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STATISTICAL APPROACH TO FOREX MARKET ANALYSIS

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242-44-09

This report is submitted as a partial requirement for obtaining the Masters of Software
Engineering degree

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APPROVAL

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This thesis titled on “Statistical Approach to Forex Market Analysis”, submitted by Mohamed Dirir Abdi, ID: 242-44-009 to the Department of Software Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of Masters of Science in Software Engineering and approval as to its style and contents.

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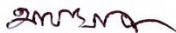
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Declaration of Private Defense Completion for M.Sc. Final Defense

To,

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Subject: Request for Permission to Participate in M.Sc. Final Defense /Successful, Declaration to the completion of Private Defense for M.Sc. Thesis in front of My Supervisor

I declared that I have successfully completed my Private Defense for my M.Sc. thesis in front of my supervisor on **11 August at 10 AM**. I am now prepared and eager to proceed to the final defense.

During the private defense, I had the opportunity to present and discuss my research findings, methodologies, and conclusions with my supervisor. I have shown the entire document and presentation slide to my supervisor.

Based on the outcomes of the Private Defense, I believe my research is ready to be presented to the final defense board. So, please give me permission to attain the final defense.

In this circumstance, I look forward to your positive response and give me the opportunity to present my research to the thesis committee during the Final Defense.

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CHAPTER: 1 INTRODUCTION

A Forex indicator that's driven by stats helps traders make calls based on proven patterns, not just guesswork. What makes it different from generic tools is that it builds a custom model for each currency pair. It understands that symbols like XAUUSD or GBJPY have their own unique volatility, liquidity, and market behaviors. The indicator uses statistical methods (like Retracement Trail, Level Analysis, and Retracement Top Bottom) to forecast market direction or potential returns. Instead of just giving a "buy" or "sell" signal, it gives these forecasts as probabilities, showing traders a measurable signal strength.

Backtesting is a core part of this. You won't just see hand-picked examples; the indicator shows its performance 'out-of-sample' in real-world trading setups. It also considers different holding times to give realistic estimates for metrics like win rate, return-to-risk, and drawdown. The data comes from a live broker, which helps cut down on errors and improves accuracy.

Every time the indicator runs, it generates a report for that specific pair. This report shows the current trade bias, the expected return, and its past performance. This helps avoid broad, misleading claims and lets traders adjust their trade size and strategy based on a proven historical edge. By combining statistical modeling with clear, pair-specific backtesting, it gives traders a disciplined and repeatable, data-backed way to trade.

These indicator results do not include spreads and commissions.

The objectives for this project:

1. The first goal is to use advanced statistical methods to find hidden patterns in forex price moves, going beyond the usual chart patterns.
2. It's also just as important to develop custom code based on deep market-watching. This code will let us see, test, and prove these statistical insights, and then turn them into a set of working trading tools.
3. The project also aims to create new trading strategies and improve old ones. We'll find any flaws by visualizing and testing them, which will help us judge their potential profit and make sure our trading is solid and data-driven.

A Comprehensive Analysis on the Foreign Exchange Market and Core Trading Strategies

Executive Summary

This report takes a deep dive into the Foreign Exchange (Forex) market, which is known as the world's biggest and most liquid financial market. It starts by laying out the market's structure, the main players, and its basic functions. It also tracks how the market grew, from the Bretton Woods system up to the current period of floating exchange rates. The report then focuses on the two main analytical methods traders use: Fundamental Analysis and Technical Analysis. Each method is looked at in detail, covering its main principles, key tools, and practical uses, including a wide range of economic indicators, central bank policies, chart patterns, and technical metrics.

The report also looks at how to use both approaches together to build a stronger, more complete trading model. This means blending the long-term view from fundamental analysis with the sharp entry and exit timing from technical analysis. This new edition also adds two really important sections: 'Risk Management in Forex Trading,' which covers key ways to protect your capital, and 'The Psychology of Trading,' which deals with the mental discipline you need to succeed long-term. In the end, the goal is to offer a complete, reliable guide for getting a handle on the complexities of the Forex market.

1. Introduction to the Foreign Exchange (Forex) Market

The Foreign Exchange (Forex or FX) market is a worldwide, decentralized, over-the-counter (OTC) system for trading national currencies. With a daily volume of over \$7.5 trillion, it's the biggest financial market in the world, easily larger than all the globe's stock markets combined. Unlike stock exchanges, Forex doesn't have a central physical location. Instead, trades happen electronically through a huge global network of banks, big companies, investment firms, hedge funds, and individual traders.

1.1 A Brief History: From Bretton Woods to Floating Rates

The Forex market as we know it is fairly new. Its story starts after WWII with the Bretton Woods Agreement in 1944. This system pegged most major currencies to the U.S. dollar, which was tied to gold at \$35 an ounce. This setup brought stability but was very rigid. By the late 60s and early 70s, the U.S. was under too much economic pressure, and the system couldn't last. In 1971, President Nixon cut the dollar's direct link to gold, an event known as the "Nixon Shock." By 1973, the whole Bretton Woods system had collapsed. This led major world currencies to "float," meaning their values were set by supply and demand. This shift created the modern Forex market.

1.2 Market Structure and Participants

The Forex market has a kind of hierarchy. At the very top is the interbank market, which is an exclusive club for the world's biggest banks to trade currencies directly with each other. This top level handles the bulk of all global Forex trades and has the tightest 'bid-ask' spreads because it has so much liquidity. Everyone else in the market gets access to currency trading through connections to this top tier.

Key participant categories include:

- **Central Banks:** National monetary authorities (e.g., the European Central Bank, the U.S. Federal Reserve) intervene to manage foreign currency reserves, influence domestic currency valuations, and maintain overall market stability.
- **Commercial Banks and Financial Institutions:** They trade for their own profit while also acting as middlemen, helping their corporate clients and smaller banks execute trades.
- **Corporations:** Multinational companies get involved to hedge risk from cross-border business. For instance, a European importer buying from the U.S. needs to swap euros for dollars.
- **Investment Managers and Hedge Funds:** These firms trade currencies mainly to speculate, trying to profit from exchange rate shifts on behalf of their clients.
- **Retail Traders:** These are individual traders, usually using online brokerage platforms, who speculate on where currency prices are headed. They're everyday people like you and me speculating the market.

1.3 Currency Pairs: Majors, Minors, and Exotics

Currencies are always traded in **pairs**. The first currency is the **base currency**, and the second is the **quote currency**. The exchange rate indicates how many units of the quote currency are needed to buy one unit of the base currency.

- **Major Pairs:** These consist of the U.S. dollar paired with one of the other most liquid currencies in the world. They account for over 80% of all Forex trading. Examples include EUR/USD, USD/JPY, GBP/USD, and USD/CHF.
- **Minor Pairs (or Cross-Currency Pairs):** These are pairs that do not include the U.S. dollar but feature other major currencies. Examples include GBP/JPY, EUR/JPY, and GBP/AUD.
- **Exotic Pairs:** These consist of one major currency paired with the currency of an emerging or smaller economy. Examples include USD/TRY (Turkish Lira) or EUR/PLN (Polish Zloty). These pairs are typically less liquid and have wider bid-ask spreads.

1.4 Key Terminology

- **Pip (Percentage in Point):** The smallest standardized increment of price movement in a currency pair. For most currency pairs, one pip equals the fourth decimal place (0.0001), whereas for pairs involving the Japanese yen, it is the second decimal place (0.01).
- **Lot:** This refers to a standard size for a trade. A 'standard' lot is 100,000 units of the base currency. Traders also commonly use 'mini' lots (10,000 units) and 'micro' lots (1,000 units) to manage different account sizes and risk levels.
- **Leverage:** This is a tool that lets traders open positions that are much larger than their actual account balance. For example, with 100:1 leverage, a trader can control a \$100,000 position using only \$1,000 of their own money. While leverage can dramatically increase potential profits, it also makes potential losses much larger.

- **Margin:** This is the amount of a trader's own money needed to open and hold a leveraged trade. It's not a fee; it's more like a security deposit that the broker holds to cover the position.
- **Bid–Ask Spread:** This is the small difference between the 'bid' price (what the broker will pay to buy) and the 'ask' price (what they will charge to sell). This gap is how brokers primarily get paid and can also show how much liquidity is in the market.

2. Fundamental Analysis: Gauging Economic Vitality

This is a way to figure out a currency's value by looking at the economic, social, and political factors that affect its supply and demand. The main idea is that a currency's long-term price is a sign of its home country's overall economic health. People who use this method study economic reports to guess a currency's 'real' value. They then make trades based on whether the current market price is higher or lower than that estimated value.

2.1 In-Depth Look at Economic Indicators

- **Gross Domestic Product (GDP):** This number comes out every quarter and is the biggest-picture look at a country's total economic output. If the GDP is higher than expected, it usually means the economy is doing well. This can lead the central bank to take a "hawkish" stance (like raising interest rates), which often makes the currency stronger.
- **Inflation (Consumer Price Index & Producer Price Index):** The CPI measures changes in the price of a typical basket of goods and services for consumers, while the PPI tracks inflation at the wholesale level. Most central banks aim for an inflation target around 2%. High inflation eats away at purchasing power, but it also often pushes central banks to raise interest rates to cool down the economy. This move is usually good for the currency.
- **Employment Data:** Non-Farm Payrolls (NFP) This monthly U.S. report is one of the most-watched economic indicators. It shows the number of new jobs created outside of the farming sector. A strong NFP result usually points to a healthy economy and can signal rising inflation, which often strengthens demand for the U.S. dollar. The unemployment rate is another key metric that's released with it
- **Retail Sales:** This monthly report tracks the total value of goods sold by retailers. Since consumer spending is a huge driver of GDP, a retail sales number that's better than expected is usually a bullish sign for the currency.
- **Industrial Production:** This measures the output of factories, mines, and utility companies, offering a window into the country's industrial health. Growing production numbers usually point to a strong economy.
- **Trade Balance:** This is the difference between what a country exports and what it imports. A trade surplus (exporting more than importing) is usually good for the currency, while a trade deficit (importing more than exporting) can put downward pressure on it.

- **Consumer Confidence and Business Sentiment Surveys:** These are forward-looking reports like the Consumer Confidence Index (CCI) or the Purchasing Managers' Index (PMI), which measure how optimistic households and businesses feel. High confidence is a good sign, as it often leads to more spending and investment, which in turn helps the economy grow and can strengthen the currency.

2.2 The Overarching Role of Central Banks

No one has a bigger pull on the Forex market than the central banks. Their main goals are usually to keep prices steady (control inflation) and, in some places, to help create as many jobs as possible. Any decision they make or statement they release can have a huge and immediate effect on currency prices.

Key policy instruments and channels include:

- **Interest Rate Policy:** The benchmark interest rate is their most powerful tool. When a central bank raises rates, it makes that country's assets more attractive to foreign investors who want a better return. This increases demand for the currency and makes it stronger. This is the simple idea behind the 'carry trade,' where traders borrow a currency with low interest rates to buy a currency with high interest rates, earning the difference.
- **Forward Guidance:** Speeches and press conferences from central bank leaders are watched very closely by traders. The market analyzes their exact words for any hints about future policy changes. A 'hawkish' tone suggests they might tighten policy (like raising rates) to fight inflation. A 'dovish' tone points toward stimulating the economy, which could mean cutting rates.
- **Unconventional Monetary Policy:** Quantitative Easing (QE) and Tightening (QT) When the economy is in trouble or during a financial crisis, central banks might use 'Quantitative Easing' (QE). This is where they buy up government bonds and other assets to pump liquidity (money) into the economy. Because this increases the money supply, it usually has a bearish (negative) effect on the currency. The opposite is 'Quantitative Tightening' (QT), which reverses QE by reducing liquidity, and this is generally seen as bullish (positive) for the currency.

2.3 Geopolitical Events: Political stability is also a big factor. Events like uncertain elections, major referendums (such as Brexit), trade disputes, or wars can all create risk and cause wild swings in currency prices. During these times, money often rushes out of the affected currency and into "safe-haven" currencies like the Japanese Yen (JPY), Swiss Franc (CHF) or the U.S. Dollar (USD).

