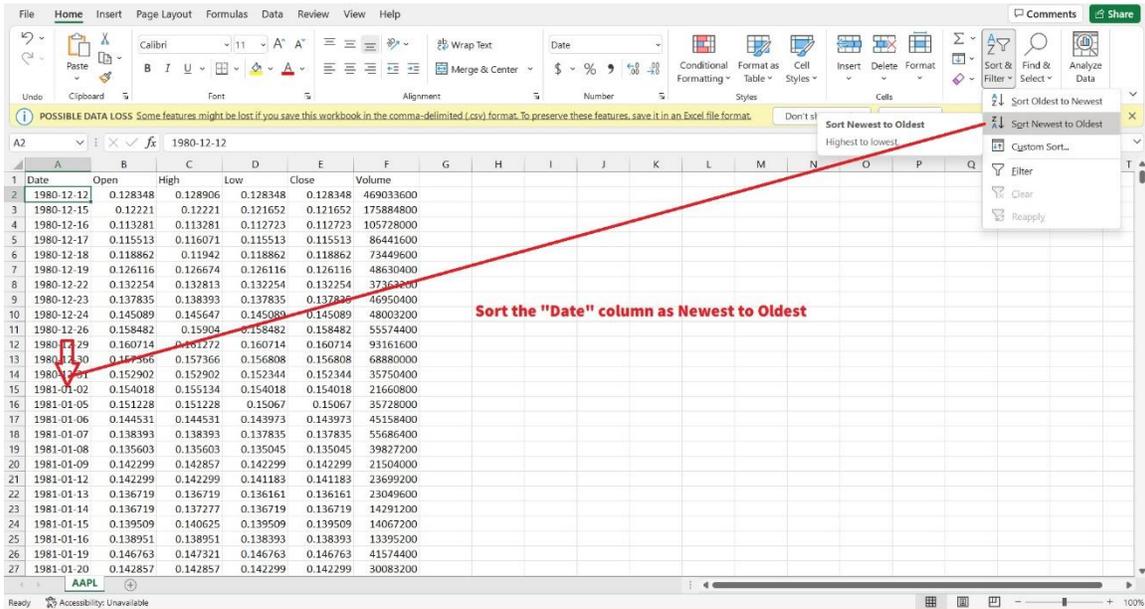
There are several sources where you can download stock historical data. Here are a few popular options:

1, Yahoo Finance: Yahoo Finance provides free historical price data for most stocks, which can be downloaded in a CSV format. Simply go to the Yahoo Finance website, enter the ticker symbol of the stock you are interested in, and select the "Historical Data" tab. From there, you can download the data for a specified time period.

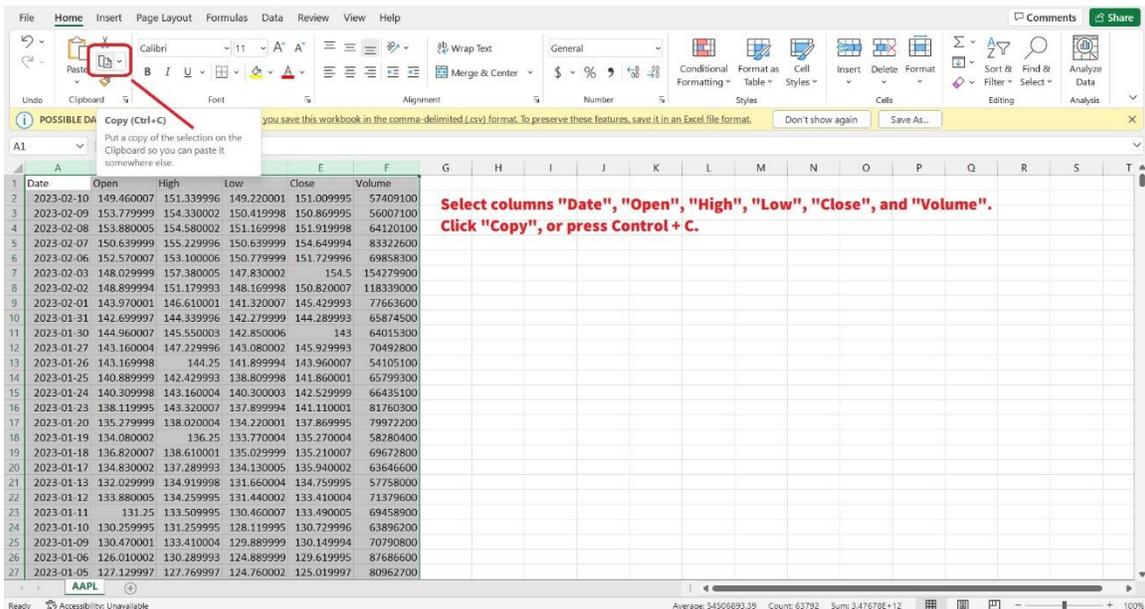
Open the .csv file, delete the "Adj. Close" column. "Adjusted close" is the closing price after adjustments for all applicable splits and dividend distributions. We don't need it in our method.

Date	Open	High	Low	Close	Adj. Close	Volume
1980-12-12	0.128348	0.128906	0.128348	0.128348	0.099722	469033600
1980-12-15	0.12221	0.12221	0.121652	0.121652	0.094519	175884800
1980-12-16	0.113281	0.113281	0.112723	0.112723	0.087582	105220000
1980-12-17	0.115513	0.116071	0.115513	0.115513	0.089749	86441600
1980-12-18	0.118862	0.11942	0.118862	0.118862	0.092351	73449600
1980-12-19	0.126116	0.126674	0.126116	0.126116	0.097987	48630400
1980-12-22	0.132254	0.132813	0.132254	0.132254	0.102756	37363200
1980-12-23	0.137835	0.138393	0.137835	0.137835	0.107093	46950400
1980-12-24	0.145089	0.145647	0.145089	0.145089	0.112729	48003200
1980-12-26	0.158482	0.15904	0.158482	0.158482	0.123135	55574400
1980-12-29	0.160714	0.161272	0.160714	0.160714	0.124869	93161600
1980-12-30	0.157366	0.157366	0.156808	0.156808	0.121834	68880000
1980-12-31	0.152902	0.152902	0.152344	0.152344	0.118965	35750400
1981-01-02	0.154018	0.155134	0.154018	0.154018	0.119666	21660800
1981-01-05	0.151228	0.151228	0.15067	0.15067	0.117065	35728000
1981-01-06	0.144531	0.144531	0.143973	0.143973	0.113862	45158400
1981-01-07	0.138393	0.138393	0.137835	0.137835	0.107093	55686400
1981-01-08	0.135603	0.135603	0.135045	0.135045	0.104925	39827200
1981-01-09	0.142299	0.142857	0.142299	0.142299	0.110561	21504000
1981-01-12	0.142299	0.142299	0.141183	0.141183	0.109694	23699200
1981-01-13	0.136719	0.136719	0.136161	0.136161	0.105792	23049600
1981-01-14	0.136719	0.137277	0.136719	0.136719	0.106226	14291200
1981-01-15	0.139509	0.140625	0.139509	0.139509	0.108393	14067200
1981-01-16	0.138951	0.138951	0.138393	0.138393	0.107526	13395200
1981-01-19	0.146763	0.147321	0.146763	0.146763	0.114029	41574400
1981-01-20	0.142857	0.142857	0.142299	0.142299	0.110561	30083200

Click any cell in the "Date" Column. Sort the "Date" as Newest to Oldest.

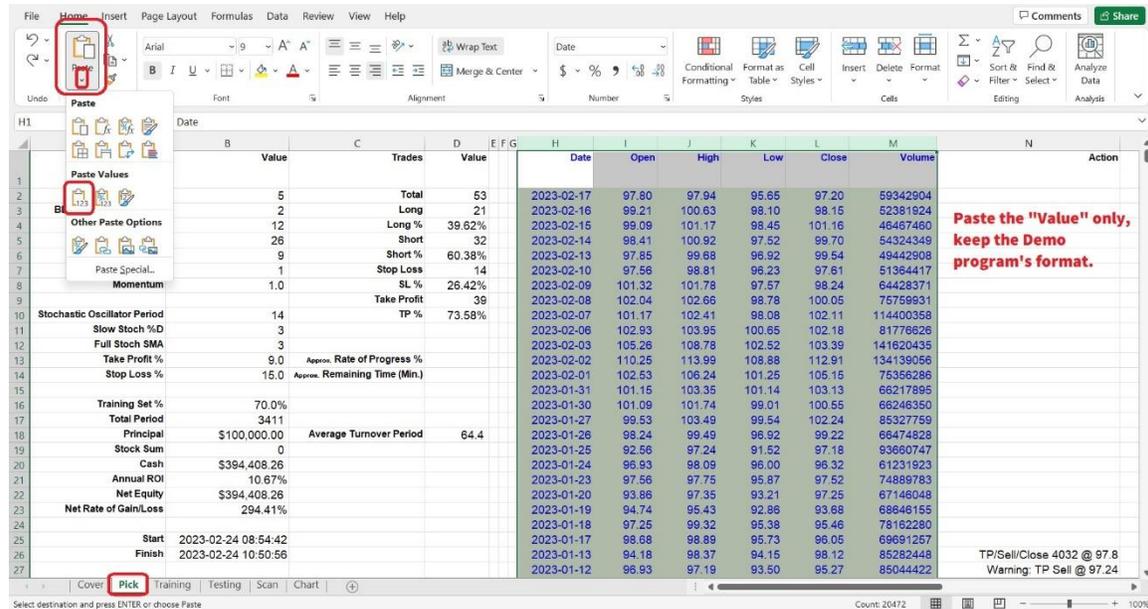


Select and Copy 6 columns including Date, Open, High, Low, Close and Volume historical data.



Open the Demo Excel file that contains the VBA Macro for back-testing, click the "Pick" worksheet tab, select columns H to M that correspond to

the 6 columns storing the Date, Open, High, Low, Close, and Volume historical data. Then, paste the “Value” only (don’t bring the .csv files’ format into the Demo Excel file) into these selected columns.



Save the Demo Excel file. We don’t need the Yahoo .csv file anymore, so close it. Now the targeted stock’s historical data has been filled in the Demo Excel file, and it is ready to run the VBA Macro program for back-testing.

2, MSN.com: You can download historical stock prices from MSN Money by following these steps:

Go to the MSN Money website (<https://www.msn.com/money>).

Enter the ticker symbol of the stock you want to download data for in the search bar and click "Search".

On the stock's page, click on the "History" button, sometimes it is hidden inside the three dots button in the top right corner.

In the "History" section, select the time range you want to download data for.

The historical data will be displayed on the page. Select and copy the data, paste into Excel sheets.

Note that not all stocks may be available on MSN Money, and the historical data may be subject to delays or inaccuracies. It's always a good idea to double-check the data before using it in your analysis or trading strategy.

3, Google Finance: Google Finance also provides free historical price data for most stocks. Simply go to the Google Finance website, enter the ticker symbol of the stock you are interested in, and select the "Historical Prices" option. You can then download the data for a specified time period.

You can download historical stock prices from Google using Google Sheets by following these steps:

Open a new or existing Google Sheet.

In a cell, enter the following formula:

```
=GOOGLEFINANCE("ticker", "attribute", "start_date", "end_date", "interval")
```

where "ticker" is the stock symbol you want to download data for, "attribute" is the price or volume attribute you want to download (such as "open", "high", "low", "close", "volume", or "all"), "start_date" is the date you want to start downloading data from (in the format "YYYY-MM-DD"), "end_date" is the date you want to stop downloading data at (in the format "YYYY-MM-DD"), and "interval" is the frequency of the data you

want to download (such as "DAILY" for daily data, "WEEKLY" for weekly data, or "MONTHLY" for monthly data).

For example, if you want to download the daily closing price data for Apple stock (symbol "AAPL") from January 1, 2012, to December 31, 2022, you would enter the following formula in a cell:

```
=GOOGLEFINANCE("AAPL", "all", "2012-01-01", "2022-12-31", "daily")
```

Press Enter. The formula will automatically download the historical data for the stock and display it in the cell.

If you want to download data for multiple stocks or attributes, you can copy the formula to other cells and edit the parameters as needed.

Note that the GOOGLEFINANCE function may not be available in all regions or may be subject to certain limitations. Additionally, the historical data downloaded using this method may be subject to delays or inaccuracies, so it's always a good idea to double-check the data before using it in your analysis or trading strategy.

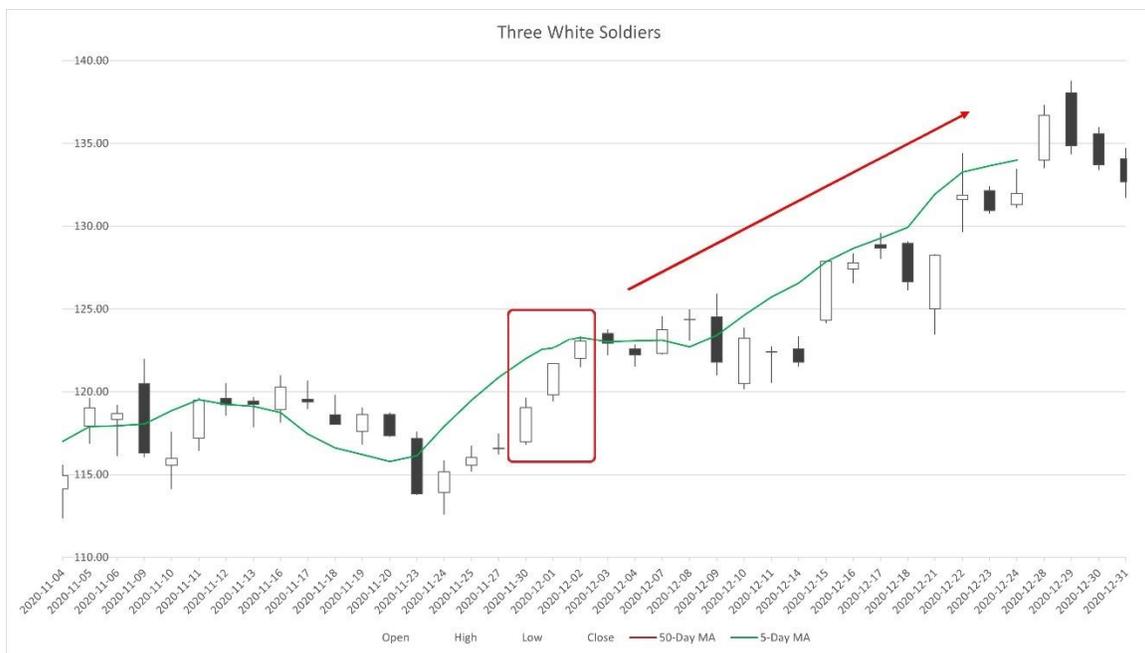
These are other options for downloading stock data, but need to pay some fees. It's important to note that the availability and quality of data may vary depending on the source, so it's always a good idea to do your research and make sure the data is suitable for your needs before using it.

After importing all your historical stock data into Excel, you may start to feel like a data analysis wizard. But be careful, with great power comes great responsibility... to not accidentally delete all your hard work with one misplaced click of the mouse! So, remember to save your Excel file often and always have a backup, because you never know when Excel will decide to crash on you. And if all else fails, just blame it on the stock market. It's always the stock market's fault.

CHAPTER 4: CREATING TRADING STRATEGIES

To create a trading strategy, you need to identify a set of rules that will determine when to enter and exit trades. In this chapter, we will cover some basic trading strategies and show you how to implement them in Excel using formulas and VBA.

For example, have you ever heard of the “Three White Soldiers” and “Three Black Crows” stock candlestick patterns? Let’s take a look at this chart:



This is the so-call "Three White Soldiers". It is a bullish candlestick pattern that typically indicates a strong uptrend in the stock price. It consists of three long white (or green) candles, each with small or no shadows, that open higher and close higher than the previous day's candle.

The pattern is called "Three White Soldiers" because the three candles resemble three soldiers marching in a row. It is a sign of strong buying pressure and suggests that the bulls are in control of the market. Traders often look for this pattern to identify potential entry points for long positions, but it should be confirmed with other technical indicators before making any trading decisions.

Now, here we have another pattern:



Let's say hello to the "Three Black Crows". It is a bearish candlestick pattern that is typically seen at the end of an uptrend in the stock price. It consists of three long black (or red) candles, each with small or no shadows, that open lower and close lower than the previous day's candle.

The pattern is called "Three Black Crows" because the three candles resemble three crows sitting in a row. It is a sign of strong selling pressure and suggests that the bears are in control of the market. Traders often look for this pattern to identify potential entry points for short positions,

but it should be confirmed with other technical indicators before making any trading decisions.

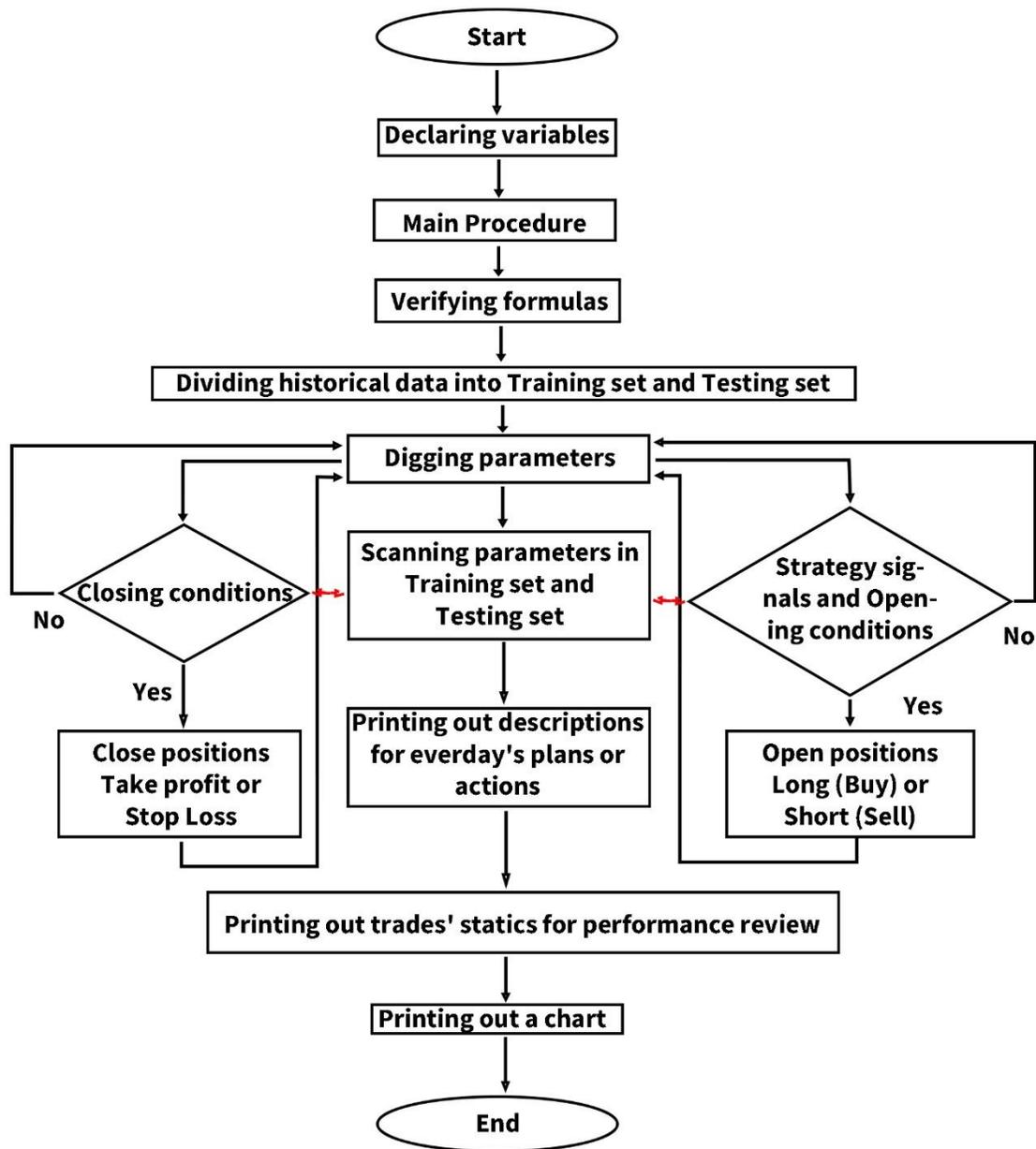
According to these ideas, we can develop a trading strategy to buy stocks while we see the Three White Soldiers appearing, and short sell the stocks when we find the Three Black Crows sitting there.

Now we start to write a VBA Macro, a simple program to execute this strategy. To write a VBA macro, follow these steps:

1. Open Microsoft Excel.
2. Press Alt+F11 to open the Visual Basic Editor.
3. In the Visual Basic Editor, select the workbook in which you want to create the Macro.
4. Click on the Insert menu and select Module. This will create a new module for the Macro.
5. In the module, type the code for the Macro. The code should be written in the VBA programming language.
6. Save the Macro by clicking on the Save button or by pressing Ctrl+S.
7. Close the Visual Basic Editor.
8. To run the Macro, open the workbook in which it was created and press Alt+F8 to open the Macros dialog box.
9. Select the Macro you want to run and click the Run button.

Note: It is important to test the Macro thoroughly before using it on important data. Also, make sure to enable Macros in Excel before running the Macro.

Before starting to do this VBA coding, we need a plan. It looks like the programming flowchart below:



First of all, we need to declare variables. Declaring variables in VBA is important because it helps to allocate memory to store the data that the variable will hold. This allows the program to use the variable efficiently and effectively.

By declaring variables, you can also specify the data type of the variable (such as integer, string, or boolean), which ensures that the variable is used correctly throughout the program. If you don't declare a variable, VBA will assume a data type based on the value assigned to the variable, which can cause errors or unexpected results.

Declaring variables also makes the code more readable and easier to understand, as it makes it clear what each variable represents and how it will be used.

In the Main Procedure, we will turn off Automatic Calculation to speed up VBA. Use `Application.Calculation = xlCalculationManual` at the beginning of the code, and turn it on again at the end with `Application.Calculation = xlCalculationAutomatic`.

Then we do some initialization, and call four subroutines, each implementing a different function.

```
Call Self_Verifying 'Verifying formulas  
  
Call Digging 'Digging parameters  
  
Call Scanning 'Scanning parameters in Training set and Testing set  
  
Call EquityChart 'Printing out a chart to evaluate the result
```

In the Self-Verifying procedure, we will verify all formulas used in every Excel worksheet, such as calculating moving average value, indicator value, stock position, cash, equity, etc. These formulas have been set into the demo Excel files. To prevent them from being ruined or damaged accidentally, every time the VBA Macro is run, the program will verify all formulas automatically to ensure that the results and output are correct and fit the same standards.

In the Digging procedure, we will dig through every parameter combination to simulate opening and closing positions, calculate the profit or loss, compare ROI, eliminate low-performance parameters, and select profitable combinations.

For digging out good parameter combinations, we want to borrow some ideas from Machine Learning technology (very fashionable, eh?), to divide historical data into two parts, test our Trading Strategy (or we can use another word, “Model”, in Machine Learning) under different conditions.

In machine learning, the data is often divided into two subsets: the training set and the testing set. The training set is used to train the machine learning model, while the testing set is used to evaluate the performance of the trained model.

The purpose of dividing the data into training and testing sets is to avoid overfitting, which is a situation where the model performs very well on the training data but poorly on new, unseen data. By evaluating the model's performance on the testing set, we can get an estimate of how well the model will perform on new, unseen data.

For stock trading, it means: based on the training set's performance, we can select some strong parameters to test in the testing set, screen out and throw out the weak ones which will lead us to failure and loss, those survivors will give us a likelihood to estimate how profitable the strategy will perform in the future theoretically.

The historical data can be divided into training and testing sets, with a typical split of 70% for training and 30% for testing. In our Demo Excel files, the default split is 70% for Training set and 30% for Testing set. Users can adjust them to 60% or 80% for training and 40% or 20% for testing. Be careful, the split ratio could affect the final results significantly.

