



# Integrating Physics and Mathematics into Short-Term Trading

Emilia Landa Shikomba, Elias Elizabeth

*Emilia Landa Shikomba is currently pursuing doctorate degree program in Business Administration in Chongqing University, China,. E-mail: [eshikomba@gmail.com](mailto:eshikomba@gmail.com)  
Elias Elizabeth, lecture at University of Namibia [eliaselizabeth93@gmail.com](mailto:eliaselizabeth93@gmail.com)*

## KeyWords

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## ABSTRACT

Incorporating principles from Albert Einstein and Minkowskian spacetime diagrams, this study introduces an innovative trading strategy for short-term traders with limited capital. While previous research has rarely explored the fusion of physics and trading, our study capitalizes on the concept of roundtrip trading in conjunction with angle-based trading techniques pioneered by Gann. We develop a predictive model for buy and sell signals, enhancing technical analysis-based trading strategies. The primary aim is to devise a trading system grounded in physics and mathematics that is both accessible and reassuring for traders, encouraging their active participation in the market. Notably, our findings emphasize the significance of specific angles: a 45-degree angle indicating a favorable selling opportunity, and a 315-degree angle suggesting a buying moment. These angles are interpreted while considering the round trip, whereby past price dynamics influence future prices, aligning with Einstein's concept. The study highlights the importance of the midpoint that connects the two angles, forming a right-angled triangle which creates support or resistance in the future.

## MAIN PAPER STARTS HERE...

### Introduction

The issue with standard statistical analysis in forex markets needs to allow the creation of new methods considering time and the market's memory of past events (Peters, 1996). The aim of this paper is to highlight the significance of investigating the forex market within space-time diagrams and how the geometric patterns in Minkowski spacetime can be used by traders in forecasting market trends using specific angles that act as support and resistance in the market for buying and selling. The method used is of geometric nature, not algebra. (Stein (1968) and Mundy (1986) argument is presented against Einstein's determination of distant simultaneity and the interrelationships among coordinates, under the belief that it does not guarantee predictability. Other researchers argue that future price movements are independent of past behavior, rendering historical data ineffective for prediction (Aktan et al., 2018). However, Peters (1996) emphasized that present decisions are influenced by past experiences.

For present activities in forex market authors indicate different unpredictably factors such as economic events (Bakhach et al., 2016), geopolitical developments (ZXhang et al., 2023), and unforeseen circumstances that can affect the market (Beckman & Czundai, 2017). Traders in forex market may use trading rules that are systematically applied to take advantage of these patterns and maneuver through the forex market with accuracy and consistency (Schulmeister, 1988). The issues of generalizability trading strategies might occur since often applied to a small group of highly traded forex pairs (Park & Irwin, 2007; Taylor, 2014). Traders who possess a flexible and robust approach can adapt their strategies across multiple currency pairs, as highlighted (Neely & Weller, 2012). Some traders that use physics to construct trading rules. An example of integration of relativistic theories into financial models remain in literature rare and occasionally inconsistent (Carvalho & Gaspar, 2021). Since Einstein's theory of relativity is quite difficult understand and most do not get what is about (Prado et al., 2020). Despite physics scientific insights contributes to financial analysis the ,economists often resist data that contradicts their predictions (Savoio & Siman, 2013).

We than ask can market predict market trends using technical analysis based on Space-time diagram. Space time diagram can accurately predict pattern shifts within a 1-hour timeframe in the market. Utilizing the fundamental principles of physics as a guiding framework, this research drawing inspiration from Einstein's profound exploration of time synchronization, in the context of addressing the problem of simultaneous events in Newtonian theory, the present study endeavors to extend Einstein's conceptual insights to the domain of forex trading. This is to overcome the issues of noise caused by random price fluctuations or market manipulation. Einstein's contributions of general relativity propose a universe where events unfold continuously and deterministically, their trajectory eventually leading to a return to their original positions which is roundtrip (Giannoni, 1970; Rouaud, 2022) and a round trip where two light paths go in directions that are right angles to each other (Reid, 2005). Consequently, this conception intertwines the past with the future, suggesting a predetermined course within the confines of space-time. This concept holds relevance within the forex market, prices are recurrently assessed over time. This indicates the potential applicability of the past is future principle within the forex market.

