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Identification and Evaluation of Practical Technical Analysis Strategies in the Iranian Stock Market

Mohammad Amin Ojaghi
PhD student, Department of Accounting, Ahvaz branch, Islamic Azad University, Ahvaz, Iran.

Mohammad Tamimi
Assistant Professor, Department of Accounting, Dezful branch, Islamic Azad University, Dezful, Iran
(Corresponding Author).
tamimi@iaud.ac.ir

Saeed Nasiri
Assistant Professor, Department of Accounting, Ahvaz branch, Islamic Azad University, Ahvaz, Iran.

Mehdi Basirat
Assistant Professor, Department of Economics, Ahvaz Branch, Islamic Azad University, Ahvaz, Iran.

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ABSTRACT

The aim of this research is to identify and evaluate practical technical analysis strategies in the Iranian capital market. To identify the strategies, a comprehensive search was conducted using the NoorMagz, IranDoc, and SID databases, gathering all articles published in scientific and research journals with keywords such as technical, technical analysis, and chartist. Subsequently, through content analysis, the practical strategies found in these articles were extracted and converted into trading robots using MQL5 language. Finally, after execution, these strategies were evaluated using the Sharpe ratio. The results from the content analysis identified 21 technical analysis strategies. The evaluation results show that the strategy "Short-Term 5-Day Moving Average and Long-Term 60-Day Moving Average with 1% Filter" with a Sharpe ratio of 0.9 performed the best, while the strategy "Breakthrough of Important Highs and Momentum" with a Sharpe ratio of 0.33 had the weakest performance among the strategies examined. Given that the Sharpe ratio for all strategies falls between zero and one, it appears that these strategies are not optimized, and caution should be exercised in their practical application.

Keywords: Technical Analysis, Trading Strategies, Trading, Technical Analysis Articles.

1. Introduction

Financial markets have long been attractive to many individuals due to their inherent uncertainty and the unpredictability of trading outcomes. Each year, numerous investors enter these markets to preserve the value of their capital against inflation or to earn returns. A lack of scientific investment approaches often results in many people losing their capital. Numerous reports and scientific studies indicate that most financial market investors either lose their capital or transfer it to a minority who possess the necessary knowledge and expertise in this field (williams, 2023; Newall & Weiss-Cohen, 2022; Carlson, 2021; Chague, 2020; Mehrani, Mirshahvalad, & Abbasi, Portfolio Optimization Using Black Hole Meta Heuristic Algorithm, 2019; Meyer, Schroff, & Weinhardt, 2014; Bauer, Cosemans, & Eichholtz, 2009). Therefore, understanding how to invest in financial markets is a key question for enthusiasts of these markets. One of the common methods used across all financial markets is technical analysis. This method assumes that price and its movement reflect all actions of market participants, and traders execute their trades using patterns and price-based tools known as technical analysis. Consequently, technical analysis knowledge is one of the most important methods for analyzing financial markets (Barzideh, Taghvifard, & Zamanian, 2013; Moradi, Shafeisardashti, & Rahmani, 2013; Gradojevic, Kukolj, Adcock, & Djakovic, 2023) In this approach, analysts use various tools such as trend type, trend lines, Fibonacci, Gann, patterns, indicators, time dimensions, candlesticks, etc., to design strategies, and then verify the effectiveness of the strategies through testing on historical market data. They then apply these strategies in real-world trading with capital management and trading psychology. At the time of publishing this article on the TradingView platform (which is one of the advanced trading platforms), there are over 100 main indicators and more than 5,000 public indicators available in the site's public library, from which millions of strategies can be designed. The differing macroeconomic conditions across countries, which lead to varying results in technical analysis (Ahmadi, Paytakhti Oskooi, Fakhimi Azar, & Badavar Nahandi , 2021; Valach, Martin, & and Maria, 2024), necessitate that these methods also be evaluated and localized for domestic markets. Scientific and research journals play a crucial role in promoting and introducing scientific investment methods, including technical analysis. Given the breadth of various sciences, each researcher can contribute to a small part of the field with their papers, and technical analysis is no exception. Research is needed to consolidate the subject. Content analysis of articles in the field of technical analysis strategies helps researchers identify studied strategies and allows enthusiasts to understand the performance of each strategy. Given that it appears no research in this area has been conducted in our country, Iran, this study aims to use content analysis to evaluate all published articles from the beginning of their publication until the end of 2021. Thus, the research problem is to identify technical analysis strategies through the review of published articles and evaluate the strategies used in this field.

Theoretical Foundations and Background

Despite the fame of the renowned book *Technical Analysis of the Financial Markets* by John Murphy, often referred to as the "Bible" of technical analysts, many mistakenly consider him the father of technical analysis. Technical analysis is derived from the articles published by Charles Dow in the Wall Street Journal from 1900 to 1902. Charles Dow is credited with creating the Dow Jones Industrial Average and the Dow Jones Transportation Average, which are frequently mentioned in news (Gobadi & Abdolbaghi, 2015).

