IMPACT OF AVERAGING TREND INTENSITY IN 'ENTANGLEMENT THEORY'

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Abstract

The main objective of this study is that, in Entanglement Theory, whether averaging the trend intensity is beneficial for improving returns. The Entanglement Theory is created by an anonymous trader, and it is a trading strategy. This study uses the trading data of Chinese commodity futures to test it and explore its impact. This article illustrated the origin of Entanglement Theory and the origin of technical analysis. The details of the Entanglement strategy are carefully analyzed and explained. This research will use the quantitative transaction framework for backtesting the strategy. Transaction results will be used to conduct paired sample t-test. Hopefully, averaging trend intensity in entanglement is indeed useful for more accurate judgment of trading signals to improve the rate of return.

Keyword: Entanglement Theory, Quantitative Trading, Algorithm Trading, Technical Analysis

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Chapter 1 – Introduction

Background

Quantitative trading is a field combining computer programming and financial trading, attracting so many intellectual individuals to devote into the development of the subject. Quantitative trading also yields great profit, corresponding to great risks. Entanglement Theory is a set of related trading strategies that, in the essence, absorbed the Dow Theory and the Elliot Wave Theory. The Entanglement Theory owns many loyal followers in Chinese stock market. This study aims to test the effectiveness of the Entanglement Theory on Chinese futures market.

Problem Definition

In 'Entanglement Theory', will having the MACD hist area divided by time interval be conducive to the rate of return in Chinese future market?

Problem Statement

Entanglement Theory is a trading strategy created by an anonymous trader who, assumedly, is passed away. This theory is disseminating by the trader's left-over, a blog with 108 diaries. A small group of people hold firm belief in this trading practice and earn money off this in the stock market. Little research exposes to the commodity futures market because the anonymous trader made his fortune in the stock market.

The Entanglement Theory claims to inherit many theories of western world including Wave Theory, the theory of Willian Delbert Gann and the theory of Larry

Richard Williams, etc. Elliott Wave Theory has the advantages of universality and accuracy. It accurately depicts the way the stock market works and has become an important tool in securities market modeling. (Duan, 2018) The wave theory, althought was a experience method instead of a quantitative one, is still attractive in this field of interest. (Vantuch, 2018) Since the Entanglement Theory won so many audiences, this research aims to pry into the effectiveness and robustness of the trading strategy.

Purpose of the Study

This study focuses on the utility of the Entanglement Theory applying to the Chinese commodity futures market. Programming will take the lead to incorporate the theory, producing the trading result off the futures data before running effectiveness and robustness test on them. As the experiment cedes the study will know how well the strategy performs on the futures market or just bluffing. And the study will investigate the optimization strategy like varying the parameters trough other stock indicator like Bollinger Band and moving average. (Genoveva-Mihaela, 2018)

Research Questions

The study will attempt to answer the following research questions.

- What does the Entanglement Theory look like?
- Is there any similar theory?
- What should be noticed applying a strategy to stock market and futures market?
- How should the study conduct the effectiveness test?
- Where should the study pay extra attention if put into real-life practice?
- Can the theory be improved?

Significance of the Study

Entanglement Theory might be a mix of many existing trading strategy; thus, it was necessary to learn what the Entanglement Theory absorbed from them. The core function of each theory might have composed a strong weapon in the market.

The future market in China has some comparative advantage over the stock market: it can short the commodity future contract while stock cannot, and it can conduct intraday trading while stock cannot. So, such features would make the strategy more suitable applying into quantitative use. Because computer algorithm has few rivals when comes to the scaling, speed and precision.

This theory may fall into many specific strategies since different rebar scale would require different configuration, which will perform varied density of transaction. This study would also know the performance of the theory under different time-frame.

When put into real trading, the outcome may offset or even reverse the back-testing result because in the market, the past does not represent the future. So this study would only be a indication of the performance in the past. If it would fit the history evenly, it will fit into the future trading in all likelihood.