3. Technical Analysis: The Study of Price Action

Technical analysis offers a different approach. It's a method for spotting trading opportunities by studying statistical patterns from market activity, focusing mainly on price movements and trading volume. The core idea behind it is that all public information, like economic news, is already built into the current market price. Because of this, supporters of technical analysis believe that simply examining historical price data is enough to forecast future market behavior and make trading decisions.

3.1 The Three Tenets of Technical Analysis

1. **Market Action Discounts All Information:** The first principle is that all known information, whether it's fundamental, political, or just market psychology, is already baked into the current price. In this view, the price action itself is the final word, a complete summary of everything affecting the market.
2. **Prices Move in Trends:** Currency markets show clear directional movements, or "trends, whether they're moving up, down, or sideways. A technical trader's main goal is to spot the current trend and trade with it, based on the idea that a trend will keep going until there's clear proof it's reversing.
3. **Historical Patterns Tend to Recur:** Market psychology tends to stay consistent. Because traders often react to similar situations in the same ways, their behavior creates repeating chart patterns. These patterns can then be found and used to forecast where prices might go next.

3.2 Price Charts and Candlestick Patterns

- Price Charts –

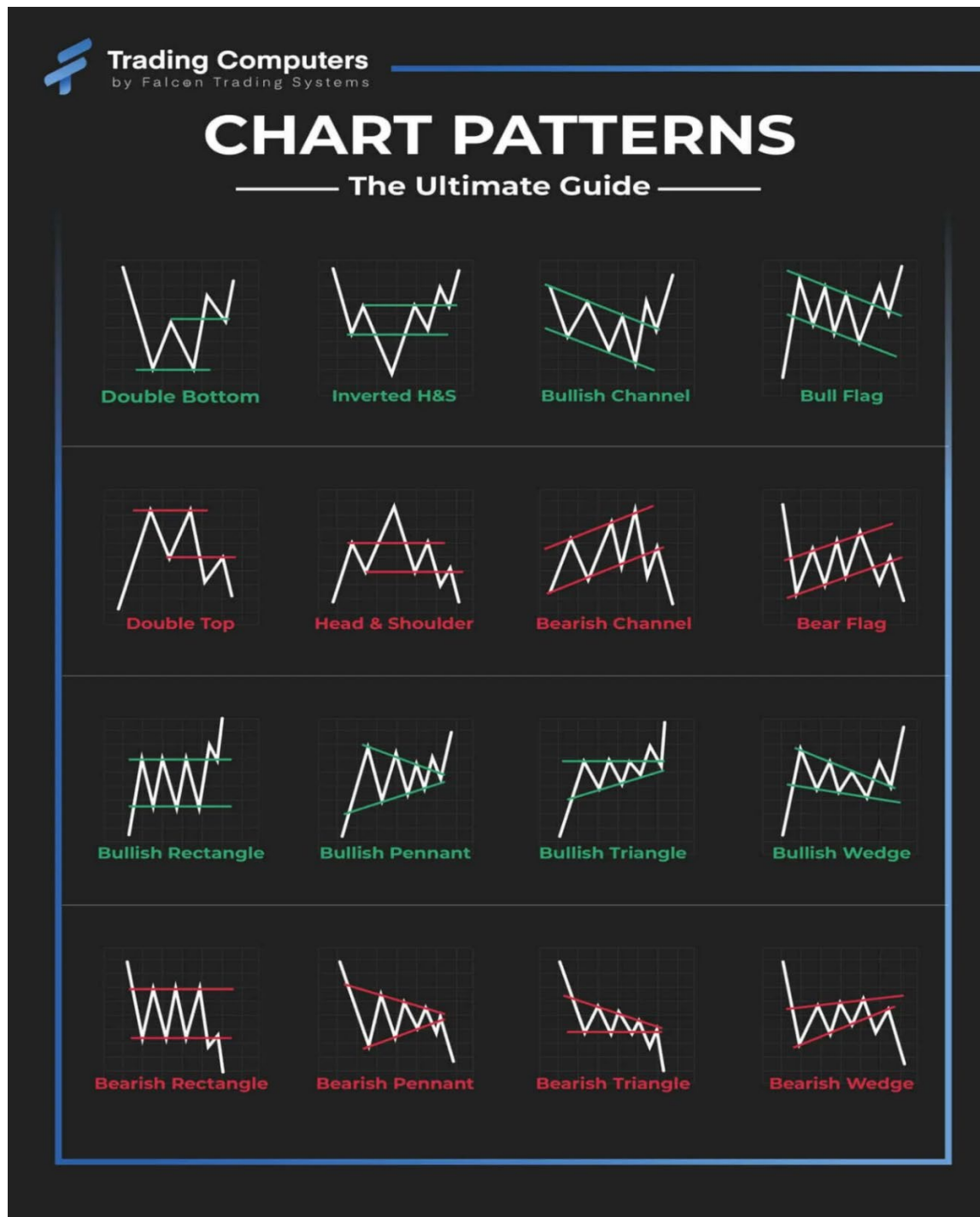


Figure 1.1 Prominent Forex Chart Patterns

Price charts are the basic tool for technical analysis. Candlestick charts are especially popular because they show four key pieces of information for a specific time period: the open, high, low, and close prices. A 'Bullish' candle (usually green or white) means the price closed higher than it opened. A 'Bearish' candle (usually red or black) means the price closed lower than it opened. The thin lines sticking out, called 'Wicks' or 'Shadows,' show the total price range during that period.

- Key Candlestick Patterns –

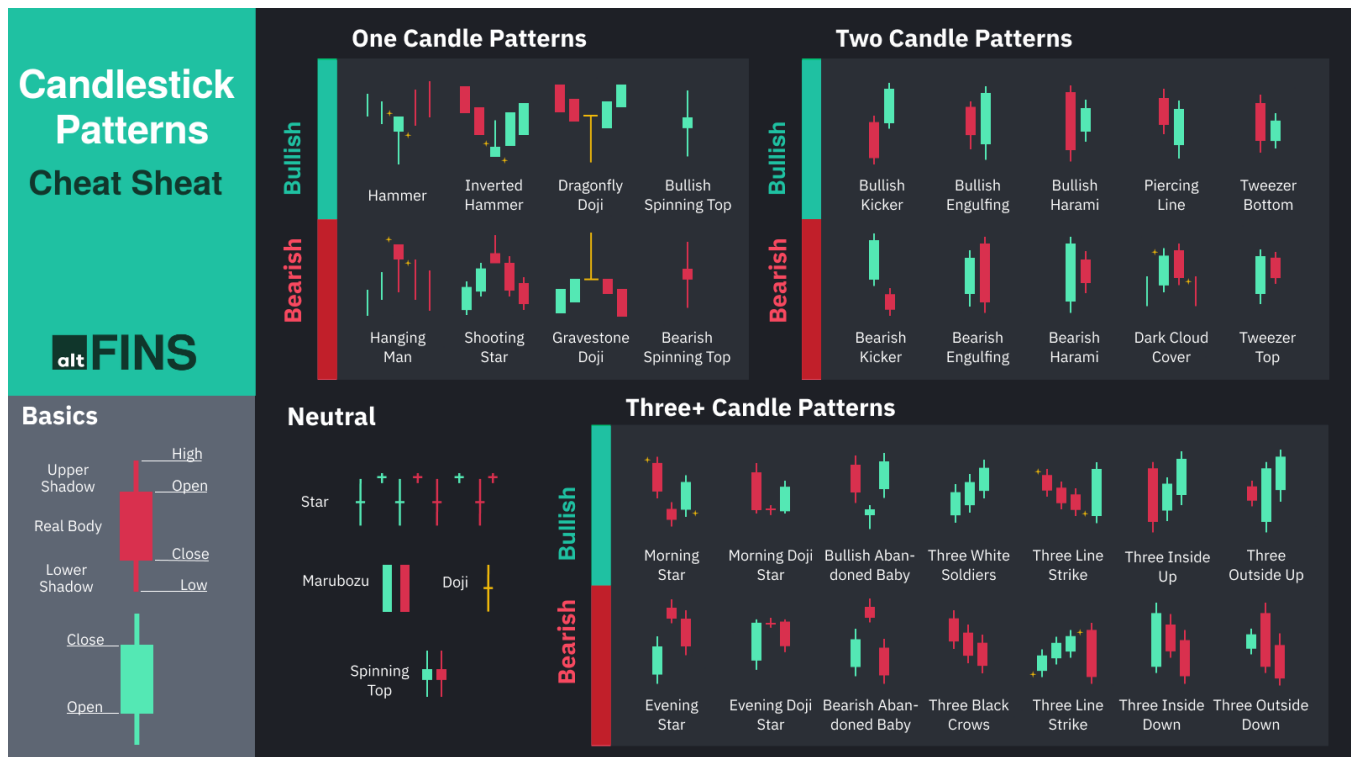


Figure 1.2: Popular Forex Candle Stick Patterns

- Doji: A candle with little to no 'body,' meaning the open and close prices are nearly identical. This signals indecision in the market. A Doji can sometimes hint at a potential reversal, especially if the following candles start moving in the opposite direction. Sometimes it appears as plus sign when you look at it.
- Hammer / Hanging Man: These two patterns look similar, with a small body and a long lower wick. The difference is where they show up. A 'Hammer' appears after a downtrend and is seen as a potential bullish (upward) reversal signal. A 'Hanging Man' appears after an uptrend and can signal a potential bearish (downward) reversal.
- Engulfing Pattern (Bullish/Bearish): This is a two-candle setup where the body of the second candle completely "engulfs" or covers the body of the first. A Bullish Engulfing pattern following a downtrend is considered a strong buying signal, whereas a Bearish Engulfing pattern after an uptrend is viewed as a strong selling signal.

- Morning Star / Evening Star – Three-candlestick reversal formations. The Morning Star typically occurs at the base of a downtrend and signals potential bullish reversal, while the Evening Star forms at the crest of an uptrend, suggesting possible bearish reversal.

3.3 Major Chart Patterns

- **Reversal Patterns:**

- **Head and Shoulders:** A pattern consisting of three peaks, with the middle peak (the head) being the highest. A break below the "neckline" (a support level connecting the lows) signals a major trend reversal from bullish to bearish. An Inverse Head and Shoulders signals a reversal from bearish to bullish.
- **Double/Triple Top & Bottom:** These patterns occur when the price tests a resistance (top) or support (bottom) level two or three times and is unable to break through, signaling a potential trend reversal.

- **Continuation Patterns:**

- **Triangles (Symmetrical, Ascending, Descending):** These patterns indicate a period of consolidation before the price is likely to "break out" and continue in the direction of the prior trend.
- **Flags and Pennants:** Short-term consolidation patterns that form after a sharp, strong price move. They represent a brief pause in the market before the trend resumes.

3.4 Technical Indicators

- **Trend Indicators:**

- **Moving Averages (MA):** The most common indicator. A Simple Moving Average (SMA) calculates the average price over a set number of periods like the 30 for 9 bars. An Exponential Moving Average (EMA) gives more weight to the recent prices. Traders watch for "golden crosses" (a short-term MA crossing above a long-term MA, a bullish signal) and "death crosses" (the opposite, a bearish signal).

