Harmonic Volatility Line Indicator

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About this book

Gann's angle was one of the very first concept using the geometric study between price and time for practical trading (Gann, 1935). In spite of the powerful idea behind the Gann's angle, the chart scaling issue makes the Gann's angle less practical for traders. In this book, we suggested the alternative approach of establishing the geometric relationship between price and time through probability. We showed how we created the Harmonic Volatility Line indicator using this alternative approach. The Harmonic Volatility Line indicator is not suffering from the chart scaling issue like Gann's angle does. At the same time, the Harmonic Volatility Line indicator offers many functionality similar to the Gann's angle. This book introduced how the Harmonic Volatility Line indicator could be used for market forecasting, turning point prediction, supports and resistances for traders in details. In spite of its wonderful features, the Harmonic Volatility Line indicator is still not bullet proof trading system. It requires discipline and knowledge to use for trading like Gann's angle does. This book was published on behalf of http://algotrading-investment.com. However, the original creation of Harmonic Volatility Line indicator was done by Young Ho Seo after spending years of time on doing empirical research and strategy building in the Forex, Stock and Futures markets.

1. Market forecasting with the Gann's Angle

Gann believed that the geometric angle could be used to forecast the movement of the stock and commodity market (Gann, 1935 and 1976). What is known as the Gann's angle is the popular tool in the world of technical analysis. The idea behind the Gann's angle is intuitive. Gann believed that the ideal balance between time and price exists in the stock market. Therefore, he expressed the price in terms of time using the angled trend lines. He suggested that possibly nine important angles could serve as the important support and resistance lines for traders to predict future of the stock price. The first important angle is 45 degrees. Gann denoted 45 degree as 1x1 angle in his work (Gann, 1935 and 1976). The rest of eight angles can be found in Table 1-1. We have listed the corresponding geometric angle too. Please note that the geometric angle is only accurate when price and time is in one to one scale precisely.

Angles	Angles in degrees
1x8	82.5
1x4	75
1x3	71.25
1x2	63.75
1x1	45
2x1	26.25
3x1	18.75
4x1	15
8x1	7.5

Table 1-1: Gann's nine angle.

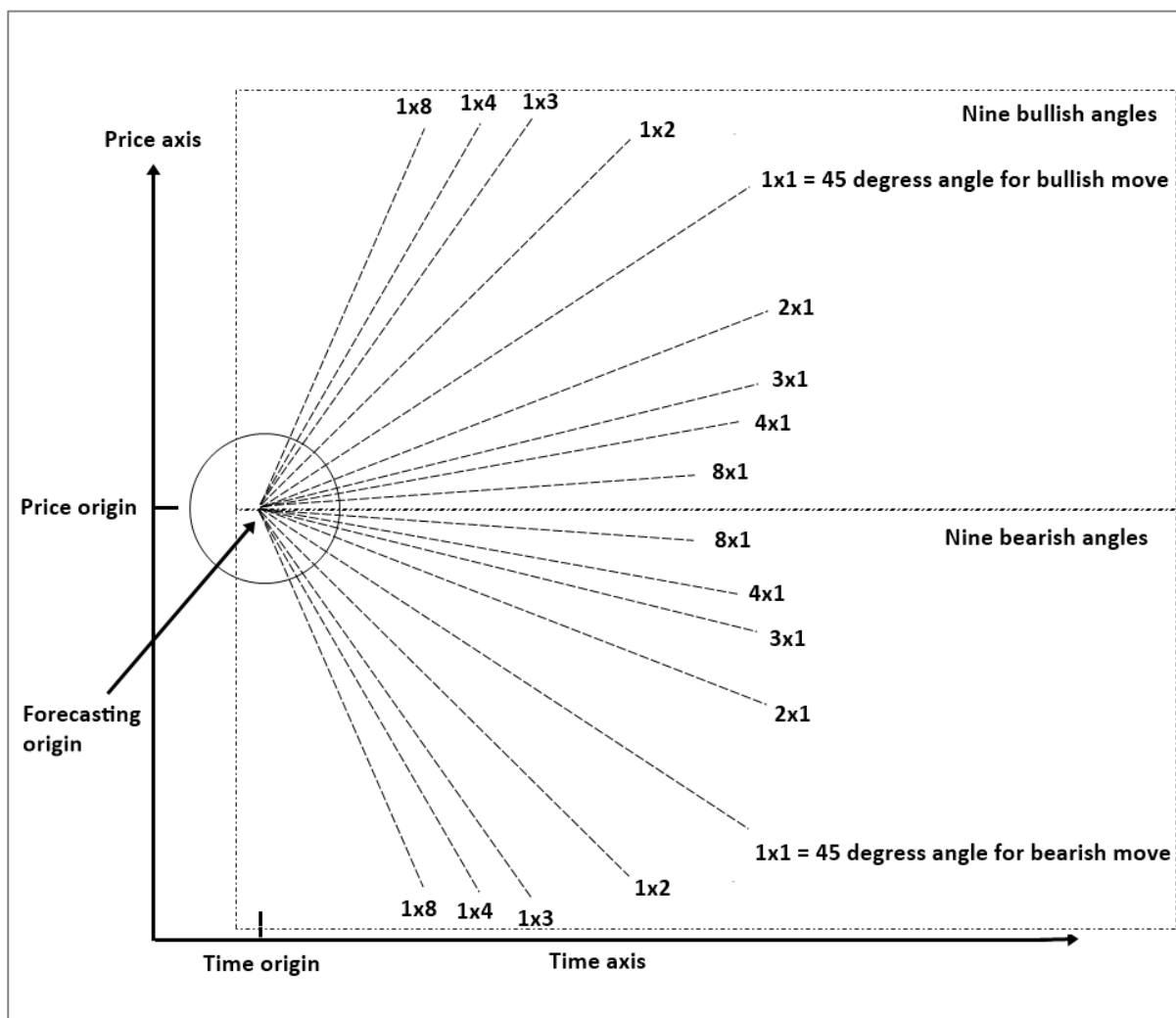Figure 1-1: Nine bullish angles and nine bearish angles. Note that this figure was drawn to represent the concept of the Gann's angle and each angle in the figure may be not accurate.

In Gann's angle, there are total 18 angles line for trading (Figure 1-1). Nine angle lines are there to describe the bullish movement. They are the ascending angle lines. Another nine angle lines are there to describe the bearish movement. They

are the descending angle lines. Gann's Angle mathematically express the ratio of the number of price unit movement per one time unit in the price chart. For example, the 1x1 angle indicates one price unit movement per one time unit. Therefore, the 1x1 angle corresponds to 45 degrees when the price and time have one to one scale. Likewise, the 1x2 angle indicates two price unit movement per one time unit. Speed of price is twice faster than time in the 1x2 angle. The speed of price is highest in the 1x8 angle because price moves eight time faster than time. The 1x8 angle makes the stiffest angle among the nine angles. The 2x1 angle indicates half price unit movement per one time unit. Likewise, 4x1 angle indicates a quarter price unit movement pre one time unit. The 8x1 angle represents the slowest price movement among the nine angles. Gann's angles are typically drawn from significant peaks and troughs in your chart. Picking up significant peaks and troughs might impose some subjectivity in drawing the Gann's angle in your chart. However, generally picking one or two important peaks and troughs are not difficult task even for average traders. In general, finding significant peaks and for daily and weekly chart is easier than doing the same task in hourly or minutely chart.