The most important part in Digging procedure is the trading strategy conditions. We have a subroutine named as Signals to take charge of comparing the opening conditions. For example, we can Call Signals() to generate the simplest "Three White Soldiers" signals (three white candles in a row) like this:

```

If LongOK = False And _

    (Cells(Candle, "L").Value - Cells(Candle, "I").Value) / Cells(Candle, "I").Value > Trigger And _

    (Cells(Candle + 1, "L").Value - Cells(Candle + 1, "I").Value) / Cells(Candle + 1, "I").Value > Trigger
And _

(Cells(Candle + 2, "L").Value - Cells(Candle + 2, "I").Value) / Cells(Candle + 2, "I").Value > Trigger
Then

'The "Candle + 1" means one day before today's candlestick, The "Candle + 2" means two days
before today's candlestick. Within these three days, Close prices (stored in column L) are higher
than Open prices (stored in column I) in a row, and exceed at a certain point, the difference is
bigger than the Trigger, then the Long signal goes to OK.

    LongOK = True

    BCBM = Candle

    BBP = Round(Cells(Candle, "L").Value, 2)

    Cells(Candle, "N").Value = "Long OK " & Int([B20].Value * CP / 100 / BBP) & "@ " & BBP

    Exit Sub

End If

```

And generate the "Three Black Crows" signal as below:

```

If ShortOK = False And _

```

```
(Cells(Candle, "L").Value - Cells(Candle, "I").Value) / Cells(Candle, "I").Value < -1 * Trigger And _
```

```
(Cells(Candle + 1, "L").Value - Cells(Candle + 1, "I").Value) / Cells(Candle + 1, "I").Value < -1 *  
Trigger And _
```

```
(Cells(Candle + 2, "L").Value - Cells(Candle + 2, "I").Value) / Cells(Candle + 2, "I").Value < -1 *  
Trigger Then
```

'The "Candle + 1" means one day before today's candlestick, The "Candle + 2" means two days before today's candlestick. Within these three days, Close prices (stored in column L) are lower than Open prices (stored in column I) in a row, and exceed at a certain point, the difference is bigger than the Trigger, then the Short signal goes to OK.

```
ShortOK = True
```

```
SCBM = Candle
```

```
SBP = Round(Cells(Candle, "L").Value, 2)
```

```
Cells(Candle, "N").Value = "Short OK " & Int(((B20).Value + 1.5 * [B19].Value * SIPEbP) / 1.5 * CP  
/ 100 / SBP) & "@" & SBP
```

```
Exit Sub
```

```
End If
```

On the next few days, if the LongOK signal is On and the ShortOK signal is Off, then the VBA Macro will open a Long position. Conversely, if the ShortOK signal is On and the LongOK signal is Off, the program will open a Short position. Codes look like these:

```
If BCBM - Candle > [B7].Value Then LongOK = False
```

```
If SCBM - Candle > [B7].Value Then ShortOK = False
```

'Open Long

If BCBM - Candle <= [B7].Value Then

' If LongOK = True And ShortOK = False And Cells(Candle, "I").Value > BBP Then

If LongOK = True And ShortOK = False Then

DIpe = Round((Cells(Candle, "J").Value + Cells(Candle, "K").Value) / 2, 2)

If [B19].Value = 0 Then

TdSum = Int([B20].Value * CP / 100 / DIpe)

Cells(Candle, "O").Value = -1 * TdSum * DIpe

[B19].Value = [B19].Value + TdSum

PBM = DIpe

BM = [B20].Value + Cells(Candle, "O").Value + [B19].Value * PBM

[B20].Value = [B20].Value + Cells(Candle, "O").Value

Cells(Candle, "AE").Value = [B20].Value + [B19].Value * Cells(Candle, "L").Value

Cells(Candle, "N").Value = "Buy/Open " & TdSum & " @ " & DIpe

End If

End If

End If

'Open Short

```

If SCBM - Candle <= [B7].Value Then

' If ShortOK = True And LongOK = False And Cells(Candle, "I").Value < SBP Then

If ShortOK = True And LongOK = False Then

    DIpe = Round((Cells(Candle, "J").Value + Cells(Candle, "K").Value) / 2, 2)

If [B19].Value = 0 Then

    TdSum = Int([B20].Value / 1.5 * CP / 100 / DIpe)

    Cells(Candle, "O").Value = TdSum * DIpe

    [B19].Value = [B19].Value - TdSum

    PBM = DIpe

    BM = [B20].Value + Cells(Candle, "O").Value + [B19].Value * PBM

    [B20].Value = [B20].Value + Cells(Candle, "O").Value

    Cells(Candle, "AE").Value = [B20].Value + [B19].Value * Cells(Candle, "L").Value

    Cells(Candle, "N").Value = "Sell/Open " & TdSum & "@" & DIpe

End If

End If

End If

```

VBA Macro will execute these codes again and again, until finish all loops which are appointed by us. According to all results, the program will delete bad parameters and retain the good ones to pass to the next procedure.

The Scanning procedure looks the same as the Digging procedure. All good parameters screened out from the Digging procedure will be tortured (if you feel this word is too cruel, replace it by “tested”) again in this part.

We will use historical data from the Testing set to test the parameters and simulate opening and closing positions during the Testing set's time period. Most parameter combinations will be eliminated because they fail to generate a profit, or the profit is too low. Only the top-performing parameters have value and can be considered as real fighters.

In the end, we will let the winners scanned in the Testing set run a full test/torture, from day one to the most recent data, and screen out the final competitors for future's real battles.

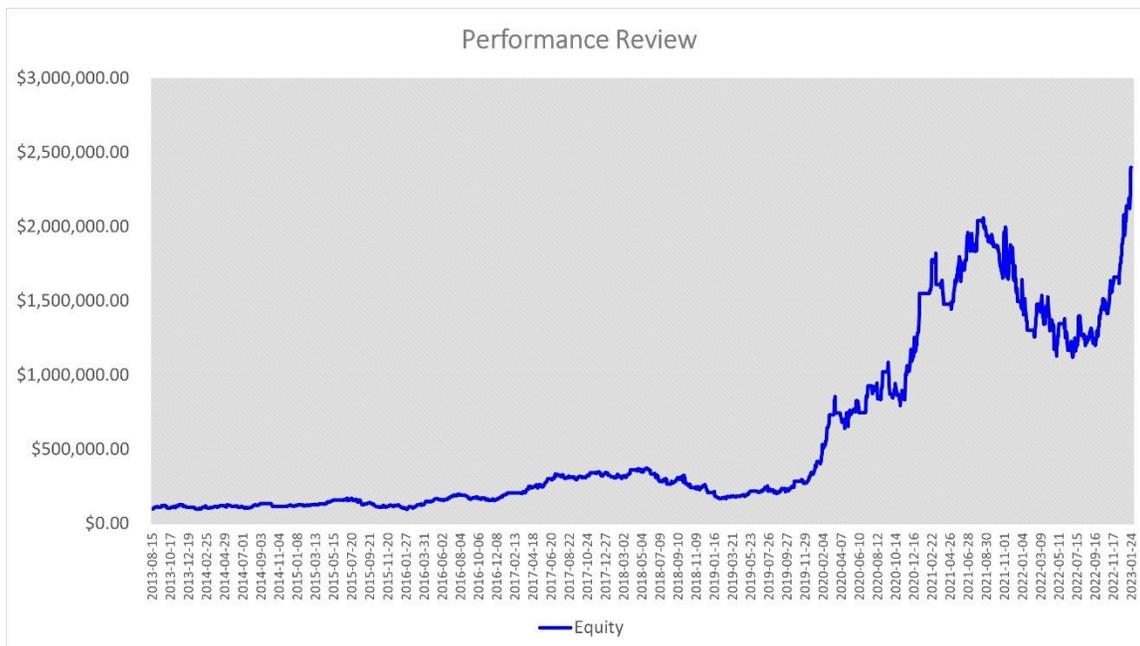
I've heard some traders and investors expressing their complaints and confusion, asking “Why do most trading strategies fail?”

Well, we can name dozens of reasons why most trading strategies fail, but one of the most significant factors should be the lack of proper back-testing and forward-testing. Many traders fail to thoroughly test/torture their strategies before implementing them in real-time trading. They may simply copy and use default parameters for indicators without exploring profitable parameter settings or even being aware of tools for back-testing and parameter optimization. That leads to failure in the ever-changing market environment. Markets are dynamic and constantly evolving, and what may have worked in the past may not be effective anymore. Without regularly updating and optimizing trading strategies, traders are at risk of using settings that are no longer relevant to the current market conditions, resulting in poor performance.

Furthermore, blindly copying parameter settings without understanding the underlying logic of the strategy can also contribute to failure. It's

essential to thoroughly understand how a trading strategy works and why it may or may not be successful in different market conditions. This requires conducting thorough back-testing and forward-testing to determine the optimal parameter settings that are aligned with the current market dynamics.

In the final stage, the VBA Macro generates a chart which allows users to easily evaluate the results. Charts and curves provide a visual representation of data, facilitate comparative analysis, aid in trend identification, support data interpretation, and explain the tests or experimental results. With just a glance at the curve, the pattern speaks for itself, better than thousands of words. The curve may resemble something like the chart below:



Can you guess which stock this is? If I told you it was Tesla, you might say "No wonder", eh? The curve appears like a roller coaster ride, eh? The ROI is so high (Annul ROI goes to almost 40%), but it will also cause our blood pressure to rise high, eh? The “Three White Soldiers” and “Three Black

Crows” trading strategy looks “WOW!”, but still require a lot of modifications and optimizations, which we will cover in a future chapter.

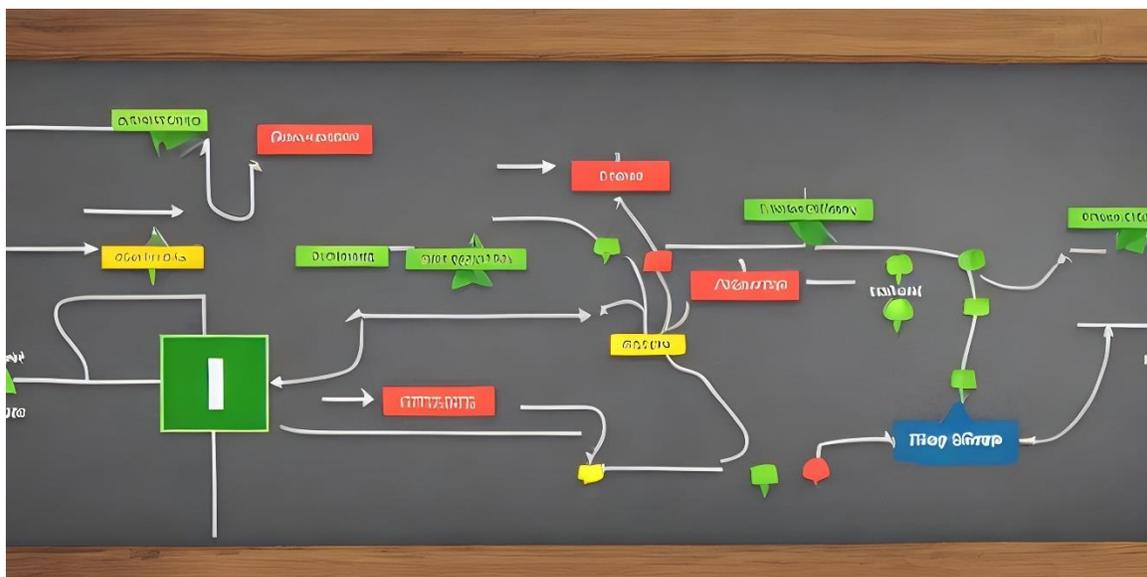
As we come to the end of this chapter, let me remind you of a crucial fact: trading is not for everyone. If you find yourself getting anxious or losing sleep over your trades, it's time to take a break and re-evaluate your life choices. Maybe knitting or stamp collecting is more your speed.

But if you're still determined to become a successful trader, remember to keep your sense of humor intact. As Groucho Marx once said, "If you're not having fun, you're doing something wrong." So laugh off your losses, celebrate your wins, and don't forget to take a break from staring at those candlestick charts every once in a while.

With that said, happy trading and may the Three White Soldiers always march in your favor! (Just don't get too close to the Three Black Crows.)

If you would like to try out the “Three White Soldiers & Three Black Crows” strategy back-testing tool, click on

<https://www.tyzu.com/Trial/index.html> to get a 30-day free trial demo.



CHAPTER 5: BACKTESTING YOUR TRADING STRATEGIES

Once you have a trading strategy, the next step is to do back-testing for it. In this chapter, we will show you how to create a back-testing spreadsheet that will allow you to test your strategies on historical data.

Before doing back-testing, we need to set some conditions first. For example, we use the “Three White Soldiers” and “Three Black Crows” strategy to simulate trading TSLA (Tesla, Inc.), click the “Pick” worksheet, we can see:

Parameters	Value	Trades	Date	Open	High	Low	Close	Volume	Action	Cost/Income	SMA	Equity
SMA Period	5	Total	2023-01-24	143.00	146.60	141.10	143.89	15899100	Long OK @ 143.89		135.40	\$2,401,088.43
BB Standard Deviations	2	Long	2023-01-23	135.87	145.38	134.27	143.75	203119200			132.92	\$2,396,732.41
MACD Fast	12	Long %	2023-01-20	128.68	133.51	127.35	133.42	138428900			128.05	\$2,226,366.00
MACD Slow	26	Short	2023-01-19	127.26	129.88	124.31	127.17	170291800			128.08	\$2,122,078.50
MACD Signal	9	Short %	2023-01-18	136.56	138.88	127.01	128.78	164680300			125.89	\$2,146,942.97
Expiration	1	Stop Loss	2023-01-17	125.70	131.70	125.02	131.49	186477000	Buy/Open 16686 @ 128.36	(\$2,141,814.96)	123.90	\$2,194,162.13
Momentum	0.1	SL %	2023-01-13	116.55	122.03	115.60	122.40	160438300	Long OK 17499 @ 122.4		121.56	\$2,141,934.87
Stochastic Oscillator Period	14	Take Profit	2023-01-12	122.56	124.13	117.00	123.56	168403000			119.09	\$2,141,934.87
Slow Stoch %D	3	TP %	2023-01-11	122.09	125.86	120.51	123.22	163810800			117.05	\$2,141,934.87
Full Stoch SMA	3		2023-01-10	121.07	122.76	114.92	118.85	167842500			115.13	\$2,141,934.87
Take Profit %	20.0	Rate of Progress %	2023-01-09	118.96	123.52	117.11	119.77	160284000			112.98	\$2,141,934.87
Stop Loss %	12.0	Remaining Time (Min.)	2023-01-06	103.00	114.39	101.81	113.06	220575800	TP/Close 9034 @ 102.89	(\$996,476.80)	113.06	\$2,141,934.87
Training Set %	70.0%		2023-01-05	110.51	111.75	107.16	110.54	157988300	Warning TP Buy @ 103.56		115.42	\$2,087,775.81
Principal	\$100,000.00	Average Turnover Period	2023-01-04	109.11	114.59	107.52	113.64	180389000	Warning TP Buy @ 103.56		115.89	\$2,035,785.58
Stock Size	10000		2023-01-03	118.47	118.80	104.64	108.10	231402800	Warning TP Buy @ 103.56		114.98	\$2,089,490.35
Cash	\$119.91		2022-12-30	119.95	124.48	119.75	123.18	157304500	Long OK 25470 @ 123.18		117.99	\$1,943,334.81
Annual ROI	39.97%		2022-12-29	120.39	123.57	117.50	121.82	221803300			118.43	\$1,956,488.05
Net Equity	\$2,401,088.43		2022-12-28	110.35	116.27	108.24	112.71	221070500	Warning TP Buy @ 103.56		121.58	\$2,044,001.00
Net Rate of Gain/Loss	2301.07%		2022-12-27	117.50	119.67	108.76	108.10	208643400	Short OK 19171 @ 108.1		126.59	\$2,078,796.35
Start	2023-02-23 17:48:16		2022-12-23	126.37	128.62	121.02	123.15	169889700			134.75	\$1,943,595.61
Finish	2023-02-23 18:17:55		2022-12-22	138.00	138.63	122.26	125.36	210080300	Sell/Open 9694 @ 129.45	\$1,254,888.30	140.16	\$1,922,288.85
RSI Period	14		2022-12-21	139.34	141.26	135.89	137.57	145417400	Short OK 9122 @ 137.57		146.83	\$1,882,523.43
SMA Offset	5		2022-12-20	146.05	148.47	137.66	137.80	159563300	TP/Close 6433 @ 137.69	(\$885,759.77)	150.47	\$1,882,523.43
Serial Number	421		2022-12-19	154.00	155.25	145.82	149.87	138390600			156.10	\$1,804,169.52
Original Annual ROI	32.27%		2022-12-16	159.64	160.90	150.34	150.23	158032300			158.69	\$1,801,803.84
Optimization Factor	2.41783685		2022-12-15	153.44	160.93	153.28	157.87	122334500			164.48	\$1,753,992.10
			2022-12-14	159.25	161.62	155.31	156.80	140682300	Short OK 11769 @ 156.8		167.61	\$1,759,588.78
			2022-12-13	174.87	175.05	160.91	160.95	175862700			171.06	\$1,732,891.87
			2022-12-12	178.10	177.37	167.52	167.82	160794500			174.83	\$1,688,097.10
			2022-12-09	173.84	182.50	173.36	178.05	104872300			177.78	\$1,616,454.53
			2022-12-08	172.20	175.20	169.06	173.44	97624500	Sell/Open 6433 @ 172.13	\$1,107,312.29	180.92	\$1,652,543.67
			2022-12-07	175.03	178.38	172.22	174.04	84213300	Short OK 6302 @ 174.04		185.17	\$1,600,970.91
			2022-12-06	181.22	182.86	175.33	179.82	62150800			189.31	\$1,600,970.91
			2022-12-05	186.44	188.93	180.42	180.42	60430300			189.24	\$1,600,970.91

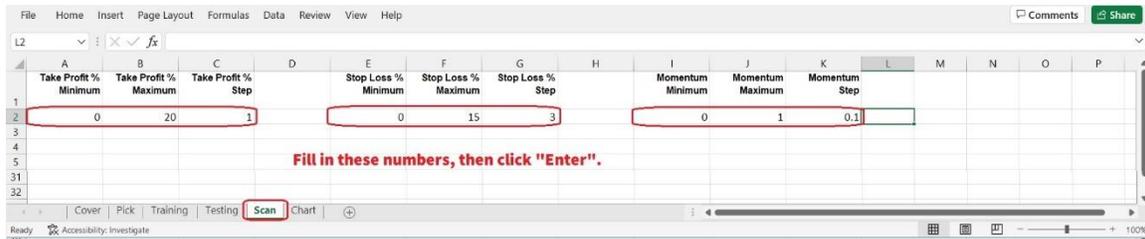
In the "Pick" worksheet, set the Principal at cell B18 (typically set at 100,000), and the Training % at cell B16 (normally set at 70).

Set the SMA at cell B2 (normally set at 5), and the Expiration at cell B7 (normally set at 3).

Fill the Optimization Factor value in cell B34. This value is specific to each stock and is calculated based on its unique features. It influences the

Trigger and Momentum used during the back-testing VBA Macro. Users can follow us for getting the newest unique Optimization Factor for particular stock.

Now, let's go to the "Scan" worksheet, set the scan ranges for Take Profit, Stop Loss, and Momentum. The "Scan" worksheet looks like below:

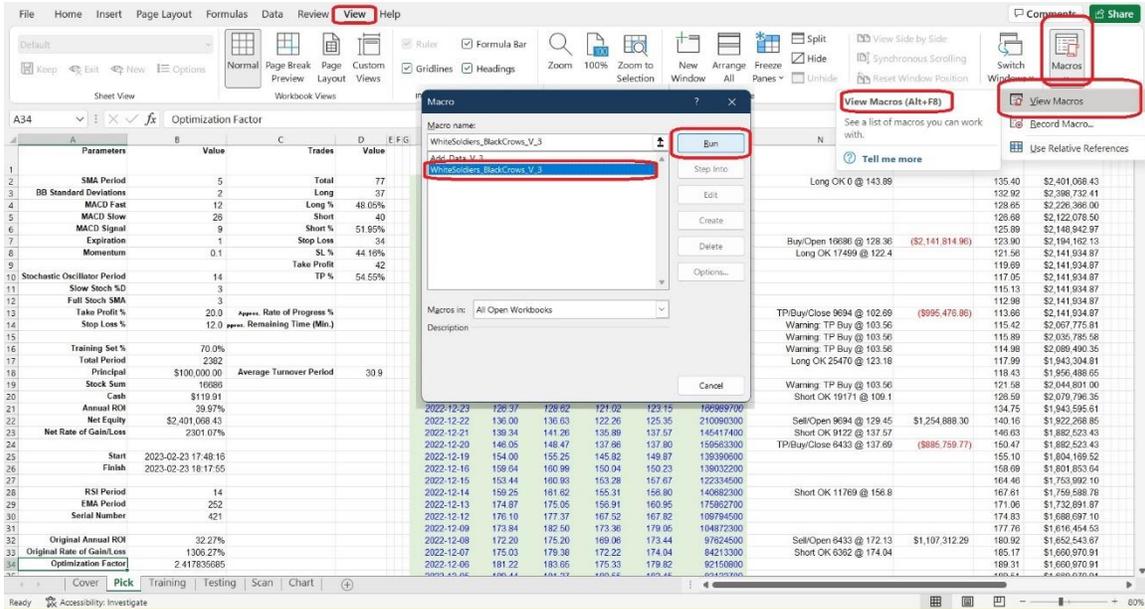


The back-testing VBA Macro will try every combination, such as Take Profit at 3%, Stop Loss at 10%, and Momentum (a standard to trigger the Buy or Sell actions) at 0.5, etc. This tool will execute these conditions to simulate a series of trading actions using historical data from the beginning, opening and closing long or short positions based on the signals generated by your trading strategies.

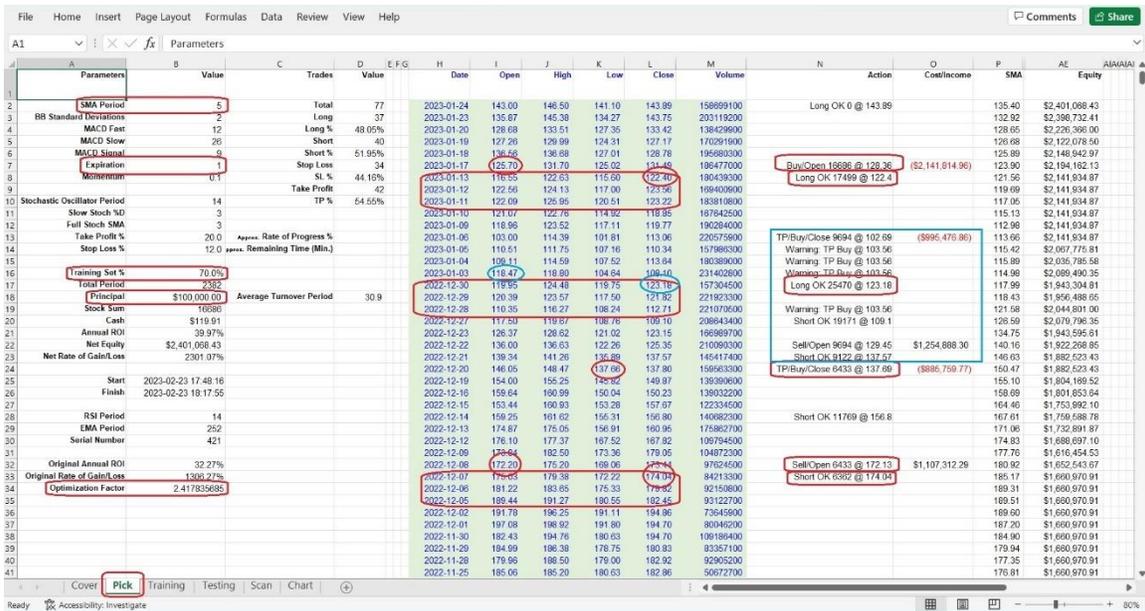
To run the VBA Macro program, there are several methods, for example, we can:

1. Click on the "View" tab on the Excel ribbon.
2. Click on the "Macros" button in the "Macros" group. This will open the "Macro" dialog box.
3. In the "Macro" dialog box, select the Macro that you want to run.
4. Click on the "Run" button.
5. We can also press Alt + F8, the "Macro" dialog box will jump out, select the Macro (the name in this demo is "WhiteSoldiers_BlackCrows" and its version number), then click the "Run" button.

