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The Impact of Technical Analysis on Investors' Financial Decisions in an Emerging Market: Evidence from the Egyptian Stock Market

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Abstract

This paper aims to examine the impact of technical indicators on the behaviors of investors in the Egyptian stock market from 2019-2022. Technical indicators are widely used to understand and predict market trends and behaviors. The study evaluates how technical indicators shape the investment decisions of individual investors and institutional investors. The study adopts a research design, using quantitative data analysis approaches. The quantitative part of the research uses descriptive, correlation, and regression statistics to analyze the stock market data retrieved from the Egyptian Stock market database. Meanwhile, the study found that technical indicators have a significant impact on investor behaviors, with institutional investors relying more on technical indicators than individual investors. Moreover, the findings reveal that there are additional factors, such as market sentiment, political climate, and the economic environment, that also impact investment decisions. As such, the paper concludes that technical indicators should only be used as one of many factors in determining investment strategies, in conjunction with broader macroeconomic and market conditions.

Keywords

Technical Indicators, Investor's Financial Decisions, Investors Types, Egyptian Stock Market

1. Introduction

Academic studies have shown the existence of investment behavioral biases that lead to irrational decision-making that affects the financial and economic sys-

tems, recently financial behavior was very irregular which affected the financial markets due to many modern finance theories and models. According to technical analysis theory, modern and behavioral finance are divided into perspectives of investors and market behaviors. The modern finance paradigm has defended the assumption of rationality and market efficiency as the correct theoretical basis for describing the approximate behavior of investors and the market. On the other hand, the behavioral finance paradigm believes that investor behavior is bounded and rational and collectively forms inefficient markets.

The investment decision is the most important factor in the investment process, which may result in achieving higher returns or losses. Technical Analysis strategies are considered the main tool for individual investors to make investment decisions. Investing in stock exchanges attracts a great number of investors to watch the market to make buy and sell decisions for the purpose of achieving abnormal returns, so the investor needs a specific timing tool to determine the best buying position, best price for entering specific instrument and the time when it's better to stop the executed buy transaction and save the invested capital not to lose it all. This tool can be provided through technical analysis that uses historical data of the market to forecast changes in future price movements.

Technical analysis is a wide term that includes the usage of a range of trading strategies in international stock markets. The strategy that technical analysts use stems its power from the notion that upcoming stock prices are anticipated by means of the study of historical stock prices. However, this philosophy violates the random walk hypothesis that stock prices change independently of their historical trends and actions.

If the investors have complete information about the asset pricing, pricing of securities in the market, the prospect of the company in the future, and government guidelines for investment in the securities, then also they are prone to make irrational decisions. This is because while making any investment decision, they are influenced by both the potential and emotional outcomes. It has been confirmed that studying the market price movements and behavior over time reveals more information than the accounting that is used to calculate the intrinsic value of the firm as investors can get information related to the psychology and sentiment of the market participants, they can get influenced by the perceptions of their peers, friends, family or even their competitors. Such behavior of the investors to act differently in different situations makes it essential to combine the concepts of psychology with finance. This can explain the reasons for varying investor behavior under different circumstances that they face in the market. The strategies of the investment made keeping in view the principles of behavioral finance can increase the profits of the investors. It can also guide investors to invest in profitable securities and to withdraw from the loss-making securities. Rational investors are able to attain the benefits by investing in profitable securities by following those technical analysis indicators and beneficial

opportunities that are not recognized by irrational investors.

Mainly the investor specifically in Egypt, has a complex component to decide where to invest because he is risk averse by nature. For this reason he always follows different forces and interdisciplinary insights on the market behaviors. This concludes that investors' behaviors are shaped collectively by internal and external forces, namely, psychological, sociological, and biological factors.

Hence, the investor can analyze the market and encourage new institutions in place of the big institution that is unstable due to the instability of the foreign market. This is why the investor should know how to select the optimal technical indicator that helps him to invest in the most active stock in the Egyptian stock market without any losses and to identify solutions to deal with the adverse effect of the biases on the investment decisions and suggestions given by various authors to mitigate the effect of these biases to the different investors like avoiding problems in investment decisions, application of analytical techniques in finance solution of cognitive biases, also to provide useful insights about the applicability of behavioral finance and to find the appropriate area that could focus some prospect research to be conducted in the field of behavioral finance.

Technical indicators are a statistical form of technical analysis where technicians apply various mathematical formulas to prices and volumes. The most common technical indicators are moving averages, which smooth price data to help make it easier to spot trends. More complex technical indicators include the smoothing moving average (SMA), moving average convergence-divergence (MACD), which looks at the interplay between several moving averages, Relative strength index (RSI), stochastic oscillator, and Rate of change (ROC). Many trading systems are based on technical indicators since they can be quantitatively calculated.

For those reasons, we need to pay more attention to technical analysis and study the indicator that is going to help the investor realize the best profit at the best time and to understand the psychology and the psychological effect of the market participants that are not clear in other types of analysis.

2. Literature Review

2.1. Theoretical Framework

The objective of this paper is to provide a background of the relationship between the technical analysis indicators on the investor's decision in the Egyptian stock market and why it is an important area of research. In addition, it will highlight the investors' behavior in the Egyptian Stock Market therefore this will be the objective of the research.

2.1.1. Technical Analysis Overview

Technical analysis is a wide term that includes the usage of a range of trading strategies in international stock markets. The strategy that technical analysts use stems its power from the notion that upcoming stock prices are anticipated by

means of the study of historical stock prices. However, this philosophy violates the random walk hypothesis that stock prices change independently of their historical trends and actions. (Marshall & Cahan, 2010)

If the investors have complete information about the asset pricing and pricing of securities in the market, the prospect of the company in the future, and government guidelines for investment in the securities, then also they are prone to make irrational decisions. This is because while making any investment decision, they are influenced by both potential and emotional outcomes. It has been confirmed that studying the market price movements and behavior over time reveals more information than the accounting that is used to calculate the intrinsic value of the firm as investors can get information related to the psychology and sentiment of the market participants, they can get influenced by the perceptions of their peers, friends, family or even their competitors. Such behavior of the investors to act differently in different situations makes it essential to combine the concepts of psychology with finance. (Gorgulho & Neves, 2011) This can explain the reasons for varying investor behavior under different circumstances that they face in the market. The strategies of the investment made keeping in view the principles of behavioral finance can increase the profits of the investors. It can also guide investors to invest in profitable securities and to withdraw from the loss-making securities. Rational investors are able to attain the benefits by investing in profitable securities by following those technical analysis indicators and beneficial opportunities that are not recognized by irrational investors. (Petrusheva, 2016)

Technical analysis empowers dealers to distinguish expected changes in a security's value conduct, including the beginning of a recent fad or the finish of an enduring pattern. In the event that security has been progressing and making new highs, for instance, the dealer is ready to project it's anything but an overbought state of the security so, all things considered, he can sell his positions, ensure his benefits, and make a vastly improved return eventually. (Bansal, 2018)

2.1.2. Efficient Market Hypotheses Overview

The efficient market hypothesis (EMH) is concerned with how quickly and precisely the market responds to new information. If the market is informationally efficient, security prices respond to new information quickly and accurately. According to this hypothesis, security prices fully reflect all available market information. Because all of the information is already included in the prices, a trader cannot make any additional profits. As a result, EMH contends that outperforming the market through market timing or stock selection is impossible. If the behavior of stock returns deviates from the EMH, this is referred to as an "anomaly". However, this does not preclude the existence of market efficiency prerequisites such as freely available information, investor competition, and effective communication among market participants. (Ahmed & Ahmed, 2016)

