Applying Technical Trading Rules to Beat Long-Term Investing: Evidence from Asian Markets

Thomas S. Coe[1] · **Kittipong Laosethakul**[2]

Abstract

We provide evidence that the use of technical trading rules provides traders the opportunity to generate profits from actively buying and selling individual stocks across Asian markets. We test the trading performance of three widely used technical trading strategies, the Arithmetic Moving Average, the Relative Strength Index, and the Stochastic Oscillator, as well as variations to each trading strategy. We compare the results of these trading rules to a long-term buy-and-hold strategy across 4822 stocks traded in 39 Asian countries. Our results, when applying a simple behavior intervention filter of only selling a position when a trade is profitable, show that these technical trading rules, on average, were able to outperform the buy-and-hold strategy for 66% of the stocks listed in our sample. Additionally, given any of the listed Asian stocks, we found that, on average, a trader could apply any technical trading strategy and have a greater than 50–50 chance of outperforming the buy-and hold strategy for that stock for 63% of all stocks.

Keywords Asian Stock Markets · Behavioral Finance · Technical Trading · Weak-form Market Efficiency

JEL Classifications G11 · G14 · G15 · G41

1 Introduction

Individual investors are trading on Asian markets at unprecedented levels. The majority of the new individual (retail) investors who are trading on the region's markets are younger and use online trading apps to make investment and trading decisions (Yoon, 2021). The growth in traders across Asian equities markets provides

✉ Thomas S. Coe
  doc59bus@hotmail.com

1   Madisonville, LA 70447, USA

2   Sacred Heart University, 5151 Park Avenue, Fairfield, CT 06825, USA

a need to determine if there are consistently profitable technical trading techniques which can be applied for use in Asian equities markets, to compare the results of these techniques for generating profits, and to determine if profits from technical trading can exceed those from a naïve long-term buy-and-hold strategy. Traders, in this sense, represent individuals who actively manage their positions by holding short-term positions and taking advantage of shorter-term secondary and tertiary Dow Theory waves. Their buying and selling activity contrasts to that of investors, who have a longer-term investment horizon and are more passive in their investing activities, using a naïve buy-and-hold strategy, where the intent is to follow a longer-term, primary Dow Theory wave. The primary difference is tactical–whether taking advantage of short-term price movements and of more frequent, albeit smaller, gains is more beneficial than long-term price movements and the potential for a single, larger gain.

According to the weak-form of the efficient market hypothesis, there can be no chart-reading technique which makes the expected profits of the investor greater than they would be under a naive buy-and-hold model (Fama, 1965). Yet, traders continue to use technical analysis to establish buy and sell decisions for various assets across markets. Given an environment where retail investors have access to programs and apps on computers and smart phones to research, trade, and track individual stocks; and where transaction costs for trading are approaching zero and trading commissions are being reduced globally and are actually free in several countries; the motivation for improving investment performance with technical trading rules should gain further traction, given reliable, positive results from applying and adhering to the signals from using technical trading rules.

2 What is Technical Analysis?

Technical analysis, in contrast to fundamental analysis, looks at the informational content that represents a stock's current market price and relates this to its own past price history in order to determine the timing of trading the stock. Fundamental analysis strives to discover the intrinsic value of stock and determine if the current market price overvalues or undervalues that stock; however fundamental analysis doesn't address the timing issue beyond any mispricing. Investment advisors suggest that technical trading rules complement fundamental analysis, partly to address any timing concerns (Kahn, 2019).

There are numerous technical trading techniques available and the number and complexity of these techniques seemingly increases to keep pace with their proponents. However, in the end, most trading techniques are based on taking advantage of simple mathematical rules based on the tendency toward mean reversion, where prices tend to an average over time. Simply stated, 'what goes up must come down' (and hopefully, the reverse occurs as well). Deviations, above or below an average price, provide an opportunity to profit from "natural" price changes. Whereas an investor who utilizes the primary Dow wave ignores these deviations, traders attempt to take advantage of these intermediate and short-term deviations which make up potentially profitable, multiple secondary and tertiary Dow waves.

In this paper, we show that the use of technical trading rules provides traders the opportunity to generate profits above those from a naïve long-term buy-and-hold strategy from their actively buying and selling individual stocks. We apply our analysis across thirty-nine Asian markets.

The diverse economies and history of the development of the stock markets of the Asian economies provide a rich examination of the degrees of market efficiencies. Overall, the market capitalization of Asian stock markets has grown dramatically over the 2010–2018 period, mirroring the region's overall economic growth following the 2008 global financial crisis. Additionally, the launching of new markets and the expansion of existing markets has provided for the offering of thousands of new listings that provide investment opportunities for private (retail) investors, financial institutions, and public investors in each country. As the number of retail investors has grown, the opportunities for enhancing their financial literacy as well as wealth has grown. These retail investors have the choice of using a long-term buy-and-hold strategy or to actively manage their portfolios. It is primarily this segment of the investment community that we hope benefits from this research.

3 Prior Literature

The bulk of the early technical analysis in the popular press and trade publications bases itself on the apparent visual verification on an *ex-post* basis of the gain potential of technical trading (Arnold, 1994; Elder, 1987; Etzkhorn, 1995; Stein, 1989). Of the academic work studying the effectiveness of the various trading techniques available, most focus on applying technical analysis and/or time-series tools to broad indices and not on individual equities. Brock et al. (1992); Gencay (1996); Bessembinder and Chan (1998); and Kwon and Kish (2002) examine the returns on U.S. stock market indices and find that technical trading provides positive predictive power, in direct conflict with the weak form of the Efficient Market Hypothesis. Yu and Chen (2004) find that applying a genetic programming technique to the S&P 500 provides consistent trading decisions; a high frequency of profitable transactions, regardless of market direction; and returns that exceed a buy-and-hold strategy. Poterba and Summers (1988) find evidence of mean reversion in the U.S. and other international markets and that the tendency for mean reversion is greater for less broad-based and sophisticated markets.

Separately, Seiler (2001) finds that an optimal filter of the RSI rule provides for positive returns; however, his study only shows results for the RSI rule and only illustrates its use on one stock.