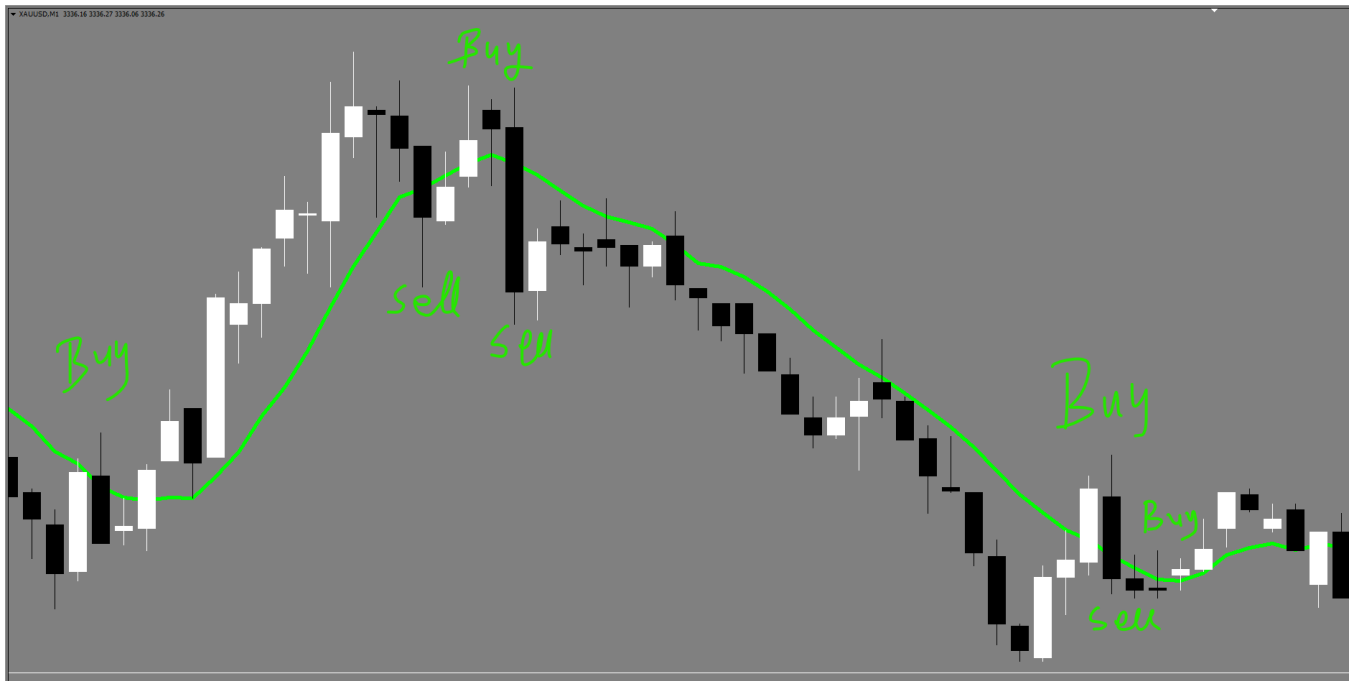


Figure 1.3: Moving Average. You Buy/Sell when price crosses over to the top/dottom

- **Momentum Oscillators:**

- **Relative Strength Index (RSI):** Measures the speed and change of price movements on given period on a scale of 0 to 100. A reading above 70 is considered "overbought," and a reading below 30 is "oversold." **Divergence** (when the price makes a new high/low but the RSI does not) can be a powerful reversal signal.
- **MACD (Moving Average Convergence Divergence):** Consists of two lines (MACD line and the signal line) and a histogram bar. Crossovers of the two lines can provide buy and sell signals.

- **Volatility Indicators:**

- **Bollinger Bands:** Consist of a middle band (SMA) and two outer bands that are a set number of standard deviations away. The bands widen during high volatility and contract (a "squeeze") during low volatility, which often precedes a significant price move.

- **Fibonacci Tools:**

- Based on the Fibonacci sequence, these tools help identify potential support and resistance levels. **Fibonacci Retracement** levels (commonly, 61.8%, 50% and 38.2%) are used to identify where a price might pull back to within a trend.

4. The Synergistic Utilization of Both Strategies

While some traders are purists, the most sophisticated approach often involves integrating both fundamental and technical analysis. This hybrid methodology allows a trader to build a more complete picture of the market, combining the "why" of fundamental analysis with the "when" of technical analysis.

A Practical Walkthrough:

1. **Form a Fundamental Bias:** A trader reads that the Bank of England has signaled it is likely to raise interest rates at its next meeting to combat rising inflation. UK employment data has also been strong. This creates a long-term **bullish fundamental bias** for the British Pound (GBP).
2. **Select a Currency Pair:** For example, a trader might look for a chance to buy GBP against a currency with a weak economic outlook, like the Japanese Yen (JPY), because the Bank of Japan is sticking to an extremely 'dovish' (loose) policy. The chosen pair in our case is GBP/JPY.
3. **Identify a Technical Entry:** Looking at the GBP/JPY chart, the trader notices the pair is in a solid uptrend but has just experienced a pullback. Using a Fibonacci Retracement tool, they find that the price is getting support at the 50% level. This level also happens to line up with the 50-period moving average (EMA). Right at this combined support area, a bullish hammer candle forms. This combination gives a strong technical signal to enter the trade.
4. **Manage the Trade:** The trader opens a long order. They place a **stop-loss** just below the low of the hammer candle to protect against a losing move. They set a **take-profit** target at the previous major high, ensuring a favorable risk-to-reward ratio.

In this example, the fundamental analysis provided the strategic direction, while technical analysis provided the tactical entry and risk management plan.

5. Risk Management: The Foundation of Successful Trading

No trading strategy is complete without a robust risk management plan. More traders fail due to poor risk management than poor analysis. The goal is not to win every trade, but to ensure that winning trades are larger than losing trades over time.

- **The 1-2% Rule:** Never risk more than 1-2% of your total trading capital on any single trade. This ensures that a string of losses will not wipe out your account, allowing you to survive to trade another day.
- **Position Sizing:** Your position size (how many lots you trade) should be calculated based on your stop-loss distance and your 1% risk. If your stop-loss is wider, your position size must be smaller, and vice versa.
- **Always Use a Stop-Loss:** A stop-loss order is an order placed with your broker so that it automatically closes your position if the price moves against you by a certain amount. Trading without a stop-loss is like driving without brakes.

- **Risk-to-Reward Ratio:** Before placing any trade, you should know your potential profit (reward) and your potential loss (risk). A favorable risk-to-reward ratio is at least 1:2, meaning you stand to make at least twice as much as you are risking.
- **Understand Leverage:** This is a tool that lets traders control a position much larger than their own capital. For instance, 100:1 leverage allows a trader to open a \$100,000 position with only \$1,000 of their own money. This is often called a 'double-edged sword' because while it can massively boost profits, it can also lead to huge losses if not handled with care. It's safer to use low leverage and important to remember that it doesn't change the real value of your position—it only changes the amount of deposit (margin) required to open it.

6. The Psychology of Trading

The last, and often toughest, part of the trading puzzle is mastering your own mind. The market is driven by fear and greed, and decisions made based on emotion are almost always the wrong ones.

- **The Enemies: Fear and Greed:** Greed can push a trader to use too much leverage, chase a trade that's already taken off, or hold on too long hoping for even bigger gains instead of taking profit. Fear works the other way, causing traders to bail out of good trades too soon, be too scared to take a valid setup, or try to "revenge trade" to make back money after a loss.
- **Cognitive Biases:** It's crucially important to watch out for common biases. This includes confirmation bias, where you only look for news that agrees with your trade, and recency bias, which is when you give too much weight to what just happened in the market.
- **The Importance of a Trading Plan:** A trading plan is your personal rulebook. It's something you write down before you trade, not during the heat of the moment, and it clearly defines your rules for getting in, getting out, and managing your money for every single trade. Your main job as a trader isn't to guess what the market will do, but to follow your plan perfectly.
- **Discipline and Patience:** What really separates a professional trader is discipline. This means following your trading plan even when it's hard. It also means having the patience to wait for a high-quality setup to appear, rather than trying to force a trade when the market isn't offering a good opportunity to avoid getting bamboozled.

Conclusion

The Forex market is huge and complicated. It offers big opportunities, but also comes with major risks. A shallow understanding just won't cut it for long-term success. You need minimum three years to grasp it fully and become consistently profitable. This report has shown that to really get it, you need a deep understanding of its history, how it's built, and who is involved. To master it, you need to use two types of analysis: grounding your trades in the big-picture economic facts (fundamental analysis) and then using technical analysis to get your timing and execution just right.

But even the best analysis will fall apart without a solid foundation of strict risk management and a disciplined mindset. Protecting your capital is the top priority, and learning to control your emotions is

what makes the difference between an amateur and a pro. In the end, successful Forex trading isn't a get-rich-quick-scheme sprint; it's a marathon that requires constant learning, careful planning, and total discipline.

1. Project Planning and Initiation

Feasibility Study (Step-by-Step):

Phase 1: Preliminary Analysis & Project Scope Definition

Relying on common chart patterns is a big problem. These patterns are so well-known that not only do regular traders see them, but big banks do too, and they can use this shared knowledge to manipulate the market. This imbalance highlights a major hole in current research: not many people have looked into statistical methods that could help protect traders from this kind of manipulation. Creating new statistical indicators could help level the playing field by offering a way to analyze the market that is more open, testable, and easier to measure. This kind of progress could ultimately lead to better trading results and a fairer market for everyone.

Lately, a lot of research and writing has focused on forex indicators that mostly just recognize chart patterns. This method is all about spotting specific visual patterns that have been used as trading signals for a long time. But the problem is, these patterns are so widely used that just about everyone knows them, including the big banks. Because they're so popular in both research and real-world trading, there's a risk. It can lead to 'overcrowded' trades where everyone is doing the same thing, which makes the patterns less effective at predicting anything.

Project Scope Definition

The scope of this project is to do a full investigation of trading strategies. This will involve taking trading courses, watching the market closely, careful coding, and using advanced visualization tools. The process includes methodically testing and checking our market insights and strategies in a safe, controlled setup. This will help build a solid system for analysis before we try to prove it with real data. Finally, the project aims to take these well-tested theories and use them in the live market by actually placing trades. This ensures every step, from the initial idea to the final execution, is checked and tuned for the best performance.

Phase 2: Market Feasibility Analysis (or Market Research)

Before diving into this project, I have undertaken and acquired the necessary information related to trading in the financial markets. I have done extensive research and read a lot of literature like [7 Winning Strategies for Trading Forex by Grace Cheng](#) and [ESTIMATING DIRECTIONAL CHANGES TREND REVERSAL IN FOREX USING MACHINE LEARNING by Adesola Tolulope Noah Adegboye](#). I also review several Forex courses in the market being taught by mentors. This gave me the insight about trading frequent problems and I sought out to fix them what I can in this project. There is also an opportunity to sell this indicator to the market and make money out of or I can use to trade on my own.

Phase 3: Technical Feasibility Analysis

Since I require the programming skills coding this project will be easy. I am also familiar with Java and the platform MetaTrader 4 uses programming language that pseudo-Java. Optimizing parameters, coding simulations, visualizations and computer performance efficiency will be easy.

Phase 4: Financial Feasibility Analysis

This project might cost maximum 50 USD that will be tested on a live Forex Market. Also, the broker will give real live data that is free from errors and gaps.

2. Target User Profile and Tentative Elicitation Process

Our target users will be Forex traders beginners and professionals a like. Most of the indicators can be used in Stock and crypto too.

3. System Requirements

The system design is centered within the MetaTrader 4 platform, which will serve as the primary environment for interfacing with and developing the majority of the project's strategic modules, while Python is utilized for advanced statistical analysis of data extracted from MT4.

Windows 10 dual core, 2G of RAM and 5 GB of Hard drive space is sufficient to run this program this they are optimized to run low end systems.

5. Project Scheduling

Project scheduling is all about organizing tasks, timelines, and what depends on what, so you can hit your deadlines on time. It makes sure you're using your resources well, that tasks happen in a logical order, and it points out the major goals along the way. By figuring out the most important activities and keeping an eye on progress, it helps you stay on track and avoid setbacks. People often use tools like Gantt charts and network diagrams to see everything clearly and manage their time well.

Table 1.1: Project Scheduling

DATES	PHASE
May 1 st 2025 – May 31 st 2025	Initiation / Conceptualization
June 1 st 2025 – June 10 th 2025	Requirement Gathering / Elicitation
June 11 th 2025 – July 31 st 2025	Implementation and Testing
August 1 st 2025 – August 10 th 2025	Implementation and Testing

a. Time Frame/ Gantt Chart/Risk Management.

Project scheduling involves laying out clear timelines, figuring out the order of tasks in terms of their priority and precedence, and assigning resources to make sure deadlines are met. Gantt charts are useful for seeing how things are progressing and what tasks depend on others, and they also help spot the most critical steps. Risk management is built into the plan to get ahead of potential delays and make adjustments. All these tools work together to make sure the project runs smoothly, finishes on time, and can handle any surprises.