Chapter 2 - Literature Review

Introduction

This literature review was organized by technical analysis and algorithm trading. Technical analysis stock market overreaction and herding behaviors are incorporated into technical analysis. (Yensen Ni, 2015) Definition of technical analysis is as follows: "Technical analysis is the organized and systematic study of a pictorial representation (chart) of the past price actions of a particular item with a view of ascertaining its expected future behavior". (Shan, 2012)

Technical analysis has a long history. Many theories are known for half a century, like the Gann Theory. W. D. Gann has long been regarded as one of those mystical, ledgendary traders of yesteryear, known mostly for his work with angles, cycles and squaring price and time. Gann is the pioneer of technical analysis which this study relies on. (Burton, 2003) Gann's method of forecasting the financial markets consisted of two elements: 1) cycles of time and 2) the rate of vibration. These two elements are also the key part of our research object, Entanglement Theory. (Smithson, 2016)

The Dow theory is another underlysing technical analysis theory that can be explained for almost all exchanges in the trading world. (Dicle, 2014) Charles Dow's theory provides several trading strategies like Classic Buy Signal, the Classic Sell Signal, and Morningstar's Equity Style Box. The Dow Theory outperforms a buy-and-hold model would yield increased advantage. (Schannep, 2012) The Dow Theory is the foundation of modern technical analysis. Dow Theory reveals the trend of stock market, relating to this study. (Shan, 2012)

The Wave Principle, known as Elliott Wave Principle (EWP), is a theory widely used in technical analysis and is based on the idea that the fluctuations in markets follow recognizable and repetitive cycles, which are the reflection of market participants' mass psychology. The EWP can be used to analyze commodity cycles. (Marañon, 2018) The Elliot Wave Theory accurately depicts the way the stock market works and has become an important tool in securities market modeling. (Duan, 2018) The wave theory, althought was a experience method instead of a quantitative one, is still attractive in this field of interest. (Vantuch, 2018) The proposed theory aptly depicts the overall law of the Chinese commodity futures market. (Ye, 2019)

Algorithm trading, The article discusses algorithmic trading (AT), which is defined as any form of trading that uses sophisticated algorithms to automate all or some part of the trade cycle. (TRELEAVEN P, 2013) Trading strategy usually includes several parameters to adjust itself. There is optimization strategy like varying the parameters through other stock indicator like Bollinger Band and moving average. (Genoveva-Mihaela, 2018) The optimized strategy would outperform the original one in most case. The trading behaviour and performance from this modified strategy are different from the standard approach with results showing that, on average, the proposed modification increases the cumulative return and the Sharpe ratio of the investor while exhibiting smaller maximum drawdown and smaller drawdown duration than the standard strategy. (Papailias, 2015) Once electronic trading was widespread released, reliable solutions can be found using algorithmic trading systems. The Cyclical Trading Method will be presented together with the main principles and practices to design and optimize trading software. Test results are also included in this article in order to compare

the presented method with other known methodologies to trade the capital markets. (PĂUNA, 2019)

Conclusions

The existing research around technical analysis explains the definition of technical analysis and covers many well-known theories including Gann Theory, Dow Theory and Elliot Wave Theory. This study's object, the Entanglement Theory, is lying on these well-known theories. The literature also reveals the algorithm trading and the strategies' optimization. The multi-parameter strategy can be improved by running the optimization.

Chapter 3 – Research Design and Methodology

Theory

Technical analysis refers to the sum of the methods that take market behavior as the research object to judge the market trend and follow the cyclical changes of the trend to make decisions about the stock and all financial derivatives. Technical analysis suggests that market behavior is inclusive of digesting all information prices in a trendy way and that history will repeat itself. (Wen-I Chuang, 2004)

Since the emergence of the stock market, people began to explore the stock investment theory and formed a variety of theoretical results. Like technical analysis was produced more than 100 years ago in obscurantism. The theory of stock investment is that smart investors observe the change in stock price for a long time and accumulate experience. Investors have gradually summed up many so-called stock market volatility laws. (Michel M. Dacorognaa, 2000) After a long period of development and evolution of technical analysis has formed a variety of categories of which the most representative is the Dow theory and wave theory.

Technical analysis introduction. Technical analysis focuses on the analysis of stock price volatility. The fundamental analysis focuses on the long-term investment value of stocks. The technical analysis mainly analyzes the stock supply and demand performance market price and trading quantity and other market factors. (Fotis Papailias, 2015) The fundamental analysis is to analyze the external factors of various economic

and political stock markets — Moreover, the relationship between these external factors and the stock market.