Among studies of non-U.S. international markets, Bessembinder and Chan (1995) find enhanced performance of technical trading rules in developing markets but diminished performance in developed markets. Wong et al. (2003); Ben-Zion et al. (2003); and Papathanasiou and Samitas (2010) find that traders can exploit potential inefficiencies that arise from smaller and thinner international markets by using technical trading rules. Ratner and Leal (1999) apply variable length moving average rules to Latin American and Asian markets and find evidence of profitable trading in three of the markets when using these rules. Lai and Lau (2006)

apply fixed and variable moving average rules to nine Asian market indices and find profit potential for eight of the markets. Yu, et al. (2013) compare Moving Average rules for Southeast Asian market indices and find the technical trading outperformed the buy-and-hold strategy over the 1991–2008 period; however, trading costs eliminate most of the advantage of active trading, implying weak-form market efficiency. As markets become more operationally efficient and trading costs shrink, the profit potential for technical trading may increase for more informationally inefficient markets. Nor and Wickremasinghe (2014) apply two technical trading rules, the Moving Average Convergence Divergence (MACD) and the Relative Strength Index (RSI) to the Australian stock market and find that while the MACD did not outperform a naïve buy-and-hold strategy for long positions, the RSI was able to outperform the buy-and-hold strategy over much of the 1996–2014 period. Tharavanij, et al. (2015) apply the MACD and RSI rules, along with other technical indicators (Stochastic Oscillator, Directional Movement Indicator, and On Balance Volume) to five Southeast Asian market indices for 2000–2013. They find statistically significant returns generated for four of the five markets, but before transaction costs. Khand, et al. (2020) find that technical trading rules can outperform the naïve buy-and-hold strategy when applied to the Pakistan stock market's KSE-100 Index for 1997–2014.

Each of these studies focus and apply their analysis to one or more market indices. While index fund investing can be applied to broad market and industry indices, those types of securities are more commonly used for passive, longer-term investment strategies that removes the stock selection process as well as any worry about timing the market. Our study broadens the literature by examining individual stock prices, in contrast to stock market indices, across a greater number of stock markets, including larger, well established markets as well as smaller, newer markets. We expand the data sample to include individual stocks from stock markets of various sizes as well as their distinct periods of development. We employ thirty-one separate variations of popular technical trading rules and measure the overall profit performance from strictly following these technical trading strategies on an *ex-ante* basis.

4 Data

The data sample in this study includes daily high, low and closing prices from 4822 individual equities that comprise 42 various market indices in 39 Asia and Oceania countries. The data examines the trading of a broad mix of large and small stocks over a relatively long period of time so that stock prices are not entirely subject to specific events. The sample period extends from December 31, 2010 through December 31, 2018. During this period, there was generally a bull market for most of the countries' stock exchanges. We include a greater number of markets in our sample in order to compare the trading performances of broadly-traded, high-volume listings in well-established markets of developed nations (i.e., Australia, Hong Kong, Israel, Japan, New Zealand, Singapore) as well as those of emerging nations (China, India, Indonesia, Malaysia, Pakistan, Philippines, Qatar, Saudi Arabia, South Korea, Taiwan, Thailand, Turkey, United Arab Emirates); and finally in markets that have less depth and trading activity or of smaller, more recently established

markets (Armenia, Bahrain, Bangladesh, Cambodia, Fiji, Iraq, Jordan, Kazakhstan, Kuwait, Laos, Lebanon, Maldives, Mongolia, Nepal, Oman, Palestine, Papua New Guinea, Sri Lanka, Syria, Vietnam). It is expected that the greater coverage of stocks by analysts as well as institutional and individual investors in the larger, more established markets and the larger companies within those markets would lessen any operational and informational inefficiencies in trading which may be exploited by use of technical trading tools. In contrast, newer and smaller markets and stocks that trade less often and have a lower trading volume could be subject to more trading inefficiencies.

5 Methodology

We compare the long-term investment performance of individual stocks in the local currency of each country to various technical trading rules that are available for individuals to use to follow technical trading signals. The trading tools we employ are the arithmetic Moving Average (MA), the Relative Strength Index (RSI), and a Stochastic Oscillator (K) and its Moving Average (Z). These are among the more popular, general techniques used by technical traders and the basis for many trading programs (Colby, 2003; Mitchell, 2020). Daily stock prices and values of the MA and RSI were accessed through the Bloomberg Professional System. The Stochastic Oscillator (K) and its Moving Average (Z) were calculated using the formulas, below, and are also available on Bloomberg; however, these values cannot be directly downloaded.

6 Arithmetic Moving Average

The arithmetic Moving Average is the arithmetic average of prices of a stock over the most recent period of n days:

$$\mathrm{MA}_t = \frac{\sum_{i=0}^{n-1} P_{t-i}}{n}$$

The Moving Average generates a forecast from the past prices of a security. A Moving Average that is increasing indicates that, on average over time, prices are trending higher. The degree of sensitivity for the technique is determined by the value of *n*, the number of days in the period. If *n* is too small, there is too much sensitivity to changes in daily prices; if *n* is too large, the Moving Average will not be sensitive enough.

The trading signal generated by the Moving Average calculation is determined when the current price crosses the Moving Average line. If the current day's closing price crosses to trade above the Moving Average line, that generates a "buy" signal to traders—demand for the stock is currently stronger than in the past. If the closing

price crosses to trade below the Moving Average line, demand is currently weaker than in the past and that event generates a "sell" signal to traders.

7 Anticipated Trend Performance of the Moving Average Indicator

The effectiveness of using the Moving Average for generating a correct "buy" or "sell" decision can be anticipated by looking at the dynamics of the Moving Average model itself:

$$\frac{dMA_t}{dP_t} > 0$$

One would expect, during a bull market when equities generally show higher prices, that the Moving Average of prices would move accordingly higher but remain lower than the higher-trending current price. This is due to the Moving Average retaining prices from earlier in the time period. Without any crossing of the price line and Moving Average line, there would be no "buy" signals or "sell" signals upon which an investor could act.[1] A similar, but opposite, analysis would be observed during a bear market. Thus, without periodic price changes, traders would not be able to take advantage of the potential long-term gains that less active buy-and-hold investors could enjoy during a sustained trend. From this, any advantage of using a Moving Average rule would be diminished in comparison to gains generated by long-term holding.

8 Relative Strength Index

The Relative Strength Index was developed by Wilder (1978). The index measures the strength of prices for the most recent period of **n** days, using the following formula:

$$RSI_t = \left(\frac{U_t^{n-1}}{D_t^{n-1} + U_t^{n-1}} \right) * 100$$

U_t is the average of the closing prices for those days in which the price increases from the previous trading day during the period; **D_t** is the average of the closing prices for those days in which the price declines from the previous trading day; **t** ranges from 0 to **n-1**. The index is on a 0–100 scale. An upward-trending stock would have a value approaching 100 and a downward trending stock would have a value approaching zero. The perceived usefulness of the RSI is that it shows trends

---

[1] Throughout our methodology, we assume that traders can only act upon a change in signal. This avoids over-accumulating or over-borrowing on long or short positions. Similar restrictions hold for the Relative Strength Index and the Stochastic Oscillator techniques.

or breakouts sooner and/or more clearly than waiting for confirmation from simple price charting. When the RSI is at a high level, the stock can be considered over-bought, and this would provide a signal for a trader to sell the stock (a "sell" signal). A low RSI value would be considered an oversold condition, and this provide a signal for a trader to buy the stock (a "buy" signal). If a trader believes that the RSI does signal the beginning of a new trend, then the trading signals generated by the Relative Strength Index would be appropriate. This corresponds to evidence of longer-term mean reversion.