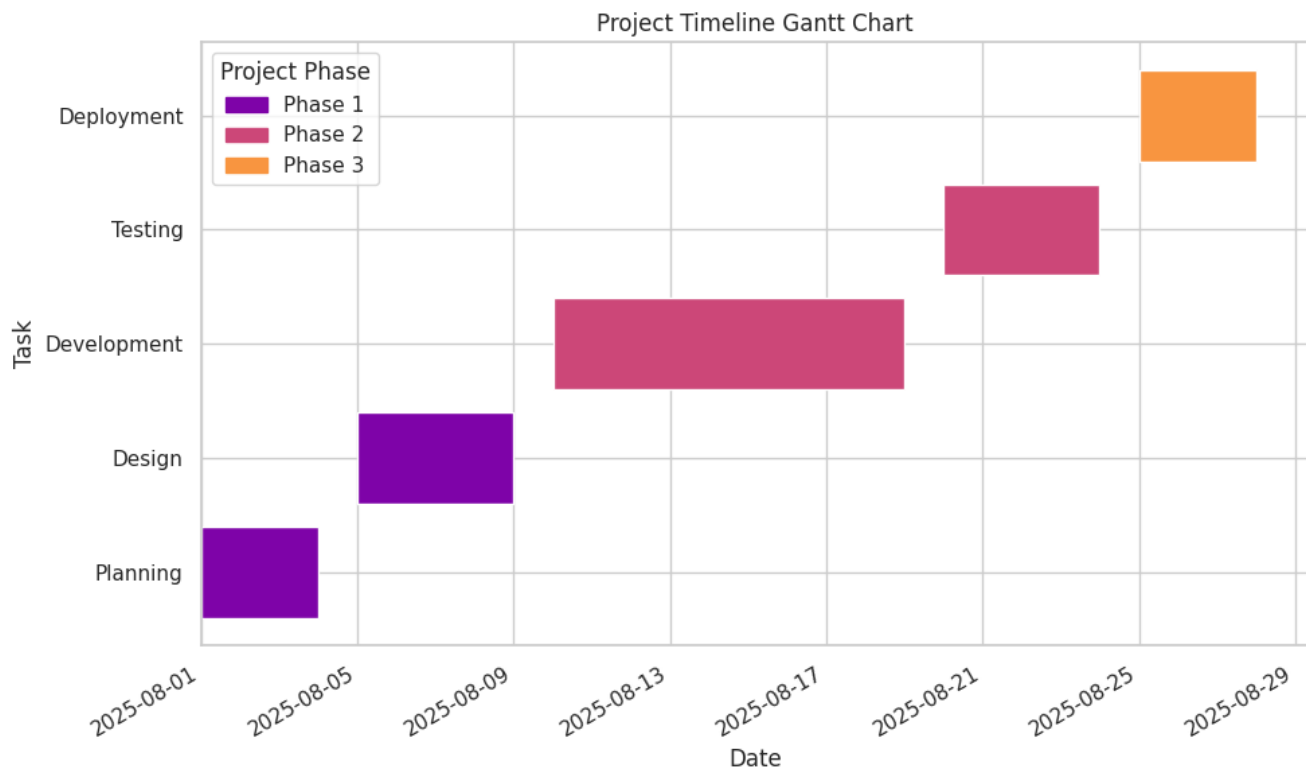


Figure 1.4: Time frame/ gantt chart/risk management

CHAPTER 2: DESIGN AND IMPLEMENTATION

2.1 Functional Requirements

Functional requirements are the essential things a system must be able to do to work correctly. They spell out exactly how the system should react to user actions, how it needs to manage data inside, and what kinds of results it should produce. These requirements make sure the system's features actually match what users need and what the business is trying to achieve with the software. By laying out specific tasks, processes, and how the interface should work, these requirements give the development team a clear guide for building the right software. They also help with quality control, like testing and verification, which keeps the system working consistently from the first design all the way through its release and updates.

Table 2.1: Functional Requirements

Fr id	Name	Description	Priority	Stakeholder
FR01	Change Look Back Time	Give the option to change the time lookback	High	ALL USERS
FR02	Change Esthetics	Give the user to change chart object colors	Medium	ALL USERS
FR03	Paint candles	Highlight candles of interest	High	ALL USERS
FR04	Draw Market Structure	Show price movements on the chart	High	ALL USERS
FR05	Draw strategies and Insights	Draw on the chart these strategies so the user can place trades when these patterns appear	High	ALL USERS
FR06	Extract Analytical Data	Extract data from MT4	High	ALL USERS

FR07	Draw Trading Sessions	Show trading sessions so user can anticipate price volume surges	High	ALL USERS
FR08	Show statistics	Show statistics on the chart	High	ALL USERS
FR09	Clear Chart	Clear Chart after indicators is removed	High	ALL USERS

2.2 Non-Functional Requirements

Non-functional requirements, on the other hand, are about the system's overall quality and how it operates, feels, not the specific tasks it performs. This covers things like its speed (performance), uptime (availability), safety (security), ability to grow (scalability), and how easy it is to use (user experience). Instead of listing features, they set the standards for how the system should behave. These requirements are super important for planning the system's architecture, as they affect design and infrastructure choices and overall user experience. They make sure the system stays dependable, fast, and easy to maintain. By setting targets for usability, legal compliance, and toughness, these requirements help the team build software that works well and meets all the bigger technical and business rules.

Table 2.2: Non-Functional Requirements

Nfr id	Name	Description	Priority	Stakeholder
NFR01	Performance	The computations should be memory sufficient	High	ALL USERS
NFR02	Usability	It should have nice UI and multiple control options and Alerts	High	ALL USERS
NFR03	Reliability	Re-render chart to make sure wrong signals are recalculated	High	ALL USERS

2.3 Object-oriented System design using UML

2.3.1 Use Case Diagram

Use case diagrams show how a user interacts with a system. They map out the 'actors' (users) and the tasks they perform. This helps to clear up what the system needs to do (functional requirements), defines who

does what, and simplifies the system's overall behavior. These diagrams assist developers and stakeholders in understanding system scope, ensuring accurate design and effective communication throughout the development process.

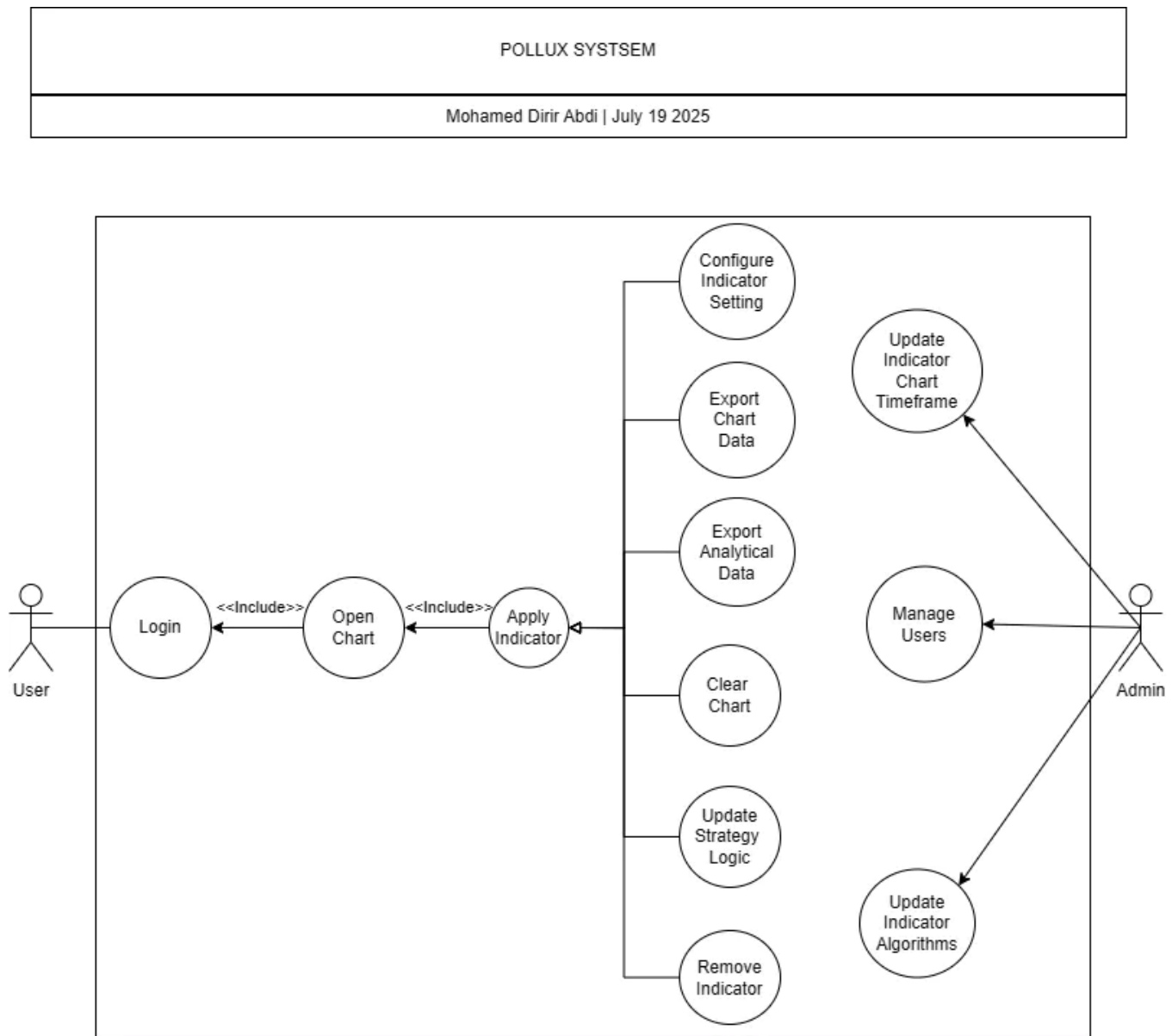


Figure 2.1: Use Case Diagram

2.3.2 Case Description

Table 2.3: Use Case Description

Use Case ID:	UCD01
Use Case Name:	Apply Indicator
Created By:	User
Date Created:	System time

Description:	User drags indicator to chart
Primary Actor:	User
Secondary Actor:	Admin
Precondition:	User has to login and opens a chart
Postconditions:	The chart must have minimal data
Main Flow:	1. The user login MetaTrader Account 2. User locates the indicator in the navigator window 3. User drags and drops the indicator to chart
Alternative Flows:	1. The user login MetaTrader Account 2. User locates the indicator in the navigator window 3. User drags and drops the indicator to chart 4. User changes the default settings to his own

2.3.3 Activity Diagram

Activity diagrams show how a system behaves by charting out its actions, changes, and decision points. They create a visual map of how a process flows, showing steps that happen at the same time or one after another. This helps designers check the system's logic and find ways to make it more efficient. These diagrams are great for communicating how work gets done, making them useful for fine-tuning the system and spotting where things can be improved.

