Winning Financial Trading with Equilibrium Fractal Wave

Subtitle: Introduction to Equilibrium Fractal Wave Trading

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About the book

This book will introduce you the brand new concept called “Equilibrium fractal wave” for the financial trading. This powerful concept can guide and improve your practical trading. The concept taught here can also help the strategist to create new trading strategies for Stock and Forex market. Please note that this book was designed to introduce the equilibrium fractal wave concept mostly. If you are looking for more trading strategy oriented guidelines, then please read “Financial Trading with Five Regularities of Nature” instead of this book. You can find the Book “Financial Trading with Five Regularities of Nature”: Scientific Guide to Price Action and Pattern Trading (Seo, 2017) in both from amazon.com and algotrading-investment.com.

Risk Disclaimer

The information in this book is for educational purposes only. Leveraged trading carries a high level of risk and is not suitable for all market participants. The leverage associated with trading can result in losses, which may exceed your initial investment. Consider your objectives and level of experience carefully before trading. If necessary, seek advice from a financial advisor.

Important warning: If you find the figures and table numberings are mismatched in this book, please report it to: admin@algotrading-investment.com

Table of Contents

1. Equilibrium Fractal Wave in the Contemporary Science

1.1 Introduction to Equilibrium Fractal Wave

The concept of Equilibrium Fractal Wave was first introduced in the book: Financial Trading with Five Regularities of Nature: Scientific Guide to Price Action and Pattern Trading (Seo, 2017). At that time, the book was written for the pure motivation to identify the important market dynamics for financial traders. The concept of Equilibrium Fractal Wave was born by combining two scientific areas including time series and fractal analysis. The main propositions in the Equilibrium Fractal Wave include:

1. The separate or combined analysis of trend and Fractal wave is possible.
2. The repeating patterns in Equilibrium Fractal Wave are equivalent to the infinite number of distinctive cycles because the scale of the repeating pattern varies infinitely.
3. Equilibrium Fractal Wave is a superclass of all the periodic wave patterns we know.

First, let us demonstrate the equilibrium fractal wave for readers. The easiest way to demonstrate the equilibrium fractal wave is through the pattern table presented in Figure 1-1 (Seo, 2017). Many applied researchers in time series and statistics will agree that patterns in the column 1, 2, 3 and 4, from first regularity to fourth regularity, are the mainly extracted features and patterns in their everyday research and operation. It is also agreeable that cyclic wave pattern can co-present with trend together. This concept is the main assumption behind

the classic decomposition theory in the time series analysis. In the time series pattern table created by Gardner in 1987 (Figure 1-2) represents this concept clearly. The first row in the pattern table (Figure 1-1) shows the data in which no trend or weak trend exists. The second, third and fourth rows shows the co-existence of trend and waves.

Until now, many forecasting or industrial scientists use such concept to build forecasting models. Likewise, there are many applied software to create the forecasting or prediction model of this kind. Some example forecasting software with such modelling capability includes:

1. Stata (www.stata.com)
2. Eviews (www.eviews.com)
3. IBM SPSS (www.ibm.com/products/spss-statistics)
4. SAS (www.sas.com)
5. MatLab (www.mathworks.com)
6. And many others

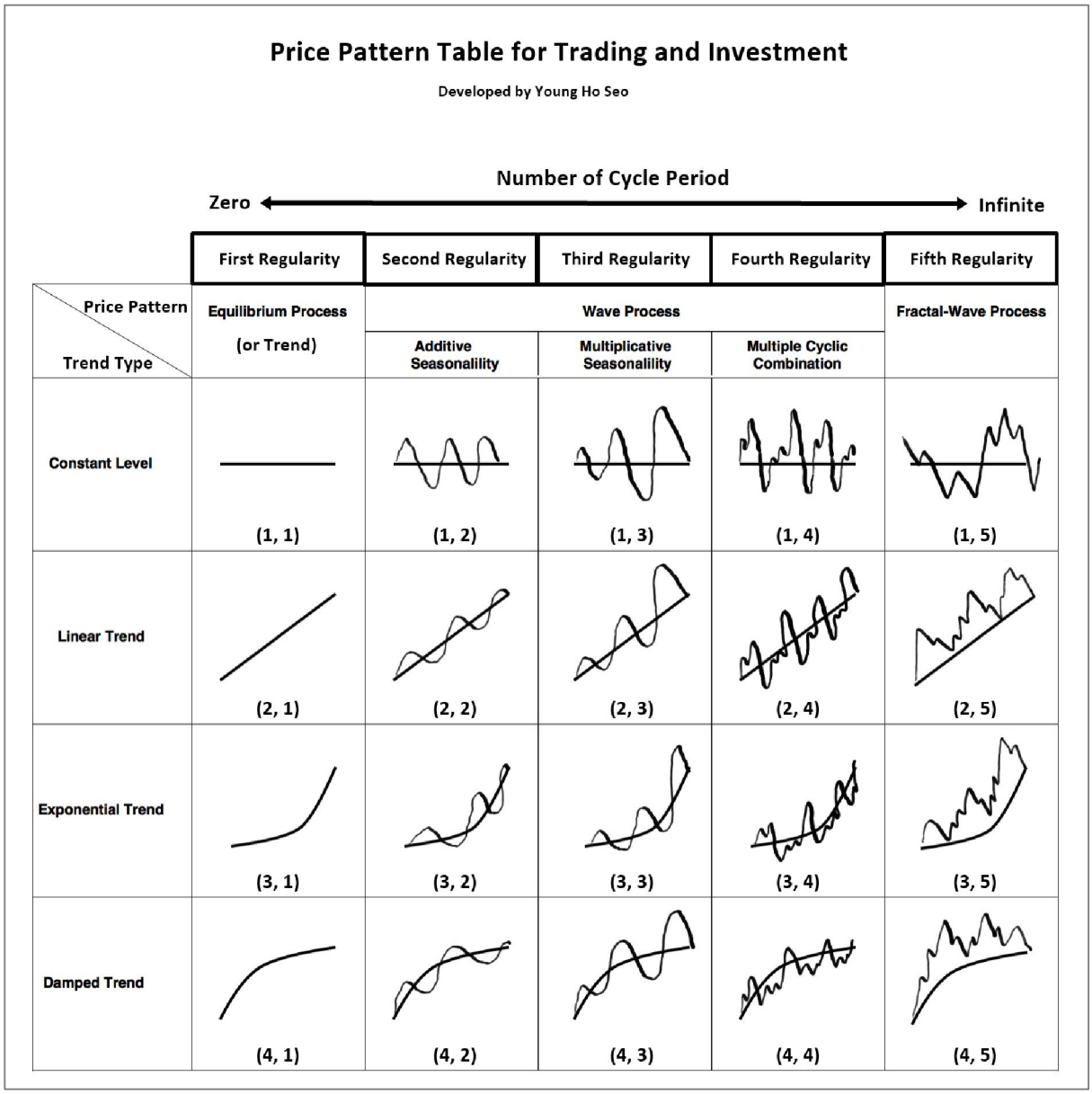

Figure 1-1: Five Regularities and their sub price patterns with inclining trends. Each pattern can be referenced using their row and column number. For example, exponential trend pattern in the third row and first column can be referenced as Pattern (3, 1) in this table.

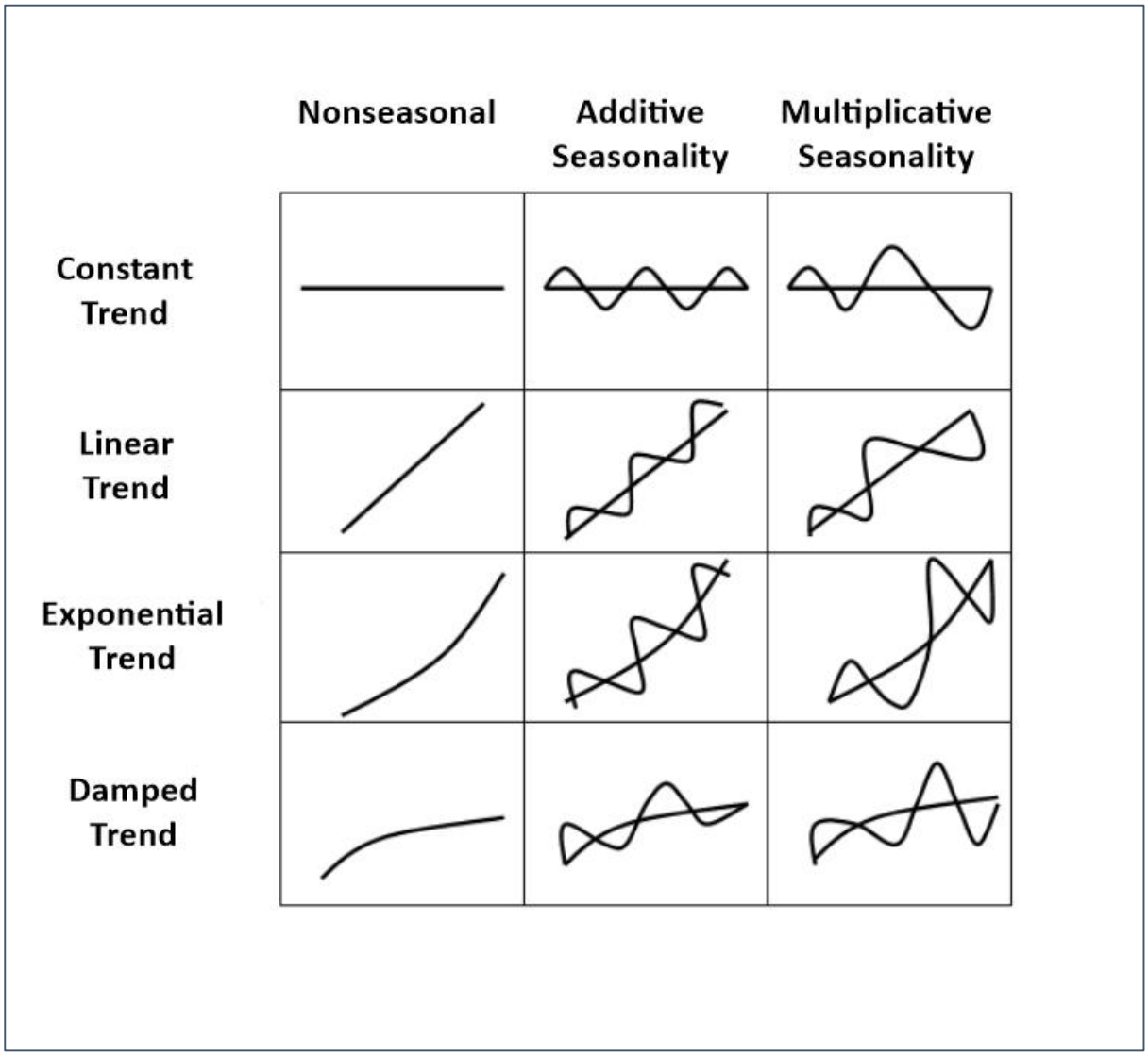

Figure 1-2: The original Gardner's table to visualize the characteristics of different time series data (Gardner, 1987, p175). Gardner assumed the three components including randomness, trend and seasonality in this table.

Now the fifth column in Figure 1-1 presents the equilibrium fractal wave. This is extended part from the original Gardner's table (Figure 1-2). When we list the equilibrium fractal wave in the fifth column, we can see that the pattern table (Figure 1-1) shows a systematic pattern. From left column to right column, we

can see that the number of distinctive cycles in the data increases. For example, we can assume the pure trend does not have any periodic cycle. Therefore, number of the distinctive cycle is zero for pure trend series. Under the second and third columns, we can have one to several distinctive cycles depending on if the series follows daily, monthly, and yearly cycles. Under fourth column, we can have many more distinctive cycles outside daily, monthly and yearly cycles but the number of the cycles is finite. Fourier analysis or principal component method can be used to reveal the number of cycles for any series under column 4. From column 1 to column 4, you might be following this systemic pattern pretty well. However, you might question why equilibrium fractal wave in column 5 possesses such infinite number of distinctive cycles. This is indeed the right question to ask. To understand this, you have to understand the fractal wave first.

A lot of research on fractal analysis was done by B. Mandelbrot (1924-2010). The Book: fractal geometry of nature (Kirkby, 1983) describes the nature of fractal geometries in scientific language. What is the difference between fractal wave and equilibrium fractal wave in this article? Fractal wave views a series as the subject of fractal analysis. Equilibrium Fractal wave views a series as the co-subject of fractal analysis and trend analysis. Hence, equilibrium fractal wave believes co-existence of trend and wave pattern in a single data series. The significance of equilibrium fractal wave is that we can model the trend and fractal wave in two separate steps or in one-step.

Indeed, scientists use the two-step process to model the data in column 2, 3 and 4 in economic and financial research. For example, price series under column 4 can be modelled with trend in the first step. Then the reminding data can be

modelled using cycles in the second step. Likewise, for a data series under column 5, we can model a trend part first, then we can model a fractal wave patterns in separate steps. This explains the **Proposition 1**. This also imposes the fractal analysis under non-stationary condition when the trend component is strong in the data series. In this case, two-step modelling process might be advantageous. When the trend component is less dominating comparing to fractal wave component, the entire price series can be modelled using fractal analysis only. **Proposition 1** states that the choice on the modelling process, either one-step or two-steps, is conditional upon the characteristics of the price series.

In the Book: fractal geometry of nature (Kirkby, 1983), the main characteristics of fractal wave is described as the repeating patterns in varying scales. To give you some idea of repeating patterns in varying scales, we can create a synthetic data like that using Weierstrass function. This function is famous for being continuous everywhere but non-differentiable nowhere among the math community. Of course, real world data will never look like this. However, this synthetic data describe what is repeating pattern in varying scale very well for our readers in Figure 1-3. You will see the same patterns everywhere in the data. Small pattern are combined to become the bigger pattern. The resulting bigger patterns look the same like small patterns. As the combing process continues, the size of the pattern can increase infinitely. This is referred to as repeating patterns in varying scale or varying size. This is the core assumption on any fractal analysis.

Now let us walk backwards from this combining process. Let us assume that we can extract those patterns in the same scale from rest and we can put them on the separate paper for each scale. When we separate those patterns in the smallest scale from rest, then the extracted series become the first cycle of our data. This extracted series with one cycle is not different from data or a series in column 2, 3 and 4. Likewise, we can separate the second smallest patterns from rest. This will become second cycle of our data. In this time, the frequency of second cycle will be less comparing to the first cycle because the period of second cycle is greater than first cycle. We can keep continue this separating process to create another cycles. Since we can combine to create the repeating patterns infinitely, we can separate the repeating pattern infinitely too. This describes **the proposition 2**, the infinite number of distinctive cycle.

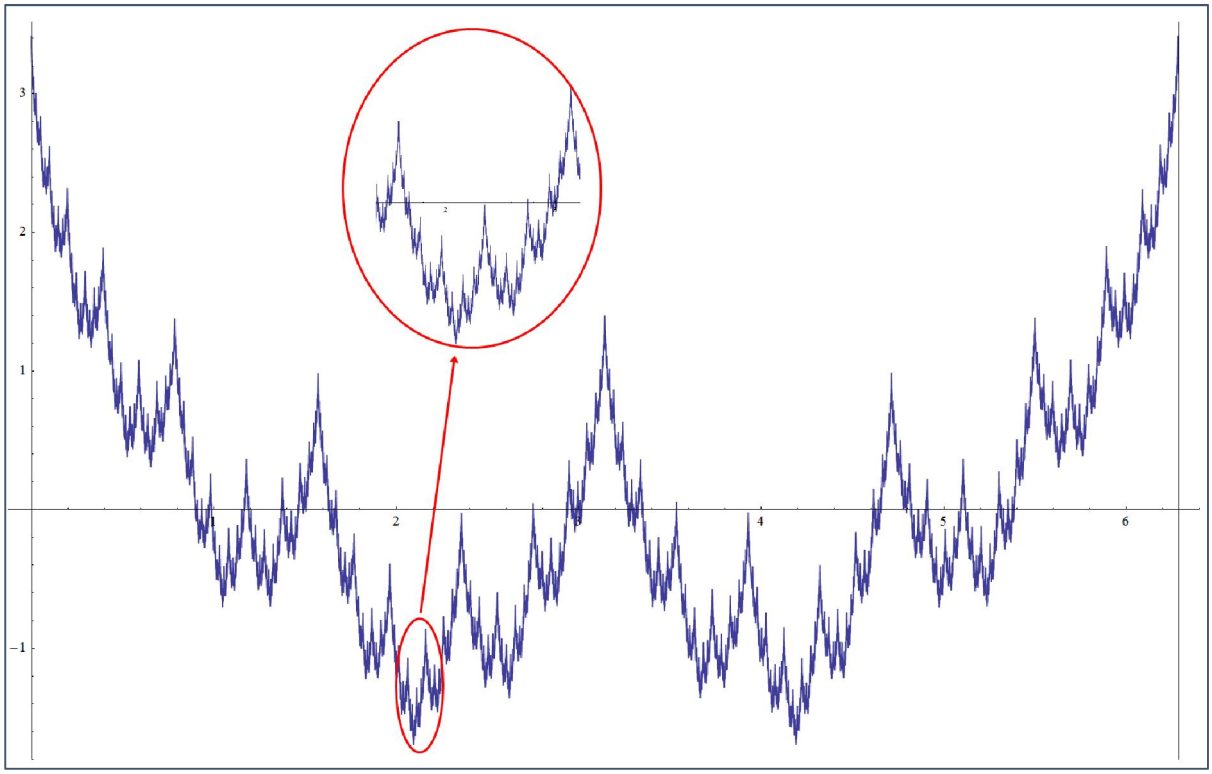

Figure 1-3: Weierstrass function to give you a feel for the Fractal-Wave process. Note that this is synthetic Fractal-Wave process only and this function does not represent many of real world cases.

Now the **Proposition 2** can lead to the **Proposition 3** naturally. As you can see from Figure 1-4, from left to right columns, the number of distinctive cycle increases. Therefore, it is not so hard to say that equilibrium Fractal Wave is a superclass of all the periodic wave patterns we know in column 1, 2, 3 and 4. Figure 1-4 shows this concept clearly to our reader.

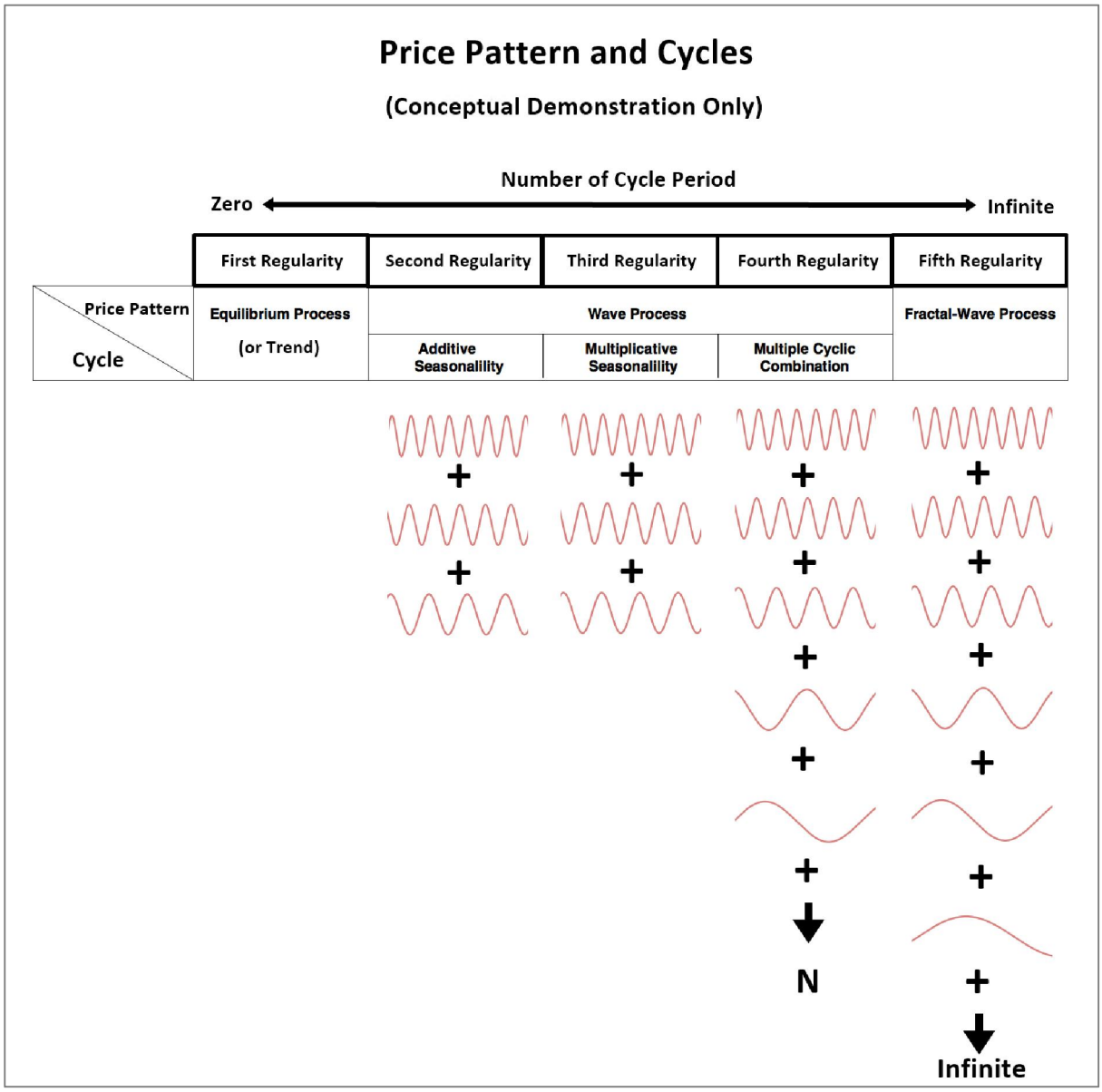

Figure 1-4: Visualizing number of distinctive cycle periods for the five regularities. Please note that this is only the conceptual demonstration and the number of cycles for second, third and fourth regularity can vary for different price series.

Finally, in many real world data, we do not possess the highly regular patterns as in a synthetic data like that using Weierstrass function in Figure 1-3. The highly

regular repeating patterns are described as the stick self-similarity in In the Book: fractal geometry of nature (Kirkby, 1983). Instead of the strict self-similarity, the real world data will form loose self-similarity shown in Figure 1-5. For the financial price series, we can observe the repeating zigzag patterns made up from so many triangles. The triangles are only similar. However, each triangle in the data will be never identical to the other triangles. This is the typical example of loose self-similarity. This sort of loose self-similarity is much harder to model comparing to the strict self-similarity shown in a synthetic data like that using Weierstrass function (Figure 1-3).

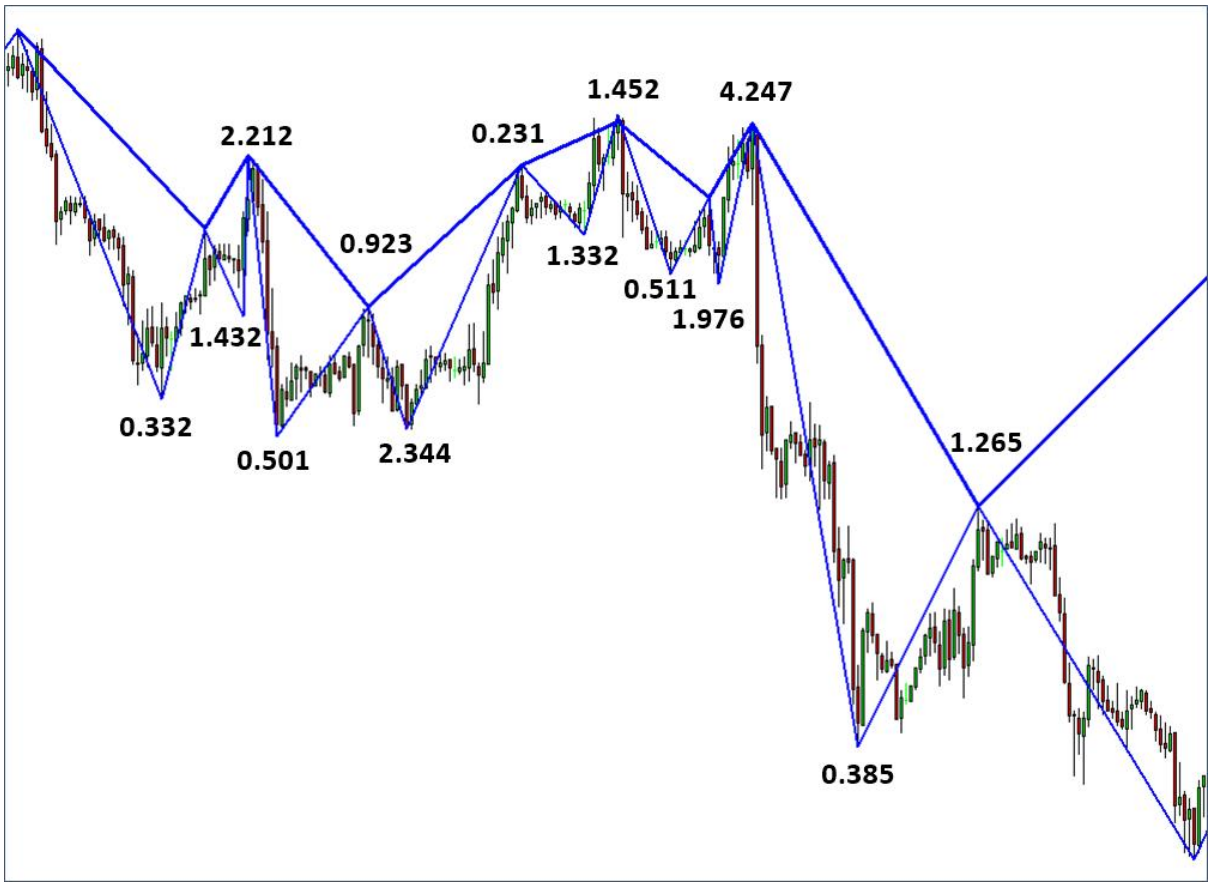

Figure 1-5: Loose self-similarity in the financial price series.

1.2 Empirical Research on Equilibrium Fractal Wave

As we have described, the concept of equilibrium fractal wave allow us to model the series as the co-subject between trend and fractal wave or as the single subject of fractal wave. The modelling choice will depend on the characteristics of data. Regardless of the modelling choice, Empirical research on equilibrium fractal wave must concern the fractal patterns in data series. Empirical research on equilibrium fractal wave in the price series data is relatively small because mainstream academic research is based on the algorithm utilizing the entire data sets like multiple regression techniques instead of detecting patterns.

One exception is the financial trading community. In the trading community, the repeating patterns or repeating geometry was used as early as 1930s. Some pioneers include R. Schabacker (1932), H.M. Gartley (1935) and R.N. Elliott (1938) in time order. In their books, the various repeating patterns were described for various US stock market data (Figure 1-6, 1-7 and 1-8). Until now, millions of traders are using these patterns in their practical applications for the profiting purpose in forex, future, and stock markets. Figure 1-6, 1-7 and 1-8 shows the commonly used repeating patterns by the financial trader. Having said that these repeating patterns in Figure 1-6, 1-7 and 1-8 were not modelled as the co-subject between trend and fractal wave. Instead, those repeating patterns are only modelled as the subject of fractal wave. Only exception is the trend filtered ZigZag indicator and excessive momentum indicator created recently (Seo, 2018). This is understandable consequence because the idea of equilibrium fractal wave and the two-step modelling process were only introduced in 2017.

The modelling technique using trend and fractal wave patterns are only available recently. One very purpose of this article is to inform you that it is possible to model the financial price series as the co-subject between trend and fractal wave in two separate steps.

At the same time, another purpose to create equilibrium fractal wave was to connect the contemporary science to many repeating patterns used by the financial traders. Considering that millions of the financial traders now use the repeating patterns for their every day trading, this is a phenomenal level of activity by the society. Many traders are much happier to use the repeating patterns than the traditional math or technical indicators. Unfortunately, the connection between the repeating patterns and the contemporary science is very poor. It seems no literature is positioning those repeating patterns in the scalable scientific framework. Neither the financial trading community have much idea on what these repeating patterns are and why they are using these patterns. Simply speaking the communication between two communities is blocked. If R.N. Elliott (1938) had a chance to meet B. Mandelbrot (1924-2010), then things may have changed bit. However, they lived in two different time.

The pattern table in Figure 1-1 shows that repeating patterns are merely the extended concept from the conventional mathematical knowledge. We know that it is not so hard to put these five regularities together under the same table. Potential for academic and applied research in equilibrium fractal wave is huge. The main concern is that many techniques used for periodic wave pattern analysis may not work with equilibrium fractal wave because of the infinite

number of the distinctive cycle in the data. To the best knowledge, Fourier analysis and many other similar techniques will not handle the infinite number of the distinctive cycle. Therefore, developing new analytical techniques remain as the main challenge for the empirical research in equilibrium fractal wave. In many cases, the algorithm or pattern recognition modelling the price series as the co-subject of trend and fractal wave will improve the prediction accuracy much more.

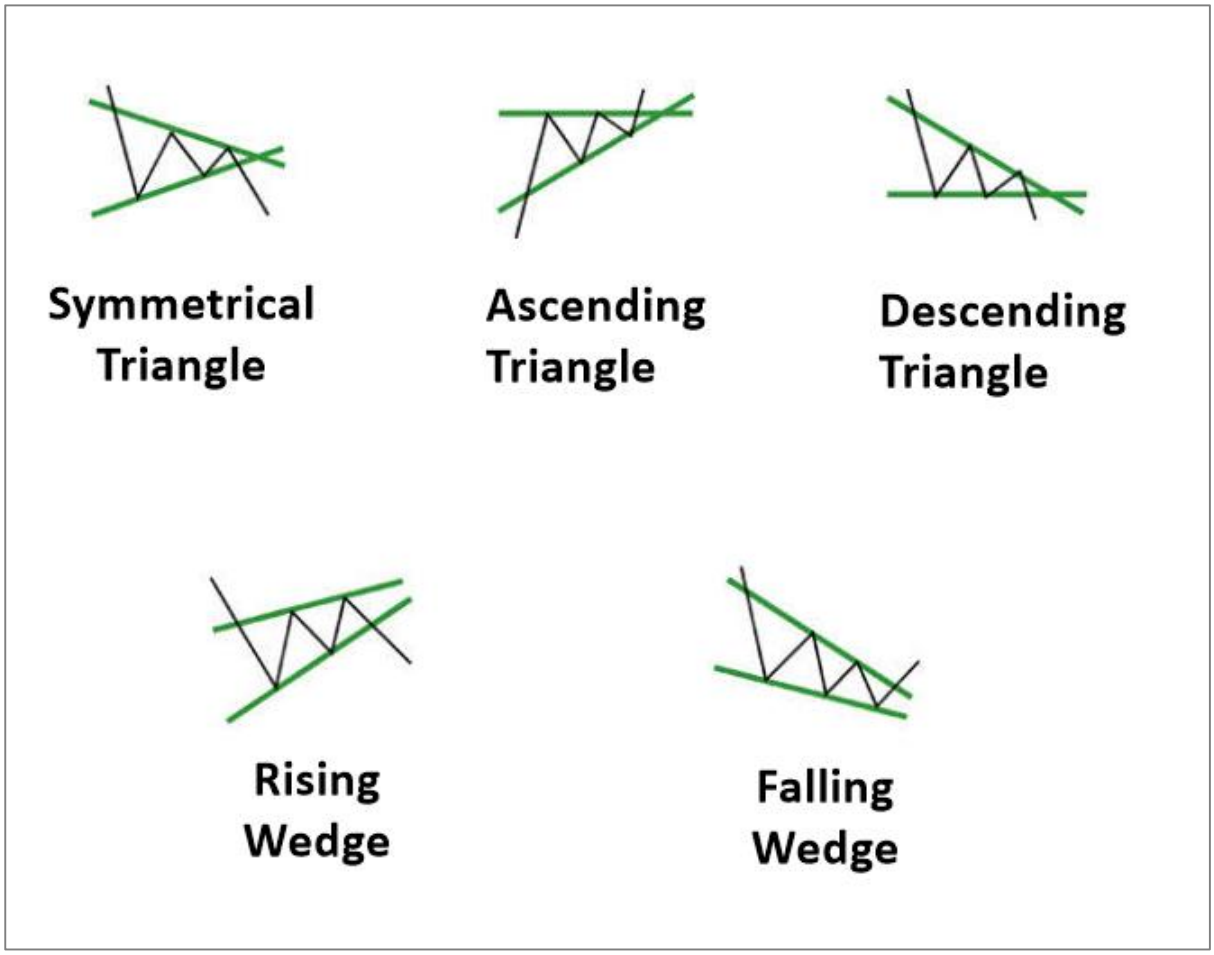

Figure 1-6: List of triangle and wedge patterns.