9 Anticipated Trend Performance of the Relative Strength Index

The effectiveness of the RSI during a trending market can be anticipated by looking at the effect of rising and falling prices have on the Index:

$$\frac{\partial \text{RSI}_t}{\partial \text{U}_t} > 0, \ \frac{\partial \text{RSI}_t}{\partial \text{D}_t} < 0$$

In a bull market, with upward-trending prices, **U** would have dominance over **D**. The RSI of the stock would increase correspondingly, signaling more "sells" than "buys". Acting upon signals generated by the RSI technique would limit any gain in a trending equity by selling too soon. In a bear market, **D** would have dominance over **U**. The RSI of the stock would decrease, signaling "buys" to a greater degree than "sells". Under that setting, traders would tend to buy before a stock bottoms out.

10 Stochastic Oscillators

A Stochastic Oscillator compares the value of current prices with the range of prices during the most recent **n**-day trading period. The Oscillator further compares two indices of price movements to generate buy and sell signals: **K**, the index itself and **Z**, a moving average of the index:

$$K_t = \left(\frac{P_t - L_t^{n-1}}{H_t^{n-1} - L_t^{n-1}} \right) * 100, \ Z_t = \frac{\sum_{i=0}^{n-1} K_{t-i}}{n}$$

In this index, **H$_t$** is the highest high and **L$_t$** is the lowest low for intraday prices during the period. We note differences and similarities among the three trading rules; the Stochastic Oscillator incorporates the intraday price movements along with the closing prices. A low value for **K$_t$** generates a "buy" signal (an oversold condition) and a high value for **K$_t$** generates a "sell" signal (overbought). This is similar in nature to the RSI. And, just as with the arithmetic Moving Average, **K$_t$** crossing **Z$_t$** signals a "buy" or a "sell".

11 Anticipated Trend Performance of the Stochastic Oscillator

The performance of the Stochastic Oscillator with respect to price movements differs from the Relative Strength Index by including the price variable into the formula. The range of prices is also important in determining the value of $\mathbf{K}_t$ and $\mathbf{Z}_t$:

$$\frac{\partial \mathrm{K}_t}{\partial \mathrm{P}_t} > 0, \ \frac{\partial \mathrm{K}_t}{\partial \mathrm{H}_t} < 0, \ \frac{\partial \mathrm{K}_t}{\partial \mathrm{L}_t} < 0, \ \frac{\partial \mathrm{Z}_t}{\partial \mathrm{K}_t} > 0$$

Within a bullish period, as more recent prices increase relative to the range of trading, there is a stronger "sell" signal. However, as prices increase overall, there is some downward pressure in $\mathbf{K}_t$. This is shown by the negative influence of $\mathbf{H}_t$. During a bear period, the more recent, lower prices generate a "buy" signal, but this is countered by the influence of $\mathbf{L}_t$. The Oscillator also is sensitive to the magnitude of the price range, $\mathbf{H}_t$-$\mathbf{L}_t$, during the period. Price changes within a period of low volatility are magnified. This creates more trading signals than recent price stability during a period of high volatility.

12 Testing

In this study, we compare gains from using the trading signals generated by the MA, the RSI, and the Stochastic Oscillators. The gains from these rules are compared with a simple buy-and-hold strategy for each of the stocks in the sample. We assume that the passive investor buys one share of each stock on January 2, 2011 (or, whenever trading began for the stock, if listed afterwards) and holds this investment until December 31, 2018. Likewise, we calculate profits from technical trading by summing the differences on closing positions, and assume any open positions are sold at the end of 2018.

The MA rule uses 20-, 100-, and 200-day periods to determine if the length of *n* affects the performance of the rule. The RSI and the K will have two separate "sell" levels, at 70 and at 80 and two separate "buy" levels, at 30 and at 20. These will help determine if stricter filtering (80 versus 70 and 20 versus 30) of index movements improves the results of these rules. In addition, **n** for the RSI will vary; using 3-, 9-, 14-, and 30-day periods; that for the $\mathbf{K}_t$, 9-, 20-, 100- and 200-day periods; for the Stochastic Oscillator Moving Average ($\mathbf{Z}_t$), 20-, 100- and 200-day periods, for consistency to the MA rule. In total, we compare the buy-and-hold investment to 31 separate trading indicators. By abiding by the trading rules, we hope to determine if traders can invest in a mechanical, non-emotional fashion and outperform the market. If traders can use trading rules to outperform a naïve buy-and-hold investment strategy, then these results provided further evidence that contradicts the weak-form of the efficient market hypothesis.

We calculate the overall gains from the long-term buy-and-hold investing each of the individual stocks as equivalent to buying one share of stock at either the start of the sample period or whenever a stock is issued in the case of the buy-and-hold

strategy. We purchase one share of stock on an initial "buy" signal and subsequently sell that share upon a "sell" signal.[2] We sum the profits of each trading strategies' separate buying and selling round trips. Stock prices were adjusted for splits by Bloomberg LP. Profits are not adjusted for dividends or commissions. In this paper, we do not allow for a short sale to initiate the opening trade.

We seek to ascertain the general performance of technical trading rules and test two hypotheses. The first determines whether any of the thirty-one technical trading rules, i, applied to any stock, **n**, can generate profits that exceed those from a long-term buy-and-hold strategy from investing in that stock,

$H_0(1): \pi_{i,n} - \pi_n = 0.$
$H_A(1): \pi_{i,n} - \pi_n > 0.$

The second hypothesis determines, given any individual stock being selected, whether a majority of technical trading rules earn more than the long-term buy-and-hold strategy of that stock at least fifty percent of the time. When trading with technical rules, individual traders may follow different trading rules, either based on past success or to try a new rule. Assuming the trader has selected a stock to focus on, it would be important for the trader to know that using trading rules would have a good chance of success of outperforming a long-term investment. We measure this by counting how many of the trading rules outperform the long-term buy-and-hold strategy of the investor for the chosen stock in a market. We define this as *x* and we count the number of these occurrences. ***Rules*** is the number of m = 31 trading rules which actually trigger a "buy" signal to act upon for a stock.[3] We then find this proportion for all **n** stocks across the individual countries.

$H_0(2): \frac{\text{count}(x_i)}{\sum_{i=1}^{m} \text{Rules}_i} = .50.$
$H_A(2): \frac{\text{count}(x_i)}{\sum_{i=1}^{m} \text{Rules}_i} > .50.$

Finally, we determine which trading rules have the best overall ability to outperform the long-term buy-and-hold strategy for all Asian stocks, regardless of market or individual stock.

13 Results

We apply the technical trading rules to the daily trading across the 4822 stocks in the thirty-nine Asian markets. Table 1 shows the results of trading for each of the national markets. We calculate the average gain for the **n** stocks within each market

---

[2] We also compare results from this mechanical approach by incorporating a simple behavioral filter to our trading rules, to provide human intervention before closing a trading position. We discuss below.