Activity Diagram - Pollux System Indicator

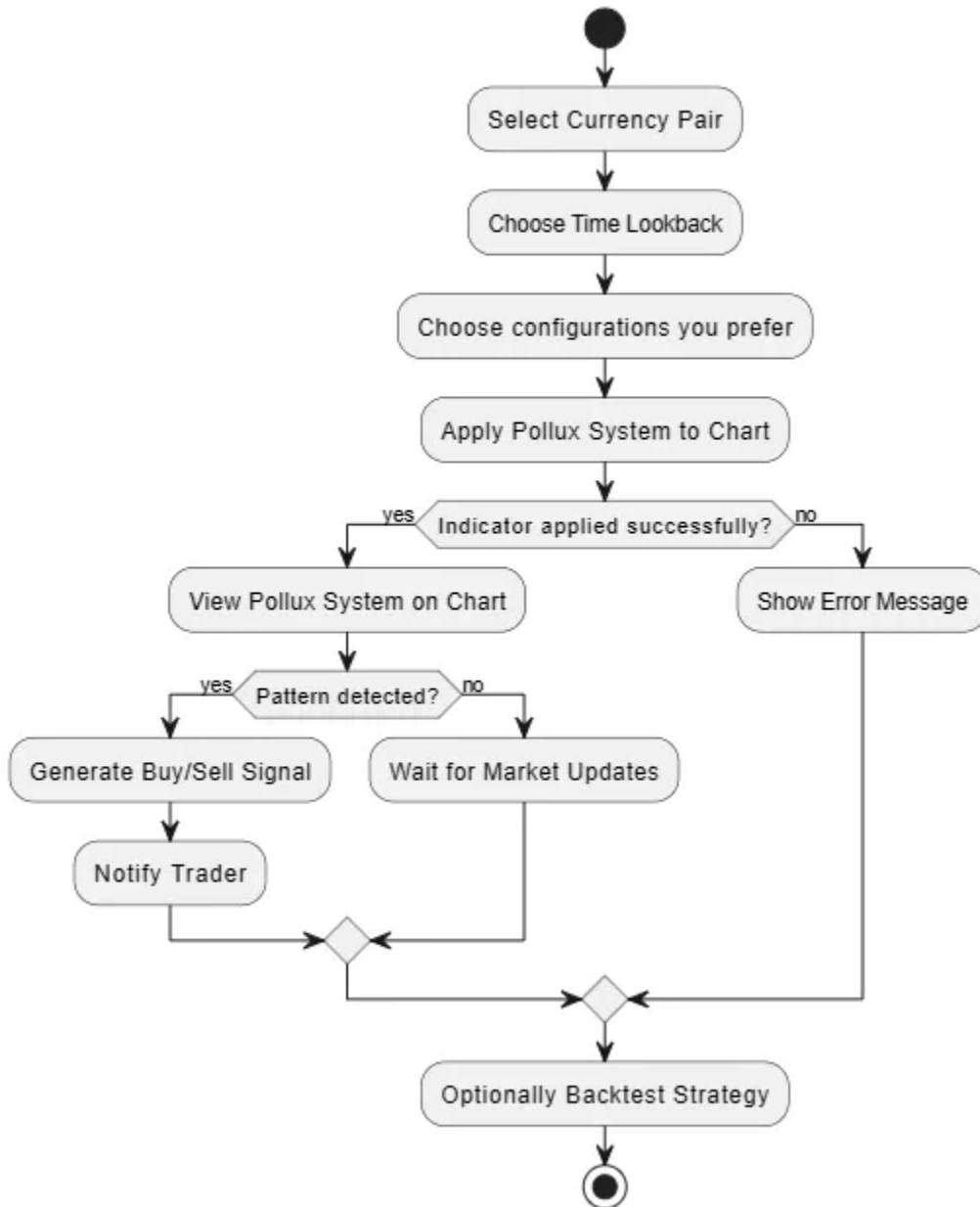


Figure 2.2: Activity Diagram

2.3.4 Sequence Diagram

Sequence diagrams illustrate how different parts of a system talk to each other, showing the back-and-forth messages in the order they happen. They map out the flow of communication for a specific task, which helps developers see the timing of events and understand what depends on what. These diagrams clarify system logic, support design accuracy, and enhance understanding of component collaboration within software architecture.

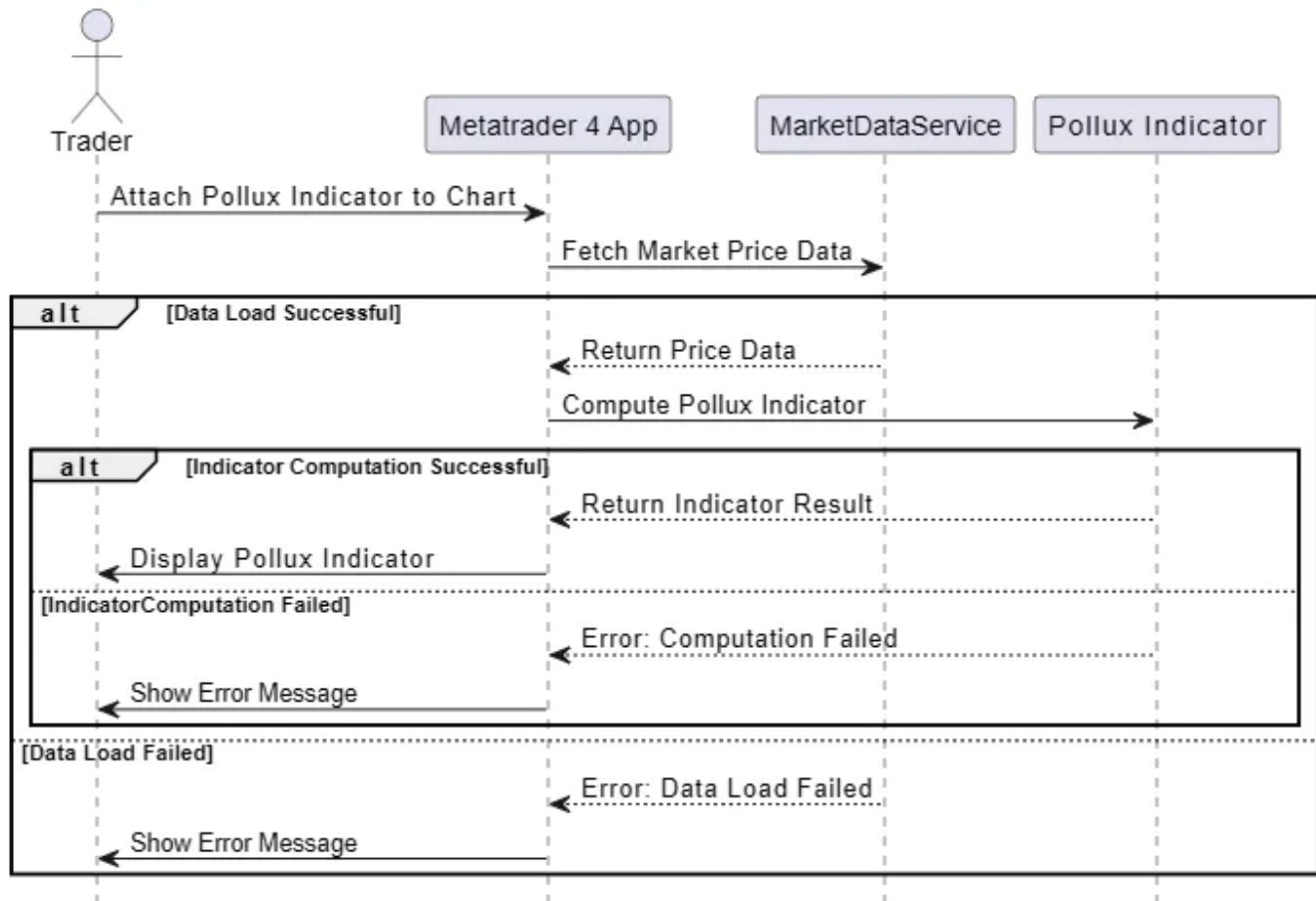


Figure 2.3: Sequence Diagram

2.4 Coding: Appendix B

CHAPTER 3: SOFTWARE TESTING

3.1 Testing Features

All the features each indicator uses have systematically and painstakingly tested.

You can see the implementation images were provided in each indicator. The code was tested on debugged multiple times to make sure statistical precision and mathematical error free indicators.

The only error worth mentioning is sometimes levels are not draw where they should and it occurs 3% of the time according investigation and that bug remains un resolved.

3.2 Testing Strategies

All the strategies used are well documented and explained under each indicator section.

3.2.1 Level Analysis

This indicator helps the trader trade psychological or rounded levels.

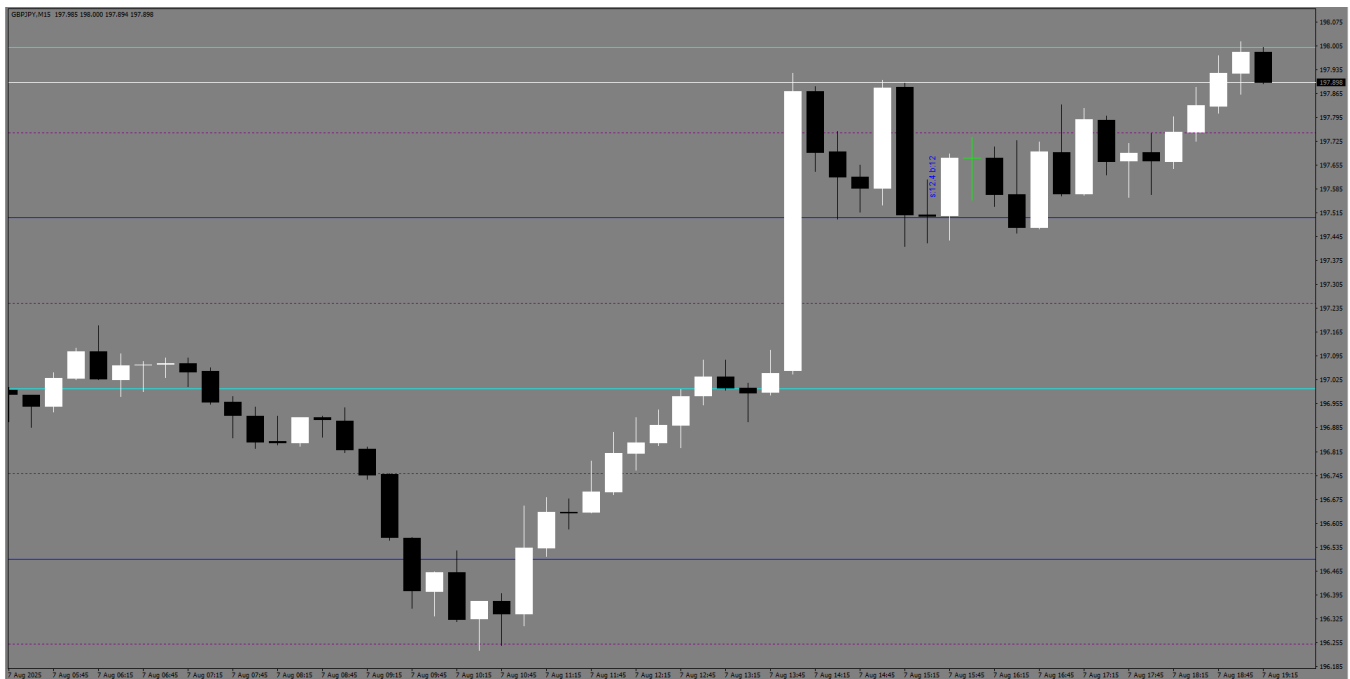


Figure 3.1: Level Analysis Indicator

What are psychological levels?

In Forex markets, psychological levels refer to price points—typically round numbers (e.g., 1.2000, 150.00)—that attract heightened trader attention due to cognitive biases and collective behavior. These levels often act as support or resistance zones, not because of intrinsic value, but due to their memorability and perceived significance. Traders often base their decisions on these round numbers, which can cause a lot of orders to pile up and make the market more volatile around those specific prices. Studies have shown that the way prices react at these psychological

levels isn't just random, which is why they are a key part of both technical analysis and behavioral finance. How well they predict moves, however, depends on the overall market situation, how much trading is happening, and how price has behaved at those levels in the past.

3.2.1.1 How does it work

Let us say Figure, the price is reaching or at dashed purple line of level 25, according to our statical modeling, the result show that price is likely to go below the 25 level approximately 12 pips, similarly it also goes up 12 pips in a period of 1000 candles intervals. The different levels have been color coded. The averages can vary between levels and per 1000 candle range since the market is dynamic and volatility involved can quite change.

You can see stats above or below the zone in blue color. There is an option to choose which level the price is reaching, so user must choose it manually.

3.2.1.2 How do we trade with it

Whenever, the price reaches down that zone, you can either wait for a break below the level of 12 pips and go long or enter long at the price touches the level at the top side. Same logic applies to the Sell trades. *Don not over-do it.* Place trades on that zone maximum 3 times. When you become expert you can do a lot with it as you see fit.

3.2.1.3 Risk and Drawbacks

This indicator is most profitable when the price is reaching exhaustion level or volatility is dying down. You should not place trades with it more frequently when you have used this system less than a week. When you observe how it works and you can interpret the visualizations it gives you clearly, then you can use it fully and aggressively.

Drawbacks I can only think is the user having to manually adjust the level the price is at, that was done on purpose so the user knows what level he is about to trade with system and to distinguish between two different level stats.

3.2.2 Round levels Retracement

The market moves in zigzags creating higher highs and lower lows. It would be ideal for us to anticipate where market would create those highs and lows and enter the market in the opposite direction using retracement reversal. The problem is nobody knows the level where the market can retrace, so if I can narrow down the likeliest place that it would do so, you can enter trade early and make a lot of money ideally by letting your trade run.