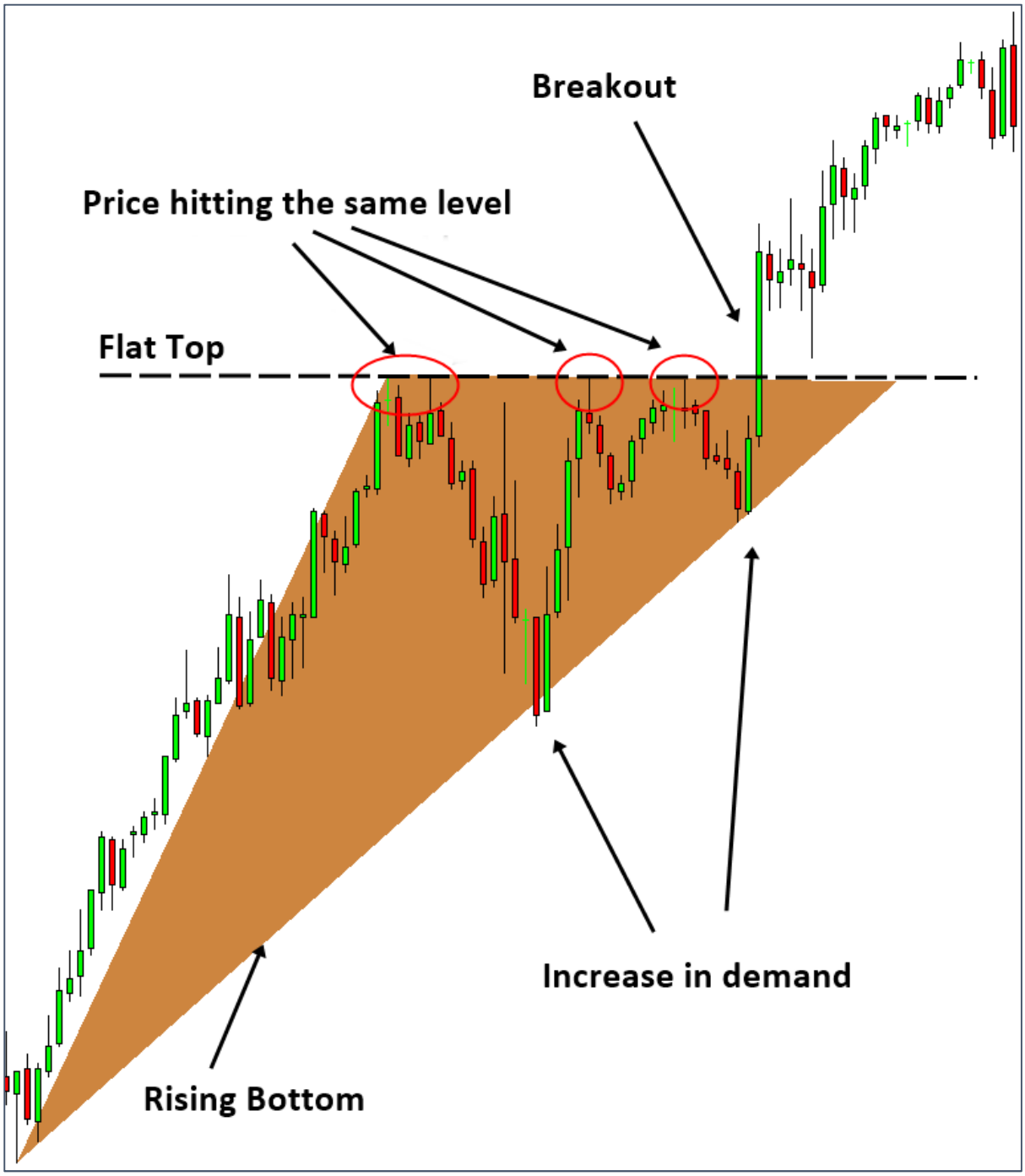

Figure 1-7: Ascending Triangle pattern found in USDCAD in H1 chart.

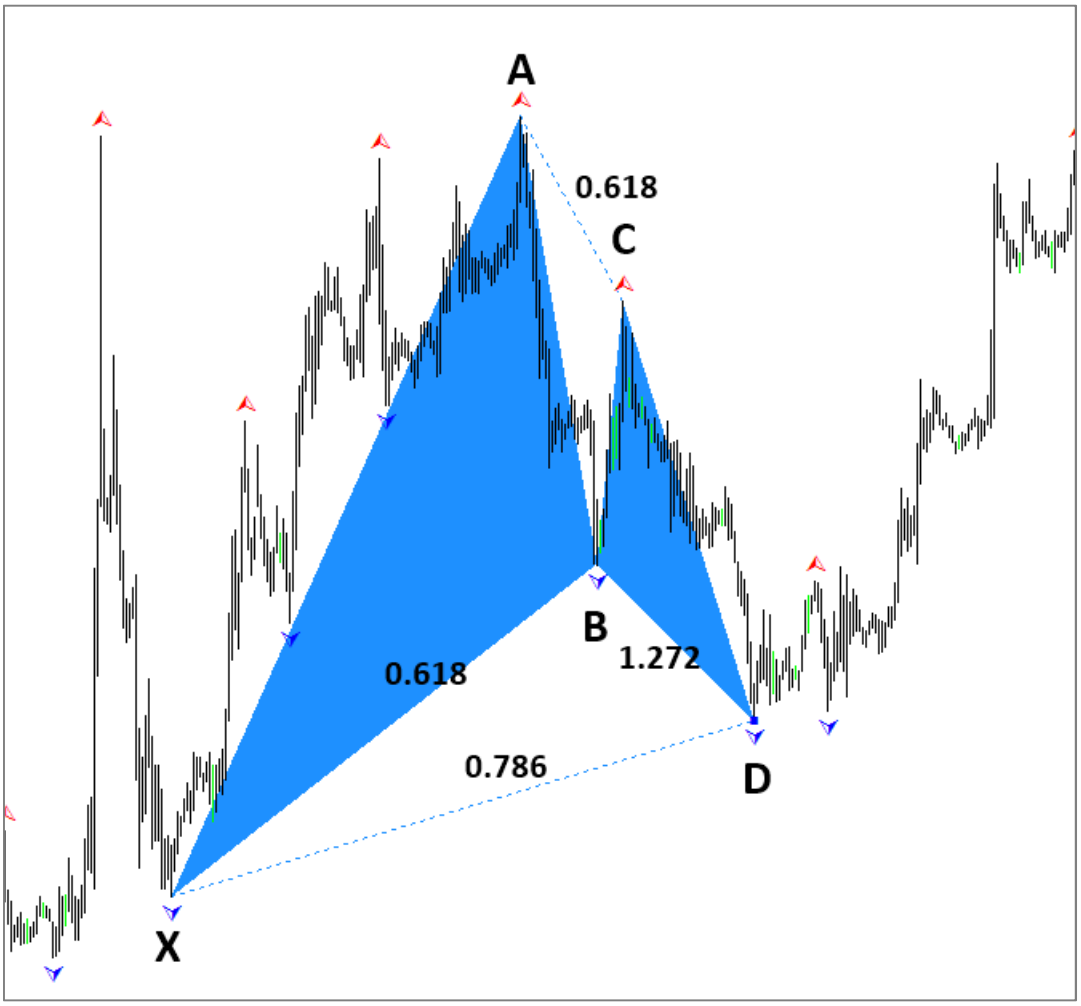

Figure 1.8: Repeating Gartley patterns in Hourly EURUSD Chart Hourly.

1.3 Analogical Reasoning to the Modified Quantum Physics

This section discusses the separate concern from this article. However, this part serves another important purpose for this article. In previous chapter, we have shown that equilibrium fractal wave in column 5 extends the structure of trend and wave in column 2, 3 and 4 of the price pattern table (Figure 1-1). We were able to create the systematic framework for data with zero to infinite number of distinctive cycles. For convenience, we will call the wave and trend structure

as equilibrium wave as shown in Figure 1-9. Equilibrium wave is common data structure found in real world. The important characteristic of Equilibrium wave is the finite number of periodic cycles. The cycles in equilibrium wave are periodic and we can measure how long the cycle lasts with our stopwatch. Many social and non-social data can show strong behaviour of equilibrium wave too. The periodic cycles can be modelled well using Fourier analysis and other similar techniques. As we know, Fourier analysis and the quantum physics have a strong connection. Fourier analysis can be used to decompose a typical quantum mechanical wave function. In addition, the trend part of equilibrium wave and particle part of quantum physics can be modelled through many common analysis techniques in the statistics, signal processing, and object tracking field too, for example, Kalman filter or similar techniques. Therefore, it is not so harsh to say that equilibrium wave in column 2, 3 and 4 in Figure 1-1 closely resembles the idea of wave and particle duality of the quantum physics.

To the best knowledge, both data structure is not 100% compatible. However, there is certainly some compatible structure between equilibrium wave and wave-particle duality. For this reason, we could make some analogical reasoning here. As we can extend the classic wave pattern into equilibrium fractal wave pattern (Figure 1-1), we might be able to extend the quantum physics further to deal with the infinite number of distinctive cycles. It is often heard that many quantum physics based algorithms fail to bring the profits or good prediction in the financial trading. The reason might be that the contemporary quantum physics is not dealing with the infinite number of distinctive cycles present in the data. Although this might be just guess for now, the modified quantum physics might work better in the financial trading than the contemporary quantum

physics. If they do so, then the modified quantum physics can possibly lead to the potential technological breakthrough in developing better medicine and better spaceship in the future. This is just some research ideas for those working in physics in a hope to provide some alternative solutions to many unsolved problems in this world.

Price Pattern Table for Trading and Investment

Developed by Young Ho Seo

Number of Cycle Period: Zero ← → Infinite

Price Pattern / Trend Type	First Regularity	Second Regularity	Third Regularity	Fourth Regularity	Fifth Regularity
	Equilibrium Process (or Trend)	Wave Process			Fractal-Wave Process
		Additive Seasonality	Multiplicative Seasonality	Multiple Cyclic Combination	
Constant Level	Stationary Process or Random Process (1, 1)	Wave Process (1, 2)	Wave Process (1, 3)	Wave Process (1, 4)	Fractal Wave Process (1, 5)
Linear Trend	Equilibrium Process (2, 1)	Equilibrium Wave Process (2, 2)	Equilibrium Wave Process (2, 3)	Equilibrium Wave Process (2, 4)	Equilibrium Fractal Wave Process (2, 5)
Exponential Trend	Equilibrium Process (3, 1)	Equilibrium Wave Process (3, 2)	Equilibrium Wave Process (3, 3)	Equilibrium Wave Process (3, 4)	Equilibrium Fractal Wave Process (3, 5)
Damped Trend	Equilibrium Process (4, 1)	Equilibrium Wave Process (4, 2)	Equilibrium Wave Process (4, 3)	Equilibrium Wave Process (4, 4)	Equilibrium Fractal Wave Process (4, 5)

Figure 1-9: Five Regularities and their sub price patterns.

2. Introduction to Equilibrium Fractal Wave for Financial Trading

The concept of Equilibrium fractal wave was first introduced in the Book: Financial Trading with Five Regularities of Nature: Scientific Guide to Price Action and Pattern Trading (2017). In the book, I have categorized the three distinctive market behaviours (regularities) for financial trading (see appendix). The second behaviour was further split into the three sub categories. Therefore, the five distinctive market behaviours were introduced for financial trading in total (see appendix). Most of trading strategies can be categorized under these five categories except the correlation (i.e. fundamentals). Having said that, the correlation is still the main cause behind these five distinctive market behaviours. Therefore, we are still studying the effect of correlation while we are studying these five distinctive market behaviours. If the five categories sound too much, forget about it. I always like things simple and stupid. Just remember the three categories for your trading as shown in Figure 2-1. The three categories include equilibrium (first), equilibrium wave (second), and equilibrium fractal wave (third). In brief, equilibrium is equivalent to the trend. Equilibrium wave is equivalent to the market cycle with some definable cycle period. Equilibrium fractal wave is equivalent to the infinitely repeating price patterns in the financial market.

Many people might feel curious to see equilibrium wave and equilibrium fractal wave instead just wave and fractal wave. They or you might question why “equilibrium“ in front of “wave” and “fractal wave”? In fact, this is due to my personal understanding on particle-wave duality from Quantum Physics. Equilibrium is in fact a term to represent the particle or the behaviour of the particle in the financial market. Many scientist believe that they can not apply

the quantum physics directly to the financial market. Indeed, what I believe is that we can use the Quantum physics but we just need a modified version of Quantum physics to better model the financial market due to the strong presence of Equilibrium fractal wave. Only discuss this to show you how the five categories (i.e. the five regularities) are inter-related to other branches of science. The focus in this article is to explain equilibrium fractal wave as simple as possible without any mathematical equation.

Anyway, the way we can capture each of these three market behaviours into our profit is very different because their distinctive characteristics. Therefore, we need different trading strategies for each of the three market behaviours as shown in Figure 1-1. There are two cases where many traders make a serious mistake for their financial trading. Firstly, many traders often believe that the second (i.e. equilibrium wave) and third categories (i.e. equilibrium fractal wave) are strongly similar in terms of how to capture them technically, because both have the term “wave” inside. Secondly, many others also believe that they should only capture the first category (i.e. equilibrium) of the market behaviour ignoring the second and third category. First case is due to the lack of technical knowledge. If you are trying to define the cycles where the cycle period is not definable, then your model will start to break down. We cannot torture data to see what we want. If you can define the periodic cycles, yes, it is great opportunity for our trading. Go ahead with it. However, if the equilibrium fractal wave is present strongly, modelling the market with periodic cycle can be useless. The second case is due to the overly simplified belief on the financial market. Just imagine that financial market is the transformation of infinite number of internal and external variables into the two dimensional space between price and time. Therefore, the price represents the complex crowd

behaviour. In highly liquid and competitive financial market, an overly simplified assumption can offer you the immature or too late entry and exit only for your trading. You will be often find that you are out of rhythm with the market. You will enter the position too early or too late since your lagging indicator cannot capture more complex price patterns than just a trend.

To avoid the above two cases, it is helpful to understand the three distinctive behaviours of the financial market in details. Indeed the main book: Financial Trading with Five Regularities of Nature: Scientific Guide to Price Action and Pattern Trading (2017) will provide the good introduction over all three distinctive behaviours of the financial market. In this introductory book, we will only cover the basics of the Equilibrium fractal wave for your trading.

		Market Behaviour		
		Equilibrium	Equilibrium Wave	Equilibrium Fractal Wave
Direction	Momentum	Strategy Category 1	Strategy Category 2	Strategy Category 3
	Reversion	Strategy Category 4	Strategy Category 5	Strategy Category 6

Figure 2-1: Six trading strategy categories for your trading.

3. Five Characteristics of Equilibrium Fractal Wave

The basic building block of the fractal geometry in the financial market looks like the triangle for up market as shown in Figure 3-1. For down market, you can just flip the triangle vertically. One triangle is made when the price makes two price movements. For example, either peak-trough-peak or trough-peak-trough in the price series will make one triangle as shown in Figure 3-2. Since these triangles are propagating to reach the market equilibrium price, we can call these triangles as the equilibrium fractal waves. By definition, the single equilibrium fractal wave is equivalent to a simple triangle made up from two price movements. Since equilibrium fractal wave is a fractal geometry, we only concern its shape regardless of its size. Equilibrium fractal wave can have many different shapes. Since equilibrium fractal wave is made up from two price moves, the one possible way to describe the shape of equilibrium fractal wave is by relating these two price moves. One can take the ratio of current price move to previous price move (Y2/Y1) to describe the shape of the equilibrium fractal wave typically.

The shape ratio of equilibrium fractal wave = current move in price units (Y2)/ previous move in price units (Y1).

Using the shape ratio, we can differentiate a specific shape of equilibrium fractal wave from the other shapes. For example, Figure 3-3 shows two identical equilibrium fractal waves in their shape. Their shape can be considered as identical as their shape ratio is identical. Likewise, if the shape ratios of two

equilibrium fractal waves are different, then two equilibrium fractal waves can be considered as being non-identical in their shape (Figure 3-4).

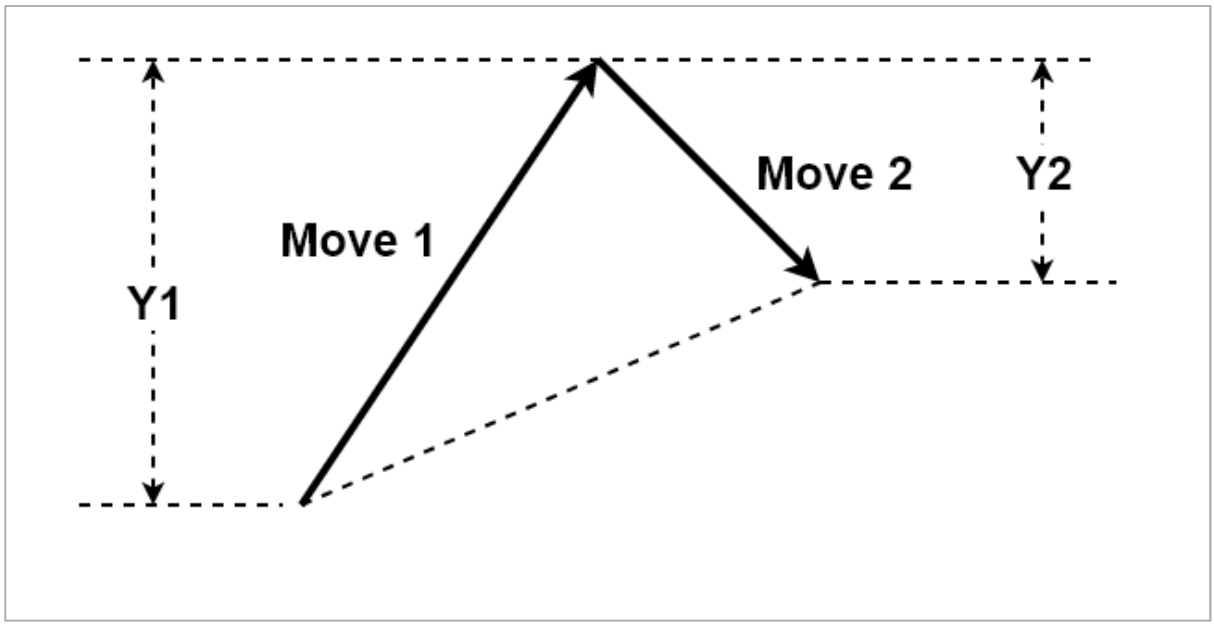

Figure 3-1: Structure of one equilibrium fractal wave. It is made up from two price movements (i.e. two swings).

Figure 3-2: one unit cycle of an equilibrium fractal wave in the candlestick chart.

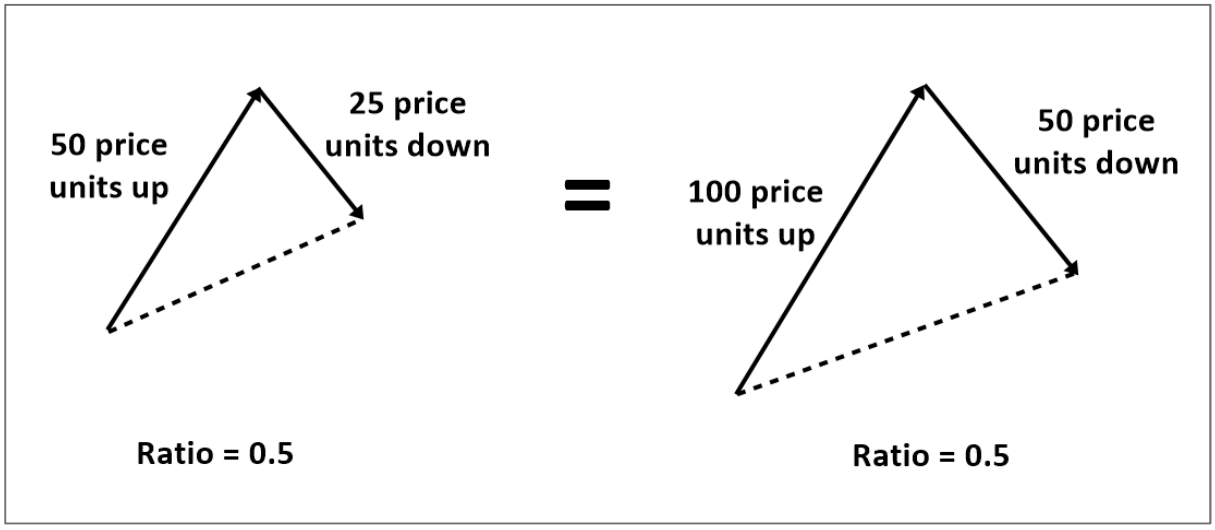

Figure 3-3: An example of two identical equilibrium fractal waves in their shape.

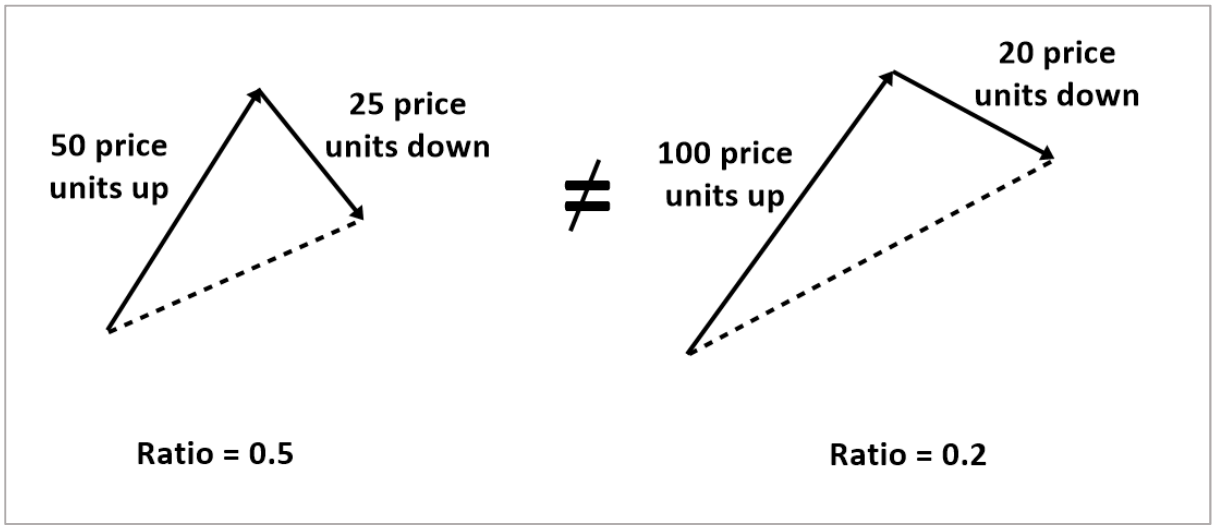

Figure 3-4: An example of non-identical equilibrium fractal waves in their shape.

To make use of equilibrium fractal wave for your trading, you have to understand the characteristics of equilibrium fractal wave. In this book, we outline the five most important characteristics for your trading. When you trade with equilibrium fractal wave or other EFW derived patterns, you will find out that the trading strategies are based on one or few of these characteristics.

The first characteristic of equilibrium fractal wave is the repeatability. While the price is moving to its equilibrium price level, we observe the zigzag path of the price movement. After extensive price rise, the price must fall to realize the overvaluation of the price. Likewise, after extensive price fall, the price must rise to realize the undervaluation of the price. This price mechanism builds the complex zigzag path of the price movement in the financial market. During the zigzag path, the price shows the four possible triangle shapes as shown in Figure 3-5. These four equilibrium fractal waves are the mirrored image of each other. Therefore, they are the fractal. The complex price path in the financial market is

in fact the combination of these four equilibrium fractal waves in alternation. Whenever the price needs to move on to the equilibrium level, the price will travel in the zigzag path through the combination of these four equilibrium fractal waves in alternation.

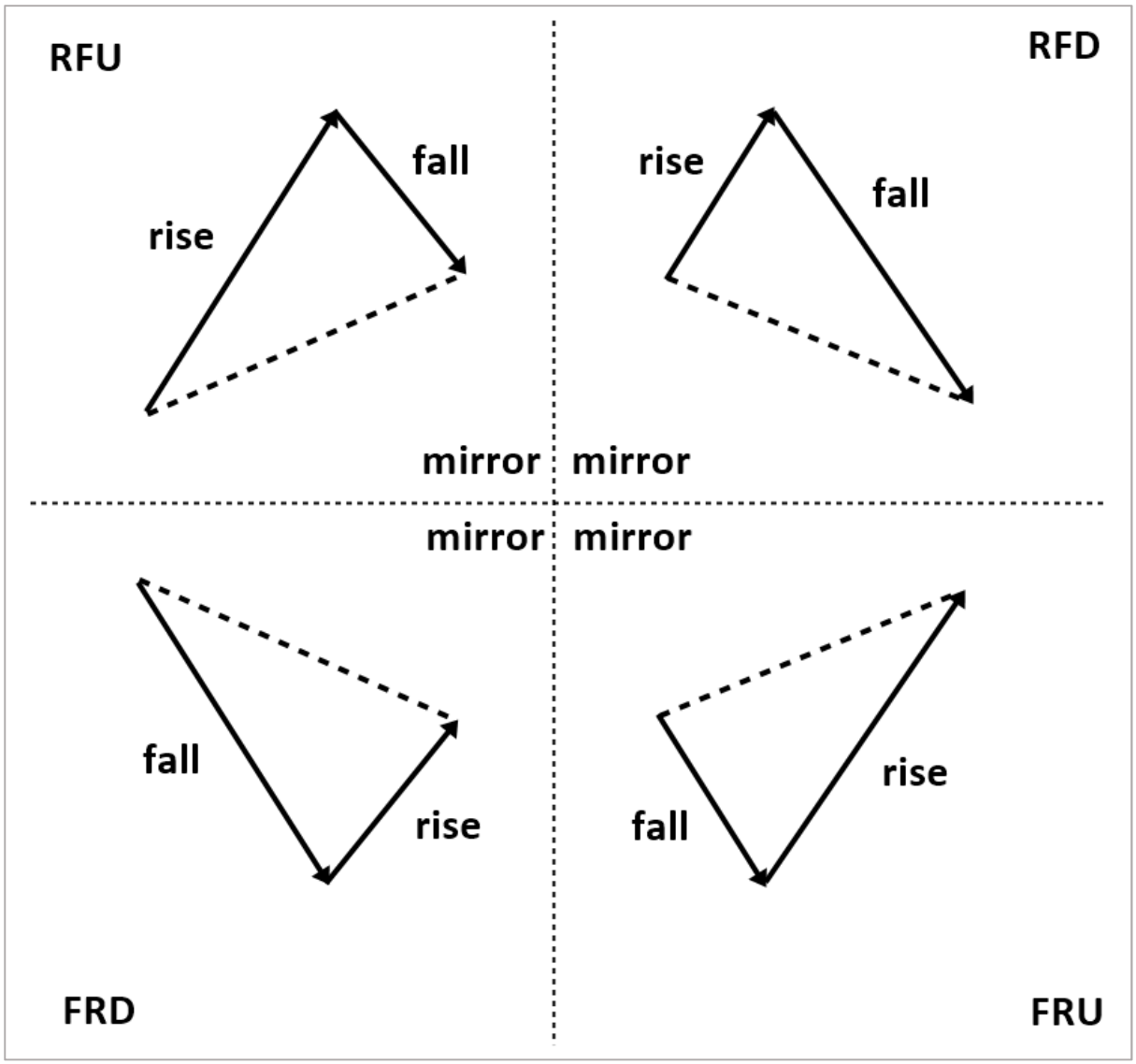

Figure 3-5: Equilibrium fractal wave in the Zig Zag price path where RFU = Rise Fall UP pattern, RFD = Rise Fall Down pattern, FRD = Fall Rise Down pattern and FRU = Fall Rise Up pattern.

The second characteristic of equilibrium fractal wave is that equilibrium fractal wave can be extended to form another bigger equilibrium fractal wave as shown in Figure 3-6. During the important data release or market news release, the financial market can experience a high volatility or shock. When the market experiences the high volatility or shock, the last leg of equilibrium fractal wave can extends to adapt the shock or volatility introduced in the market. Even after the extension, the equilibrium fractal wave still maintains its fractal geometry, the triangle. Hence, the fractal nature of financial market is unbreakable. This price extension often determines the reversal or breakout movement around the important support and resistance levels. One possible way of trading with this second characteristic is to trade on the potential size of equilibrium fractal wave. In the case of reversal, we are betting on that the size of wave will remain the same. In the case of breakout, we are betting on that the size of wave will be extended. This characteristic is also the basis for the straddle trading strategy during the important economic data release.

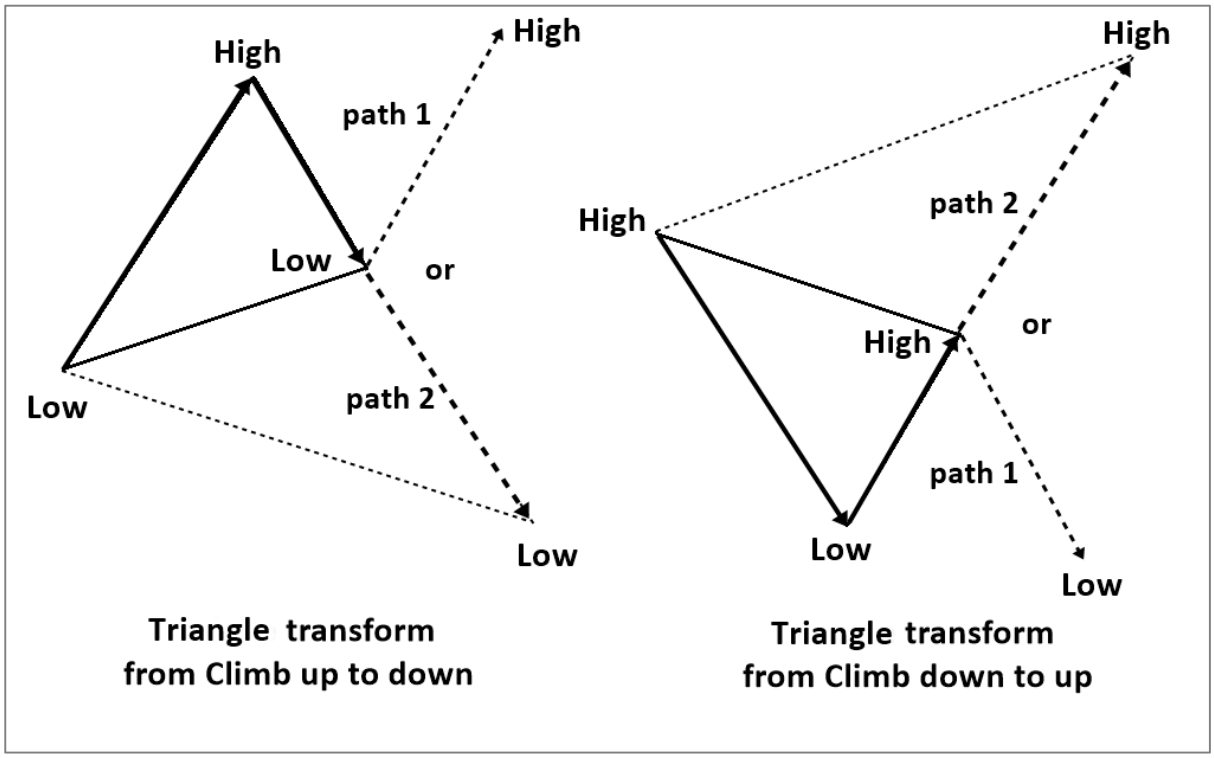

Figure 3-6: Illustration of price transformation (extension) from path 1 to path 2 to meet new equilibrium price due to an abrupt introduction of new equilibrium source in the financial market.

Third characteristic of equilibrium fractal wave is that smaller equilibrium fractal waves can combine to form a bigger equilibrium fractal wave (superimposed). Imagine, when the equilibrium fractal wave is propagating, it will start with smaller equilibrium fractal waves first. After the appearance of the several equilibrium fractal waves, we can draw the bigger equilibrium fractal wave by joining these smaller waves. These kinds of jagged patterns are repeatedly found in the financial market as shown in Figure 3-7. This third characteristic is often used by a professional trader to improve the predictability of the financial market. For example, instead of puzzling with a set of small equilibrium fractal waves, it is much more accurate to puzzle with both small and big equilibrium

fractal waves together to predict the market direction. If you want to become a successful trader, you will need a discipline on how to combine small and big equilibrium fractal waves for your trading. Of course, later, we will show you how to improve your trading performance with these superimposed equilibrium fractal waves.

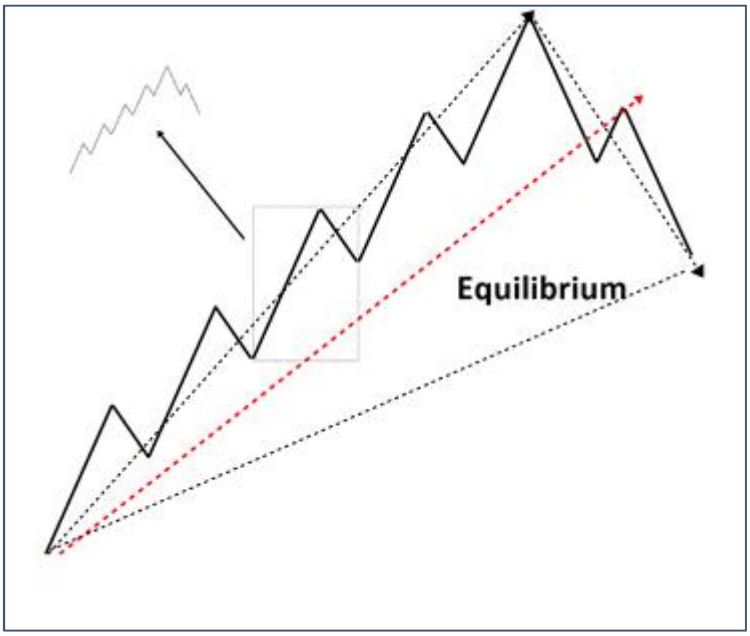

Figure 3-7: Pictorial representation of jagged (superimposed) equilibrium fractal wave with a linear trend.