6. The fastest method is using shortcut hot keys: Press Ctrl + Y, the Macro will run immediately.



Let's take a closer look at the back-testing trading simulation record generated by the VBA Macro. In column N, the program lists every plan and action, which allows users to easily understand the trading strategy's actions. For example:



We can see:

On December 5, 2022, TSLA's Open price was 189.44 and closed at 182.45, with the Close price being lower than the Open price, the first Black Crow appeared.

On December 6, 2022, TSLA's Open price was 181.22 and closed at 179.82, with the Close price being lower than the Open price too, the second Black Crow appeared.

On December 7, 2022, TSLA's Open price was 175.03 and closed at 174.04, with the Close price being lower than the Open price again, the third Black Crow appeared. The condition of Short was triggered, and this VBA back-testing tool generated a Short OK signal after this trading day, planning to open short positions on the next trading day if the Open price of the next trading day is lower than the current day's Close price.

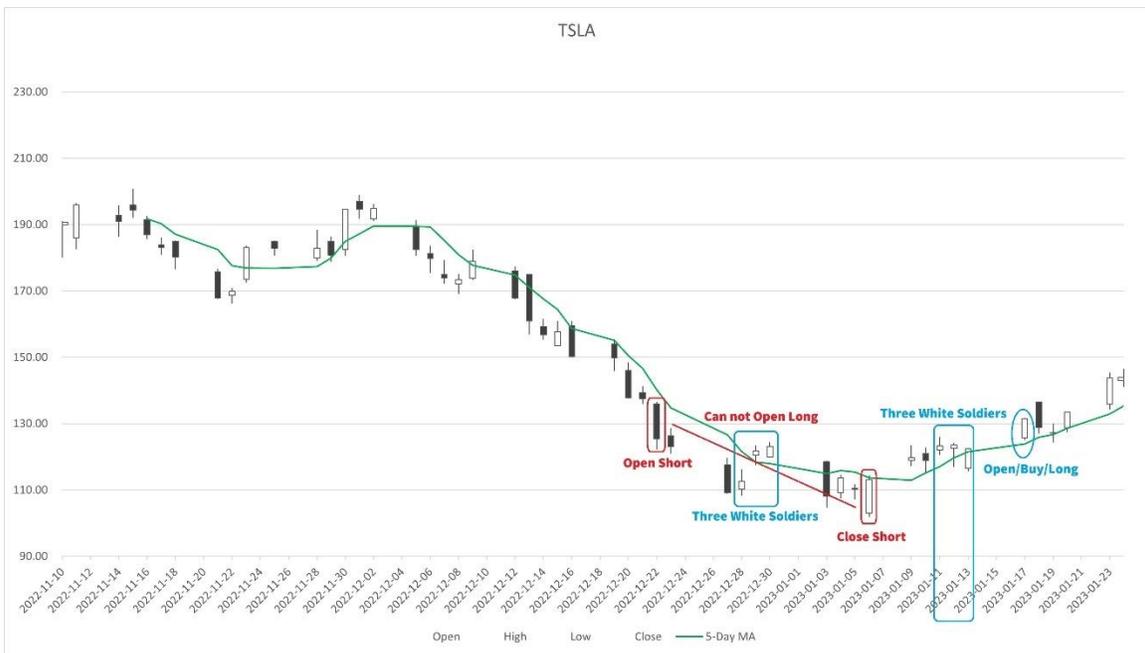
On December 8, 2022, TSLA's Open price was 172.20, which was lower than the previous day's Close price, the final condition of our strategy was triggered, then the VBA back-testing tool executed the Short (Sell) Open action finally.

(If you would like to try out the “Three White Soldiers & Three Black Crows” strategy back-testing tool, click on <https://www.tyzu.com/Trial/index.html> to get a 30-day free trial demo. Besides this one, there are several other strategies back-testing tools for free trial too.)

On December 20, 2022, TSLA's price went down to 137.66, hitting the 20% Take Profit target, so the VBA back-testing tool executed the Close action according to the program, as seen in the chart below:



2022-12-30, the “Three White Soldiers” signal appeared, the VBA Macro generated a Long signal, but did not execute Opening action on the next day, why? Because on 2022-12-22, the program had opened a Short position, and this Short position was not closed until 2023-01-06, therefore we could not open a Long position during the Short action.



2023-01-11 to 2023-01-13, the “Three White Soldiers” signal appeared again, the next trading day, 2023-01-17, the back-testing tool executed Open Long positions finally, just like the chart above.

As you can see, everything can be explained based on data, without any guesswork. This type of tool can help us calculate, evaluate, and make decisions based on concrete facts and details. While historical performance cannot guarantee future results, back-testing can theoretically help us avoid hopeless and blind guessing and imagination. Although it may not guarantee making money in the present, it can help us make more informed decisions for the future, in theory. The process of back-testing ideas, methods, and tools can be applied to various financial instruments including stocks, Forex (foreign exchange), options, futures, cryptocurrencies, and bonds, among others.

After every loop is done, the VBA program will calculate the ROI, and store into a cell, then move to next loop. When it has finished calculating and comparing all ROI from the beginning to the end of the training set, the tool will move to the testing set and repeat the process. Finally, it will give you a chart, showing how good or bad this strategy will work.

Here we go to another example. Let's pick a famous indicator, MACD, and use NVDA's historical data to perform a backtest for a MACD trading strategy (NVDA is Nvidia Corporation's stock symbol). The MACD (Moving Average Convergence Divergence) indicator is a popular technical analysis tool used by traders to identify potential trend reversals and momentum shifts in financial markets.

The MACD indicator is composed of three components: the MACD line, the signal line, and the histogram. The MACD line is the difference between two exponential moving averages (EMAs) of different time periods, usually 12 and 26 periods. The signal line is a 9-period EMA of the MACD line, and

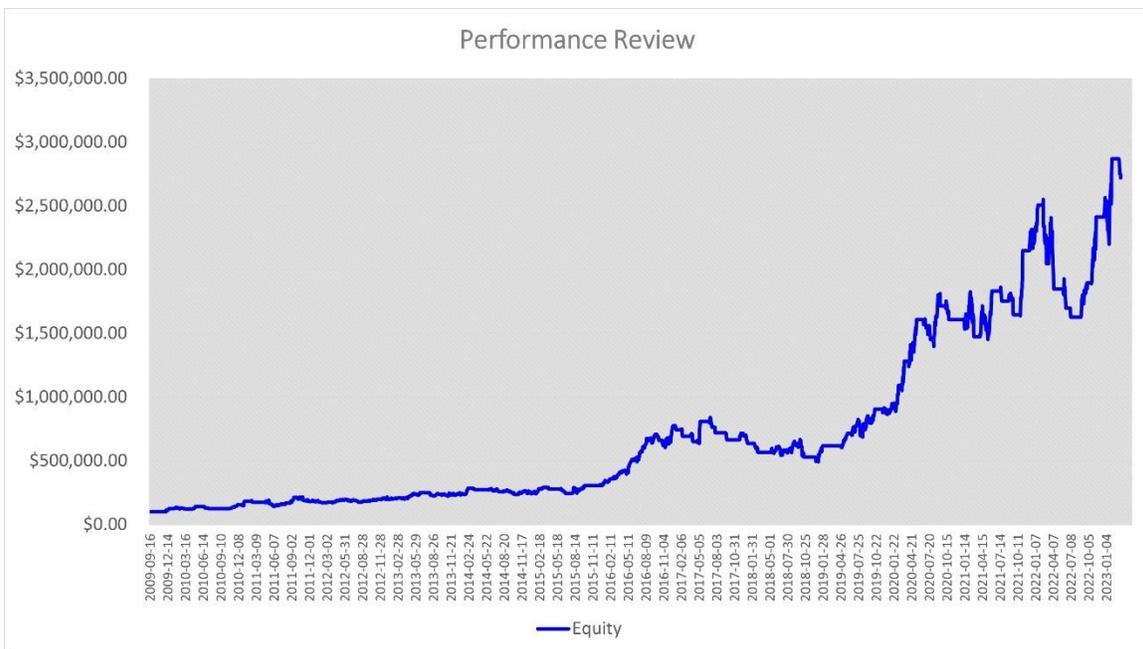
the histogram represents the difference between the MACD line and the signal line.

When the MACD line crosses above the signal line, it is considered a bullish signal, indicating that momentum is shifting to the upside. Conversely, when the MACD line crosses below the signal line, it is a bearish signal, indicating that momentum is shifting to the downside.

Now, let's go to the "Scan" worksheet, set the scan ranges for Take Profit, Stop Loss, Momentum, and MACD Fast, Slow and Signal. The "Scan" worksheet looks like below:

	A	B	C	D	E	F	G	H	I	J	K	L
1	Take Profit % Minimum	Take Profit % Maximum	Take Profit % Step		Stop Loss % Minimum	Stop Loss % Maximum	Stop Loss % Step		Momentum Minimum	Momentum Maximum	Momentum Step	
2	9	30	3		0	15	3		0	10	1	
3												
4												
5												
6	MACD Fast Minimum	MACD Fast Maximum	MACD Fast Step		MACD Slow Minimum	MACD Slow Maximum	MACD Slow Step		MACD Signal Minimum	MACD Signal Maximum	MACD Signal Step	
7	5	20	3		19	40	3		5	20	3	
8												

After running the VBA tool, we will get a curve in "Chart" worksheet like this:



And we can see, when the MACD is crossing up and higher than MACD Signal, the VBA Macro generates a Long OK signal, and Buy to open Long in 1 day; when the MACD is crossing down and lower than MACD Signal, the VBA program gives a Short OK signal, then Sell to open short in 1day. If we set the Expiration (“Pick” worksheet cell B7) as 3, the signals will expire after 3 days.

After a long run, since 2009-07-24 to 2023-03-20, which is a total of 3437 trading days, and with the following parameters set: Momentum at 0, Take Profit at 24%, Stop Loss at 6%, MACD Fast at 20, MACD Slow at 37, MACD Signal at 20, we will get an Annual ROI at 27.47%, compared to S&P 500 Index’s average of 7%, it sounds impressive, eh?

Although we should not rely solely on one indicator for making trading decisions, if this indicator shows such quality while working solely, it is qualified to be one part of the materials in a trading strategy that integrates other indicators or patterns of the same quality, and has the potential to be combined with other good indicators or patterns to create a stronger trading strategy.

Some traders complain that MACD does not work well for them. There could be many reasons for this failure, but one of the reasons could be that they did not do the back-testing correctly, especially if they did not find the right parameter combinations or settings. Do you remember the default parameters of MACD? They are MACD Fast at 12, Slow at 26, and Signal at 9, right? We tried these default settings to back-test the MACD, using the same data of NVDA, and got a sad result: no matter how the Take Profit, Stop Loss, and Momentum were set, the typical 12-26-9 MACD setting failed.

This sad result explains why some traders dislike the MACD indicator. Actually, they do not know that it is not the MACD's fault, but rather a

problem with the parameter settings. If they had known how to adjust the parameter settings earlier, they might have discovered a “gold mine”.

Let's get to the point, back-testing is crucial, and a back-testing tool can be very helpful. Sometimes it can make the difference between life and death. If you still do not have a back-testing tool to verify trading strategies and find the correct settings for your favorite indicators, [get one now](#). You must be glad when you have a good tool on hand and your competitors don't even know there are such cool things in the world.

While a trading strategy may perform well in back-testing, there is no guarantee that it will be profitable in future real-money trading. Past performance is not necessarily indicative of future results. Conversely, if a trading strategy consistently loses money in back-testing, there is a high likelihood that it will also lose money in future real-money trading.

In short, if an apple was tasty and fresh in the past, there is no guarantee it will remain as good in the future, and it may even spoil quickly. On the other hand, if an apple was sour or tasted bad in the past, it is unlikely to become fresh and sweet in the future.

Just like an apple's taste and quality can change over time, a trading strategy's performance can also change in the future, even if it has performed well in the past. And just like a bad-tasting apple is unlikely to become fresh and sweet, a trading strategy that consistently loses money in back-testing is unlikely to become profitable in the future. That is why we say that back-testing may not necessarily help us create a money-making machine, but in theory, it can greatly assist us in identifying and eliminating poor trading strategies, as well as theoretically optimizing a good strategy by adjusting its parameter settings.

After all that hard work back-testing your trading strategy, you finally sit back and admire your spreadsheet. You're feeling pretty confident in your

strategy until you notice that your cat has been walking across the keyboard and undoing all your hard work. Looks like it's time to start over, but hey, at least you have a trading strategy that even your cat can appreciate.

Remember, always make sure to save a backup copy of your work, especially when working with important data and trading strategies. It's better to be safe than sorry, and having a backup can save you a lot of time and stress in case something goes wrong with your original file. So, be sure to save and backup your work regularly to avoid losing any progress or important information.

If you would like to try out the “MACD” strategy back-testing tool, click on <https://www.tyzu.com/Trial/index.html> to get a 30-day free trial demo.



CHAPTER 6: ANALYZING YOUR RESULTS

After back-testing your strategies, you need to analyze the results to see if they are profitable. In this chapter, we will cover some basic metrics that you can use to evaluate your strategy's performance.

Analyzing the results of your back-testing is a critical step in evaluating the effectiveness of your trading strategies. It helps you to identify strengths and weaknesses in your approach and to make any necessary adjustments to improve your strategy's performance.

There are several metrics that you can use to evaluate your strategy's performance, including the following:

1. **Profit and Loss (P&L):** This is the most basic metric for evaluating a trading strategy. It measures the total profit or loss generated by the strategy over a specific period.
2. **Win Rate:** Win rate is the percentage of trades that are profitable. A high win rate does not necessarily mean a profitable strategy.
3. **Turnover Period:** It is typically calculated as the average number of days between two actions. A shorter turnover period is generally seen as more efficient, as it indicates that the trading strategy is more robust.
4. **Maximum Drawdown:** Maximum drawdown is the largest decline in value experienced by a portfolio or investment strategy from its peak value to its lowest value.
5. **Sharpe Ratio:** The Sharpe ratio is a measure of risk-adjusted return. It takes into account the return of the investment relative to the risk involved.

6. Average Profit and Loss per Trade: This metric helps you to determine whether your strategy is making enough money per trade to justify the risk.
7. Average Holding Time: Average holding time is the average length of time a trade is held. This metric can help you to optimize your strategy's holding period.

By analyzing these metrics, you can gain insights into the performance of your strategy and make adjustments as needed to improve its profitability. It is important to remember that no strategy is perfect, and there is always a risk of loss in trading. However, by back-testing and analyzing your results, you can reduce the risk and increase the chances of success.

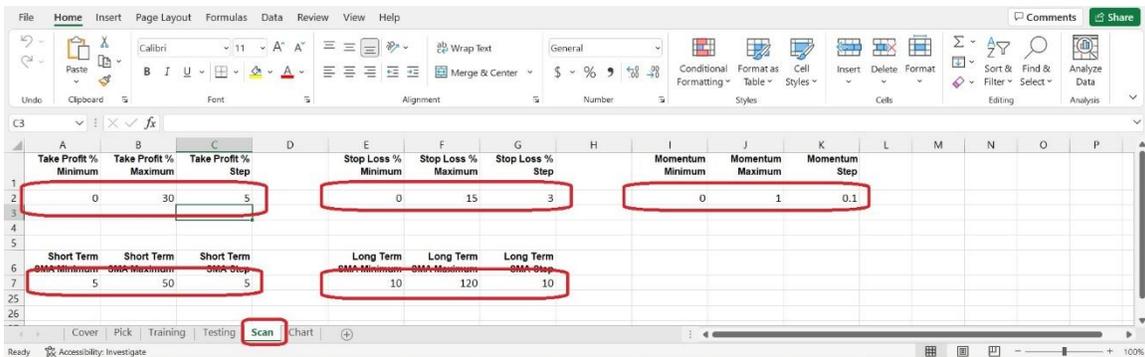
In this demo version, we provide several simple metrics to help users understand some basic ideas about how to evaluate a trading strategy. For more complicated metrics, we will add them in future releases. In this chapter, we will use another trading strategy – “Golden Cross and Death Cross” for AAPL – as an example to explain how to analyze back-testing results.

Golden Cross is a bullish technical analysis pattern that occurs when a short-term moving average crosses above a long-term moving average. For example, a stock's 50-day moving average crosses above its 200-day moving average. This pattern is widely used by traders and investors to identify potential buying opportunities.

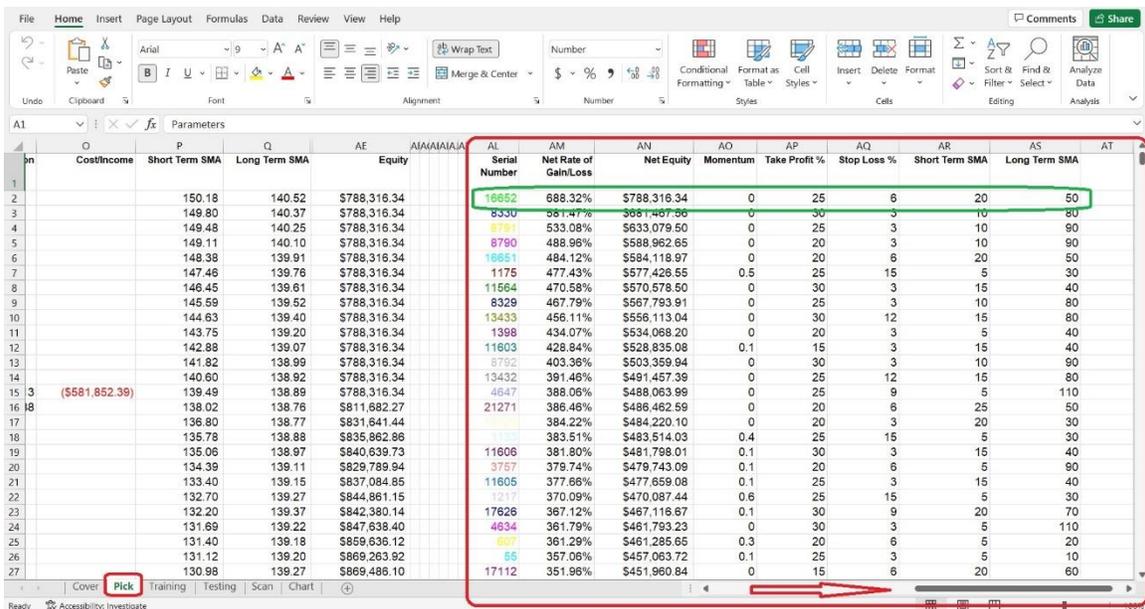
The Golden Cross suggests that the momentum of the stock is turning bullish, as the short-term moving average is starting to rise above the long-term moving average. This can be seen as a bullish signal, as it indicates that the stock's recent price trends are starting to shift to the upside.

The "death cross" is a technical chart pattern that occurs when a stock's short-term moving average crosses below its long-term moving average, indicating a bearish trend. For example, the stock's 50-day moving average crosses below its 200-day moving average. This can be seen as a signal of increased selling pressure in the market and a potential downturn in the stock's price. Some traders use the death cross as a signal to sell their positions or to take a short position in the stock.

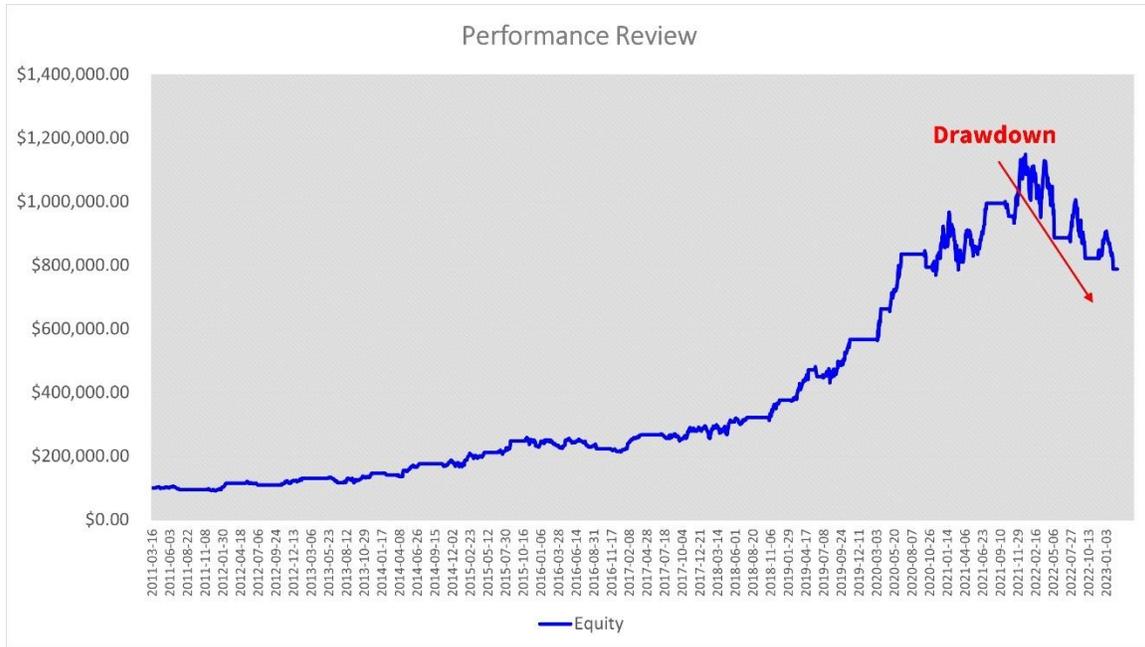
Let's set parameter scanning range in "Scan" worksheet like this:



After running the VBA tool, we will get a series of parameter combinations in "Pick" worksheet like this:



The VBA Macro will pick the top one parameter combination (stored in cells AO2 to AS2) to print out a chart:



The Maximum Drawdown looks a little bit ugly. And we can review this parameter combination's performance metrics in worksheet "Pick":

Parameters	Value	Trades	Value	Date	Open	High	Low	Close	Volume	Action	Cost/Income	Short T
Short Term SMA	20	Total	31	2023-02-23	150.09	150.34	147.42	149.40	46705421			
BB Standard Deviations	2	Long	14	2023-02-22	148.87	149.95	147.16	148.91	50828522			
MACD Fast	12	Long %	45.16%	2023-02-21	150.20	151.29	148.40	148.48	62154122			
MACD Slow	26	Short	17	2023-02-17	152.35	153.00	150.85	152.55	58753236			
MACD Signal	9	Short %	54.84%	2023-02-16	153.51	156.33	153.35	153.71	86914188			
Expiration	2	Stop Loss	17	2023-02-15	153.11	155.50	152.88	155.33	85573800			
Momentum	0.0	SL %	54.84%	2023-02-14	152.12	153.77	150.87	153.20	57805592			
		Take Profit	14	2023-02-13	150.95	154.26	150.92	153.85	61806499			
		TP %	45.16%	2023-02-10	149.46	151.34	149.22	151.01	57409100			
Stochastic Oscillator Period	14			2023-02-09	153.78	154.33	150.42	150.87	56007100			
Slow Stoch HD	3			2023-02-08	153.88	154.58	151.17	151.92	84120100			
Full Stoch SMA	3			2023-02-07	150.64	155.23	150.64	154.65	83322800			
Take Profit %	25.0	Average Rate of Progress %		2023-02-06	152.57	153.10	150.78	151.73	69856300			
Stop Loss %	6.0	Average Remaining Time (Min.)		2023-02-03	148.03	157.38	147.83	154.50	154279900	SL/Buy/Close 3703 @ 157.13	(\$581,852.39)	
				2023-02-02	148.90	151.18	148.17	150.82	118339000	Warning: SL Buy @ 156.88		
Training Set %	70.0%			2023-02-01	143.97	146.61	141.32	145.43	77663800			
Total Period	3056	Average Turnover Period	98.6	2023-01-31	142.70	144.34	142.28	144.29	85874500			
Principal	\$100,000.00			2023-01-30	144.96	145.55	142.85	143.00	64015300			
Stock Sum	0			2023-01-27	143.16	147.23	143.08	145.93	70492800			
Cash	\$788,316.34			2023-01-26	143.17	144.25	141.90	143.96	54105100			
Annual ROI	18.56%			2023-01-25	140.89	142.43	138.81	141.86	85799300			
Net Rate of Gain/Loss	688.32%			2023-01-24	140.31	143.16	140.30	142.53	66435100			
				2023-01-23	138.12	143.32	137.90	141.11	81760300			
Start	2023-02-25 11:51:35			2023-01-20	135.28	138.02	134.22	137.87	79972200			
Finish	2023-02-26 00:54:19			2023-01-19	134.08	136.25	133.77	135.27	58280400			
				2023-01-18	138.82	138.61	135.03	138.21	89672800			
RSI Period	14			2023-01-17	134.83	137.29	134.13	135.94	83646800			
Long Term SMA	50			2023-01-13	132.03	134.92	131.66	134.76	57758000			
Serial Number	1693			2023-01-12	133.88	134.26	131.44	133.41	71379600			
				2023-01-11	131.25	133.51	130.46	133.49	69458900			
Original Annual ROI	23.31%			2023-01-10	130.26	131.26	128.12	130.73	63896200			
Original Rate of Gain/Loss	1169.33%			2023-01-09	130.47	133.41	129.89	130.15	70790800			
Optimization Factor	1.268887046			2023-01-08	128.01	130.26	124.88	128.82	87688300			
				2023-01-05	127.13	127.77	124.76	125.02	80862700			

After a long run, since 2011-01-03 to 2023-02-23, which is a total of 3056 trading days, and with the following parameters set: Momentum at 0, Take Profit at 25%, Stop Loss at 6%, Short Term SMA at 20 days, and Long Term SMA at 50 days, we will get an Annual ROI at 18.56%. It looks like excellent, since Warren Buffett's performance is 18~19% per year, eh?