Market efficiency is typically divided into three levels based on the informa-

tion reflected in market prices. There are three types of market efficiency: weak, semi-strong, and strong. In inefficient stock markets, the current stock price reflects all information about previous stock price changes. Data on previous prices, trading volume, and so on are examples of such information. Based on the information presented above, it is now impossible to make an excessive profit in the stock market. As a result, if the market is inefficient, technical analysis produces no excess return. Current stock prices in semi-strongly efficient markets reflect not only information about historical prices but also all current publicly available information, such as acquisition announcements, dividend payments, accounting policy changes, and so on. Finally, in highly efficient markets, current stock prices reflect all possible information that does not have to be made public. This type of market efficiency implies that it is impossible to make a profit while trading on insider information, which appears unlikely. (Degutis & Novickyte, 2014)

According to Efficient Market Theory, stock prices represent the entirety of what is known about a stock at any given time. Because this theory concludes that it is impossible to estimate prices, stock prices already reflect everything that is currently known about the stock. The EMH depicts a perfect capital market in which all participants have free access to all information, all participants are price takers, and there are no transaction costs. Companies make sound investment decisions and consumers choose securities based on these assumptions. Under this assumption, the EMH can be tested by tracking stock price changes and disclosing information to all participants. Experiential studies in efficient markets identify three levels of market efficiency based on the amount of information presented to the market, referred to as the "set of information". (Masry, 2017)

2.1.3. Theories of Technical Indicators

Various researchers use a variety of technical indicators and argue that by combining the specific characteristics of each indicator, they can gain a more global perspective on the outcome of technical indicators. However, using technical indicators with different properties and uneven characteristics at the same time may produce unexpected results because they may negate each other. We contend that a more careful selection of indicators with similar characteristics but different methods of arriving at their outcomes ensures a stronger and more justified prediction. (Chatzoglou, 2020)

Generally speaking, technical indicators are mathematically derived price representations designed to provide additional information beyond the price alone. There are countless indicators, most of which have their own unique calculation methods, and packaging price behavior in different and often innovative ways. Some of these indicators are designed to be used in specific financial markets, such as stocks or futures. Others also apply to all financial market charts. proposed a novel technical analysis method to increase the profitability of investors. The methods make use of trend-based classification, indicator selec-

tion, and forecasting of stock market trading signals. (Agrawal & Khan, 2019)

The first type of theoretical model accounts for variations in the time it takes for investors to receive information. Under this friction, Trey and Freguson in 1985 demonstrated that technical analysis is useful for determining whether or not information has been fully incorporated into equity prices, whereas Jennings (Jennings, 1989) demonstrate that past prices allow investors to make better price inferences. Furthermore, Grundy (Grundy, 1989) and Blume (Blume, 1994) demonstrate that trading volume can provide useful information in addition to prices.

The second type of model assumes that heterogeneous investors react differently to information. Cespa (Cespa, 2011) recently demonstrated that if there is a positive level of asset residual payoff uncertainty and/or persistence in liquidity trading, asset prices can deviate from their fundamental values. In this context, rational long-term investors adhere to trends. In the real world, different responses to information are more likely during recessions, as a result of consumption smoothing asset sales by jobless households and liquidation sales of margined assets by some investors. These factors help to explain why technical indicators have a better predictive ability during recessions.

To summarize, theoretical models based on information frictions aid in explaining the predictive value of technical indicators. Moskowitz (Moskowitz, 2012) recently discovered empirically that widespread price trends exist across commonly traded equity indices, currency, commodity, and bond futures. Because technical indicators are primarily designed to detect trends, they should be useful in detecting trends in the stock market, which is not a pure random walk. (Neely & Rapach, 2014)

2.1.4. Technical Analysis vs. Behavioral Finance

Behavioral finance began as a troubling challenge to proponents of the efficient market hypothesis (EMH) and was initially dismissed by them. It revealed instances of investor behavior that contradicted the main tenets of EMH, which assumes that investors are rational decision-makers and that securities prices reflect all available information about them at any given time. This implies that all efforts by security analysts and traders to outperform the market are futile and that investors should simply build a portfolio comprised of risk-free assets and the "market" portfolio that best suits their risk tolerance, and then sit back and enjoy the fruits of their labor. (Dehnad, 2011)

Investors are emotional beings; they recall the price they paid for a stock, which influences their decisions on when and at what price to sell it. Investors also have a tendency to get caught up in the current market atmosphere, whether it is greed, panic, fear, or apathy. Fundamentalists who examine the same factors at the same time have a tendency to drive prices to extremes. (Vasiliou & Eriotis, 2008)

Smith and Kahneman contend that, as a result of the cognitive mainstreaming trend, human financial decisions are mentally and cognitively limited. People are

unconcerned about the purpose of their decisions regarding the final position of the asset portfolio. (Antony, 2019)

The efficient portfolio, according to the behavioral finance approach, is not the one that optimizes the relationship between standard deviation and profitability, but the one that can best manage and accommodate the lent's personal investing objectives. The scientific approach of behavioral finance is based on classical finance concepts, to which it adds an interest in how investors put them into practice. The psychological factor has an impact on how an investor thinks and behaves. The new finance theories attempt to diversify the classical theories by incorporating elements of information socialization, such as the analysis submitted by behavioral finance. (SUCIU, 2015)

2.2. Previous Studies

2.2.1. Technical Analysis and Investor Types Theories

According to the Egyptian Stock Market's loss Which decreased the market cap from 156 million dollars to 40 million dollars means that the market capital has dropped by 75% which led to the delisting of the majority of the Egyptian intuitions from 1100 companies to 240 companies which lead to the instability of the Egyptian stock market. The individual transaction accounts before the 25th of January was 48% of the Egyptian market, after the revolution became 52% of the total volume of Egyptian stock trading at 2018 the percentage was totally changed the individuals represents 50% from the Egyptian stock market where the Egyptian institutions was 14% and after 2018 Egyptian institutions begin to take its place in the Egyptian market again which means that there is a negative relationship between the Egyptians institutions and the individuals because the market of the individuals become very small, it is true that the statistics shows an increasing in the percentage of the individuals but this explain that their market is decreasing year by year due to their unawareness of the indicators and when they have to buy and sell, evidence from the Egyptian report in 2019, which mean that we are facing a very big problem that the Egyptian institutions doesn't maintain the best tool to buy or sell at the best time and most of them loose their money because they don't have the expertise of prediction and estimation the value of the stock and they don't have a physical institutions to take care about them and by consequently no indicators to follow for taking the buying and selling decision and they don't know how to calculate the fair value also this refer also to the broker that he didn't well trained about these indicators instead of losing profit to another investor.

