



Analyzing the Gann Rule of Trading of Buying High and Selling Low using Pythagorean Theorem

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ABSTRACT

This paper aims to contribute to the buy-high and sell rule created by Gann with the practical application of Pythagorean theorem in the market chart. Using right-angled triangles, especially on Fridays when the market closes, can give traders a special chance to do short-term trading and make money by predict the market when it is open in the following week. Gann's trading rules have the potential to improve how people trade in today's financial markets.

Introduction

Gann's theory continues to demonstrate its applicability within contemporary financial markets, yielding notable levels of precision and profitability in trading (Fu, 2011). In this paper, we specifically focus on Gann rule of buying high and selling low, a principle originally articulated by Gann in 1923. We employed the Pythagorean theorem to indicate the mathematical underpinnings of this approach within the context of financial markets. Our central inquiry revolves around the efficacy of the buy high and sell low strategy in generating enhanced short-term trading profits. The primary objective of this study is to ascertain the practicality buying high and sell low strategy as a means to achieve superior profitability in the financial markets, particularly among traders who do not change price of assets in the market. Notably, we underscore the analogical similarities between right angle triangle and market dynamics, emphasizing the existence of congruent aspects upward, downward, or sideways. Consequently, a trader, guided by Gann's insights, would buy on rising, sell on falling trends all while respecting key historical price levels as points of reference, Since crucial levels of support and resistance have mathematical relationships in (Reddy, 2012).

Market dynamics are heavily influenced by the relative balance of buyers and sellers at different price levels. When there is a surplus of buyers at a higher price point compared to the number of sellers, it generally exerts upward pressure on prices. Conversely, when there are more sellers than buyers at lower price levels, it typically leads to a decline in prices (Xu et al., 2023). An example of this phenomenon is observed in the activities of market makers, who purchase assets from investors at relatively elevated historical price levels and subsequently sell them at lower prices. On the surface, this may appear as if market makers are incurring losses. However, their profitability is affirmed through the accrual of transaction fees, underscoring the vital role they play as facilitators of trading activities (Day & Huang, 1990). Nevertheless, the "buy high, sell low" approach, if adopted by individual investors, often results in financial losses and a decrement in overall wealth (Xu et al., 2023). These adverse outcomes are frequently attributed to the influence of emotions and irrational exuberance rather than a meticulous and rational evaluation of prevailing market conditions (De Long, Shleifer, Summers & Waldmann, 1990). It is imperative to acknowledge that the issue of financial loss in the market is often attributed to timing decisions, where investors either buy too late or sell prematurely. This tendency arises from traders' propensity to acquire assets at elevated prices and divest them at price levels that are near points where market reversals occur (Day & Huang, 1990).

Market reversals can manifest in both short and long durations, with the "buy high, sell low" strategy often regarded as a short position approach (Kozierkiewicz, Hernes, & Nguyen, 2019). Rational speculators employing this strategy purchase assets at higher prices with the expectation of selling them at even higher prices in the near future. They target individuals whose actions do not significantly influence market prices (De Long et al., 1990). Interestingly, traders who cannot substantially impact market prices may still accumulate wealth, even while adopting the "buy high, sell low" strategy, as they dominate the market and are willing to assume higher risks and engage in more frequent trading activities (DeLong, Shleifer, Summers, & Waldmann, 1988). Contrary, Caulker (2021) contends that, in the realm of short-term trading, adopting a strategy of buying low and selling high tends to be more profitable than its inverse counterpart. Smart investors strategically position themselves to acquire assets when prices are substantially lower, setting themselves up for potential profits. Conversely, they choose to sell when prices are high, exiting the market to mitigate heightened loss risks. This strategic approach remains consistent regardless of the market's direction, whether it is trending upward or downward (Day & Huang, 1990).