In Iran, most research focuses on combining technical analysis tools with advanced methods such as neural networks, genetic algorithms, and the firefly algorithm, Black Hole Algorithms (Mehrani, Mirshahvalad, & Abbasi, 2019). One tool that has received less attention is the research by Ghasemian & Rahnamay Roodposhti (2017), which introduces astrological knowledge and its application in market analysis. Additionally, the use of pair trading methods, mentioned by Eghbalnia, Pouyanfar, & Maleki (2015), Jalilian & Mohsen (2015), and Azizzadeh & Ebadi (2017), presents challenges in comparison with other methods due to the selection of pairs for each symbol. Other studies on technical analysis can be categorized into five groups:

Use of Filtering Rules

It appears that following international research, the first published scientific paper in this area is by

Namazi & Shoushtarian (2001)This paper examines filtering rules and compares them with the buy-and-hold method. The results of this research indicate that filtering rules are more effective than the buy-and-hold method. However, these findings differ from the study by Islami Bidgoli & Sadeghi Batani (2004), although the research by Pourzamani, Heidarpour & Mohammadi (2011) confirms the applicability of the filtering method once again.

Use of Candlestick Patterns, Price Patterns, and Support and Resistance Levels

Regarding the use of Japanese candlestick patterns, studies by (Nasrolahi, Samadi & vaez barzani (2013), Yassini, Rahnamay Roodposhti & Fallahshams (2019), and Peymany Foroushany, Erzae, Salehi & Salehi (2020) have been conducted, suggesting that some candlestick patterns have the potential to generate returns for investors. For price patterns, the head and shoulders pattern and the symmetrical triangle pattern, as employed by Shabahang & Hosni (2012) and Mohammadi (2004), have been confirmed. The symmetrical triangle pattern by Shabahang & Hosni (2012) and the double top and bottom pattern by Mohammadi (2004) have also been validated. Furthermore, Shabahang & Hosni (2012) concluded that the rectangle pattern lacks effectiveness in the stock market.

In technical analysis, there are two types of support and resistance levels: dynamic and static. Static support and resistance levels, which include round numbers and historical highs and lows of a stock, have been validated by studies such as those by Razmi, Joulaei, & Emami (2007), Alizadeh Nodehi, Mahfoozi & Vasiresh (2015), and Assadi & Emami (2019). However, there is no evidence for dynamic support and resistance levels, which are typically created using trend lines and channels.

Use of Moving Averages and Trend-Following Indicators

Most research in the field of technical analysis focuses on moving averages. Studies by Shariat Panahi & Heydari Nia (2004), Mohammadi (2004), Razmi et al. (2007), Setayesh, Taghizadeh Sayade, Pormosa & Abozarilotf (2009), Tehrani, Modarres & Tahriri (2010), Tehrani & Esmaeili (2012), Heybati, Rahnamay Roodposhti & Salmani (2010), Alizadeh Nodehi et al. (2015), Bashir Khodaparasti, Jahangardi, Boroomandzadeh & Saba (2019), and Safari & Ashna (2019) have confirmed the effectiveness of simple moving averages in the Tehran Stock Exchange. However, their findings do not align with those of Pourzamani et al. (2011), Nabavi Chashmi & Hassanzadeh (2011) and Tehrani & Esmaeili (2012). The use of weighted moving averages by Setayesh et al. (2009) and Tehrani et al. (2010), exponential moving averages by Setayesh et al. (2009), Tehrani et al. (2010), Heybati et al. (2010), Salmani (2010), and Nabavi Chashmi & Hassanzadeh (2011), and variable and triangular moving averages by Setayesh et al. (2009) have also been confirmed. In terms of dual moving averages, which combine two moving averages, mixed results have been observed. Studies by Najarzadeh & Godari (2008), Samadi et al. (2010), Salmani (2010), Abbasi & Jahrami (2012), Alizadeh Nodehi et al. (2015), and Bashir Khodaparasti et al. (2019) found this method useful, while Sinayi & Khan Babaei (2006) concluded that it is not applicable in the Tehran Stock Exchange.

Indicators such as Parabolic SAR, Bollinger Bands, and Ichimoku are used for trend detection or direct trading. Regarding the effectiveness of Bollinger Bands, Mohammadi (2004) and Razmi et al. (2007) found it useful in the Tehran Stock Exchange, contrary to the findings of Tehrani & Esmaeili (2012). The application of Ichimoku was confirmed by Davoodi et al. (2019), while the use of Parabolic SAR was not confirmed by Mousavi Anzahaei & Nikoomaram (2020).