Figure 3.2: Rounded Level Retracement Indicator Demonstration

3.2.2.1 How does it work

In this Figure below, we have used 6 months' worth of data to illustrate the separation between rounded levels (Colored lines). The levels were ordered in terms of their frequency of appearing on the chart. For example, twenty-five (dashed purple) has high frequency than any other level.

Table 3.1: Round levels Retracement 6-month Stats

Trade Direction	25	50	100
TOP/Sell	49%	25%	24%
Bottom/Buy	50%	25%	24%

3.2.2.2 How do we trade with it?

In this Figure we can see twenty-five has the highest level the price is most likely to retrace back, if you think the price is at crucial reversal level, you can place trade after candle confirmation printing direction is found or *you can jump in at 12.5 pips below or above the zone*.

When you place trade, using this strategy close that position if confirmation candle high/low is broken by the current candle high/low since holding that trade can cause increased risk and uncertainty.

3.2.2.3 Risk and Drawbacks

This signal it is probability sometimes it might do in your direction and sometimes not. The major benefit this has it can give great risk to reward ratio, since you are entering as market starts retracing back and will have greater return if your intuition about a level of retracement is correct.

3.2.3 Market Structure

In this indicator we want to help trader map out how market structure looks like. This will help understand the historical price movement at a technical analysis and indicate where the price might go in the future, so the trader is not caught out trading wrong trend direction and to also avoid entering early in the market at a riskier place.



Figure 3.3: Market Structure Indicator

3.2.3.1 How does it work

You simply pop in this indicator in the chart and visualize different time frames, if price breaks level of smaller insignificant timeframe, it means it will likely go the level with higher timeframe of stronger significance. This indicator can also help you visualize no trade zones or riskier zones. Like top Figure the green down arrow points to clean range.

3.2.3.2 How do we trade with it?

As you visualize the indicator everyday it will help become more efficient trader understanding micro movements of price action and can also help you place trades in an ongoing price move; like the price starting at 197.125 Figure, that comes down all the way to 196.245, you can scale in when the price is at 196.925 by placing sell order.

3.2.3.3 Risk and Drawbacks

Trading the middle of the zones are risky compare to the beginning of a move or potential retracement of a move or when it is likely to close to reaching a level.

Drawbacks are this indicator can print premature false signals in some cases, but it will rectify it in the next candle. Suppose you enter a trade based on the signal given, the next candle can break the previous candle high/low and create new high/low, so the old signal drawings will get updated to reflect new changes, do not get surprise when that happens.

3.2.4 Double Top and Bottom

In this indicator we investigate popular chart patterns called double top or double bottom, triple top or triple bottom. What does it mean? When the price reaches back previous level that retraced from and touches and sells again, since price touched that high twice, we call double top, similarly double bottom but the prices touches previous bottom level again. When the price visits the same level three times, we call triple top/bottom. In the Figure below the price touched top level Thrice; (1) it drops down slightly then coming back to re-test the zone again (2) It touched again making it triple touch or triple top and *without breaking the zone*, and sold off aggressively. At the bottom, the green dashed line, you can see the price breaks aggressively negating double bottom, however at the dashed yellow line it was supposed to comeback up from the zone to fill the previous high(Top solid green) and it did, but after breaking that zone slightly.

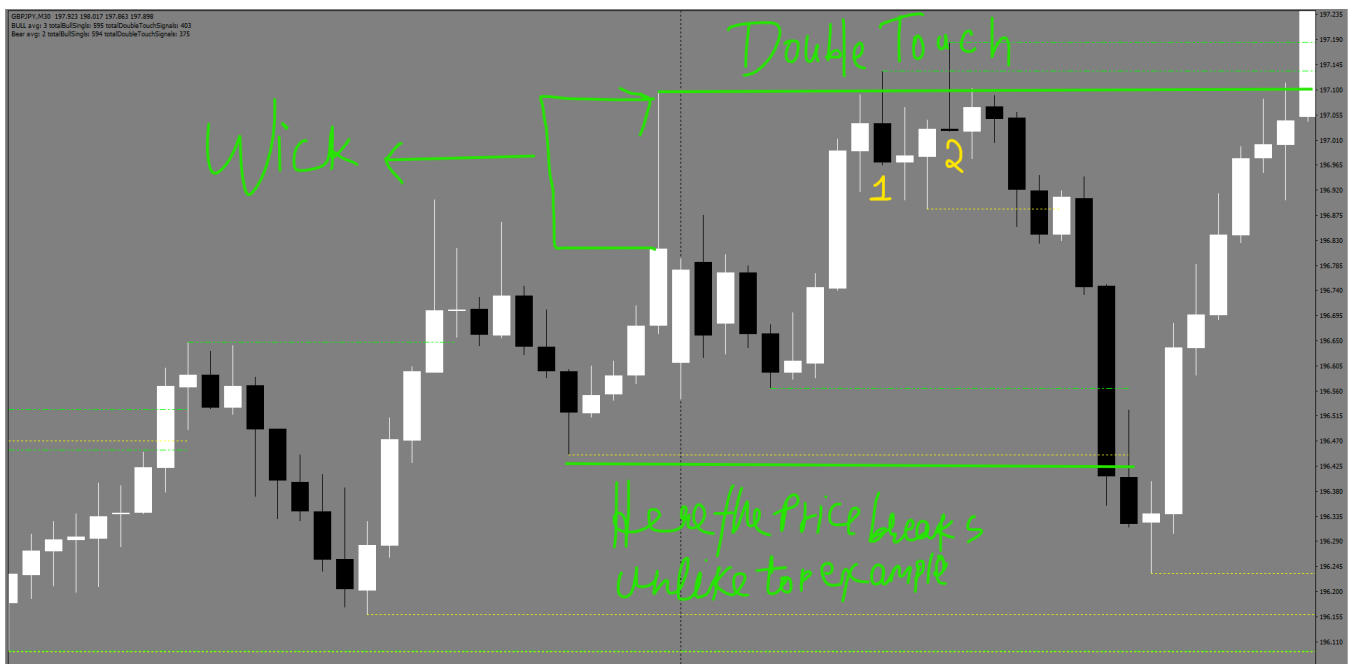


Figure 3.4: Double Top and Bottom

3.2.4.1 How does it work

When the price reaches back previous high/low we anticipate the price will the same thing again and not break the zone, however it breaks sometimes causing us to lose money.

Table 3.2: Double Top and Bottom Stats

Trade Direction	Avg Touches	Total Signals	Total Double Toch Signals
BULL/Sell	3	595	403
Bear/Buy	2	594	375

In this indicator on this specific currency for a 6-month period of 30m timeframe, it shows you should only place trades as double touch/bottom only no more than 2 times after and expect *profit of 15 pips minimum*.

3.2.4.2 How do we trade with it

When the price reaches back Candle Wick refer to Figure, you can consider it double touch or bottom starting *after confirmation candle and candle next to it is printed*. Place trades, you can expect minimum 15 pip profit. Do not close the trade until the candle closes above/below that level. Do not place trades if the level has been touched more than the average given. Stay away from those bad trades, since the like hood of price breaking that zone increases with each re-touch.

3.2.4.3 Risk and Drawbacks

The risk is high since you are exiting the trade after the candle closes top high/low of the entry level. *Sometimes the wick is too big, avoid those*.

No Drawbacks.

3.2.5 Breakouts and Fake-outs

This indicator is really exciting. This indicator draws you the current timeframe market structure. The next step, is to investigate what is the probability of breakouts and fake-outs in a given currency pair, since each currency pair has its own unique behavior. We investigate in this Figure below XAUUSD and I also tested on GBPJPY, so let us stick to this pair for now. When you place this indicator on the chart after choosing timeframe lookback of your choosing, you can visualize the probability of breaks and fake-outs average profit and risk wise in pips by focusing on a *3-candle threshold which you can change manually in input tab*.



Figure 3.5: Breakouts and Fake-outs

3.2.5.1 How does it work

What is a breakout?

When the price breaks high level and does not come back into the zone but continues on.

What is Fake-out?

When the price breaks the zone, but immediately goes back into the zone, so it can retrace partially or fully.

3.2.5.2 How do we trade with it?

Whenever Signal is generated, enter a trade in that direction, while aware of potential risks and profits.

Tables below shows different months of Gold and GBJPY results. Note different currency have different volatility.

Table 3.5: Breakouts and Fake-outs 6-Month Stats

Currency	Signal Type	Trade Direction	Profit (pips)	Drawdown (pips)
GBJPY	Breakout	Buy	22.51	9.87
		Sell	23.06	12.84
	Fake-out	Buy	15.40	17.69
		Sell	15.57	18.00
XAUUSD	Breakout	Buy	64.74	30.89
		Sell	74.32	46.31
	Fake-out	Buy	39.68	45.35
		Sell	75.04	43.36

Results: 3 Months

Table 3.4: Breakouts and Fake-outs 3-Month Stats

Currency	Signal Type	Trade Direction	Profit (pips)	Drawdown (pips)
GBJPY	Breakout	Buy	15.04	8.69
		Sell	24.48	8.45
	Fake-out	Buy	9.44	16.88
		Sell	16.42	12.65
XAUUSD	Breakout	Buy	55.38	31.09
		Sell	57.08	40.28
	Fake-out	Buy	26.42	42.90
		Sell	55.90	41.41

Results: 1 Month

Table 3.3: Breakouts and Fake-outs 1-Month Stats

Currency	Signal Type	Trade Direction	Profit (pips)	Drawdown (pips)
GBJPY	Breakout	Buy	13.49	8.76
		Sell	20.66	9.61
	Fake-out	Buy	10.85	16.04
		Sell	17.27	14.96
XAUUSD	Breakout	Buy	58.33	37.17
		Sell	48.46	36.40
	Fake-out	Buy	29.03	29.45
		Sell	57.55	43.40

As you can see in this table Breakouts are more favorable risk wise offering 1:2 risk reward ratio. Whenever you place trades using this strategy do not exceed that amount of risk.

3.2.5.3 Risk and Drawbacks

Drawback is when you hear “average”, It means is just an average the risk can go higher or lower and so is the profit, you can never know. Tread carefully. *I would suggest to minimize the risk, you should wait for the price to retrace back to 50% of the risk pip wise and enter only then specially on fake-outs, to take 50% risk off the table, the downside is you let go and miss out on some good trades. Remember you cannot catch all fish in the sea just catch some and call it a day.*

3.2.6 Retracement Trail

This indicator is quite exciting. Whenever market is a critical level it would print retracement candle in your direction of trade, and you are expected to place an order and make the stoploss the confirmation candle’s low for buying and vice versa when selling.