Figure 1-2: Gann's nine angles were drawn on the monthly EURUSD chart. After figuring out the Gann's angle in one to one scale, the chart was scaled back to the default scale provided by the charting package so entire price series can be captured for this book.

Gann used the geometric angle for three different application. Firstly, Gann used this geometric angle to identify bullish or bearish market. For example, if the prices remains above the 1x1 ascending angle line, then he considered the market as bull (Figure 1-1). Likewise, if the price remains below the 1x1 descending angle line, then he considered the market as bear (Figure 1-1). Secondly, Gann used these angle lines to identify turning points (Figure 1-3).

Gann believed that the turning point might occur where the several angles are intersecting together. More angles are intersecting together, higher chance for the turning point occurs. Thirdly, Gann use these angles as the supports and resistances (Figure 1-3). You will expect that price will either penetrate or bounce hard at these supports and resistances. When price is penetrated through the angle line, you might expect that price can go to test next adjacent angle line above. Likewise, when price is reversed at the angle line, price will likely come down to test next adjacent angle line below. If the Gann's angle is properly drawn in one to one scale in your chart, the Gann's angle can be used for practical trading purpose. However drawing Gann's angle accurately is not straight forwards for the real world trading. We elaborate the drawbacks of the Gann's angle in next chapter.

Figure 1-3: Gann's angle in Oil.

2. An alternative way of relating time and price through the geometric dimension

Gann's work about the geometric angle is fascinating. It was one of the very first concept relating price and time through the geometric dimension for the financial trading. Knowing that no personal computers are available during his time, the advancement he made is impressive in the world of technical analysis. In spite of the fact that I like the concept of Gann's angle, I do think that his approach of squaring time and price to get the precise 45 degrees angle is practically difficult. Firstly, just drawing 45 degrees angle line in your chart will not create the correct 1x1 angle line if your chart is not scaled correctly to one to one in the price and time axes. Most of charting packages are designed for the optimal visual experience for traders and they are not necessarily tuned for the one to one scale in the price and time axes. Frequently, your charting package will provide very different scale for price and time. Therefore, circle and square drawn in your chart can be eclipse and rectangle in fact. 45 degrees angle might be 10 degrees angle. Unless you can accurately calculate the ratio of how many units of price are required for each unit of time, you will run into this first problem with Gann's angle. If the charting package does not offer the flexible scaling option, then you can not use Gann's angle in that charting package.
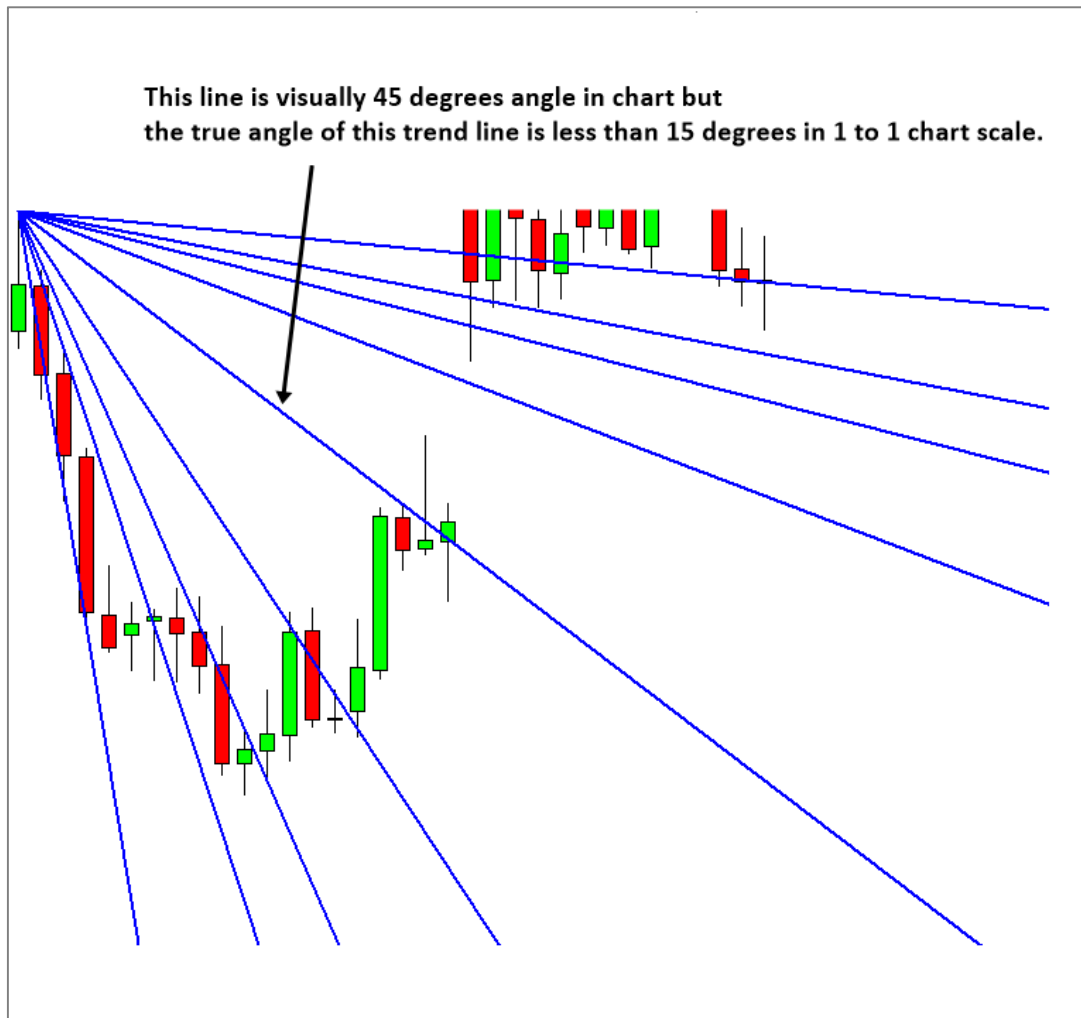
Figure 2-1: Drawing geometric 45 degrees in the chart when the chart scaling is not fixed to one to one scale. This 45 degrees angle will corresponds to some other angles in one to one scale chart.