Use of Indicators and Oscillators

Research on indicators and oscillators, particularly oscillators, has mainly focused on the Relative Strength Index (RSI). Studies by Shariat Panahi and Heydari Nia (2004), Mohammadi (2004), Sadeghi Sharif & Soltan Zali (2008), Razmi et al. (2007), Setayesh et al. (2009), Tehrani, Mohammadi & Porebrahimi (2011), Tehrani et al. . (2010), Heybati, Rahnamay Roodposhti & Salmani (2010), Alizadeh Nodahi et al. (2015), Bashir Khodaparasti et al. (2019), and Safari & Ashna (2019) have confirmed the effectiveness of the RSI in the Tehran Stock Exchange. However, Tehrani & Esmaeili (2012) and Mousavi Anzahaei & Nikoomaram (2020) found it ineffective. The Stochastic Oscillator, which also

fluctuates within a range of 0 to 100, has been found useful by Mohammadi (2004), Razmi et al. (2007), and Tehrani et al. (2010). Conversely, Tehrani & Esmaeili (2012) and Mousavi Anzahaei & Nikoomaram (2020) reported the opposite results. Other studies on indicators and oscillators are summarized in the table below:

Table 1: Summary of Research Findings on Technical Analysis Indicators

Technical Analysis Tool	Status	References
Rate of Change (ROC)	Confirmed	(Mohammadi, 2004).
	Not Confirmed	(Tehrani & Esmaeili, 2012).
MACD	Confirmed	(Razmi, Joulaei, & Emami, 2007) (Heybati, Rahnamay Roodposhti, & Salmani, 2010) (Salmani, 2010) (Bashir Khodaparasti, Jahangardi, Boroomandzadeh, & Saba, 2019).
	Not Confirmed	(Tehrani & Esmaeili, 2012) (Keshavarzi, Yarmohammadian, & Nadi, 2018) (Ranjbari Vahid, Sadeghi Sharif, Eivazlu, & Mehrara, 2020).
Money Flow Index (MFI)	Confirmed	(Tehrani, Modarres, & Tahriri, 2010) (Salmani, 2010) (Alizadeh Nodehi, Mahfoozi, & Vasiresh, 2015).
	Not Confirmed	(Setayesh, Taghizadeh Sayade, Pormosa, & Abozarilotf, 2009) (Tehrani & Esmaeili, 2012).
Directional Movement Index (DMI)	Confirmed	(Setayesh, Taghizadeh Sayade, Pormosa, & Abozarilotf, 2009).
Intraday Momentum Index (IMI)	Not Confirmed	(Setayesh, Taghizadeh Sayade, Pormosa, & Abozarilotf, 2009).
Williams %R	Confirmed	(Tehrani, Modarres, & Tahriri, 2010).
	Not Confirmed	(Setayesh, Taghizadeh Sayade, Pormosa, & Abozarilotf, 2009).
Commodity Channel Index (CCI)	Confirmed	(Tehrani, Modarres, & Tahriri, 2010).
Demand Index (DI)	Confirmed	(Tehrani, Modarres, & Tahriri, 2010).
Volume	Confirmed	(Ahmadpour, Aghajani, & Fadavi, 2013) (Kebryaie & Dehghan , 2020).
	Not Confirmed	(Mousavi Shiri, Salehi, Shakeri, & Bakhshian, 2016).
Momentum	Confirmed	(Kebryaie & Dehghan , 2020).

Use of Multi-Tool Combined Strategies

Most research has tested the effectiveness of basic technical analysis tools. However, technical traders often use multiple tools to develop their strategies, which may involve one or more tools providing buy signals and one or more providing sell signals. Pourzamani & Rezvaniaghdam (2017) designed two strategies using moving averages, Parabolic SAR, and the Relative Strength Index (RSI). Their results showed that in the years 2011 and 2012, the technical strategies performed well, but in 2013, during a bullish market, the buy-and-hold method performed better. These findings were later replicated by Pourzamani & Rezvaniaghdam (2017). Conversely, the research by Barzideh & Allahgholi (2008) provided different results. They designed a strategy using Bollinger Bands and the RSI and found that the buy-and-hold method yielded higher returns compared to their designed strategy. The designed strategy, however, had lower variance and thus lower risk, offering some advantage. Unfortunately, a common issue with some studies in this area is that the buy and sell points, parameters used in the tools, and the returns of the strategies are not always clearly stated, which reduces the comparability and reliability of the published articles.

Research Questions

1) What practical strategies have been employed in the published articles on technical analysis?
2) Among the strategies used in the articles, which one performs better?

Research Methodology

This study employs a quantitative-qualitative approach, utilizing content analysis to examine technical analysis articles from their inception until the end of 2021. The following steps were taken to collect relevant articles from three reputable databases: Noormags, Magiran, and the Scientific Information

Database of Jahad Daneshgahi (SID). Articles were gathered using the following parameters:

1) Keywords such as "technical," "technical analysis," and "chartist" were searched as exact phrases.
2) The type of scientific and research journals was selected.
3) The time frame from the beginning until the end of 2021 was chosen.
4) Journals in the fields of accounting, management, and economics were selected.
5) The search scope included titles, abstracts, keywords, and full texts of articles.