### **Literature review**

Relativity approach offers objective measurements, prioritizing numerical accuracy reduce emotional biases and expectations of individuals to grasp inertial observer dynamics(Savage, Searle, & McCalman, 2007). According to the principles of Relativity of which space-time diagram is from state that different observers may perceive events in the differently based on their coordinate systems(Putnam, 1967). In Mundy (1986) work argued coordinate systems are human-made constructs, artificial descriptions fashioned by humans to interpret the natural world and its physical laws. In this article we use forex exchange market which is human-made construct and traders use lightning-fast information to exploit market fluctuations and secure financial gains. Since the information can not travel faster than light, the paths that light follows from an event will decide which points in the future and past can be linked and at 45° angle is where the light will go through between the directions of space and time(Carvalho & Gaspar, 2021; Siebersma, 2022). Figure 1 accommodates the concept of present, past and future show in the Minkowski spacetime with space characterized by symmetry and use Cartesian coordinate (Carvalho & Gaspar, 2021; Siebersma, 2022).

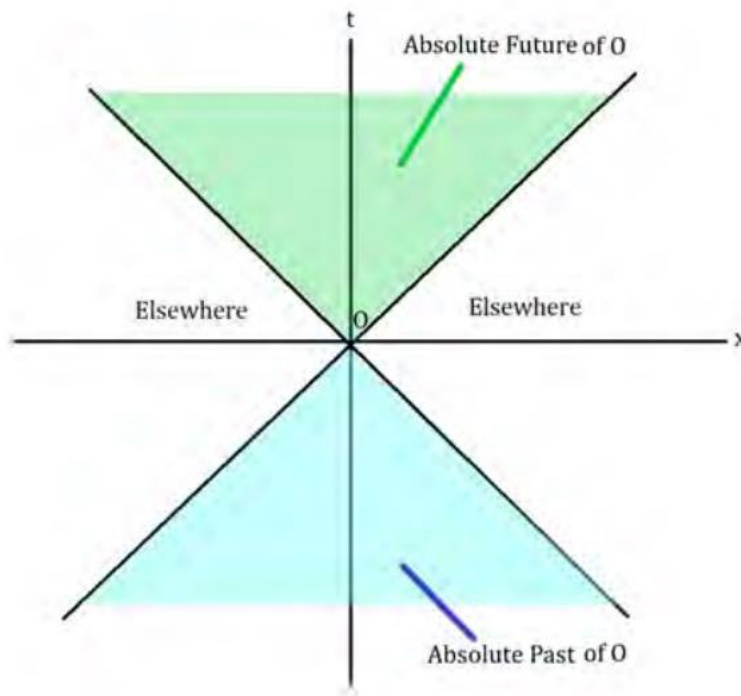


Figure 1

Source from : (Siebersma, 2022)

Space-time diagrams employ a simple technique by excluding additional spatial dimensions and instead depict only one spatial dimension and one time. In these diagrams, events are represented as having both a specific time and a specific location. Utilizing concepts like space-time diagrams, we can visualize the interconnectedness of the past, present, and future within a two-dimensional framework and facilitate trading endeavors (Putnam, 1967; Rietdijk, 1966). Dhond and Aggarwal (1989) argued that space-time allows for the intersection and parallelism of straight lines, facilitating accurate measurement of distances and durations enabling the establishment of a universal framework for physical laws and mathematical principles. Indeed, straight line intersections represent significant events, convergence, and interactions (Miller, 2017). The space time diagrams may provide insights and uncover hidden patterns in market behavior when making trading decisions (Kennedy, 2014). In the context of time, the theory of relativity states that time is considered a dimension. A dimension, in terms of measurement, refers to a particular aspect or direction in which something can exist or be measured (Sonin, 2001). We use time in forex market to trace price at certain time in the past and future.

From a general point view of diagram importance. Geometry deals with objects that can exist in physical space, and our understanding of geometry is influenced by how we perceive and represent the physical world (Izard et al., 2022). Therefore diagrams have real value for knowledge and that geometry knowledge can enhance our everyday lives (Norman, 2003). Geometry is essentially formal logic, encompassing the entirety of pure mathematics (Russell, 1917). Moreover, diagrams serve as reliable mathematical tools that tap into universally shared cognitive abilities (Dal Magro & García-Pérez, 2019). Utilizing diagrams increase finding in research, particularly in two-dimensional representations can increase novel findings (De Toffoli, 2022). Drawing diagrams increase in generating new inferences, representing visually, and organizing information spatially to facilitate future inferences (Larkin & Simon,

1987). Thus, a study by Toms (2011) indicates that traders can align trading strategies with leveraging geometric patterns formed as price move on y axis within different time and anticipate future market behavior so to gain a more comprehensive understanding of market dynamics and have a competitive edge in the market. The issues of generalizability due to trading strategies that often applied to a small group of highly traded forex pairs (Park & Irwin, 2007; Taylor, 2014). Traders who possess a flexible and robust approach can adapt their strategies across multiple currency pairs, as highlighted (Neely & Weller, 2012).