We have 6 investor types that exist in the Egyptian market (individual foreign, institutions foreign, individuals Arab, institutions Arab, individuals Egyptian, and institutions Egyptian). (Market, 2011-2019)

2.2.2. Egypt vs. Arab Market

In 2010, the Arab markets delivered a mixed bag of results. Beginning to recover from the global financial crisis in the first quarter of the year, the Arab markets

suffered severe losses as a result of global market declines caused by the Greek debt crisis, as well as fluctuations in oil prices. (EGX, 2010) During 2011, the majority of Arab countries suffered significant losses. These losses were primarily attributed to revolutions that erupted in several countries (Tunisia, Egypt, Yemen, Libya, and Syria), as well as global economic issues that had a negative impact on the performance of the Arab Exchanges (EGX, 2011). In 2019, this year, the Egyptian market attracted 31998 new investors, including approximately 1019 new foreign funds and institutions. (EGX, 2019)

2.2.3. Individuals vs. Institutions

Institutions dominated the Egyptian market in 2010, accounting for 52 percent of the value traded, up from 37 percent in 2009. Furthermore, individuals accounted for 48 percent of the value traded in 2010, compared to 63 percent the previous year. Meanwhile, after excluding transactions, institutions ended the year 2010 as net buyers, with nearly LE 3.9 billion versus LE 2.2 billion in 2009. (EGX, 2010). Institutions dominated the Egyptian market, accounting for 59 percent of the value traded in 2011, up from 52 percent in 2010. Furthermore, individuals accounted for 41 percent of the value traded in 2011, compared to 48 percent the previous year. Meanwhile, after excluding transactions, institutions ended 2011 as net sellers, with nearly LE 1 billion versus a net inflow of LE 3.9 billion in 2010 (EGX, 2011). Individuals accounted for 26.16 percent of total transactions in 2019: Egyptians account for 23.67 percent of the population, while foreigners account for 2.49 percent.

The percentage was 73.84 percent at the institutional level: (Egyptians make up 43.39 percent of the population, while foreigners make up 30.45 percent) (EGX, 2019).

2.2.4. Egyptians vs. Foreigners

After excluding deals, foreigners accounted for 29 percent of the total value traded in 2011, with Arab investors accounting for 5 percent and non-Arab foreign investors accounting for the remaining 24 percent. The sequence of events that reflected a state of political unrest had a significant impact on foreigners' performance, as they recorded a net outflow of around LE 4.3 billion. Nonetheless, the outflow is regarded as moderate, as it accounts for less than half of non-Arab foreign inflows in the Egyptian market in 2010. (LE 8.4 billion). Arab investors, on the other hand, saw a slight net inflow of LE 194 million in 2011, compared to a net outflow of LE 997 million in 2010 and LE 4 billion in 2009. Furthermore, after excluding deals, European investments dominated foreign investments on EGX in 2011, accounting for approximately 49 percent of total foreign investments. Investments in the United States and Canada accounted for 27% of all foreign investments, while Arab investments accounted for 18%. At the country level, the United Kingdom came first, accounting for approximately 41 percent of total foreign investments on EGX in 2011, followed by the United States and Saudi Arabia, which accounted for 27 percent and 8 percent of total

foreign investments, respectively. After excluding transactions, the UAE accounted for 5% of total foreign investments (EGX, 2011). Non-Egyptian (foreign) investors accounted for 32.94 percent of total transactions in 2019, while Egyptian investors accounted for 67.06 percent. In comparison, the United Kingdom accounted for 30.09 percent of total foreign transactions in 2019, followed by the United States of America, Luxembourg, and the Kingdom of Saudi Arabia with 13.28 percent, 10.98 percent, and 7.17 percent, consequently, of total foreigner transactions Foreigners' net purchases totaled EGP 42.31 billion this year, up from EGP 5.73 billion the previous year, representing a significant increase in net purchases by foreigners (EGX, 2019). Despite the difficult conditions imposed by the Corona pandemic, the Egyptian Stock Exchange was able to attract 28,368 new investors at the end of this year, including 391 foreign investment funds, as shown in the table below (EGX, 2020). By the end of 2021, the Egyptian capital market had attracted 59,002 new investors. It is important to note that around 1621 funds and organizations have entered the market, including 950 that are not Egyptian. A total of 27% of all transactions in the Egyptian market during 2021 were made by non-Egyptian investors, while 73% of all transactions were made by Egyptian investors. In 2021, individual transactions made up 26% of all transactions, as broken down as follows: Egyptians by 24%, while foreigners are down 2%.

The breakdown of the percentage of transactions at the level of institutions, which was 74%, is as follows: Egyptians by 49% and non-Egyptians by 25%. (EGX, 2021)

By 2022, total trade values had increased to a previously unheard-of EGP 1.084 trillion. Additionally, 2022 saw the highest daily volume of transactions (almost 109 K transactions) in EGX history. Transactions involving listed equities made up 31% of all trading in 2022, up from 21% in 2021. Additionally, institutional trading over listed equities increased to 47% in 2022 from 32% in 2021.

A record 175 K new retail investors joined the EGX in 2022, increasing the total number of registered investors to 526 K at the end of the year. (EGX, 2022)

2.2.5. Technical Analysis and Signaling Theory

Many existing studies, including those by Fama (Fama & Blume, 1966), Gencay (Gencay, 1998), and Kestner (Kestner, 2003), have documented the success of technical analysis in profitable trading in financial markets (2003). According to Loh (Loh, 2005) and Lento (Lento, 2009), when indicators are combined, technical analysis can be more effective in profiting from recurring price patterns. Mohd. Nor (Mohd Nor & Wickremasinghe, 2017) investigated the profitability of a widely used technical indicator, moving average (MA) rules, in the Bursa Malaysia during the 2008-2009 global financial crisis (GFC) and discovered that MA rules performed differently before, during, and after the crisis. Pandya (Pandya, 2013) investigated the use of technical analysis for trading in listed In-

dian IT firms. He used the EMA (exponential moving average), MACD, ROC (rate of change), and RSI indicators. Nithya (Nithya & Thamizhchelvan, 2014) investigated MACD and RSI in relation to banking sector stocks. Subramanian (Subramanian & Balakrishnan, 2014) used refined MACD indicators to test the Efficient Market Hypothesis, which contends that it is impossible to consistently outperform the market. Chong (Chong & Ng, 2008) discovered that MACD and RSI rules were effective in generating excess return on the London Stock Exchange in their study. Metghalchi (Metghalchi et al., 2012) examined the profitability of some technical trading rules for 16 European stock exchanges using price data from 1990 to 2006. They discovered that increasing moving average rules had good predictive power, which resulted in profitable trading. (Shalini & Pranav, 2019)

Overall, the results of Brock and Lakonishok (Brock et al., 1992) show that buy signals consistently generate higher returns than sell signals, and the second moments of the distributions of the buy and sell signals behave quite differently because returns following buy signals are less volatile than returns following sell signals. The asymmetry of the returns and the volatility of the Dow series over the periods of buy and sell signals suggest that the linear conditional mean estimators fail to characterize the temporal dynamics of security returns and point to the existence of nonlinearities as the data generation mechanism.