Applying these parameters and removing duplicate articles, a total of 310 articles were collected. Given the broad range of keywords, in the first stage, articles focused on the development and use of technical analysis were separated, resulting in 162 articles for preliminary review. In the second stage, articles that utilized technical analysis strategies were identified, leaving 48 articles. Finally, practical strategies were determined by applying the following constraints:

1) Strategies must use at least two technical analysis tools or one technical tool combined with capital management to avoid testing simple strategies.
2) The timing and parameters for buying and selling in the strategy must be clearly specified to allow for implementation and testing.
3) The article introducing the strategy must report the strategy's returns to facilitate comparison with the results obtained.
4) Strategies must be applied in the Tehran Stock Exchange to ensure comparability of results.

The statistical population of the research for evaluating the identified strategies consists of the 50 largest liquid companies as of April 2013 (the first year in which the reports of large companies are available). The trading dates considered start from the beginning of April 2011. The sample was selected using systematic elimination as follows:

1) Companies with halted symbols were excluded (1 company) as their analysis would not yield future benefits.
2) Companies for which data was not available for 2011 have been excluded. This ensures that trading can be conducted for all symbols from the beginning of 2011, making the sample more homogeneous (16 companies).
3) Companies with adjusted data showing price gaps greater than 20% were excluded (15 companies) as such gaps typically result in losses or random returns, leading to misleading results. The 20% threshold was chosen based on the recovery formula, which indicates that a trader experiencing a 20% loss needs a 25% gain to recover, assuming a 5% fluctuation limit, which translates to a minimum of 5 days (one business week) for recovery. Gaps greater than 20% cannot be quickly recovered and thus would not provide accurate results in short-term evaluations. The loss recovery formula is as follows:

$$\text{loss recovery} = \left[\frac{1}{1-\text{loss percent}}\right] - 1$$
$$= \left[\frac{1}{1-0.2}\right] - 1 = 0.25$$

After applying the above restrictions, a total of 18 symbols were ultimately evaluated.

5. Research Findings

To address the research questions, the strategies that meet the defined conditions from the research methodology were first identified through content analysis of the articles. The buy and sell signals for each strategy were then specified in detail. To eliminate personal judgment and errors, the strategies were implemented using MQL5 language in the form of trading robots. These robots were tested from April 1, 2013, to April 1, 2024.

Question 1: This question focuses on identifying the practical strategies used in domestic articles. As shown in the table below, 21 strategies met the necessary conditions for evaluation. All selected strategies are combination strategies, meaning they utilize two or more technical analysis tools for trading and have specified buy and sell parameters for assessment on the Tehran Stock Exchange. The relevant strategies are listed in the table below.

Table 2: Practical Strategies Found in the Articles

No	Strategies
1	**Strategy Name:** Reversal from Important 6-Month Low (Crosslow). **Buy Conditions:** The price reaches its 6-month low and then shows a reversal of at least 20%. **Sell Conditions:** When the price reaches the most recent low, the stop-loss is adjusted with the formation of a new low or if the price reverses by more than 30% (Assadi & Emami, 2019).
2	**Strategy Name:** Breakout from Important High and Momentum (CrossHigh) **Buy Conditions:** The price increases by more than 5% weekly above a significant high within less than 3 months. **Sell Conditions:** When the price reaches the most recent low, the stop-loss is adjusted with the formation of a new low, or if the price rises by more than 30% from the previous low, the low of the previous week serves as the stop-loss (Assadi & Emami, 2019).
3	**Strategy Name:** Reversal from Important Low or Breakout from Important High and Momentum (CrossHighOrLow) **Buy Conditions:** Based on Strategies 1 and 2, the strategy that gives a signal first will be used for buying. **Sell Conditions:** The exit condition will follow the same strategy that was used for the initial buy (Assadi & Emami, 2019).
4	**Strategy Name:** Parabolic SAR and Double Moving Average (SarMa10Ma5) **Buy Conditions:** The crossing of the 5-period Exponential Moving Average (EMA) and the 10-period EMA upwards, with the Parabolic SAR points positioned below the price. **Sell Conditions:** The crossing of the 5-period EMA and the 10-period EMA downwards, or when the Parabolic SAR points are positioned above the price (Poorzamani & Rezvaniaghdam, 2015; Pourzamani & Rezvaniaghdam, 2017).
5	**Strategy Name:** Parabolic SAR and Relative Strength Index (SarRsi) **Buy Conditions:** The Relative Strength Index (RSI) is above 50, and the Parabolic SAR points are positioned below the price. **Sell Conditions:** The RSI is below 50, and the Parabolic SAR points are positioned above the price (Poorzamani & Rezvaniaghdam, 2015; Pourzamani & Rezvaniaghdam, 2017).
6	**Strategy Name:** Parabolic SAR, Relative Strength Index, and Moving Average (MaRsiSar) **Buy Conditions:** Price is above the 20-day moving average, the Relative Strength Index (RSI) is above 50, and the Parabolic SAR points are positioned below the price. **Sell Conditions:** The Parabolic SAR points are positioned above the price (Pourzamani & Rezvaniaghdam, 2017).
7	**Strategy Name:** Bollinger Bands and RSI70 (Rsi70AndBolingerband) **Buy Conditions:** Price is above the upper Bollinger Band and the Relative Strength Index (RSI) is below 70. **Sell Conditions:** Price is below the upper Bollinger Band and the RSI is above 70 (Barzideh & Allahgholi, 2008).
8	**Strategy Name:** Bollinger Bands and RSI30 (Rsi30AndBolingerband) **Buy Conditions:** Price is below the lower Bollinger Band and the Relative Strength Index (RSI) is below 30. **Sell Conditions:** Price is below the lower Bollinger Band and the RSI is above 30 (Barzideh & Allahgholi, 2008).
9	**Strategy Name:** Short-Term and Long-Term Moving Average Crossover with 1% Filter (Ma60Ma5Filter1) **Buy Conditions:** The short-term moving average (5 periods) is more than 1% above the long-term moving average (60 periods). **Sell Conditions:** The short-term moving average (5 periods) is less than 1% below the long-term moving average (60 periods) (Shariat Panahi & Heydari Nia, 2004).
10	**Strategy Name:** Short-Term and Long-Term Moving Average Crossover with 1% Filter (Ma120Ma5Filter1) **Buy Conditions:** The short-term moving average (5 periods) is more than 1% above the long-term moving average (120 periods). **Sell Conditions:** The short-term moving average (5 periods) is less than 1% below the long-term moving average (120 periods) (Shariat Panahi & Heydari Nia, 2004).
11	**Strategy Name:** Short-Term and Long-Term Moving Average Crossover with 1% Filter (Ma180Ma5Filter1) **Buy Conditions:** The short-term moving average (5 periods) is more than 1% above the long-term moving average (180 periods). **Sell Conditions:** The short-term moving average (5 periods) is less than 1% below the long-term moving average (180 periods) (Shariat Panahi & Heydari Nia, 2004).