Secondly, even if the chart is correctly scaled to one to one in the price and time axes, one has to rescale the chart every time when the number of price units and time units increases substantially in your chart. For example, today you might scale your chart for 7000 pips range and 1000 bars in your chart for EURUSD. If the price moved rapidly another 1000 pips outside the old price range after 100 bars added, then you have to scale your chart again for 8000 pips range and 1100 bars to get the new 45 degrees angle. This is because the

ratio of how many units of time are required for each unit of price are directly related to the price range and time range in your chart. The second problem can be amplified for hourly chars and minutely chart as the new price range often override old price range each day. I personally never attempt to use the Gann's angle for timeframe below one hour.
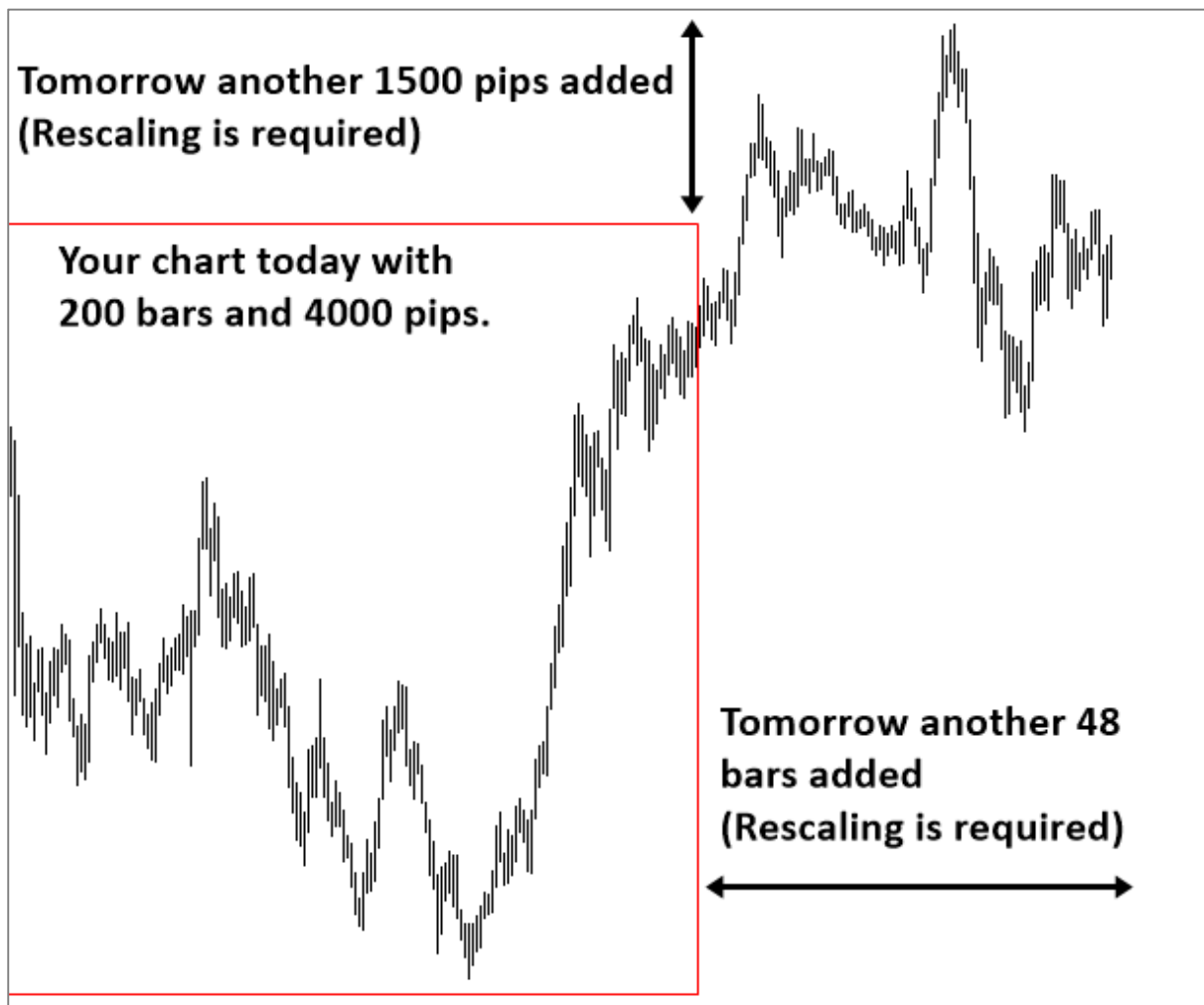

Figure 2-2: Rescaling is required for Gann's angle if new price range and time units are added to your charts.

Finally, the scaled chart looks quite horrible when there are significant amount of historical data in your chart. For example, let us say that our time axis spans around 10,000 pixels in your screen for 100,000 bars. Then you will need to have

the exact 10,000 pixels to fit the price axis in your chart in one to one scale. For most of normal screen size, you will be able to see the 10% of the price range assuming your screen support 1000 pixels vertically only. You have to scroll up and down your chart frequently to see the area of interest in the price series (Figure 2-3). This is inconvenient. Unless you want to draw Gann's angle only in your chart, you probably have to scale your chart back to the optimal scale for other technical analysis. The optimal scale for general technical analysis is often marginally different from the one to one scale.
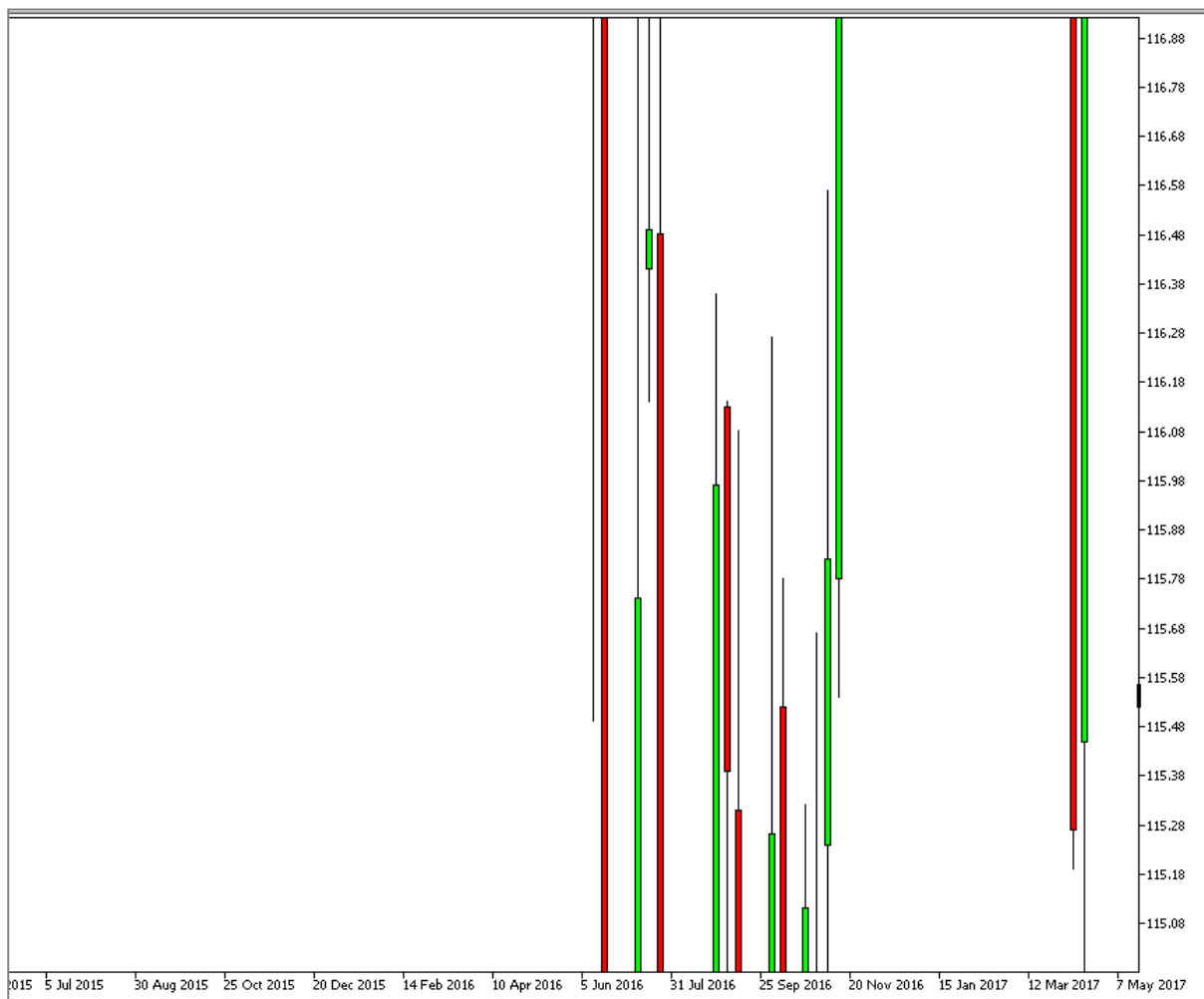