However, using technical indicators with different properties and uneven characteristics at the same time may produce unexpected results because they may negate each other. We contend that a more careful selection of indicators with similar characteristics but different methods of arriving at their outcomes ensures a stronger and more justified prediction. (Chourmouziadis & Chourmouziadou, 2021)

2.2.6. Schools and Signals Technical Indicators

According to the research of Jasemi et al. (Jasemi et al., 2011), "technical analysis is about signals and signs, where signs are generated by stock price changes and signals are limited to three states of ascending, descending, and neutral." Price movements that are plotted graphically are thought to convey signals and messages about the crowd's expectations, moods, and attitudes, allowing us to predict their future response and act accordingly. (Mohsen, 2017)

Stock market forecasting uses historical data to estimate the future value of a company's stock. The forecasters' main problems are buying/selling the stock at the right time and buying/selling the right stock. Due to the complexities of the forecasting process, investors and traders have relied heavily on a decision support system (technical analysis). Technical indicators are mathematical and statistical calculations based on statistical data such as stock and ETF close prices, volume, and trends. There are two types of technical indicators: leading indicators and lagging indicators. Leading indicators display the market's buyer-seller ratio and provide signals when a stock is oversold or overbought. Lagging indicators, on the other hand, show the market's trend direction and

strength. The most well-known leading indicators are oscillators such as the Relative Strength Index (RSI), while the majority of lagging indicators are moving averages such as the Simple Moving Average (SMA). (Ozbayoglu & Erkut, 2016)

2.2.7. Signals of Technical Indicators

According to Ivanovski (Ivanovski, 2017), the oldest technical clue appeared in Joseph de la Vega's record of the Dutch market in the 17th century. The principle of technical analysis is derived from hundreds of years of observing financial market behavior. The technical approach to investing is fundamentally based on the idea that prices follow a trend determined by changes in investor attitudes toward various economies, monetary, political, and psychological forces. The most important aspect of technical analysis is its ability to identify trends as early as possible. Technical analysis is performed by observing patterns in index or price movements over time. Depending on the needs, the price movement history can be data every few seconds, minutes, hours, weeks, months, or even annually. As a result, users of technical analysis believe that, when used correctly, technical analysis can provide more practical and faster guidance, resulting in more optimal benefits. (Pramudya & Ichsani, 2020)

The study will clarify in detail five of the most popular price indicators that are the concern of this study. Price indicators are most commonly used by the majority of traders. This section is concerned with clarifying popular price indicators that will be tested in this study on EGX30 including RSI, MACD, SMA, ROC, and stochastic Oscillator

1) Relative Strength Index—RSI Indicator

A movement indicator used in technical analysis to measure recent price swings is the Relative Strength Index (RSI). It aids in identifying overbought or oversold conditions for a stock or other asset. An RSI performing of 70 or greater has historically been understood as indicating that investment is becoming overbought or overpriced, which might result in a trend reversal or corrective price retreat. In contrast, a reading of 30 or less on the RSI denotes an oversold or undervalued market. (Investopedia, 2022)

2) Moving Average Convergence Divergence—MACD Indicator

An indicator that illustrates the correlation between two moving averages of a stock's price is the moving average convergence divergence (MACD). The MACD is a tool used by investors to spot shifts in the strength or direction of a stock's price trend. The security has been overbought or oversold and will soon go back to normal levels if the MACD shows a large increase or decrease. Investors typically combine this study with the relative strength index (RSI) or other technical indicators in order to confirm overbought or oversold positions. (Dolan, 2023)

3) Smoothing Moving Average—SMA Indicator

A moving average is a valuable statistical tool utilized to analyze data points by calculating various averages of different subsets of a complete data set. In

finance, specifically, a moving average (SMA) is a widely used stock indicator in technical analysis. Its primary function is to smooth out price data by continually calculating an average price, thereby minimizing the impact of random short-term fluctuations on the stock price over a specific period of time. A moving average is a straightforward yet effective technical tool that is frequently employed to determine a stock's trend direction or to identify its support and resistance levels. (Hayes, 2022)

4) Rate of Change—ROC Indicator

The Rate of Change (ROC) is a tool used to measure the momentum of a price. It determines the percentage difference between the current price and the price from a specific number of periods in the past. However, some analysts believe that the ROC calculation places the same weight on both recent and past prices, despite the fact that recent price changes may be more crucial in forecasting future price movements. (Mitchell, 2023)

5) Stochastic Oscillator—Indicator

The stochastic oscillator, created by Lane, shows where a stock's closing price falls within its high and low range over a period of 14 days. This indicator measures momentum by comparing a security's closing price to its price range over a certain time period. To reduce sensitivity to market movements, the time period can be adjusted or a moving average can be taken. The oscillator is limited to a range of 0 to 100 and can identify overbought and oversold conditions. Typically, readings above 80 indicate overbought conditions, while readings below 20 indicate oversold conditions. (Hayes, 2021)

3. Data and Methodology

3.1. Variables Description and Calculations

In research the dependent variable is the six types of investors such as individuals or institutions as measured by the responses of their behaviors in the selling and buying decision on the Egyptian stock market, while the independent variables are the relative strength index, moving average convergence and divergence, moving average, Stochastic oscillators and Rate of change which are measured with their ordinary equations. (**Table 1**)

3.2. Study Hypotheses

The examination of several investigations conducted on the relationship by previous studies led to the development of the following hypotheses. These hypotheses will be tested to see the impact of technical indicators on the six investors who invest in the Egyptian stock market.

H1: There is a negative significant relationship between the investor's decision and the RSI;

H2: There is a positive significant relationship between the investor's decision and the MACD;

H3: There is a negative significant relationship between the investor's decision and the Stochastic Oscillator;

Table 1. Summarizes the variables used in this study and the methods used to measure each of them.

Variables	Code	Measurement	Expected Sign	Source
Independent Variables				
Relative strength index	RSI	$\text{RSI step one} = 100 - \frac{100}{1+\frac{\text{Average gain}}{\text{Average loss}}}$ $\text{RSI step two} = 100 - \frac{100}{1+\frac{(\text{Previous average gain} * \text{lock back period}) + \text{current gain}}{-((\text{previous average loss} * \text{lock back period}) + \text{current loss})}}$	–	(Kahn, 2008)
Moving average convergence divergence	MACD	MACD =12 – Period EMA – 26-Period EMA	+	(Kahn, 2008)
Smoothing Moving Average	SMA	$\text{SMA} = \frac{A1 + A2 + A3 + \cdots + An}{n}$ $\text{EMA}_t = V_t * \frac{S}{1+d} + \text{EMA}_y * \left(1 - \frac{S}{1+d}\right)$	+	(Larson, 2007)
Stochastic Oscillator	K	$\%K = \frac{C - L14}{H14 - L14} * 100$	–	(LIM, 2016)
Rate of change	ROC	$\text{ROC} = \frac{\text{Closing Price p} - \text{Closing Price p} - n}{\text{Closing Price p} - n} * 100$	+	(Kahn, 2008)
Dependent variables				
Egyptian individuals	$\mathbf{Egy_{ind(s/B)}}$	The value of the daily trading volumes for both individual and institutional investors through the difference between buy and sell transactions on the Egyptian stock Exchange applied on daily basis from 2019 to 2022		(EGX, 2010-2020)
Egyptian institutions	$\mathbf{Egy_{inst(S/B)}}$			
Arab individuals	$\mathbf{Ar_{ind(S/B)}}$			
Arab institutions	$\mathbf{Ar_{inst(S/B)}}$			
Foreign individuals	$\mathbf{F_{ind(S/B)}}$			
Foreign institutions	$\mathbf{F_{inst(S/B)}}$			

H4: There is a positive significant relationship between the investor's decision and the SMA;

H5: There is a positive significant relationship between the investor's decision and the ROC.