No	Strategies
12	**Strategy Name:** Short-Term and Long-Term Moving Average Crossover with 1% Filter (Ma4Ma1Filter1) **Buy Conditions:** The short-term moving average (1 period) is more than 1% above the long-term moving average (4 periods). **Sell Conditions:** The short-term moving average (1 period) is less than 1% below the long-term moving average (4 periods) (Razmi, Joulaei, & Emami, 2007).
13	**Strategy Name:** Short-Term and Long-Term Moving Average Crossover with 1% Filter (Ma9Ma1Filter1) **Buy Conditions:** The short-term moving average (1 period) is more than 1% above the long-term moving average (9 periods). **Sell Conditions:** The short-term moving average (1 period) is less than 1% below the long-term moving average (9 periods) (Razmi, Joulaei, & Emami, 2007).
14	**Strategy Name:** Short-Term and Long-Term Moving Average Crossover with 1% Filter (Ma18Ma1Filter1) **Buy Conditions:** The short-term moving average (1 period) is more than 1% above the long-term moving average (18 periods). **Sell Conditions:** The short-term moving average (1 period) is less than 1% below the long-term moving average (18 periods) (Razmi, Joulaei, & Emami, 2007).
15	**Strategy Name:** Short-Term and Long-Term Moving Average Crossover with 1% Filter (Ma50Ma1Filter1) **Buy Conditions:** The short-term moving average (1 period) is more than 1% above the long-term moving average (50 periods). **Sell Conditions:** The short-term moving average (1 period) is less than 1% below the long-term moving average (50 periods) (Razmi, Joulaei, & Emami, 2007).
16	**Strategy Name:** Short-Term and Long-Term Moving Average Crossover with 1% Filter (Ma100Ma1Filter1) **Buy Conditions:** The short-term moving average (1 period) is more than 1% above the long-term moving average (100 periods). **Sell Conditions:** The short-term moving average (1 period) is less than 1% below the long-term moving average (100 periods) (Razmi, Joulaei, & Emami, 2007).
17	**Strategy Name:** Short-Term and Long-Term Moving Average Crossover with 1% Filter (Ma150Ma1Filter1) **Buy Conditions:** The short-term moving average (2 periods) is more than 1% above the long-term moving average (150 periods). **Sell Conditions:** The short-term moving average (2 periods) is less than 1% below the long-term moving average (150 periods) (Razmi, Joulaei, & Emami, 2007).
18	**Strategy Name:** Short-Term and Long-Term Moving Average Crossover with 1% Filter (Ma200Ma1Filter1) **Buy Conditions:** The short-term moving average (1 period) is more than 1% above the long-term moving average (200 periods). **Sell Conditions:** The short-term moving average (1 period) is less than 1% below the long-term moving average (200 periods) (Razmi, Joulaei, & Emami, 2007).
19	**Strategy Name:** 50-Period Support and Resistance with Filter (SupportResistant50Filter1) **Buy Conditions:** Price crosses above the highest price of the last 50 periods with a 1% filter. **Sell Conditions:** Price crosses below the lowest price of the last 50 periods with a 1% filter (Razmi, Joulaei, & Emami, 2007).
20	**Strategy Name:** 100-Period Support and Resistance with Filter (SupportResistant100Filter1) **Buy Conditions:** Price crosses above the highest price of the last 100 periods with a 1% filter. **Sell Conditions:** Price crosses below the lowest price of the last 100 periods with a 1% filter (Razmi, Joulaei, & Emami, 2007).
21	**Strategy Name:** 200-Period Support and Resistance with Filter (SupportResistant200Filter1) **Buy Conditions:** Price crosses above the highest price of the last 200 periods with a 1% filter. **Sell Conditions:** Price crosses below the lowest price of the last 200 periods with a 1% filter (Razmi, Joulaei, & Emami, 2007).