During this period, there were 31 trade deals completed, with 14 of them being long positions and 17 of them being short positions. Stop loss was triggered 17 times, while take profit was achieved 14 times. The ratio of stop loss vs. take profit was 54.84% vs. 45.16%. On average, it took 98.6 days to complete one full round of buying, selling, holding, and empty position waiting.

It's worth noting that the transactions occurred only 31 times over a 12-year period, which may not provide sufficient evidence to establish the strategy's repeatability with certainty. Too few transactions may lead to overfitting. And it shows that this type of trading strategy is a low-frequency trading strategy, or even an ultra-low-frequency trading strategy, which may not be suitable for short-tempered traders lacking patience.

Now the ugly Drawdown and the Annual ROI at 18.56% (on par with Warren Buffett's performance) come together, can you accept that? Some people may enjoy high returns and can bear temporary big losses, while others may prefer stability and may not care if the profits are low. It depends on individual's investment philosophy; we cannot say whether it is right or wrong.

Profit and risk are inseparable in the market, and high profit comes with high risk, which is a normal situation in the real trading world. For example, investing in a start-up company or a volatile cryptocurrency may offer the potential for high returns, but also comes with a high level of risk. Conversely, investing in a stable, blue-chip stock or a government

bond may offer more moderate returns, but also carries a lower level of risk.

While this VBA back-testing tool can save time on calculations and charting, it cannot replace your own decision-making process and critical thinking.

Still remember the TSLA's curve in chapter 4? Let's review it here:



Since 2013-08-08 to 2023-01-24, the back-testing Annual ROI of TSLA using the “WhiteSoldiers_BlackCrows” VBA Macro has been as high as 39.97% in theory, and it has gained a total of 2301.07%. This performance is not only better than Warren Buffett’s average of 18~19%, but also higher than the original Tesla stock’s ROI of 32.27% during the same period.

Please take a close look at the "Average Turnover Period", now it is 30.9 days in cell D18, much shorter than in the last example, eh? The transactions occurred only 77 times over a 9-year period. This result

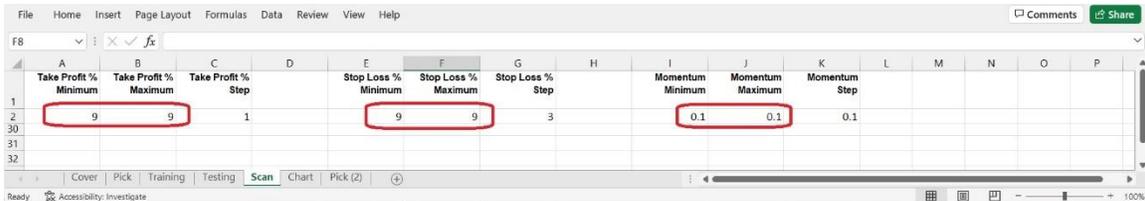
provides strong evidence to establish the strategy's repeatability with certainty.

Parameters	Value	Trades	Value	Date	Open	High	Low	Close	Volume	Action	Cost/Income	Profit
SMA Period	5	Total	77	2023-01-24	143.00	146.50	141.10	143.89	158699100	Long OK 0 @ 143.89		135.4
BB Standard Deviations	2	Long	37	2023-01-23	135.67	145.36	134.27	143.75	203119200			132.1
MACD Fast	12	Long %	48.05%	2023-01-20	128.68	133.51	127.35	133.42	138429900			126.4
MACD Slow	26	Short	40	2023-01-19	127.26	129.99	124.31	127.17	170291900			125.1
MACD Signal	9	Short %	51.95%	2023-01-18	136.56	136.68	127.01	128.78	195680300			123.1
Expiration	1	Stop Loss	34	2023-01-17	125.70	131.70	125.02	131.49	186477000	Buy/Open 16686 @ 128.36	(\$2,141,814.96)	121.1
Momentum	0.1	SL %	44.16%	2023-01-13	116.55	122.63	115.60	122.40	180439300	Long OK 17499 @ 122.4		119.4
Stochastic Oscillator Period	14	Take Profit	42	2023-01-12	122.56	124.13	117.00	123.56	169400900			117.4
Slow Stoch KD	3	TP %	54.55%	2023-01-11	122.09	125.95	120.51	123.22	183810800			115.1
Full Stoch SMA	3			2023-01-10	121.07	122.76	114.92	118.85	167642500			112.1
Take Profit %	20.0	Average Rate of Progress %		2023-01-09	119.96	123.52	117.11	119.77	190284000			111.1
Stop Loss %	12.0	Average Remaining Time (Min.)		2023-01-08	103.00	114.39	101.81	113.06	220675900	TP/Buy/Close 9694 @ 102.69	(\$995,476.86)	110.1
Training Set %	70.0%			2023-01-05	110.51	111.75	107.16	110.34	157965300	Warning: TP Buy @ 103.56		115.1
Total Period	2382			2023-01-04	109.11	114.59	107.52	113.64	180389000	Warning: TP Buy @ 103.56		114.1
Principal	\$100,000.00	Average Turnover Period	30.9	2023-01-03	118.47	118.80	104.64	108.10	231402800	Warning: TP Buy @ 103.56		117.1
Stock Sum	16696			2022-12-30	119.95	124.48	119.75	123.18	157304500	Long OK 25470 @ 123.18		118.1
Cash	\$169,841			2022-12-29	120.39	123.57	117.50	121.82	221823300			121.1
Annual ROI	39.97%			2022-12-28	110.35	116.27	108.24	112.71	221070500	Warning: TP Buy @ 103.56		126.1
Net Equity	\$2,401,068.43			2022-12-27	117.50	119.67	108.76	109.10	208643400	Short OK 19171 @ 109.1		134.1
Net Rate of Gain/Loss	2301.07%			2022-12-23	126.37	128.62	121.02	123.15	168698700			140.1
Start	2023-03-01 19:06:30			2022-12-22	136.00	136.63	122.26	125.35	210090300	Sell/Open 9694 @ 129.45	\$1,254,888.30	146.1
Finish	2023-03-01 19:37:54			2022-12-21	139.34	141.26	135.89	137.57	145417400	Short OK 9122 @ 137.57		150.1
RSI Period	14			2022-12-20	146.05	148.47	137.66	137.80	159663300	TP/Buy/Close 6433 @ 137.69	(\$885,759.77)	155.1
EMA Period	252			2022-12-19	154.00	155.25	145.82	149.87	139390600			158.1
Serial Number	421			2022-12-16	159.64	160.99	150.04	150.23	139023200			164.1
Original Annual ROI	32.27%			2022-12-15	153.44	160.99	153.28	157.67	122334900			167.1
Original Rate of Gain/Loss	1306.27%			2022-12-14	159.25	161.62	155.31	156.80	140682300	Short OK 11769 @ 156.8		174.1
Optimization Period	2,411,033,065			2022-12-13	174.87	175.05	156.91	160.95	175862700			171.1
				2022-12-12	176.10	177.37	167.52	167.82	109794500			177.1
				2022-12-09	173.84	182.50	173.36	179.05	104872300			180.1
				2022-12-08	172.20	175.20	169.06	173.44	97624500			185.1
				2022-12-07	175.03	179.38	172.22	174.04	84213300	Sell/Open 6433 @ 172.13	\$1,107,312.29	189.1
				2022-12-06	181.22	183.65	175.33	179.82	92153800	Short OK 6362 @ 174.04		189.1
				2022-12-05	189.44	191.97	180.55	182.45	93122700			189.1

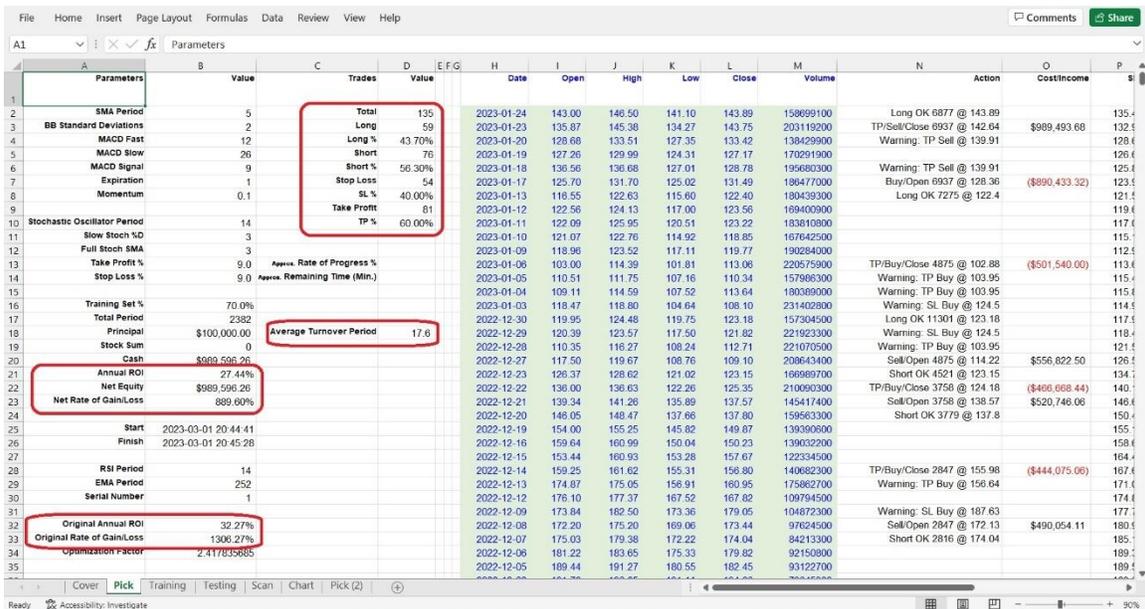
This return is based on the parameter combination stored in cells A02 to A02 of the "Pick" worksheet: Momentum at 0.1, Take Profit at 20%, and Stop Loss at 12%, which is indicated by a red frame as shown below:

Volume	Action	Cost/Income	SMA	AE	Equity	Serial Number	Net Rate of Gain/Loss	Net Equity	Momentum	Take Profit %	Stop Loss %
158699100	Long OK 0 @ 143.89		135.40	\$2,401,068.43	231	2301.07%	\$2,401,068.43	0.1	20	12	
203119200			132.92	\$2,398,732.41	229	1696.06%	\$2,398,732.41	0.1	16	12	
138429900			128.65	\$2,226,366.00	216	1888.61%	\$1,788,606.48	0.1	19	12	
170291900			126.68	\$2,122,078.50	210	1190.11%	\$1,290,112.25	0.1	20	9	
195690300			125.89	\$2,146,942.97	208	1159.61%	\$1,259,610.15	0.1	17	12	
186477000	Buy/Open 16686 @ 128.36	(\$2,141,814.96)	123.90	\$2,194,162.13	209	1006.96%	\$1,109,953.89	0.1	19	9	
180439300	Long OK 17499 @ 122.4		121.66	\$2,141,934.87	103	939.40%	\$1,039,397.29	0	18	12	
169400900			119.69	\$2,141,934.87	105	919.17%	\$1,019,174.23	0	20	12	
183810800			117.05	\$2,141,934.87	205	996.46%	\$996,492.64	0	16	9	
167642500			115.13	\$2,141,934.87	115	889.60%	\$989,596.26	0.1	9	9	
190284000			112.98	\$2,141,934.87	104	805.44%	\$805,437.20	0	18	12	
220575900	TP/Buy/Close 9694 @ 102.69	(\$995,476.86)	113.66	\$2,141,934.87	220	696.74%	\$796,743.89	0	9	12	
157986300	Warning: TP Buy @ 103.56		115.42	\$2,067,775.81	241	671.64%	\$771,636.19	0.1	9	15	
180389000	Warning: TP Buy @ 103.56		115.89	\$2,035,785.58	207	614.26%	\$714,262.66	0.1	17	9	
231402800	Warning: TP Buy @ 103.56		114.98	\$2,089,490.35	227	585.44%	\$685,436.05	0.1	16	12	
157304500	Long OK 25470 @ 123.18		117.99	\$1,943,304.81	117	567.10%	\$667,097.16	0	19	9	
221923300			118.43	\$1,956,488.65	111	513.90%	\$613,900.31	0	16	12	
221070500	Warning: TP Buy @ 103.56		121.58	\$2,044,801.00	82	482.12%	\$582,124.69	0	18	9	
208643400	Short OK 19171 @ 109.1		126.59	\$2,079,796.35	84	480.49%	\$580,490.08	0	20	9	
166989700			134.75	\$1,943,595.81	200	465.22%	\$565,224.58	0.1	10	9	
210090300	Sell/Open 9694 @ 129.45	\$1,254,888.30	140.18	\$1,922,268.85	225	448.05%	\$548,049.81	0.1	14	12	
145417400	Short OK 9122 @ 137.57		146.83	\$1,862,523.43	81	445.40%	\$545,400.70	0	17	9	
159563300	TP/Buy/Close 6433 @ 137.69	(\$885,759.77)	150.47	\$1,862,523.43	102	433.53%	\$533,530.64	0	17	12	
139380600			155.10	\$1,804,169.52	208	417.24%	\$517,240.19	0.1	12	12	
139032200			158.69	\$1,801,853.84	218	393.85%	\$493,851.27	0.1	8	12	
122334500			164.46	\$1,753,992.10	196	375.41%	\$475,414.46	0.1	6	9	
140682300	Short OK 11769 @ 156.8		167.61	\$1,759,588.78	198	352.25%	\$452,254.61	0.1	8	9	
175862700			171.06	\$1,732,891.87	221	351.30%	\$451,300.15	0.1	10	12	
109794500			174.83	\$1,688,697.10	325	325.85%	\$425,845.02	0.2	9	9	
104872300			177.76	\$1,616,454.53	197	319.39%	\$419,387.37	0.1	7	9	
97624500	Sell/Open 6433 @ 172.13	\$1,107,312.29	180.92	\$1,652,543.67	180	281.01%	\$381,012.56	0.1	2	9	

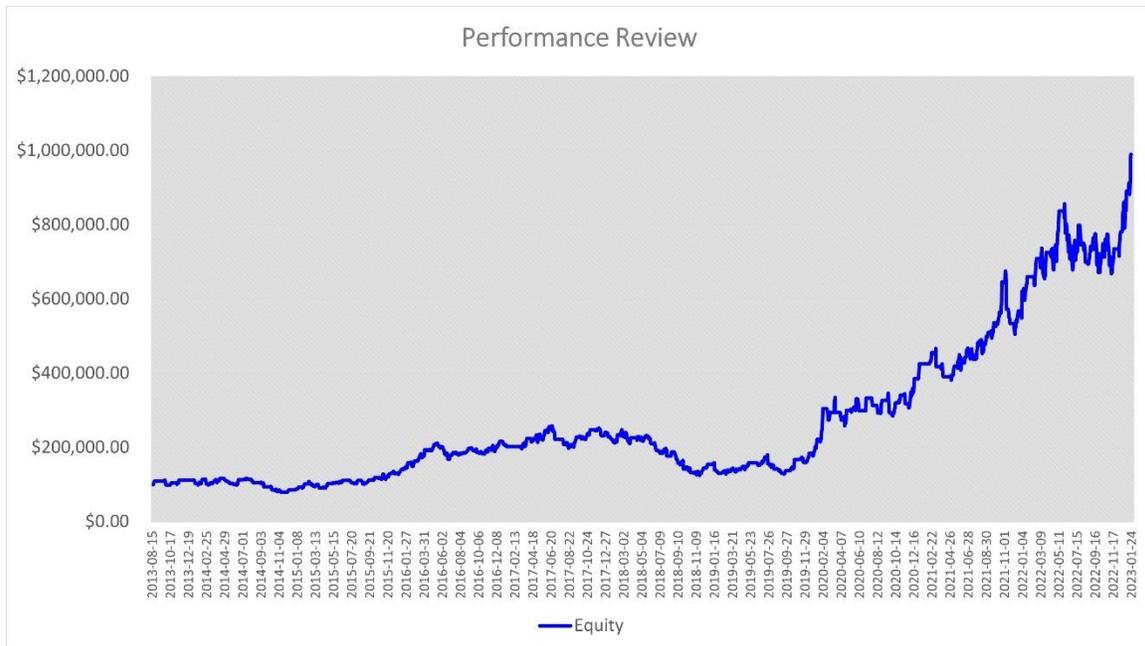
If you want to avoid a large drawdown, try using a different set of parameters indicated by the green frame in cells AO11 to AQ11. Write down these values, go to the “Scan” worksheet, and enter them into the Take Profit, Stop Loss, and Momentum cells. In this case, set both the “Take Profit % Minimum” and “Take Profit % Maximum” to 9, and ignore the “Take Profit % Step”. This setting tells the VBA Macro to run this specific parameter combination only once, without running all other loops. Similarly, set both the “Stop Loss % Minimum” and “Stop Loss % Maximum” to 9 (occasionally, here it is the same as the TP group, but in other cases, it may be other values), and ignore the “Stop Loss % Step”. Then set both the “Momentum Minimum” and “Momentum Maximum” to 0.1, and ignore the “Momentum Step”. Now run the VBA Macro, the program will scan these settings particularly, and ignore other groups.



After pressing Control + Y, you will quickly receive a new result:



The Annual ROI drops to 27.44% in theory, with 135 trade deals (almost double the number of trades than the top-gun setting). Look at the "Average Turnover Period" again, now it is 17.6 days in cell D18, excellent! This strategy's repeatability, certainty, and robustness for this stock is convinced, at least theoretically on paper. The Take Profit to Stop Loss ratio is now 60% to 40%. The drawdown...



Also looks more comfortable and less severe, eh?

In conclusion, back-testing cannot accurately predict how much profit we will make in the future, but in theory, it can certainly calculate how much we have lost in the past if we have used a wrong trading strategy, or how much we have missed out on if we own a strong trading strategy but picked some weak parameters, heartbroken, eh?

As an example, let's consider TSLA's historical data, which we split into a Training set (from 2013-08-08 to 2020-03-23) and a Testing set. If we pick the parameter combination with serial number 229 and strictly follow the rules of the "Three White Soldiers and Three Black Crows" strategy,

obeying every signal and plan to act from the Testing set's day one (2020-03-24) until 2023-01-24, which amounts to a total of 715 trading days...

Low	Close	Volume	Action	Cost/Income	SMA	Equity	Serial Number	Net Rate of Gain/Loss	Net Equity	Momentum	Take Profit %	Stop Loss %
2	7.37	28.95			27.75	\$744,072.05	231	644.07%	\$744,072.05	0.1	20	12
3	8.39	28.50			27.89	\$744,072.05	230	468.70%	\$568,695.90	0.1	19	12
4	3.90	28.51	SL/Buy/Close 22020 @ 29.16	(\$642,103.20)	29.48	\$744,072.05	210	337.43%	\$437,431.17	0.1	20	9
5	3.37	24.08	Sell/Open 22020 @ 25.18	\$554,463.60	31.25	\$855,904.30	209	307.93%	\$407,928.80	0.1	19	9
6	6.40	28.68	Short OK 19333 @ 28.68		34.89	\$831,711.65	105	300.90%	\$400,897.33	0	20	12
7	9.48	29.67	TP/Buy/Close 13215 @ 29.54	(\$390,371.10)	37.76	\$831,711.65	229	216.27%	\$316,274.91	0.1	18	12
8	3.47	36.44	Sell/Open 13215 @ 36.99	\$488,822.85	39.93	\$740,510.52	104	207.35%	\$307,352.87	0	19	12
9	6.42	37.37	Short OK 13081 @ 37.37		42.02	\$733,259.90	199	194.13%	\$294,130.23	0.1	9	9
10	0.87	42.28			44.21	\$733,259.90	217	162.99%	\$262,990.30	0.1	6	12
11	0.53	43.02			45.74	\$733,259.90	241	155.88%	\$255,993.80	0.1	9	15
12	0.33	40.53			47.08	\$733,259.90	196	136.14%	\$236,143.46	0.1	6	9
13	5.62	46.90			48.89	\$733,259.90	84	122.75%	\$222,751.50	0	20	9
14	7.87	48.30			48.42	\$733,259.90	228	120.03%	\$220,028.52	0.1	17	12
15	8.32	49.97			47.81	\$733,259.90	83	118.49%	\$218,488.98	0	19	9
16	7.74	49.70			48.20	\$733,259.90	219	110.00%	\$209,997.19	0.1	8	12
17	5.78	49.57			48.92	\$733,259.90	103	108.00%	\$208,004.88	0	18	12
18	0.77	44.53			50.13	\$733,259.90	234	106.27%	\$206,270.25	0.1	2	15
19	4.60	45.27	TP/Buy/Close 7662 @ 44.78	(\$343,104.36)	53.23	\$733,259.90	220	103.58%	\$203,580.86	0.1	9	12
20	1.74	51.92	Short OK 13820 @ 51.92		56.17	\$678,553.24	213	103.34%	\$203,340.96	0.1	2	15
21	2.47	53.33			58.02	\$667,770.24	106	97.91%	\$197,906.29	0	0	15
22	4.81	55.59	Sell/Open 7662 @ 56.19	\$430,527.78	58.80	\$650,484.34	208	95.78%	\$195,776.54	0.1	18	9
23	8.70	60.07	Short OK 7167 @ 60.07		58.35	\$645,836.48	748	91.96%	\$191,956.61	0.5	12	15
24	7.33	59.96			57.06	\$645,836.48	875	89.69%	\$189,693.11	0.6	13	15
25	0.07	61.16	TP/Sell/Close 10335 @ 62.49	\$645,834.15	55.30	\$645,836.48	82	88.17%	\$188,174.68	0	18	9
26	5.49	57.23	Long OK 0 @ 57.23		53.39	\$591,439.91	192	84.23%	\$184,228.52	0.1	2	15
27	2.37	53.34			52.23	\$551,223.02	81	82.21%	\$182,208.02	0	17	9
28	9.00	53.80			51.53	\$553,958.31	874	81.48%	\$181,477.08	0.6	12	15
29	0.89	51.15			50.80	\$528,665.15	198	77.18%	\$177,194.70	0.1	8	9
30	0.53	51.63			50.37	\$533,550.14	238	76.98%	\$176,978.34	0.1	6	15
31	0.16	51.42			51.87	\$531,414.25	207	71.87%	\$171,686.54	0.1	17	9
32	8.67	49.87			51.98	\$515,422.57	367	69.77%	\$169,769.96	0.2	9	15

We could have gained... Hold your breath... Bingo!