[3] The price ranges for some stocks may not trigger any "buy" signal from a trading rule to begin trading. So, not all 31 trading rules can be counted. While possible for any trading rule, it is more common for those trading rules with stricter filters on less volatile stocks.

Table 1 Overall Performance of Technical Trading Rules in Various Asian Markets

	n	Average gain, buy-and-hold (LC)	% of rules with gains that exceed stock's buy and hold gains	% of stocks where more than half of all rules provide gains which exceed stock's buy and hold gains	% of rules with gains that exceed stock's buy and hold gains (Intervention)	% of stocks where more than half of all rules provide gains which exceed stock's buy and hold gains (Intervention)
Central Asia						
Kazakhstan	9	2459.29	37.7%	33.3%	55.2%	44.4%
Eastern Asia						
China	529	2.54	55.0%	59.2%	78.3%	78.4%
Hong Kong	50	14.80	40.9%	40.0%	57.3%	54.0%
Japan	504	1476.96	24.3%	16.7%	48.2%	36.7%
Mongolia	20	154.09	42.4%	35.0%	63.7%	65.0%
South Korea	100	29,821.21	41.4%	40.0%	67.5%	63.0%
Taiwan	115	2.86	57.8%	60.9%	83.4%	83.5%
South-Eastern Asia						
Cambodia	5	132.00	38.1%	20.0%	54.2%	60.0%
Indonesia	168	322.46	37.9%	32.7%	58.6%	54.8%
Laos	4	−1279.56	56.5%	50.0%	95.2%	100.0%
Malaysia	30	6.50	27.8%	26.7%	49.5%	46.7%
Philippines	30	76.57	26.6%	13.3%	48.9%	40.0%
Singapore	174	0.73	47.8%	47.7%	75.1%	72.4%
Thailand	579	7.00	44.3%	39.0%	69.1%	64.8%
Viet Nam	320	4773.24	48.1%	46.3%	73.2%	70.3%
Southern Asia						
Bangladesh	76	40.66	59.0%	61.8%	72.8%	69.7%
India	384	875.30	31.1%	25.3%	51.2%	42.7%
Maldives	6	−16.00	69.0%	83.3%	86.5%	100.0%
Nepal	33	68.48	70.3%	78.8%	80.8%	81.8%

Table 1 (continued)

	n	Average gain, buy-and-hold (LC)	% of rules with gains that exceed stock's buy and hold gains	% of stocks where more than half of all rules provide gains which exceed stock's buy and hold gains	% of rules with gains that exceed stock's buy and hold gains (Intervention)	% of stocks where more than half of all rules provide stock's buy and hold gains (Intervention)
Pakistan	99	268.82	28.3%	11.1%	42.2%	27.3%
Sri Lanka	165	25.71	49.3%	52.4%	79.9%	78.8%
Western Asia						
Armenia	8	60,774.03	24.0%	12.5%	29.3%	25.0%
Bahrain	39	−0.11	54.3%	60.5%	70.1%	65.8%
Iraq	33	−0.93	80.5%	82.4%	89.9%	91.2%
Israel	123	1232.50	37.1%	34.1%	56.5%	45.5%
Jordan	78	−0.58	52.2%	60.3%	84.4%	83.3%
Kuwait	147	−40.48	61.2%	74.1%	89.4%	89.1%
Lebanon	11	−2.19	59.3%	72.7%	91.8%	90.9%
Palestine	48	0.61	41.1%	45.8%	59.3%	56.3%
Oman	30	−0.16	70.6%	86.7%	92.2%	93.3%
Qatar	20	1.56	48.7%	50.0%	67.7%	55.0%
Saudi Arabia	185	−1.74	61.2%	69.7%	80.4%	82.22%
Syria	17	177.76	29.4%	17.4%	32.6%	17.4%
Turkey	100	12.35	43.7%	40.0%	64.5%	59.0%
UAE	98	−0.05	49.0%	54.1%	76.2%	78.6%
Oceania						
Australia	346	3.13	35.6%	31.5%	57.6%	50.6%
Fiji	16	2.13	10.3%	12.5%	13.5%	18.8%
New Zealand	111	0.28	35.4%	35.1%	53.9%	47.7%
Papua New Guinea	12	−1.23	48.9%	66.7%	59.8%	75.0%

Table 1 (continued)

	n	Average gain, buy-and-hold (LC)	% of rules with gains that exceed stock's buy and hold gains	% of stocks where more than half of all rules provide gains which exceed stock's buy and hold gains	% of rules with gains that exceed stock's buy and hold gains (Intervention)	% of stocks where more than half of all rules provide gains which exceed stock's buy and hold gains (Intervention)
Total	4822		45.5%	45.6%	65.6%	63.1%

The average gain for each country's stocks over the 2011–2018 period is reported, in the local currency. The percentage of each of the 31 technical trading rules which provide gains that exceed those of each underlying stock, either using the BUY/SELL signal (column 3) or adding a behavioral filter (Intervention; column 5) is given. Additionally, we show the percentage of each of the country's stocks for which more than half of the trading rules provide gains that exceed those of the stock, either using the BUY/SELL signal (column 4) or adding the behavioral filter (Intervention; column 6)

from the underlying buy-and-hold strategy. These are shown in the second column, using the local currency of the various markets. Unlike previous studies that apply trading rules to market indices, we compare the individual stocks' long-term buy-and-hold performance to the gains generated by adhering to trading rules. When any trading rule is strictly adhered to, we find that, on average, a trading rule outperformed the buy-and-hold strategy for only 45.5% of stocks. These results are shown in the third column. The results vary greatly by country, with a trading rule outgaining the buy-and-hold strategy, on average, for only 10.3% of stocks in Fiji, but for 80.5% of stocks in Iraq. Within countries, some trading rules never outperformed the gains from a buy-and-hold investment strategy; but in others, some trading rules always outperformed the buy-and-hold strategy. Thus, it seems to be a matter of chance of selecting a profitable trading rule and applying that rule to the "right" stock. These results, in themselves, are not noteworthy, not consistently profitable, and thus not useful as an overall trading strategy.

When we consider the success of trading rules for any given stock (as if one were applying fundamental analysis to select a stock), to determine if more than half of the trading rules beat the buy-and-hold gain for the stock, our findings are, on average, 45.6% of all stocks have better performance with trading rules than with a buy-and-hold strategy for any stock within all Asian countries. These results are shown in the fourth column. Again, results across countries and within individual countries vary, with any trading rule outperforming the buy-and-hold strategy for only 11.1% of stocks in Pakistan but for 86.7% of stocks in Oman. With some stocks, none of the trading rules beat the buy-and-hold strategy, whereas with other stocks, all the trading rules beat the long-term performance. Given our results, it appears a matter of luck to select the right trading rule to use for any given stock.