Figure 2-3: One to one scale achieved in EURJPY Weekly charts. You can only see few candle bars in your charts.

Gann's angle is achievable. However, it is practically difficult to use in general due to the chart scaling issue. I personally met too many traders using the geometric 45 degrees angle instead of the true Gann's angle because the chart is not properly scaled to one to one. It is not how Gann was meant to use his angle lines for trading. The one to one scaling must be in place before traders can apply the angle lines for his trading. Applying Gann's angle without good technical knowledge on chart scaling, trader can risk their capital in their trading. Therefore, I personally sought for new approach to relate time and price through the geometric dimension rather than using the troublesome angle concept. In this book, we propose an alternative solution. In our approach, we use probability variable to mingle price and time into the geometric dimension. In simple term, the geometric relationship between time and price can be established using the concept of the volatility. In mathematical term, probability can transform price and time space into higher dimension. Due to this extra dimension opened up by probability, we can extract the geometric relationship between time and price easily in our chart.
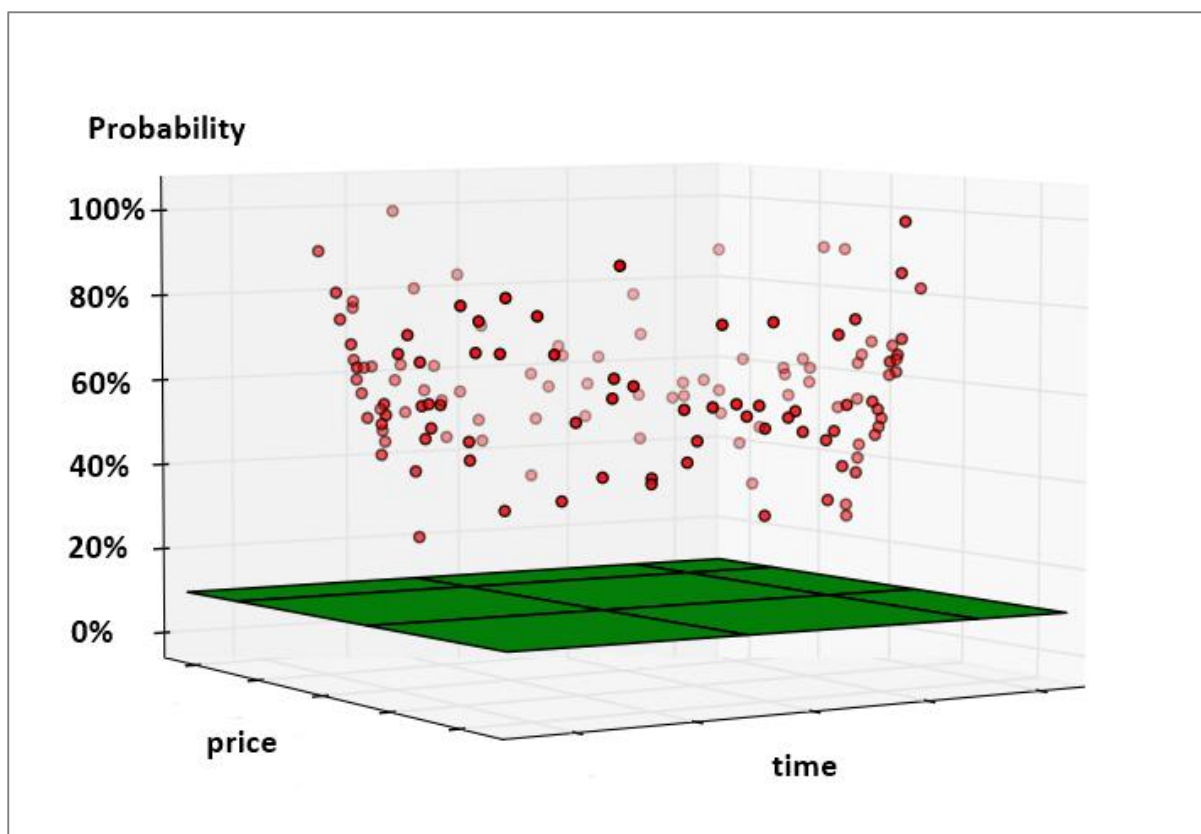
Figure 2-2: Probability transform price and time into higher dimension.

