

## THE EFFICACY OF TECHNICAL ANALYSIS IN THE FOREIGN EXCHANGE MARKET: A CASE STUDY OF THE USD/JPY PAIR

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### **Abstract**

Financial markets, known for their unpredictability (Lee, 2020), present significant challenges for researchers. Technical analysis, rooted in the principle of market efficiency, focuses on price movements to predict future trends (Fang & Jacobsen, 2024). Originating in the 17th century, technical analysis has gained prominence in modern financial markets (Dongrey, 2022). Technical analysts rely on historical forex data (Garza Sepúlveda et al., 2023) and employ various tools, including candlestick patterns, moving averages, trendlines, resistance levels, and indicators like Bollinger Bands, MACD, RSI, and moving averages, to forecast price movements (Oktaba & Grzywińska-Rapca, 2024). This study aimed to evaluate the effectiveness of technical analysis in the foreign exchange market by analyzing historical USD/JPY data from 2019, a period unaffected by major global events. The USD/JPY pair was chosen due to its high volatility and economic significance (Fiszeder, 2018 and Peng et al., 2021). Our analysis involved identifying support and resistance levels, trends, and applying various technical indicators to assess their effectiveness in predicting market movements (Mate & Jiménez, 2021). The findings validate the use of technical analysis tools, demonstrating their ability to identify potential reversal and continuation zones.

**Keywords:** Financial markets; Forex market; Technical analysis; Exchange rate; Volatility.

**JEL Classification:** G10, G14, G15.

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## 1. Introduction

Forecasting financial markets, encompassing shares, commodities, and foreign exchange, presents significant challenges for researchers and quantitative analysts due to their inherently chaotic and unpredictable nature (Lee, 2020). Technical analysis is founded on the principle of market efficiency, which posits that asset prices fully reflect all available information, leading technical analysts to focus their studies on price movements (Fang & Jacobsen, 2024). Dongrey (2022) asserts that technical analysis originated in 17th-century Japan, where rice traders pioneered the study of price patterns. However, it wasn't until recent decades that technical analysis gained widespread recognition alongside the growth of modern financial markets. Historical forex data is a pivotal component in the analytical methods employed by technical analysts (Garza Sepúlveda et al., 2023). Investors utilise various tools to predict future price movements, but technical analysis tools like candlestick patterns, moving averages, trendlines, resistance levels, and indicators such as Bollinger Bands, Moving Average Convergence Divergence (MACD), Relative Strength Index (RSI), and moving averages are particularly popular in behavioural finance (Oktaba & Grzywińska-Rapca, 2024).

This study seeks to evaluate the efficacy of technical analysis in the foreign exchange market. To achieve this, a historical analysis of the USD/JPY exchange rate from 3 May 1993 to 31 December 2018 was conducted, focusing on identifying support and resistance levels and prevailing trends. Subsequently, the pair's movements were analyzed to assess the impact of these levels. The study also explored various technical indicators, including chart patterns, candlestick patterns, Fibonacci retracements, and price breakouts. Particular attention was given to reversal candlestick patterns, as they are commonly used by investors to signal market entry points.

This research has substantiated the efficacy of the technical analysis tools scrutinized, affirming their applicability and utility within the foreign exchange market. Trends, trendlines, and channels, along with support and resistance levels, and Fibonacci retracements, have exhibited their reliability in forecasting potential trend reversals or continuations. Graphical and candlestick reversal patterns have proven to be accurate, as their occurrence within the charts of the analyzed currency pairs, coupled with the fulfillment of their underlying assumptions, has demonstrated their effectiveness in predicting trend reversals. Similarly, graphical continuation patterns have shown their reliability in forecasting trend continuations, as their presence within the charts of the analyzed currency pairs, followed by a breakout, has resulted in the persistence of the prevailing trend.