3.3. Research Model

In this investigation, a multiple regression model is used to test the impact of the technical analysis indicators on the investor's decisions in the Egyptian market. From the research models presented in (Kirkpatrick II & Dahlquist, 2016; Bagheri, 2014), we can create the following mathematical research model to analyze the impact of the independent variable on the dependent variable:

$\text{Egy}_{ind} = \alpha + B_1\text{MACD} + B_2\text{RSI} + B_3\text{SMA} + B_4\text{ROC} + B_5$ Stochastic Oscillator +

E;

$Egy_{inst} = \alpha + B_1MACD + B_2RSI + B_3SMA + B_4ROC + B_5$ Stochastic Oscillator + E;

$Arab_{ind} = \alpha + B_1MACD + B_2RSI + B_3SMA + B_4ROC + B_5$ Stochastic Oscillator + E;

$Arab_{inst} = \alpha + B_1MACD + B_2RSI + B_3SMA + B_4ROC + B_5$ Stochastic Oscillator + E;

$Foreign_{ind} = \alpha + B_1MACD + B_2RSI + B_3SMA + B_4ROC + B_5$ Stochastic Oscillator + E;

$Foreign_{inst} = \alpha + B_1MACD + B_2RSI + B_3SMA + B_4ROC + B_5$ Stochastic Oscillator + E;

Egy_{ind} = Egyptian individual;

$Egy_{inst(s)}$ = Egyptian institution;

$Foreign_{ind}$ = foreign individual;

$Foreign_{inst}$ = foreign institution;

$Arab_{ind}$ = Arab individual;

$Arab_{inst}$ = Arab institution;

RSI = Relative strength index;

MACD = Moving average convergence divergence;

Stochastic oscillator = Stochastic oscillator indicator;

SMA = Smoothing Moving average;

ROC = rate of change.

3.4. Sampling and Data Collection

The Data consists of annual reports and online websites of the most active companies listed on the Egyptian stock market and what are the most common indicators used in the Egyptian stock market. The most active listed companies are specifically chosen due to the data availability and reliability in contrast to non-listed companies or those that are not the most active ones. These annual reports were used to test the most common indicator mentioned in the literature review on the five indicator indexes of the EGX30 on the Egyptian stock market, from 2019 to 2022 because there was a big fluctuation in this period of time concerning the electronic trading, access to information and lack of experience and qualifications, the data are obtained from Mubashir and Meta stock. The study will present and analyze the empirical findings of the descriptive statistics, Pearson's, Spearman's, and partial correlation and regression analysis in order to be able to either accept or reject the formulated hypotheses and will compare the findings with findings of previous studies done. Finally, the study will be able to identify whether the technical indicators have a significant effect on the investor's decisions for the most active firms listed on the Egyptian stock exchange.

3.5. Measurement—Stationary Test

In this study all the models were tested according to Dickey-Fuller and the study

data was stationary (which means that the time series' ability to be stationary in the stationarity test means that the variable's value does not fluctuate over time.) and this means that there is no time effect and non-serial correlation effect on the variables and after removing the outliers the study illustrates that the study was free from the cointegration which indicates that the stock's price of today is not based on yesterday's price.

4. Findings and Analysis

4.1. Descriptive Statistics

Table 2 illustrates the descriptive statistics of the variables on a monthly basis using the mean, median, maximum, minimum, and standard deviation for the study variables. The results of the descriptive statistics are shown in Table 2. RSI showed the maximum number for the daily data was 96.050 while the minimum was 6.459 and as for the standard deviation, it showed a result of 23.224.

With regards to MACD, the average number in the daily data was about 36.461 as shown in the mean which reported the relationship between two exponential moving averages (EMAs) of a security's price. Moreover, MACD showed the maximum number for the daily data was 263.951 while the minimum was 316.342 and as for the standard deviation, it showed a result of 176.640. Although SMA is a moving average that is determined mathematically

Table 2. Descriptive Statistics for monthly data.

		Statistics										
		Egyptian individual net (millions)	Egyptian institutions net (millions)	Arab individuals net (millions)	Arab institutions net (millions)	Foreign individuals net (millions)	Foreign institutions net (millions)	MACD	RSI	SMA	ROC	Stochastic
N		30	30	30	30	30	30	30	30	30	30	30
Mean		−29.440	602.833	25.593	−10.377	−10.907	−577.707	−793.083	44.290	12508.804	−0.111	48.049
Median		−58.200	382.400	16.300	44.700	−10.900	−385.400	−930.858	47.088	12537.006	−0.115	48.134
Std. Deviation		412.829	943.709	133.885	248.819	29.748	925.544	711.329	17.857	1611.642	0.131	17.955
Skewness		0.444	1.415	0.811	−0.792	−2.267	−1.767	0.980	−0.037	−0.006	0.364	0.109
Kurtosis		−0.083	2.050	0.364	0.639	8.523	3.936	0.762	−0.041	−1.966	−0.314	−0.923
Minimum		−721.100	−864.200	−186.800	−667.300	−131.100	−3601.300	−1815.523	7.513	10346.434	−0.357	17.996
Maximum		913.000	3133.100	348.200	433.600	28.300	618.900	990.171	85.237	14471.998	0.201	84.571
Percentiles	25	−350.925	89.775	−64.600	−195.825	−20.225	−872.350	−1282.931	34.395	10884.245	−0.217	31.501
	75	209.300	779.600	73.000	151.250	7.350	−14.350	−550.989	54.479	14180.087	−0.008	64.296

by adding recent values and then dividing the result by the number of calculation periods, SMA shows the mean according to the daily data as 10681.946, the maximum was 11153.780 while the minimum was 9873.704 and for the standard deviation 343.510 which reflects high volatility according to the high speculation in the Egyptian stock market.

Also, we still have 2 main independent variables ROC and Stochastic Oscillator the mean calculation according to the daily data was 0.02 for ROC while the stochastic Oscillator was 68.28. Since the ROC is used to calculate the difference in price, expressed as a percentage, between the price at which a stock last traded and its current price, so, the maximum data was 0.085 and the minimum was 0.071 while the standard deviation was 0.035, on the other hand the Stochastic oscillator has a maximum number 98.413 and the minimum was 2.406 and the standard deviation 30.784.

As for the dependent variables, the Egyptian individuals indicate a mean of 12.42 million, the results also showed a maximum of 25.90 million and a minimum of (30.55 million) while the standard deviation was 75.96 million. The Egyptian institutions have an average mean of (42.44 million) with a maximum of 80.31 million a minimum of (84.66 million) and a standard deviation was 18.45 million. As for the Arab individual, the mean was 21.27 million, the maximum was 20.20 million, the minimum (was 42.17 million), and the standard deviation was 35.87 million. The Arab institutions showed a mean of 33.39 million, a maximum of 79.04 million, a minimum (65.57 million), and a standard deviation of 11.47 million. We still have our last dependent variable which is divided into foreign individuals and foreign institutions which have a mean of (13.62 million) and (71.16 million) respectively. The results showed a maximum of 13.50 million, a minimum was (70.15 million), standard deviation of 26.73 million for individuals. While institutions for the maximum was 87.23 million, minimum (66.44 million) and standard deviation was 18.60 million.

The results of the descriptive statistics shown in **Table 3**. for the independent variable indicate that RSI which is the average number in the monthly data was about 44.290 as shown in the mean who reported the situation of the market and interpreted the decision taken by the players either its selling or buying decisions, this means that the Egyptian individuals, Arab institutions, Foreign individuals and foreign institutions exited the Egyptian stock market while, the Egyptian institutions and the Arab individuals were entering the market with a buying decision, the difference between the net sellers and the net buyers should be equal to zero and this is our case according to the monthly data which prove the study results.

However, we can mention that the indicators were given a good sign on the monthly data basis like the RSI given a sign of 44.290 which is very nearly to 30 Also the stochastic gives the same sign which is near the point to buy for this reason the investors can buy or sell their stocks according to the monthly data who is given a good sign related all the indicators.