In our research, we employ the Pythagorean theorem to shed light on the "buy high, sell low" approach. Gann postulated that predicting price movements could be achieved through the identification of geometrical and numerical relationships, often represented by specific patterns and angles, to forecast

market trends (Hyerczyk, 2009; Reddy, 2012). In two-dimensional space, this involves a fusion of geometry, mathematics, and empirical observations, facilitating the study of the physical aspects of price movement. Geometry, as a discipline, is so inherently evident that it transcends the need for mathematical proof and can be readily grasped through direct human intuition (Overduin & Henry, 2020). The Pythagorean theorem in two-dimensional space maintains angles between lines and distances using scale factors, a concept that traders frequently encounter when zooming in and out of price charts (Givental, 2006). Moreover, it is worth noting that technical analysis, which encompasses Gann's methods, has been shown to offer more robust predictability in comparison to fundamental analysis (Wang, Liu, & Wu, 2020). Additionally, technical analysis is less susceptible to issues related to data mining and is more resilient to changes over time, further solidifying its relevance and effectiveness in contemporary financial markets.

For a comprehensive grasp of the underlying concept, it is instructive to refer to the elucidation provided by Brill and Jacobson in 2006, which posits that a rectangle is geometrically composed of two right triangles, denoted as KML and KNL in Figure 1. The geometric properties of this rectangle, particularly its area, facilitate an insightful exploration of the interplay between time and space. Moreover, the presence of the diagonal line MN within the rectangle offers a unique avenue for the examination of spacetime-related aspects associated with the rectangle's area. Notably, in this geometric construct, the diagonal line KL (the hypotenuse) is for time dimension. In a two-dimensional context, a Pythagorean triangle is conceptualized as a geometrical entity that embodies a specific mathematical relationship among its three sides, which stipulates that the sum of the squares of the two shorter sides equals the square of the longest side. This fundamental geometric principle, as expounded by several authors serves as a foundational framework for comprehending the intricate dynamics of financial markets, where it is applied to derive insights into the timing of buying high and selling low strategies (Agarwal, 2020; Brill & Jacobs, 2006).

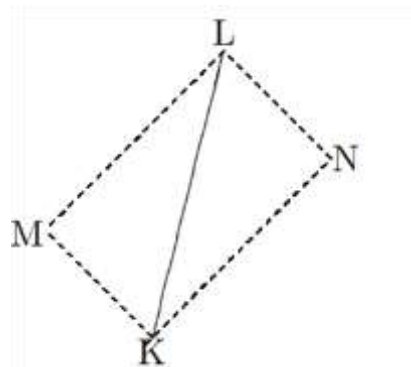


Figure 1: Source From (Brill & Jacobson, 2006)

We have selected a specific Pythagorean theorem from the work of Brill and Jacobson (2006) to elucidate the fundamental concept of buying high and selling low within the financial markets. This Pythagorean theorem is graphically depicted in Figure 2, where its geometrical form conveys the essence of the theorem through a mathematical equation. Within the context of financial markets and the buying high and selling low strategy, this theorem takes on a graphic role drawn with in grind around price level in the market for profit potential. The application of Pythagorean theorem to the financial domain, we gain a mathematical perspective and strategically utilizing various market variables to optimize trading decisions, ultimately contributing to the profitability and success of traders in buying high and selling low scenarios.

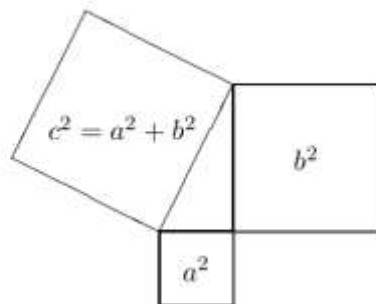


Figure 2: Source from (Brill & Jacobson, 2006)

In the realm of technical analysis, the concept of support can seamlessly transform into resistance, and conversely, resistance into support once these critical levels are breached. However, it is essential to recognize that these support and resistance levels are not always exact and can exhibit fluctuations due to the inherent volatility of financial markets, as elucidated by (Ramyar, 2006). It is worth noting that in this context, manual trading strategies are favored over automated systems due to their superior capacity for precise timing of entry and exit points within our proposed trading methodology. Our research aims to make the current knowledge better by explaining why the Pythagorean theorem can help people make money in the financial market. This explanation is important for people who don't know much about financial analysis. The Pythagorean theorem is like a picture that shows how to buy

high and sell low in the financial market. Using this math idea, traders and researchers can understand more about how trading plans work and what things affect them.