The technical analysis mainly aims at the stock's performance belongs to short-term nature. The fundamental analysis mainly aims at the enterprise's investment value, and the safety margin belongs to the long-term nature. Technical analysis focuses on helping investors choose the right ones with timing and operation. The fundamental analysis focuses on helping investors to choose the right investment objects.

Application. The fundamental analysis method can fully grasp the long-term trend of the stock price, but it is difficult to make a correct judgment on the market changes in the short and medium term. Technical analysis is close to the market. Short-term response to market changes fast and intuitive but poor accuracy and reliability. Technical analysis does not determine how long-term trends, particularly macroeconomic and policy factors, can be predicted. (Baghdadabad, 2014)

It can be seen from the above that the fundamental analysis method technical analysis method has its advantages and disadvantages as well as the scope of application the fundamental analysis method can grasp the long-term price trend while the technical analysis can provide a reference for short-term sales. (Michael Zabarankina, 2014) Improve the scientific applicability and reliability of the market analysis. Therefore, investors in the specific use of their organic combination can be achieved to maximize their effectiveness. (Haixiang Yao, 2013)

Overall, technical analysis has the following characteristics. Emphasize the relatively high and low point of price change. There is an inevitable trend of change. Price movements can be reflected in the chart. The accuracy of the securities market with the standard operating degree gradually improved. Suitable for speculative short-term operations.

Theoretical basis. Market behavior embraces all factors that influence prices. These include fundamentals. Political factors, psychological factors, and other factors should be reflected in the final sale of the price; that is, the price changes reflect the relationship between supply. Prices tend to evolve in a trend-like manner, usually along with existing trends such as Newton's law of inertia. History will repeat technological analysis, and market behavior and human psychology have a positive relationship. The price pattern through the specific chart has expressed the people to some market value or light psychology.

Elliot Wave Theory. Eliot, an American securities analyst, create Elliot Wave Theory. Using the Dow Jones industrial average as a research tool, the study finds that the changing structure of stock prices reflects the beauty of natural harmony.

Based on this discovery, Eliot proposed a set of relevant market analysis theory to refine the 13 market patterns or waves in the market in these patterns repeated. However, the time interval and amplitude are not necessarily reproducible. He then discovered that these structural shapes could be joined together to form larger shapes of the same shape. (Hendrik Bessembinder, 1995)A series of authoritative deductive laws will be proposed

to explain the behavior of the market and emphasize the predictive value of the wave principle. This is the famous Eliot wave theory. Eliot's wave theory is. A theory of stock technical analysis. Elliott wave theory holds that market movements are a pattern of repetition. Each cycle there are five rising waves and five falling waves. Elliott wave theory divides trends of different scales into nine categories. The longest huge ring waves are long cycles spanning 200 years. The second microblog is a trend that covers a few hours, but no matter what the scale of the trend is, the fact that each cycle is made up of eight waves remains.

The premise of this theory is. If the price follows the trend, it fluctuates according to the order of the five waves. (Xinfu Chen, 2015) If the price changes against the primary trend, it fluctuates according to the order of the three waves. Large waves can last for more than 100 years and the build-up period is quite short.

The Dow theory. An American writer, Robert Rhea, write the Dow theory. In the field of technical analysis. Dow theory is the blogger of all market technical analysis theories. Dow theory is the originator of all market technical analysis theory. Although he was often criticized for being too slow, he was sometimes derided by those who refused to believe his verdict. (Haroon, 2013) However, anyone with a little experience of the stock market has heard of it and is respected by most people. However, people never realized that it was purely technical and not based on what the stock market itself did, not on the business statistics that fundamental analysts relied on.