Table 3. Pearson's correlation for monthly data.

Pearson Correlations												
		Egyptian individual net (millions)	Egyptian institutions net millions	Arab individuals net millions	Arab institutions net millions	Foreign individuals net millions	Foreign institutions net millions	MACD	RSI	SMA	ROC	Stochastic
Egyptian individual net (millions)	Pearson Correlation	1										
	Sig. (2-tailed)											
	N	30										
Egyptian institutions net (millions)	Pearson Correlation	−0.098	1									
	Sig. (2-tailed)	0.606										
	N	30	30									
Arab individuals net (millions)	Pearson Correlation	−0.156	−0.125	1								
	Sig. (2-tailed)	0.411	0.510									
	N	30	30	30								
Arab institutions net (millions)	Pearson Correlation	−0.013	−0.337	0.140	1							
	Sig. (2-tailed)	0.945	0.069	0.461								
	N	30	30	30	30							
Foreign individuals net (millions)	Pearson Correlation	0.184	−0.265	0.232	0.002	1						
	Sig. (2-tailed)	0.331	0.157	0.217	0.994							
	N	30	30	30	30	30						
Foreign institutions net (millions)	Pearson Correlation	−0.326	−0.859**	0.007	0.060	0.122	1					
	Sig. (2-tailed)	0.079	0.000	0.969	0.753	0.521						
	N	30	30	30	30	30	30					
MACD	Pearson Correlation	−0.133	0.006	−0.214	−0.215	0.141	0.137	1				
	Sig. (2-tailed)	0.484	0.975	0.256	0.253	0.456	0.469					
	N	30	30	30	30	30	30	30				
RSI	Pearson Correlation	−0.022	−0.654**	−0.034	0.089	0.013	0.657**	0.011	1			
	Sig. (2-tailed)	0.907	0.000	0.857	0.639	0.946	0.000	0.952				
	N	30	30	30	30	30	30	30	30			

Continued

SMA	Pearson Correlation	−0.077	0.009	−0.473**	−0.444*	−0.058	0.214	0.729**	0.158	1	
	Sig. (2-tailed)	0.685	0.961	0.008	0.014	0.762	0.255	0.000	0.404		
	N	30	30	30	30	30	30	30	30	30	
ROC	Pearson Correlation	−0.001	−0.462*	−0.104	0.059	0.106	0.467**	−0.055	0.314	0.273	1
	Sig. (2-tailed)	0.996	0.010	0.584	0.758	0.576	0.009	0.773	0.092	0.145	
	N	30	30	30	30	30	30	30	30	30	30
Stochastic	Pearson Correlation	0.053	−0.412*	−0.297	0.151	−0.128	0.403*	0.061	0.710**	0.135	0.235	1
	Sig. (2-tailed)	0.781	0.024	0.111	0.427	0.501	0.027	0.749	0.000	0.478	0.212	
	N	30	30	30	30	30	30	30	30	30	30	30

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

Moreover, SMA showed the maximum number for the monthly data was 14471.998 while the minimum was 10346.434 and as for the standard deviation, it showed a result of 1611.642.

With regards to MACD, the average number in the monthly data was about (793.083) as shown in the mean which reported the relationship between two exponential moving averages (EMAs) of a security's price. Moreover, MACD showed the maximum number for the monthly data was 990.171 while the minimum was (1815.523) and as for the standard deviation, it showed a result of 711.329. Although RSI shows the mean according to the monthly data as 44.290, the maximum was 85.237 while the minimum was 7.513, and the standard deviation was 17.857 which reflects a high volatility according to the high speculation in the Egyptian stock market.

Also, we still have 2 main independent variables ROC and Stochastic Oscillator while the mean calculation according to the monthly data was (0.111) for ROC while the stochastic Oscillator was 48.049. Since the ROC is used to calculate the difference in price, expressed as a percentage, between the price at which a stock last traded and its current price, so, the maximum data was 0.201 and the minimum was (0.357) while the standard deviation was 0.131, on the other hand the Stochastic oscillator has a maximum number 84.571 and the minimum was 17.996 and the standard deviation 17.955.

As for the dependent variables, the Egyptian individuals indicate a mean of (29.440) million, results also showed a maximum of 913 million and a minimum of (721.1 million) while the standard deviation was 412.829 million. The Egyptian institutions have an average number mean of 602.833 million with a maximum of 3133.1 million a minimum of (864.62 million) and a standard deviation was 943.709 million. As for the Arab individual, the mean was 25.593 million,

the maximum was 348.2 million, the minimum (was 186.8 million) and the standard deviation was 133.885 million. The Arab institutions showed a mean of (10.377) million, a maximum of 433.6 million, a minimum (of 667.3 million) and a standard deviation of 248.819 million. We still have our last dependent variable which is divided into foreign individuals and foreign institutions which have a mean of (10.907 million) and (577.707 million) respectively. The results have shown a maximum of 28.2 million, a minimum was (131.1 million), standard deviation of 29.748 million for individuals. While institutions for the maximum was 618.9 million, minimum (1815.523 million), and standard deviation 925.544 million.

4.2. Pearson's Correlation

To analyze the relationship among the variables of interest in the study, Pearson correlation analysis has been conducted on a monthly basis to make it more efficient instead of daily analysis **Table 4** shows the direction and strengths of the relationships between all variables with one another.

The correlation matrix shows that the Egyptian institutions have a negative significant relationship with the Arab institutions, RSI, SMA, and ROC While positively insignificant with foreign individuals but a positive significant relationship with the stochastic Oscillator. Also, negative insignificant with the Egyptian individuals, Arab individuals, foreign institutions, and MACD.

The Egyptian individuals indicate a significant negative relationship with Egyptian institutions and foreign institutions, while a positive insignificant with the Arab individuals and foreign individuals. Regarding the indicators, the Egyptian individuals show an insignificant positive relationship with MACD and SMA and an insignificant negative relationship with Arab institutions, RSI, ROC, and Stochastic Oscillator.

Arab individuals show a positive insignificant with Arab institutions, foreign individuals, and Arab individuals, while a significant positive relationship with foreign institutions, negative significance with RSI, and an insignificant negative with MACD, ROC, SMA, and Stochastic Oscillator.

Arab institutions indicate an insignificant positive relationship with MACD, ROC, RSI, SMA, and Stochastic Oscillator

Moreover, the foreign individuals show an insignificant positive relationship with MACD, RSI, ROC, Stochastic Oscillator, and Egyptian individuals and a negative insignificant with SMA, Egyptian institutions, Arab individuals, Arab institutions, and foreign institutions.

The foreign institutions show a significant negative with MACD and SMA while the negative insignificant relationship with RSI, ROC, and Stochastic Oscillator. Concerning the other players, foreign institutions show a significant negative relationship with Egyptians. Individuals, Arab individuals, and an insignificant negative relationship with Egyptian institutions, Arab institutions, and foreign individuals.