Methods

The secondary data utilized in this study are taken from the Vault Market Broker, selected purposefully due to the market's closure at 23:00 hours on Fridays. Specifically, the study focuses on data corresponding to the lowest and highest prices observed on the 7th July 2023. The analytical framework employed in this investigation draws upon Gann trading rules, specifically emphasizing the application of grid-based forecasting techniques. Furthermore, the Pythagorean theorem is used, with emphasis on a right triangle characterized by side lengths of 3, 4 and 5 units.

This research adopts a geometrical reasoning approach, enabling both researchers and traders to engage in data mining activities aimed at identifying and exploiting specific patterns, thus diverging from the conventional practice of handling extensive datasets. The overarching objective of this research is to develop a trading strategy optimized for short-term trading, defined as positions held for a duration ranging from one day to two weeks. This strategy leverages the same information to inform buy or sell decisions within the market.

Results

The rectangle shown figure 1 formed from the hypotenuse on the right angle indicate once the time like is broken one can buy high.

The findings, as illustrated in Figure 3 for the EURUSD exchange rate, highlight a profitable strategy of entering the market when a blue arrow is observed, signifying the buying at higher price levels. Conversely, the red arrow indicates opportune moments to sell at lower prices, often corresponding to predicted troughs in the price trajectory. This approach effectively capitalizes on buying during upward price trends, thereby fostering potential investment gains. In contrast, selling during descending price trends, as indicated by the red arrows, aligns with a strategy suited for capitalizing on declining market conditions.

The rectangular pattern delineated in Figure 1, formed by the hypotenuse of the right-angled triangle drawn in the chart of figure 3, serves as a crucial indicator for market analysis. When this rectangle is breached, it signifies a significant shift in the market dynamics. In particular, the breaking of this rectangular boundary suggests an opportune moment to execute high-purchase orders, taking advantage of potential price increases. This observation underscores the importance of geometrical reasoning and pattern recognition in guiding trading decisions within the context of short-term investment strategies.

The empirical results and geometrical analyses presented in this study provide valuable insights into the profitability of buying high during ascending trends and selling low within descending trends. The identification of specific patterns, as exemplified by the rectangular configuration, enhances the trader's ability to make informed decisions regarding market entry and exit points, thereby contributing to the development of effective short-term trading strategies.



Figure 3: EURUSD

Discussion and conclusion

The results presented in Figure 3 for the EURUSD exchange rate suggest the existence of a potentially profitable trading strategy based on the use of buy high and sell low for entering and exiting the market. This study indicates the efficacy of the "buy high and sell low" trading approach through a Pythagorean theorem, employing geometric concepts and Gann's grid-based methodology to construct right triangle in the chart. The analysis focuses on market behavior during the opening hours of Fridays, as this temporal reference is deemed essential for forecasting subsequent market movements. It is important to acknowledge the significance of chart scaling in the interpretive process. Our empirical findings substantiate the assertion that non-market makers can indeed profit from this trading strategy, as expressed by DeLong (1988). However, it is imperative to note that our investigation does not account for long-term traders or market makers. Following this approach, traders aim to maximize their profit potential by aligning their actions with the

current market direction. Buying when the market is on an upward trajectory can lead to gains as the price continues to rise, while selling during downward trends can help traders avoid losses or even profit from price declines.

The Pythagorean theorem allows traders the ability to navigate the forex market without the need for in-depth consideration of fundamental news. Instead, it underscores the paramount importance of mathematical relationships within the market, as articulated by (Overduin & Henry, 2020). Forecasting in financial markets is acknowledged as a complex endeavour, but our research underscores the robustness of technical analysis in predicting market behavior with minimal data input requirements, as asserted by (Wang, Liu, and Wu, 2020).

The performance and effectiveness of employing right-angled triangles, particularly on Fridays' closing day, provide traders with a distinct opportunity to engage in short-term trading and attain profit. The Pythagorean-derived tools, as showcased in our study, offer a remarkably accurate means of anticipating market trends and reversals. This underscores the robustness and utility of the approach, reinforcing the potential benefits of trading according to the "buy high and sell low" strategy within the context of financial markets.

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