## 2. Literature Review

Ayitey Junior et al. (2023) state that the foreign exchange market, or forex, is the world's largest financial market for trading currencies. Ho et al. (2017) highlight the Forex market as a 24-hour, electronically traded market with an estimated daily trading volume of \$3.2 trillion, making it the world's largest financial market. This dynamic environment contributes to the market's distinctive volatility. The decentralized structure and lower entry barriers of the Forex market make it highly attractive to investors, while its high trading volumes and continuous trading hours render it sensitive to shifts in the political and economic landscape (Wen & Wang, 2020). Information acquisition remains crucial in shaping asset prices, even within the highly liquid foreign exchange market (Goddard et al., 2015). Forex traders extensively employ technical analysis, delving deep into market data to inform their trading decisions (Hassanniakalager et al., 2021). Hernes et al. (2024) state that technical analysis involves the study of historical market data using statistical methods to identify patterns and trends, with the goal of developing trading models and rules based on indicators like the relative strength index, moving averages, and correlation analysis to gain a predictive advantage. The principles of technical analysis are underpinned by three core concepts: firstly, the 'market efficiency hypothesis' posits that all available information is fully reflected in asset prices; secondly, 'prices move in trends' suggests that price movements exhibit a directional bias, either upward, downward, or sideways; lastly, the concept of 'market history repeating itself' proposes that investor behaviour is cyclical, influenced by recurring patterns of emotion and psychology (Wagdi et al., 2023). Jiang et al. (2023) assert that technical analysis entails the study of price patterns in charts to forecast future price movements. Candlestick patterns, which visually depict price movements, are a pivotal component. By analyzing these patterns, traders can anticipate market trends and make informed trading decisions.

## 3. Methodology

This study aims to assess the effectiveness of technical analysis in the foreign exchange market by examining historical USD/JPY exchange rate data from January 1st to December 31st, 2019. This

timeframe was selected to mitigate the potential impact of the COVID-19 pandemic and the ongoing Russia-Ukraine and Middle East conflicts. The USD/JPY exchange rate pair was selected for analysis, as argued by Fiszeder (2018) and Peng et al. (2021), due to its high volatility and economic significance. Secondary data extracted from the Tradingview platform was utilized to facilitate the study and achieve the stated objectives.

In order to attain the study's objective, we employed key technical analysis tools, including trends, support and resistance levels, Fibonacci retracements, and graphical patterns, to evaluate their efficacy and reliability within the foreign exchange market (Fernández & Crespo, 2022 and Zafeiriou & Kalles, 2023). The analysis began with a weekly timeframe (Umoru et al., 2024), providing a broad overview of the USD/JPY exchange rate's historical movements from 3 May 1993 to 31 December 2018. This was followed by the adoption of a daily timeframe for a more detailed examination of the pair's behaviour during 2019 (Milke et al., 2024). The study involved a comprehensive analysis of various technical tools, such as trends, support and resistance levels, Fibonacci retracements, and candlestick patterns, to assess their effectiveness in the foreign exchange market (Mate & Jiménez, 2021). Our approach included several steps: first, selecting the USD/JPY currency pair due to its high volatility; second, analysing its historical movements to identify key support and resistance levels, along with prevailing trends; third, reviewing the pair's movements in 2019 to evaluate the impact of those levels; fourth, examining various technical indicators like chart patterns, candlestick patterns, and price breakouts; and finally, focusing on reversal candlestick patterns, commonly used to signal market entry points.

#### 4. Results

As can be seen in Figure 1, the USD/JPY pair has been following a downward trend since 1998. Moreover, it is possible to observe an upward trend since 2012, only broken in 2018. Similarly to the analysis of the previous pairs in the weekly chart, it was possible to define some support/resistance zones that the price has been respecting since 1993 (blue lines), only identified within the price oscillation range of the pair during 2019 (white lines).

Figure 1 - Global Overview of USD/JPY



Source: Own elaboration on the Tradingview platform

Figure 2 shows that the price followed three trends throughout the year. The first trend, upward, is delimited by a trendline (LTA1) and a channel line 1 (LC1) until the end of March, when the price breaks above LTA1 but continues to rise until May, once again confirming Pring's (2014) premise with LTA1 acting as resistance. The second trend, this time downward, begins when the price fails to break the resistance at the 112,122 level and starts its descent in a channel also delimited by the downward trendline 1 (LTD1) and the channel line 2 (LC2). In early July, the price breaks below LTD1 but continues its downward movement until the end of August, in turn, LTD1 then acts as support until the end of its downward movement. Failing to break the resistance around 104,795, the price rises again, respecting the upward trendline 2 (LTA2) until breaking it at the beginning of December.