The inheritance of Dow's theory. The formation of the Dow theory took place decades after the death of Charles Dowd in 1902. Hamilton and Robert Rhea of William Abbey inherited the Dow theory. Moreover, then in the stock market about anemia. In the process of writing, they organized and induced the theories the study see today, and their stock market barometer and Dow theory became the classic works of later. (Jing Zhang, 2018)

The essence of Dow's theory. Charles, the founder of this theory, said. It claims that the theory is not used to predict the stock market, or even to guide investors, but rather a barometer of the overall trend of the market. This is a deplorable view. The most significant thing about Dow's theory is that it has a valuable philosophy, which is the essence of it all. In all the books he has written, he has emphasized that the Dow theory is designed as a tool to enhance the intellectual reserves of investors or speculators. (Nikola Gradojevic, 2015) It is not an all-round and strict technological theory that can be divorced from the fundamental economic conditions or the current market situation. Dow theory is a scientific theory, in other words. It is based on the study of price patterns — a way to speculate about future price behavior. (Gradojevic, 2012)

The Entanglement Theory is a kind of investment theory about market securities. The Entanglement theory is suitable for all investment markets with fluctuating trends, such as stocks, securities, and futures. Online celebrity pestering said Zen on June 7, 2006, wrote a series of articles to teach you to invest in stocks. This theory of investment. The Entanglement theory is officially published.

Entanglement is based on the fundamental certainty of the market. Any movement will end on a basis. From the geometric point of view, the trend of the structure gradually deduced. Entanglement theory makes a complete classification of the various movements of the market to guide the actual operation.

Research objective

The judgment trading signal is mainly for the comparison of the two trends. It is the same with the purchase. When the price of the trend on both sides of the price of a new high or low price and MACD hist area did not appear high or low, this shows that the trend is weakening. Moreover, according to this theory, this would produce a trading signal. However, the formation of MACD hist may last a long time. This would misguide the strategy to miss a trading signal. This study is meant to explore the effectiveness of MACD hist strength per unit time, as in the average trend strength, to tell whether the trend has weakened.

The research focuses on whether the intensity of the MACD hist per unit time can help us to judge the trading signal more precisely. The criterion is whether dividing the MACD by time will improve the rate of return. (Yu-Chia Hsua, 2011)

Theoretical framework

How to determine the buying and selling point? The core idea of Entanglement theory is Entanglement. The Entanglement theory uses average moving lines with different sensitivity to tell weakening of the trend.

For example, the average 5-day moving average line reflects the 5-day price mean value. The 10-day moving average line reflects 10-day price mean value. If the 5-day average moving line and the 10-day average moving line have been entangled three times recently and moving in the same direction, then the three entanglements can form two areas. If the area of the last section is smaller than the area of the previous section, meanwhile the price keeps going towards the same direction, that means the trend has weakened.

One cannot quantify such a rough operation. Although this can be done with the human eye, the programmer needs to give the computer specific parameters and structural codes to ensure certainty and feasibility. Because Entanglement is a comparison of the strength of the two trends, it is necessary to know the strength-indicator of these two trends and the start and stop time of these two trends. For strength, this study uses an indicator called MACD, also known as Moving Average Convergence Divergence.

MACD is developed from the double exponential moving average by fast exponents moving average minus slow exponential moving average. Having the fast line dif multiplied by 2, one can calculate the MACD hist. The meaning of MACD is the same as the double moving average. That is, there is a discrete aggregation of fast and slow moving averages. When MACD goes from negative to positive, it is a buy signal. When MACD from positive to the contrary, it is a sell signal. The difference between a fast moving average and a slow moving average is enormous when the MACD changes at

large angles — expressed a shift in the general trend of the market. (Dongdong Lv, 2019)

So the trend strength that the study compare is the area that MACD hist combined. However, how does the study determine which period the hist area needs to be compared? At this point, the study needs to determine the starting and ending time of the trend.

The theory uses many constructs to determine the fundamental element of a trend. So there are many, many other structural elements under the trend. The following table is how it works.