The fourth characteristic of equilibrium fractal wave is the infinite scales. The infinite scales mean that you will see the similar patterns repeatedly in the price series while their sizes are keep changing. The repeating pattern can come in any size from small to large. For example, if we stack the varying size of equilibrium fractal waves with the particular shape ratio, then literarily we can stack the infinite number of triangle as shown in Figure 3-8. This implies the

infinite number of cycle periods. This is exactly why “Equilibrium Fractal-Wave” process is much harder to be handled by traditional technical indicators because they were not designed to deal with the infinite scaling problem most of time.

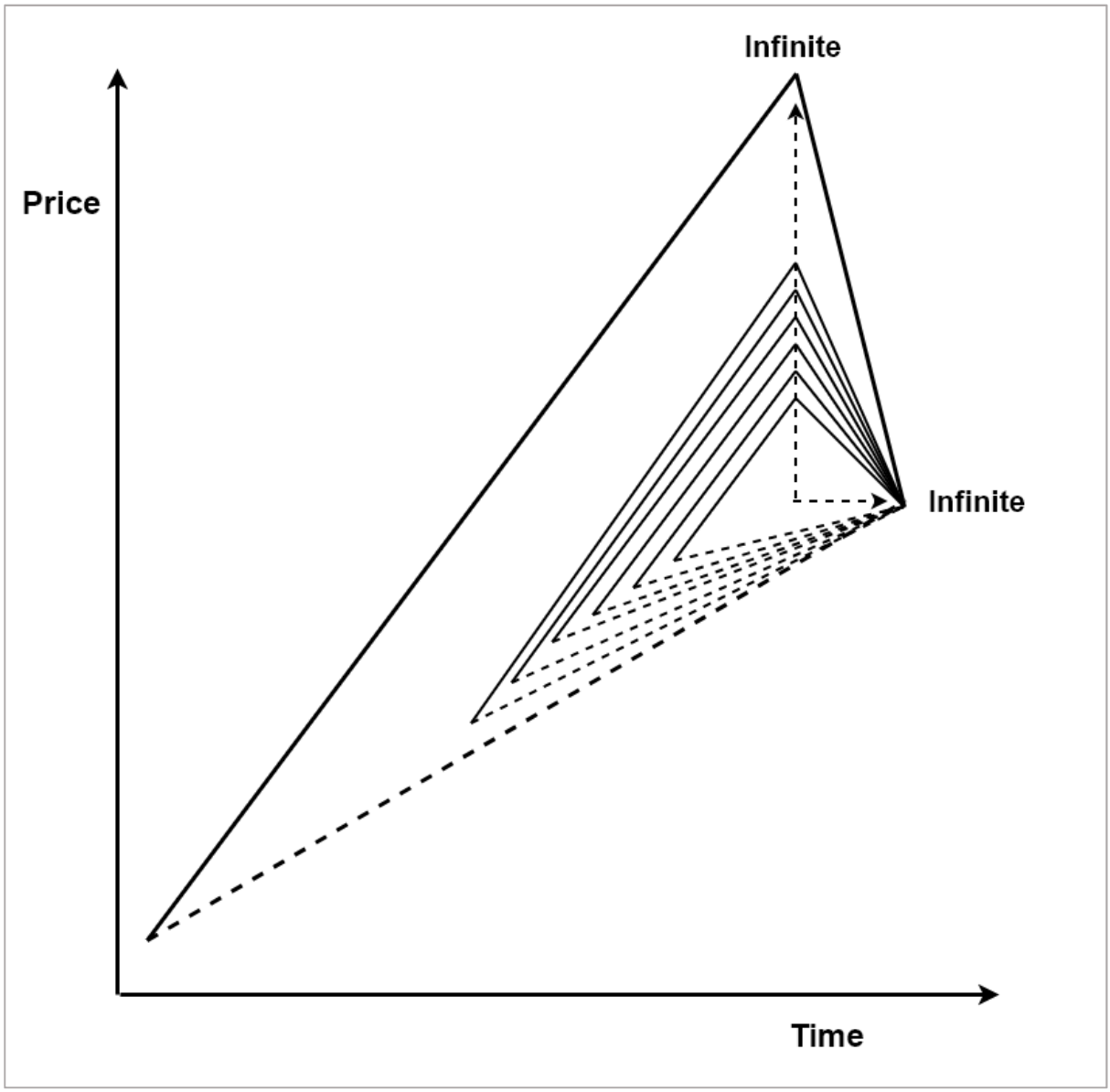

Figure 3-8: Infinite number of stacked triangles.

The fifth characteristic of equilibrium fractal wave is the loose self-similarity (heterogeneity). In nature, it is easy to find the strict self-similarity. However, we can only expect the loose self-similarity in the financial market due to the highly diverse players, participating in the market. Even though all the equilibrium fractal waves will have the triangular form, their shape ratio will be different to each other. For example, if we display the shape ratios of all the series of equilibrium fractal waves in the chart, then we will expect the different shape ratios to its adjacent one (Figure 3-9). This does not mean that we will never have the similar or identical shape ratios in history. In fact, we can get lots of them repeating in the history. For example, we get to see the shape ratio of 0.618 all the time in the financial market. However, we are just saying that the same shape ratios will not often come in the successive manner. This heterogeneous characteristic also implies that the financial market have some shapes more frequently occurring than some other shapes. This also has an important implication for our trading. Imagine that we have a financial market with three shape ratios 0.450, 0.850 and 1.300 repeating infinitely. We only found the shape ratio 0.450 and 1.300 repeated ten times in the historical data whereas the shape ratio 0.850 repeated 100 times in the historical data. Which shape ratio shall we trade with? Of course, we will trade with the ratio 0.850. Likewise, last hundreds years, traders had a solid belief in using the Fibonacci ratios like 0.618, 0.382 and 1.618 for their trading. This belief is based on the assumption that the Fibonacci ratios 0.618, 0.382 and 1.618 occurs more frequently comparing to other non-Fibonacci ratios like 0.567, 0.855, 1.333, etc in the financial market. This loose self-similarity (heterogeneity) is the rationale behind the Fibonacci ratio analysis and other Fibonacci ratio based strategies like Elliott Wave and Harmonic Pattern. The main idea is that, among many

diverse equilibrium fractal wave shapes, we need to choose the most frequently occurring shapes (i.e. ratio) for our trading.

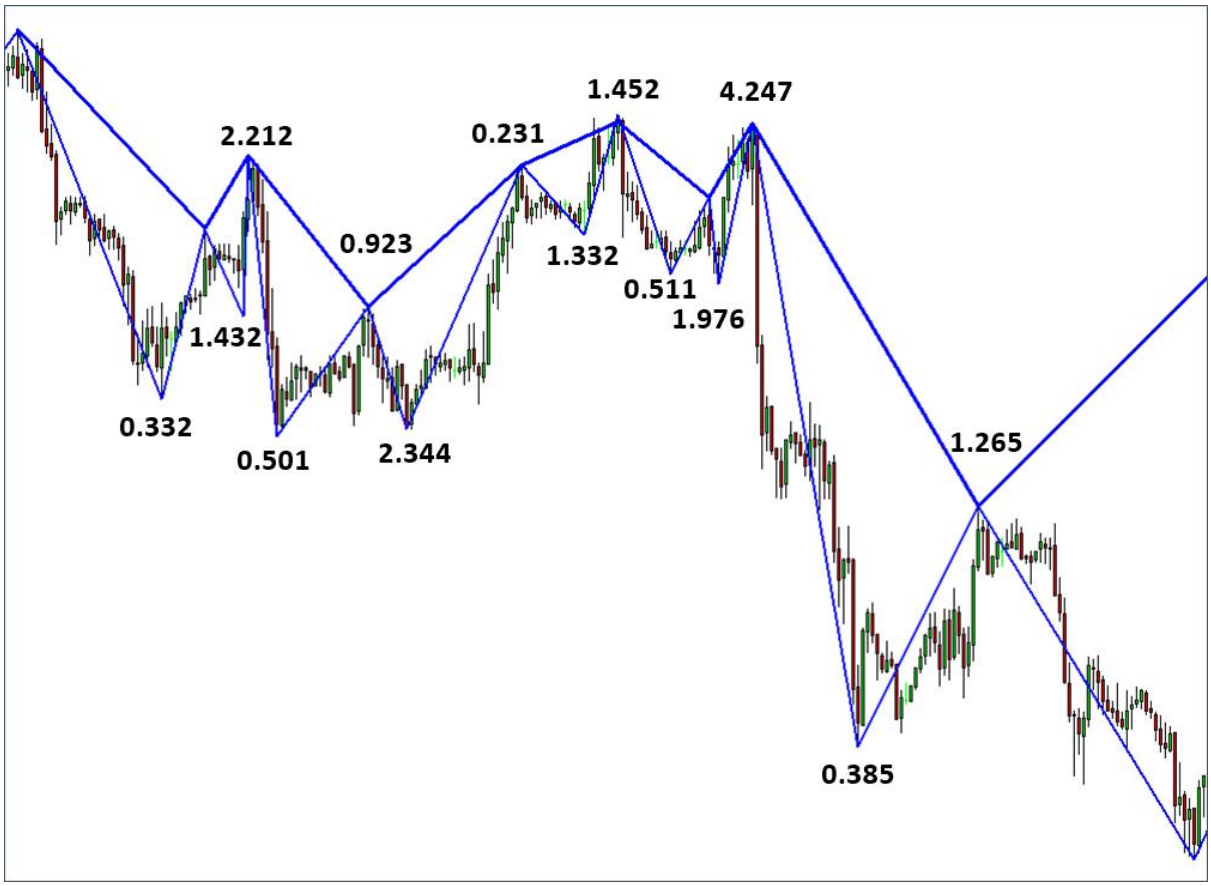

Figure 3-9: Equilibrium fractal waves with different shape ratios.

To give you some idea of equilibrium fractal wave, let us have some real world example using currency pairs. Regardless of how long the market goes on, the market can be described with few cycles of equilibrium fractal waves due to the fractal nature of the financial market. For example, the financial prices series with 20 years of history can be described using two unit cycles of equilibrium fractal wave (Figure 3-10). Likewise, the price series with 2 weeks historical data can be described using two unit cycles of equilibrium fractal wave too (Figure 3-

11). The main difference is that there are more jagged patterns inside the financial price series for 20 years comparing to the two weeks data.

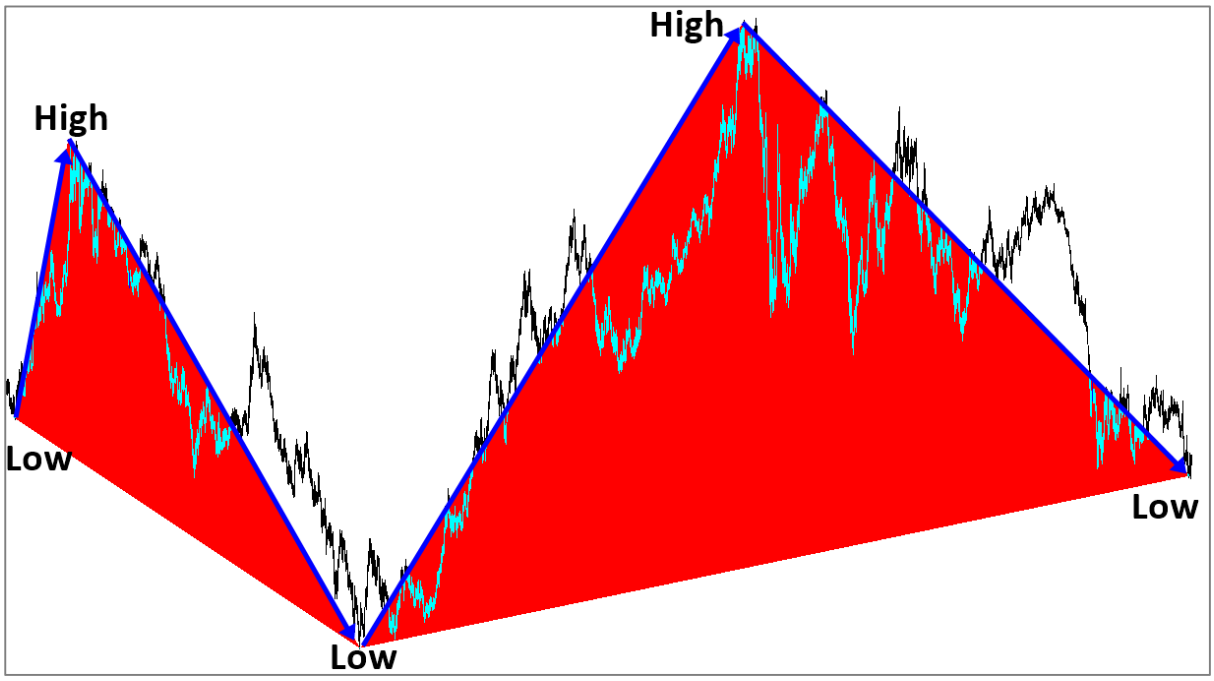

Figure 3-10: EURUSD twenty years' historical data from 1992 to 2016.

Figure 3-11: EURUSD two weeks historical Data from 2015 August 28 to 2015 September 16.

Each equilibrium fractal wave can be combined to form the patterns that are more complex. Several popular tradable patterns can be derived by combining several equilibrium fractal waves. For example, Harmonic patterns are typically made up from three equilibrium fractal waves. Impulse Wave 12345 pattern in Elliott Wave Theory is made up from four equilibrium fractal waves. Corrective Wave ABC pattern in Elliott Wave Theory is made up from two equilibrium fractal waves. Like the case of Elliott Wave patterns and Harmonic patterns, some derived patterns can have some definite number for equilibrium fractal wave for the defined patterns. However, there are some derived patterns does not have the definite number of equilibrium fractal wave. For example, rising wedge, falling wedge and triangle patterns does not require the definite number

of equilibrium fractal wave. Rising wedge, falling wedge and triangle patterns are envelops connecting highs and lows of each equilibrium fractal wave.

EFW Derived patterns	**Number of equilibrium fractal waves**	**Number of points**
ABCD pattern	2	4
Butterfly pattern	3	5
Bat pattern	3	5
Gartley pattern	3	5
Impulse Wave 12345	4	6
Corrective wave ABC	2	4
Falling wedge pattern	Not defined	Not defined
Rising wedge pattern	Not defined	Not defined
Symmetric triangle	Not defined	Not defined
Ascending triangle	Not defined	Not defined
Descending triangle	Not defined	Not defined

Table 3-1: List of derived patterns for trader from equilibrium fractal waves

The properties of these derived patterns remain identical to the equilibrium fractal wave because the derived patterns are also fractals by nature. Therefore, the derived patterns are repeating in different scales. For example, the size of butterfly pattern detected in EURUSD today will be different to the butterfly pattern detected 1 month ago. In addition, the size of butterfly pattern detected in EURUSD will be different to the butterfly pattern detected in GBPUSD. The

detected patterns can have slightly different shape too. It is also possible to have nested patterns inside larger patterns. For example, we can have a small bullish butterfly pattern inside the greater bullish butterfly pattern. Likewise, we can have a nested bullish Impulse Wave 12345 pattern inside greater bullish Impulse Wave 12345 pattern. Another important point about these derived patterns is that they will serve for the price to propagate in the direction of the market equilibrium. The formation of the repeating patterns will typically guide the price to the end of the equilibrium price. Some derived patterns like Harmonic Patterns can pick up the trend reversal. Some patterns like impulse wave 1234 can help you to predict trend continuation. Therefore, these derived patterns provide good clue about trading direction for us. Presence of these derived patterns can represent the existence of fifth regularity, equilibrium Fractal-Wave process in the financial price series.

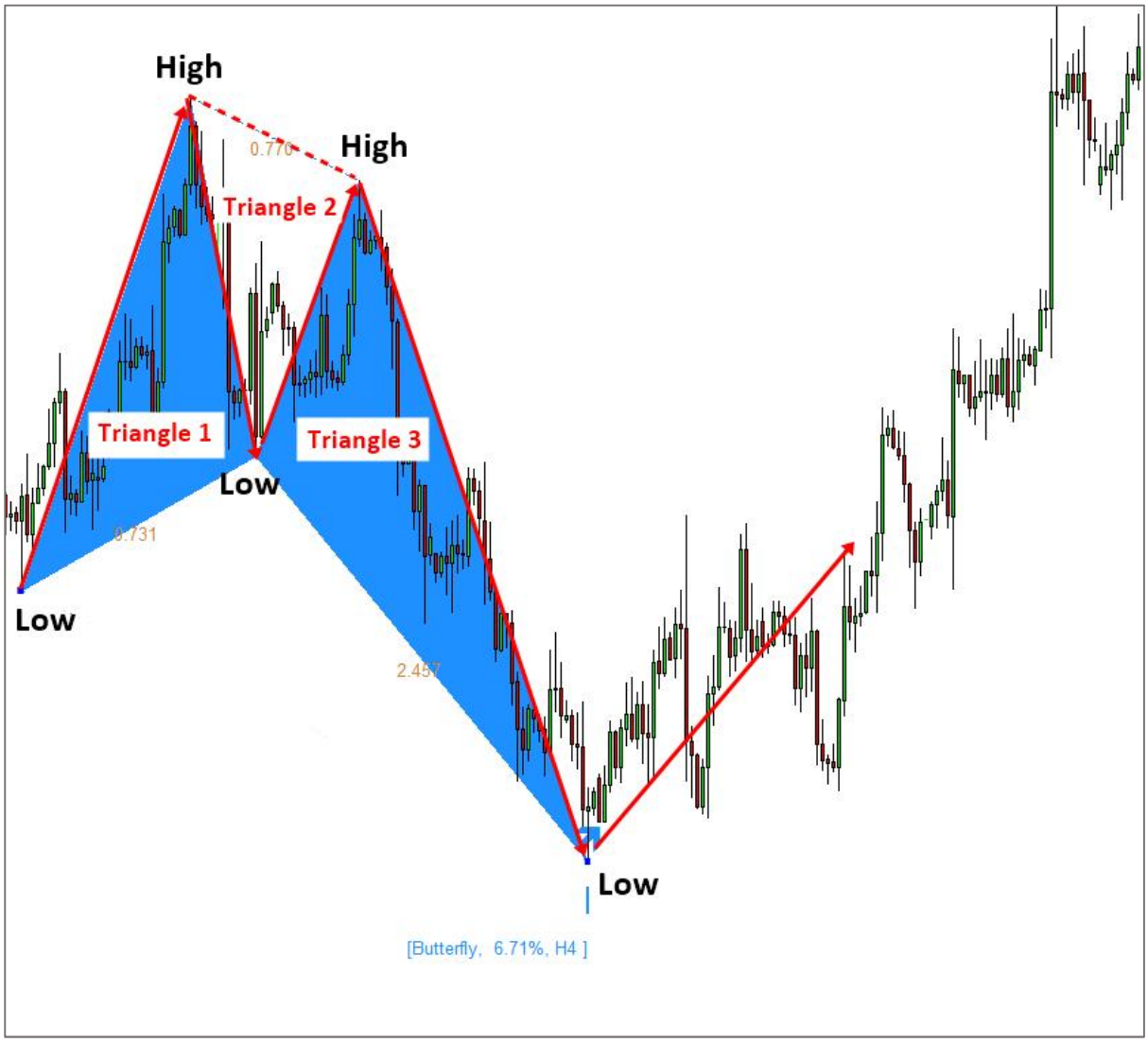

Figure 3-12: Butterfly pattern formed in EURUSD H4 timeframe.

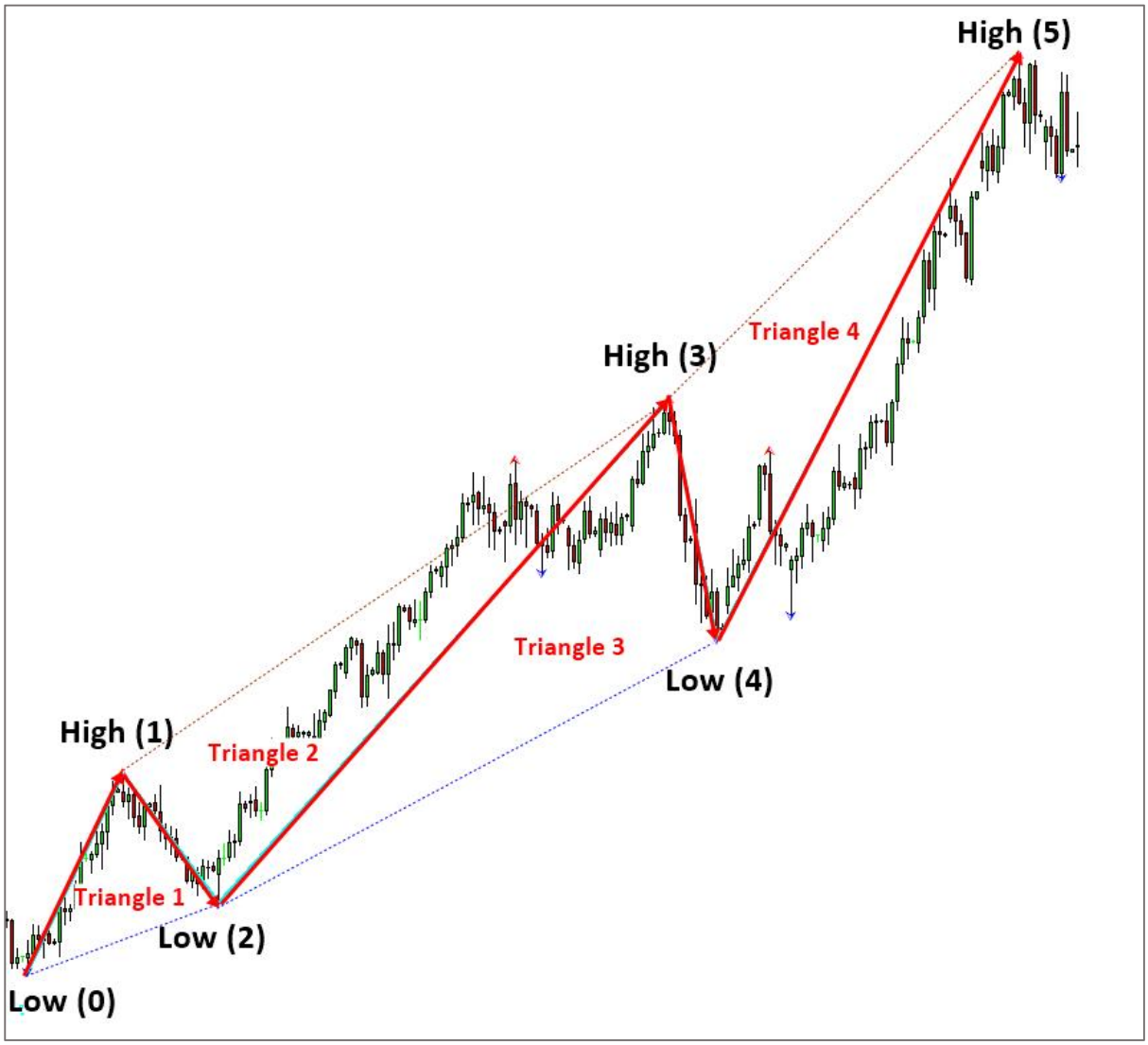

Figure 3-13: Impulse Wave 12345 pattern formed in EURUSD D1 timeframe.

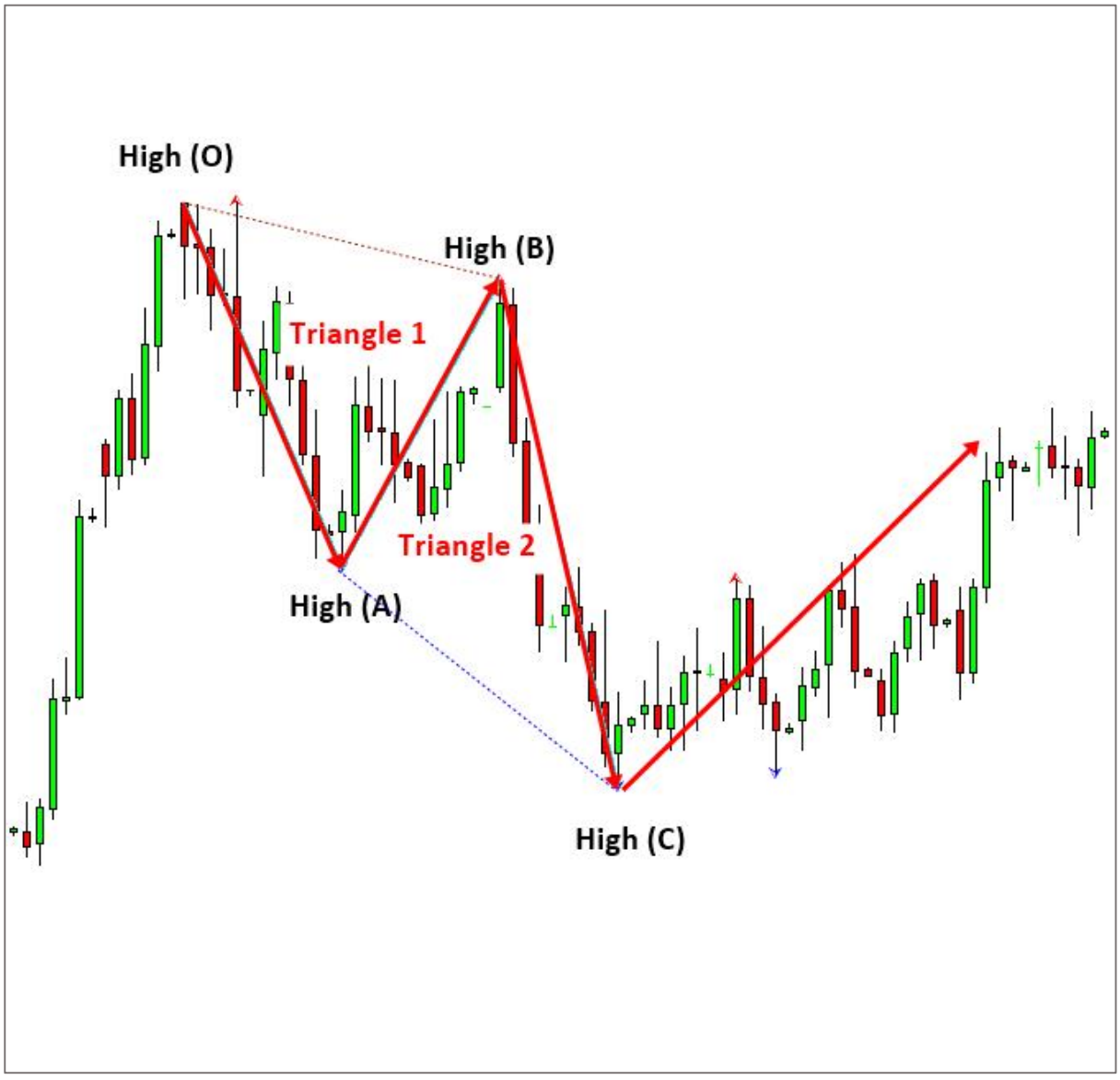

Figure 3-14: Corrective Wave ABC pattern formed in EURUSD D1 timeframe.

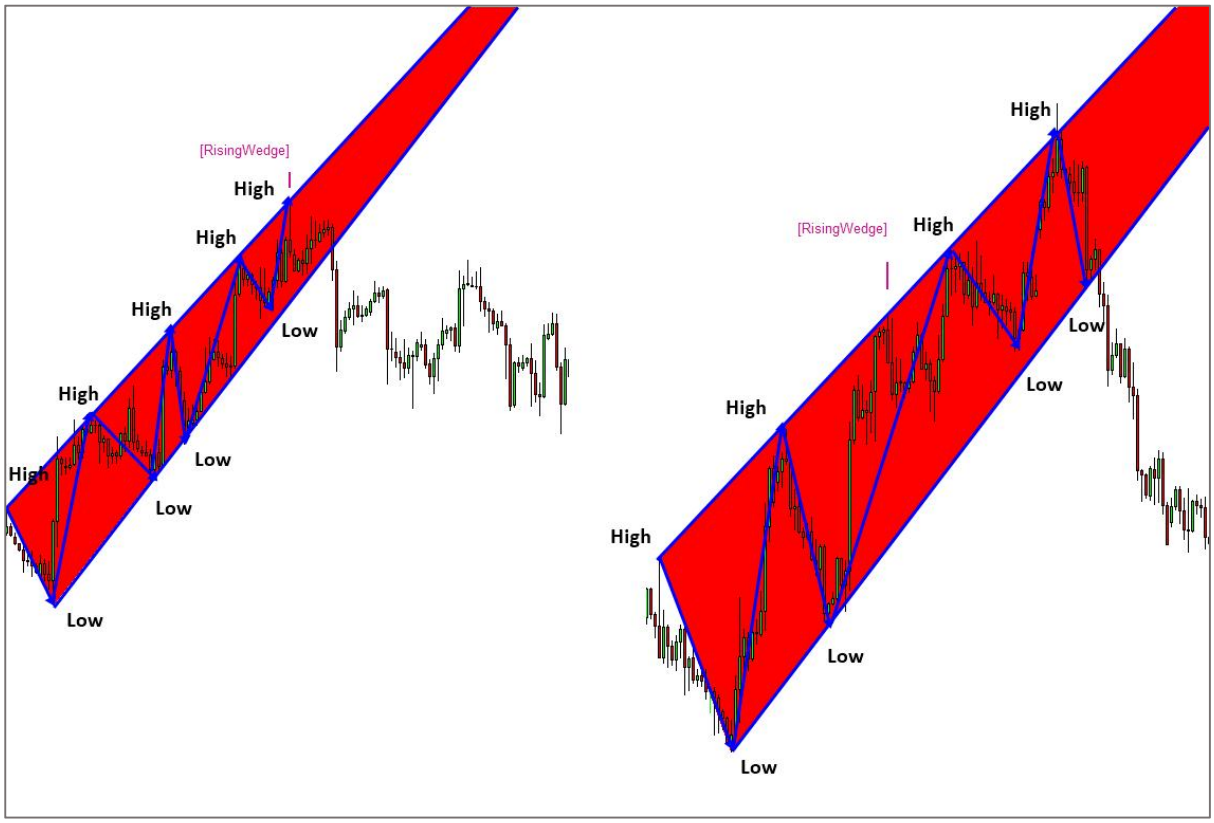

Figure 3-15: Rising Wedge pattern A (left) and another Rising Wedge pattern B (right) formed in EURUSD H4 timeframe.

4. Hurst Exponent and Equilibrium Fractal Wave Index for Financial Trading

The term fractal was used for the first time by Benoit Mandelbrot (20 November 1924 – 14 October 2010). This is how he defined fractals: “Fractals are objects, whether mathematical, created by nature or by man, that are called irregular, rough, porous or fragmented and which possess these properties at any scale. That is to say they have the same shape, whether seen from close or from far.” This is a general description of the fractals from the father of fractals. At the most plain language, the fractal is the repeating geometry. For example, in Figure 4-1, a triangle is keep repeating to form larger triangles. How big or small we zoom out or zoom in, we can only see the identical triangle everywhere. When the pattern or structure is composed of regular shape as shown in Figure 4-1, we call such a pattern as the strict self-similarity.

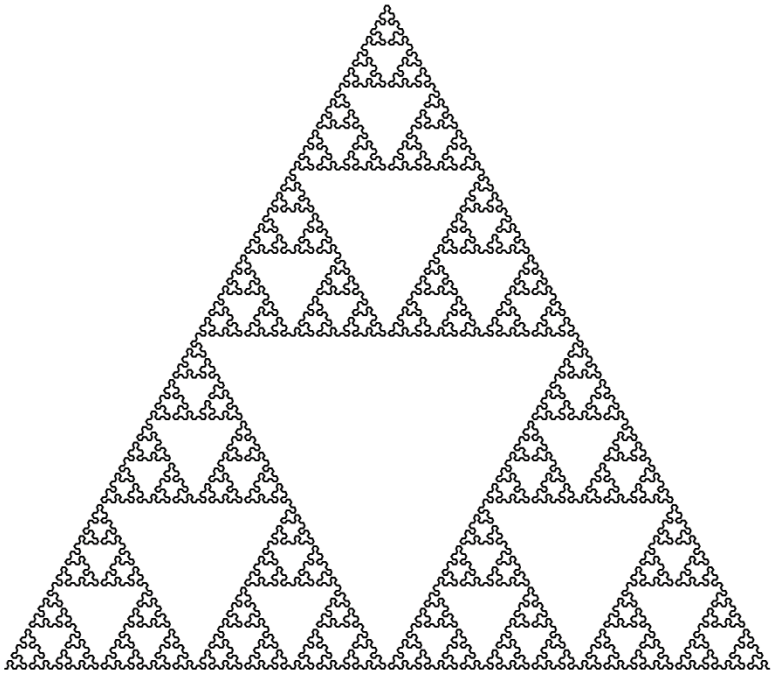

Figure 4-1: Example fractal geometry with strict self-similarity.