These results beg the obvious question whether technical trading rules can be profitably used. We test this further by adding a simple filter for our trading–allowing for traders to "intervene" and possibly override the "sell" signal generated by a mechanical rule. With our intervention filter, we again accept any "buy" signals generated by trading rules to create a long position, but we only close that long position if a "sell" signal generates a profit for the trader (sell price > buy price) for the long position. This intervention follows behavioral aspects of minimizing regret; however, simply using the Intervention filter reinforces the negative tendencies of riding losers too long (Shefrin & Statman, 1985). However, unlike with Shefrin and Statman, if traders believe that technical trading offers a better than 50–50 chance of profitability over a buy-and-hold strategy, the decision to intervene in order to earn a profit and minimize losses is justified.

When using the Intervention filter, we find a marked improvement across all markets and for our overall sample of Asian stocks. Column 5 of Table 1 shows that technical trading rules outperform the buy-and-hold strategy, on average, for 65.6% of stocks across the 39 Asian countries. This corresponds to outperforming the buy-and-hold strategy, on average, for 66% of all Asian stocks, regardless of country. The use of the Intervention filter improves the rate of success for using technical trading to outperform the buy-and-hold strategy by a factor of 1.4. Again, the results vary by country. In Fiji, intervention only results in an average of 13.5% (versus 10.3% using technical trading without intervention) of stocks where the buy-and-hold strategy is

outperformed by technical trading rules; however, Oman traders would have technical trading outperform long-term investing on 92.2% (versus 70.6%) of stocks. We find that several larger markets also have technical trading outperform buy-and-hold investing. In China (n = 529), traders outperform investors on 78.3% of all stocks. Likewise, Vietnam (n = 320) results in traders outperforming investors on 73.2% of all stocks. In Thailand (n = 579), traders outperform investors on 69.1% of all stocks. Although there are marked improvements in results using intervention, not all markets illustrate such impressive results. Some developed markets, such as Japan (technical trading rules outperforming the buy-and-hold strategy for only 48.2% of all stocks), as well as developing countries (Malaysia, 49.5%; Philippines, 48.9%; Pakistan, 42.2%) still had the buy-and-hold strategy outperforming technical trading.

When we consider the success of trading rules across stocks, again we see a marked improvement when traders use the Intervention filter on technical trading "sell" signals. Across all thirty-nine countries, 63.1% of stocks had at least half of the technical trading rules outperform a buy-and-hold strategy. These are shown in Column 6. Again, this is an increase over the strict use of technical trading signals by a factor of 1.4. This higher level of success can serve to reinforce the use of human intervention to abide by or disregard "sell" signals.

14 Differences in Gains from Technical Trading

Table 3 illustrates the average difference in gains from technical trading rules to that of the underlying naïve buy-and-hold investment strategy. We again show the average gains in the local currency for the stocks within each country (column 2). Twenty-eight of the thirty-nine countries show stocks with positive gains, on average, when using the buy-and-hold strategy. We then calculate the difference in the gains for each of the thirty-one trading rules to each individual stock's overall gains and report the average difference, regardless of which trading rule, with both the unfiltered (column 3) as well as with the Intervention filter (column 4). Only stocks in nine countries show greater gains, on average, from using technical trading rules with no Intervention filter. In twenty countries, unfiltered technical trading actually would entirely erase the gains generated by long-term investing over the 2011–2018 period. When using the Intervention filter, the difference between gains from the use of technical trading rules, on average, are all improved, except in Syria. In twenty-seven of the thirty-nine countries, the differences in gains are positive. In eleven countries, the average differences from using technical trading are negative, which dampen the overall gains from investing. Only in Syria does the use of the Intervention filter erase all the gains from a buy-and-hold strategy.

15 Which Technical Trading Rules Perform Best?

The results shown in Tables 1 and 3 illustrate the performance of technical trading rules on a country-by-country basis. As stated above, the use of technical trading rules outperformed the buy-and-hold strategy for 65.6% of stocks across all Asian markets. When we repeat the analysis, regardless of country, we find similar results – technical trading, on average, outperforms a buy-and-hold strategy for 66.0% of all Asian stocks. Likewise, 61.7% of all Asian stocks had technical trading rules with success rates of more than 50% in outperforming the gains from investing.

It would be of interest to traders to be able to select and apply a trading rule that provides more consistency in its performance and a greater likelihood of outperforming the underlying buy-and-hold strategy. In Table 2, we present the best performing trading rules. As a set of trading rules, the Stochastic Moving Average (Z) rule, which outperforms the buy-and-hold strategy for 69.8% of all Asian stocks, and the Moving Average (MA) rules, outperforming for 69.3% of all Asian stocks, are the best performing sets of trading rules. The most successful individual trading rules were the 100-day Moving Average on the 200-day Stochastic Oscillator (Z-100 (K200)), which outperforms the buy-and-hold strategy on 75.8% of all Asian stocks and the 200-day Moving Average on the 100-day Stochastic Oscillator (Z-200 (K100)), which outperforms on 75.1% of all Asian stocks. The worst performing group of trading rules is the Relative Strength Index (RSI), which, on average, outperforms the buy-and-hold strategy for only 58.6% of all Asian stocks. The 30-day rule with the wider 20 and 80 range as a filter (RSI-30 (20/80)) has the worst overall performance, besting the buy-and-hold strategy on only 47.9% for all Asian stocks, reflecting an inability to be profitable, even by chance. General observations show that shorter periods (e.g., 20-day vs. 100-day vs. 200-day Moving Average) have a better ability to outperform the buy-and-hold strategy for a greater number of stocks. Yu, et al (2013) find similar performance on variations of trading rules. Likewise, the narrower bounds (i.e., 30–70 vs. 20–80) on the Relative Strength Index and the Stochastic Oscillator show a better ability to outperform the buy-and-hold strategy for a greater number of stocks.

We also find which trading rules are the best and worst in generating gains above those from the buy-and-hold strategy within any country. The best rules are the 9-day Stochastic Oscillator with a 20/80 range filter (K-9 (20/80)), which outperforms 72.9% of all Asian stocks, is the best trading rule in six countries. The 20-day Moving Average, which outperforms 72.4% of all Asian stocks, is the best trading rule in four countries. In contrast to this, the 30-day RSI with a 20/80 range filter (RSI-30 (20/80)), which only outperforms 47.9% of all Asian stocks, is the worst performing rule in 17 countries. However, this rule is not to be disregarded entirely, since it is the best performing rule in Australia.