Elements	**Principles**
BAR (Bar)	Only keep the low and the high of the candlestick.
BBAR (Contained Bar)	Keep the high if ascending, keep the low if descending
FX	If the ascending BBARs are turning, there will be a top FX, if the descending BBARs are turning, there will be a bottom FX
	The gap between FXs must exceed 4 BBARS, disavowed otherwise
	If the new is the same kind of the previous FX, the new one would disavow the previous one.
BI	Two different kind of FX would form a BI

	Replacement of BI would update the last FX
TZ (Vector)	XD heading down is determined by BIs heading up, which is called TZ. XD heading up is determined by BIs heading down, which is also called TZ
	When you don't know the direction at first, you can use the two eigenvectors of the head to judge the direction. The first two feature vectors can be used to determine the direction.
	At the same time, two sets of eigenvectors are given.
XD (Line)	The turning point of TZs would line up to form a XD, similar to BI.
	The classification of the top and bottom of the feature sequence does not need to be separated by three strokes.
	If there is a gap between the first element and the second element, the typing remains to be confirmed.
	If a fractal is to be confirmed and the third element touches the first element, then it can be confirmed.
	If the connection has two-line segments to confirm, the previous line segment is confirmed.
	If we look at the real up segment, we ignore the down segment. If we look at the line segment up, we ignore the next eigenvector. A downward moving feature vector.
	If the second element contains the first and third elements. The second element and the third element are dealt with by the inclusion at this time no wind is formed.

	If two inclusion relationships are present, then the third element after the survey. If not, form a type if included in the process contains. If there is no third element, move on. All contained before processing.
	If the previous typing has not been confirmed, the subsequent first and second elements also deal with inclusion relationships.
	A line segment to be confirmed cannot be counted as a line segment.
	The line segment to be confirmed can be denied, i.e. replaced by a subsequent homothetic flight. As long as the rules are violated.
ZS (Center)	Five XDs' intercept is the ZS. The intersection of continuous intersecting lines constitutes the center.
	If the counts of XDs within ZS reached the multiple of 3, recalculate the range of ZS
	Each time the center contains three more segments, the intersection is recalculated.
	XD within the ZS's range would narrow the ZS.
	The last hub may keep updating the last segment.
	A XD does not intercept with last ZS marks the end of the ZS.
QS (Trend)	The line connecting the two ends of the same direction's ZSs.... The end point of a line segment at both ends of all concentric centers.
	1-min QS equals 5-min XD

Explanation of the variables in our model

In the trading strategy, the study has three variables, two of which are independent variables and one dependent variable. All two of these variables are discrete variables.

Variable is_MACD_divided. The first variable is the one the study is going to explore. When the study compares the strength of two trends, are the study comparing the strength of its comprehensive trends or unit trends? Because if extreme examples are given, the two trends are likely to occur at very different times. Even though the latter trend has weakened, it is possible to last for a very long time. So, its total MACD area will be larger than the previous trend. Hence the strategy might have lost a sell signal.

So by dividing the area of MACD hist by the time interval, the strategy can compare the average strength of the two trends. Then there are only two values of the independent variable here. The variable here is a Boolean value.

Variable time-window. The quantification strategy is to accept the price value when the program accepts the candlestick bar. Moreover, the candlestick bar has different time frames. For example, there are 5-minute, 10-minute, 15-minute, 30-minute for a candlestick bar frame. Here this study uses different time-window to reduce the deviation of the study at various time scales. The result will cover as many possibilities as possible. For each commodity future in this study, four time-windows were used to eliminate errors.

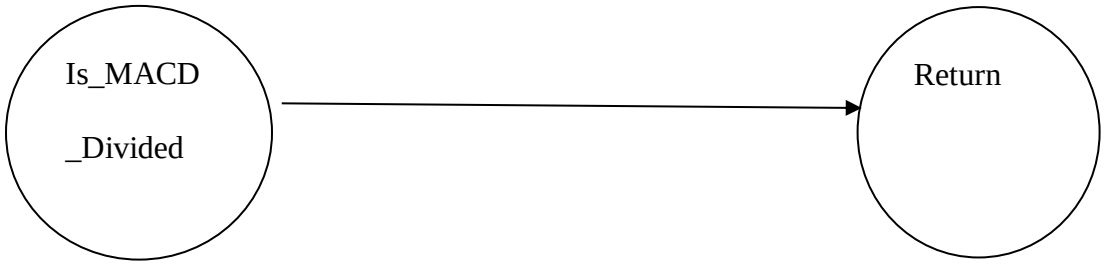
Variable return. The dependent variable is the rate of return on the strategy. It is calculated from the transaction order, which is generated from the trading signal the Entanglement strategy generated.