Fractal geometry can be found in nature including trees, leaves, mountain edges, coastline, etc. The financial market has also strong fractal nature in it. Since the price of financial instruments is drawn in time and price space, the fractal in the financial market comes in waveform over the time. However, we are not talking about the typical cyclic wave as in the sine or cosine wave, which can be defined with a definite cycle period. In the financial market, we are talking about the repeating geometry or patterns over the time without definite cycle period. Another important fractal characteristic of the financial market is a loose self-similarity in contrast to the strict self-similarity in Figure 4-1. Loose self-similarity means that the financial market is composed of slightly different variation of the regular shape (Figure 4-2). Therefore, to understand the financial market, we need some tools to visualize its structure. If we understand the fractal nature of the financial market, we can definitely improve our trading performance. Many investment banks and fund management firms do spend considerable amount of efforts and time to reveal the fractal properties of the financial market. They use such a knowledge for their trading and investment decision. From the next chapter, we introduce few important scientific tools to reveal the market structure and behaviour of the financial market for your trading.

Figure 4-2: Loose self-similarity of the financial market.

Financial market is one of the most interesting topics in science. The fractal nature of the financial market was studied more than decades in both academic and industrial research. Many investment banks and fund management firms spend a considerable amount of time and efforts to reveal the fractal properties of the financial market so they can use such a knowledge for their trading and investment decision. Since fractal geometry in the financial market is complex, we need scientific tools to study the structure and the behaviour of the financial market. If we understand the structure and the behaviour of the financial market, we can create better trading strategies for sure. In this article, we will help you to understand two important fractal based scientific tools including

Hurst Exponent and Equilibrium Fractal wave index. We explain these two tools in a simple language for the example of financial trading.

The name “Hurst exponent” or “Hurst coefficient” was derived from Harold Edwin Hurst (1880-1978), the British hydrologist. Among the scientists, Hurst exponent is typically used to measure the predictability of time series. In fact, Hurst exponent is theoretically tied to the Fractal dimension index coined by Mandelbrot in 1975. Therefore, when we explain Hurst exponent, we can not avoid to mention about the Fractal Dimension index. The relationship between Hurst exponent and Fractal dimension index is like this:

Fractal dimension index (D) = 2 – Hurst exponent (H).

Even if we had a definite mathematical relationship between these two, we should interpret them independently. For example, Fractal dimension index can range from one to two. This value corresponding to the typical geometric dimension we know. For example, everyone knows that one dimension indicates a straight line whereas the two dimension indicates an area. Three dimension is a volume. Of course, for some big science fiction fans, four dimension might be an interesting topic. Now we know that the fractal dimension index can range from 1 to 2. What does 1.5 dimension means? Fractal dimension index 1.5 is simply the filling capacity of the geometric pattern. If the geometric patterns are highly wiggly and then can fill more space than a straight line, the geometric patterns will have higher fractal dimension index. If the geometric pattern is simple, then the pattern will have lower fractal dimension index close to one (i.e. straight line). For the financial market, the fractal dimension index can range somewhere between 1.36 and 1.52. You can imagine how complex they are. It is important to note that the fractal dimension index is not a unique descriptor

of shape. Therefore, the number does not tell how the shape of the fractal geometry.

Hurst exponent can range from 0.0 and 1.0. Unlike the fractal dimension index, Hurst exponent tell us the predictability of the financial market. For example, if the Hurst exponent is close to 0.5, this indicates the financial market is random. If the Hurst exponent is close to 0.0 or 1.0, then it indicates that the financial market is highly predictable. The best-known approach using the Hurst exponent for the financial trading is to classify the financial market data into momentum (i.e. trending) and mean reversion (i.e. ranging) characteristics. For example, if Hurst exponent of the financial market is greater than 0.5, then we can assume that the financial market have a tendency for trending. If Hurst exponent is less than 0.5, we can assume that the financial market have a tendency for ranging. Hurst exponent is generally calculated over the entire data. It is used as a metric to describe the characteristic of the financial market. However, there are some traders using Hurst exponent like a technical indicator by calculating them for short period. When you calculate Hurst exponent over short period, you might run the risk of incorrect range analysis (Figure 4-3). For example, it is well known that with small data set, the estimated standard deviation can be far off from the true standard deviation of the population. However, at the same time, if you are using overly long period to calculate Hurst exponent, you will get the lagging signals (Figure 4-4). If you are using Hurst exponent for reasonably long calculating period, then Hurst exponent will not alternate between trending (> 0.5)and ranging region (<0.5) but the value will stay only one side (Figure 4-5). In Figure 4-5, Hurst exponent stayed over 0.57 always when we have the calculating period 3000 for EURUSD H1 timeframe. It

is also important to note that Hurst exponent does not tell you the direction of the market.

Figure 4-3: Hurst Exponent indicator with period 30 on EURUSD H1 timeframe. The green dotted line is at 0.5.

Figure 4-4: Hurst Exponent indicator with period 100 on EURUSD H1 timeframe. The green dotted line is at 0.5.

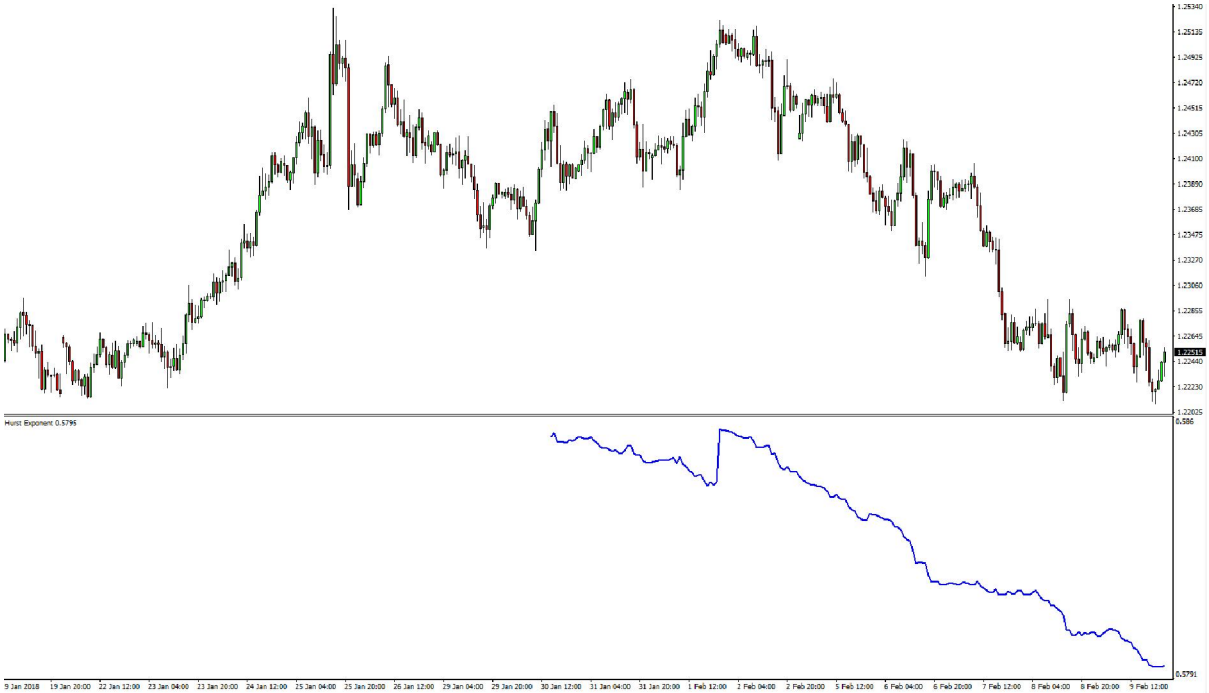

Figure 4-5: Hurst Exponent indicator with period 3000 on EURUSD H1 timeframe. Hurst exponent value is always greater than 0.57.

The Equilibrium fractal wave index was first introduced in the Book: Financial trading with Five Regularities of Nature: Scientific Guide to Price Action and Pattern Trading (2017). If Hurst exponent was created to extract insight for the overall data of the financial market, the Equilibrium fractal wave index was created to extract insight for the fractal geometry in the loose self-similarity system like the financial market. In the Equilibrium fractal wave index, the building block of the fractal geometry is assumed as the simple triangular waveform called equilibrium fractal wave. Remember that in the strict self-similarity system, the fractal geometry is composed of infinite number of regular shape as in Koch Curve and Sierpinski Triangle as shown in Figure 4-1. In the loose self-similarity structure, the fractal geometry is composed of infinite number of slightly different version of the regular shape. Likewise, many different variation of the triangular shape shown in Figure 4-6 can become the equilibrium fractal wave in the financial market. The variation of shape in the equilibrium fractal wave can be expressed as the Shape ratio of latest price move to previous price move at the two swing points (i.e. the shape ratio = Y2/Y1). Figure 4-7 and 4-8 show the example of identical shape and non-identical shape of equilibrium fractal wave. Since the financial market is the complex system with loose self-similarity, the financial market is composed of infinite number of some identical and some non-identical shape of equilibrium fractal waves as shown in Figure 4-9. The Equilibrium fractal wave index simply tells you how often the identical shape of equilibrium fractal wave is repeating in the financial

market. To help you understand further, the mathematical equation for the Equilibrium Fractal Wave index is shown below:

Equilibrium fractal wave index = number of the particular shape of equilibrium fractal wave / number of peaks and troughs in the price series.

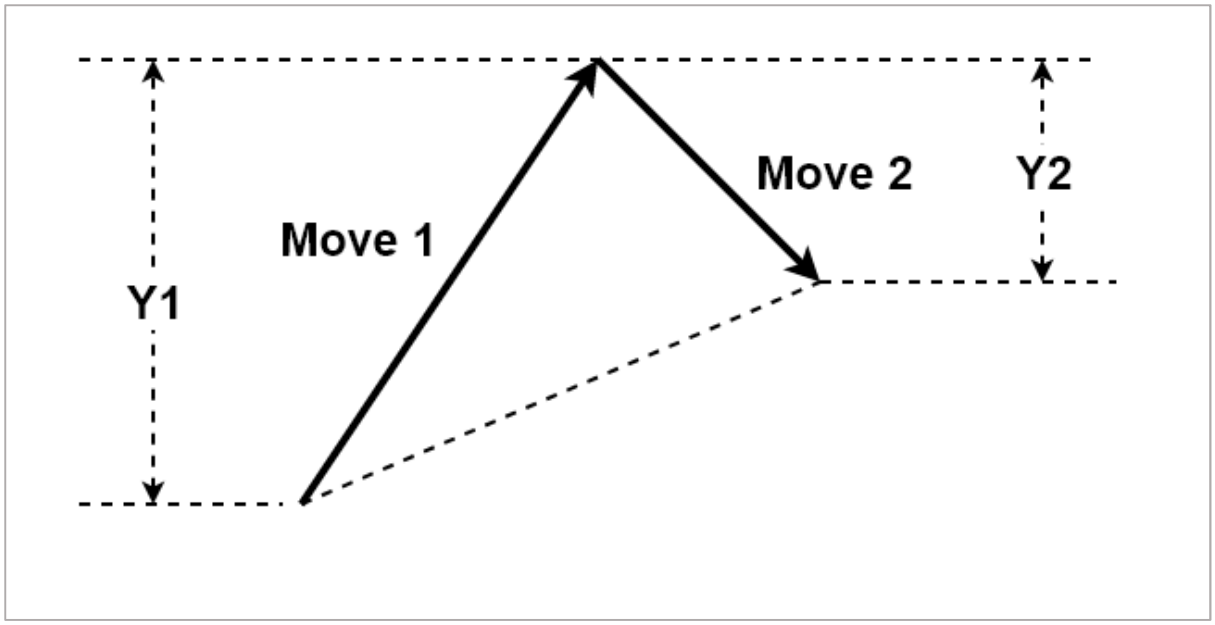

Figure 4-6: Structure of one equilibrium fractal wave. It is made up from two price movements (i.e. two swings).

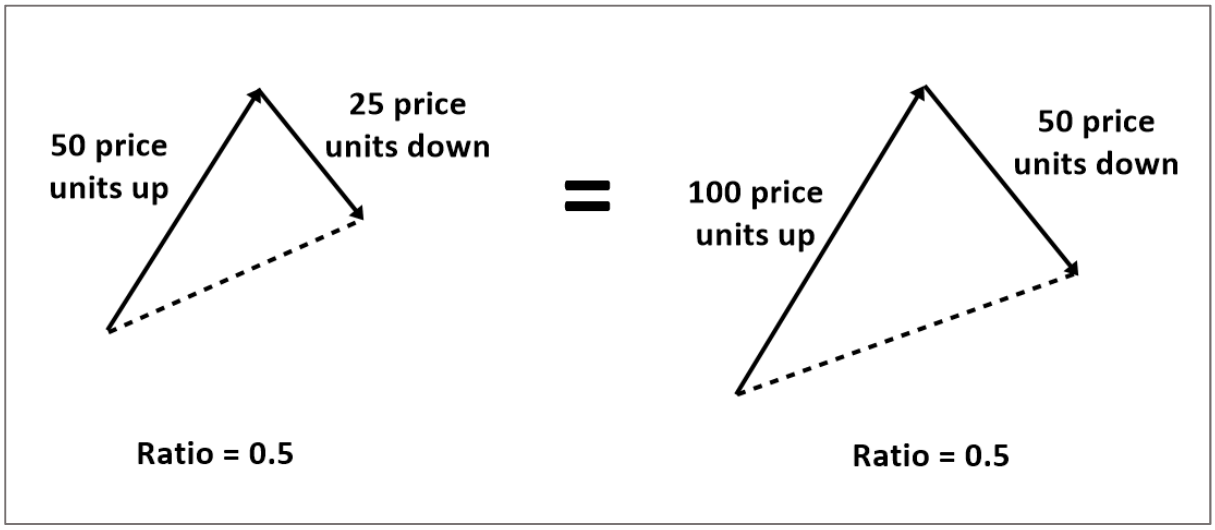

Figure 4-7: An example of two identical equilibrium fractal waves in their shape.

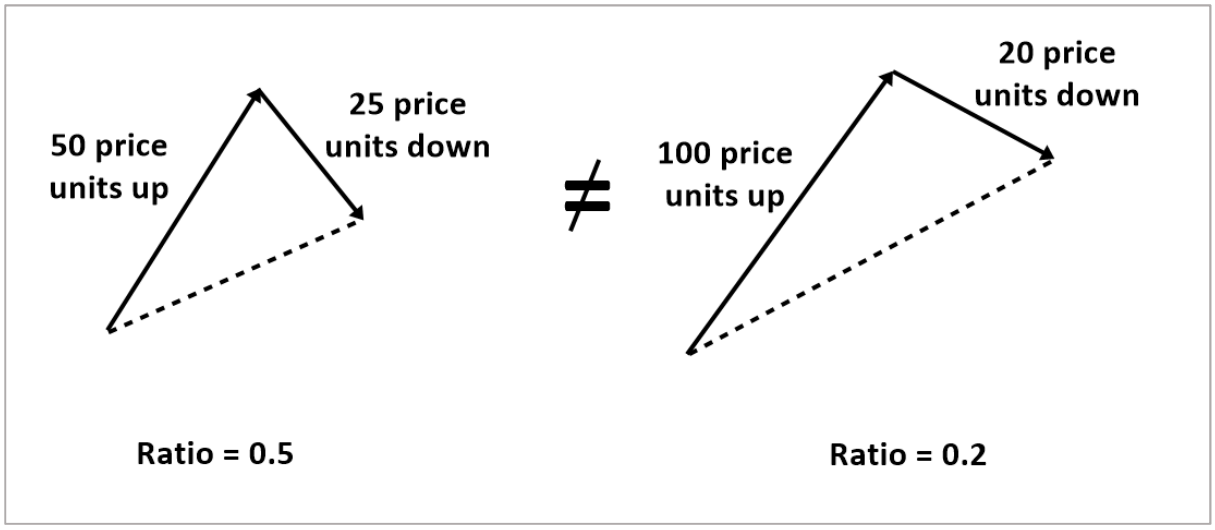

Figure 4-8: An example of non-identical equilibrium fractal waves in their shape.

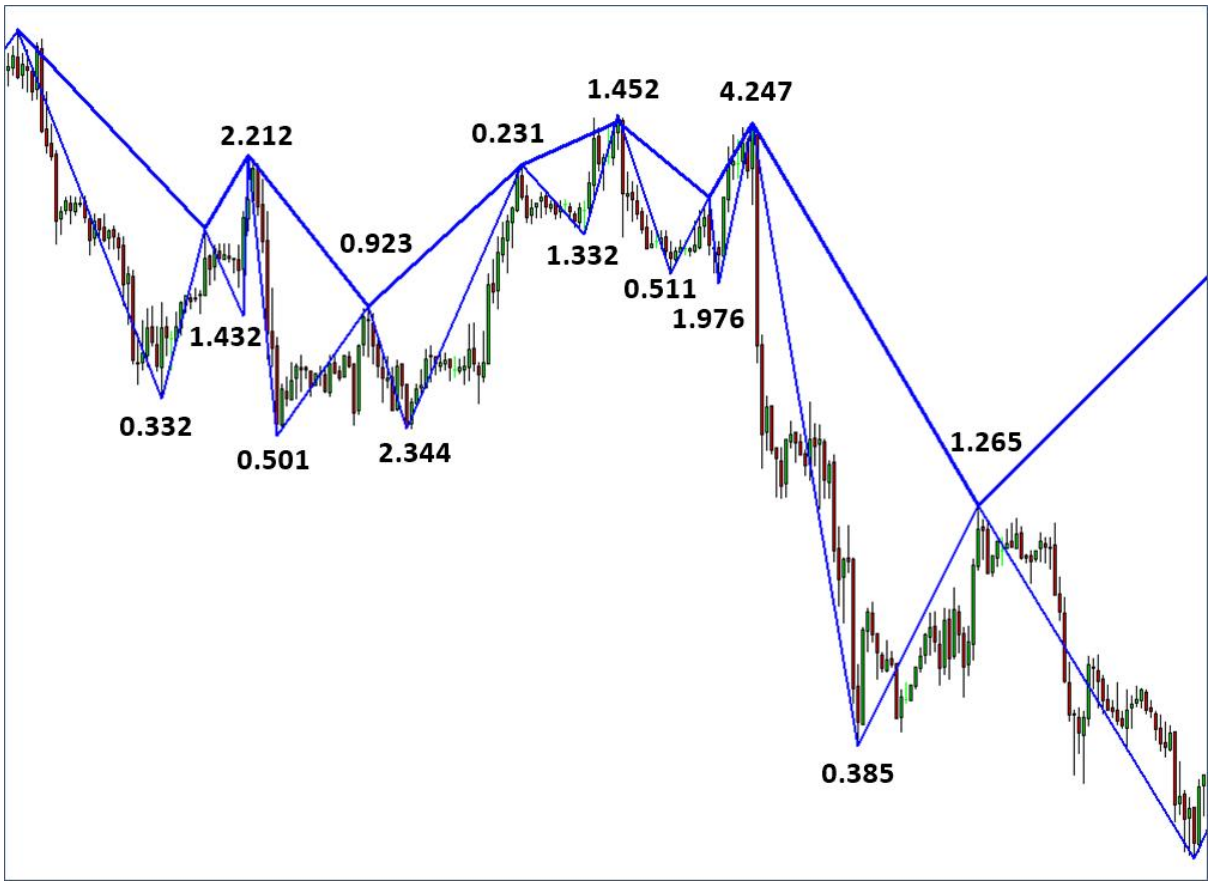

Figure 4-9: Financial market with loose self-similarity. The shape ratio (Y2/Y1) corresponds to each equilibrium fractal wave.

So how to use Equilibrium fractal wave index for financial trading? If the Hurst exponent tells you the predictability of the financial market, then the Equilibrium fractal wave index can reveal the internal structure of the financial market. For example, Table 4-1 shows the internal structure of EURUSD for around 12 years of history data. We can tell how the six different variation of equilibrium fractal waves exist in EURUSD in different proportion. Some variation of equilibrium fractal wave appears more frequently than the other shape ratios. For example, the shape ratio 0.618 (i.e. the golden ratio) and 0.850 appears more frequently than the other shape ratios in EURUSD. The higher the Equilibrium fractal wave index means that the shape ratio indicates reliable

trading opportunity whereas the lower the Equilibrium fractal wave means that they are not so significant to trade. With Equilibrium fractal wave index, you can also cross compare the internal structure of different financial instruments. Table 4-2 shows how GBPUSD is composed of these six variation of equilibrium fractal waves. You can tell the composition is not similar to the case of EURUSD (Table 4-1). This simply tells you that each financial instrument have their own behaviour. In addition, with Equilibrium fractal wave index, we can cross-compare the composition for multiple of financial instruments. For example, in Table 4-3, we cross compared the composition of the shape ratio 0.618 for 10 different currency pairs. You can tell that the shape ratio of 0.618 take up the higher proportion in some currency pairs whereas it is not so significant in other currency pairs. For example, the appearance of shape ratio in USDJPY is roughly 25% more than the appearance of the shape ratio in AUDNZD (Table 4-3). This indicates that you will be better off to trade with USDJPY than AUDNZD if your trading strategy involves using the golden ratio 0.618.

Shape Ratio	Start	End	Number of Equilibrium Fractal Wave	Number of Peaks and troughs	EFW Index
0.618	2006 09 20	2018 01 20	108	321	33.6%
0.382	2006 09 20	2018 01 20	99	321	30.8%
0.500	2006 09 20	2018 01 20	102	321	31.8%
0.300	2006 09 20	2018 01 20	65	321	20.2%
0.450	2006 09 20	2018 01 20	101	321	31.5%
0.850	2006 09 20	2018 01 20	138	321	43.0%
Sum			613	321	190.97%
Average			102.17	321	31.83%
Stdev			23.28	0.00	N/A

Table 4-1: Internal structure of EURUSD D1 timeframe from 2006 09 20 to 2018 01 20 with six different shape ratios.

Shape Ratio	Start	End	Number of Equilibrium Fractal Wave	Number of Peaks and troughs	EFW Index
0.618	2007 01 04	2018 01 20	116	339	34.2%
0.382	2007 01 04	2018 01 20	95	339	28.0%
0.500	2007 01 04	2018 01 20	124	339	36.6%
0.300	2007 01 04	2018 01 20	62	339	18.3%
0.450	2007 01 04	2018 01 20	114	339	33.6%
0.850	2007 01 04	2018 01 20	147	339	43.4%
Sum			658	321	194.10%
Average			109.67	321	32.35%
Stdev			28.79	0.00	N/A

Table 4-2: Internal structure of GBPUSD D1 timeframe from 2007 01 04 to 2018 01 20 with six different shape ratios.

Instrument	Start	End	Number of Equilibrium Fractal Wave	Number of Peaks and troughs	EFW Index 0.618
EURUSD	2006 09 20	2018 01 20	108	321	33.6%
GBPUSD	2007 01 04	2018 01 20	116	339	34.2%
USDJPY	2008 04 01	2018 01 20	134	326	41.1%
AUDUSD	2008 03 08	2018 01 20	117	333	35.1%
USDCAD	2008 02 19	2018 01 20	120	328	36.6%
NZDUSD	2007 08 15	2018 01 20	122	330	37.0%
EURGBP	2008 05 01	2018 01 20	130	342	38.0%
AUDNZD	2007 08 03	2018 01 20	107	325	32.9%
AUDCAD	2006 08 26	2018 01 20	137	342	40.1%
AUDJPY	2007 04 17	2018 01 20	121	315	38.4%
Average			121.20	330.10	36.7%
Stdev			9.56	8.54	2.60%

Table 4-3: Counting number of equilibrium fractal wave with the shape ratio 0.618 on D1 timeframe for over 3000 candle bars.

Just like Hurst exponent, you can turn the Equilibrium fractal wave index into the technical indicators too. In this case, you can monitor the EFW index over time to check the dominating shape ratio for the financial instrument. Just like the case of Hurst exponent, if you are using too small calculating period, you have the risk of under or over estimating the index values. Therefore, it is important to use the reasonably long calculation period to avoid the risk of under or over estimating the index values.

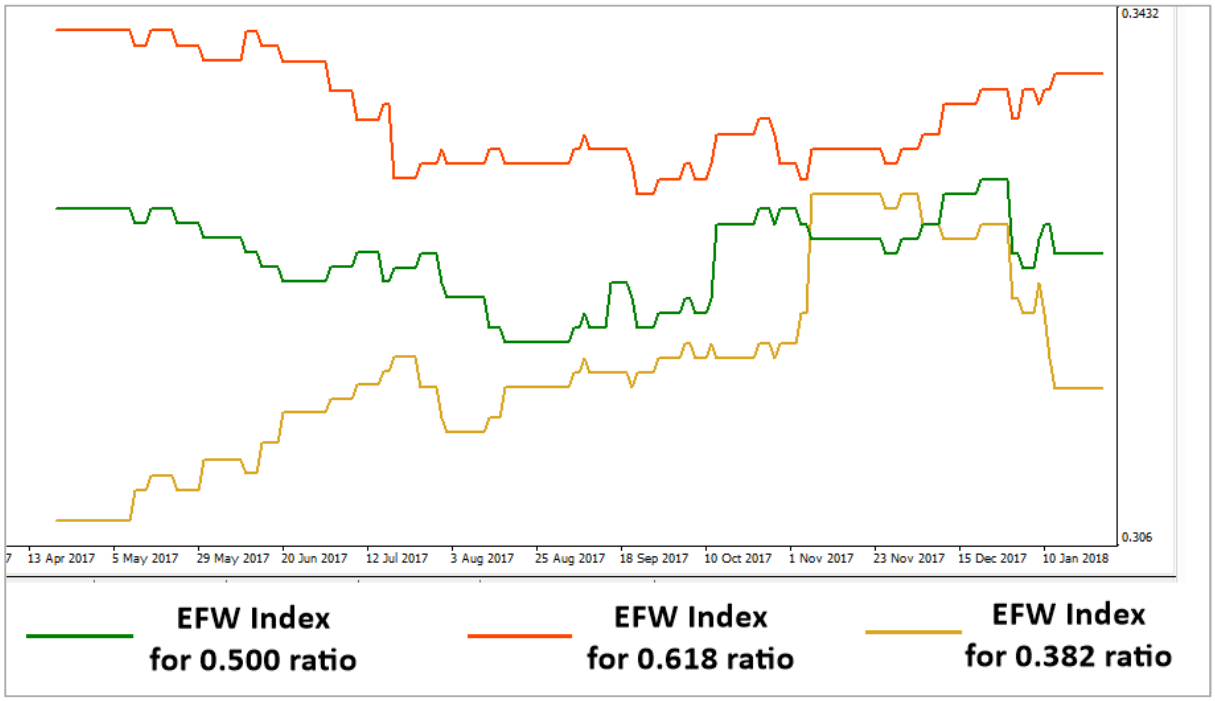

Figure 4-10: EFW index for EURUSD D1 timeframe from 2006 09 20 to 2018 01 20.

There are many different ways of using Hurst exponent and Equilibrium fractal wave index for the practical trading. In this section, we share one practical tips. In general, Hurst exponent value far away from 0.5 is preferred for your trading because they are more predictable. Based on this knowledge, you can select your best timeframe to trade. For example, in Table 4-4, we can tell that M30 and H4 timeframe is easiest to trade among the six timeframes for EURUSD because they are more predictable than the other timeframes.

	M5	M15	M30	H1	H4	D1
Hurst Exponent	0.553	0.539	0.588	0.58	0.594	0.532

Table 4-4: Hurst exponent for different timeframe for EURUSD.

Likewise, if you are going to trade using the Golden ratio, you can use the Equilibrium fractal wave index to select the best timeframe. For example, in Table 4-5, we can tell that M30 and H1 have more significant EFW index for the shape ratio 0.618. Therefore, it is easier to trade with M30 and H1 using the Golden ratio.

	M5	M15	M30	H1	H4	D1
EFW Index for 0.618	0.284	0.272	0.308	0.300	0.267	0.290

Table 4-5: Equilibrium fractal wave index of the shape ratio 0.618 for different timeframe for EURUSD.

Both Hurst exponent and Equilibrium fractal wave index can be used to select the financial instrument to trade. At the same time, you can use both Hurst exponent and Equilibrium fractal wave index to fine-tune your trading strategy.

5. Shape Ratio Trading and Equilibrium Fractal Wave Channel

5.1 Introduction to EFW Index for trading

By definition, an equilibrium fractal wave is a triangle made up from two price movements in opposite direction. When the price is moving towards the equilibrium price, the equilibrium fractal waves propagate. In the financial market, various shapes of equilibrium fractal wave exist. They are often mixed and jagged to form more complex price patterns. The shape of each equilibrium wave can be described by their shape ratio. This shape ratio can be used to identify the shape of an individual equilibrium fractal wave in the complex price patterns. As you can tell from the equation, the shape ratio of equilibrium fractal wave is independent from their size.

The shape ratio of equilibrium fractal wave = current move in price units (Y2)/ previous move in price units (Y1).

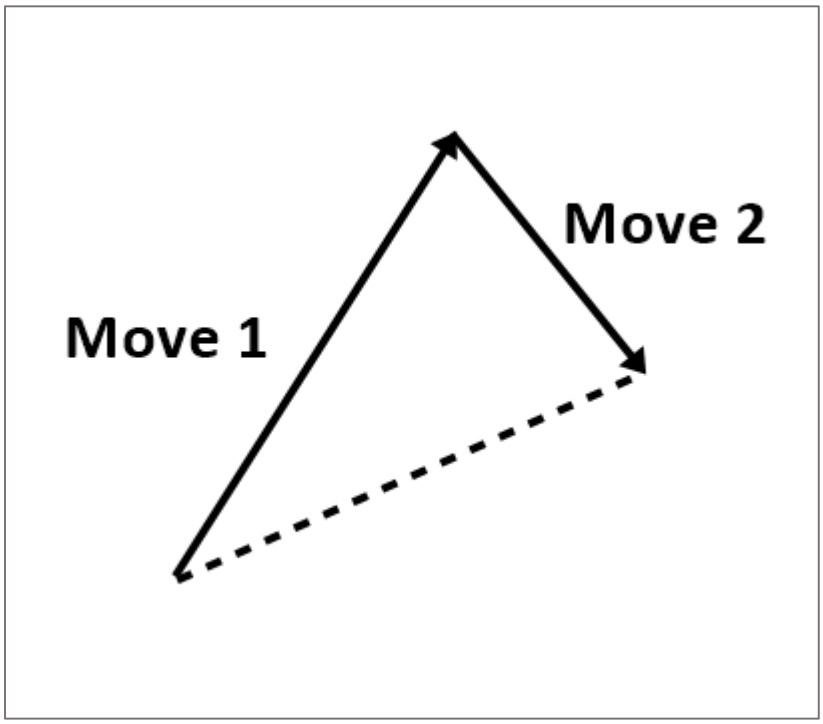

Figure 5-1: One unit cycle of Equilibrium Fractal Wave is a triangle made up from two price movements.

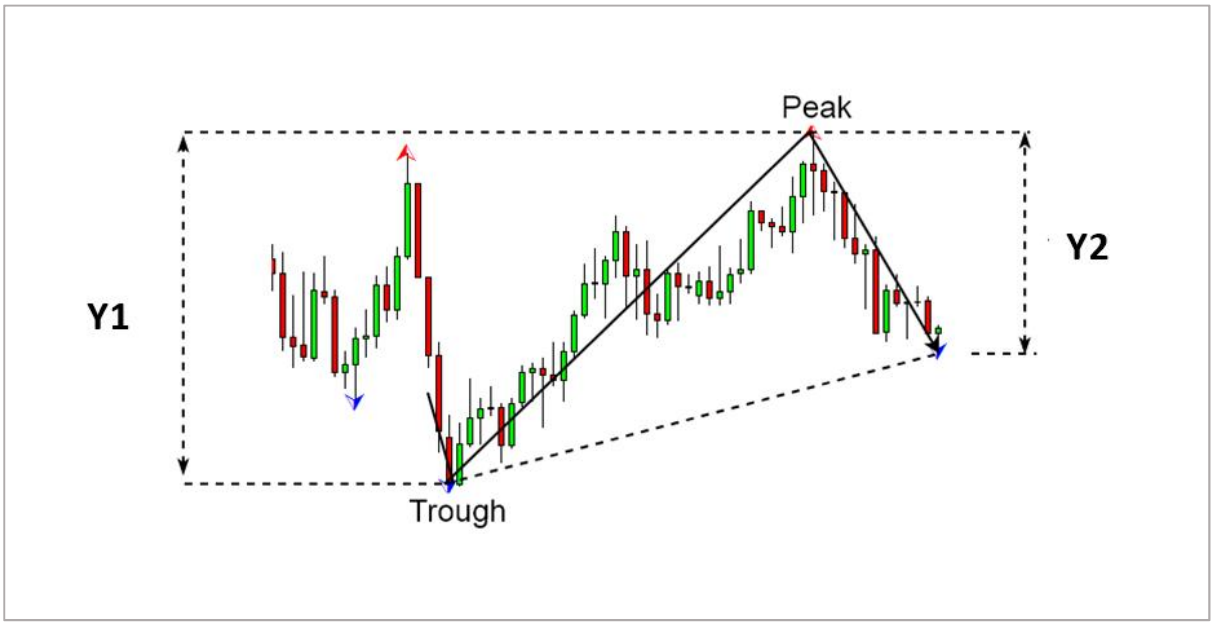

Figure 5-2: one unit cycle of an equilibrium fractal wave in the candlestick chart.

Two important shape classes for equilibrium fractal wave include Fibonacci based ratios and non-Fibonacci based ratios. Trader can trade both ratios if they wish. However, traders are required to have a knowledge on which shape of equilibrium fractal wave is more suitable for your trading. To find out the suitable EFW shape, you can simply use the "Equilibrium Fractal Wave (EFW) Index" to do a simple exploratory analysis. The EFW index can be calculated using following equation.