Finally, we present the difference in gains from using technical trading rules over the gains from the long-term buy-and-hold strategy in Table 4. Since we previously establish that using the Intervention filter is better than the unfiltered approach, we present the differences, on average, for each set (Moving Average (MA), Relative Strength Index (RSI), Stochastic Oscillator (K), and its Moving Average (Z)) for

Table 2 Performance of Variations on Technical Trading Strategies

Technical indicator	Outperforms buy-and-hold			Best performing rule (# countries)	Worst performing rule (# countries)
MA-20	72.4%			4	1
MA-100	69.3%			0	1
MA-200	66.2%			1	1
RSI-3 (30/70)	65.9%			2	0
RSI-3 (20/80)	65.3%			1	1
RSI-9 (30/70)	62.5%			0	0
RSI-9 (20/80)	59.1%			0	0
RSI-14 (30/70)	59.5%			0	1
RSI-14 (20/80)	55.0%			1	0
RSI-30 (30/70)	53.6%			0	2
RSI-30 (20/80)	47.9%			1	17
K-9 (30/70)	72.5%			3	0
K-9 (20/80)	72.9%			6	1
K-20 (30/70)	72.0%			1	0
K-20 (20/80)	70.5%			2	0
K-100 (30/70)	63.3%			1	0
K-100 (20/80)	60.9%			2	1
K-200 (30/70)	60.5%			1	2
K-200 (20/80)	59.2%			0	3
Z-20 (K9)	74.4%			3	0
Z-20 (K20)	68.8%			2	0
Z-20 (K100)	68.7%			1	2
Z-20 (K200)	69.8%			2	0
Z-100 (K9)	72.5%			1	0
Z-100 (K20)	67.1%			1	0
Z-100 (K100)	59.1%			2	0
Z-100 (K200)	75.8%			0	2
Z-200 (K9)	70.5%			0	0
Z-200 (K20)	69.4%			0	1
Z-200 (K100)	75.1%			1	3
Z-200 (K200)	66.5%			0	0
	Average	Best Rule	Worst Rule	Best Performing Group (# countries)	Worst Performing Group (# countries)
Moving Average (MA)	69.3%	MA-20	MA-200	5	3
Relative Strength Index (RSI)	58.6%	RSI-3 (30/70)	RSI-30 (20/80)	5	21
Stochastic Oscillator (K)	66.5%	K-9 (20/80)	K-200 (20/80)	16	7
Stochastic Oscillator Moving Average (Z)	69.8%	Z-100 (K200)	Z-100 (K100)	13	8

The percentages show how many technical trading rules outperform the gains from a naïve buy-and-hold strategy of the 4822 Asian stocks. Additionally, we observe the number of countries where each of the trading rules were the best performing and worst performing in providing gains that exceed those of the naïve buy-and-hold strategy

each country using only the Intervention filter. Additionally, we provide the best- and worst-performing trading rules and the average difference in gains from each. These correspond to the number of countries shown in Table 2. For twenty-five countries, each set of trading rules generate positive differences, on average, on top of the gains from buy-and-hold investing. Included in this group of countries are stocks in the established markets of Israel, New Zealand, and Singapore. In ten countries, the average differences for all sets of trading rules are negative. While these include stocks from the large, well-established markets of Japan and Hong Kong, the group also includes emerging markets such as India, Malaysia, and Pakistan as well as stocks from the smaller and newer markets in Armenia, Fiji, Kazakhstan, Palestine, and Syria.

16 Summary and Conclusions

The growth of the number of exchanges and the number of stocks listed on the various Asian equities markets provides an opportunity to examine the profitability of applying technical trading rules to actively manage an investment, in lieu of a passive, long-term buy-and-hold strategy. We mimic the behavior of individual investors by testing the trading performance of three widely used technical trading strategies, the Arithmetic Moving Average, the Relative Strength Index, and the Stochastic Oscillator (and its moving average), as well as variations to each trading strategy. We compare the results of these trading rules to the long-term buy-and-hold investing strategy across 4822 stocks traded on 42 exchanges in 39 Asian countries. Our results, when applying a simple behavior intervention filter of only selling a position when a trade is profitable, show that these technical trading rules, on average, are able to outperform the buy-and-hold strategy for 66% of the stocks listed in our sample. We find that in twenty-five countries, the use of any type (Moving Average, Relative Strength, Stochastic Oscillator, or Stochastic Oscillator Moving Average) of technical trading rule provides positive average gains above those from long-term buy-and-hold investing, whereas in ten countries, no type of trading rule provides average positive gains. Additionally, given any of the Asian stocks in our sample, we find that, on average, a trader can apply any technical trading strategy and have a greater than 50–50 chance of outperforming the buy-and hold strategy on that stock for 63.1% of all stocks.

Overall, the best performing trading rule variation is the 100-day moving average for the 200-day Stochastic Oscillator (Z-100 (K-200)). That trading rule outperforms the buy-and-hold strategy for 75.8% of all Asian stocks, regardless of country, although it is not the best performing overall rule for any country. The worst performing trading rule variation is the 30-day Relative Strength Index with a 20–80 boundary (RSI-30 (20/80)). It outperforms the buy-and-hold strategy for only 47.9% of all Asian stocks. RSI-30 (20/80) is also the worst performing trading rule, overall, in 17 of the countries in our sample.

Whereas previous studies focus on market indices from one or more countries, this study enhances the literature by providing a more comprehensive study of the

Table 3 Differences in Gains from Using Technical Trading Rules in Various Asian Markets

	N	Average per-share gain, buy-and-hold (LC)	Average difference using technical trading rules	Average difference using technical trading rules (Intervention)
Central Asia				
Kazakhstan	9	2459.29	−4649.41	−363.78
Eastern Asia				
China	529	2.54	−1.27	5.70
China, Hong Kong SAR	50	14.80	−13.36	−4.24
Japan	504	1476.96	−1492.31	−337.11
Mongolia	20	154.09	−2372.44	6544.79
Republic of Korea	100	29,821.21	−36,664.88	31,179.03
Taiwan	115	2.86	−2.20	10.86
South-Eastern Asia				
Cambodia	5	132.00	−752.39	1066.26
Indonesia	168	322.46	−593.48	296.08
Lao People's Democratic Republic	4	−1279.56	117.29	3131.88
Malaysia	30	6.50	−8.56	−3.58
Philippines	30	76.57	−98.49	26.48
Singapore	174	0.73	−0.88	0.55
Thailand	579	7.00	−11.73	2.15
Viet Nam	320	4773.24	−9972.15	6390.32
Southern Asia				
Bangladesh	76	40.66	−42.81	37.98
India	384	875.30	−763.25	−370.32
Maldives	6	−16.00	126.37	180.86
Nepal	33	68.48	−24.50	419.47
Pakistan	99	268.82	−266.23	−110.74

Table 3 (continued)

	N	Average per-share gain, buy-and-hold (LC)	Average difference using technical trading rules	Average difference using technical trading rules (Intervention)
Sri Lanka	165	25.71	−100.31	64.49
Western Asia				
Armenia	8	60,774.03	−52,319.29	−43,211.06
Bahrain	39	−0.11	0.09	0.21
Iraq	33	−0.96	1.35	1.98
Israel	123	1232.50	−1910.66	2928.85
Jordan	78	−0.58	0.14	1.58
Kuwait	147	−40.48	−16.05	147.50
Lebanon	11	−2.19	1.28	5.42
Oman	30	−0.16	0.15	0.32
Palestine	48	0.61	−0.83	−0.17
Qatar	20	1.56	−1.73	0.79
Saudi Arabia	185	−1.74	5.68	19.27
Syrian Arab Republic	17	177.76	−125.58	−189.31
Turkey	100	12.35	−12.43	−1.94
United Arab Emirates	98	−0.05	−0.50	1.64
Oceania				
Australia	346	3.13	−3.55	−0.05
Fiji	16	2.13	−2.94	−1.98
New Zealand	111	0.28	−0.57	1.14
Papua New Guinea	12	−1.23	21.93	23.80
Total	4822			