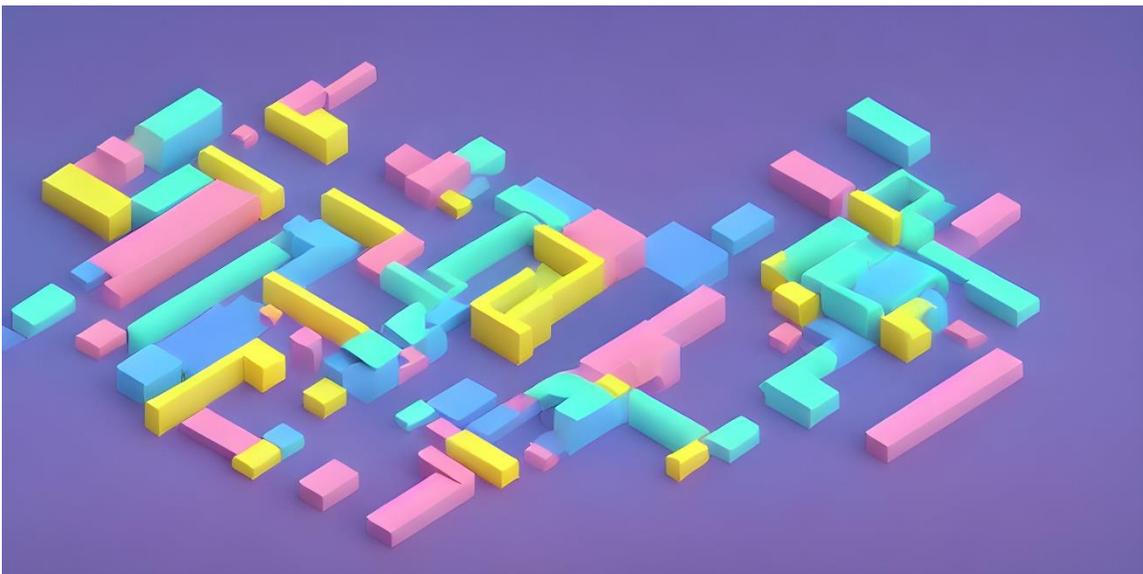
Parameters	Value	Trades	Date	Open	High	Low	Close	Volume	Action	Cost/Income
SMA Period	5	Total	2023-01-24	143.00	146.50	141.10	143.89	15899100	Long OK 4460 @ 143.89	135.4
BB Standard Deviations	2	Long	2023-01-23	135.87	145.38	134.27	143.75	203119200		132.5
MACD Fast	12	Long %	2023-01-20	128.68	133.51	127.35	133.42	138429900		128.6
MACD Slow	26	Short	2023-01-19	127.26	129.99	124.31	127.17	170291900		125.1
MACD Signal	9	Short %	2023-01-18	136.56	136.68	127.01	128.78	195663300	TP/Sell/Close 4780 @ 134.25	\$641,715.00
Expiration	1	Stop Loss	2023-01-17	125.70	131.70	25.02	131.49	186477000	Warning: TP Sell @ 131.82	
Momentum	0.1	SL %	2023-01-13	116.55	122.63	115.60	122.40	180439300	Long OK 0 @ 122.4	121.1
Stochastic Oscillator Period	14	Take Profit	2023-01-12	122.58	124.13	117.00	123.56	169400900		119.4
Slow Stoch %D	3	TP %	2023-01-11	122.09	125.95	120.51	123.22	183810800	Warning: TP Sell @ 131.82	117.6
Full Stoch SMA	3		2023-01-10	121.07	122.76	114.92	118.85	167642500		115.7
Take Profit %	18.0		2023-01-09	118.96	123.52	117.11	119.77	190284000		112.5
Stop Loss %	12.0		2023-01-06	103.00	114.39	101.81	113.06	220575900	Warning: SL Sell @ 98.31	113.1
Rate of Progress %			2023-01-05	110.51	111.75	107.16	110.34	157968300		115.4
Remaining Time (Min.)			2023-01-04	109.11	114.59	107.52	113.64	180389000		115.1
Total Period	715		2022-12-31	118.47	118.80	104.64	108.10	231402800	Buy/Open 4780 @ 111.72	(\$534,021.60)
Principal	\$100,000.00	Average Turnover Period	2022-12-30	119.95	124.48	119.75	123.18	157304500	Long OK 4335 @ 123.18	117.1
Stock Sum	0		2022-12-29	120.39	123.57	117.50	121.82	221923300		118.4
Annual ROI	92.56%		2022-12-28	110.35	118.27	108.24	112.71	221070500		121.1
Net Equity	\$641,777.14		2022-12-27	117.50	119.67	108.76	109.10	208643400	TP/Buy/Close 2270 @ 111.2	(\$252,424.00)
Net Rate of Gain/Loss	541.78%		2022-12-23	126.37	128.62	121.62	123.15	196869700	Short OK 4257 @ 123.15	140.1
			2022-12-22	136.00	136.63	122.26	125.35	210905300		140.1
			2022-12-21	139.34	141.26	135.89	137.57	145417400	Sell/Open 2270 @ 138.57	\$314,553.90
			2022-12-20	146.05	148.47	137.66	137.80	159563300	Short OK 2283 @ 137.8	150.4
			2022-12-19	154.00	155.25	145.82	149.87	139308000		155.7
			2022-12-16	159.64	160.99	150.04	150.23	139032200	TP/Buy/Close 1509 @ 151.08	(\$227,979.72)
			2022-12-15	153.44	160.93	153.28	157.67	122334500	Warning: TP Buy @ 152.12	164.4
			2022-12-14	159.25	161.62	155.31	156.80	140682300	Short OK 2975 @ 156.8	167.1
			2022-12-13	174.87	175.05	158.91	160.95	173862700	Warning: TP Buy @ 152.12	171.1
			2022-12-12	178.10	177.37	167.52	167.82	108794500		174.1
			2022-12-09	173.84	182.50	173.36	179.05	104872300		177.1
			2022-12-08	172.20	175.20	169.06	173.44	97624500		180.1
			2022-12-07	175.03	179.38	172.22	174.04	84213300	Short OK 2681 @ 174.04	185.1
			2022-12-06	181.22	183.65	175.33	179.82	92150800		189.1
			2022-12-05	189.44	191.27	180.55	182.45	93122700		189.1

An explosive theoretical annual ROI of 92.56%!

Back-testing is a cold-blooded truth teller, use it wisely. Not only is back-testing a valuable tool for stock trading, but it can also be applied to other financial markets such as Forex (foreign exchange), Options, Futures, Cryptocurrencies, Bonds, and more. The trickiest challenge is how to pick the right parameter combination, such as whether to pick serial number 229's parameters instead of the top one in Training set, which is serial number 231. We never know what will happen tomorrow, even if we have a powerful tool like back-testing. Ultimately, success depends on our own experience, mindset and perhaps even... fate, eh?

As you analyze the results of your back-testing, you might start to feel like a stock market Sherlock Holmes, but don't forget to keep it fun! Just like in life, sometimes you win, sometimes you lose, and sometimes you're just stuck in a holding pattern. But with enough persistence and analysis, you'll eventually uncover the clues to a profitable trading strategy. So grab your magnifying glass, put on your deerstalker hat, and let's solve the mystery of the stock market! (Disclaimer: No actual detective skills required.)

If you would like to try out the “Golden Cross & Death Cross” strategy back-testing tool, click on <https://www.tyzu.com/Trial/index.html> to get a 30-day free trial demo.



CHAPTER 7: IMPROVING YOUR TRADING STRATEGIES

If your strategy is not profitable, you need to make some changes to improve it. In this chapter, we will cover some basic techniques for improving your trading strategies.

Improving stock trading strategies is a continuous process that requires traders to regularly evaluate their strategies and make adjustments based on their performance. Here are some steps that traders can take to improve their stock trading strategies:

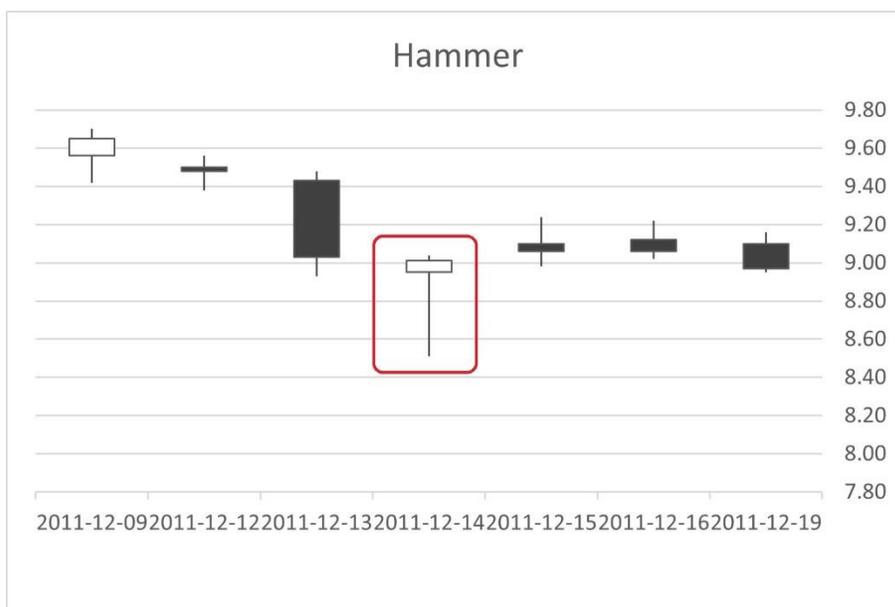
1. **Analyze the results:** After back-testing your trading strategies, analyze the results to determine the strategy's profitability. Look for patterns in the data and identify areas where the strategy is performing well or poorly.
2. **Identify weaknesses:** Identify any weaknesses in your strategy and determine the cause. For example, if the strategy is failing to generate profits in a particular market condition, it may need to be adjusted to account for that condition.
3. **Experiment with new ideas:** Try new ideas to improve your strategy. This may involve experimenting with new indicators, adjusting your position sizing, or tweaking your entry and exit rules.
4. **Keep a trading journal:** Keep a trading journal to track your trades and analyze your performance over time. This will help you identify trends and patterns in your trading behavior and allow you to make adjustments to your strategy accordingly.
5. **Stay up-to-date:** Stay up-to-date with the latest market data, trends and technologies, even some high-tech such as Artificial Intelligence (AI), Machine Learning, Quantitative Trading (Quant), or chatGPT etc.,. This will help you adjust your strategy to account for changes in market conditions and stay ahead of the competition.

6. Seek feedback: Seek feedback from other traders and experts in the field. This can help you identify areas where your strategy can be improved and give you new ideas for trading more effectively.

This chapter, we would like to introduce you to one method to improve your trading strategies, called “Hybrid Power”. This involves blending two or more rules or indicators together to filter out signal noise and identify real trading opportunities, thereby increasing your chances of success and reducing your chances of failure.

For example, let’s try mixing Hammer and Shooting Star candlestick patterns and RSI indicator to make a Hybrid trading strategy, and do some back-testing to verify how well (or bad) this Hybrid Power machine (or monster) will run.

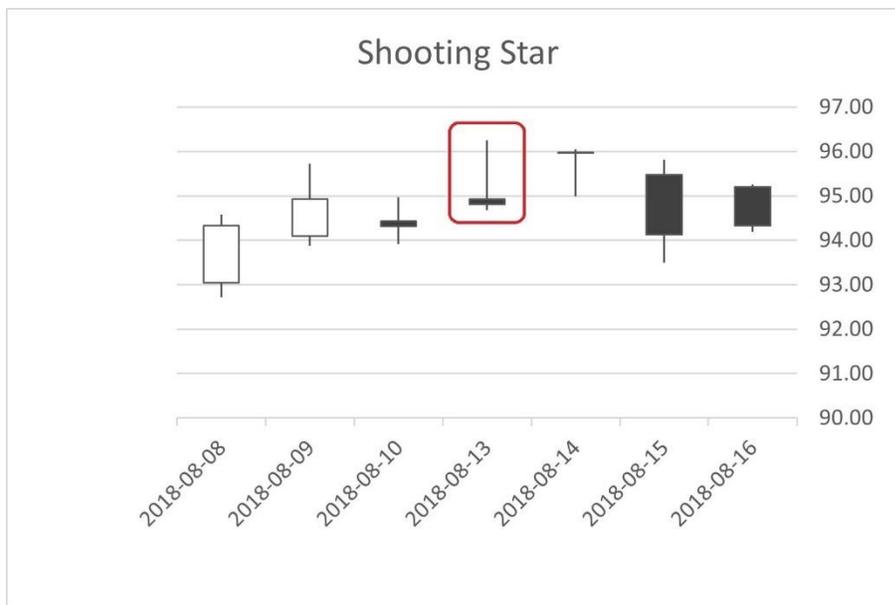
A hammer is a bullish reversal candlestick pattern that can be identified on a stock chart. It is formed when the price opens near its high, then drops during the day to a low, but then recovers to close near the opening price. This creates a candlestick shape that looks like a hammer, with a small real body and a long lower shadow.



The hammer pattern is significant because it shows that the price of the stock was pushed down during the day by sellers, but then buying pressure came in to push the price back up to the opening level. This suggests that the bulls have taken control and that the price may start to rise.

Traders often look for confirmation of the hammer pattern, such as a gap up on the next trading day, or a move above the high of the hammer pattern. This helps to confirm that the bullish momentum is continuing and can be used as a signal to buy the stock.

A shooting star is a bearish reversal candlestick pattern that can appear in an uptrend. It is formed when a stock's price opens higher than its previous close, trades higher throughout the day, but then sells off to close near its opening price. This results in a candlestick with a long upper shadow and a small real body near the bottom of the trading range.



The shooting star pattern suggests that sellers were able to overcome the buying pressure earlier in the day and push the price down. It is often

seen as a sign of a potential trend reversal, as the bulls appear to be losing control and the bears are gaining momentum.

Traders who spot a shooting star pattern may look to take a short position or sell their existing long position, in anticipation of a price drop. However, it is important to confirm the pattern with other technical indicators and not rely solely on the shooting star as a trading signal.

RSI stands for Relative Strength Index, which is a technical analysis indicator used to measure the strength and momentum of a stock's price movement. It was developed by J. Welles Wilder Jr. in 1978.

The RSI is calculated by comparing the average gains and losses over a specific time period. The formula takes into account the average price gains and losses over a set period of time and produces a value ranging from 0 to 100.

Traders and investors use the RSI indicator to identify potential buy and sell signals for a stock. For example, when the RSI is above 70, it may suggest that the stock is overbought and due for a price correction, which could be a signal to sell. Conversely, when the RSI is below 30, it may suggest that the stock is oversold and due for a price rebound, which could be a signal to buy.

The principles of technical analysis and its indicators (such as RSI) can be used to analyze and interpret market trends across various financial instruments, such as stocks, Forex (foreign exchange), options, futures, cryptocurrencies, and bonds, etc.

OK, now let's blend these ideas together to make a new strategy. The signal generation part may look like these:

'The strategy is inside between If and Then. If Hammer appears and RSI is lower than 30, Then generate a Long OK signal.

If Cells(Candle, "L").Value > Cells(Candle, "I").Value And Cells(Candle, "K").Value < Cells(Candle, "I").Value Then

If LongOK = False And _

(Cells(Candle, "I").Value - Cells(Candle, "K").Value) / (Cells(Candle, "L").Value - Cells(Candle, "I").Value) > Trigger And _

(Cells(Candle, "J").Value - Cells(Candle, "L").Value) / (Cells(Candle, "I").Value - Cells(Candle, "K").Value) < 0.1 And _

Cells(Candle, "Y").Value < 30 Then 'Strategy for Long

LongOK = True

BCBM = Candle

BBP = Round(Cells(Candle, "L").Value, 2)

Cells(Candle, "N").Value = "Long OK " & Int([B20].Value * CP / 100 / BBP) & " @ " & BBP

Exit Sub

End If

End If

If Cells(Candle, "L").Value < Cells(Candle, "I").Value And Cells(Candle, "K").Value < Cells(Candle, "L").Value Then

If LongOK = False And _

$(\text{Cells}(\text{Candle}, "L").\text{Value} - \text{Cells}(\text{Candle}, "K").\text{Value}) / (\text{Cells}(\text{Candle}, "I").\text{Value} - \text{Cells}(\text{Candle}, "L").\text{Value}) > \text{Trigger And } _$

$(\text{Cells}(\text{Candle}, "J").\text{Value} - \text{Cells}(\text{Candle}, "I").\text{Value}) / (\text{Cells}(\text{Candle}, "L").\text{Value} - \text{Cells}(\text{Candle}, "K").\text{Value}) < 0.1 \text{ And } _$

$\text{Cells}(\text{Candle}, "Y").\text{Value} < 30 \text{ Then } \text{'Strategy for Long}$

$\text{LongOK} = \text{True}$

$\text{BCBM} = \text{Candle}$

$\text{BBP} = \text{Round}(\text{Cells}(\text{Candle}, "L").\text{Value}, 2)$

$\text{Cells}(\text{Candle}, "N").\text{Value} = \text{"Long OK " \& Int}([\text{B20}].\text{Value} * \text{CP} / 100 / \text{BBP}) \& \text{" @ " \& BBP}$

Exit Sub

End If

End If

'The strategy is inside between If and Then. If Shooting Star appears and RSI is higher than 70, Then generate a Short OK signal.

$\text{If } \text{Cells}(\text{Candle}, "L").\text{Value} < \text{Cells}(\text{Candle}, "I").\text{Value} \text{ And } \text{Cells}(\text{Candle}, "J").\text{Value} > \text{Cells}(\text{Candle}, "I").\text{Value} \text{ Then}$

$\text{If } \text{ShortOK} = \text{False} \text{ And } _$

$(\text{Cells}(\text{Candle}, "J").\text{Value} - \text{Cells}(\text{Candle}, "I").\text{Value}) / (\text{Cells}(\text{Candle}, "I").\text{Value} - \text{Cells}(\text{Candle}, "L").\text{Value}) > \text{Trigger And } _$

$(\text{Cells}(\text{Candle}, "L").\text{Value} - \text{Cells}(\text{Candle}, "K").\text{Value}) / (\text{Cells}(\text{Candle}, "J").\text{Value} - \text{Cells}(\text{Candle}, "I").\text{Value}) < 0.1 \text{ And } _$

```

Cells(Candle, "Y").Value > 70 Then 'Strategy for Short

ShortOK = True

SCBM = Candle

SBP = Round(Cells(Candle, "L").Value, 2)

Cells(Candle, "N").Value = "Short OK " & Int(((B20).Value + 1.5 * [B19].Value * SIpebP) / 1.5 *
CP / 100 / SBP) & " @ " & SBP

Exit Sub

End If

End If

If Cells(Candle, "I").Value < Cells(Candle, "L").Value And Cells(Candle, "J").Value > Cells(Candle,
"L").Value Then

If ShortOK = False And _

(Cells(Candle, "J").Value - Cells(Candle, "L").Value) / (Cells(Candle, "L").Value - Cells(Candle,
"I").Value) > Trigger And _

(Cells(Candle, "I").Value - Cells(Candle, "K").Value) / (Cells(Candle, "J").Value - Cells(Candle,
"L").Value) < 0.1 And _

Cells(Candle, "Y").Value > 70 Then 'Strategy for Short

ShortOK = True

SCBM = Candle

SBP = Round(Cells(Candle, "L").Value, 2)

```

```
Cells(Candle, "N").Value = "Short OK " & Int([(B20].Value + 1.5 * [B19].Value * SIPEB) / 1.5 *
CP / 100 / SBP) & " @ " & SBP
```

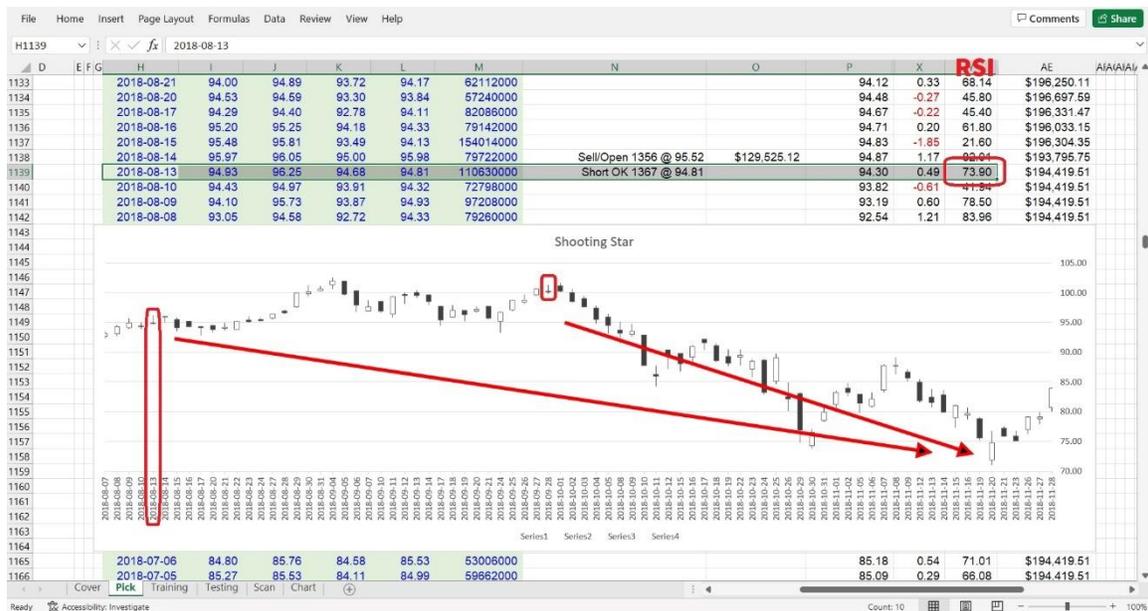
```
Exit Sub
```

```
End If
```

```
End If
```

The above is a simplified version of the VBA (Visual Basic for Applications) code, provided for demonstration purposes only. In real-world scenarios, the actual VBA code could be much more complex and may involve multiple steps to execute in order to achieve the desired results. For instance, it may require handling different data sources, performing complex calculations, or interacting with external systems.

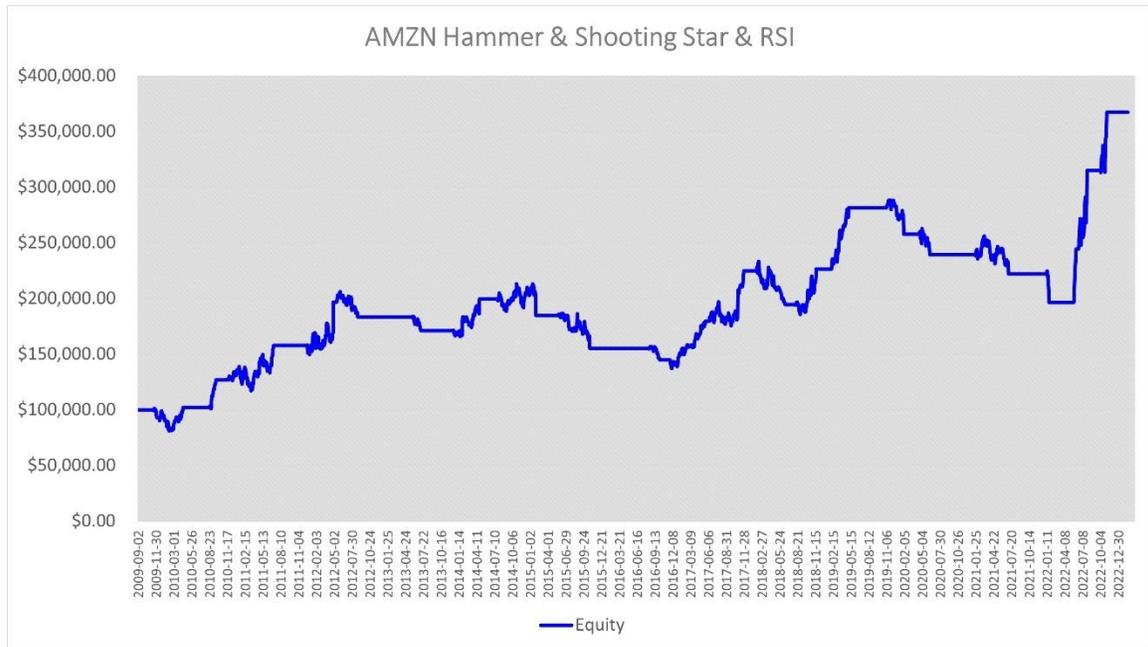
So, let's run the VBA Macro to test our new trading strategy using AMZN (Amazon.com, Inc.). The Macro will generate a set of paper trading records on Excel worksheets that will help us evaluate the strategy's effectiveness. When the Shooting Star pattern appears and the RSI is higher than 70, this strategy will open Short:



Similarly, when the Hammer candlestick appears and the RSI index value is lower than 30, the strategy will trigger a Long position:



After scanning all parameter combinations which ranges are set in “Scan” worksheet, we will get a curve like this:



It doesn't look as impressive as the "Three White Soldiers and Three Black Crows" strategy for Tesla, but it still performs better than the S&P 500 index Annual Growth Rate (average around 7%). This teaches us that sometimes a simple strategy can be better than a complex one. Additionally, if we don't convert our strategy into code and run it through back-testing, we'll never have clear visualizations to compare and draw meaningful conclusions.