To elaborate further, let us assume that the price series have the normal distribution for now. If traders want to forecast the price movement from the forecasting origin at the current time and price, trader can draw the geometric lines corresponding to each probability. Note that we have the probability variable in the place of angle variable now. Since the scaling function for probability for the extended forecasting horizon, that is calculating volatility for bigger timeframe, is mathematically known, it is easy to extend the line through the chart. Since we are using the scaling function derived mathematically, we do not suffer from chart scaling issue any more. In next chapter, we used this geometric relationship between price and time to develop the Harmonic Volatility Line indicator for practical trading purpose.
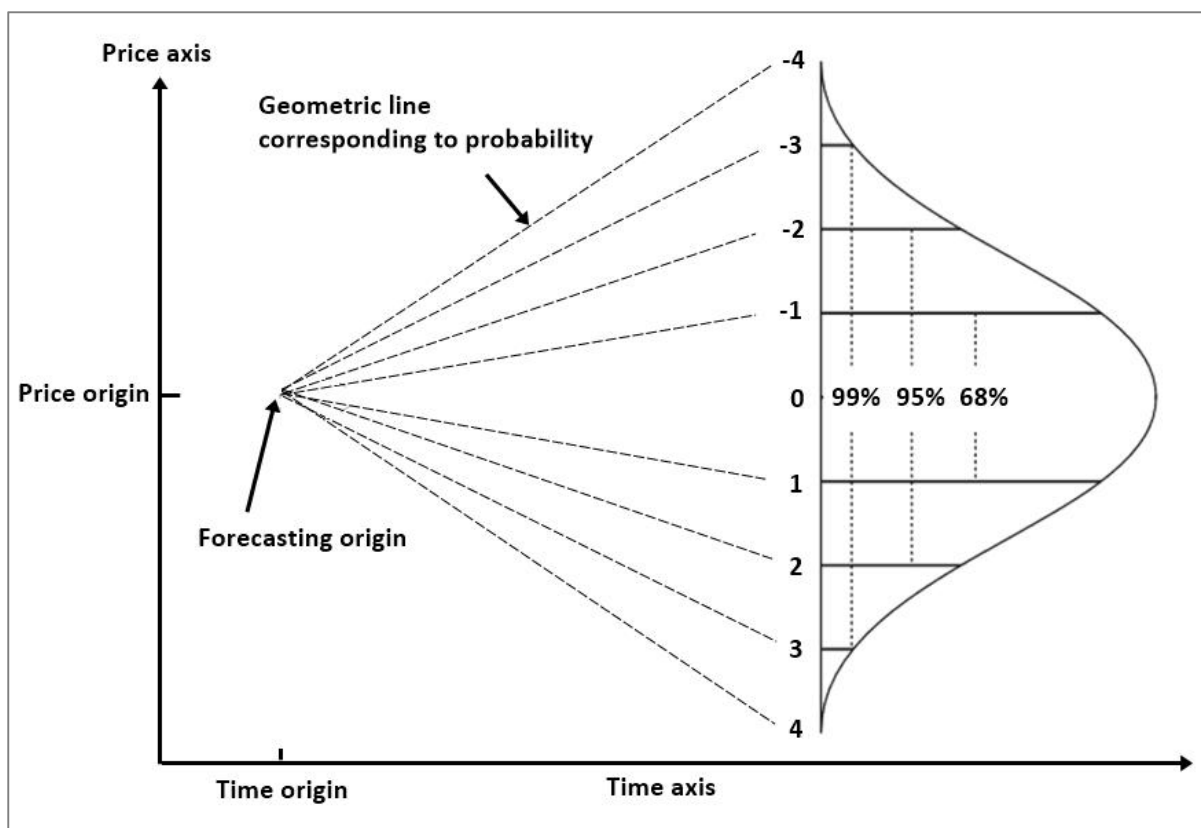
Figure 2-3: Conceptual drawing to represent the geometric relationship between price and time through probability.

3. Introduction to Harmonic Volatility Line Indicator

In previous chapter, we have shown that we can mingle price and time into the geometric dimension using probability. One of important questions are not yet answered. The unanswered question is what probability we can select for our trading and how we can select them for our trading. For example, Gann mentioned that he come up with the important nine angles from his empirical study on stock market. It seems that inclusion of 45 geometric angle among nine of them is very intuitive choice if price and time really balances. Probability

works slightly different from angle. Probability can help us to describe the state of the market as an event. For example, in the statistical point of view, there are 50% to 50% chance for the price going up or going down. Including the sideways market state, each state of the market can be expressed as the 33.3% probability for bearish, bullish and sideways markets (Figure 3-1). Simply speaking if the price stays between price A and price B, then we can assume that market is moving in sideways (Figure 3-1). This approach is intuitive. However, we still does not have the sufficient lines as Gann's angle provided nine geometric lines for traders. To produce nine geometric lines for traders, we can split both bullish region and bearish region into subsection as Gann did. We found that using golden ratio 0.618 seems working out pretty well. Instead of using 33.3% probability for sideways, we can use 38.2% probability. The 38.2% probability (i.e. probability inside boundary) corresponds to the 61.8% probability, which describes the chance for the price to be outside the price A and price B (i.e. probability outside boundary). Since we have the 61.8% probability for the first value, it is easy to derive rest using golden ratio 0.618. For example, if we can keep multiplying 0.618 to derive next probability. So we will continue to have 0.382 (38.2%), 0.236 (23.6%), 0.146 (14.6%), etc until we have nine lines. The derived probabilities using the Golden ratio is listed in Table 3-1. When we derived our 9th lines, the corresponding probability is 1.3%. This 1.3% probability seems quite reasonable probability since many real world applications put the particular emphasis on 1% and 5% probability level.
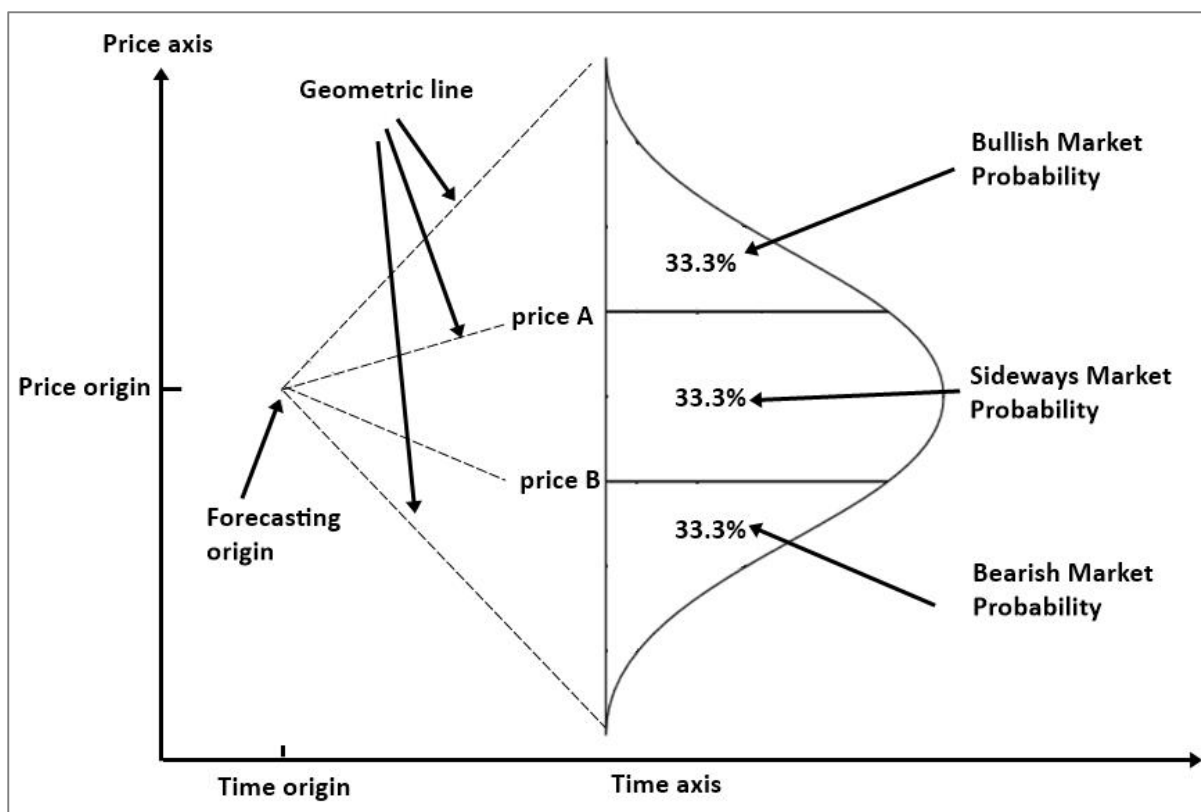
Figure 3-1: Conceptual drawing to represent three states of the market.