Equilibrium fractal wave index = number of the particular shape of equilibrium fractal wave / number of peaks and troughs in the price series.

The very best part of equilibrium fractal wave trading is that it combines both the exploratory analysis and trading in one practice. In the exploratory analysis, you will build your trading logic. In the trading, you will use the logic to build the best outcome for your trading. In the exploratory analysis, you will use the EFW index exclusively. With the EFW index, you can answer the following questions:

- What particular shape of equilibrium fractal wave exists in the price series?
- Which particular shape of equilibrium fractal wave is dominating in the price series?
- How frequently have they occurred in the past?
- Which financial instruments like currency pairs and stocks prices are easier to trade than rest of the market?
- Is the fifth regularity the most dominating characteristics of this financial market?

For example, Figure 5-3 shows the EFW indices for EURUSD daily timeframe for the three ratios including 0.618, 0.500 and 0.382. We have shown the three EFW indices over the time. From the chart, it is possible to figure out that 0.618 is the most dominating ratio for EURUSD followed by the ratio 0.500. Would this tendency hold the same for GBPUSD too? Let us check the Figure 5-4 for this. You can tell that the ratio 0.500 is more frequently occurring than the ratio 0.618. For GBPUSD and EURUSD, the ratio 0.382 is the least occurring shape of the equilibrium fractal wave. By inspecting the EFW indices, we can tell that EURUSD and GBPUSD have a strong presence of equilibrium fractal wave. For this reason, we can use any trading analysis and strategies designed for the fifth regularity. To calculate the EFW index, we typically recommend using as much data as you can. For example, in Figure 5-3 and Figure 5-4, we have used more than 3000 bars (i.e. around 10 years long history) to calculate each EFW index. You might be able to use more data if you wish.

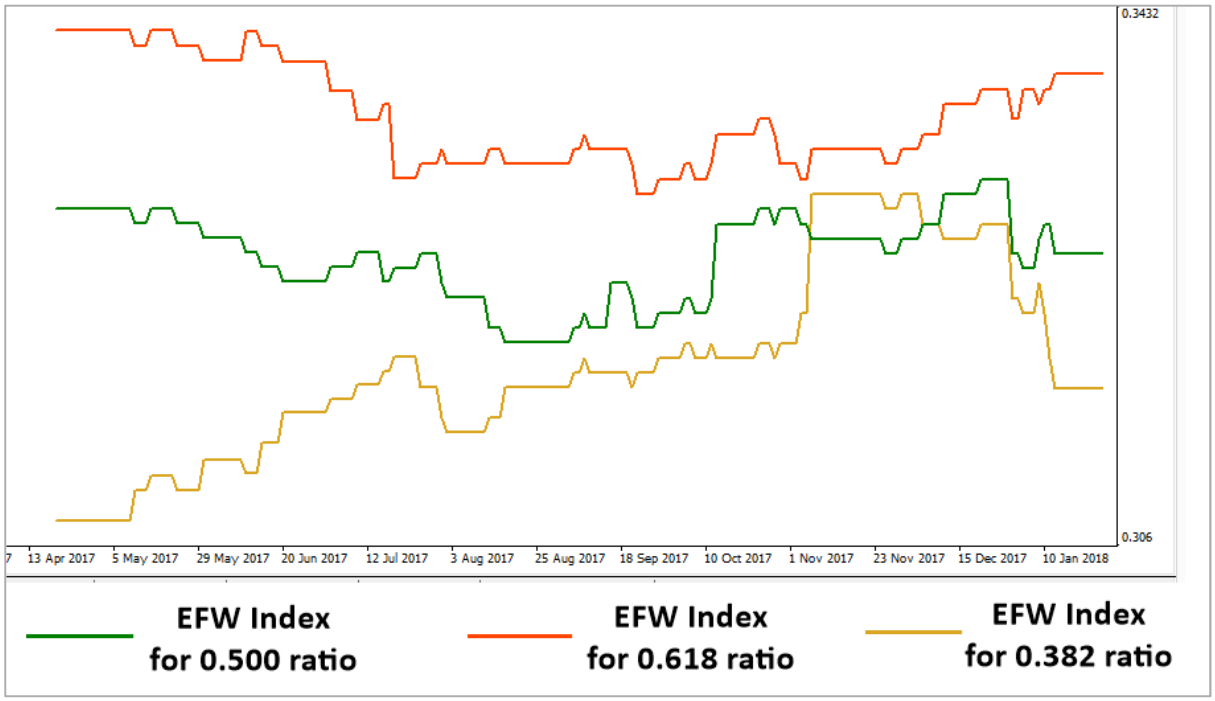

Figure 5-3: EFW index for EURUSD D1 timeframe from 2006 09 20 to 2018 01 20.

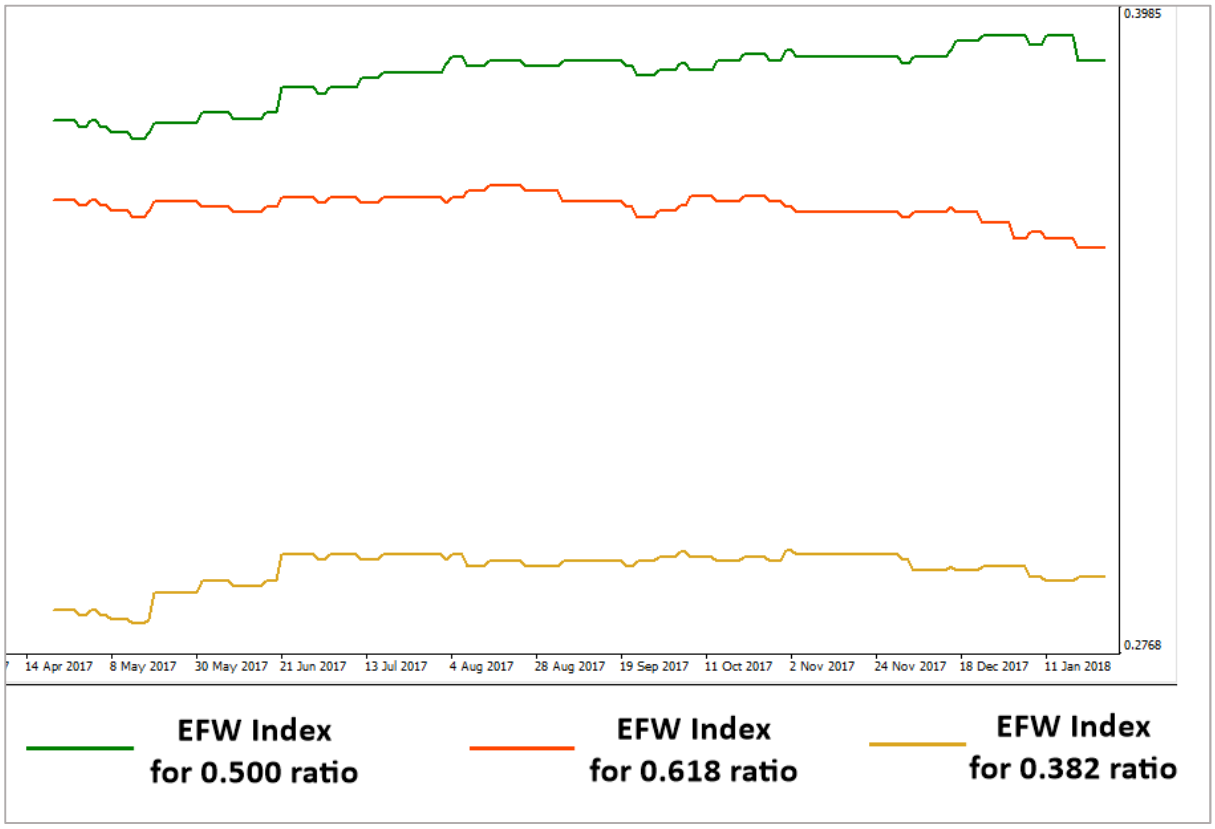

Figure 5-4: EFW index for GBPUSD D1 timeframe from 2007 01 04 to 2018 01 20.

5.2 Trading with the shape ratio of equilibrium fractal wave

The simplest way to trade with a single equilibrium fractal wave is to trade with their shape ratio. The shape ratio is an identifier of the shape of individual equilibrium fractal wave in the financial market. Hence, each equilibrium fractal wave has one corresponding shape ratio. The way the shape ratio trading works is very similar to the Fibonacci retracement trading. Fibonacci retracement trading is a popular trading technique. In the Fibonacci retracement trading, we predict the potential reversal area by projecting 38.2%, 50% or 61.8% the retracement. Anyone understanding this simple Fibonacci retracement trading can readily understand the trading operation with the shape ratio too because they are similar in term of operation. However trading with shape ratio has

several distinctive advantages against the Fibonacci retracement trading. Trader must thoroughly understand the difference between shape ratio trading and Fibonacci retracement trading to yield the better performance.

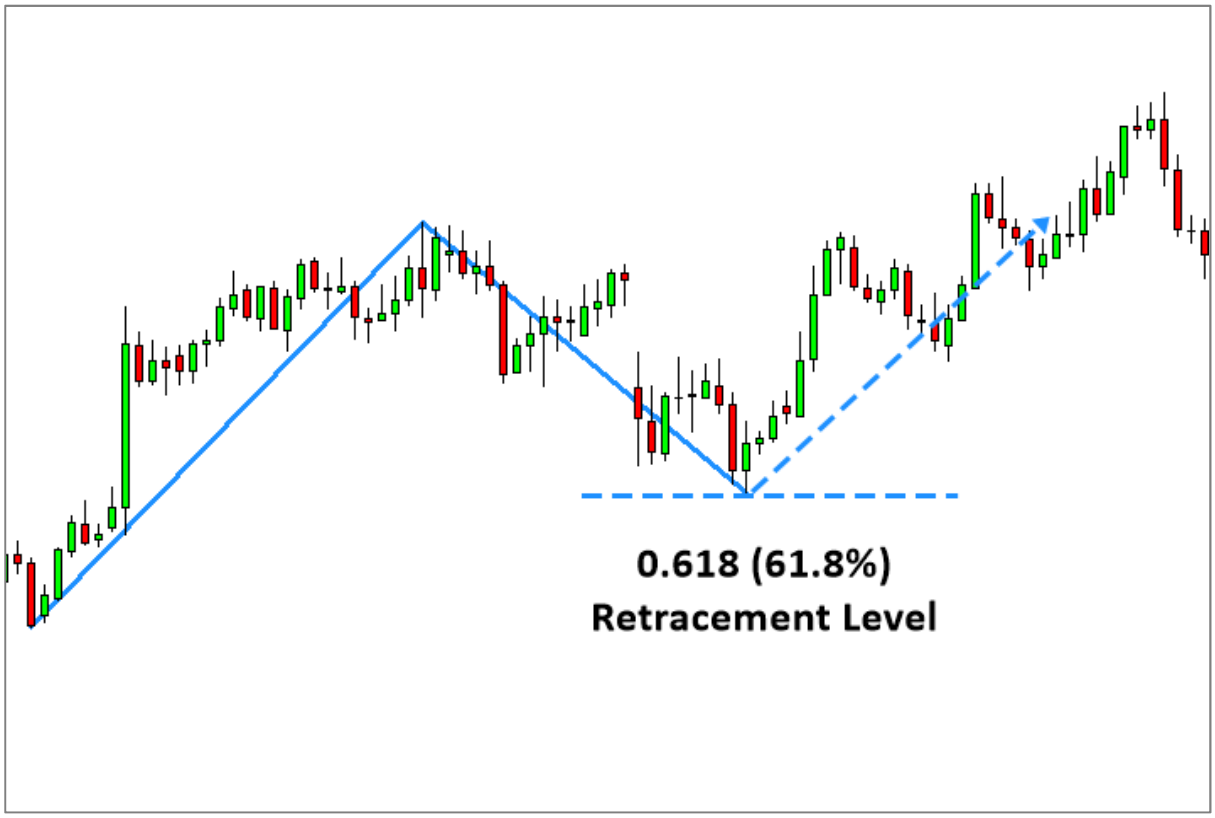

Figure 5-5: Fibonacci retracement trading example with ratio 0.618 on EURUSD daily timeframe.

Firstly, in the shape ratio trading, we do not limit our trading opportunity to Fibonacci ratios only. In the Fibonacci retracement trading, traders assume that the Fibonacci ratios like 0.382, 0.500 or 0.618 or some other Fibonacci ratios are only ratios they can trade. In the shape ratio trading, this assumption is not valid any more. Trader can trade with any shape ratios including the Fibonacci ratios and non-Fibonacci ratios. Since the EFW index tells us exactly which shape ratio

is dominating in the particular financial market, it is possible we can pick up the shape ratio based on the EFW index. For example, trader can even trade the shape ratio 0.850 or 0.450 if the EFW index indicates the strong presence of the shape ratio 0.850 or 0.450 in the financial market. Of course, the ratio 0.850 and 0.450 are not the Fibonacci ratios. As we have shown in the previous chapter, it is possible to have the higher EFW index with non-Fibonacci ratios. For example, in EURUSD daily timeframe, the ratio 0.850 had much stronger presence than the golden ratio 0.618.

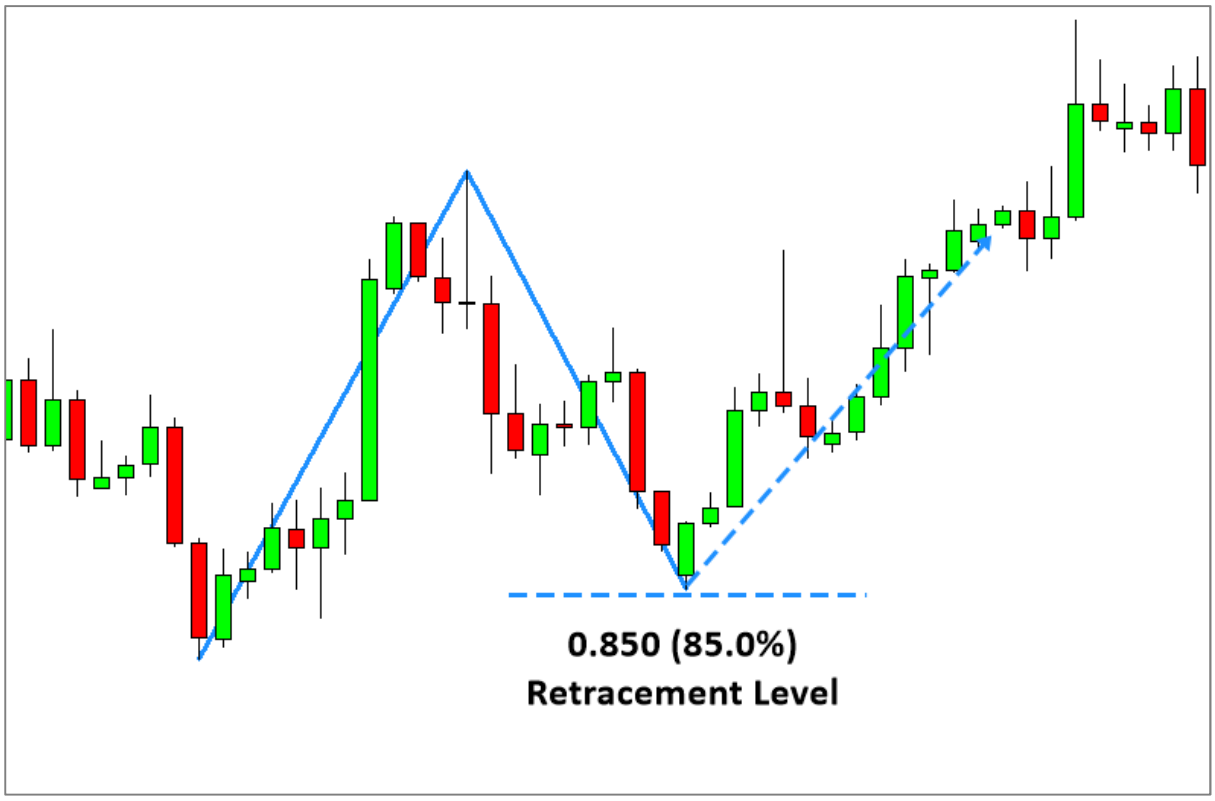

Figure 5-6: Shape ratio trading example with ratio 0.850 on EURUSD daily timeframe.

Secondly, in the shape ratio trading, we believe that some ratios will perform better than the other ratios. At the same time, we also believe that the same

ratio can perform differently for other financial instrument. This is related to the loose self-similarity (heterogeneity) characteristic of equilibrium fractal waves. For this reason, we do not blindly apply any ratios for our trading even they are Fibonacci ratios or even golden ratios. We can get the guidance for choosing the ratios from the EFW index too. By applying the EFW index, we can get the good ideas on which shape ratios we should avoid and which ratios we should use for the particular financial market.

Thirdly, in the Fibonacci retracement trading, trader assumes that price will reverse at the projected level. In the shape ratio trading, we do not assume that the price will reverse at the projected level, but we are open to both reversal and breakout (expansion) trading. It is related to the extension (transformation) characteristic of equilibrium fractal waves. We have already covered that the last leg of equilibrium fractal wave can be extended to form the bigger equilibrium fractal wave. This extension can happen when new equilibrium source arrived to market including any economic data release or any significant market news release. The extension will never be able to break the fractal nature of the financial market because the extension creates merely another bigger equilibrium fractal wave (i.e. another bigger triangle). For this reason, in the shape ratio trading, we prefer to bet on the size of equilibrium fractal wave rather than assuming the reversal. How to trade is nearly identical to the support and resistance trading. We will take buy or sell action when the price enter the buy and sell trigger level around the projected level.

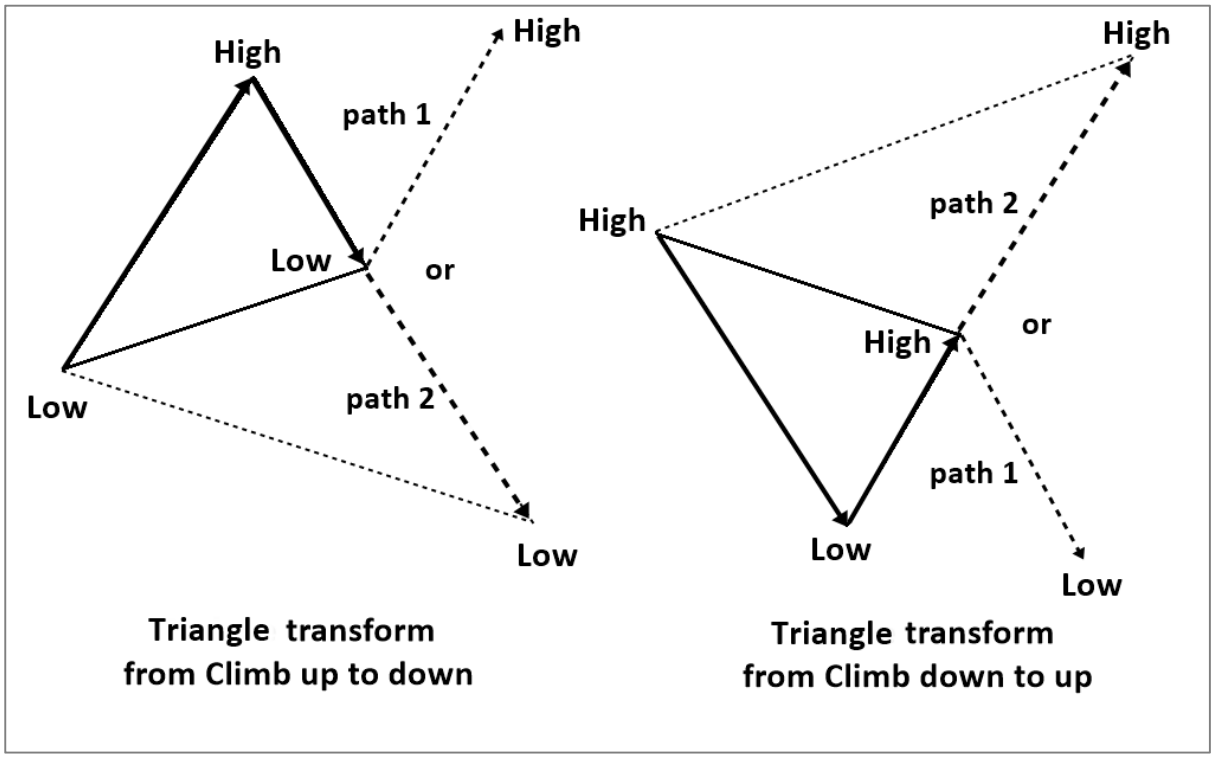

Figure 5-7: Illustration of price transformation (extension) from path 1 to path 2 to meet new equilibrium price due to an abrupt introduction of new equilibrium source in the financial market.

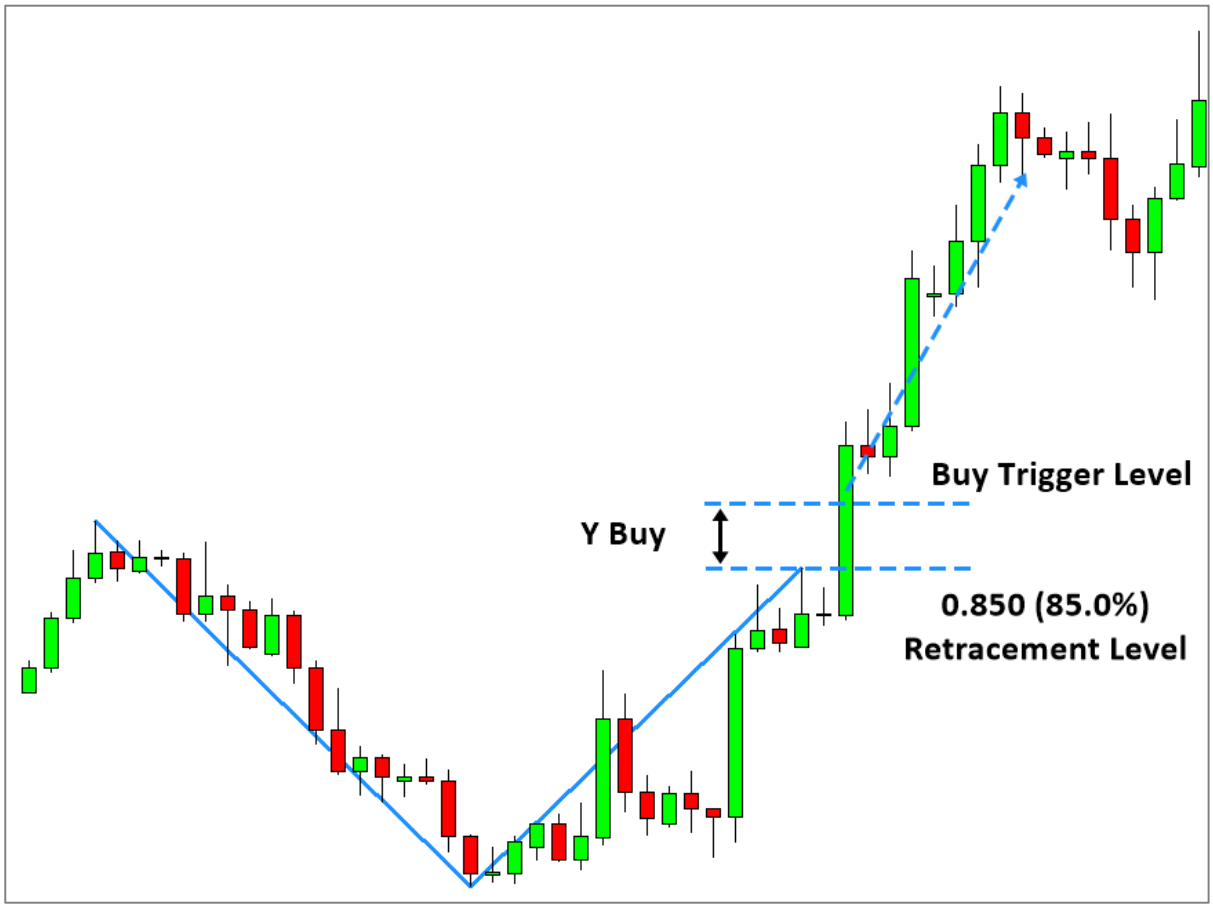

Figure 5-8: Shape ratio trading with breakout example on EURUSD H4 timeframe.

5.3 Introduction to Equilibrium Fractal Wave (EFW) Channel

Unlike many other EFW derived patterns including harmonic patterns and Elliott wave patterns, equilibrium fractal wave is relatively easy to use for our trading. In spite of its simplicity, equilibrium fractal wave can provide an extremely useful insight for our trading. One of the very important usage of equilibrium fractal wave is a channelling technique. The Equilibrium fractal wave channel can be constructed in two steps. In first step, you need to connect the first and third points to draw the base line. Once base line is drawn in your chart, offset the

baseline to the middle point of the equilibrium fractal wave to draw the extended line. Since the base line and extended line is parallel to each other, these two lines form a single channel as shown in Figure 5-9.

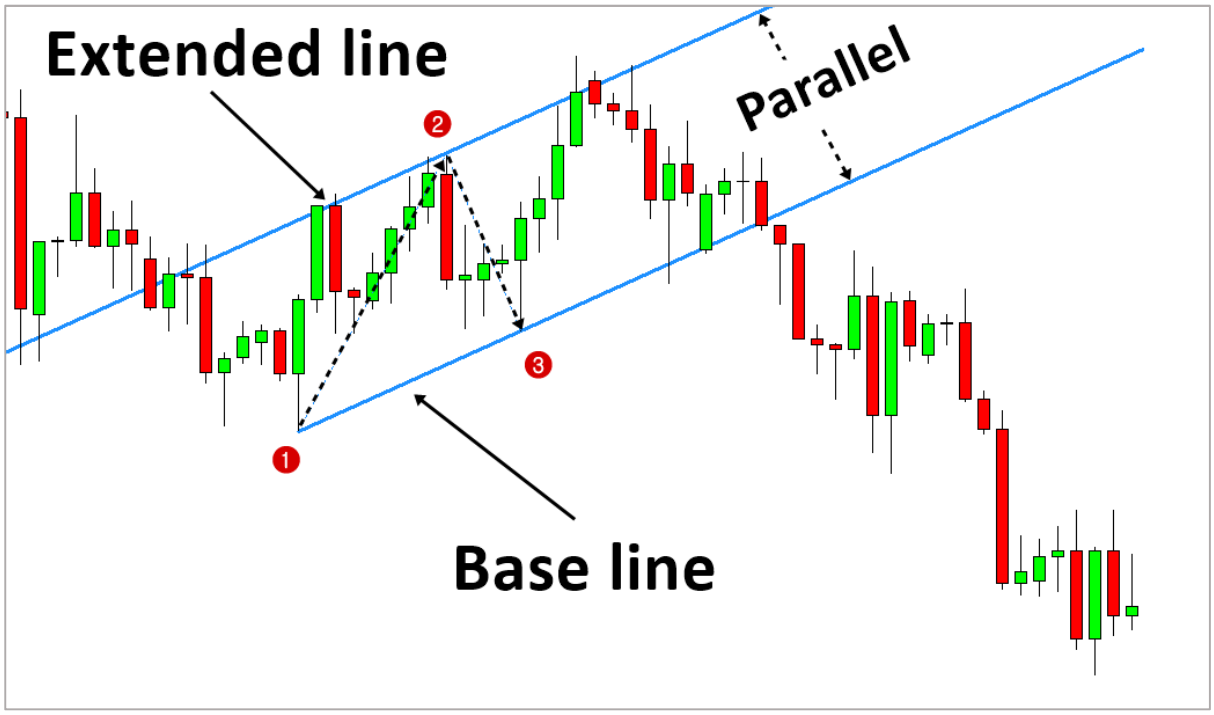

Figure 5-9: Drawing Equilibrium fractal wave channel.

In the previous chapter, we have spotted that channels are merely a pair of support and resistance lines aligned in parallel. In general, there is various way of drawing channels for your trading. Sometimes, you can draw the channel by connecting several peaks and troughs in your chart. The main difference between the typical channels and EFW channel is that EFW channel is drawn using only three points of a triangle whereas the typical channels are drawn with more than three points.

When you want to control the angle of channel, equilibrium fractal wave provide the most efficient way of controlling the angles. For example, sometimes you might prefer to trade with horizontal channel only. Sometimes, you might prefer to trade with a channel with stiff angle. With equilibrium fractal wave, the angle of channel is simply controlled by the shape ratio. The shape ratio close to 1.000 provides near the horizontal channel or a channel with a near flat angle (Figure 5-10). On the other hands, the shape ratio close to 0.000 provides a channel with a stiff angle (Figure 5-11). The shape ratio around 0.500 provides a channel with a moderate angle (Figure 5-12). Especially when you want to build a mechanical rule for your trading, this property of EFW channel becomes useful.

Figure 5-10: Equilibrium fractal wave channel with the shape ratio around 1.000.

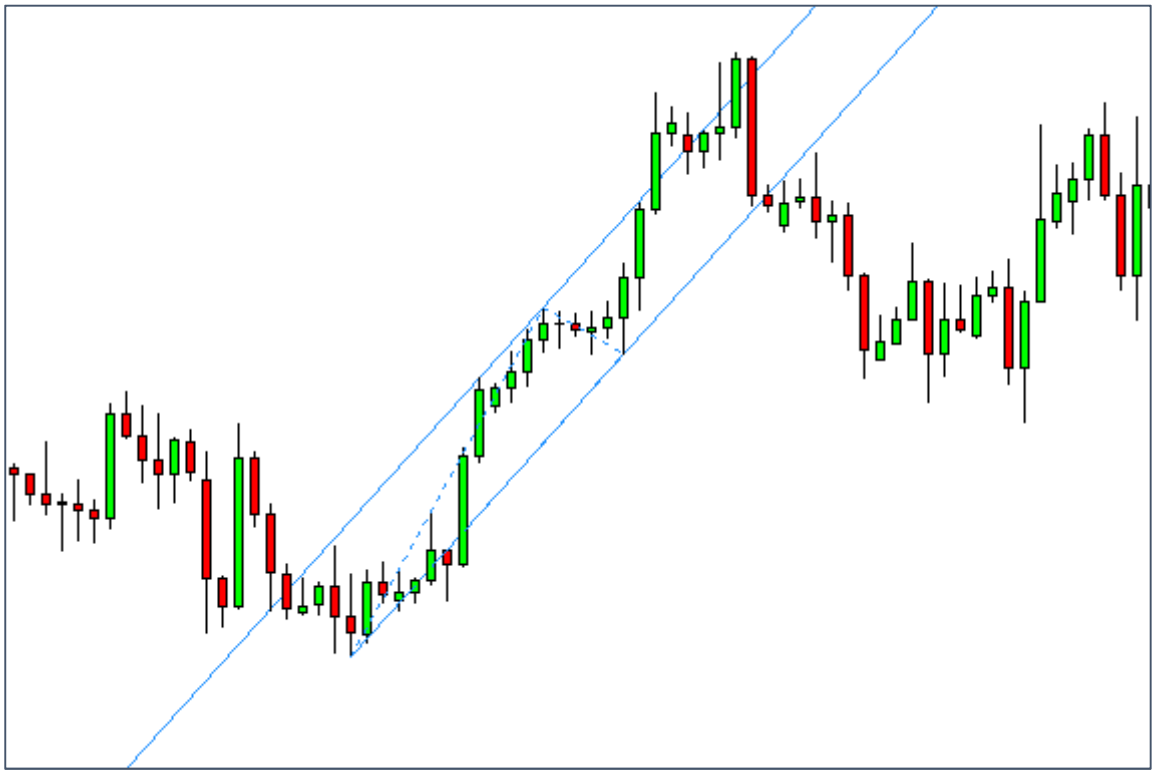

Figure 5-11: Equilibrium fractal wave channel with the shape ratio around 0.100.

Figure 5-12: Equilibrium fractal wave channel with the shape ratio around 0.500.

EFW Channel can be used for many different purposes for our trading. Trader can use channel for the reversal trading. At the same time, trader can use channel for the breakout trading. Trader can use channel for market prediction. For example, an experienced trader can predict the short-term or long-term market direction with a channel or with several channels. Typically, you can detect the four-market states with EFW Channel. Firstly, you can detect the turning point when the market changes from bullish to bearish (Figure 5-13). Likewise, you can detect the turning point when the market changes from bearish to bullish too (Figure 5-14). At the same time, you can measure the momentum of the current market. For example, when the price moves over the upwards EFW Channel, it indicates the strong bullish momentum in the market (Figure 5-15). Likewise, when the price moves below the downwards EFW

Channel, it indicates the strong bearish momentum in the market (Figure 5-16). This logic is very similar to the way Gann's angle (or Fan) works.