The per-share gains of the individual stocks from each country during the 2011–2018 period are compared to the differences from applying any of the 31 technical trading rules, using the signal generated by the trading rule or applying a behavioral filter to the trading rule signal (Intervention). Results are shown in the local currency of each country

Table 4 Performance of Trading Rule Groups for Each Country

Central Asia

Kazakhstan (n=9; differences shown in tenge)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	-995.50	-8559.03	1582.06	K9 (20/80)	K200 (20/80)
Relative Strength Index (RSI)	-447.29	-9494.97	2795.45		
Stochastic Oscillator (K)	-554.68	-13280.79	5142.46	1923.46	-5314.92
Stochastic Oscillator Moving Average (Z)	**-22.91**	-4588.96	3147.57		

Eastern Asia

China (n=529; differences shown in yuan)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	4.75	-172.72	101.24	Z20 (K9)	RSI 30 (20/80)
Relative Strength Index (RSI)	3.37	-356.20	76.84		
Stochastic Oscillator (K)	4.81	-260.63	73.79	12.04	0.46
Stochastic Oscillator Moving Average (Z)	**8.07**	-207.30	80.50		

Hong Kong (n=50; differences shown in dollars)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	-4.01	-276.74	51.82	Z200 (K20)	RSI 30 (20/80)
Relative Strength Index (RSI)	-7.59	-278.32	51.98		
Stochastic Oscillator (K)	-4.30	-276.70	68.19	3.49	-13.50
Stochastic Oscillator Moving Average (Z)	**-2.02**	-276.77	71.77		

Japan (n=504; differences shown in yen)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	-53.82	-32028.33	9878.67	Z20 (K9)	RSI 30 (20/80)
Relative Strength Index (RSI)	-769.28	-31836.75	7341.88		
Stochastic Oscillator (K)	-494.86	-32998.75	7803.48	515.10	-1337.11
Stochastic Oscillator Moving Average (Z)	**-14.66**	-26838.33	13506.50		

Mongolia (n=20; differences shown in tögrög)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	6780.66	-6783.33	59803.67	K9 (30/70)	RSI 14 (30/70)
Relative Strength Index (RSI)	4702.10	-16383.75	70905.13		
Stochastic Oscillator (K)	**8184.35**	-10435.63	91033.75	13946.26	2135.01
Stochastic Oscillator Moving Average (Z)	6621.25	-12409.92	67880.93		

South Korea (n=100; differences shown in won)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	22465.88	-665166.67	490333.33	K9 (20/80)	RSI 30 (20/80)
Relative Strength Index (RSI)	18519.32	-731750.00	496621.25		
Stochastic Oscillator (K)	**47768.16**	-592773.38	490864.63	82871.14	-20729.31
Stochastic Oscillator Moving Average (Z)	30737.70	-594608.33	524496.00		

Taiwan (n=115; differences shown in dollars)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	8.24	-246.55	152.56	Z200 (K9)	RSI 30 (20/80)
Relative Strength Index (RSI)	9.11	-154.64	125.14		
Stochastic Oscillator (K)	9.82	-209.77	113.41	16.55	0.10
Stochastic Oscillator Moving Average (Z)	**13.37**	-111.53	161.47		

South-Eastern Asia

Cambodia (n=5; differences shown in riel)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	**1833.33**	-4140.00	9243.33	20 MA	Z20 (K200)
Relative Strength Index (RSI)	890.50	-4222.50	5938.75		
Stochastic Oscillator (K)	984.00	-3672.50	5520.00	2604.00	184.00
Stochastic Oscillator Moving Average (Z)	1046.50	-4073.33	7407.50		

Indonesia (n=168; differences shown in rupiah)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	272.54	-6698.33	13998.00	RSI 3 (30/70)	K9 (20/80)
Relative Strength Index (RSI)	199.81	-7715.00	24045.00		
Stochastic Oscillator (K)	332.54	-6908.75	29440.50	828.87	-77.60
Stochastic Oscillator Moving Average (Z)	**341.85**	-8414.92	20087.42		

Table 4 (continued)

Laos (n=4; differences shown in kip)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	2339.33	122.57	4616.67	RSI 14 (20/80)	RSI 3 (20/80)
Relative Strength Index (RSI)	3059.19	587.38	5504.56		
Stochastic Oscillator (K)	3229.14	1075.02	6799.54	5609.58	1542.00
Stochastic Oscillator Moving Average (Z)	**3313.63**	1046.88	6536.45		

Malaysia (n=30; differences shown in ringgit)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	**-1.49**	-40.28	5.90	200 MA	RSI 30 (20/80)
Relative Strength Index (RSI)	-5.04	-113.84	8.93		
Stochastic Oscillator (K)	-4.25	-98.90	10.73	0.14	-6.36
Stochastic Oscillator Moving Average (Z)	-2.67	-62.29	6.82		

Philippines (n=30; differences shown in pesos)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	27.28	-1063.33	2093.67	K20 (20/80)	K200 (20/80)
Relative Strength Index (RSI)	3.67	-813.64	2301.63		
Stochastic Oscillator (K)	31.77	-857.95	2558.50	122.55	-106.98
Stochastic Oscillator Moving Average (Z)	**37.96**	-700.62	2264.50		

Singapore (n=174; differences shown in dollars)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	0.46	-50.43	16.40	K9 (30/70)	RSI 30 (20/80)
Relative Strength Index (RSI)	0.23	-51.65	27.75		
Stochastic Oscillator (K)	**0.91**	-13.13	25.14	1.43	-0.60
Stochastic Oscillator Moving Average (Z)	0.55	-38.57	21.03		

Thailand (n=579; differences shown in baht)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	**4.31**	-156.67	207.00	K9 (20/80)	RSI 30 (20/80)
Relative Strength Index (RSI)	-1.20	-376.19	214.25		
Stochastic Oscillator (K)	3.29	-293.75	370.38	7.91	-4.84
Stochastic Oscillator Moving Average (Z)	3.07	-301.60	307.80		

Vietnam (n=320; differences shown in dong)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	6392.49	-119166.67	80934.34	Z20 (K100)	RSI 30 (20/80)
Relative Strength Index (RSI)	2890.33	-129000.00	75020.54		
Stochastic Oscillator (K)	6935.86	-114241.81	114024.42	12772.53	-2426.37
Stochastic Oscillator Moving Average (Z)	**8359.41**	-154886.55	97254.73		