By the way, do you still remember the "Three White Soldiers and Three Black Crows" strategy in chapter 4? We just used the simplest patterns (three white candles or three black candles in a row) to create a signal generator, and it worked well. However, if we add more restrictive conditions, such as requiring each candle to have a small or no shadow and to open higher and close higher than the previous day's candle, we may see quite different results. You can try it out to verify for yourself.

Overall, the key to improving your stock trading strategies is to remain flexible and open to change. By analyzing your results, identifying weaknesses, experimenting with new ideas, keeping a trading journal, staying up-to-date, and seeking feedback, you can continuously improve your strategies and achieve greater success in the market.

Remember, trading is not a sprint, it's a marathon. But beware, if you're not vigilant, you may find yourself running in the wrong direction. Good luck with your trading, and remember, the only thing worse than losing money in the stock market is losing your sense of humor. Keep laughing, keep trading!

If you would like to try out the "Hammer & Shooting Star & RSI" strategy back-testing tool, click on <https://www.tyzu.com/Trial/index.html> to get a 30-day free trial demo. There are also several other strategies back-testing tools available for trial, and dozens more for subscription.

CHAPTER 8: FORWARD TESTING

Forward-testing is a method of evaluating a stock trading strategy by applying it to current or future data, and then monitoring its performance in real-time. This is in contrast to back-testing, which involves testing the strategy on historical data.

Forward-testing is an important step in the development of a stock trading strategy, as it can provide insight into how the strategy will perform in real-world conditions. By testing a strategy in real-time, traders can observe how it performs under actual market conditions and make any necessary adjustments to improve its performance.

Forward-testing can be done manually, by paper trading or demo trading, or it can be automated using trading software. The goal is to evaluate the strategy's performance over a period of time and make any necessary changes to improve its profitability.

Paper trading (or demo trading) is a simulated trading process that allows traders to practice trading strategies without risking real money. It involves using a simulated account, which looks and operates like a real trading account but uses fake money to execute trades.

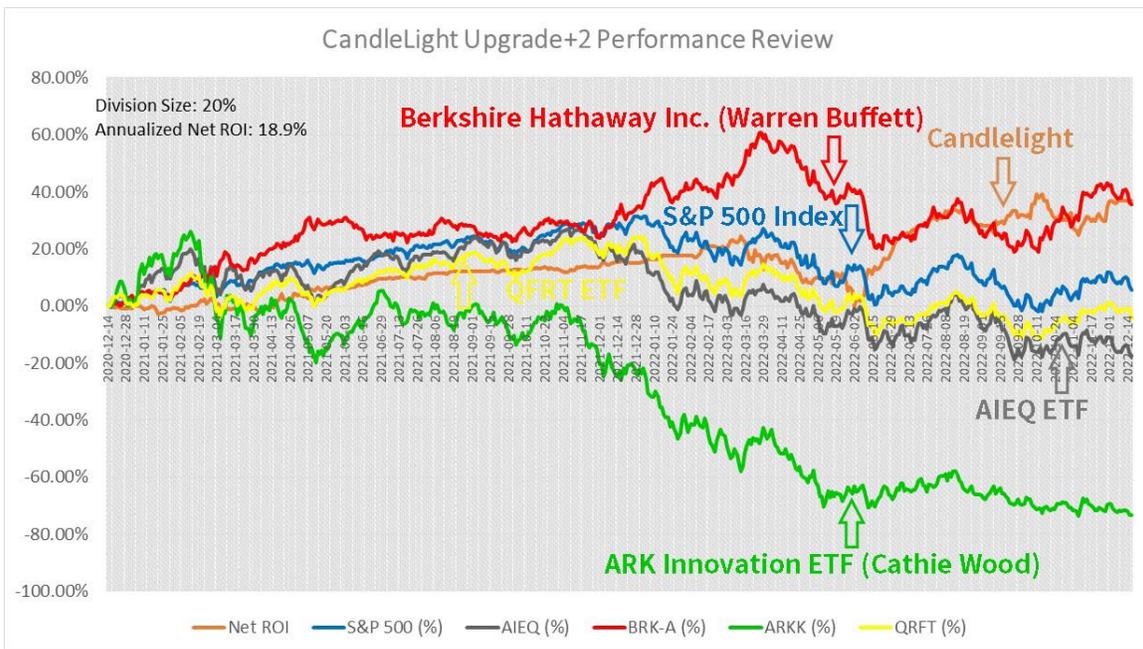
With paper trading, traders can test their strategies in real market conditions and gain experience without the risk of losing actual money. It allows traders to evaluate the effectiveness of their trading strategies and make necessary adjustments before risking their capital in the actual market.

Paper trading can also be used to test and compare multiple trading strategies to determine which one is the most profitable. Additionally, it

can be used to test the performance of new trading instruments, such as options, futures, or Forex, before trading them with real money.

After finishing the back-testing process for a trading strategy, it is not advisable to rush into real trading immediately. In my opinion, it is better to spend several months doing paper trading based on the strategy to verify its robustness repeatedly. During this time, it is important to update the training set and testing set with new data to ensure they remain relevant and reflective of current market conditions.

For example, besides these Demo strategies which are based on Technical Analysis Methodology and have been displayed in this handbook, I am developing another strategy based on Artificial Intelligence Machine Learning, and have been doing Forward-Testing over 2 years. Do you still remember how many things happened during 2020 and 2022?



Let's take a look back at some of the most dramatic events that have occurred during the past 24 months, as well as the 113 groups of forward-testing done for this AI-Powered trading strategy:

December 2020: One year had passed since the outbreak of COVID-19;

January 2021: Capitol Hill Riots, USA political turmoil;

August 2021: Afghanistan changed, and the United States accepted defeat and withdrew hastily;

December 2021: Two years had passed since the outbreak of COVID-19;

January 2022: The USA reports that the inflation rate hit 7% the previous month;

February 2022: The Russia-Ukraine war broke out;

March 2022: The Fed raised interest rates by 25 points for the first time in nearly three years; America's inflation rate jumped to 8.5% last month; Shanghai lockdown; The Russia-Ukraine peace talk, which turned out to be a scam;

May 2022: The Fed raised interest rates by 50 points due to severe inflation;

June 2022: The USA inflation rate hit 8.6%, the highest since 1981; The Fed raised interest rates by a whopping 75 points;

July 2022: US inflation hit 9.1%, the highest since 1981; The Fed raised another blockbuster 75 points interest rates; The USA economy grew at a negative rate for the second quarter in a row; Political turmoil in UK, prime minister resigned;

August 2022: China reported unemployment at 5.4% last month and youth unemployment at 19.9%;

September 2022: Queen of UK Elizabeth II died; Russia partially mobilized and the war escalated; The explosion of the Nord Stream gas pipeline between Russia and Germany, worsening the European energy crisis and high inflation; US inflation still high, the Fed raised interest rates for the third time with 75 points;

October 2022: USA-Saudi Arabia relations broke down as OPEC+ announced crude oil production cuts; The Crimean bridge was bombed; UK's new prime minister resigns after just 45 days, the shortest serving in the history of UK;

November 2022: US inflation remained high and the Federal Reserve raised interest rates by 75 heavy points for the fourth time this year;

December 2022: G7 and the European Union set a cap on the price of Russian oil, causing another wave in the international energy supply; The Fed raises rates aggressively by 50 points to fight inflation.

...

See? Every day, we may encounter so many unknown incidents that can affect stock markets, some small like Hollywood stars' fashion dresses, some big like wars. Therefore, it's important to be patient, and conducting more Forward Trading can give you more confidence in your trading strategies.

After reading several chapters above, we suppose you have understood how Excel VBA macros will help backtesting your stock trading strategies, and perhaps you have downloaded some [free trial](#) VBA programs to give them a try. Do you know there is another surprise for these [VBA tools](#)?

These Excel VBA macros can not only perform back-testing, but also forward-testing. By inputting new data daily, these VBA programs will generate fresh signals and instructions that are up to date!

Let's keep this as a secret and not tell anybody else:)

We can sit and watch to see if these new signals, plans, and actions fit the real-time market's waves and trends. The longer we forward test for, and the more signals, plans, and actions generated by the VBA macro tools hit their targets for future dates and data, the stronger confident we'll be in the tested trading strategies and parameter settings.

For instance, do you still remember the example in chapter 4, the strategy "Three White Soldiers and Three Black Crows" for TSLA? We discussed it in chapter 6 and mentioned that for reducing a big drawdown, we would rather pick another lower set of second-best parameter settings (marked by green) instead of the top one (marked by red), right?

Serial Number	Net Rate of Gain/Loss	Net Equity	Momentum	Take Profit %	Stop Loss %
231	2301.07%	\$2,401,068.43	0.1	20	12
199	889.60%	\$989,596.26	0.1	9	9

Let's take a look at this worksheet again:

Parameters	Value	Trades	Value	Date	Open	High	Low	Close	Volume	Action	Cost/Income
SMA Period	5	Total	135	2023-01-24	143.00	148.50	141.10	143.89	158699100	Long OK 6877 @ 143.89	135.4
BB Standard Deviations	2	Long	59	2023-01-23	135.87	145.38	134.27	143.75	203119200	TP/Sell/Close 6937 @ 142.64	\$989,493.68
MACD Fast	12	Long %	43.70%	2023-01-20	128.68	133.51	127.35	133.42	138429900	Warning: TP Sell @ 139.91	128.6
MACD Slow	26	Short	76	2023-01-19	127.26	129.99	124.31	127.17	170291900		126.6
MACD Signal	9	Short %	56.30%	2023-01-18	136.56	136.68	127.01	128.78	195680300	Warning: TP Sell @ 139.91	125.4
Expiration	1	Stop Loss	54	2023-01-17	125.70	131.70	125.02	131.49	186477000	Buy/Open 6937 @ 128.36	\$890,433.32
Momentum	0.1	SL %	40.00%	2023-01-13	118.55	122.63	115.60	122.40	180439300	Long OK 7275 @ 122.4	121.5
Stochastic Oscillator Period	14	Take Profit	81	2023-01-12	122.56	124.13	117.00	123.56	169400900		119.6
Slow Stoch %D	3	TP %	60.00%	2023-01-11	122.09	125.95	120.51	123.22	183810800		117.6
Full Stoch SMA	3			2023-01-10	121.07	122.76	114.92	118.85	167642500		115.6
Take Profit %	9.0	Approx. Rate of Progress %		2023-01-09	118.96	123.52	117.11	119.77	190284000		112.6
Stop Loss %	9.0	Approx. Remaining Time (Min.)		2023-01-06	103.00	114.39	101.81	113.06	220575900	TP/Buy/Close 4875 @ 102.88	(\$501,540.00)
Training Set %	70.0%			2023-01-05	110.51	111.75	107.16	110.34	157986300	Warning: TP Buy @ 103.95	115.6
Total Period	2382			2023-01-04	109.11	114.59	107.52	113.64	180090900	Warning: TP Buy @ 103.95	115.6
Principal	\$100,000.00	Average Turnover Period	17.6	2022-12-29	120.39	123.57	117.50	121.82	221923300	Warning: SL Buy @ 124.5	114.6
Stock Sum	0			2022-12-28	110.35	116.27	108.24	112.71	221070500	Warning: TP Buy @ 103.95	121.6
Cash	\$989,596.26			2022-12-27	117.50	119.67	108.76	109.10	208643400	Sell/Open 4875 @ 114.22	\$556,822.50
Annual ROI	27.44%			2022-12-23	126.37	128.62	121.02	123.15	166969700	Short OK 4521 @ 123.15	134.6
Net Equity	\$989,596.26			2022-12-22	138.00	136.63	122.26	125.35	210692700	TP/Buy/Close 3758 @ 124.18	(\$488,668.44)
Net Rate of Gain/Loss	889.60%			2022-12-21	139.34	141.26	135.89	137.57	145417400	Sell/Open 3758 @ 138.57	\$520,746.06
Start	2023-03-01 20:44:41			2022-12-20	148.05	148.47	137.66	137.80	159563300	Short OK 3779 @ 137.8	150.6
Finish	2023-03-01 20:45:28			2022-12-19	154.00	155.25	145.82	149.87	139390800		155.6
RSI Period	14			2022-12-16	159.64	160.99	150.04	150.23	139032200		158.6
EMA Period	252			2022-12-15	153.44	160.93	153.28	157.67	122334500		164.6
Serial Number	1			2022-12-14	159.25	161.62	155.31	156.80	140682300	TP/Buy/Close 2847 @ 155.98	(\$444,075.06)
Original Annual ROI	32.27%			2022-12-13	174.87	175.06	158.91	169.95	175682700	Warning: TP Buy @ 156.64	171.6
Original Rate of Gain/Loss	1306.27%			2022-12-12	178.10	177.37	167.52	167.82	109794500		174.6
Optimization Factor	2.417835685			2022-12-09	173.84	182.50	173.36	179.05	104872300	Warning: SL Buy @ 187.63	177.6
				2022-12-08	172.20	175.20	169.06	173.44	97624500	Sell/Open 2847 @ 172.13	\$490,054.11
				2022-12-07	175.03	179.38	172.22	174.04	84213300	Short OK 2816 @ 174.04	185.6
				2022-12-06	181.22	183.65	175.33	179.82	92150800		189.6
				2022-12-05	189.44	191.27	180.55	182.45	93122700		189.6

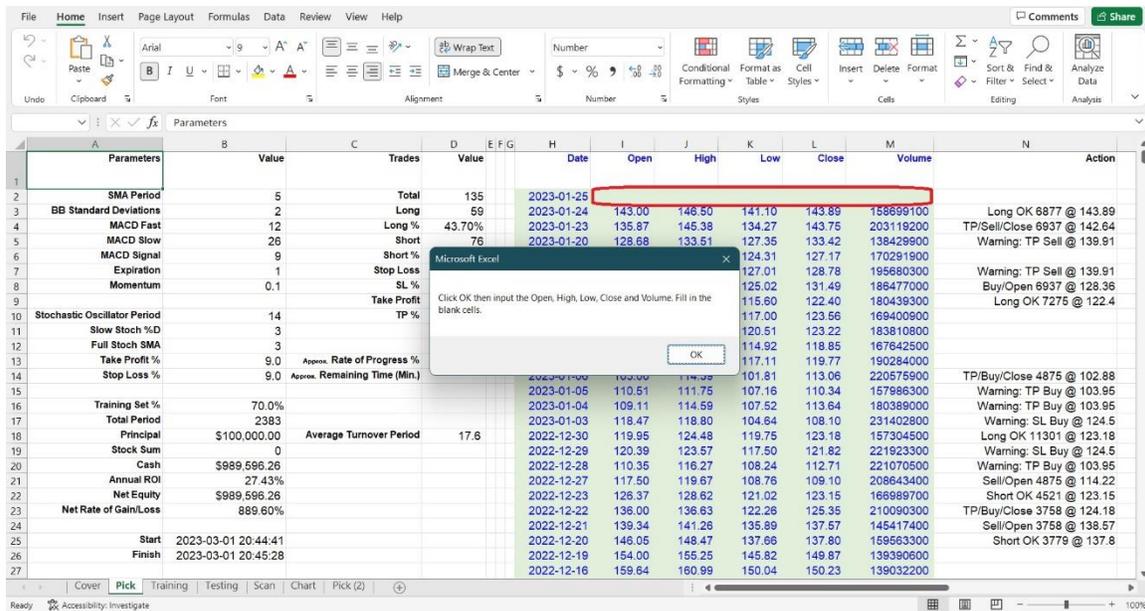
This result was based on these parameter settings:

Take Profit % Minimum	Take Profit % Maximum	Take Profit % Step	Stop Loss % Minimum	Stop Loss % Maximum	Stop Loss % Step	Momentum Minimum	Momentum Maximum	Momentum Step
9	9	1	9	9	3	0.1	0.1	0.1

The last back-testing date is 2023-01-24. Let's say we feel this strategy and parameters are good enough for trading TSLA, then we decide to pause back-testing and start forward-testing since the second day, 2023-01-25.

After the market closes on 2023-01-25, we search and grab today's newest data for TSLA. The method was mentioned in chapter 3, so read it again in case you have forgotten. Now we have TSLA's Open, High, Low, Close prices, and Volume as 141.91, 146.41, 138.07, 144.43, and 192734300.

Let's turn on the Excel file and VBA macro named "TSLA AceLight White Soldiers & Black Crows." Now we press Control + E, fill in the fresh TSLA prices and volume data one by one.



Make sure parameters in the worksheet "Scan" are set to as same as the result which has been chosen by us in back-testing:

Both the "Take Profit % Minimum" and "Take Profit % Maximum" are set to 9;

Both the "Stop Loss % Minimum" and "Stop Loss % Maximum" are set to 9;

And both the "Momentum Minimum" and "Momentum Maximum" are set to 0.1;

Ignore all the "Steps".

During the whole forward-testing period, these "Scan" parameters are frozen, don't change them.

Now we can press Control + Y, and within several minutes, we will get the newest action result in worksheet "Pick" cell N2 (If nothing needs to be noticed or done, this cell will be empty):

Parameters	Value	Trades	Date	Open	High	Low	Close	Volume	Action
SMA Period	5	Total	2023-01-25	141.91	146.41	138.07	144.43	192734300	Buy/Open 6957 @ 142.24
BB Standard Deviations	2	Long	2023-01-24	143.00	146.50	141.10	143.89	158599100	Long OK 6877 @ 143.89
MACD Fast	12	Long %	2023-01-23	135.87	145.38	134.27	143.75	203119200	TP/Sell/Close 6937 @ 142.64
MACD Slow	26	Short	2023-01-20	128.68	133.51	127.35	133.42	138858100	Warning: TP Sell @ 139.91
MACD Signal	9	Short %	2023-01-19	127.26	129.99	124.31	127.17	170291900	
Expiration	1	Stop Loss	2023-01-18	136.56	136.68	127.01	128.78	195680300	Warning: TP Sell @ 139.91
Momentum	0.1	SL %	2023-01-17	125.70	131.70	125.02	131.49	186477000	Buy/Open 6937 @ 128.36
		Take Profit	2023-01-13	116.55	122.63	115.60	122.40	180714100	Long OK 7275 @ 122.4
Stochastic Oscillator Period	14	TP %	2023-01-11	122.56	124.13	117.00	123.56	169400900	
Slow Stoch %D	3		2023-01-11	122.09	125.95	120.51	123.22	183810800	
Full Stoch SMA	3		2023-01-10	121.07	122.76	114.92	118.85	167642500	
Take Profit %	9.0	Approx. Rate of Progress %	2023-01-09	118.96	123.52	117.11	119.77	190284000	
Stop Loss %	9.0	Approx. Remaining Time (Min.)	2023-01-08	103.00	114.39	101.81	113.06	220811100	TP/Buy/Close 4875 @ 102.88
			2023-01-05	110.51	111.75	107.16	110.34	157986300	Warning: TP Buy @ 103.95
Training Set %	70.0%		2023-01-04	109.11	114.59	107.52	113.84	180389000	Warning: TP Buy @ 103.95
Total Period	2383		2023-01-03	118.47	118.80	104.84	108.10	231402900	Warning: SL Buy @ 124.5
Principal	\$100,000.00	Average Turnover Period	2022-12-30	119.95	124.48	119.75	123.18	157777300	Long OK 11301 @ 123.18
Stock Sum	6957		2022-12-29	120.39	123.57	117.50	121.82	221823300	Warning: SL Buy @ 124.5
Cash	\$32.58		2022-12-28	110.35	116.27	108.24	112.71	221070500	Warning: TP Buy @ 103.95
Annual ROI	27.64%		2022-12-27	117.50	119.67	108.76	109.10	208643400	Sell/Open 4875 @ 114.22
Net Equity	\$1,004,832.04		2022-12-23	126.37	128.62	121.02	123.15	169999700	Short OK 4521 @ 123.15
Net Rate of Gain/Loss	904.83%		2022-12-22	136.00	136.63	122.26	125.35	210090300	TP/Buy/Close 3758 @ 124.18
			2022-12-21	139.34	141.26	135.89	137.57	145417400	Sell/Open 3758 @ 138.57
Start	2023-05-03 16:35:35		2022-12-20	146.05	148.47	137.66	137.80	159563300	Short OK 3779 @ 137.8
Finish	2023-05-03 16:38:23		2022-12-19	154.00	155.25	145.82	149.87	139390600	
			2022-12-16	159.64	160.99	150.04	150.23	139032200	

Because the algorithm based on the strategy "Three White Soldiers and Three Black Crows" gave a "Long OK 6877 @ 143.89" signal yesterday (2023-01-24), and the High price of today (2023-01-25) reached 146.41, it triggers the Buy action at the price of 143.89. That is why the action in cell N2 shows "Buy/Open 6957 @ 142.24". It means buying 6957 shares of TSLA stock and opening a Long position at an average price of \$142.24.

Why is the final Buy price being \$142.24, instead of \$143.89 in yesterday's signal?

Because we want the VBA program to act more like reality. \$143.89 is the signal to trigger the Buy action, but in the real market, it is impossible to buy all shares at the exact price of \$143.89. Sometimes we get it at a higher price, sometimes lower. Then we take the average of the High and the Low to be a simulated Buy transaction price.

Now, time comes to 2023-01-26. After the market closes, we grab the fresh data, keep the parameter settings, run the VBA tool again.

Let's see:

Trades	Value	Date	Open	High	Low	Close	Volume	Action	Cost/Income	SMA	Equity
Total	136	2023-01-26	159.97	161.42	154.76	160.27	234815100	TP/Sell/Close 6957 @ 158.23	\$1,100,806.11	145.15	\$1,100,838.69
Long	60	2023-01-25	141.91	146.41	138.07	144.43	192734300	Buy/Open 6957 @ 142.24	(\$989,563.68)	138.53	\$1,004,832.04
Long %	44.12%	2023-01-24	143.00	146.50	141.10	143.89	158699100	Long OK 6877 @ 143.89		135.40	\$989,596.26
Short	76	2023-01-23	135.87	145.38	134.27	143.75	203119200	TP/Sell/Close 6937 @ 142.64	\$989,493.68	132.92	\$989,596.26
Short %	55.88%	2023-01-20	128.68	133.51	127.35	133.42	138858100	Warning: TP Sell @ 139.91		128.85	\$925,637.11
Stop Loss	54	2023-01-19	127.26	129.99	124.31	127.17	170291900			126.88	\$882,280.86
SL %	39.71%	2023-01-18	136.56	136.68	127.01	128.78	195680300	Warning: TP Sell @ 139.91		125.89	\$893,449.43
Take Profit	82	2023-01-17	125.70	131.70	125.02	131.49	186477000	Buy/Open 6937 @ 128.36	(\$890,433.32)	123.90	\$912,248.74
TP %	60.29%	2023-01-13	116.55	122.63	115.60	122.40	180714100	Long OK 7275 @ 122.4		121.56	\$890,535.90
		2023-01-12	122.56	124.13	117.00	123.56	189400900			119.89	\$890,535.90
		2023-01-11	122.09	125.95	120.51	123.22	183810800			117.05	\$890,535.90
Approx. Rate of Progress %		2023-01-10	121.07	122.76	114.92	118.85	167642500			115.13	\$890,535.90
Approx. Remaining Time (Min.)		2023-01-09	118.96	123.52	117.11	119.77	190294000			112.98	\$890,535.90
		2023-01-08	103.00	114.39	107.81	113.06	220911100	TP/Buy/Close 4875 @ 102.88	(\$501,540.00)	113.66	\$890,535.90
		2023-01-05	110.51	111.75	107.16	110.34	157998300	Warning: TP Buy @ 103.95		115.42	\$954,168.42
		2023-01-04	109.11	114.59	107.52	113.64	180389000	Warning: TP Buy @ 103.95		115.89	\$838,090.90
Average Turnover Period	17.5	2023-01-03	118.47	118.80	104.64	108.10	231402800	Warning: SL Buy @ 124.5		114.98	\$865,088.41
		2022-12-30	119.95	124.48	119.75	123.18	157777300	Long OK 11301 @ 123.18		117.99	\$791,573.40
		2022-12-29	120.39	123.57	117.50	121.82	221923300	Warning: SL Buy @ 124.5		118.43	\$798,203.40
		2022-12-28	110.35	118.27	108.24	112.71	221070500	Warning: TP Buy @ 103.95		121.58	\$842,614.65
		2022-12-27	117.50	119.67	108.76	109.10	208843400	Sell/Open 4875 @ 114.22	\$556,822.50	126.59	\$860,213.41
		2022-12-23	126.37	128.62	121.02	123.15	166989700	Short OK 4621 @ 123.15		134.75	\$835,253.40
		2022-12-22	136.00	136.63	122.26	125.35	210080300	TP/Buy/Close 3758 @ 124.18	(\$466,668.44)	140.16	\$835,253.40
		2022-12-21	139.34	141.26	135.89	137.57	145417400	Sell/Open 3758 @ 138.57	\$520,746.06	146.63	\$784,933.75
		2022-12-20	146.05	148.47	137.66	137.80	159563300	Short OK 3779 @ 137.8		150.47	\$781,175.78
		2022-12-19	154.00	155.25	145.82	149.87	139390600			155.10	\$781,175.78

A new action happens in cell N2: “TP/Sell/Close 6957 @ 158.23”. TP means Take Profit. 6957 shares of TSLA that were bought yesterday have now been sold at \$158.23. The Long position opened on 2023-01-25 has been closed.