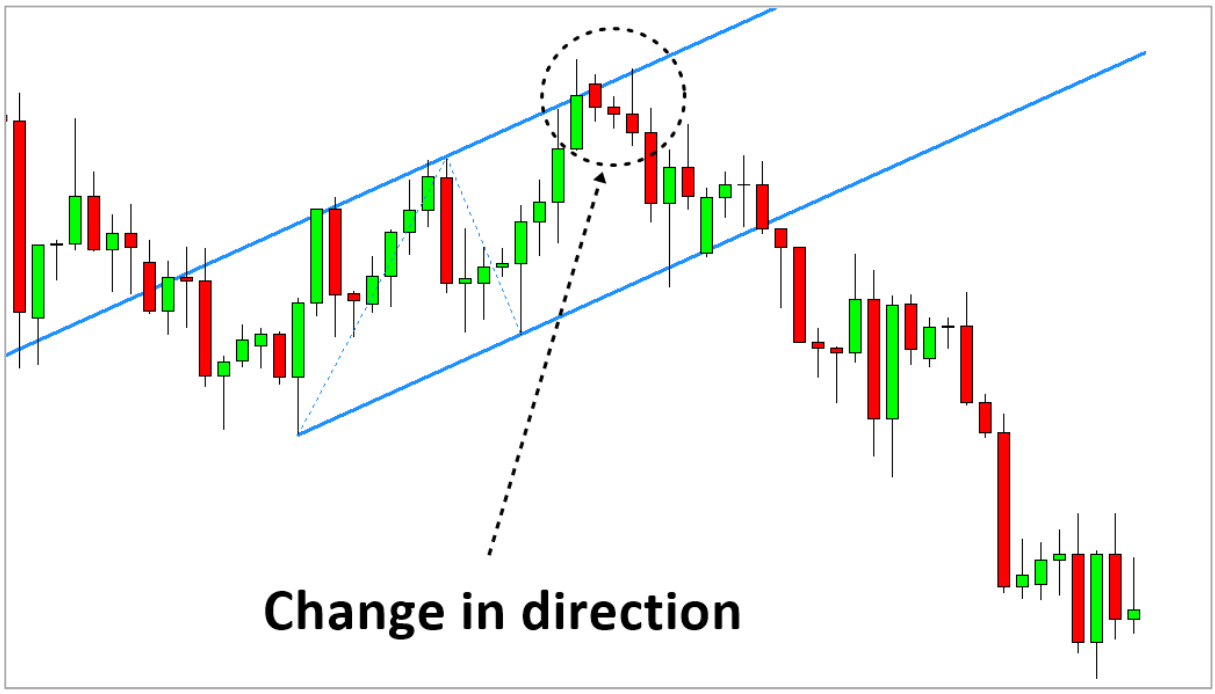

Figure 5-13: Detecting the bearish turning point with EFW channel.

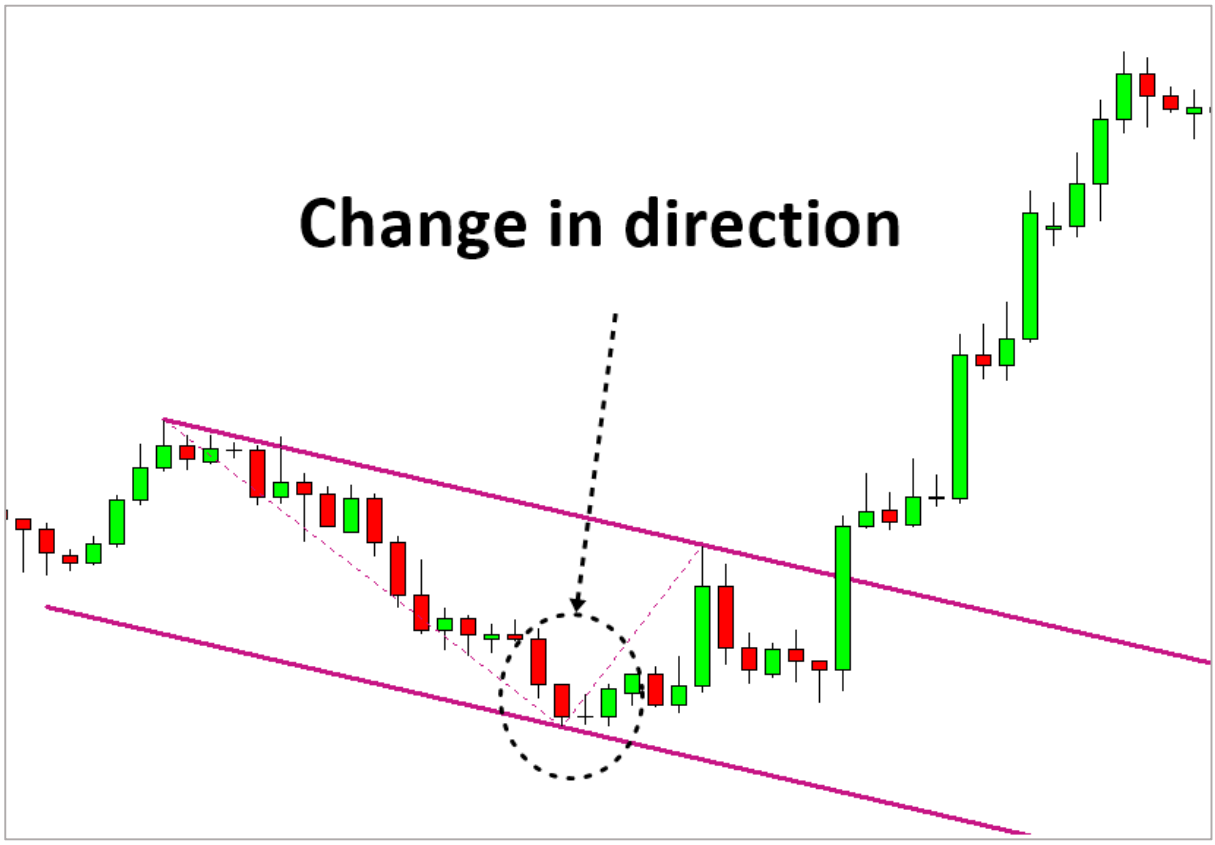

Figure 5-14: Detecting the bullish turning point with EFW channel.

Figure 5-15: Measuring the strong bullish momentum with EFW channel.

Figure 5-16: Measuring the strong bearish momentum with EFW channel.

5.4 Practical trading with Equilibrium Fractal Wave (EFW) Channel

Trading with the EFW channel is almost identical to the support and resistance trading. The main trading principle is that we are betting on the potential size of the equilibrium fractal wave. If the equilibrium fractal wave does not extend, the price will make the reversal movement. If the equilibrium fractal wave extends due to any surprise in the market, then the price will likely to show the breakout movement. To catch either reversal or breakout move, we can apply the threshold approach again from the concept of support and resistance

trading in the previous chapter as shown in Figure 5-17 and Figure 5-18. Figure 5-17 shows the trading setup for the bearish turning point. Figure 5-18 shows the trading setup for the strong bullish momentum with the upwards EFW Channel. Trader can use the proportional approach to execute buy and sell. Since we are dealing with angle, it is much easier to use the proportional approach. To calculate the trigger level for buy and sell, we can use the same formula as before:

Y Buy = Proportion (%) x Y Height and

Y Sell = Proportion (%) x Y Height, where Y Height = the height of the channel and Proportion is fraction of the height of the channel expressed in percentage.

Some proportions you can use include 20% and 30% for your trigger level. You can even use greater proportion like 50% if you wish. The upper and lower channel lines can be used as the minimum stop loss level. To avoid the tight stop loss, you should always have the greater stop loss size than the minimum stop loss level. You can set the take profit according to your preferred rewards/risk level. With the EFW channel, it is possible to achieve Reward/Risk ratio greater than 3. We also show some trading examples in Figure 5-19, 5-20, 5-21 and 5-22.

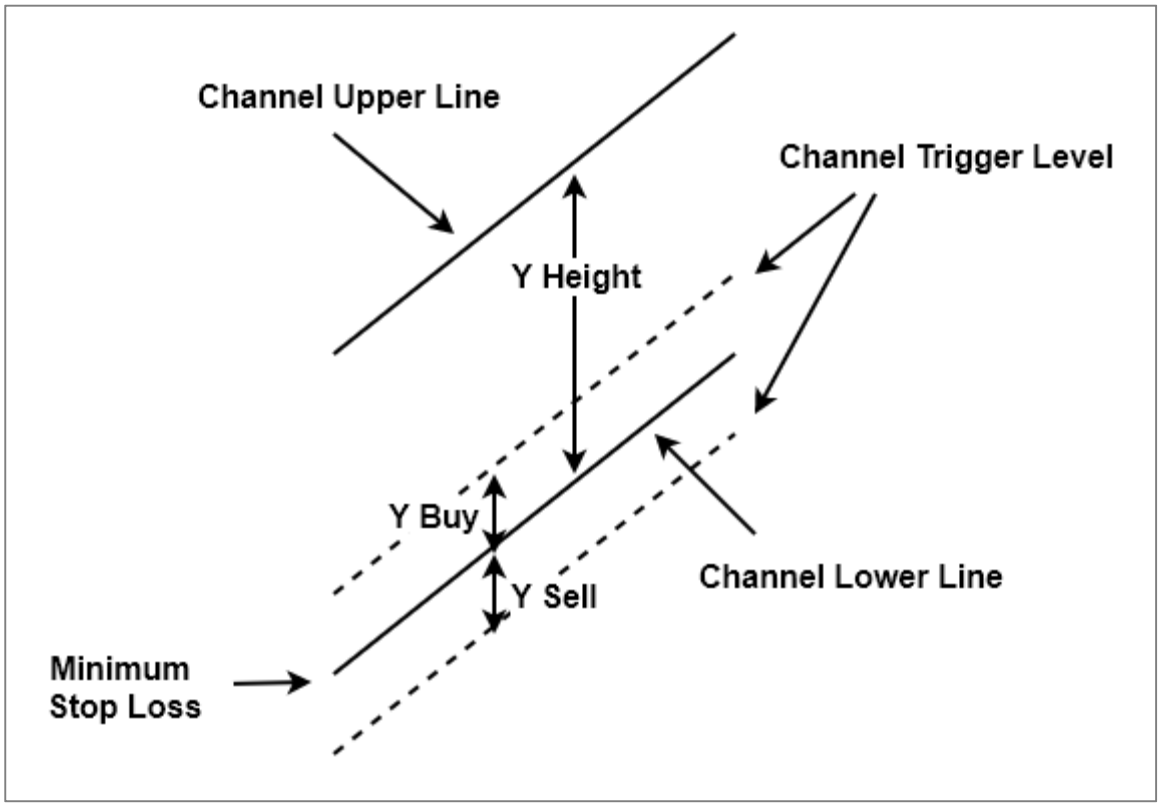

Figure 5-17: EFW Upwards Channel trading setup for the bearish turning point.

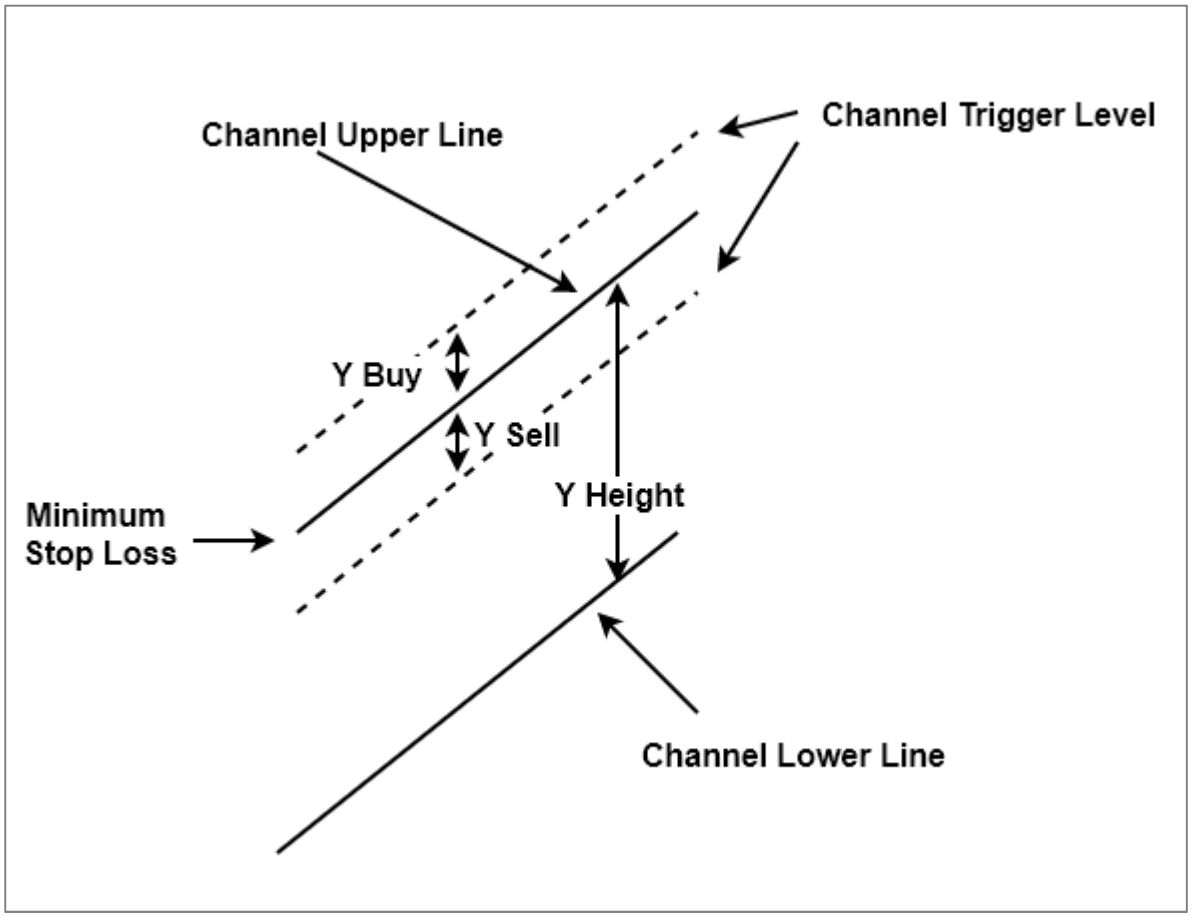

Figure 5-18: EFW Upwards Channel trading setup for strong bullish momentum.

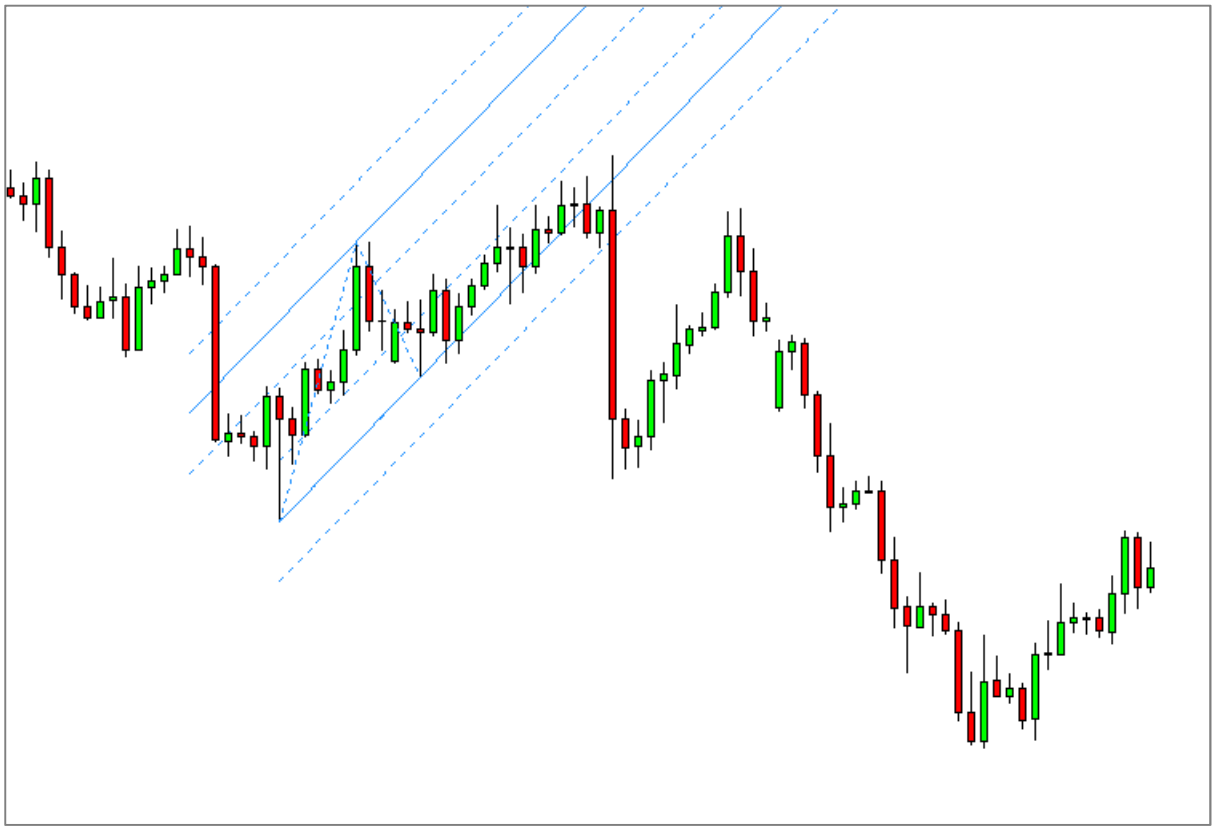

Figure 5-19: EFW Upwards channel sell trading setup on EURUSD D1 timeframe.

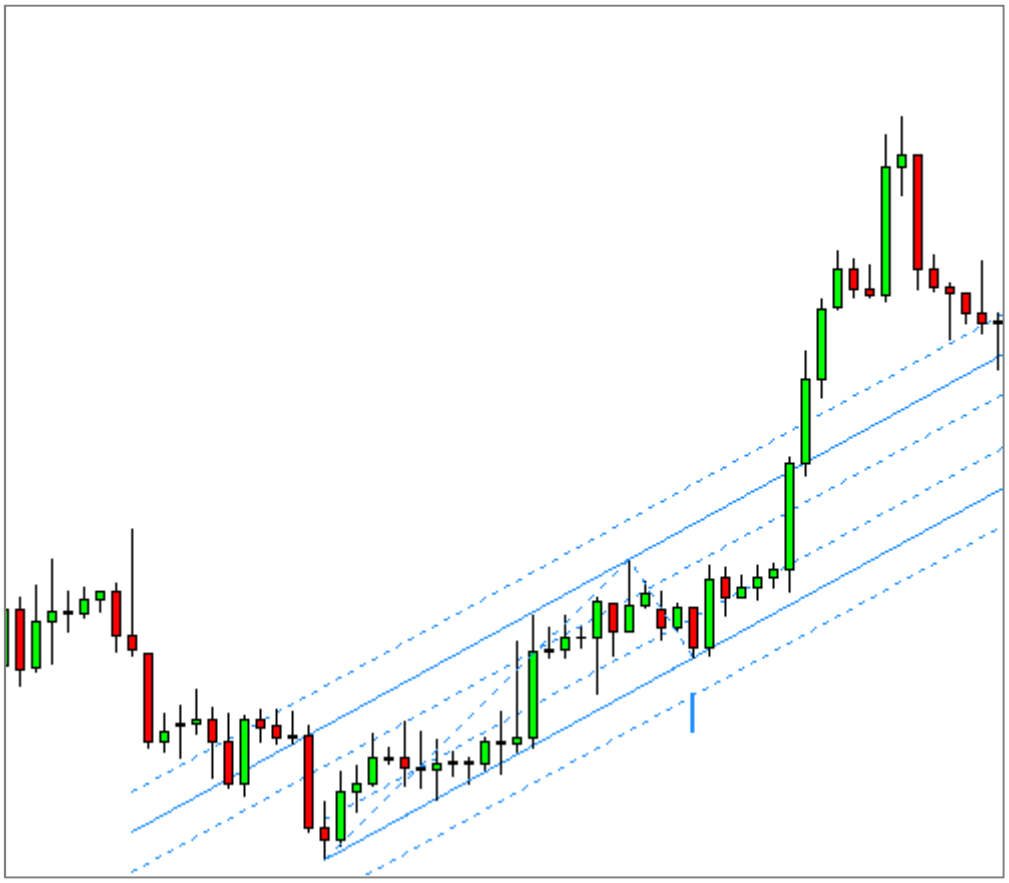

Figure 5-20: EFW Upwards channel buy trading setup on EURUSD H4 timeframe.

Figure 5-21: EFW Downwards channel buy trading setup on EURUSD D1 timeframe.

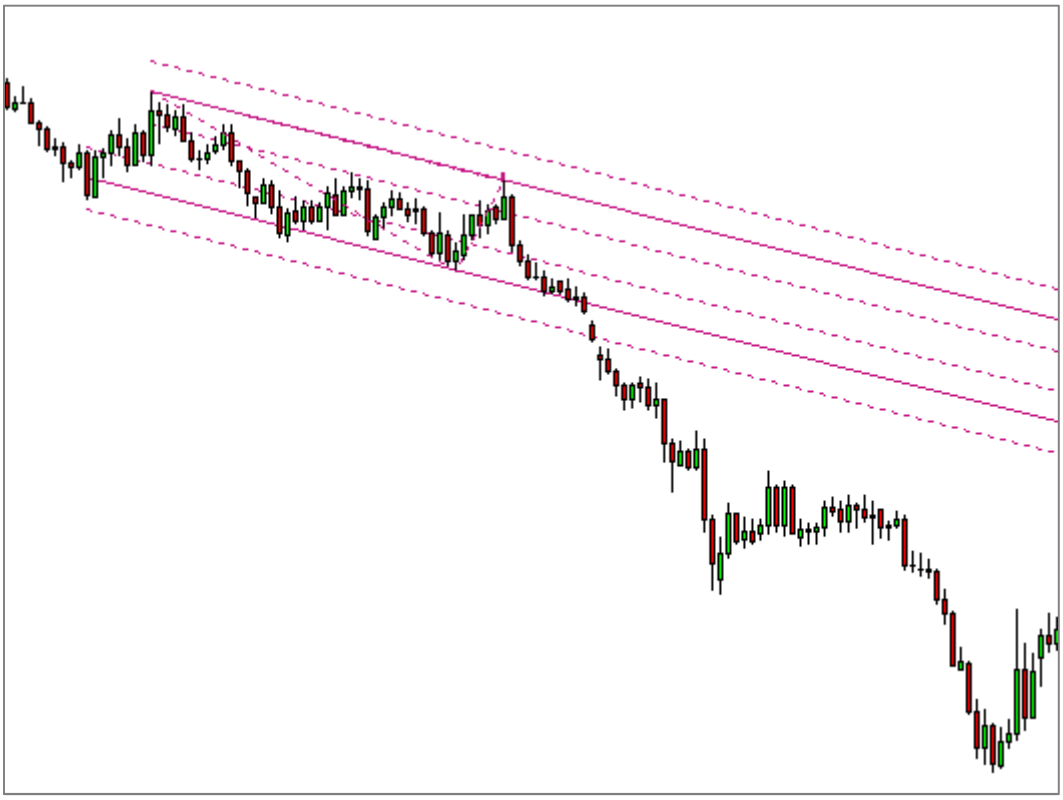

Figure 5-22: EFW Downwards channel sell trading setup on EURUSD D1 timeframe.

5.5 Superimposed Equilibrium Fractal Waves

Third characteristic of equilibrium fractal wave is that smaller equilibrium fractal waves can combine to form a bigger equilibrium fractal wave (superimposed). This third characteristic is often used by a professional trader to improve the predictability of the financial market. For example, instead of puzzling with a set of small equilibrium fractal waves, it is much more accurate to puzzle with both small and big equilibrium fractal waves together to predict the market direction.

Especially when these superimposed patterns have the highly occurring shape ratios, then the significance of these pattern increases for our trading. Let us say that EURUSD price series shows high occurrences of the shape ratio 0.382 and 0.500. If two equilibrium fractal waves, in different size, end in the same point by providing the ratio 0.500 and 0.382, there is high chance that market can turn in this ending point. This is one way to utilize these superimposed patterns for our trading.

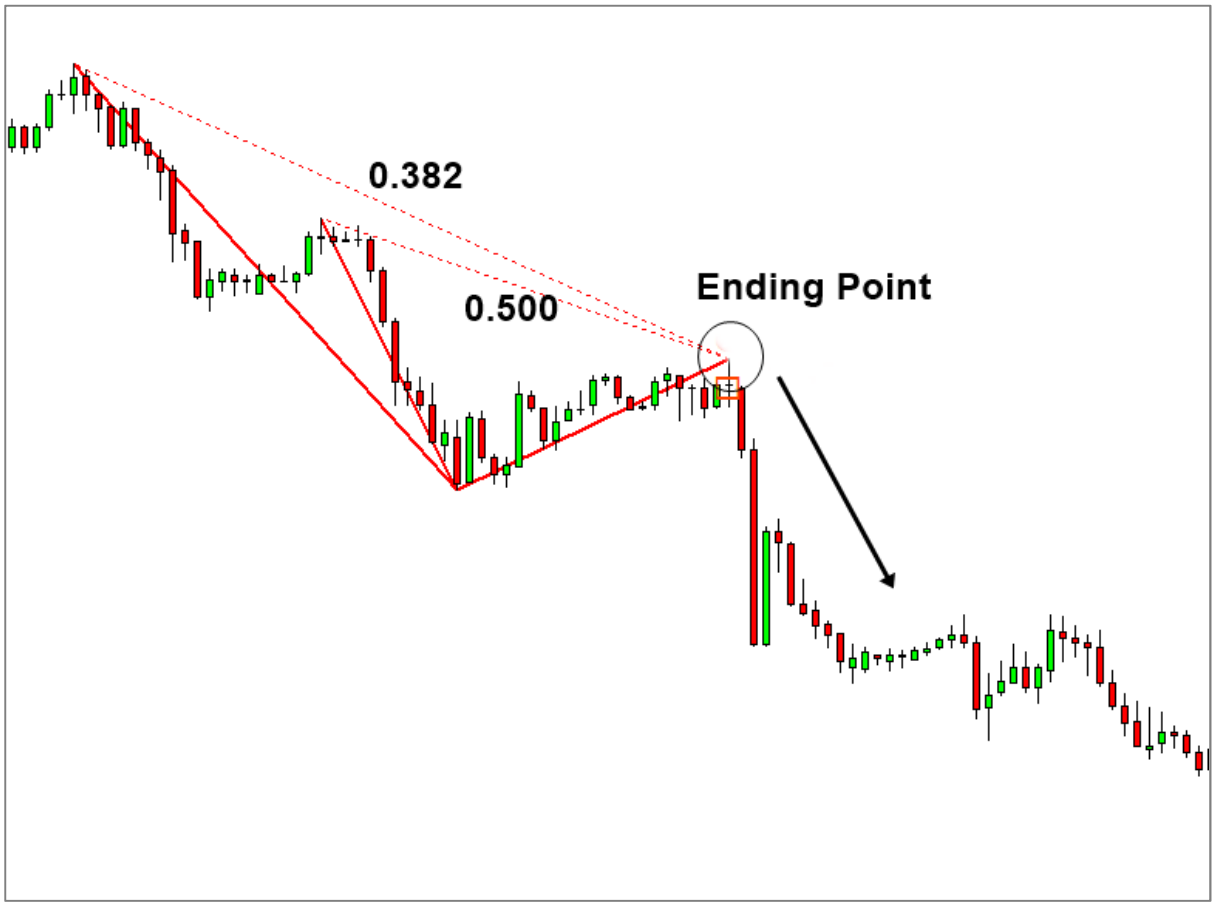

Figure 5-23: Superimposed Equilibrium fractal wave example.

Now we show some more examples of our reversal prediction using this superimposed equilibrium fractal waves. In Figure 5-24 and Figure 5-25, a large Equilibrium fractal wave is overlapping with a small equilibrium fractal wave. We

can make the bullish reversal prediction after the last candle is completed. Making the prediction based on the two Equilibrium fractal waves can increase the probability of winning marginally over just using one equilibrium fractal wave.

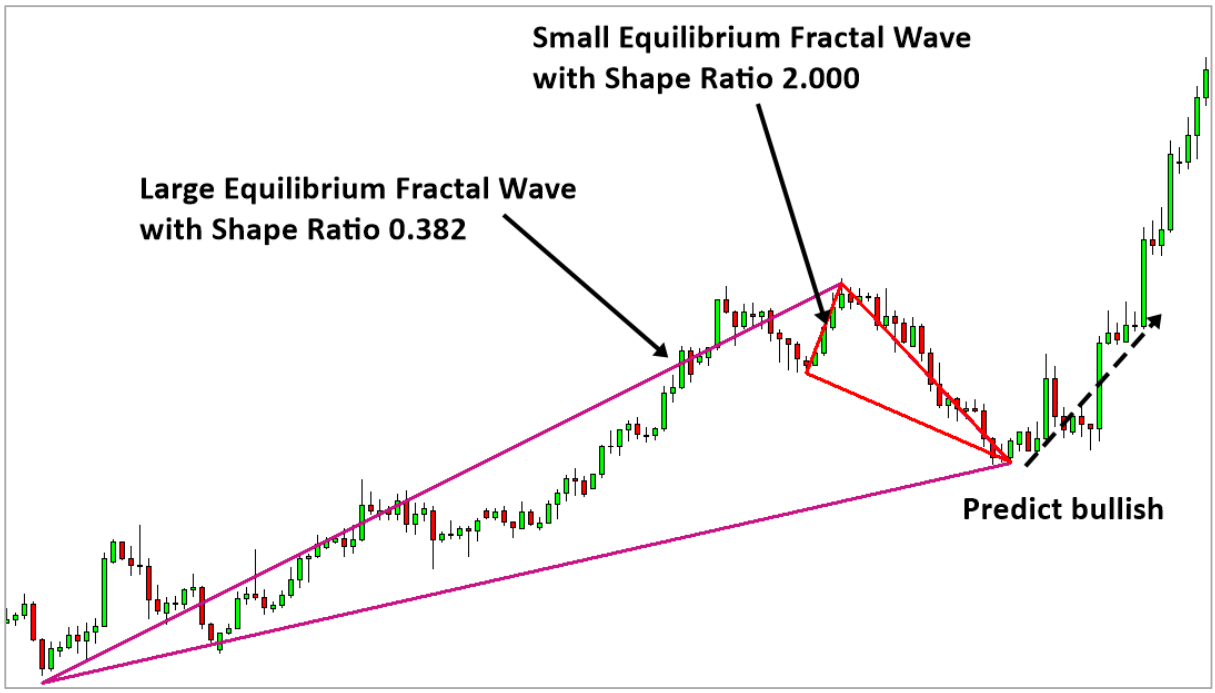

Figure 5-24: Superimposed Equilibrium fractal wave for bullish reversal trading setup (EURUSD D1).

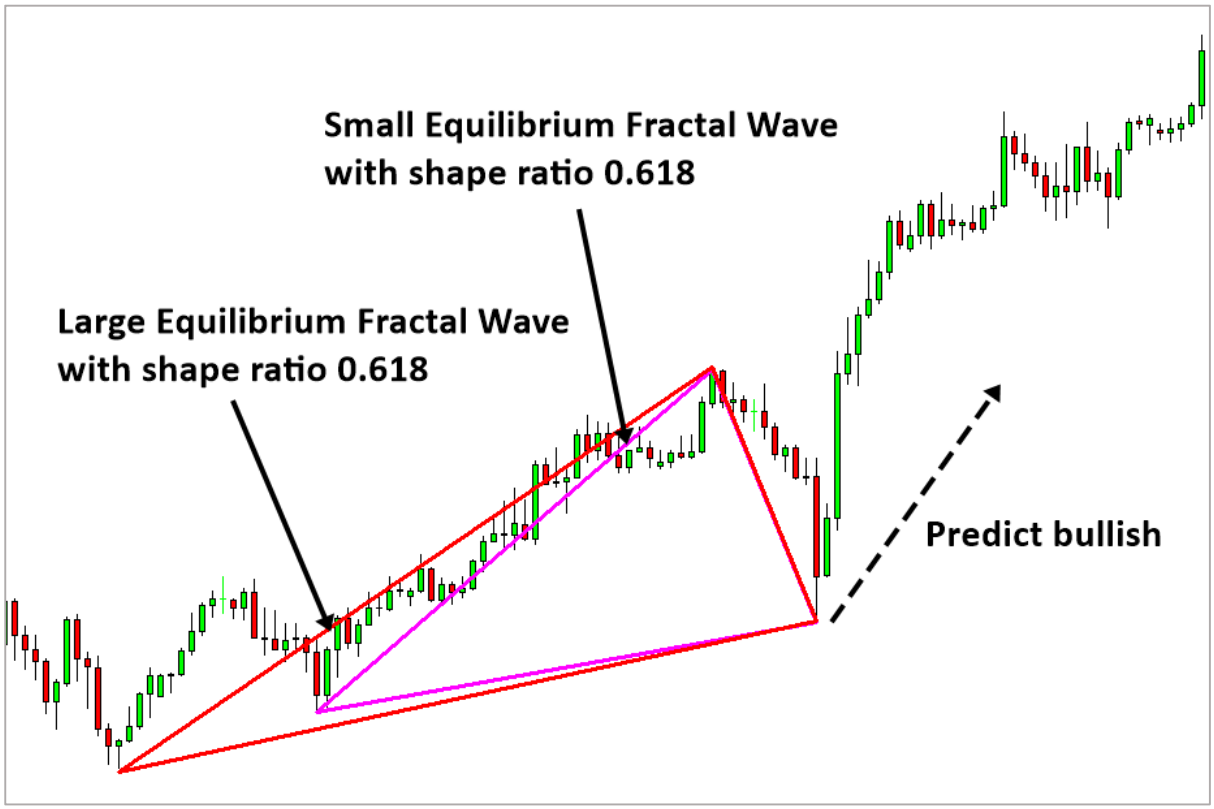

Figure 5-25: Superimposed Equilibrium fractal wave for bullish reversal trading setup (EURUSD H1).