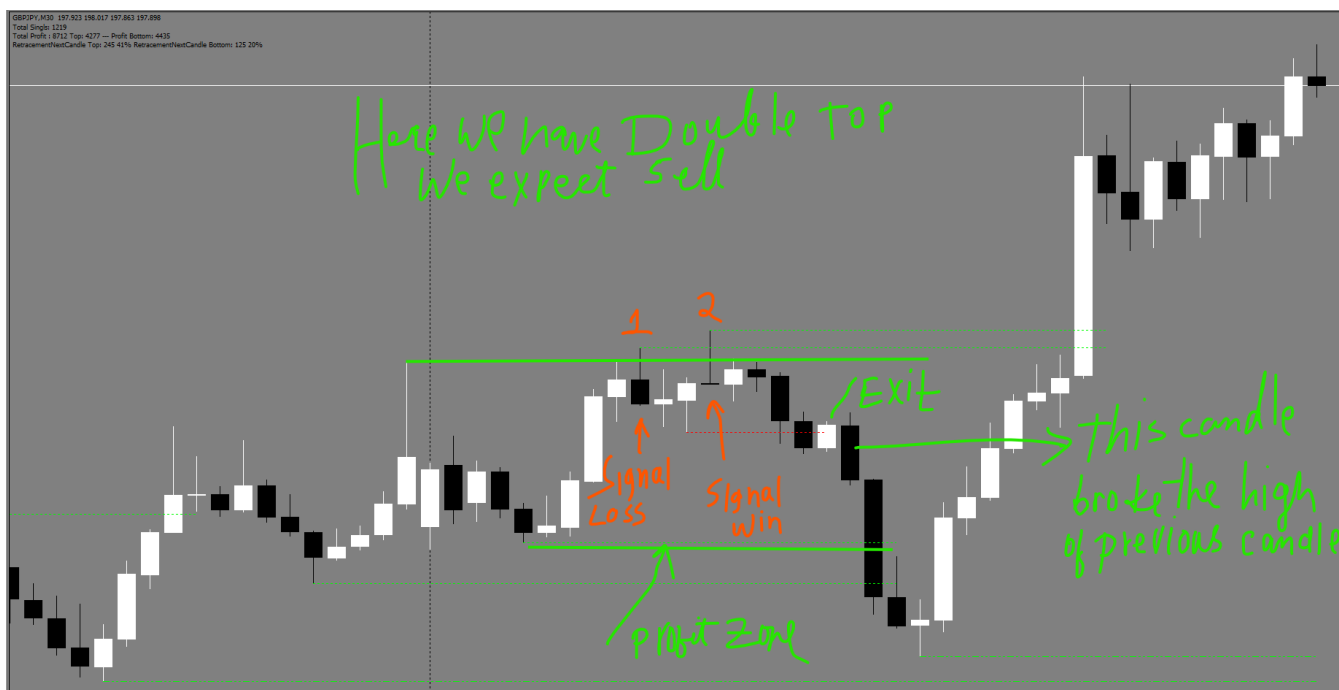


Figure 3.6: Retracement Trail

The result of trailing every time we have signal is from a 6-month timeframe:

Table 3.6: Retracement Trail 6-Month Stats

Signal Direction	Profit (Pip)
Top/Sell	4277
Bottom/Buy	4435

Total Signal: **1219**

8712

Results for 3 Moths:

Table 3.7: Retracement Trail 3-Month Stats

Signal Direction	Profit (Pip)
Top/Sell	1476
Bottom/Buy	1599
Total Signal: 425	3076

Results for 1 Month:

Table 3.8: Retracement Trail 1-Month Stats

Signal Direction	Profit (Pip)
Top/Sell	1716
Bottom/Buy	1043
Total Signal: 213	2759

3.2.6.1 How does it work

It is very simple. Just like the Figure above, When the price reaches at a place where you hope it will retrace back, wait for an entry confirmation candle like case (1) and (2) and then sell and vice versa and the below or above level.

3.2.6.2 How do we trade with it?

You place sell order on (1) or (2) in the above figure and take a profit at profit zone. Your stoploss would be if price breaks above the confirmation candle like Case(1) we lost, the price dropped down slightly and went back again triggering our stoploss. Case(2) is a success and price never reaches close to our stoploss and hits our take profit level with haste. Similar logic applies to sell trades.

3.2.6.3 Risk and Drawbacks

Drawback is the result of this indicator looks perfect because the market already happened, but when you in a live account be very careful about the signal, because it can give you a signal but becomes continuation signal rather than reversal signal and that zone will get deleted from the drawing if it is insignificant. Look for zones near the top or the bottom to minimize the risk but i am sure with time you use it perfectly.

3.2.7 Retracement Top and Bottom

In this indicator works like the above one, but with more informational undertone. Whenever we have a level at the top, then we expect the price to go down and it to fill the below level, what are the chances of that happening. We also would like to know when confirmation candle prints in our direction, how likely is the next candle to wick up above and break the previous candle high, since the price is more prone to resistance before dropping down. Same logic applies to sell trades.



Figure 3.7: Retracement Top and Bottom

3.2.7.1 How does it work

After confirmation candle prints in our direction, we place buy trade and that candle's high or stoploss, hoping the price would come down to the below target level. We show you this information so you can make informed decisions while placing trades.

Table 3.9: Retracement Top and Bottom Stats

Stats Type	Total	Top/Sell	Bottom/Buy
Signals	1187	589	598
Profits(pips)	5705	3142	2563
Next Candle Retracement	41%	21%	20%
Potential Profit Avg(pips)	68	33	35

3.2.7.2 How do we trade with it?

Stats are the important in this indicator nothing else as you are familiar with this process about how enter a trade and how exit it.

Potential Profits is to illustrate when then confirmation candle is found, what is percentage of the retraced price to reach the top level if it is a buy trade. In our case it is 35%. We shouldn't be greedy beyond that percentage, if we decide no to use the traditional profit taking methods mentioned above topic.

3.2.7.3 Risk and Drawbacks

Is similar to the above indicator.

3.2.8 Retracement Statistics

This indicator is similar to the above indicator but laced with more informational nuances. This indicator focusses on the entire leg going up or down retracement capability, so we know when the momentum is fading and is about to shift in other direction to close or profitable positions. The way I have generated these signals have been carefully optimized.

3.2.7.1 How does it work

Previously we were waiting for confirmation candle, this time we measure the entire leg's stats, to understand how market creates its zigzag structure, so we can scale in on these pullbacks.

Results for 6 months:

Table 3.10: Retracement Statistics 6-month Stats

Currency	Stats Type	Total	Top/Sell	Bottom/Buy
GBJPY	Total Signals	1190	576	614
	Profits(pips)	5194	2711	2483
	Next Candle Retracement	40%	22%	20%
	Potential Profit Avg(pips)	126	60	66
	Retracement Avg	81%	78%	84%
	Retracement After Confirmation avg	43%	41%	44%
XAUUSD	Total Signals	1147	570	577
	Profits(pips)	18631	10833	7797
	Next Candle Retracement	39%	19%	20%
	Potential Profit Avg(pips)	383	187	196
	Retracement Avg	79%	76%	83%
	Retracement After Confirmation avg	41%	39%	43%

Results for 3 months:

Table 3.11: Retracement Statistics 3-month Stats

Currency	Stats Type	Total	Top/Sell	Bottom/Buy
GBJPY	Total Signals	411	193	218
	Profits(pips)	1556	566	989
	Next Candle Retracement	39%	21%	18%
	Potential Profit Avg(pips)	103	48	55
	Retracement Avg	81%	77%	85%
	Retracement After Confirmation avg	42%	43%	40%
XAUUSD	Total Signals	437	215	222
	Profits(pips)	3594	3876	-282
	Next Candle Retracement	41%	19%	22%
	Potential Profit Avg(pips)	318	159	159
	Retracement Avg	80%	78%	81%
	Retracement After Confirmation avg	42%	40%	43%

Results for 1 month:

Table 3.12: Retracement Statistics 1-month Stats

Currency	Stats Type	Total	Top/Sell	Bottom/Buy
GBJPY	Total Signals	200	92	108
	Profits(pips)	1020	129	891
	Next Candle Retracement	38%	23%	15%
	Potential Profit Avg(pips)	100	44	56
	Retracement Avg	81%	75%	87%
	Retracement After Confirmation avg	42%	42%	43%
XAUUSD	Total Signals	223	109	114
	Profits(pips)	1201	1015	186
	Next Candle Retracement	44%	20%	24%
	Potential Profit Avg(pips)	273	132	141
	Retracement Avg	80%	76%	83%
	Retracement After Confirmation avg	42%	40%	44%

3.2.7.2 How do we trade with it?

In this indicator we either fully reach the above tp zone while buying or we lose completely, it is all nothing approach, so we can truly measure its strength if we were to trade with it.

3.2.7.3 Risk and Drawbacks

Similar to the Retracement Trail indicator.

3.3 System Testing.

The user has the option to choose how much timeframe snapshot or currency pair he wants to test; it is up to the user to check the stats according to his wish. The results shown to the left top corner of the screen chart are well optimized and accurate.

The system was tested currency pairs like GBJPY with 3 digits and XAUUSD with 2 digits. *The indicator system stats will not show correctly if you choose currency pair with 5 digits*, but market structures drawings will work fine with no issues in crypto or even In stocks.

CHAPTER 4: DEPLOYMENT AND MAINTENANCE

The processes of deployment and maintenance encompass the initial implementation of a system within its operational context and the subsequent activities required to preserve its effectiveness. Deployment entails precise installation, configuration, and stakeholder preparation, whereas maintenance involves iterative enhancements, security assurances, and issue remediation to maintain optimal performance over time.

Table 4.1: Deployment and Maintenance

SRLC phase	Purpose	Primary environment	Key artifacts	Exit/gate criteria
Pre-alpha	Create hypothesis and validate them. Collect new requirements based on observation and the research available.	Dev	Project budget is \$50. Vision is to create to create market structure basic code. Indicator Should display price action from multiple timeframes.	Created the indicator, no errors while drawing/removing the chart lines. The lines are touching the lowest/highest price level in each timeframe.
Alpha (iterative)	Core features are created and tested.	Dev	Remove duplicate lines from multiple timeframes. Improve text/line readability. Hide smaller timeframe lines.	All the features are unit tested to be mathematically precise and error free.
Beta (internal/external)	Test strategies logic and results by creating statistics & Validate usability and NFRs with real users.	QA/UAT, sandbox	Verify that all calculations are working as intended.	Statistical modeling has been added to the system and is working nominally.
Release candidate (RC)	Improve performance and runtime. Give	Staging	Add user manual and usage guidance.	Test system live trading environment.

	user more input controls.			
General availability (GA)		Canary/prod	Collect customer Feedback and requirements and final release.	Release version records. Project within budget.
Maintenance	Collect bugs. Collect user feedback. Measure user satisfaction.	Prod	Bug fixes, and feature releases.	Users are happy. Bugs are fixed. New feedback is implemented.
End-of-life (EOL)	Retire safely	Prod/Archive	EOL Notices, migration guides, data archival records	Data retention satisfied, customers migrated, removed from online stores.

CHAPTER 5: USER MANUALS

5.1 Downloads and Installation

5.1.1 You can download all these indicators in the link given.

5.1.2 Installation process:

1. Install Metatrader 4
2. Open Demo or live account
3. Launch the Metatrader 4
4. Go to -> File and open Data Folder -> MQL4 -> Indicators
5. Paste the indicator there
6. Restart the Metatrader 4
7. Press CTR+N to open navigator menu. Locate the indicator from the list
8. Open a chart then drag and drop the indicator there
9. The indicator has INPUTS tab. Change only “ExtMaxBar” to control how far back you want the stats/drawings to go. You can control each timeframe.
10. Visualize the stats to the right and drawings will be drawn on the chart.

User Inputs:

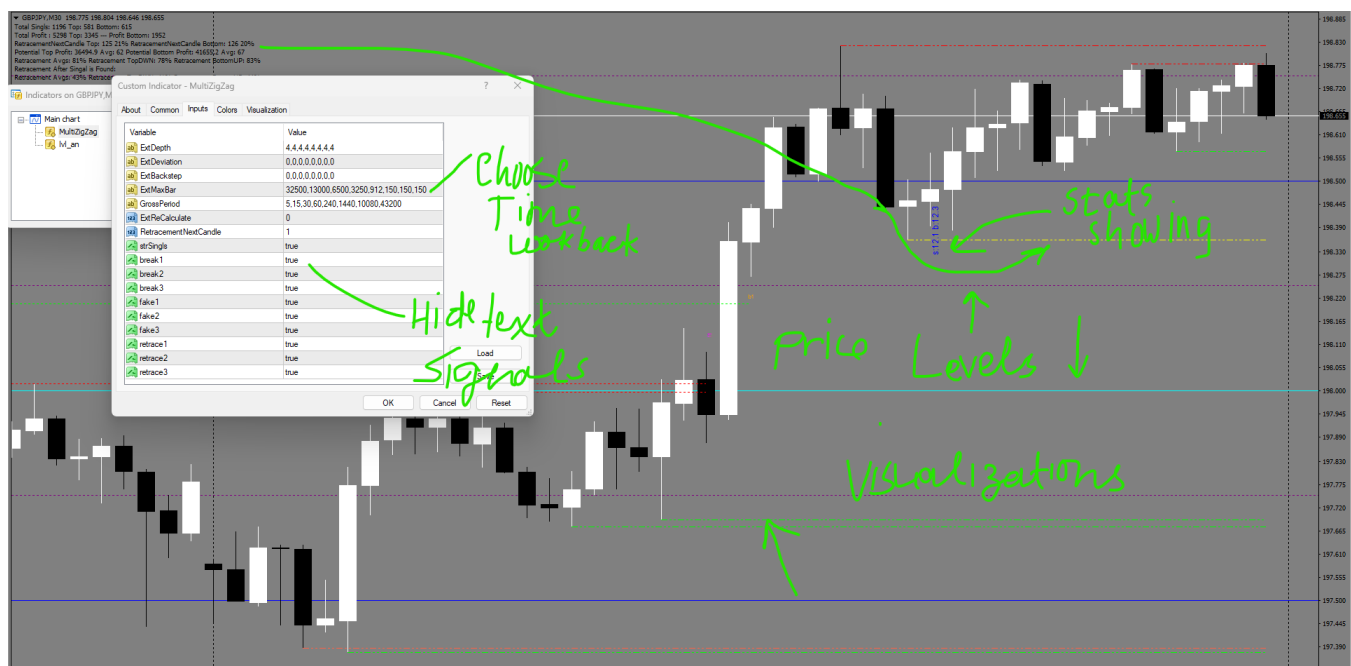


Figure 5.1 Indicator User Inputs

All these indicators below have INPUTS tab. If you do not change while attaching the indicator to the chart, you can bring them up by pressing CTR+I, then choose your indicator and find Input tab. Change only “ExtMaxBar” to control how far back you want the stats/drawings to go. You can control each

timeframe. You can also toggle on off breakout and fake-out signals in some of them because in the input you will find them.