Do you remember the Take Profit % in the “Scan” worksheet?

Yes, it is 9, which means the algorithm based on the strategy “Three White Soldiers and Three Black Crows” will take profit at the average Buy price plus 9%. The average buy price was 142.24. Therefore, the TP price should be $142.24 \times (1 + 9\%) = 155.04$.

Let’s take a look at the High price during 2023-01-26. It is 161.42, higher than 155.04, far enough to trigger the Sell action and close the Long position. For the same reason as the final Buy price on 2023-01-25, we use an average of the High and Low (or TP target price, pick the higher) to be a simulated Sell transaction price.

Repeat forward-testing, go on and go on, day by day.

On 2023-02-02, after the market closes, we grab fresh data, keep the same parameter settings as screened by back-testing, and run the Excel VBA macro. A new signal is generated:

Parameters	Value	Trades	Value	Date	Open	High	Low	Close	Volume	Action
SMA Period	5	Total	136	2023-02-02	187.33	196.75	182.61	188.27	217448300	Long OK 5847 @ 188.27
BB Standard Deviations	2	Long	60	2023-02-01	173.89	183.81	169.93	181.41	213806300	
MACD Fast	12	Long %	44.12%	2023-01-31	164.57	174.30	162.78	173.22	196813500	
MACD Slow	26	Short	76	2023-01-30	178.05	179.77	166.50	166.66	230878800	
MACD Signal	9	Short %	55.88%	2023-01-27	162.43	180.68	161.17	177.90	306590600	
Expiration	1	Stop Loss	54	2023-01-26	159.97	161.42	154.76	160.27	234815100	TP/Sell/Close 6957 @ 158.23
Momentum	0.1	SL %	39.71%	2023-01-25	141.91	146.41	138.07	144.43	192734300	Buy/Open 6957 @ 142.24
		Take Profit	82	2023-01-24	143.00	146.50	141.10	143.89	158699100	Long OK 6877 @ 143.89
		TP %	60.29%	2023-01-23	135.87	145.38	134.27	143.75	203119200	TP/Sell/Close 6937 @ 142.64
Stochastic Oscillator Period	14			2023-01-20	128.68	133.51	127.35	133.42	138858100	Warning: TP Sell @ 139.91
Slow Stoch %D	3			2023-01-19	127.26	129.99	124.31	127.17	170291900	
Full Stoch SMA	3	Approx. Rate of Progress %		2023-01-18	136.56	136.68	127.01	128.78	195680300	Warning: TP Sell @ 139.91
Take Profit %	9.0	Approx. Remaining Time (Min.)		2023-01-17	125.70	131.70	125.02	131.49	186477000	Buy/Open 6937 @ 128.36
Stop Loss %	9.0			2023-01-13	116.55	122.63	115.60	122.40	180714100	Long OK 7275 @ 122.4
Training Set %	70.0%			2023-01-12	122.56	124.13	117.00	123.56	169400900	
Total Period	2389			2023-01-11	122.09	125.95	120.51	123.22	183810800	
Principal	\$100,000.00	Average Turnover Period	17.6	2023-01-10	121.07	122.76	114.92	118.85	167642500	
Stock Sum	0			2023-01-09	118.96	123.52	117.11	119.77	190284000	
Cash	\$1,100,838.69			2023-01-06	103.00	114.39	101.81	113.06	220911100	TP/Buy/Close 4875 @ 102.88
Annual ROI	28.79%			2023-01-05	110.51	111.75	107.16	110.34	157986300	Warning: TP Buy @ 103.95
Net Equity	\$1,100,838.69			2023-01-04	109.11	114.59	107.52	113.64	180389000	Warning: TP Buy @ 103.95
Net Rate of Gain/Loss	1000.84%			2023-01-03	118.47	118.80	104.64	108.10	231402800	Warning: SL Buy @ 124.5
				2022-12-30	119.95	124.48	119.75	123.18	157777300	Long OK 11301 @ 123.18
Start	2023-05-03 20:12:20			2022-12-29	120.39	123.67	117.50	121.82	221923300	Warning: SL Buy @ 124.5
Finish	2023-05-03 20:13:07			2022-12-28	110.35	116.27	108.24	112.71	221070500	Warning: TP Buy @ 103.95
				2022-12-27	117.50	119.67	108.76	109.10	208643400	Sell/Open 4875 @ 114.22

“Long OK 5847 @ 188.27”. This signal tells us that we have a new plan: be ready in the following 1 day (“Expiration” set in cell B7). Once the market price goes up and touches 188.27, the algorithm will trigger an opening Long position action, buying around 5847 shares of TSLA.

Keep running the forward-test...

Sure enough, on 2023-02-03, the High price of TSLA jumps to 199.00, which triggers a Buy action and opens the Long position.

We can see a new action in “Pick” worksheet cell N2: “Buy/Open 5753 @ 191.35”.

The cost is shown in cell O2: $5753 \times 191.35 = 1,100,836.55$. Buy action means that we need to pay cash to somebody else, then the cost is marked as red in cell O2.

Trades	Value	Date	Open	High	Low	Close	Volume	Action	Cost/Income	SMA	Equity
Total	137	2023-02-03	183.95	199.00	183.69	189.98	232862000	Buy/Open 5753 @ 191.35	(\$1,100,836.55)	179.91	\$1,092,957.06
Long	61	2023-02-02	187.33	196.75	182.61	188.27	217448300	Long OK 5847 @ 188.27		177.49	\$1,100,838.69
Short	76	2023-01-31	164.57	174.30	162.78	173.22	196813500			164.50	\$1,100,838.69
Stop Loss	54	2023-01-27	162.43	180.68	161.17	177.90	306590600			154.05	\$1,100,838.69
Take Profit	82	2023-01-25	141.91	146.41	138.07	144.43	192734300	TP/Sell/Close 6957 @ 158.23	\$1,100,806.11	145.15	\$1,100,838.69
TP %	59.85%	2023-01-24	143.00	146.50	141.10	143.89	156899100	Buy/Open 6957 @ 142.24	(\$989,563.68)	138.53	\$1,004,832.04
		2023-01-23	135.87	145.38	134.27	143.75	203119200	Long OK 6877 @ 143.89		135.40	\$989,596.26
		2023-01-20	128.68	133.51	127.35	133.42	138858100	TP/Sell/Close 6937 @ 142.64	\$989,493.68	132.92	\$989,596.26
		2023-01-19	127.26	129.99	124.31	127.17	170291900	Warning: TP Sell @ 139.91		128.85	\$925,637.11
		2023-01-18	136.56	136.68	127.01	128.78	195680300	Warning: TP Sell @ 139.91		125.89	\$893,449.43
		2023-01-17	125.70	131.70	125.02	131.49	186477000	Buy/Open 6937 @ 128.36	(\$890,433.32)	123.90	\$912,248.74
		2023-01-13	116.55	122.63	115.60	122.40	180714100	Long OK 7275 @ 122.4		121.56	\$890,535.90
		2023-01-12	122.56	124.13	117.00	123.56	169400900			119.89	\$890,535.90
		2023-01-11	122.09	125.95	120.51	123.22	183810800			117.05	\$890,535.90
		2023-01-10	121.07	122.76	114.92	118.85	167842500			115.13	\$890,535.90
		2023-01-09	118.96	123.52	117.11	119.77	190284000			112.98	\$890,535.90
		2023-01-06	103.00	114.39	101.81	113.06	220911100	TP/Buy/Close 4875 @ 102.88	(\$501,540.00)	113.86	\$890,535.90
		2023-01-05	110.51	111.75	107.16	110.34	157986300	Warning: TP Buy @ 103.95		115.42	\$854,168.42
		2023-01-04	109.11	114.59	107.52	113.64	180389000	Warning: TP Buy @ 103.95		115.89	\$838,080.90
		2023-01-03	118.47	118.80	104.64	108.10	231402800	Warning: SL Buy @ 124.5		114.98	\$865,088.41
		2022-12-30	119.95	124.48	119.75	123.18	157777300	Long OK 11301 @ 123.18		117.99	\$791,573.40
		2022-12-29	120.39	123.57	117.50	121.82	221923300	Warning: SL Buy @ 124.5		118.43	\$798,203.40
		2022-12-28	110.35	116.27	108.24	112.71	221070500	Warning: TP Buy @ 103.95		121.58	\$842,614.65

Continue the same forward-testing procedures day by day.

While time goes to 2023-02-09, we get this result:

Parameters	Value	Trades	Value	Date	Open	High	Low	Close	Volume	Action
SMA Period	5	Total	137	2023-02-09	207.78	214.00	204.77	207.32	215431400	TP/Sell/Close 5753 @ 211.28
BB Standard Deviations	2	Long	61	2023-02-08	196.10	203.00	194.31	201.29	180673600	Warning: TP Sell @ 208.57
MACD Fast	12	Long %	44.53%	2023-02-07	196.43	197.50	189.55	196.81	186010300	
MACD Slow	26	Short	76	2023-02-06	193.01	198.17	189.92	194.76	186188100	Warning: TP Sell @ 208.57
MACD Signal	9	Short %	55.47%	2023-02-05	195.95	199.00	183.69	189.98	232620000	Buy/Open 5753 @ 191.35
Expiration	1	Stop Loss	54	2023-02-04	183.33	196.75	182.61	188.27	217448300	Long OK 5847 @ 188.27
Momentum	0.1	SL %	39.42%	2023-02-03	189.89	183.81	169.93	181.41	213806300	
		Take Profit	82	2023-02-02	157.57	174.30	162.78	173.22	196813500	
		TP %	60.58%	2023-02-01	179.05	179.77	166.50	166.66	230878800	
Stochastic Oscillator Period	14			2023-01-31	180.68	181.17	177.90	306590600		
Slow Stoch %D	3			2023-01-30	143.00	146.50	141.10	143.89	156899100	TP/Sell/Close 6957 @ 158.23
Full Stoch SMA	3			2023-01-29	135.87	145.38	134.27	143.75	203119200	Buy/Open 6957 @ 142.24
Take Profit %	9.0			2023-01-28	128.68	133.51	127.35	133.42	138858100	Long OK 6877 @ 143.89
Stop Loss %	9.0			2023-01-27	127.26	129.99	124.31	127.17	170291900	TP/Sell/Close 6937 @ 142.64
Training Set %	70.0%			2023-01-26	136.56	136.68	127.01	128.78	195680300	Warning: TP Sell @ 139.91
Total Period	2394			2023-01-25	125.70	131.70	125.02	131.49	186477000	Warning: TP Sell @ 139.91
Principal	\$100,000.00	Average Turnover Period	17.5	2023-01-24	116.55	122.63	115.60	122.40	180714100	Buy/Open 6937 @ 128.36
Stock Sum	0			2023-01-23	122.56	124.13	117.00	123.56	169400900	Long OK 7275 @ 122.4
Cash	\$1,215,495.98			2023-01-22	122.09	125.95	120.51	123.22	183810800	
Annual ROI	30.07%			2023-01-21	121.07	122.76	114.92	118.85	167842500	
Net Equity	\$1,215,495.98			2023-01-20	118.96	123.52	117.11	119.77	190284000	
Net Rate of Gain/Loss	1115.50%			2023-01-19	103.00	114.39	101.81	113.06	220911100	TP/Buy/Close 4875 @ 102.88
Start	2023-05-03 20:37:48			2023-01-18	110.51	111.75	107.16	110.34	157986300	Warning: TP Buy @ 103.95
Finish	2023-05-03 20:38:20			2023-01-17	110.51	111.75	107.16	110.34	157986300	Warning: TP Buy @ 103.95
				2023-01-16	109.11	114.59	107.52	113.64	180389000	Warning: TP Buy @ 103.95

See? The AceLight series of Excel VBA macro programs not only can execute back-testing tasks but can also continuously execute forward-

testing tasks. If we know how to use them wisely and open our mind, these tools could bring us unexpected benefits and surprise us even more.

After several months, we should redo the back-testing again to scan for fresh good parameters, along with the changing market and new historical data.

Back-testing will spend dozens of minutes, even hours to get results. But forward-testing is much shorter, only taking a few minutes, since forward-testing just scans one group of parameters, not like back-testing, which needs to scan thousands or even hundreds of thousands of groups of parameters.

If you would like to try out AceLight series of back-testing and forward-testing tools, click on <https://www.tyzu.com/Trial/index.html> to get a 30-day free trial demo. There are also dozens more for subscription.

In short, Forward Trading (Paper Trading or Demo Trading) involves using virtual money to simulate real trading, which helps traders understand how their strategies perform in different market conditions without risking actual money. It allows traders to fine-tune their strategies and make any necessary adjustments before transitioning to real trading.

Additionally, it is crucial to consider the impact of transaction costs, such as brokerage fees and slippage, on the performance of the trading strategy. This is especially important when deciding whether to continue using a particular strategy after paper trading. Therefore, it is recommended to incorporate transaction costs into the back-testing process to obtain a more accurate representation of the strategy's performance.

Forward-testing is like trying out a new recipe before serving it to your guests. Just like how you wouldn't want to serve a dish without tasting it

first, you wouldn't want to trade without forward-testing your strategy. Imagine trying out a new recipe without tasting it first, and your guests end up with a disastrous meal that makes them want to run to the nearest fast-food restaurant. The same goes for trading; you wouldn't want to risk your hard-earned money without testing your strategy first. So, forward-testing is like a taste test for your trading strategy - you want to make sure it's deliciously profitable before serving it up to the market!



CHAPTER 9: RISK AND SAFETY

Back-testing is a powerful and helpful tool for investment, but it is important to remember that past performance is not a guarantee of future results. While back-testing can theoretically provide valuable insights into the potential success of a trading strategy, it cannot predict future market conditions or unexpected events that may impact investment performance. It is important to exercise caution and use back-testing as one of many tools in the investment decision-making process.

There are many reasons why historical performance may not be a 100% reliable indicator of future performance. The economic environment can change, causing different sectors or industries to perform better or worse than they did in the past. Company management can change, leading to different strategies and outcomes. Regulatory changes, technological advancements, and other unforeseeable events can also impact future performance.

Therefore, investors should not rely solely on past performance when making investment decisions. Instead, they should consider a range of factors, including current market conditions, company fundamentals, and macroeconomic trends, to make informed decisions about their investments. Additionally, investors should diversify their portfolios and seek professional advice to help mitigate risk and increase their chances of achieving their financial goals.

And even if you have a good back-testing tool, it is important to regularly update and refresh your data to ensure that your trading strategies are relevant to the latest market conditions and changes.

Perhaps you have heard this saying:

“Risk comes from not knowing what you're doing.” - Warren Buffett

By back-testing and forward-testing trading strategies, traders can gain insights into how their strategies might perform in real-time or in the past based on historical data. By relying on data and algorithms instead of guesswork, traders can make more informed decisions, which can help reduce risk significantly. By using these testing methods, traders can identify potential flaws or weaknesses in their strategies and adjust them accordingly before putting their capital at risk in live trading. This can lead to better performance and increased confidence in the strategy, which can ultimately reduce the risk of losses.

You may also have heard the quote:

“Now, if it is to get safely through this perpetual conflict with the unexpected, two qualities are indispensable: in the first place an intellect which, even in the midst of this intense obscurity, is not without some traces of inner light, which leads to the truth, and then the courage to follow this faint light.” - “On War” by Carl von Clausewitz

The commander in the field is always in the dark, like a traveler at night. He sees only a few steps ahead, but he must see them. He must have a clear idea of the situation, a plan for how to move forward, and the ability to think and act quickly, because time is a critical factor in war. He cannot hesitate when he sees even a weak light, but must boldly move toward it.

Investing or stock trading can also feel like a battle or war, and back-testing is kind of a glimmer of light in the midst of uncertainty and the dark battlefield. It cannot predict the future with 100% certainty, so the ultimate decision rests with you, the commander, who has intellect can

find the “inner light”. It takes courage to advance towards that faint light, and success depends on your expertise, experience, and even luck or fate.

Moreover, software and Internet safety is another issue to be aware of because we need to connect to the Internet to download data often. Make sure your computer and Internet access are in a safe environment. Excel Macros can potentially be dangerous because they can execute any code, including malicious code. Therefore, it's important to take some precautions to ensure that a Macro is not affected by any dangerous outside sources and is safe to run. Here are some steps you can take to help ensure the safety of an Excel Macro:

1. **Enable Macro Security:** By default, Excel has macro security settings that block all macros from running. You should enable this security feature if it's not already enabled, and set it to the highest level that still allows you to run the macros that you need.
2. **Run the Macro in a Test Environment:** Before running a macro in a production environment, it's a good idea to run it in a test environment first. This can help you identify any issues or unintended consequences that might arise from running the macro.
3. **Use a Digital Signature:** If you create or receive a macro from a trusted source, you can add a digital signature to it. A digital signature is a way to verify the authenticity of the macro and to confirm that it has not been modified since it was signed.
4. **Keep your Antivirus Software Up to Date:** Make sure your antivirus software is up to date and running at all times. This can help to protect you from any malware that may be embedded in macros. Scan the file with an anti-virus tool and do not download anything from pirated websites.

By following these steps, you can help to ensure that any Excel macros you use are safe to run.

And remember, when it comes to investing, safety is key! So make sure to wear your helmet and kneepads when you're jumping into the stock market. You never know when you might take a tumble, and it's better to be safe than sorry. Plus, if you fall off your chair in excitement after seeing your investments soar, at least you'll have some extra protection. So, stay safe, stay smart, and happy investing!

If you would like to try out some strategy back-testing and forward-testing tools, click on <https://www.tyzu.com/Trial/index.html> to get a 30-day free trial demo. There are also several other strategies testing tools available for trial, and [dozens more for subscription](#).



CHAPTER 10: CONCLUSION

Stock trading can be a tricky business. The market is unpredictable, and even the most seasoned traders can struggle to make consistent profits. There are hundreds of stock trading strategies in the world. It is important to understand that there is no one-size-fits-all trading strategy. Different stock trading strategies can yield vastly different results. Every trader has their own unique set of skills, preferences, and risk tolerance, and what works for one person may not work for another. For example, a day trader who thrives on short-term price movements may have a vastly different trading strategy than a long-term value investor who focuses on fundamentals.

Even within the same trading strategy, different parameters can produce vastly different results. A day trader who uses technical analysis may use different indicators or timeframes to determine when to buy or sell a stock. By changing the parameters, they may get vastly different signals and therefore, different results. Similarly, a value investor may use different criteria to determine whether a stock is undervalued, such as price-to-earnings ratio, price-to-book ratio, or dividend yield. Each criterion can produce different results, and the investor must determine which criteria are most important to them and adjust their strategy accordingly.

Applying the same trading strategy and parameter settings to different particular stocks can also produce vastly different results. This is because each stock has its own unique characteristics and is affected by different market forces. For example, a day trader who uses technical analysis to identify short-term price movements may have success trading volatile stocks that have high trading volume, but may struggle to generate profits

when trading stocks with low liquidity or that are heavily influenced by external factors, such as regulatory changes or global events.

In addition, a stock's performance can be impacted by factors beyond the control of the investor, such as company news, macroeconomic trends, or unexpected events. This means that even the best-designed trading strategies can fail if market conditions change unexpectedly.

But in all seriousness, the idea of a "best" trading strategy is a bit of a myth. Sure, there are strategies that work well for certain types of stocks and investors, but there's no one-size-fits-all solution. It's like trying to find the perfect outfit - it might look great on one person but terrible on another.

Investing in the stock market can be a daunting task for many individuals. With so many trading strategies available, it's not surprising that people often wonder whether there are any "best" stock trading strategies in the world. The truth is, there are hundreds of trading strategies, but no single strategy can solve every problem for every investor.

The idea of a "best" trading strategy is a misnomer. Instead, we can say that certain trading strategies work well for specific types of stocks, under certain conditions, and for certain types of investors. For instance, a momentum trading strategy may work well for volatile stocks, while a value investing strategy may be more suitable for stable stocks with a steady stream of earnings.

Investors need to be aware of the tricks and secrets inside trading strategies. Even if a trading strategy is famous, it may not be suitable for all investors. It's crucial to understand the fundamentals of a trading strategy and the reasoning behind it before applying it to real-world investing.

Moreover, investors need to consider their risk tolerance, investment objectives, and time horizon before selecting a trading strategy. A strategy that works well for a long-term investor may not be suitable for a short-term trader.

So, if you're looking for the Holy Grail of stock trading strategies, you might be searching for a while. But don't worry, you're not alone. We're all in this together, like a bunch of lost travelers in a corn maze. In the end, the key to successful stock trading is not about finding the "best" strategy, but rather finding the one that works best for you. In short, keep testing, keep experimenting, and don't be afraid to pivot when needed. And remember, even the most experienced traders make mistakes sometimes. So, embrace the ups and downs of the stock market and enjoy the ride - after all, laughter is the best medicine, especially when it comes to navigating the unpredictable world of trading.

Trader Knights, the treasure lies not in the destination, but in the journey to seek the Holy Grail. And the real treasure is not the Holy Grail itself, but the lessons we learned, the truth we discovered, the growth we experienced, the sword we forged, the legend we wrote, and the honour we earned along the way.

The journey will be full of trials, challenges, and tortures, which test us back and forth, and impossible to be achieved overnight.

The Holy Grail is not just a prize to be won, but a symbol of our commitment to something greater than ourselves. It represents the quest for knowledge, wisdom, underlying logic and inherent patterns.

Therefore, what can traders do to improve their chances of success? First and foremost, it's important to have a solid understanding of your own skills, preferences, and risk tolerance. This will help you choose a trading strategy that is well-suited to your individual needs. It's also important to

test your strategy over different market conditions to ensure that it is robust and not over-optimized to historical data.

Testing is everything. It includes Back-Testing and Forward-Testing. And all these need time, even years long time. Please be patient. Warren Buffett said:

“The stock market is a device for transferring money from the impatient to the patient.”

It is true.

No matter how advanced or simple a stock trading strategy may be, it should not be used in real markets before it has been thoroughly tested, including both back-testing and forward-testing. These testing methods are critical for evaluating the effectiveness of a trading strategy and identifying potential flaws or weaknesses before putting capital at risk in live trading. By using these testing methods, traders can gain valuable insights into the performance of their strategies and make adjustments as needed to optimize their results. In short, testing is a necessary step in the development and implementation of any successful trading strategy, regardless of its complexity or fame, even it is recommended by some big guys.

Finally, it's important to diversify your portfolio and not rely too heavily on a single trading strategy or stock. By spreading your investments across different stocks and strategies, you can minimize your risk of losses and increase your chances of generating consistent returns over the long term.