## Methods

We create short term trading strategy and use Vaultmarket broker to back test concept which is based on Minkowski spacetime (Siebersma, 2022) and Einstein concept of round trip (Rouaud, 2022). In price behaviour there tends to be a roundtrip as describe, price tend to come back to original place where it started. The theory of relativity provides a way to measure things objectively. It focuses on getting precise numbers, which helps to lessen personal feelings and hopes when understanding how observers see behaviour (Savage, Searle, & McCalman, 2007). As shown in Figure 1 Minkowski spacetime shown the concept of present, past and future showing symmetry and use cartesian coordinate (Carvalho & Gaspar, 2021; Siebersma, 2022). Practitioners use lightning-fast information to exploit market fluctuations therefore we used 45 degree of the path of light between the directions of space and time to link future and past. For instance 45 degree in Gann method is important (Seo & Engineer, 2016). Gann Angles are used by practitioners for trading and forecasting using the geometric study between price and time based on diagonal line, although there is chart scaling with the method (Hyerczyk, 2009). We therefore identify 315 degree that is part of cartesian coordinate since we have information from past price activities. O point create symmetry and balance within the figure 1 and triangle created within symmetrical represents support and resistance (D'Angelo & Grimaldi, 2017). Therefore, there is a right triangle between 45 degree and 315 degrees. For buying if the price hits 315 provided there is support level in the past to support the decision and sell at 45 degrees provided there is resistance line to support the trading decision. We therefore used 1-hour time frame to set up the trading strategy. Most practitioner are aware that time is represented along the x-axis as a repetitive continuous random variable ranging from 00:00 to 24 hours and then transitioning from 24:00 hours to 00:00. We choose 00h00 of the past day or present day to draw geometric 45 and 315 degree. Price, on the other hand, price undergoes a cyclical journey encompassing quadrants 1 and 4 within the coordinate system until the entire cycle concludes, at which point the trend either continues or breaks.

## Results

Figure 1 found that when the price hit 45 degree there was selling opportunity and make a round trip to the price of 00h00 and go beyond. 45 degree is important for trading (Hyerczyk, 2009; Seo & Engineer, 2016). Around 00h00 is the midpoint which can be used to sell back where the price touches the 315 degree. These finding consistent O point create symmetry and create resistance (D'Angelo & Grimaldi, 2017). Figure 2 indicates also how there is sell at 45 and buy opportunity at 135 degrees. The ideal position was to buy in this case. This because price make a round trip to the price of 00h00 and above from 315 degree. Figure 3 indicate a sell at 45 degree and buy opportunity at 315. This study incorporate the round trip concept (Giannoni, 1970; Rouaud, 2022) and use the concept of present, past and future from Minkowski spacetime to determine vital angles .



Figure 1 GBPUSD H1

Source (Authors own work)



Figure 2 EURGBP H1

Source (Authors own work)



Figure 3.....INDICATE

Source; Authors own work

### Discussion and Conclusion

Few Traders use physics to read the markets. In our study we used Einstein's theory and the geometric spacetime diagram from Minkowski. The findings indicate that space time diagram can accurately predict pattern shifts within a 1-hour timeframe in the market short time. Since the information cannot travel faster than light, the future price and past price are linked at 45° angle (Carvalho & Gaspar, 2021; Siebersma, 2022). ngle 315 indicates a buy position for a short trader. This study did not use algebra or series data that require complex mathematic. We add on literature on the use relativistic theories into financial models that is rare (Carvalho & Gaspar, 2021). Our strategy can yield profit since markets are inefficient can be used on multiple currency pairs (Neely & Weller, 2012) as it is based on physics and mathematics laws. The findings suggest as the broker we used in the study requires small capital to trade this trading strategy can be used by unemployed graduates from science background to improve their income and also to debate any short coming in the study as for future studies.

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