Question 2: This question focuses on evaluating the performance of the identified trading strategies in the Tehran Stock Exchange. For the evaluation of the strategies, it is assumed that when a buy or sell signal is issued, the trader will buy or sell 100 shares of the relevant stock at the pre-opening of the next trading day to minimize the chance of being stuck in a buying or selling queue. The transaction costs considered are 0.3712% for each buy transaction and 0.88% for each

sell transaction. The summary of the evaluation of the applied strategies is provided in the table below:
As shown in the table above, each strategy evaluated 18 symbols and 47165 daily candles to issue buy and sell signals. In total, 990,465 daily candles were assessed for the 21 strategies. Regarding the number of trades, the Ma4Ma1Filter1 strategy recorded the highest number of trades with 2,778 transactions, while the SuportResistant200Filter1 strategy had the fewest trades with 68 transactions.

As seen in the net profit column for each strategy, all the introduced strategies are profitable. The Ma60Ma5Filter1 strategy achieved the highest net profit of 15,156,059 rials, whereas the CrossHigh strategy recorded the lowest net profit of 3,325,830 rials.

Since net profit is a one-sided measure for evaluating strategies and does not consider the risk of each strategy, the Sharpe ratio has been used, which is the ratio of the average returns of a period to the standard deviation of returns (risk). The Sharpe ratio, taking both return and risk into account simultaneously, provides a more suitable criterion for evaluating strategies.

Given that all Sharpe ratios are greater than zero, this indicates the strategies have performed adequately. However, since all the ratios are less than one, the strategies do not appear optimal, indicating a high level of risk and the need for cautious application. Based on the Sharpe ratio, the Ma60Ma5Filter1 strategy has the best performance with a ratio of 0.9 compared to other strategies, while the CrossHigh strategy, with a Sharpe ratio of 0.33, shows weaker performance relative to the reviewed strategies.

Table3: Summary Table of Strategy Evaluation

Strategy Name	Symbols	Candles	Trades	Net Profit	Sharpe Ratio
Ma60Ma5Filter1	18	47165	465	15156059	0.90
Ma50Ma1Filter1	18	47165	957	14364402	0.87
SuportResistant50Filter1	18	47165	278	14309352	0.81
Ma18Ma1Filter1	18	47165	1677	11414565	0.73
CrossHighOrLow	18	47165	249	10477134	0.70
Ma9Ma1Filter1	18	47165	2269	10373219	0.69
SuportResistant200Filter1	18	47165	68	13756767	0.69
Ma100Ma1Filter1	18	47165	684	11989288	0.69
Rsi30AndBolingerband	18	47165	221	6761385	0.68
SarMa10Ma5	18	47165	1806	8530095	0.67
MaRsiSar	18	47165	1599	8505256	0.65
Crosslow	18	47165	157	7449306	0.63
Ma120Ma5Filter1	18	47165	354	10710388	0.61
SarRsi	18	47165	1951	7562427	0.61
SuportResistant100Filter1	18	47165	148	10568869	0.57
Ma180Ma5Filter1	18	47165	304	9949125	0.53
Ma150Ma1Filter1	18	47165	463	9622796	0.53
Rsi70AndBolingerband	18	47165	482	4716851	0.53
Ma200Ma1Filter1	18	47165	503	9228306	0.49
Ma4Ma1Filter1	18	47165	2778	6978728	0.48
CrossHigh	18	47165	236	3325830	0.33

Additional Findings

In the section below, the cumulative return percentages for various trading strategies and the Tehran Stock Exchange Index (TEPIX) are presented. This table is designed to display the volatility and relative performance of each strategy over different years and can be used as a tool for analyzing the effectiveness of strategies under varying market conditions. The data reflect changes in profitability and the potential risks associated with each strategy, and reveal their performance over different time periods in comparison to the overall index.