Relationship between constructs

This study tested unit trend intensity against comprehensive trend intensity. This study explores whether the unit trend intensity has a better impact on the rate of return than the comprehensive trend intensity in Entanglement theory.

The time-window exists because strategies run differently under different time-windows. The futures price of the different contract in different time scales also has a different degree of volatility. So the time-window variable exists to eliminate deviation.

Figure A2 Proposed Effects



Hypotheses

This study focuses on the condition of determining the strength of the two trends in Entanglement theory, So the researchers are wondering whether dividing the area of

MACD hist by the time interval, it has a more accurate effect on spotting the trading signal.

So the research gives the following null hypothesis and non-null hypothesis. These hypotheses will be tested on the capability of s testing. In the following chapter, this hypothesis will be tested on their validity through statistical testing.

H_0: Having the First Point MACD area divided by lasting time will reduce the return of the strategy, or no effect at all.

H_1: Having the First Point MACD area divided by lasting time will increase the return of the strategy.

Research design

First, the study needs to collect the data of futures, specifically, Chinese commodity futures. Then the study needs to sort out the logic of the trading program. The logic is expressed in a series of program script. Then the research will utilize a quantitative trading framework called vnpy.

This quantitative trading framework will unite trading procedures and trading data, then calculate the result of the transaction. With the result, the backtesting engine in vnpy will calculate the rate of return. Then the study will test the data with paired samples t-test. Whether the dependent variable is affected after the independent variable has changed, which will confirm our hypothesis.

Research method and procedure

A stock backtesting is based on real market data that has occurred in history after setting certain stock index combinations. Strictly according to the set combination of stock selection and simulation of real financial trading rules, backtesting is to buy and sold in a period to obtain the maximum rate. (Tianwen Fu, 2017)

Data Collection

Before conducting the final hypothesis test, the data will go through much processing. To get the ultimate rate of return, the research requires the initial raw data to be of recent three years of Chinese commodity futures trading of 50 future symbols — 1-minute trading data.

Wind financial terminal will provide such data to the study can download. After getting the raw data, further analysis demands data-cleaning because there will be some of the outliers outside the Six Sigma such as null value and giant maxima.

We then clean the raw data without giving it to a quantitative backtesting program. The study gets every transaction based on these data. The study calculates total transaction days, continuous natural days, and the ultimate rate of return. So the study will get the result like table A1.

Table A1

is_macd_divided	time_window	symbol	return(folds)	duration(natural days)	counts
FALSE	5	A0000	0.000783253	3093	131
TRUE	5	A0000	11.62637896	3753	178
FALSE	5	A0000	0.001283817	2522	43
TRUE	5	A0000	0.001283817	2522	43
FALSE	5	A0000	0.001618988	2767	57
TRUE	5	A0000	0.001961057	2807	93
FALSE	10	A0000	0.001990988	2886	36
TRUE	10	A0000	1.730618848	3733	39
FALSE	10	A0000	3.1183E-05	3781	195
TRUE	10	A0000	0.001923588	2469	73
FALSE	10	A0000	0.0022713	594	80
TRUE	10	A0000	0.014744044	3781	128
FALSE	15	A0000	0.001033707	2925	76
TRUE	15	A0000	0.018130984	3763	55
FALSE	15	A0000	0.001481409	1119	94
TRUE	15	A0000	0.002009971	3337	44
FALSE	15	A0000	0.001031401	1205	24
TRUE	15	A0000	0.001742641	3212	121
FALSE	30	A0000	0.001568803	2581	39
TRUE	30	A0000	0.000928874	2525	32

FALSE	30	A0000	0.002280023	2000	24
TRUE	30	A0000	0.097157705	3780	183

Data Analysis

We have the final result. The table contains the following variables: whether it is the average strength of the trend, time-window, symbol code, rate of return, duration natural days, number of transaction days. Whether it is the average strength of the trend and the rate of return are the main variables the study explore. (Paresh Kumar Narayan, 2015)

In descriptive statistics, the study can produce the distribution of natural days, distribution of transaction times. If they fit the normal distribution, then the study can do a paired sample t-test because that is the premise of the sample test.