Probability Outside boundary	Probability Inside boundary	Corresponding Z Score	Market State	Calculation
61.8%	38.2%	0.499	Bullish Sideways Bearish Sideways	0.618^1
38.2%	61.8%	0.874	Bullish 1 Bearish 1	0.618^2
23.6%	76.4%	1.185	Bullish 2 Bearish 2	0.618^3
14.6%	85.4%	1.454	Bullish 3 Bearish 3	0.618^4
9.0%	91.0%	1.695	Bullish 4 Bearish 4	0.618^5
5.6%	94.4%	1.913	Bullish 5 Bearish 5	0.618^6
3.4%	96.6%	2.115	Bullish 6 Bearish 6	0.618^7
2.1%	97.9%	2.303	Bullish 7 Bearish 7	0.618^8
1.3%	98.7%	2.480	Bullish 8 Bearish 8	0.618^9

Table 3-1: Derived probability using Golden ratio.

If we have drawn all the nine probability lines for both bullish and bearish market, it will look like as in Figure 3-2. Each section between two probability lines can be used to describe the state of the market. For example, the section between 61.8% and 38.2% probability line can be denoted as Bullish 1 state. Likewise, the probability line between 38.2% and 23.6% can be described as Bullish 2 state. The last state is Bullish 8. For bearish market, we can have eight states from bearish 1 to bearish 8. Since we used the Golden ratio to derive these geometric lines, we named this indicator as the Harmonic Volatility line indicator.

Since we have devised the Harmonic Volatility line indicator to overcome the chart scaling issue in the Gann's angle, Harmonic Volatility line indicator is comparable to the Gann's angle in many ways. Certainly, there will be some similarities between them. For example, trader can always locate the Harmonic Volatility Line indicator to the peaks and troughs where they can locate the Gann's angle. This simply tells the good compatibility between Gann's angle and the Harmonic Volatility Line indicator. In terms of usage, the Harmonic Volatility Line indicator can be used to fulfil the same functionalities, which is offered by Gann's angle. For example, the Harmonic Volatility Line indicator can be used for market forecasting, turning point prediction, supports and resistances. In fact, because the Harmonic Volatility Line indicator uses volatility concept, there are additional benefits for traders to know the volatility information at any time.

Gann's angle uses the angle to relate price and time. However, the Harmonic Volatility Line indicator uses the probability to relate price and time. Therefore,

some distinctive difference exists between them too. Most important difference is that the Harmonic Volatility Line indicator draws curve instead of the straight line. In addition, nine states in the Harmonic Volatility Line indicator can be used together with the probabilistic interpretation whereas angle does not provide such information. For example, nearly 98.7% of time, the price will not cross this 1.3% probability line. What would this suggest in real world trading? It would suggest that we could expect to have some turning point if price crossed these 1.3% probability lines. We will further discuss the practical application of the Harmonic Volatility Line indicator in the next chapter.
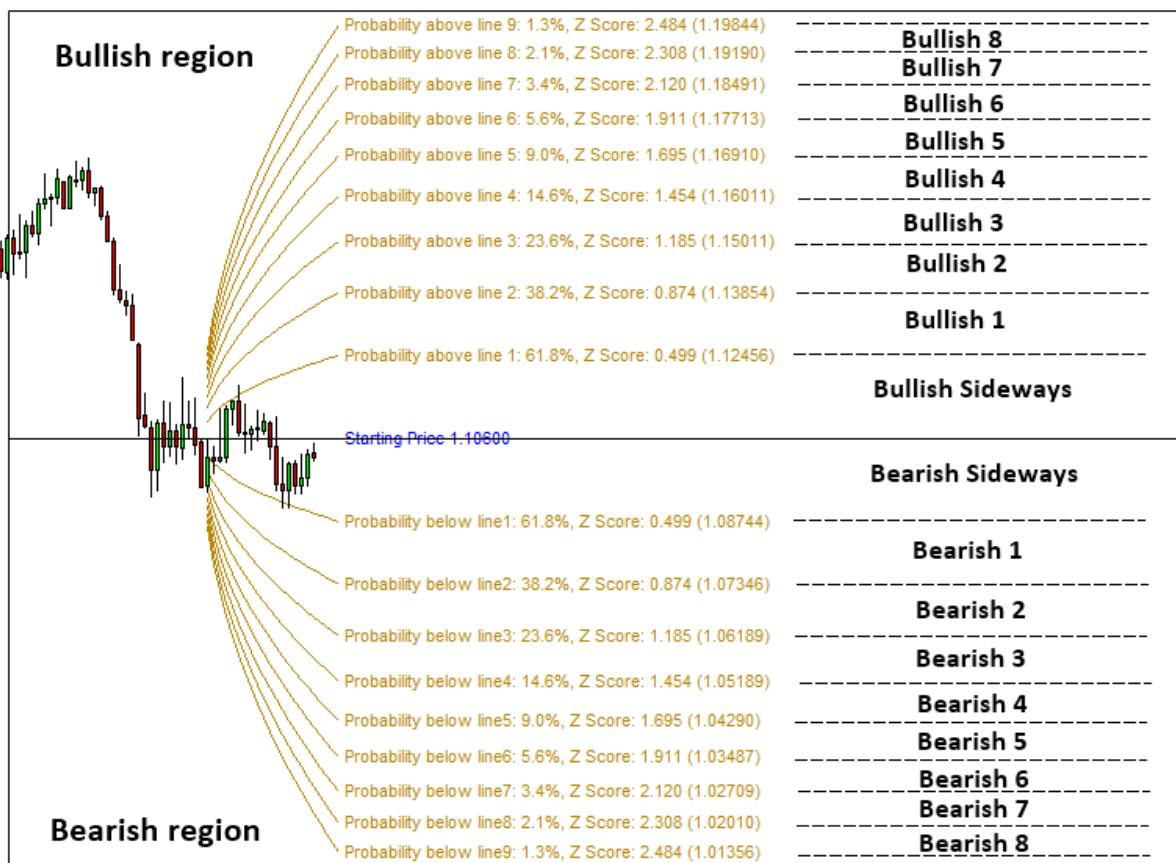

Figure 3-2: Applied Harmonic Volatility Line indicator in the chart EURUSD H1 chart.

4. Application of Harmonic Volatility Line Indicator for practical trading

The advantage of Harmonic volatility line indicator is that it is not suffering from the chart scaling issue like Gann's angle. What about its usage in real world trading? We have found some comparable advantage of the harmonic volatility line indicator to the Gann's angle. The way one can apply the harmonic volatility line indicator is nearly similar to Gann's angle. Trader need to apply the Harmonic Volatility Line indicator to some significant peaks and troughs like the Gann's suggestion. Once you have applied the Harmonic Volatility Line indicator to the significant peaks and troughs, you can use it for at least three different purpose for your trading. They are market forecasting, turning point prediction, supports and resistances. We will describe each of them by comparing the Harmonic Volatility Line indicator to the Gann's angle.