Table 4: Annual Percentage Change in Cumulative Returns

Strategy Name	1391	1392	1393	1394	1395	1396	1397	1398	1399	1400	1401
Ma60Ma5Filter1	109	-500	81	28	30	18	45	61	296	71	42
Ma50Ma1Filter1	54	-483	83	27	31	18	41	90	247	64	41
SuportResistant50Filter1	231	-1	-508	91	53	26	19	16	521	84	39
Ma18Ma1Filter1	50	-223	73	56	7	2	60	260	210	63	51
CrossHighOrLow	246	-209	297	39	54	18	46	97	252	60	34
Ma9Ma1Filter1	103	-119	-26	235	-176	349	11	-571	404	76	52
SuportResistant200Filter1	211	-15	-147	166	44	-2	14	8	2124	72	31
Ma100Ma1Filter1	158	-202	142	29	34	12	52	59	426	67	39
Rsi30AndBolingerband	3172	6810	63	27	41	24	49	44	178	82	64
SarMa10Ma5	91	-140	134	103	-11	-51	83	498	499	79	51
MaRsiSar	71	-170	129	75	6	-21	47	266	376	75	50
Crosslow	0	0	286	9	62	6	63	54	479	66	36
Ma120Ma5Filter1	200	-217	216	54	40	19	41	29	341	65	34
SarRsi	86	-169	114	73	-13	-44	49	405	486	74	48
SuportResistant100Filter1	231	-1	-508	91	53	26	19	16	521	84	39
Ma180Ma5Filter1	218	-38	-273	109	38	12	23	19	764	89	41
Ma150Ma1Filter1	212	-117	659	43	33	-2	32	23	924	71	33
Rsi70AndBolingerband	-576	481	83	46	41	20	38	98	117	56	47
Ma200Ma1Filter1	211	-15	-147	166	44	-2	14	8	2124	72	31
Ma4Ma1Filter1	110	-79	140	54	188	98	30	-114	2344	97	59
CrossHigh	254	-423	68	38	21	8	56	186	107	14	3
TEPIX	11	47	108	-21	28	-4	-19	187	187	155	5

The analysis of this table indicates that technical analysis strategies have shown varying performance depending on market conditions and different years. During the years 1398 (2019) and 1399 (2020), when the overall index of the Tehran Stock Exchange experienced significant growth, many strategies performed exceptionally well. Strategies such as "SuportResistant200Filter1" and "Ma200Ma1Filter1" yielded impressive returns during these years, with both achieving a 2124% return in 1399 (2020). This performance highlights the high potential of these strategies in bullish market periods, as confirmed by their strong performance in Table 3, where "SuportResistant200Filter1" recorded a net profit of 13,756,767 Rials and a Sharpe ratio of 0.69.

Conversely, in years like 1392 (2013) and 1394 (2015), when the market was bearish, many strategies experienced significant declines. For example, "Ma60Ma5Filter1" faced a 500% decline in 1392 (2013), which is reflected in Table 3 by its net profit of 15,156,059 Rials and a Sharpe ratio of 0.90. This suggests that in bearish markets, these strategies may not perform as well and may require more precise adjustments. In such periods, more resilient and conservative strategies like "Rsi30AndBolingerband," which achieved a 6810% growth in the same year, could be better choices.

The volatility of each strategy can indicate its risk level. Strategies that exhibit high volatility over the years carry more risk. For instance, strategies like "Ma9Ma1Filter1" and "CrossHighOrLow" experienced significant growth in some years (404% and 252% in 1399 (2019), respectively), but also faced steep declines in other years (such as -571% and -209% in 1397 (2018) and 1392 (2013)). This high volatility is also reflected in Table 3, where these strategies show relatively lower net profits and Sharpe ratios (10,373,219 and 10,477,134 Rials with Sharpe ratios of 0.69 and 0.70, respectively), indicating their high risk. In contrast, strategies like "Rsi30AndBolingerband" have shown less volatility and more stable performance over the years. Given its Sharpe ratio of 0.68, such strategies might be more suitable for investors seeking lower risk.

Examining strategies that have experienced very high growth in some years, as well as those that have faced sharp declines, is crucial. Some strategies like "Rsi30AndBolingerband" saw substantial growth in

1392 (2013) (3172%). This growth might be due to specific market conditions that year and the strategy's effectiveness in identifying upward trends. However, such high growth also comes with associated risks. Conversely, strategies like "Rsi70AndBolingerband" experienced a 576% decline in 1391 (2012). This sharp decline indicates the high risk of this strategy and the need for closer examination in specific market conditions. Table 3 shows that "Rsi70AndBolingerband" had one of the weakest performances, with a net profit of 4,716,851 Rials and a Sharpe ratio of 0.53.