Likewise, we can use these superimposed equilibrium fractal waves to make the bearish reversal prediction too as shown in Figure 5-26 and Figure 5-27. You can even use three or four equilibrium fractal waves for your prediction. However, the superimposed patterns with three or four equilibrium fractal waves are rare. If they do appears then they can provide a good trading opportunity.

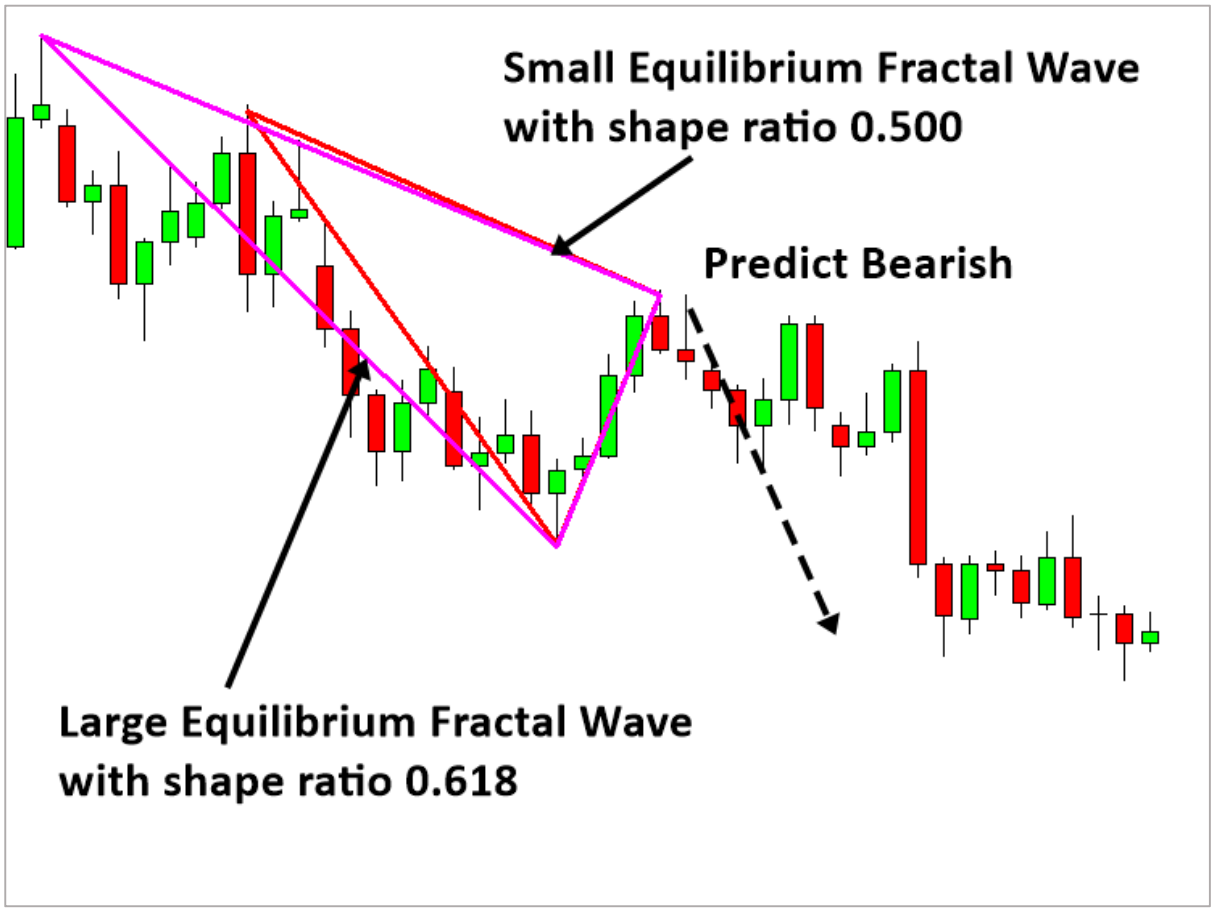

Figure 5-26: Superimposed Equilibrium fractal wave for bearish reversal trading setup (EURUSD H1).

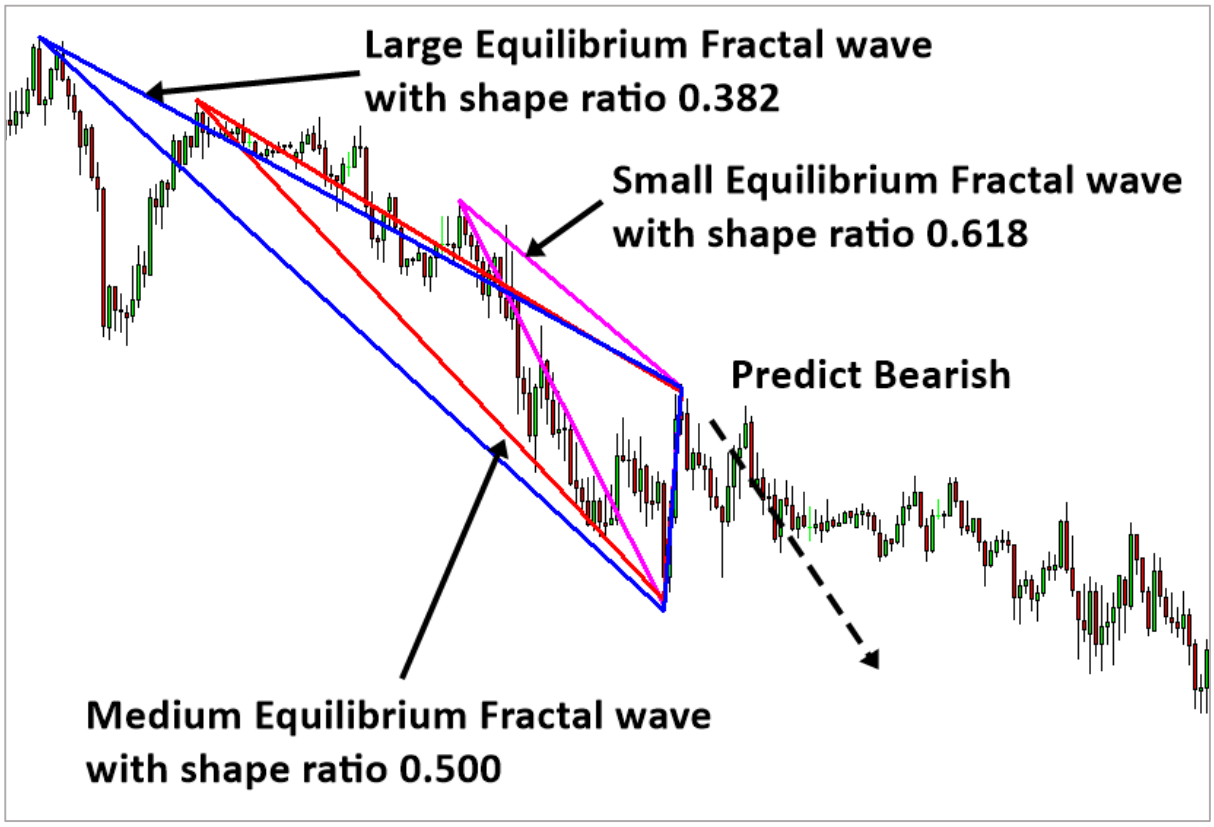

Figure 5-27: Superimposed Equilibrium fractal wave for bearish reversal trading setup (EURUSD M15).

Trader should not assume that he could predict the reversal every time. Increased probability does not mean that you are guaranteed to be right every time. Based on the second characteristic of Equilibrium fractal wave, extension, the price can still penetrate these superimposed equilibrium fractal waves for the breakout opportunities. When they do, they can penetrate the superimposed level with even higher energy than the level projected by single equilibrium fractal wave. To trade with the superimposed level, you have to project the shape ratios from several equilibrium fractal waves in advance. Once you can identify the overlapping level between several Equilibrium fractal waves, you can trade for the breakout opportunity. When you trade the breakout

opportunity, you can use the idea of trigger level we taught you before in the support and resistance trading.

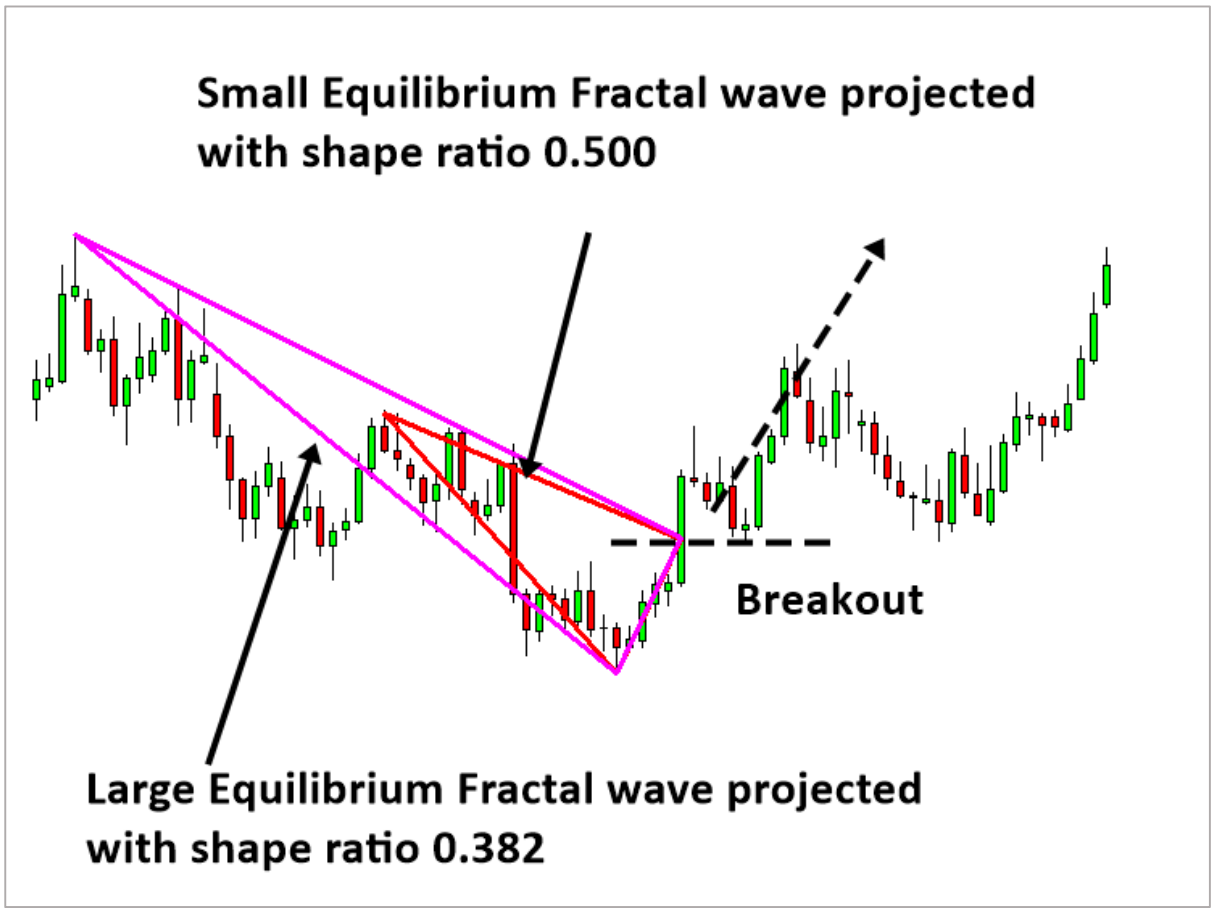

Figure 5-28: Superimposed projection for bullish breakout trading setup (EURUSD D1).

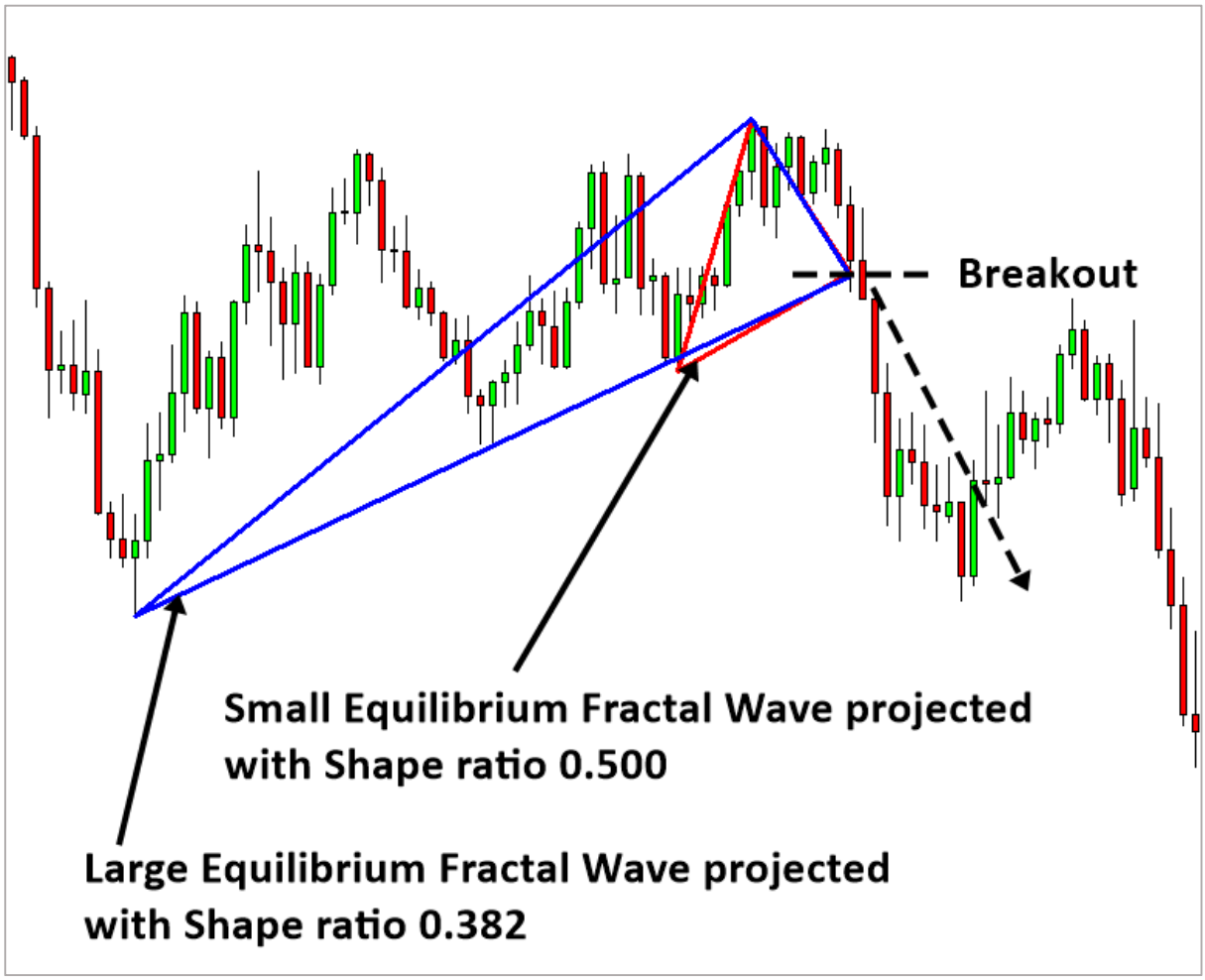

Figure 5-29: Superimposed projection for bearish breakout trading setup (USDJPY H1).

5.6 Superimposed Equilibrium Fractal Wave Channel

In previous chapter, we have introduced the EFW Channel. Probably it was not too hard in term of how to construct channels. Now the same idea can be extended using the superimposed patterns. Construction of Superimposed Channel can be done in two steps as before. Firstly, we will draw the base line by connecting point 1 and point 3. Secondly, by projecting the base line in parallel to point 2, we can create the channel over the superimposed pattern. It

is typically good idea to aim to draw the channel on the 3 points of larger Equilibrium Fractal Wave. The channel on superimposed pattern has stronger prediction power comparing to the channel created from single EFW. If you are not convinced with this idea, then imagine simple two waves interfering. Two waves can interact together either constructive or destructive. To have the constructive interference, two waves must have the peak or trough overlapping in the same position. When the final points of two equilibrium fractal waves are end up in the same position, two equilibrium fractal waves will have the constructive relationship. For example, traders recognized EFW 1 as the trading opportunity will join the force together with traders recognized EFW 2 as the trading opportunity. Hence, the superimposed patterns with two or three EFWs will bring much stronger reaction to the market. In general, more EFWs are superimposed together, its prediction power will grow too.

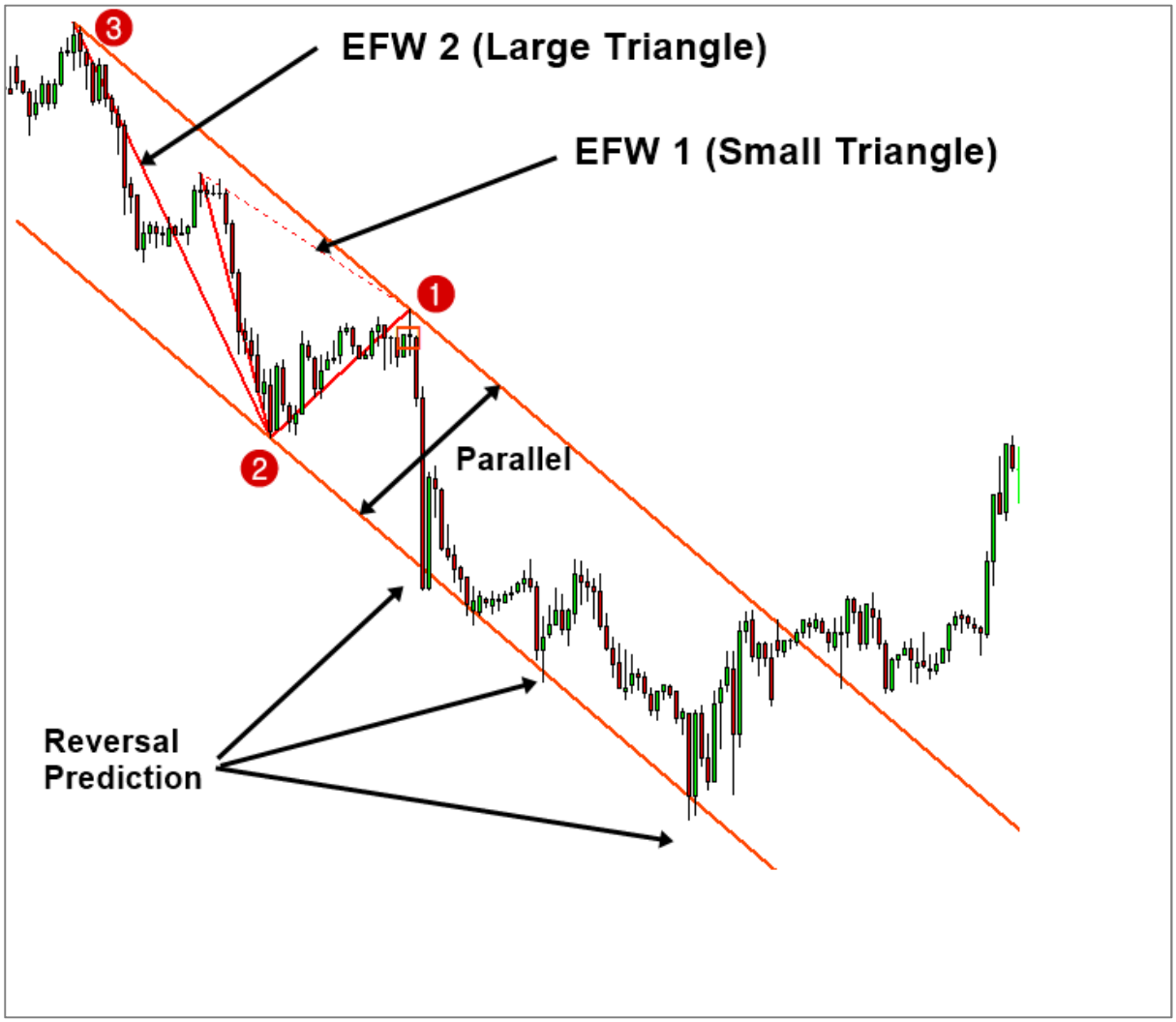

Figure 5-30: Superimposed Channel example.

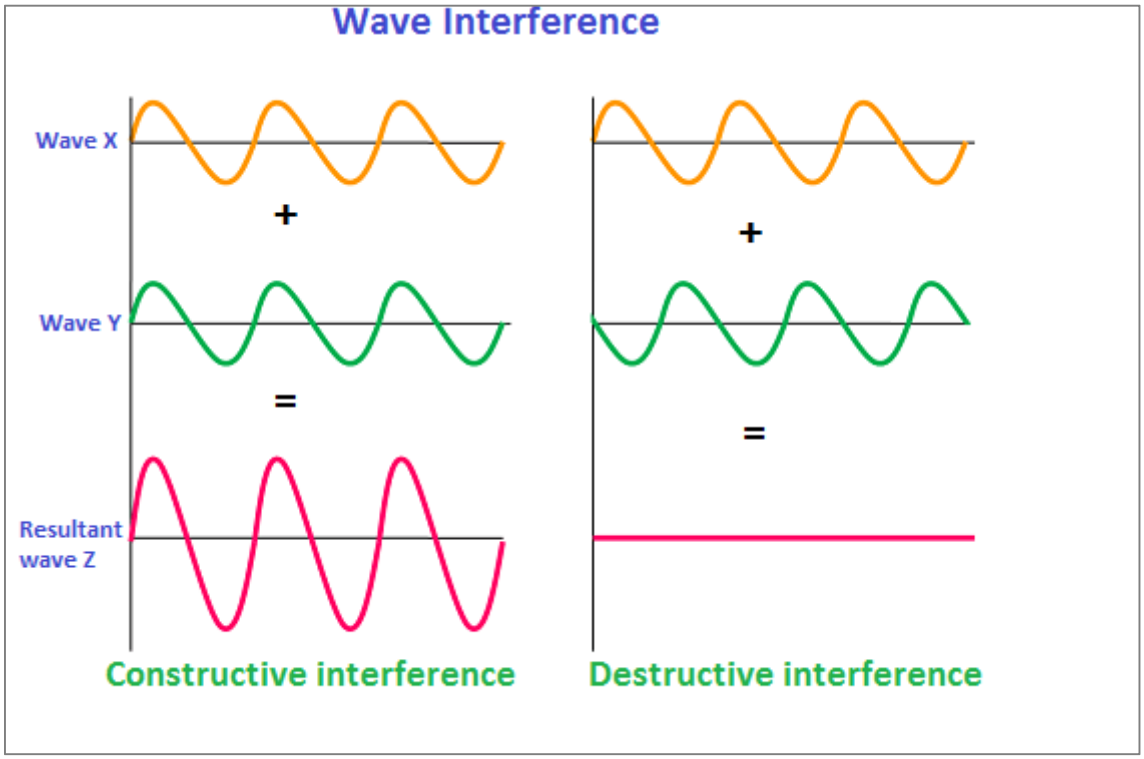

Figure 5-31: Demonstration of two simple wave interference.

Superimposed channel can be used on its own using buy and sell trigger margin rule specified in the previous chapter. Buy and sell trigger level can be identified exactly same as in the single EFW channel. Another excellent usage of superimposed channel is that we can expand the channel into grid lines to get the medium to long-term market prediction. When a superimposed channel is expanded across charts, it provides the predictable grid lines. Traders love the grid lines because they can easily read trend and reversal area. Often you will find that well positioned superimposed channel will provide amazingly accurate prediction for the market movement. Now one might question how to construct the expansion from the superimposed channel. Once again, this is not a rocket science. The expansion construction is simple. Firstly, I much prefer to use the half (50%) of channel width to construct the expansions. One might be able to

use 100% of channel width or other width if you wish. In this book, we will assume that we will construct the expansion with 50% of channel width.

As shown in Figure 5-32, expansion lines can be constructed by expanding the channel by the half of channel width in parallel. We can continue this process until we see enough parallel lines filled in your chart for the market prediction. Since superimposed channel provide the fixed location in your chart, there is the reduced subjectivity in constructing the expansion. This is one of the attraction of using superimposed channel over other competing method.

In addition, when we place two crossing channels with expansion in one chart, we can construct more detailed grid lines comparing to the case of single superimposed channel. When you want to use two superimposed channels to construct the grid lines, first channel must have up slope whereas the second channel must have down slope. If you have two up slop or two down slope channels, then you will never able to construct grid lines. Remember that well-constructed grid lines can provide you the rich information about market direction and reversal points. Typically, it is not good idea to use more than two superimposed channels because they will look messy in your chart. You should stick with either one superimposed channel or two superimposed channels to construct the grid lines. If you are hard to understand how these grid lines work for your trading, then just treat them as a diagonal support and resistance lines. These grid lines can be used together with many other trading strategies including Harmonic pattern, Elliott Wave and other technical indicators. For example, the grid lines can indicate trend strength after the formation of Harmonic pattern. This can help you to avoid failed Harmonic pattern or to identify when to disregard the detected Harmonic pattern from your trading. Beside these superimposed channel and Harmonic pattern interaction,

superimposed pattern can be used together with Harmonic pattern. For example, when superimposed pattern is coincided with point D of Harmonic pattern, this is much stronger sign of the turning point. Harmonic pattern is only one example in this article. Superimposed pattern and channel can work with many other trading strategies for your practical trading.

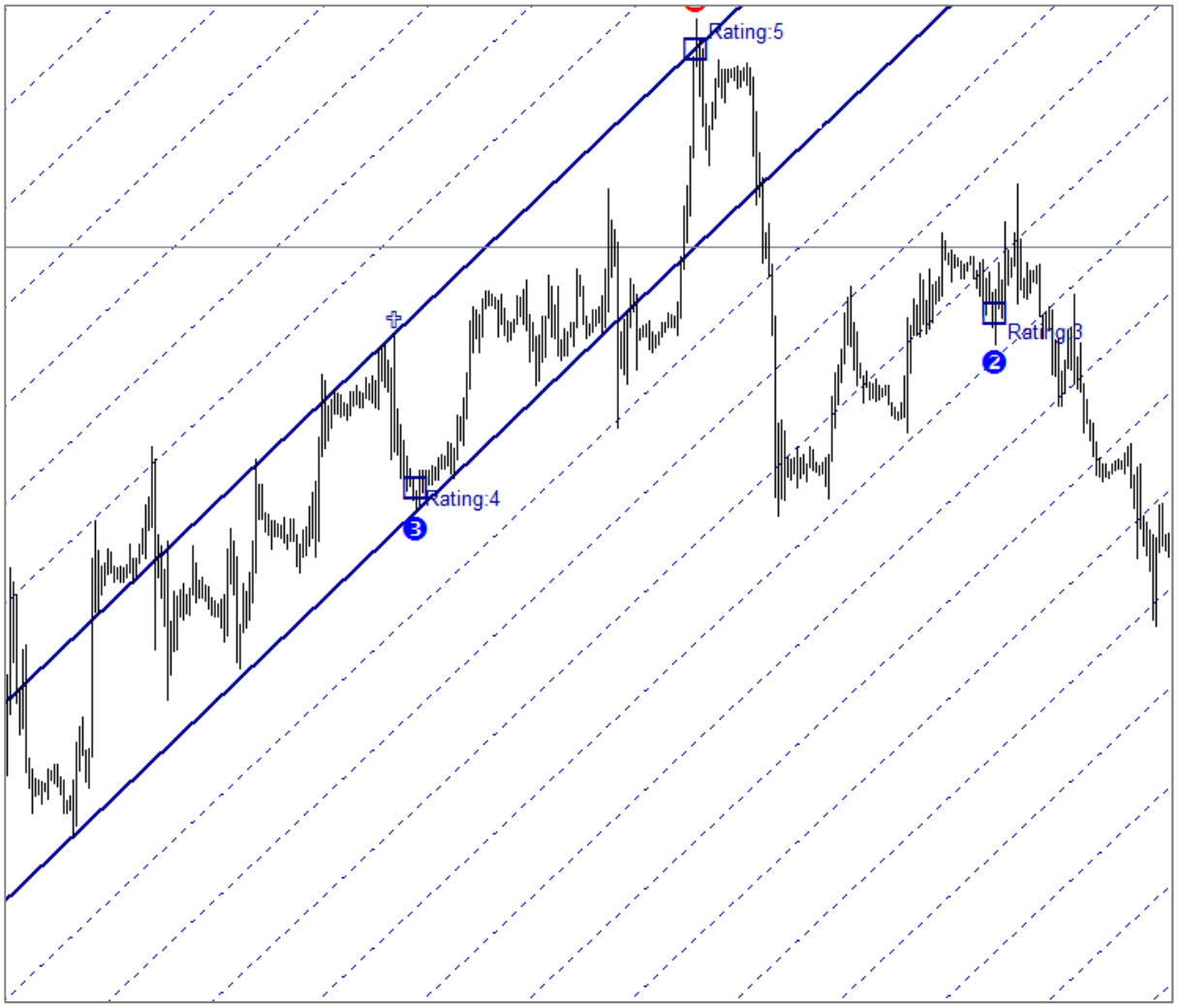

Figure 5-32: Demonstration of grid lines constructed from one superimposed Channel.

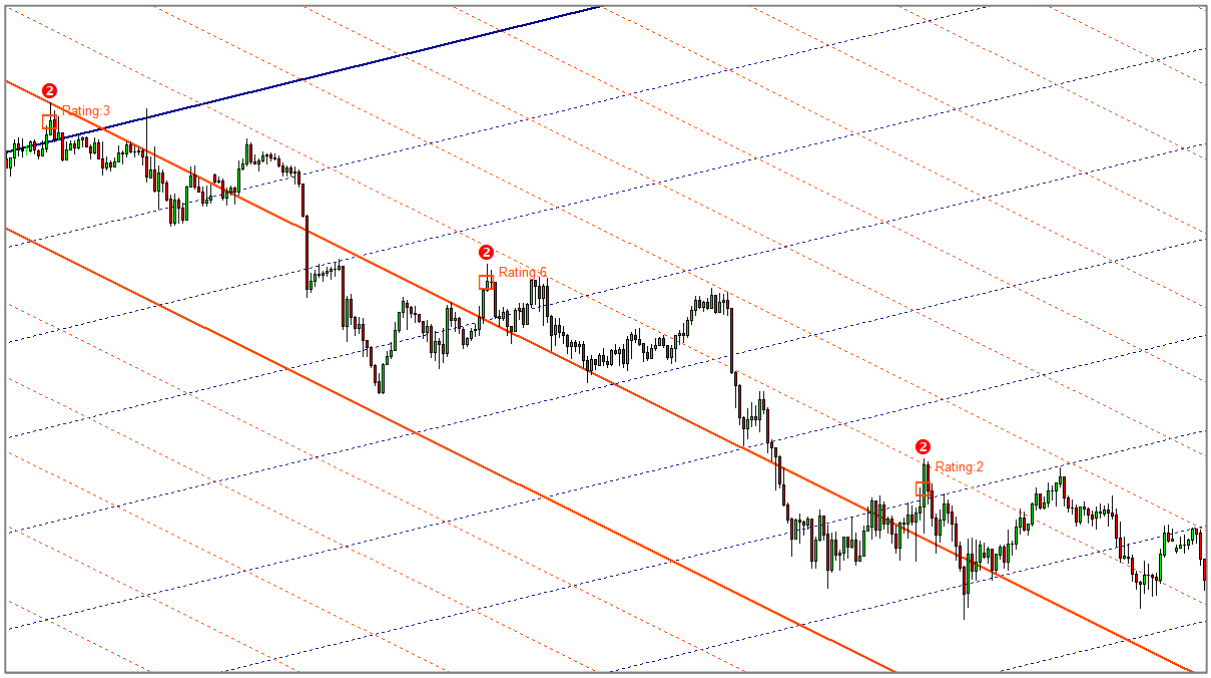

Figure 5-33: Demonstration of grid lines constructed from two superimposed channels.