To make this result more comparable. The study use ratios to compare. Dividing the rate of return by the number of transaction days renders an average return on each transaction. Dividing the number of transaction days by the number of natural days renders the transaction frequency of the strategy. Dividing the rate of return by the natural days renders the average return per natural day. In this case, the normal distributions of these ratios are more convincing.

Testing our hypotheses

The t-test for samples is a statistical procedure used to determine whether the average difference between two sets of observations is zero. Each subject or entity was

measured twice in the paired sample t-test, producing pairs of observations. Typical applications of paired sample t-tests include case-control studies or repetitive measurement designs. (Po-Hsuan Hsu, 2016)

Like many statistical programs, the paired sample t-test has two competing hypotheses, null hypotheses, and alternative hypothesis, null hypothesis. Assuming that the real average difference between paired samples is 0, all observed differences in this model are explained by random variations. (Murat Ozturk, 2016) The opposite alternative hypothesis assumes that the real average difference between paired samples is not equal to 0. One of several forms of alternative hypothesis based on expected results is to use a two-tailed test if the direction of the difference is irrelevant otherwise the upper or lower hypothesis can be used to increase the effectiveness of the test. For each. The assumptions of the alternative assumptions of the type remain unchanged.

The paired sample t-test makes some assumptions. While the t-test is very sound, a good practice is a process of assessing deviations from these assumptions. To assess the quality of the results, the differences between the two defined sets of values are observed in the paired sample t-test, and each hypothesis refers to these differences rather than the original data values. There are four main assumptions in the paired sample t-test. The dependent variables in a paired sample t test must be continuous. The observations must be independent of each other. The dependent variable should approximate the normal distribution. A dependent variable should not contain any exception values.

The paired sample t-test should have four steps. First, calculating the mean of the sample; second, calculating the standard deviation of the sample; third, calculating the test statistic; fourth, calculating the probability of observing the test statistic under the null hypothesis.

For example, in this study explore the effect of the density of MACD hist per unit time on the final return. So, what the study does with variables before the study does that is that the total MACD hist area is used to determine the trading signal. The variable after processing is whether the total area is divided by time or not. the program will generate the final return under two different treatments, also their difference and the square of the difference. The study shall come out with the mean of the difference and its standard deviation to calculate the t-value. Then the study can determine whether or not to reject the original hypothesis within the confidence interval of 95%. (Nima Zarrabi, 2017)

The statistical significance was determined by looking at the p-value. This p-value only gives the probability of observing the test results under the null hypothesis. The lower the probability of a result if the null hypotheses are correct, the lower p-values support the null hypothesis less. However, when the null hypothesis is correct, the possibility that the study only gets sporadic results can never be completely ruled out. The deadline for determining statistical significance is ultimately determined by the researchers but is usually chosen. If statistical significance is visible, so is practical significance.

Limitations

This study will prove whether unit trend intensity will affect the return of the strategy positively. There are some limitations. First of all, this study is only about futures. Moreover, it is China's commodity futures. So its limitation is that it cannot be fully applied to stocks because the result contains both long and short transaction. There are also intra-day deals. None of this is possible in the stock transaction. Second, quantitative transaction results of the backtesting do not necessarily represent the future. The study can only learn from the past and cannot use the past to determine the future.

Many other variables can be changed in the conversation. And not just the time-window and unit trend intensity. Maybe other variables' change will result in increasing or decreasing the rate of return. So the study leaves many possibilities did not try although the results of such tests can to some extent represent a level of certainty.

Summary

We hope our results will show that unit trend intensity does indeed capture trading signals more accurately. Unit trend intensity can reflect whether the trend is weakening or strengthening more timely and comprehensively.

For example, if the recent trend is weakening. However, its duration is relatively long, so it forms a MACD hist area that is still likely to be larger than the previous trend of MACD hist area. At this point, the study may lose the signal that the trend is weakening. If a trend is weakening, it is a suitable trading signal. So the study uses the

average trend intensity, which is the unit trend intensity by dividing the area of the MACD hist by the time the trend last. So the study captures the point of trading more precisely. Hopefully, utilizing the average trend intensity will contribute to the precision of capturing the trading signal.

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