**Figure 2 - USD/JPY Trends**

Source: Own elaboration on the Tradingview platform

In the upward movement at the beginning of the year, the price encounters difficulty in breaking the resistance at the 112,122 level and forms a bearish reversal pattern, a double top, as can be seen in Figure 3. The pattern is characterized by two peaks at the same level separated by a trough (Chen, 2010). The price finds some indecision at the trough line but eventually declines as expected after the pattern. Between July and October, a bullish reversal pattern, an inverse Head and Shoulders, was formed. As discussed by Pring (2014), in the complete pattern of Figure 46, the price is seen rising, then making a small correction and finding support at the neckline. It is possible to observe how the volume is high on the first shoulder and the head, and slightly lower on the second shoulder, a very important premise in the pattern under analysis.

**Figure 3 - Head & Shoulders USD/JPY**

Source: Own elaboration on the Tradingview platform

Similar to the analysis of the previous pairs in Figure 47, bearish reversal patterns are visualized in red and bullish reversal patterns in green. In this analysis, it can be observed that after the bearish reversal patterns, the price tends to decline, as expected, contrary to what happens in the bullish reversal patterns. Once again, it is important to emphasize that the patterns that deserve the most attention are those located in potential reversal zones.

**Figure 5 - EUR/USD Candlestick Patterns**

Source: Own elaboration on the Tradingview platform

The price fails to break the resistance at the 112,122 level, as seen in Figure 48, and a breakout is identified, in this case, a downside breakout in another important support zone. According to Chen (2010), the pattern is confirmed since the breakout breaks the support zone located around 111,021 and the gap is not filled.

**Figure 5 - USD/JPY Breakout Point**



Source: Own elaboration on the Tradingview platform

When the LTA 1 is broken and the upward momentum is interrupted, the Fibonacci retracement method is applied to discover the retracement zones. Once again, as Chen (2010) argues, it can be observed in Figure 49 how the most important areas of the retracement act as resistance/support. In this situation, the price finds resistance at the 0.00% zone and fails to break through it, descending and showing some indecision about which direction to follow in the retracement zones, until finally reaching the 100% retracement zone.

**Figure 6 - Fibonacci Retracement I USD/JPY**



Source: Own elaboration on the Tradingview platform

When the LTD 1 is broken, the retracement method is applied again, and once more, Figure 50 shows the retracement zones acting as support/resistance.

After breaking the 50% resistance zone, there are several attempts to use it as support on the downside, but the price remains between the 50.00% and 61.80% zones, with some difficulty in breaking out until the end of the year under study.

**Figure 6 - Fibonacci Retracement II USD/JPY**



Source: Own elaboration on the Tradingview platform

## 5. Conclusions

This study validates the efficacy of technical analysis in the foreign exchange market, aligning with findings from Grądzki & Wójcik (2024). Tools like trendlines, support and resistance levels, and Fibonacci retracements effectively identify potential reversal and continuation zones, offering valuable trading opportunities (Dammak et al., 2024). Baker (2024) and Padmavathy (2024) support the significance of these tools, emphasizing their psychological underpinnings. The Head and Shoulders pattern, in particular, has proven reliable in predicting trend reversals (Wan et al., 2020). Other reversal and continuation patterns, such as double tops/bottoms, triangles, rectangles, and flags, have also demonstrated their effectiveness in forecasting price movements (Edwards et al., 2018). Studies by Shah et al. (2019), Dichtl (2020), and Ayala (2021) further confirm the predictive nature of these patterns across various markets, including the NYSE and Nasdaq. Candlestick reversal patterns have similarly proven effective in identifying reversal zones (Heinzel et al., 2021; Cohen, 2023). Additionally, research by Low (2022) and Liang (2023) validates the predictive power of price breakouts. In conclusion, technical analysis can be a valuable tool for forex traders, but a holistic view that includes fundamental factors is essential for sustainable success.

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