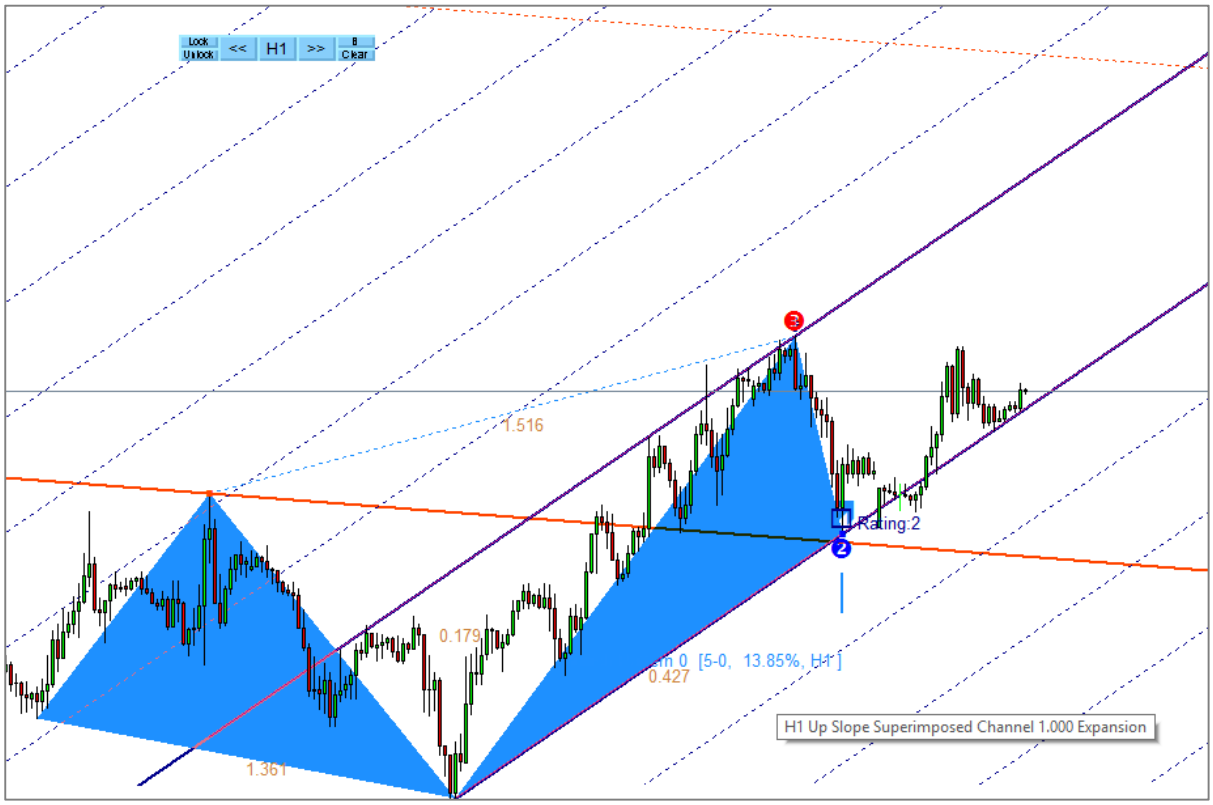

Figure 5-34: Harmonic pattern and grid lines constructed from superimposed channel.

Figure 5-35: Example of Harmonic pattern and superimposed pattern interaction.

6. Revealing the Market Structure with the distribution of EFW Index

Many of us are eager to know the true structure of the financial market. It is because such a knowledge can provide us an unmatched benefit for our financial trading. There are some scientific tools to help you with this. However, there are only few tools to reveal the structure of the financial market on its fractal level. Especially some of the tools are not easy to use for our trading. More straightforward tool for this task is the equilibrium fractal wave (EFW) index. We have already introduced the EFW index in the previous chapter. The EFW index is a quantity describing how frequently we can detect the particular shape ratio (Y2/Y1) in the financial market. For example, if the Golden ratio 0.618 is really dominating in the financial market, we should have a highest EFW index among all ratios. Otherwise, our belief on the Golden ratio can be wrong or less optimal. It is the same for other Fibonacci ratios. If you were using the Fibonacci ratios 0.382 (38.2%), you should expect the EFW index of 0.382 to be higher. Otherwise, you were trading less optimal strategy for your investment. To reveal the market structure, we can create a distribution of EFW index from the ratio 0.1 to the ratio 3.0. We list the distribution of EFW index for EURUSD, GBPUSD and USDJPY in Figure 6-1, 6-2 and 6-3.

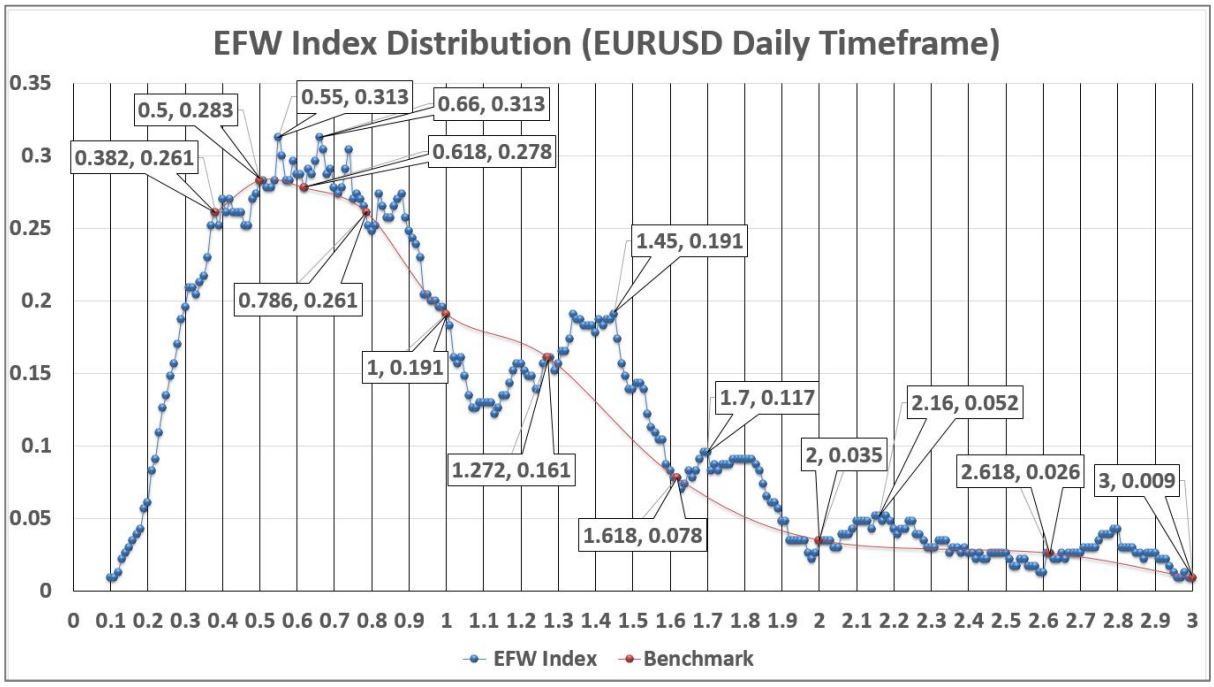

Figure 6-1: EFW Index Distribution for EURUSD Daily Timeframe from 2009 09 02 to 2018 02 20 (Label inside callout box, left: Ratio, right: EFW Index, vertical axis: EFW index, horizontal axis: ratio from 0.1 to 3.0).

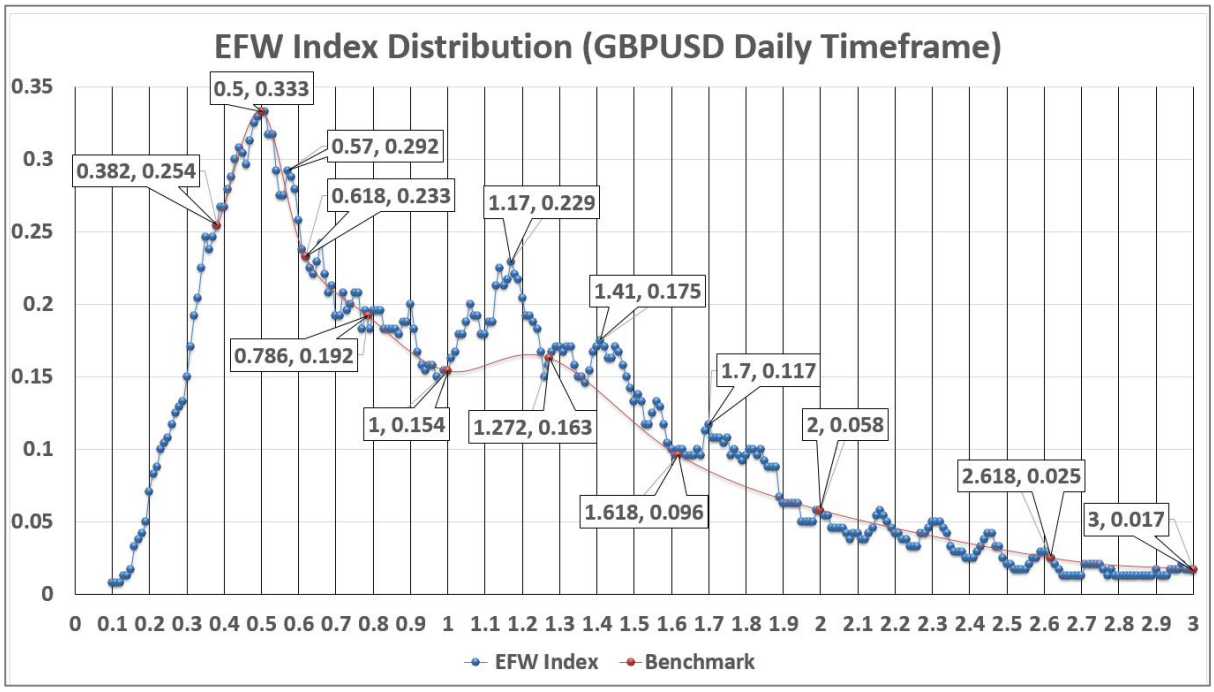

Figure 6-2: EFW Index Distribution for GBPUSD Daily Timeframe from 2009 09 02 to 2018 02 20 (Label inside callout box, left: Ratio, right: EFW Index, vertical axis: EFW index, horizontal axis: ratio from 0.1 to 3.0).

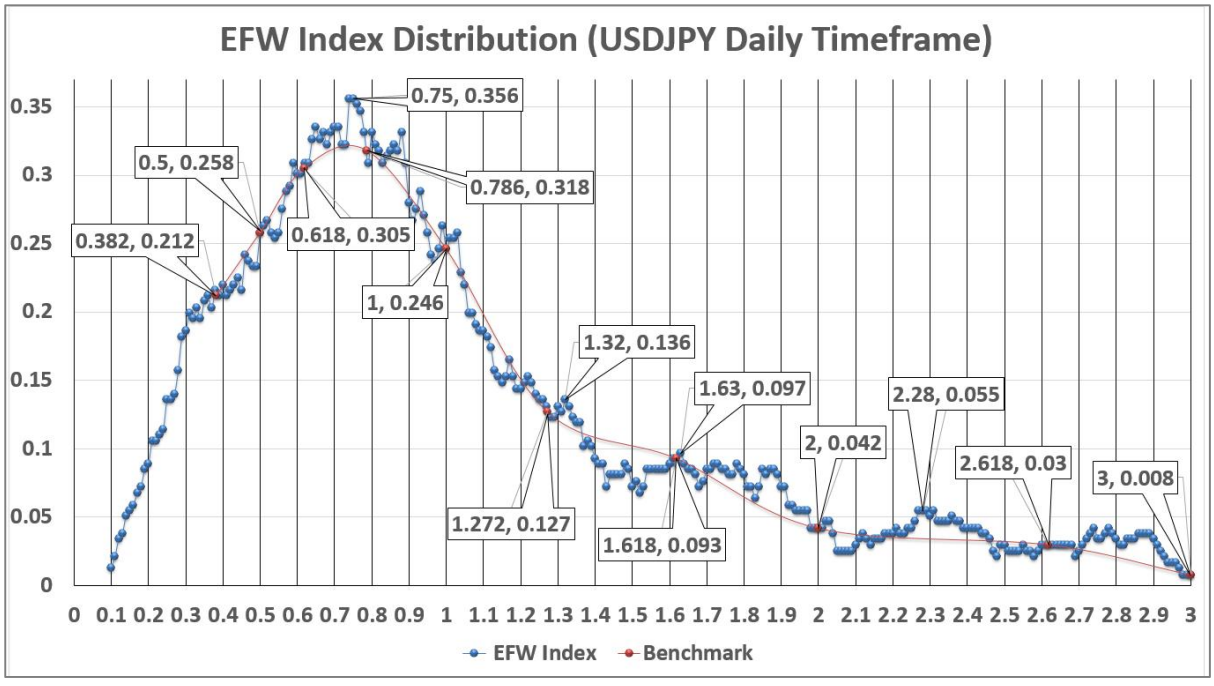

Figure 6-3: EFW Index Distribution for USDJPY Daily Timeframe from 2010 05 30 to 2018 02 20 (Label inside callout box, left: Ratio, right: EFW Index, vertical axis: EFW index, horizontal axis: ratio from 0.1 to 3.0).

You can immediately recognize several important factors by looking at Figure 6-1, 6-2 and 6-3. Firstly, each financial market has the different footprint of the EFW index distribution. This justifies their own unique behaviour of each financial instrument. Secondly, our belief on the Golden ratio and the Fibonacci ratios are less optimal rather than being wrong. We can tell that the Golden ratio and the Fibonacci ratios stay in the top of the league table for three currency pairs. However, still some other ratios are ranked highest in the table. For example, the ratio 0.66, 0.50 and 0.75 stayed in the top of the table. It should be noted that for each financial instrument, there is a preferred ratio for your trading. If you were trading using the ratio 0.618 for GBPUSD, then it was far less optimal. You should have used the ratio 0.500 instead. In Figure 6-4, we have calculated the EFW index over the rolling window for GBPUSD daily timeframe. The rank of each ratio does not change often. We can tell that the market structure is stable over the time. Therefore, the revealed market structure in Figure 6-1, 6-2 and 6-3 might be at least semi-permanent characteristics of each financial instrument.

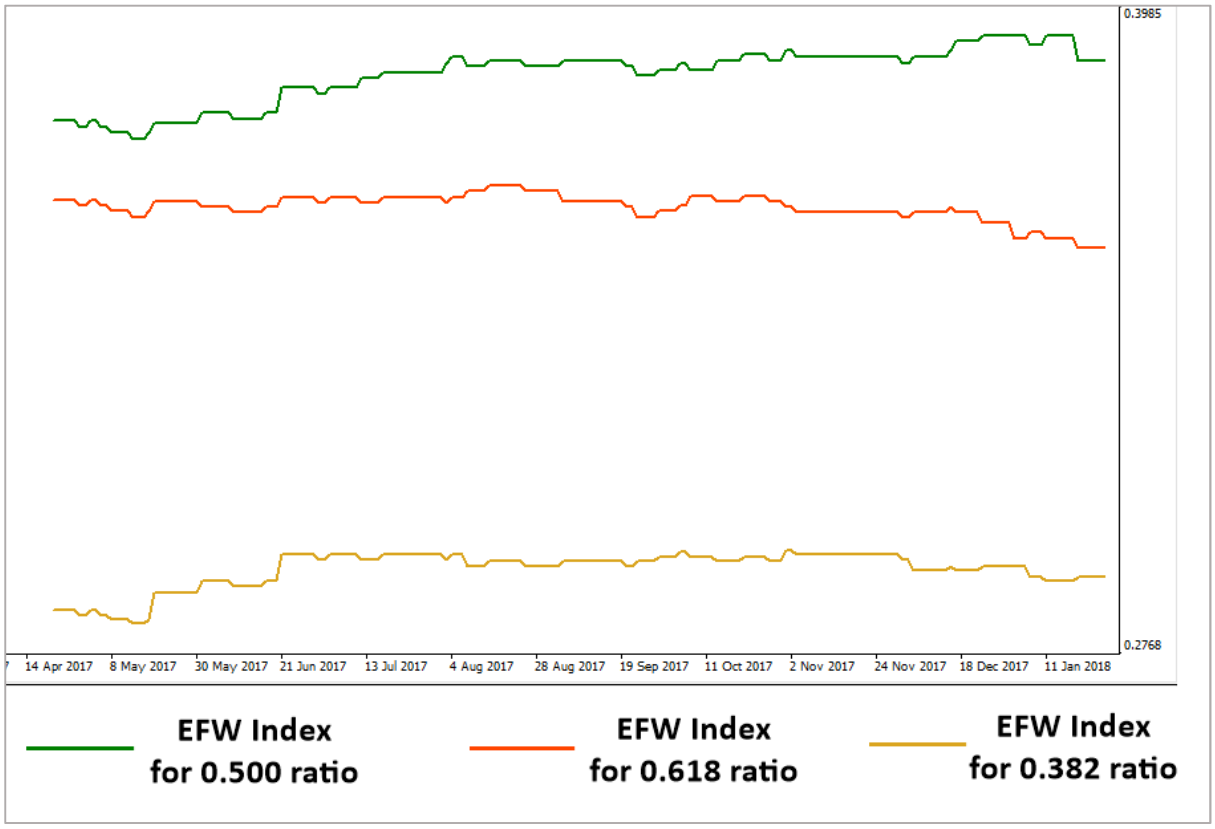

Figure 6-4: EFW index for GBPUSD D1 timeframe from 2007 01 04 to 2018 01 20.

This analysis provides useful information for our trading, that no one have revealed before. This analysis answers the questions on the Golden ratio and the Fibonacci ratio, which were not answered last 100 years. If you were trading using the Golden ratio and the Fibonacci ratio, you might be shocked a bit. Many traders including myself might be curious why the Golden ratio is less optimal or not optimal for some financial instruments as shown in Figure 6-1, 6-2 and 6-3. Well, honestly I do not have the right answer for it. I think that no one has the right answer but we can only guess. In nature, the golden ratio or other Fibonacci ratios are repeating in much higher precision than the financial market. The less precise nature in the financial market might be due to the higher noise in the financial market, resulted from the complex interaction of too many

diverse players. Another possible explanation might be that the profitability of the Golden ratio and some Fibonacci ratios might be exhausted gradually because too many of us were using them every day in our trading. Therefore, the EFW index distribution in Figure 6-1, 6-2 and 6-3 might be showing the distorted image of the financial market. Please feel free to contact me if you have a better explanation about why the Golden ratio is less or not optimal for some financial market.

7. Appendix

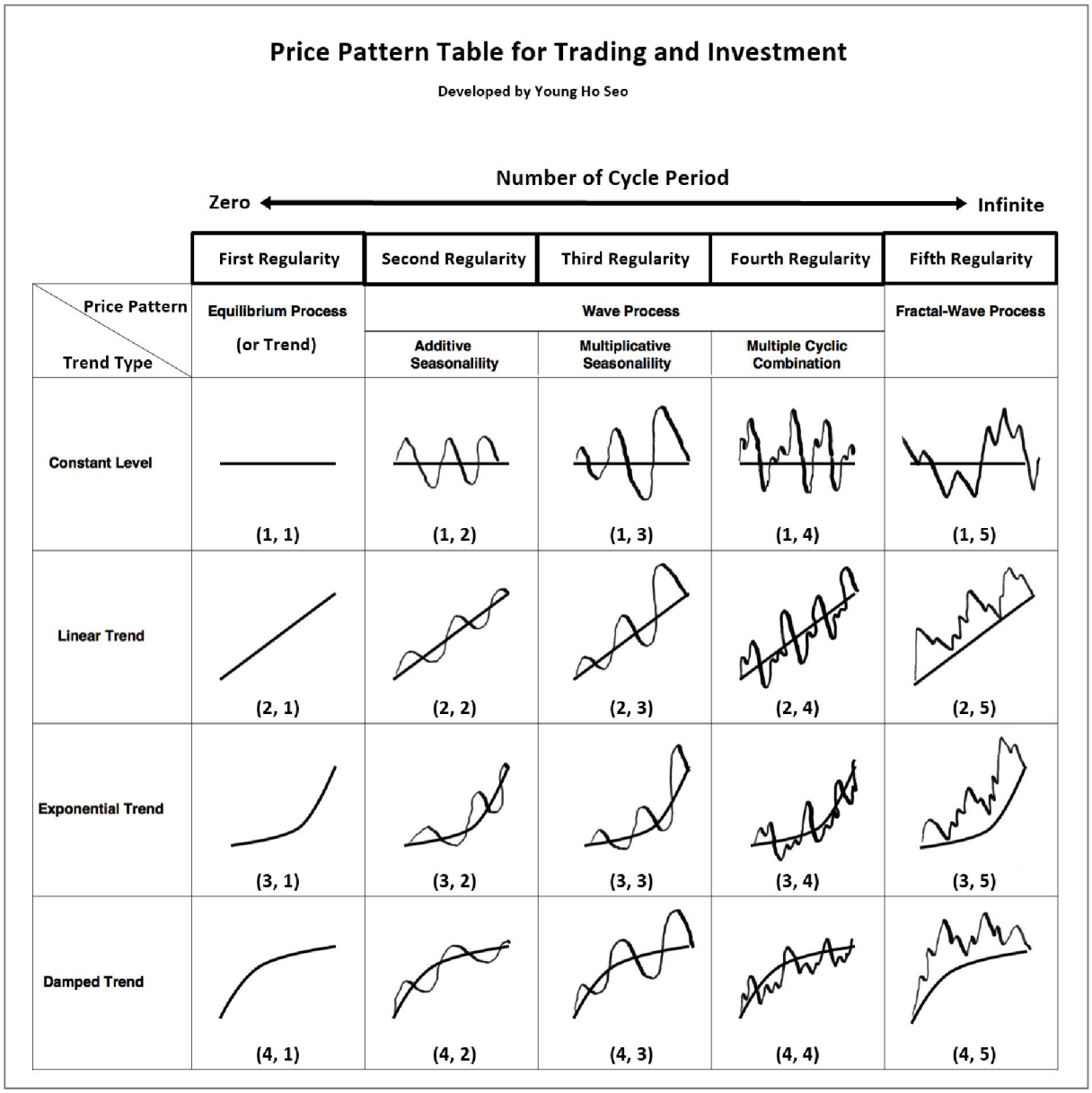

Figure 7-1: Five Regularities and their sub price patterns with inclining trends. Each pattern can be referenced using their row and column number. For example, exponential trend pattern in the third row and first column can be referenced as Pattern (3, 1) in this table.

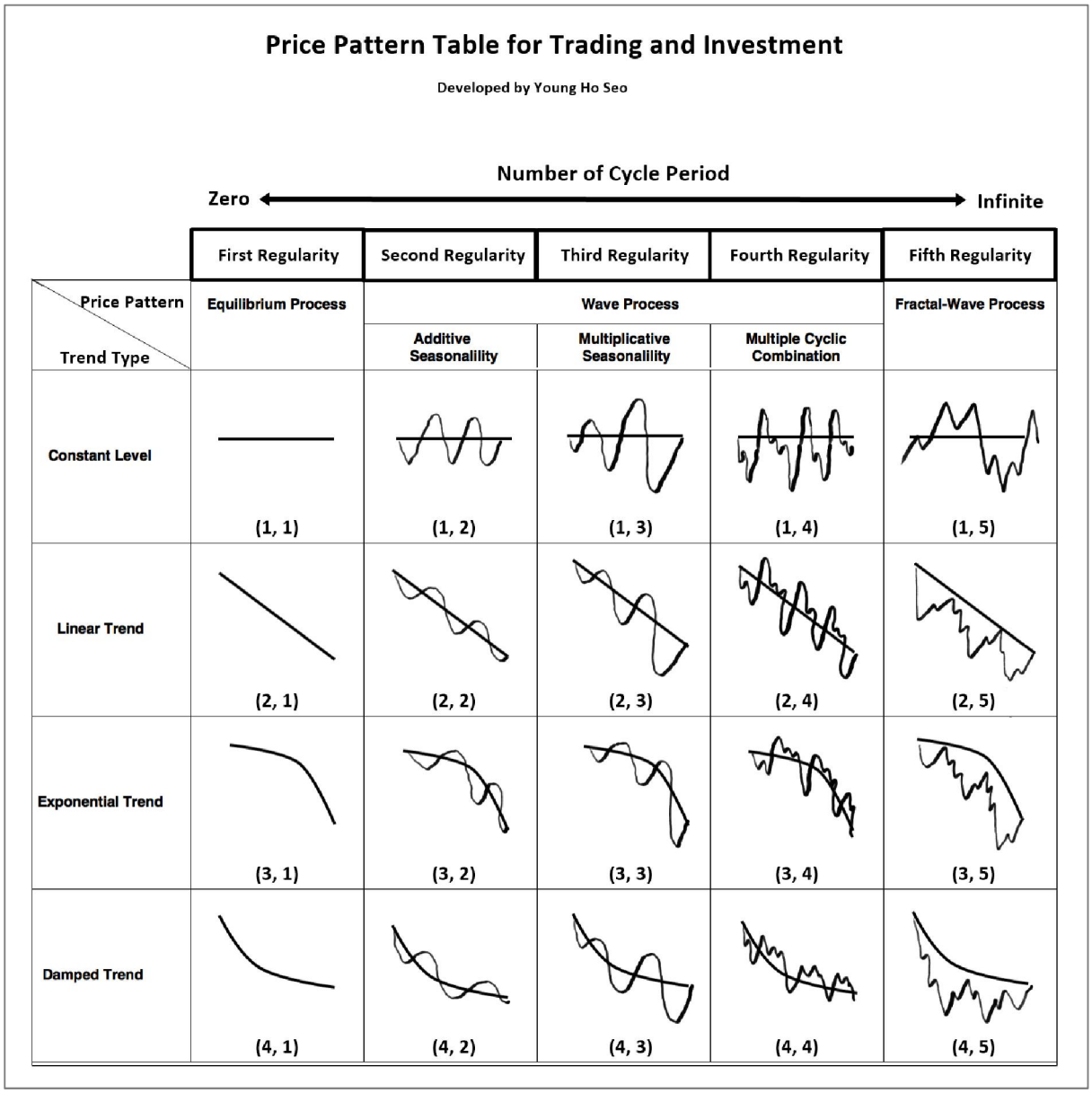

Figure 7-2: Five Regularities and their sub price patterns with declining trend. Each price pattern can be referenced using their row and column number. For example, exponential trend pattern in the third row and first column can be referenced as Pattern (3, 1) in this table.

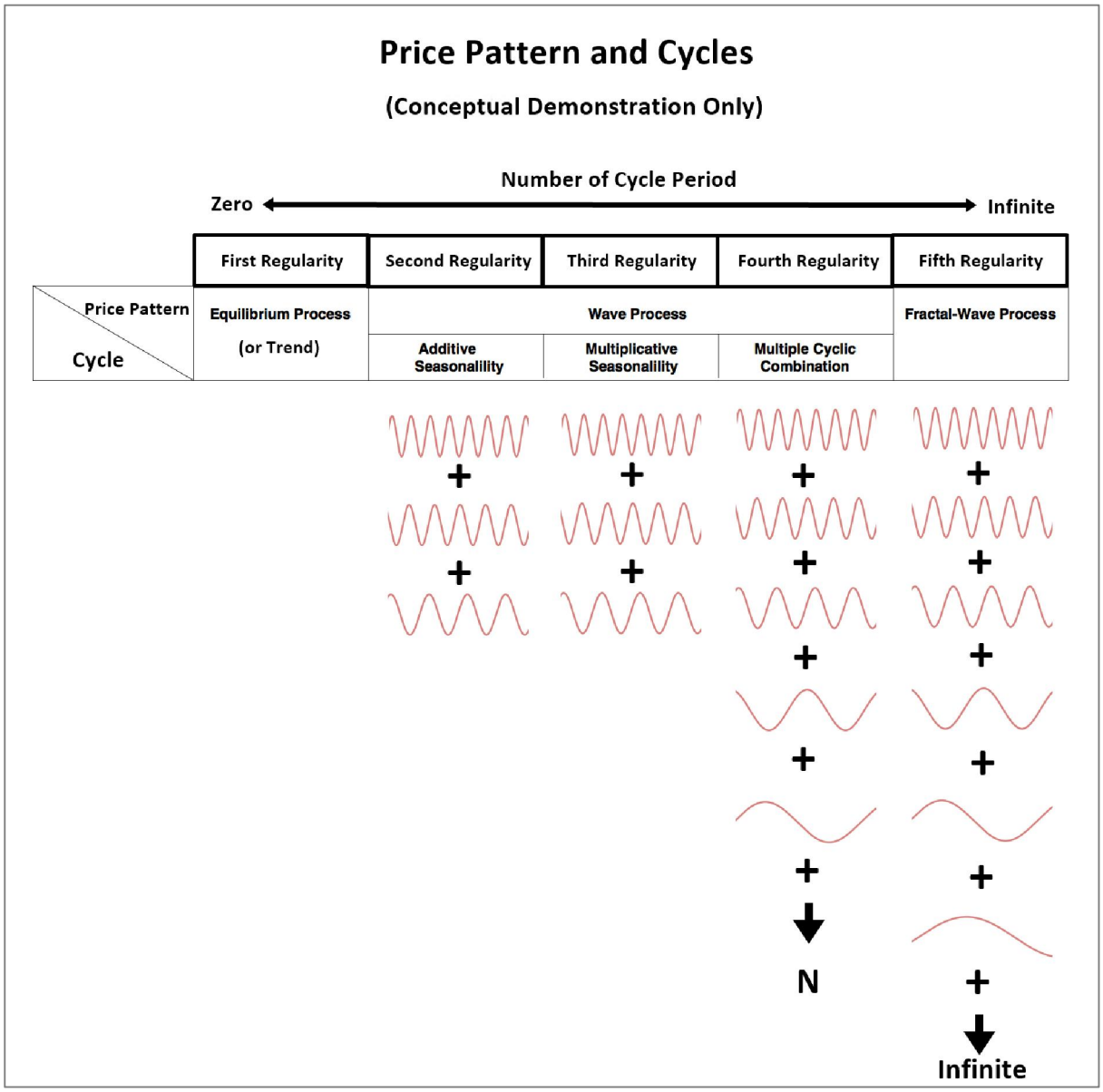

Figure 7-3: Visualizing number of cycle periods for the five regularities. Please note that this is only the conceptual demonstration and the number of cycles for second, third and fourth regularity can vary for different price series.

Price Pattern Table for Trading and Investment

Developed by Young Ho Seo

Number of Cycle Period

Zero ← → Infinite

Price Pattern / Trend Type	First Regularity	Second Regularity	Third Regularity	Fourth Regularity	Fifth Regularity
	Equilibrium Process (or Trend)	Wave Process			Fractal-Wave Process
		Additive Seasonalility	Multiplicative Seasonalility	Multiple Cyclic Combination	
Constant Level	Stationary Process or Random Process (1, 1)	Wave Process (1, 2)	Wave Process (1, 3)	Wave Process (1, 4)	Fractal Wave Process (1, 5)
Linear Trend	Equilibrium Process (2, 1)	Equilibrium Wave Process (2, 2)	Equilibrium Wave Process (2, 3)	Equilibrium Wave Process (2, 4)	Equilibrium Fractal Wave Process (2, 5)
Exponential Trend	Equilibrium Process (3, 1)	Equilibrium Wave Process (3, 2)	Equilibrium Wave Process (3, 3)	Equilibrium Wave Process (3, 4)	Equilibrium Fractal Wave Process (3, 5)
Damped Trend	Equilibrium Process (4, 1)	Equilibrium Wave Process (4, 2)	Equilibrium Wave Process (4, 3)	Equilibrium Wave Process (4, 4)	Equilibrium Fractal Wave Process (4, 5)

Figure 7-4: Five Regularities and their sub price patterns.

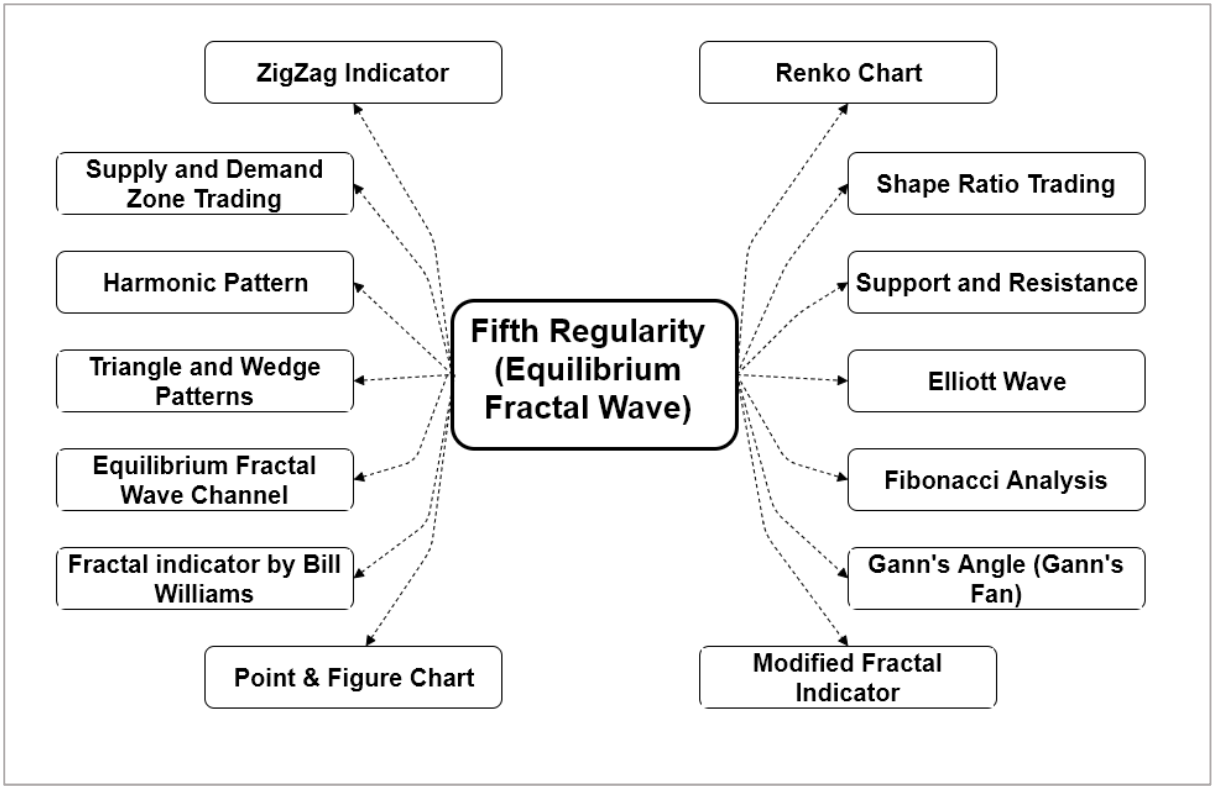

Figure 7-5: Trading strategies, indicators and charting techniques to deal with the fifth regularity.

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