Table 4. Provides a summary of the regression results obtained on a monthly basis 2019-2022.

a. Predictors: (Constant), Stochastic, MACD, ROC, RSI, SMA

b. Dependent Variable: Egyptian individual NET (MILLIONS)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.178[a]	0.032	−0.170	446.564707415469740

a. Dependent Variable: Egyptian individual NET (MILLIONS)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	−395.906	1236.564		−0.320	0.752		
	MACD	−0.113	0.186	−0.195	−0.610	0.547	0.395	2.534
	RSI	−3.106	6.786	−0.134	−0.458	0.651	0.468	2.136
	SMA	0.019	0.085	0.072	0.218	0.829	0.366	2.730
	ROC	−82.422	737.822	−0.026	−0.112	0.912	0.739	1.354
	Stochastic	3.600	6.586	0.157	0.547	0.590	0.492	2.033

a. Predictors: (Constant), Stochastic, MACD, ROC, RSI, SMA

b. Dependent Variable: Egyptian institutions net millions

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.772[a]	0.596	0.512	659.155067845846200

a. Dependent Variable: Egyptian institutions net millions

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	−2487.175	1825.239		−1.363	0.186		
	MACD	−0.502	0.274	−0.378	−1.831	0.080	0.395	2.534
	RSI	−36.315	10.017	−0.687	−3.625	0.001	0.468	2.136
	SMA	0.289	0.125	0.494	2.303	0.030	0.366	2.730
	ROC	−3125.025	1089.067	−0.433	−2.869	0.008	0.739	1.354
	Stochastic	7.058	9.721	0.134	0.726	0.475	0.492	2.033

a. Predictors: (Constant), Stochastic, MACD, ROC, RSI, SMA

b. Dependent Variable: Arab individuals net millions

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.655[a]	0.428	0.309	111.268329476751200

a. Dependent Variable: Arab individuals net millions

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	980.728	308.109		3.183	0.004		
	MACD	0.076	0.046	0.403	1.640	0.114	0.395	2.534
	RSI	3.333	1.691	0.444	1.971	0.060	0.468	2.136
	SMA	−0.066	0.021	−0.796	−3.123	0.005	0.366	2.730
	ROC	130.266	183.839	0.127	0.709	0.485	0.739	1.354
	Stochastic	−4.174	1.641	−0.560	−2.544	0.018	0.492	2.033

a. Predictors: (Constant), Stochastic, MACD, ROC, RSI, SMA

b. Dependent Variable: Arab institutions net millions

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.569[a]	0.324	0.183	224.961662193337500

a. Dependent Variable: Arab institutions net millions

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1624.008	622.932		2.607	0.015		
	MACD	0.136	0.093	0.390	1.458	0.158	0.395	2.534
	RSI	0.216	3.419	0.016	0.063	0.950	0.468	2.136
	SMA	−0.127	0.043	−0.824	−2.970	0.007	0.366	2.730
	ROC	496.563	371.685	0.261	1.336	0.194	0.739	1.354
	Stochastic	2.296	3.318	0.166	0.692	0.495	0.492	2.033

a. Predictors: (Constant), Stochastic, MACD, ROC, RSI, SMA

b. Dependent Variable: Foreign individuals net millions

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.577[a]	0.333	0.189	17.624084232842602

a. Dependent Variable: Foreign individuals net millions

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	143.754	48.814		2.945	0.007		
	MACD	0.020	0.007	0.719	2.673	0.014	0.400	2.498
	RSI	0.222	0.269	0.206	0.827	0.417	0.466	2.147
	SMA	−0.011	0.003	−0.913	−3.307	0.003	0.380	2.632
	ROC	26.010	29.742	0.174	0.875	0.391	0.734	1.363
	Stochastic	−0.059	0.269	−0.054	−0.218	0.830	0.478	2.093

a. Predictors: (Constant), Stochastic, MACD, ROC, RSI, SMA

b. Dependent Variable: Foreign institutions net millions

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.743[a]	0.553	0.459	680.564973139477800

a. Dependent Variable: Foreign institutions net millions

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	127.368	1884.525		0.068	0.947		
	MACD	0.379	0.283	0.291	1.339	0.193	0.395	2.534
	RSI	35.492	10.342	0.685	3.432	0.002	0.468	2.136
	SMA	−0.104	0.130	−0.181	−0.804	0.430	0.366	2.730
	ROC	2514.333	1124.441	0.355	2.236	0.035	0.739	1.354
	Stochastic	−8.251	10.037	−0.160	−0.822	0.419	0.492	2.033

Regarding our indicators, the MACD shows a positive significant relationship with RSI, and Stochastic but an insignificant positive relationship with SMA and a negative significance with ROC.

4.3. Regression Analysis

This study presents and discusses the regression results for the relationship between the independent variables (RSI, SMA, MACD, ROC, Stochastic Oscillator) and the dependent variables (Egyptian individuals and institutions, Arab individuals and institutions, foreign individuals and institutions).

While using multiple regression using the monthly data, we have sorted 6 models of regression, but we cannot start with this before we tested the Durbin Watson of the model which is a test for autocorrelation in the regression model's output. The Durbin Watson has a range from zero to four with a value of 2.00 indicating zero autocorrelation, values below 2.00 indicating positive correlation, and above 2.00 negative correlation. Backed to our study the Durbin Watson of the model was 1.992 which is nearly 2.00 which means that the whole model is correct and has no multicollinearity and this also indicated impartial correlation.

We are going to explain in this study the different models with different levels of significance and R adjusted (modified version of R-Squared that has been adjusted for the number of predictors in the model that is not affected by the number of observation either the research time, which is more accurate)

4.4. Testing the Hypotheses

For the first research model, we noticed the R adjusted was 0.032 which means that the explanatory power of the independent variable explains only 3.2% of the behavior of the Egyptian individuals, which means that we have 97% of inves-

tors' decisions can't be explained by behavior, and this explain that the Egyptian individuals are following the rumors and they have not the investment tools to use it so, as we mention before and according to this result we highly recommend that the stock market will not allow any investors to invest in the Egyptian stock market until they have a certificate of technical and fundamental analysis, and the existent investors must have an intensive course for free to make the right decisions concerning their investment. (Table 5)

H1: *There is a negative significant relationship between the investor's decision and the RSI*

The sign of the RSI was correct according to the study model which means that the Egyptian individuals must sell the stock when the prices go up near 70 and buy the stock when the prices go down near 30 but what happens that the Egyptian individuals don't use this indicator while his investment because it wasn't significant so the Egyptian individuals has an insignificant negative relationship with the RSI, which means that all his decisions are done randomly or according to the rumors. Also, Arab individuals, Arab institutions, and foreign individuals have a positive insignificant relationship with the RSI indicator which means that they do not follow it in their investment decisions and are following different indicators. The foreign institutions have a positive significant relationship with the RSI which means that they are following the RSI indicator but in the wrong way, they sell the stock when prices go down and buy the stocks when prices go up and this is a contradictory theory. Thus, Egyptian institutions have a negative significant relationship with the RSI and according to their repeated action, the study can interpret their action using the RSI indicator. The first hypotheses of the study have been accepted.

The second research model is the Egyptian institutions net the R adjusted was 0.596 which means that the explanatory power of the independent variable explains 59.6% of the behavior of the Egyptian institutions, which means that over the monthly data, we can see the awareness of Egyptian institutions and how they decisions are based on a technical indicators and important concepts not just rumors and speculation.

Table 5. provides a summary of the main results obtained as a response to the research hypotheses.