4.1 Market Forecasting

Gann used the geometric angle to identify strong bullish and bearish market. For example if the price remain below the 1x1 descending angle line, then it is bearish market. If the price remains above the 1x1 ascending angle line, then it is bullish market. In the Harmonic Volatility Line indicator, there are two sideways state among 18 states. The two sideways state roughly corresponds to the sideways market probability of 33.3%. Remember that we have widen the 33.3% up to 38.2% probability to apply the Golden ratio rule to derive the other probabilities. We can still use this 38.2% probability to identify the sideways state of the market. If the price stays inside the two sideways states, then we can say that market is moving in sideways.

Picking up the probability line equivalent to the 1x1 angle line is tricky since we have to compare the curve to straight line. However, if we have to choose one line, then I think 23.6% probability line might be the choice. It is because the 23.6% probability line divide the entire area into half (Figure 4-1). Therefore, trader can assume the strong bullish trend if the price remains above the 23.6% ascending probability line whereas weak bullish trend can be assumed if the price remains below 23.6% ascending probability line. Likewise, trader can assume the strong bearish trend if the price remains below the 23.6% descending probability line whereas weak bullish trend can be assumed if the price remains below the 23.6% descending probability line.

In addition, trader can assume bullish trend if the price move from lower Bullish state to upper Bullish state. For example, if the price move from Bullish 1 state to Bullish 2 state, then we can assume the market has a bullish trend. On the other hands, if price move from Bullish 5 state to Bullish 4 state, then market have a bearish trend. Likewise, if the price move from lower Bearish state to upper Bearish state, then you can assume bearish trend. For example, if the price move form Bearish 1 state to Bearish 2 state, then we can assume that the market is bearish. Sometimes price might penetrate two or three states at the same time showing strong trend (Figure 4-1).
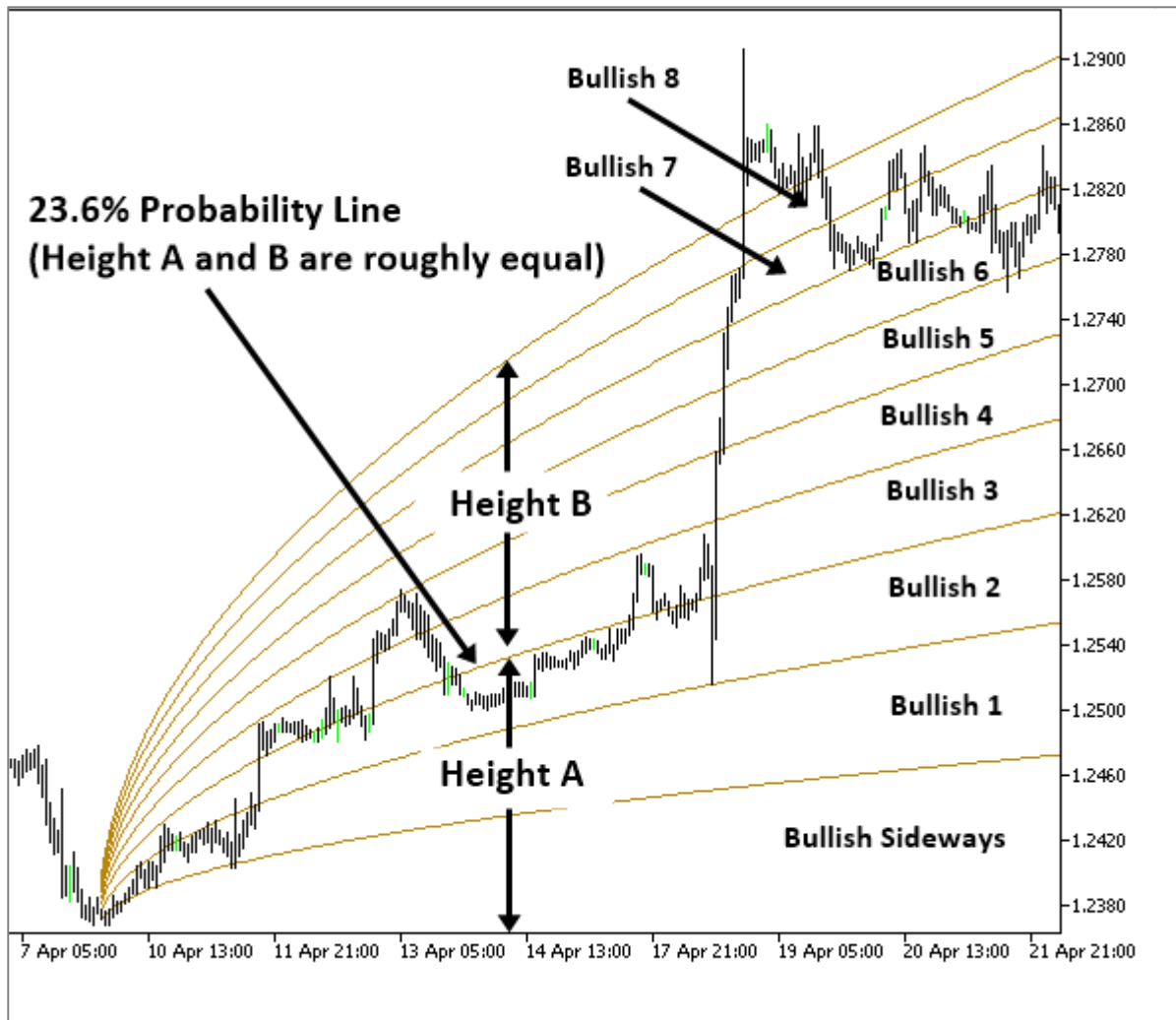
Figure 4-1: Harmonic Volatility Line indicator on GBPUSD H1 timeframe.

4.2 Supports and Resistances

Gann used the geometric angle as the supports and resistances. The same analogy can be applied to the Harmonic Volatility Line indicator. Frequently, you will observe that the probability lines in the Harmonic Volatility Line indicator act as an important supports and resistances in your chart (Figure 4-2).

Figure 4-2: Harmonic Volatility Line indicator on USDJPY D1 Chart.