Legendary martial artist Bruce Lee once said,

“I fear not the man who has practiced 10,000 (types of) kicks once, but I fear the man who has practiced one kick 10,000 times.”

The same philosophy applies to stock trading strategies. It's not so important how many different types of stock trading strategies we learn; what's crucial is that we choose one strategy to study deeply, understand every part of it, and thoroughly back-test and forward-test it.

Without proper testing, any fancy trading strategy could turn into guesswork, or even worse, gambling. But “practice one kick 10,000 times” is not so easy; we should say it's a tough job. Manually testing one stock trading strategy 10,000 times is a hard job for anybody, not to mention if we want to test 100 stocks, each one testing 10,000 times... To overcome this challenge, we need effective methods and tools to assist us in our trading journey.

Excel and VBA just provide such methods and tools which we need and help us complete repetitive tasks, which are often considered “boring”, by low costs.

In this handbook, we have shown you how to build a simple tool to verify your trading strategies' effectiveness, even if you don't have strong programming skills. By using Excel and VBA, you can create a back-testing and forward-testing spreadsheet that will allow you to test your strategies both on historical data and up-to-date fresh data. We hope that this tutorial has provided you with the knowledge and skills you need to start building your back-testing and forward-testing tool and testing your trading strategies. Various financial instruments, such as stocks, Forex (foreign exchange), options, futures, cryptocurrencies, and bonds, among others, can be tested using the same back-testing and forward-testing techniques and tools to evaluate the effectiveness of different ideas, methods and trading strategies.

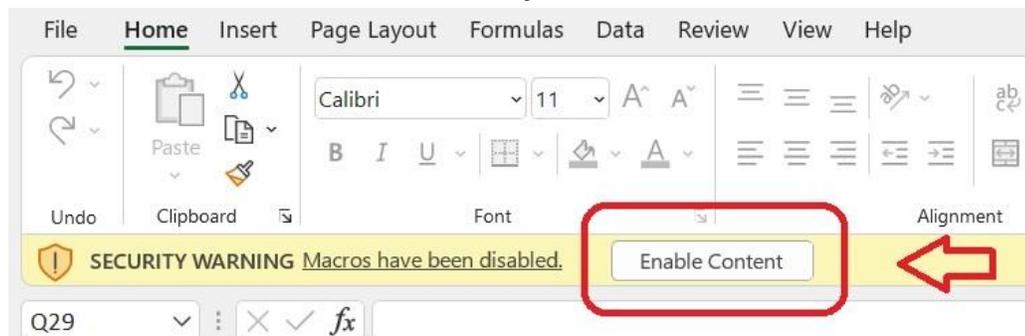
If you want to dive deeper into VBA-related knowledge, here are some resources to help you learn VBA:

1. Microsoft VBA documentation: Microsoft provides extensive documentation and examples for VBA on their website. You can find documentation for VBA in Excel, Word, Access, and other Office applications.
2. VBA Tutorials on YouTube: There are many video tutorials available on YouTube that can help you learn VBA. You can find tutorials on specific topics, as well as comprehensive courses that cover everything from the basics to advanced topics.
3. VBA Express: VBA Express is a website dedicated to VBA programming in Microsoft Office. It has a large collection of tutorials, examples, and code snippets that you can use to learn VBA.
4. Udemy: Udemy is an online learning platform that offers a variety of courses on VBA programming. You can find courses on specific topics, as well as comprehensive courses that cover everything from the basics to advanced topics.
5. Stack Overflow: Stack Overflow is a popular programming Q&A website that has a dedicated section for VBA. You can find answers to specific questions, as well as examples and code snippets that you can use to learn VBA.
6. Excel VBA Programming for Dummies: This book is a great resource for beginners who want to learn VBA programming in Excel. It covers the basics of VBA programming, as well as advanced topics like debugging and error handling.
7. VBA Masterclass: This is an online course that covers everything you need to know to become a VBA expert. It covers the basics of VBA programming, as well as advanced topics like object-oriented programming and database integration.

Most of these resources are free and easy to access online. Some books and tutorials may also be available for free at local libraries. In addition to reading books, we strongly recommend that VBA learners connect with other students, teachers, and even gurus in VBA learning communities. Many gurus are more than happy to help us learn. Don't be afraid to ask questions, no matter how simple or seemingly trivial they may be. Believe me, most teachers and gurus enjoy contributing their knowledge and helping others, at least, they won't bite.

And here is a Quick Manual for using our Demo Excel VBA Macro tools for back-testing and forward-testing:

1. Before running the Macro, scan it with anti-virus tools. Then click the button to enable the Macro if you have checked it.



2. Click the "Pick" worksheet tab, copy historical data from your source. Historical data must consist of at least 1000 data groups.
3. Then, paste it into the data area, from column H to column M. Please import the historical data corresponding to the particular stock. Do not use data from other stocks as a substitute or mix them up.
4. If you add data daily, press Ctrl + E, and fill in the data one by one.
5. Set the Principal at cell B18 (typically set at 100,000), and the Training % at cell B16 (normally set at 70).
6. Set the SMA at cell B2 (normally set at 5), and the Expiration at cell B7 (normally set at 3).
7. Fill the "Optimization Factor" in cell B34.

8. Click the "Scan" worksheet tab, and set all the parameters such as "Minimums," "Maximums," and "Steps."
9. Press Ctrl + Y, and let the Macro run.

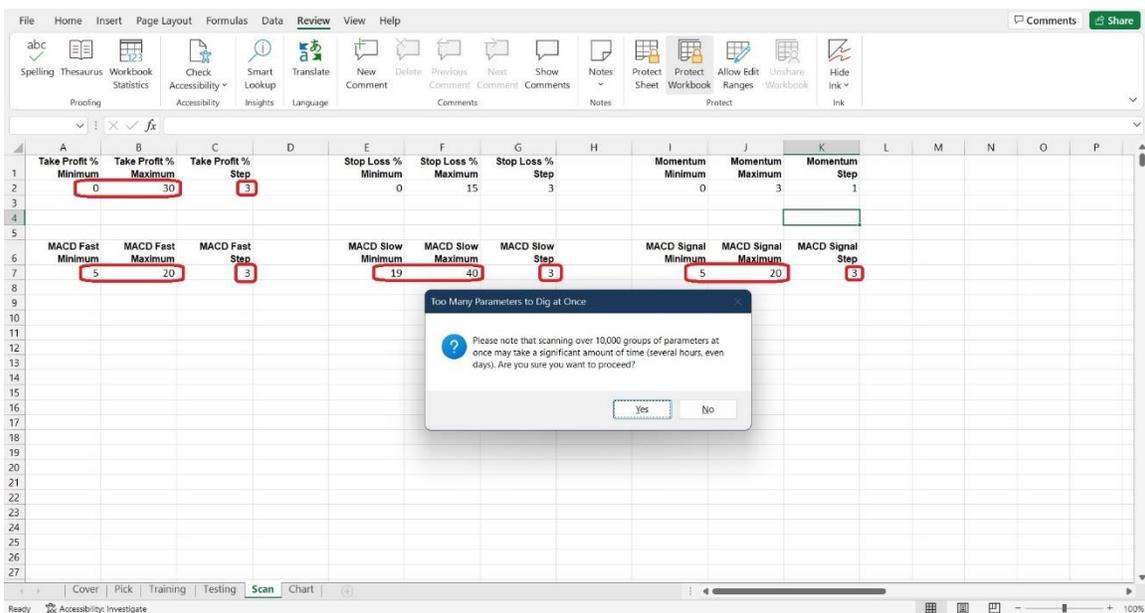
The time it takes to complete the task of digging parameters depends on the processing speed of each computer. For simple trading strategies, where there are only a few dimensions of parameters to scan, it may take dozens of minutes to finish. However, for more complex strategies that require scanning more dimensions of parameters, it may take dozens of hours to obtain results.

For example, for the “Three White Soldiers & Three Black Crows” strategy, there are only three dimensions of parameters to scan:



	A	B	C	D	E	F	G	H	I	J	K
1	Take Profit % Minimum	Take Profit % Maximum	Take Profit % Step		Stop Loss % Minimum	Stop Loss % Maximum	Stop Loss % Step		Momentum Minimum	Momentum Maximum	Momentum Step
2	0	20	1		0	15	3		0	1	0.1
3											

But for the “MACD” trading strategy, there are 6 dimensions of parameters needing to scan:



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Take Profit % Minimum	Take Profit % Maximum	Take Profit % Step		Stop Loss % Minimum	Stop Loss % Maximum	Stop Loss % Step		Momentum Minimum	Momentum Maximum	Momentum Step					
2	0	20	3		0	15	3		0	3	1					
3																
4																
5																
6	MACD Fast Minimum	MACD Fast Maximum	MACD Fast Step		MACD Slow Minimum	MACD Slow Maximum	MACD Slow Step		MACD Signal Minimum	MACD Signal Maximum	MACD Signal Step					
7	5	20	3		19	40	3		5	20	3					
8																
9																
10																
11																
12																
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Therefore, we may see a message box popping up with a warning message, such as "Please note that scanning over 10,000 groups of parameters at once may take a significant amount of time (several hours, even days). Are you sure you want to proceed?"

There are two buttons that allow us to choose: Yes and No.

If we click the "Yes" button, we will see how many minutes we have to wait for a result approximately, in Training, Testing and Pick stage.

Parameters	Value	Trades	Date	Open	High	Low	Close	Volume	Action
SMA	5	Total	2019-04-23	83.19	83.49	82.68	83.38	10595100	
BB Standard Deviations	2	Long	2019-04-22	81.87	83.22	81.64	82.90	107770600	
MACD Fast	5	Long %	2019-04-18	81.56	81.83	81.07	81.13	9493900	
MACD Slow	19	Short	2019-04-17	81.55	81.70	81.08	81.43	8311400	
MACD Signal	5	Short %	2019-04-16	80.81	81.35	80.69	81.20	7005700	
Expiration	1	Stop Loss	2019-04-15	80.89	81.06	80.52	80.65	8536100	
Momentum	0.0	Take Profit	2019-04-12	82.81	82.81	80.58	80.82	16638700	
Stochastic Oscillator Period	14	TP %	2019-04-11	81.54	82.07	81.02	81.95	9115100	
Slow Stoch %D	3		2019-04-10	81.92	82.08	81.41	81.56	10324300	
Full Stoch SMA	3		2019-04-09	82.52	82.58	81.74	81.93	8561600	
Take Profit %	3.0		2019-04-08	82.67	83.20	82.59	83.00	9108200	
Stop Loss %	3.0	Approx. Rate of Progress %	2019-04-05	82.15	82.53	81.95	82.49	10059100	
		Approx. Remaining Time (Min.)	2019-04-04	81.12	82.08	80.77	82.05	9360600	
			2019-04-03	81.77	81.77	80.61	80.90	8562900	
			2019-04-02	81.75	81.95	81.11	81.38	7648000	
Total Period	2341		2019-04-01	81.23	81.78	81.08	81.73	10816400	
Principal	\$100,000.00	Average Turnover Period	2019-03-29	81.33	81.48	80.48	80.80	10889200	
Stock Sum	839		2019-03-28	80.03	80.79	80.02	80.74	7412300	
Cash	\$71.70		2019-03-27	80.97	81.31	79.82	80.34	7258700	
Annual ROI	7.54%		2019-03-26	80.33	81.27	80.18	80.96	9472800	
Net Equity	\$196,514.26		2019-03-25	80.00	80.44	79.59	79.92	11320400	
Net Rate of Gain/Loss	96.51%		2019-03-22	81.23	81.44	80.30	80.48	12497700	
Start			2019-03-21	80.81	81.89	80.80	81.79	10117000	
Finish			2019-03-20	80.75	81.92	80.56	81.32	13133600	
			2019-03-19	81.58	82.00	80.64	80.87	19336500	
			2019-03-18	80.44	81.25	80.44	81.08	9840600	TPI/Sell/Close 839 @ 81.8

Sometimes we may see a more severe warning like "Stop! Scanning over 1,000,000 groups of parameters at once will take an uncomfortably long time. Please reset the 'Minimum's, 'Maximum's, and 'Step's' values."

In these cases, we can divide this task into two stages.

First, use a wide range setting, for instance, use a big Step, let's say 3, instead of a small Step, 1. We will make a quick and rough scan in a wide range, seeking the most possible area which can be a "gold mine" in a vast desert and mountains.

	A	B	C	D	E	F	G	H	I	J	K
1	Take Profit % Minimum	Take Profit % Maximum	Take Profit % Step		Stop Loss % Minimum	Stop Loss % Maximum	Stop Loss % Step		Momentum Minimum	Momentum Maximum	Momentum Step
2	0	30	3		0	15	3		0	3	1
3											
4											
5											
6	MACD Fast Minimum	MACD Fast Maximum	MACD Fast Step		MACD Slow Minimum	MACD Slow Maximum	MACD Slow Step		MACD Signal Minimum	MACD Signal Maximum	MACD Signal Step
7	5	20	3		19	40	3		5	20	3

After we get some good parameters from the first stage...

	P	T	U	V	W	AE	AL	AM	AN	AO	AP	AQ	AR	AS	AT
1	SMA	MACD-Fast	MACD-Slow	MACD	MACD-Signal	Equity	Serial Number	Net Rate of Gain/Loss	Net Equity	Momentum	Take Profit %	Stop Loss %	MACD Fast	MACD Slow	MACD Signal
2	115.74	115.78	112.08	3.71	3.74	\$767,612.94	5016	667.61%	\$767,612.94	3	30	15	5	28	5
3	115.42	115.21	111.72	3.49	3.76	\$778,132.00	4950	578.17%	\$678,167.66	2	30	15	5	28	5
4	115.39	115.46	111.50	3.96	3.90	\$771,792.38	5001	577.43%	\$677,427.69	3	30	12	5	28	5
5	115.19	115.16	111.16	4.00	3.86	\$773,107.28	4994	567.81%	\$667,809.69	3	30	9	5	28	5
6	115.43	114.86	110.82	4.04	3.79	\$775,643.10	71467	538.50%	\$638,497.40	2	30	12	20	37	5

we can narrow down the Minimum and Maximum range around the top parameter settings, and reduce the step setting to 1 in the second stage, then do a "fine tune".

	A	B	C	D	E	F	G	H	I	J	K
1	Take Profit % Minimum	Take Profit % Maximum	Take Profit % Step		Stop Loss % Minimum	Stop Loss % Maximum	Stop Loss % Step		Momentum Minimum	Momentum Maximum	Momentum Step
2	28	32	1		0	15	3		0	3	1
3											
4											
5											
6	MACD Fast Minimum	MACD Fast Maximum	MACD Fast Step		MACD Slow Minimum	MACD Slow Maximum	MACD Slow Step		MACD Signal Minimum	MACD Signal Maximum	MACD Signal Step
7	5	8	1		26	30	1		5	8	1

This action will eliminate large no-hope areas and focus on the sensitive hot spots. Of course, this should save us a lot of time and computer calculation resources, and then increase our work efficiency.

In theory, the more parameters we scan, the higher the chances we have of finding the "best" parameter setting.

For sure, if we really spend several days to scan some large parameter combinations, we may see some beautiful and exciting numbers.

However, in reality, this attempt can lead to two potential negative effects. One is overfitting, where the current "best" parameters may not guarantee the best performance in the future. The other is the long time it takes to consume.

"Be moderate and balanced without bias, how strong and resilient this is!" - "Doctrine of the Mean"

*"Going too far is as bad as not going far enough." -
"Analects" by Confucius (551~479 BC.)*

Yes, going to extremes is never good. Therefore, we need to become familiar with these back-testing tools, practice again and again, find the balance suitable for us, and confirm it through forward-testing.

Don't be scared of those complicated codes. Go ahead and practice. Codes are not your enemy; when you practice enough, codes will become your army.

"Whatever you do or dream you can do – begin it. Boldness has genius and power and magic in it." - Johann Wolfgang von Goethe (1749-1832)

If you would like to try out and practice AceLight series of strategy back-testing and forward-testing tools, click on <https://www.tyzu.com/Trial/index.html> to get a 30-day free trial demo. There are also [dozens more for subscription](#).

In conclusion, we'd like to share some wisdom from notable strategy masters throughout history. Perhaps we can learn from them:

“SCIENCE MUST BECOME ART”

“Knowledge must, by this complete assimilation with his own mind and life, be converted into real power.” - "On War" by Carl von Clausewitz (1780–1831)

And:

“If, before a battle, one has calculated and tested their strategy and believes they can win, the chances of victory are high. If the calculations show that they cannot win, the odds of victory are low. A detailed strategy and thorough calculation lead to victory, while a rough strategy and calculation has no chance to win, moreover, much less without any strategy or calculation at all.” - "The Art of War" by Sun Tzu (a Chinese military general, strategist, philosopher, and writer who lived during the Eastern Zhou period of 771 to 256 BC.)

As you reach the end of this handbook, we hope that you've learned enough to use back-testing and forward-testing VBA tools and test your trading strategies. I appreciate you so much for spending your precious time reading this small book. We are surprised you have hung in this long until this chapter. I hardly dare to imagine that how many readers would be interested enough to finish the first three chapters.

We cannot thank you enough, and I wish you all the best. If you find any mistakes or errors in this simple and crude book, please don't hesitate to point them out. Thanks in advance.

If you have any questions or need help, feel free to reach out to the resources we provide below. They won't bite... we think.

Although I have referenced many quotes and metaphors about war and battle in this tutorial handbook while discussing trading and competition in the market, I want to make it clear that I am a big fan and lover of peace. I pray for harmony and tranquility to reign once again on our beautiful planet. I wish everybody good health and happiness, regardless of whether they are rich or poor. Gold cannot bring our loved ones back once they have left us.

But love and peace never die.

Remember, trading is not for the faint of heart. It takes courage, discipline, and a bit of luck.

Happy trading! Good luck!

Many thanks again!



Victor J. Ma / Data Gladiator

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About the author:

Victor J. Ma (Data Gladiator) is a seasoned expert in the field of Artificial Intelligence (AI) and a pioneer in using AI technologies for data wave processing in the financial markets. As the Head Researcher of Candlelight, an AI-powered trading system, Victor has developed cutting-edge strategies that have revolutionized the way stocks, options, and FOREX markets are traded.

With a deep understanding of AI and its applications in quantitative trading, Victor has successfully developed an AI-Powered Quant Trading System that has achieved remarkable results. After two years of rigorous testing with real market data, over 100 sets of testing results have confirmed the feasibility of 100% machine decision-making in stock trading. This breakthrough has positioned Victor and Candlelight at the forefront of the industry, proving that machines can indeed outperform human traders in the stock market.



Victor's expertise in trading automation dates back to 2008 when he designed a software robot for FOREX trading. His exceptional skills and keen insights propelled him to the Top 3% winners in the prestigious Automated Trading Championship 2008, the highest level FOREX programming competition globally.

This competition would last for three months. All trading signals and actions would be generated and executed by programs and algorithms in a fully automated manner.

Victor's outstanding performance ranked him (ID: VDUX) #56 among 2420 competitors worldwide, #7 in North America, and #2 in Canada. His

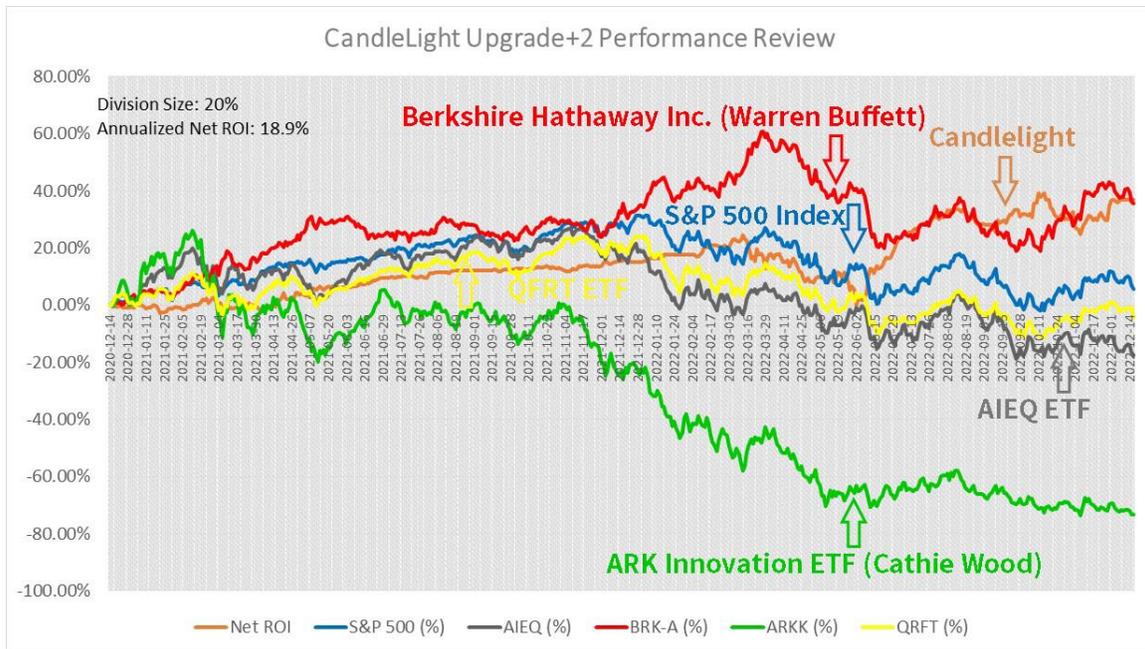
automated foreign exchange trading program made a 76% profit in three months.

Out of 2,420 contestants from different countries, only 705 passed the pre-test and made it to the finals, with only 128 making a profit, and only 80 achieving over 30% return.

#	Login	Name	Comments	Country	PF	Balance	Profit	Equity
46	600662	waldyss	30	Palestinian Territory	1.59	22 771.36	0.00	22 771.36
47	600275	higno	1	Brazil	1.52	22 771.22	0.00	22 771.22
48	600175	dvoshid	3	Japan	1.08	22 374.58	0.00	22 374.58
49	600379	Marlboro	0	Russia	1.92	20 452.64	0.00	20 452.64
50	600360	Lovecraft	2	Russia	2.40	19 772.52	0.00	19 772.52
51	600508	rdvvrch	14	Indonesia	1.24	19 742.55	0.00	19 742.55
52	600131	Damian	1	Argentina	0.00	18 890.00	0.00	18 890.00
53	600319	kausti	0	United States	2.20	18 834.86	0.00	18 834.86
54	600281	ifctrader	1	Afghanistan	3.66	18 498.00	0.00	18 498.00
55	600609	The Think	0	Russia	1.73	18 383.57	0.00	18 383.57
56	600641	VDUX	11	Canada	1.15	17 670.39	0.00	17 670.39
57	600061	Anttrak	0	Russia	2.87	17 532.00	0.00	17 532.00
58	600414	mork	2	Moldova	1.23	17 328.20	0.00	17 328.20
59	600195	Explorer	1	Russia	1.35	16 844.40	0.00	16 844.40
60	600242	Gauss	3	Slovakia	1.16	16 844.31	0.00	16 844.31

Victor's passion for leveraging AI technologies to unlock new trading opportunities and optimize investment strategies makes him a driving force in the world of quantitative trading.

With a track record of innovation in the field of AI-driven trading, Victor continues to push the boundaries of what is possible in the financial markets. His work at Candlelight has earned him a reputation as a visionary leader in the AI and trading communities, with Candlelight's growth rate consistently keeping pace with the performance of investment legend Warren Buffett for a long time.



Besides complicated AI quant trading strategies, Victor also enjoys developing simple mechanical quant trading strategies and tools, and writing tutorials for fellow strategy enthusiasts. Since 2023, Victor has been publishing free tutorials online to help readers understand how even a simple Excel VBA macro program can greatly assist investors. With the help of these trading strategy verification tools, trading is no longer guesswork or gambling, as all investment decisions can be based on solid data and facts. Victor enjoys communicating with people via social media and is enthusiastic about learning from friends and exchanging ideas with them. (chatGPT wrote this bio for me, that sounds a little overblown, eh? But I won't blame AI, hahahaha!)

Twitter: [@DataGladiator](https://twitter.com/DataGladiator)

Medium: [@DataGladiator](https://medium.com/@DataGladiator)

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