Hypotheses	Results	Hypotheses Test Values
H1: There is a negative significant relationship between the investor and the RSI	Accepted	$EGY_{inst\ net} = -2487.174 - 0.378$ (MACD) $- 0.687$ (RSI) $+ 0.494$ (SMA) $- 0.433$ (ROC) $+ 0.134$ (Stochastic Oscillator)
H2: There is a positive significant relationship between the investor and the MACD	Accepted	$Foreign_{ind\ net} = 143.754 + 0.719$ (MACD) $+ 0.206$ (RSI) $- 0.913$ (SMA) $+ 0.174$ (ROC) $- 0.054$ (Stochastic Oscillator)
H3: There is a negative significant relationship between the investor and the Stochastic Oscillator	Accepted	$ARAB_{ind\ net} = 980.728 + 0.403$ (MACD) $+ 0.444$ (RSI) $- 0.796$ (SMA) $+ 0.127$ (ROC) $- 0.560$ (Stochastic Oscillator)
H4: There is a positive significant relationship between the investor and the SMA	Accepted	$EGY_{inst\ net} = -2487.174 - 0.378$ (MACD) $- 0.687$ (RSI) $+ 0.494$ (SMA) $- 0.433$ (ROC) $+ 0.134$ (Stochastic Oscillator)
H5: There is a positive significant relationship between the investor and the ROC	Accepted	$Foreign_{inst\ net} = 127.368 + 0.291$ (MACD) $+ 0.685$ (RSI) $- 0.181$ (SMA) $+0.335$ (ROC) $- 0.822$ (Stochastic Oscillator)

H2: *There is a positive significant relationship between the investor's decision and the MACD*

The Egyptian individuals and Egyptian institutions have an insignificant negative with the MACD, while the Arab individuals, Arab institutions, and foreign institutions have an insignificant positive relationship with the MACD that means if they focus on the MACD they can realize good profits and decisions in their investment but they are not following it. The only investor who has a positive significant relationship with the MACD is the foreign individuals which means that their investment is based on the MACD indicator which makes the study hypotheses accepted.

The study's third model is the Arab individuals net the R adjusted was 0.428 which means that the explanatory power of the independent variable explains only 42.8% of the behavior of the Arab individuals, which means that the Arab individuals are aware and educated by the technical indicators and use it by 42.8% of their transactions and the rest of percentage can be done by others indicators.

H3: *There is a negative significant relationship between the investor's decision and the Stochastic Oscillator*

The Egyptian individuals, Egyptian institutions, and Arab institutions have a positive insignificant relationship with the Stochastic Oscillator, while the foreign individuals and institutions have an insignificant negative relationship with the Stochastic. The only investor who made the study hypotheses accepted is the Arab individuals and according to the repeated action done by the Arab individuals, they are following the Stochastic Oscillator indicator by a significance confidence level of 95% that interpret the action of selling the stock when the prices were around 80 and buy them when price is 20.

The study's fourth model is the Arab institutions net the R adjusted was 0.324 which means that the explanatory power of the independent variable explains only 32.4% of the behavior of the Arab institutions, which means that the rest could be a kind of speculation in the Egyptian stock market.

H4: *There is a positive significant relationship between the investor's decision and the SMA*

Egyptian individuals have an insignificant positive relationship with the SMA, while the Arab individuals, Arab institutions, and foreign individuals have a significant negative relationship with the SMA which means that they are following the SMA but in the wrong direction this means that they buy when prices go up and sell when prices go down and this is a contradictory theory and the foreign institutions have an insignificant negative relationship with the SMA which mean they are using another indicators in their investment, the Egyptian institutions are following the SMA in their investment decisions because they have a positive significant relationship with the SMA the study can conclude this by the high level of education done by the Egyptian institutions which increase their yearly returns as mention above in the literature review, so the study hypotheses is accepted.

The fifth study model is the foreign individuals net the R adjusted was 0.333 which means that the explanatory power of the independent variable explains only 33.3% of the behavior of the foreign individuals, which means that they can be educated and certified by the stock market and knows exactly what type of indicator to use. While, the sixth study model is the foreign institutions net the R adjusted was 0.553 which means that the explanatory power of the independent variable explains only 55.3% of the behavior of the foreign institutions, which means that half of their investment decisions is based on the technical indicators and the other half is based on others indicators

H5: *There is a positive significant relationship between the investor's decision and the ROC*

Egyptian individuals have an insignificant negative relationship with the ROC, while Egyptian institutions have a negative significant relationship with the ROC, although, Arab individuals, Arab institutions, and Foreign individuals have an insignificant positive relationship with the ROC and this means despite their positivity they are not following this indicator and maybe follow others indicators like technical or candles indicators. The foreign institutions support the study hypotheses because they have a positive significant relationship with the ROC which means that they make their decisions upon the analysis of the ROC indicator.

5. Recommendations

Since five of the study hypotheses are accepted, the study can conclude the research, regarding the Egyptian market if they want to analyze the market and behavior and decisions of the investors, so the study can illustrate the factors below.

Since we have six types of investors, it is normally that all the hypotheses can be accepted because the study hypotheses focus on the investor's decision in general and not on specific investors with specific indicators. So, the behavior of Egyptian individuals can be interpreted by random actions, following rumors, or a sort of speculation. The study recommends illustrating the behavior of Egyptian institutions by looking at the SMA indicator, While the Arab individuals trading in the stock market are interpreting by the Stochastic Oscillator, the Arab institutions have a contradictory theory they are not following anyone of the technical indicators maybe they have another indicator to use it like the candles or the graphs which can predict their behavior.

Regarding the foreign individuals the researchers can follow them by analyzing the MACD, while the foreign institutions are using the ROC. So, the behaviors of the six investors have shown the interpretation of entering or exiting the Egyptian market is based on which technical indicators and what is the most used by each investor. The study can conclude that there is no smarter investor existing among the six investors but all the behaviors are based on the internal and external factors in the Egyptian market first and second the type of indicator used by each investor according to their strategy and studies.

With the increasing of the professional financial institutions and the decreasing of large proportions of individual's investors in the Egyptian stock market who suffer from the lack of qualification and experience in designing their investment strategies and effective market timing. Such deficiency makes the decision-making process based on speculative performance rather than a scientific investment base. This is because the individual investor cannot handle the same types and tools of technical and fundamental analysis, performed by professional financial institutions that are characterized by appropriate methods of specialized analysis and evaluation.

Further, according to this result, the study highly recommends that the stock market will not allow any investors to invest in the Egyptian stock market until they have a certificate of technical and fundamental analysis, and the existent investors must have an intensive course for free to make the right decisions concerning their investment.

6. Conclusions

In this research, the impact of technical indicators on the behavior of investors has been investigated. This has been achieved by using data collected from the Egyptian stock market over the period 2019-2022 on a daily and monthly basis. Results have revealed that the impact of technical indicators have a different impact on different investor and the effect of their investment on the Egyptian market Referring to their use of a certain indicator and leaving others may get them in the wrong direction. As a result, the study believes that investors who use technical analysis will have more concentrated portfolios than those who do not. In addition, Egyptian individuals need multiple courses to improve themselves in their investment and not follow the broker or anyone else, they must have their knowledge to buy and sell strategy instead of the speculation strategy which fluctuates the market capital of the Egyptian stock market.

Additionally, the unavailability of data before 2019 in the Egyptian stock market was one of the limitations of this study, the fluctuation of the economy and the Egyptian stock market due to COVID-19 and the Financial floating crisis, the study was tested on 5 technical indicators only while we have more, finally, the implication of the indicator on the Egyptian stock market only is another limitation of the current study. Therefore, it is recommended for further studies to investigate other stock markets in which different behaviours are investing. Moreover, this research also seeks to encourage researchers to conduct more similar studies in this area as well as employ the technical indicators in other stock markets to result in a better understanding of technical indicators in different markets, especially after the Ukraine war and the floating crisis.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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