4.3 Turning Point Prediction

Gann used the geometric angle to predict the turning point when many angles are intersecting together. Likewise, when many probability lines are intersecting together, the Harmonic Volatility Line indicator shows strong turning point too.
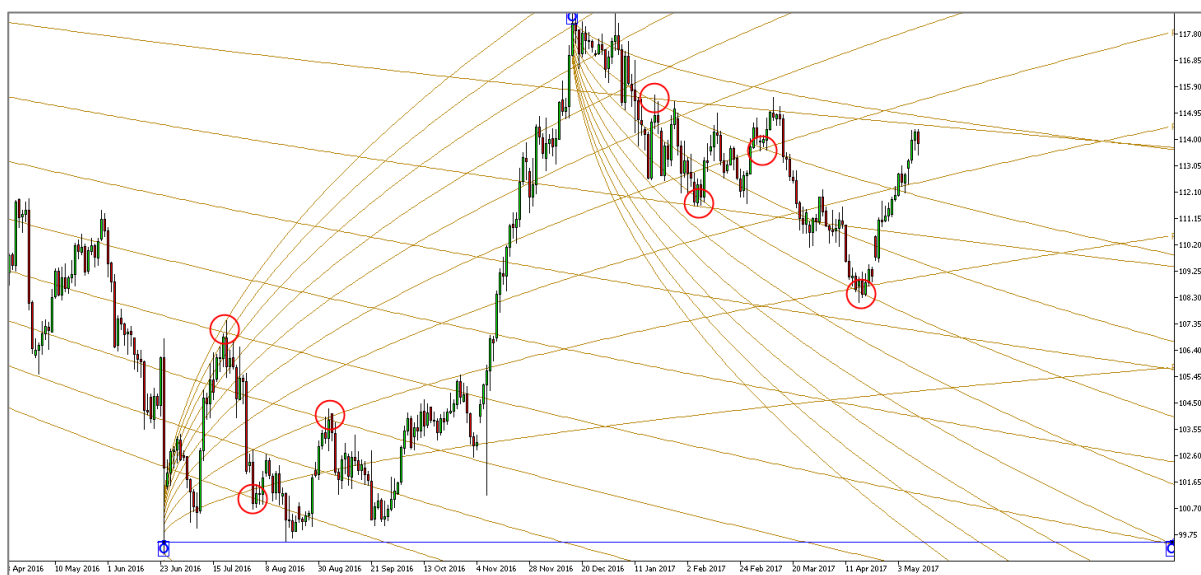

Figure 4-3: Harmonic Volatility Line indicator on USDJPY Daily Chart.

In addition, the Harmonic Volatility Line indicator can predict turning point from the volatility point of view. As we have discussed in the previous chapter, if price crosses the 1.3% probability line, then there is high chance that price will reverse. In fact, when the price remains in the Bullish 6, 7 and 8 states, you might watch out for the potential turning point. Likewise, when the price remains in the Bearish 6, 7 and 8 states, you might be warned for the potential bullish turning point too. Gann's angle does not offer this information to traders because angle does not indicate the volatility of the market.
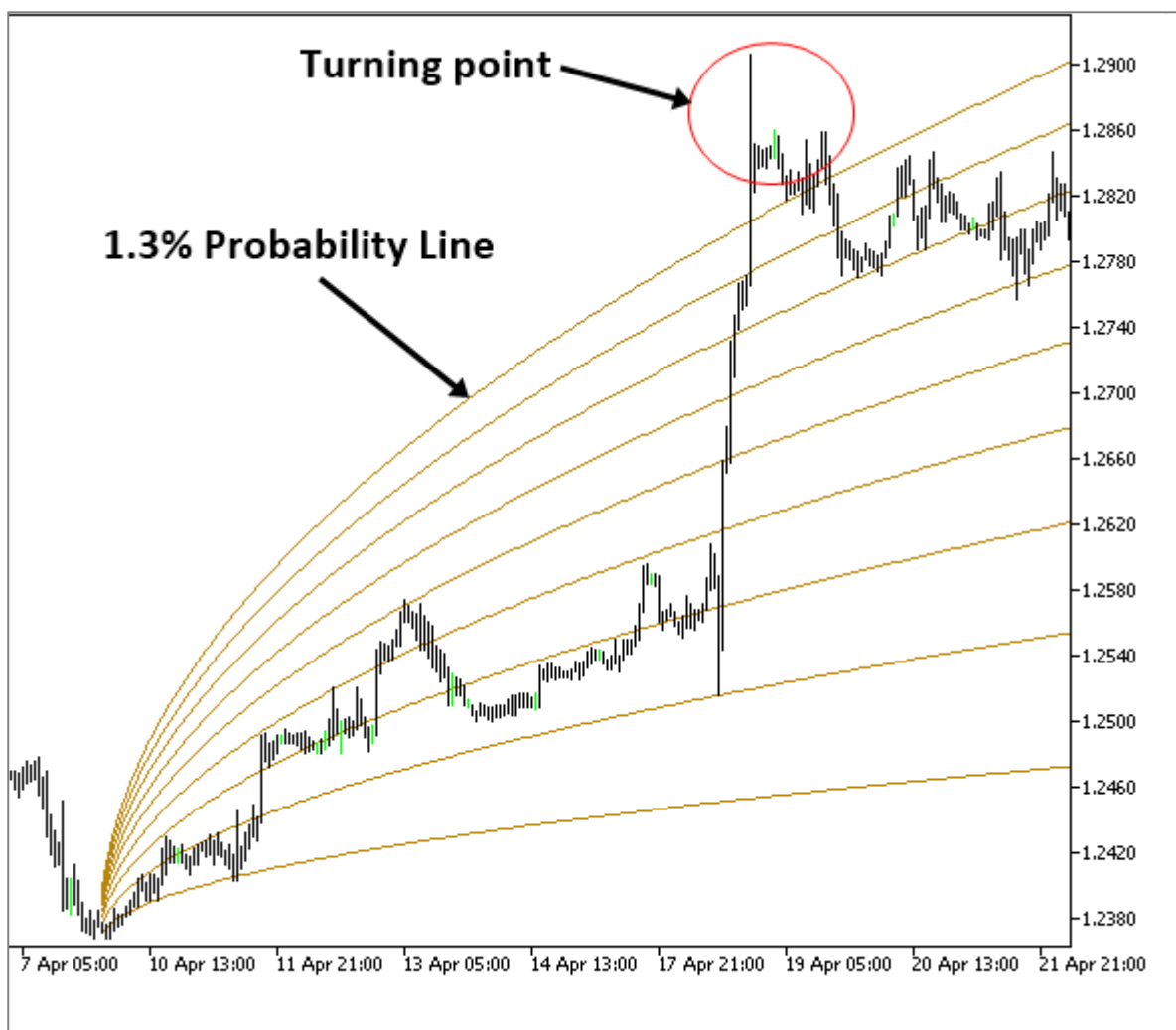
Figure 4-4: Harmonic Volatility Line indicator on GBPUSD H1 timeframe.

4.4 Combining with other technical analysis

As Gann's angle can be used with other technical analysis, the Harmonic Volatility Line indicator can be used with other technical analysis. Both mean reversion and momentum trading strategies can be combined with it. You can use the Harmonic Volatility Line indicator as the primary decision making tool or as the secondary confirmation tool according to your trading style. When the

Harmonic Volatility Line indicator is combined with other technical analysis, it would definitely provide edge for your trading.

Figure 4-5: Harmonic Volatility Line indicator on EURUSD H1 timeframe with MACD indicator.

5. Conclusion

Gann's angle was one of the very first concept using the geometric study between price and time for practical trading (Gann, 1935). In spite of the powerful idea behind the Gann's angle, the chart scaling issue makes the Gann's angle less practical for traders. In this book, we suggested the alternative approach of establishing the geometric relationship between price and time through probability. We showed how we created the Harmonic Volatility Line indicator using this alternative approach. The Harmonic Volatility Line indicator is not suffering from the chart scaling issue like Gann's angle does. At the same time, the Harmonic Volatility Line indicator offers many functionality similar to the Gann's angle. This book introduced how the Harmonic Volatility Line indicator could be used for market forecasting, turning point prediction, supports and resistances for traders in details. In spite of its wonderful features, the Harmonic Volatility Line indicator is still not bullet proof trading system. It requires discipline and knowledge to use for trading like Gann's angle does.

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