2. Round levels Retracement
3. Market Structure
4. Double Top and Bottom
5. Breakouts and Fake-outs
6. Retracement Trail
7. Retracement Top and Bottom
8. Retracement Statistics

This indicator *Level Analysis* lets have these settings and here is what they mean:

EnterLvl: Choose the level you or price is at, so it can show you level stats

NumLinesAboveBelow: Control how many lines are above the current price line or below it.

Hide##: You can hide the levels lines that you do not want drawn on the chart

Colors: You can also control the line colors.

This indicator shows these stats in a blue text “s:13.8 b:14” it means sell stats are 13.8 pips and buys are 14 pips.

CHAPTER 6: PROJECT SUMMARY

There are two main types of techniques used for financial analysis, namely statistical modelling and machine learning (Wang et al. 2011). In this project, we concentrated on the statistical aspect and found it highly promising. Our work shows that the forex market can be successfully analyzed with statistical models. We've included several examples and algorithms that help boost trader profits, cut through market noise eliminate potentially losing trades. The outcomes matched our goals, proving these strategies are solid ways to trade. For every strategy, we've laid out its potential upsides and its drawbacks. In the future, I plan to keep improving and fine-tuning these indicators. To help others explore this, I've also included the source code so anyone can take these ideas and build on them.

REFERENCES

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2. <https://www.forexfactory.com/>
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4. [Mastering Stock Chart Patterns: A Guide to Profitable Trading - Trading Computers](#)
5. [Estimating Directional Changes Trend Reversal in Forex Using Machine Learning - Kent Academic Repository](#)
6. [d1wqtxts1xzle7.cloudfront.net/57327515/winning-strategies-for-trading-forex-real-and-ac-libre.pdf?1536439839=&response-content-disposition=inline%3B+filename%3D7_Winning_Strategies_for_Trading_Forex.pdf&Expires=1755345855&Signature=Va-xFNKp2WWBnEUQTfRj6A2NDSPUIUZkS7i8HEeFO~bGI~FyjEG86IQS~SaWMVM-y7y9Fn88ykr3cJbhoElAbE2fvSeItrxRyk4Pw9XzYaLzN65FFQ8DrLez7vDSDfeepvRM8DCrxSZT0jtDHF7-KfotEcwzE72sAvjpnWC8ZZjJs4aBMbAnQEgPzno6PvFXGApH2V2M7NEeguf8PXO1W2vQ4sNOnC4SjUMVMKlz1n430JD6KVWvIP3QsBPtWHsIuuvXvQfTxq3lm3RDdlPgESzyES~djRuQL~LvE59WdiYABDXleHC1n~dRoFf3U89EqL~XlQxT4uyIxpzajl1rHw__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA](#)
7. [Forex Trading - the Best ECN Forex Broker, Currency Trading Online | FXCC](#)
8. [Learn How to Trade the Markets](#)
9. <https://www.tradingview.com/chart/>
10. [FXStreet - The Forex Market](#)

APPENDIX A: CODE

Retracement Statistics Indicator:

```
1237 void ZigEffectiveness() {
1238     double prevTopVal=0, prevBottomVal=0;
1239     double LowestValueAgg=0, HighestValueAgg=0;
1240     double profitTop=0, profitBottom=0;
1241     double topCounter=0, bottomCounter=0;
1242     int outleirRetraceTop=0, outleirRetraceBottom=0;
1243     int retracementTop=0, retracementBottom=0, SignalRetracementTop=0, SignalRetracementBottom=0;
1244     for(int i=0; i<ObjectsTotal(); i++){
1245         double LowestValue=0, HighestValue=0;
1246         if(StringSubstr(ObjectName(i),StringLen(ObjectName(i))-6,StringLen(ObjectName(i))) == "strucH"){
1247             double price = ObjectGetDouble(0,ObjectName(i),OBJPROP_PRICE);
1248             prevTopVal=price;
1249             int index_begin = ObjectGetShiftByValue(ObjectName(i),price);
1250             if(prevBottomVal<Close[index_begin-1] && (i!=0 || i!=1)){
1251                 for(int iii=1; iii<ObjectsTotal(); iii++){
1252                     if(i-iii==0){
1253                         double priceBBB= ObjectGetDouble(0,ObjectName(i-iii),OBJPROP_PRICE);
1254                         if(priceBBB<Close[index_begin-1] && StringSubstr(ObjectName(i-iii),StringLen(ObjectName(i-iii))-6,StringLen(ObjectName(i-iii))) == "strucL"){
1255                             prevBottomVal=priceBBB;
1256                             break;
1257                         }
1258                     }
1259                 }
1260                 if(prevBottomVal==0; break;
1261             }
1262             int shifted_index=0;
1263             bool shifted_index_Found=false;
1264             bool outlierTopFound=false;
1265             for(int j=index_begin-1; j>0; j--){
1266                 if(!shifted_index_Found){
1267                     if(Open[j]>Close[j] && price==High[j]){ //check flag pennent or trainagle
1268                         shifted_index=j;
1269                         shifted_index_Found=true;
1270                         LowestValue=Low[j];
1271                     }
1272                 }
1273                 //correct base found
1274                 if(shifted_index_Found && prevBottomVal!=0 && prevBottomVal<Close[shifted_index]){
1275                     //record lowest value
1276                     if(Low[j]>Low[j-1] && prevBottomVal< Low[j] && LowestValue>Low[j-1]) LowestValue= MathMin(Low[j], Low[j-1]);
1277                     else if(Low[j]>Low[j-1] && prevBottomVal< Close[j]) LowestValue= MathMin(Low[j], Low[j-1]);
1278                     //Comment(profitTop);
1279                     //Alert(index_begin, " TP ", prevBottomVal, " res ", profitTop);
1280                     if(High[shifted_index]<High[shifted_index-RetracementNextCandle] && !outlierTopFound) {outleirRetraceTop++;outlierTopFound=true;} //for statistics only
1281                     if(price< Close[j-1]) profitTop-= MathAbs(Close[shifted_index]-price)/(Point*10);
1282                     else profitTop+= MathAbs(Close[shifted_index]-Close[j-1])/(Point*10);
1283                     ObjectSet(ObjectName(i),OBJPROP_COLOR,clrRed);
1284                     //Alert(shifted_index, " --LOSS ", -MathAbs(Close[shifted_index]-High[j-1])/(Point*10));
1285                     LowestValue= MathAbs(price-LowestValue)/(Point*10);
1286                     LowestValueAgg+=LowestValue;
1287             }
1288         }
1289     }
1290 }
```

Figure A1: Retracement Statistics Indicator

Retracement Trail Indicator

```
1235 double prevTopVal=0, prevBottomVal=0;
1236 double LowestValue=0, HighestValue=0;
1237 double profitTop=0, profitBottom=0;
1238 double topCounter=0, bottomCounter=0;
1239 int outleirRetraceTop=0, outleirRetraceBottom=0;
1240 void ZigEffectiveness() {
1241     for(int i=0; i<ObjectsTotal(); i++){
1242         if(StringSubstr(ObjectName(i),StringLen(ObjectName(i))-6,StringLen(ObjectName(i))) == "strucH"){
1243             topCounter++;
1244             double price = ObjectGetDouble(0,ObjectName(i),OBJPROP_PRICE);
1245             prevTopVal=price;
1246             int index_begin = ObjectGetShiftByValue(ObjectName(i),price);
1247             int shifted_index=0;
1248             bool shifted_index_Found=false;
1249             bool outlierTopFound=false;
1250             for(int j=index_begin-1; j>0; j--){
1251                 if(!shifted_index_Found){
1252                     if(Open[j]>Close[j] && price==High[j]){ //check signal
1253                         shifted_index=j;
1254                         shifted_index_Found=true;
1255                     }
1256                 }
1257                 //correct base found
1258                 if(shifted_index_Found){
1259                     //record lowest value
1260                     if(LowestValue>Low[j])LowestValue=Low[j];
1261                     if(High[shifted_index]<High[j-1] && !outlierTopFound) {outleirRetraceTop++;outlierTopFound=true;} //for statistics only
1262                     if(High[shifted_index]<Close[j-1]){
1263                         if(price< Close[j-1]) profitTop-= MathAbs(Close[shifted_index]-price)/(Point*10);
1264                         else profitTop+= MathAbs(Close[shifted_index]-Close[j-1])/(Point*10);
1265                         ObjectSet(ObjectName(i),OBJPROP_COLOR,clrRed);
1266                         break;
1267                     }
1268                     if(price<High[j] && j!=shifted_index){
1269                         profitTop-= MathAbs(Close[shifted_index]-price)/(Point*10);
1270                         ObjectSet(ObjectName(i),OBJPROP_COLOR,clrTomato);
1271                         break;
1272                     }
1273                     if(Close[shifted_index]<Close[j]){
1274                         //profitTop+= MathAbs(Close[shifted_index]-Close[j-1])/(Point*10); //ignore this for now
1275                         //break;
1276                     }
1277                     if(Close[shifted_index]>Close[j] && High[j]< High[j-1]){
1278                         profitTop+= MathAbs(Close[shifted_index]-High[j])/(Point*10);
1279                         ObjectSet(ObjectName(i),OBJPROP_COLOR,clrTime);
1280                         break;
1281                     }
1282                 }
1283             }
1284         }
1285         else if(StringSubstr(ObjectName(i),StringLen(ObjectName(i))-6,StringLen(ObjectName(i))) == "strucL"){
1286             bottomCounter++;
1287             double priceB= ObjectGetDouble(0,ObjectName(i),OBJPROP_PRICE);
1288         }
1289     }
1290 }
```

Figure A2: Retracement Statistics Indicator

Indicator Links:

Indicator Name Link

<i>3.2.1 Level Analysis</i>	https://drive.google.com/file/d/1xIUZW4TVedg8iBhErkj_VU6m3kFzVOB0/view?usp=sharing
<i>3.2.2 Round levels Retracement</i>	https://drive.google.com/file/d/13HGUzF-iqvblotZ0mBhV6cROMbNSlp6b/view?usp=sharing
<i>3.2.3 Market Structure</i>	https://drive.google.com/file/d/195lYyVDc6kmorlh4HywQeu3yXeLeVmsr/view?usp=sharing
<i>3.2.4 Double Top and Bottom</i>	https://drive.google.com/file/d/1Q6CDAg-z8xczZce_mreCqHwYUWpoCiFE/view?usp=sharing
<i>3.2.5 Breakouts and Fake-outs</i>	https://drive.google.com/file/d/1HNwoTdjXV_EwWmO1fSy3X0Zlm3bzhr/view?usp=sharing
<i>3.2.6 Retracement Trail</i>	https://drive.google.com/file/d/1XsklS9mY3T1rEjN1xnF7g2uj7x--8ABg/view?usp=sharing
<i>3.2.7 Retracement Top and Bottom</i>	https://drive.google.com/file/d/1EhagRBLpJVqFpdifDtUrwQoL_87M24IW/view?usp=sharing
<i>3.2.8 Retracement Statistics</i>	https://drive.google.com/file/d/1ibzvBiiYpbMtOLEfa2JEqx0zRnT6HSd9/view?usp=sharing

APPENDIX B:
Plagiarism Report

APPENDIX C:

Library Clearance

Account Clearance