Some of the strategies examined are based on well-known indicators such as Moving Averages (MA) and the Relative Strength Index (RSI). Evaluating these strategies can shed light on the effectiveness of these indicators in the Tehran Stock Exchange. Strategies based on different moving averages (like "Ma60Ma5Filter1" or "Ma200Ma1Filter1") have performed very well in certain years. For instance, "Ma200Ma1Filter1" achieved a 2124% growth in 1399 (2020), which is also confirmed in Table 3 with a net profit of 9,228,306 Rials and a Sharpe ratio of 0.49. This suggests that moving averages can be effective in identifying long-term market trends. Additionally, strategies like "Rsi30AndBolingerband" and "Rsi70AndBolingerband" that operate based on the RSI have shown varying performance in different years. For example, "Rsi30AndBolingerband" performed very well in 1392 (2013) with a 3172% growth, while "Rsi70AndBolingerband" faced a 576% decline in 1391 (2012). This indicates that using RSI requires precise adjustments to optimize its performance in different market conditions.

Summary and Conclusion

The goal of this research was to identify and evaluate practical technical analysis strategies in the Iranian capital market. Identifying and assessing these strategies helps investors and enthusiasts become familiar with various combined strategies and understand their performance. To achieve this goal, all published articles in scientific databases from 2001 to 2021 were reviewed, resulting in the extraction of 21 practical strategies, which were evaluated using the Sharpe ratio. The strategies and their corresponding Sharpe ratios are as follows: 1. Reversal from Important 6-Month Low (0.63); 2. Breakthrough of Important High and Momentum (0.33); 3. Reversal from Important Low or Breakthrough of Important High and Momentum (0.70); 4. Parabolic SAR and Double Moving Average 5-Period and 10-Period (0.67); 5. Parabolic SAR and Relative Strength Index (0.61); 6. Parabolic SAR, Relative Strength Index, and Moving Average (0.65); 7. Bollinger Bands and RSI 70 (0.53); 8. Bollinger Bands and RSI 30 (0.68); 9. Short-Term 5-Period Moving Average and Long-Term 60-Period Moving Average with 1% Filter (0.90); 10. Short-Term 5-Period Moving Average and Long-Term 120-Period Moving Average with 1% Filter (0.61); 11. Short-Term 5-Period Moving Average and Long-Term 180-Period Moving Average with 1% Filter (0.53); 12. Short-Term 1-Period Moving Average and Long-Term 4-Period Moving Average with 1% Filter (0.48); 13. Short-Term 1-Period Moving Average and Long-Term 9-Period Moving Average with 1% Filter (0.69); 14. Short-Term 1-Period Moving Average and Long-Term 18-Period Moving Average with 1% Filter (0.73); 15. Short-Term 1-Period Moving Average and Long-Term 50-Period Moving Average with 1% Filter (0.87); 16. Short-Term 1-Period Moving Average and Long-Term 100-Period Moving Average with 1% Filter (0.69); 17. Short-Term 2-Period Moving Average and Long-Term 150-Period Moving Average with 1% Filter (0.53); 18. Short-Term 1-Period Moving Average and Long-Term 200-Period Moving Average with 1% Filter (0.49); 19. Support and Resistance 50-Period with Filter (0.81); 20. Support and Resistance 100-Period with Filter (0.69); 21. Support and Resistance 200-Period with Filter (0.81).

Given that all Sharpe ratios are greater than zero and all strategies are profitable, it can be concluded that technical analysis can be effectively applied in the Iranian market. These findings are consistent with previous research by Assadi & Emami (2019), Shariat Panahi & Heydari Nia (2004), Najarzadeh & Godari (2008), Setayesh et al. (2009), and (Pourzamani & Rezvaniaghdam (2017). However, since all ratios are below one, the strategies are not considered optimal, indicating a high level of risk and the need for caution in practical application.

According to the Sharpe ratio, the strategy "Short-Term Moving Average 5-period and Long-Term Moving Average 60-period with 1% Filter" has the best performance with a ratio of 0.9, while the "Significant High Breakout and Momentum" strategy with a Sharpe ratio of 0.33 shows the weakest performance among the reviewed strategies. Since all

Sharpe ratios are between zero and one, it is not possible to definitively state which strategy is best, consistent with the results of Razmi et al. (2007). The strategy "Short-Term Moving Average 5-period and Long-Term Moving Average 60-period with 1% Filter" with a profit of 15,156,059 rials performs better than others. This finding supports the better performance of moving averages as confirmed by Razmi et al. (2007), Brock, Josef, & Blake (1992), Hudson, Michael, & Kevin (1996), gençay (1998), Gunasekarage & Power (2001), Shariat Panahi & Heydari Nia (2004), Najarzadeh & Godari (2008), Setayesh et al. (2009), and Pourzamani & Rezvaniaghdam (2017).

Overall, the analysis of technical analysis strategies can reveal significantly different performances under various market conditions. Understanding the volatility, risks, and strengths of each strategy, along with adhering to investment management principles, can help investors make better decisions for managing their capital and achieving higher returns in the Tehran Stock Exchange. Timely and appropriate selection of these strategies, considering market conditions and risk management, can lead to increased profitability.

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