Southern Asia

Bangladesh (n=76; differences shown in taka)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	**71.40**	-800.71	5623.98	20 MA	RSI 30 (20/80)
Relative Strength Index (RSI)	29.98	-768.80	3392.30		
Stochastic Oscillator (K)	27.78	-838.78	3092.78	101.07	-12.18
Stochastic Oscillator Moving Average (Z)	41.75	-876.51	3811.19		

India (n=384; differences shown in rupees)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	-234.32	-59271.55	5098.80	Z20 (K20)	RSI 30 (20/80)
Relative Strength Index (RSI)	-634.47	-47359.33	1450.42		
Stochastic Oscillator (K)	-417.08	-38417.91	1686.00	51.65	-832.86
Stochastic Oscillator Moving Average (Z)	**-197.03**	-33941.47	5764.50		

Maldives (n=6; differences shown in rufiyaa)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	17.44	-95.00	95.00	K20 (30/70)	200 MA
Relative Strength Index (RSI)	157.69	-12.88	554.75		
Stochastic Oscillator (K)	**496.33**	5.00	2039.00	497.67	16.00
Stochastic Oscillator Moving Average (Z)	83.14	-79.83	266.83		

Nepal (n=33; differences shown in rupees)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	296.79	-6260.00	5039.00	Z20 (K20)	K200 (30/70)
Relative Strength Index (RSI)	288.33	-7332.75	3643.25		
Stochastic Oscillator (K)	379.00	-5867.25	4011.00	1078.39	-61.55
Stochastic Oscillator Moving Average (Z)	**564.55**	-4432.67	6634.75		

Table 4 (continued)

Pakistan (n=99; differences shown in rupees)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	**-5.91**	-4029.29	1190.33	Z100 (K200)	RSI 30 (20/80)
Relative Strength Index (RSI)	-209.04	-6611.64	233.60		
Stochastic Oscillator (K)	-161.03	-5884.77	390.85	85.56	-259.43
Stochastic Oscillator Moving Average (Z)	-37.89	-3924.42	2711.12		

Sri Lanka (n=165; differences shown in rupees)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	57.42	-1122.66	4163.17	RSI 3 (30/70)	Z100 (K200)
Relative Strength Index (RSI)	88.88	-1715.09	4851.20		
Stochastic Oscillator (K)	**103.98**	-1419.85	6268.91	181.73	-28.13
Stochastic Oscillator Moving Average (Z)	23.66	-2134.31	3897.68		

Western Asia

Armenia (n=8; differences shown in drams)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	-60643.62	-465782.27	0.00	K200 (30/70)	Z200 (K9)
Relative Strength Index (RSI)	-42213.55	-326953.27	3518.81		
Stochastic Oscillator (K)	**-35238.18**	-222836.76	7741.70	275.00	-66577.47
Stochastic Oscillator Moving Average (Z)	-43602.13	-232894.47	39.17		

Bahrain (n=39; differences shown in dinars)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	0.21	-0.38	3.15	Z100 (K9)	Z100 (K100)
Relative Strength Index (RSI)	**0.24**	-0.52	5.46		
Stochastic Oscillator (K)	0.20	-0.42	4.00	0.29	0.11
Stochastic Oscillator Moving Average (Z)	0.19	-1.09	4.05		

Iraq (n=33; differences shown in dinars)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	1.41	-0.81	6.03	K100 (20/80)	100 MA
Relative Strength Index (RSI)	1.70	-0.77	10.00		
Stochastic Oscillator (K)	**2.28**	0.05	10.89	3.04	1.30
Stochastic Oscillator Moving Average (Z)	2.11	-0.35	8.38		

Israel (n=123; differences shown in new shekels)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	**3540.24**	-25736.67	214461.39	K9 (20/80)	RSI 30 (20/80)
Relative Strength Index (RSI)	1752.18	-48951.25	306989.27		
Stochastic Oscillator (K)	3447.51	-28393.13	262663.87	5839.70	-844.27
Stochastic Oscillator Moving Average (Z)	3214.67	-47030.92	286105.28		

Jordan (n=78; differences shown in dinars)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	1.35	-2.29	28.72	K9 (30/70)	K200 (30/70)
Relative Strength Index (RSI)	1.47	-11.96	48.34		
Stochastic Oscillator (K)	**1.70**	-9.46	49.96	2.35	1.17
Stochastic Oscillator Moving Average (Z)	1.62	-5.83	37.68		

Kuwait (n=147; differences shown in dinars)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	139.65	-620.00	1788.00	K100 (30/70)	RSI 30 (20/80)
Relative Strength Index (RSI)	115.04	-2896.68	1997.38		
Stochastic Oscillator (K)	**167.72**	-2209.62	1985.50	197.03	65.03
Stochastic Oscillator Moving Average (Z)	157.61	-855.22	1998.92		

Lebanon (n=11; differences shown in pounds)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	3.57	-0.32	15.00	K100 (20/80)	20 MA
Relative Strength Index (RSI)	5.81	-1.20	20.95		
Stochastic Oscillator (K)	**6.10**	-0.69	20.32	8.18	2.86
Stochastic Oscillator Moving Average (Z)	5.17	-0.43	17.17		

Oman (n=30; differences shown in rials)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	0.36	-0.12	2.69	Z100 (K9)	K200 (20/80)
Relative Strength Index (RSI)	0.27	-0.39	1.35		
Stochastic Oscillator (K)	0.27	-0.11	1.57	0.43	0.23
Stochastic Oscillator Moving Average (Z)	**0.37**	-0.13	1.83		

Table 4 (continued)

Palestine (n=48; differences shown in Jordanian dinars)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	-0.09	-3.26	3.16	K9 (20/80)	Z100 (K200)
Relative Strength Index (RSI)	-0.27	-10.18	3.65		
Stochastic Oscillator (K)	**-0.04**	-8.21	5.90	0.34	-0.61
Stochastic Oscillator Moving Average (Z)	-0.22	-10.08	3.25		

Qatar (n=20; differences shown in rials)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	**2.30**	-4.50	9.95	Z20 (K100)	RSI 30 (30/70)
Relative Strength Index (RSI)	-0.30	-11.68	7.01		
Stochastic Oscillator (K)	0.45	-9.80	7.47	2.72	-0.96
Stochastic Oscillator Moving Average (Z)	1.36	-9.20	9.68		

Saudi Arabia (n=185; differences shown in riyals)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	**23.28**	-91.67	404.00	Z20 (K9)	RSI 30 (20/80)
Relative Strength Index (RSI)	15.79	-96.53	178.34		
Stochastic Oscillator (K)	16.02	-85.88	216.10	31.97	9.49
Stochastic Oscillator Moving Average (Z)	22.76	-84.09	322.92		

Syria (n=17; differences shown in pounds)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	-173.42	-546.08	73.45	RSI 3 (20/80)	Z100 (K200)
Relative Strength Index (RSI)	**-67.46**	-453.18	473.99		
Stochastic Oscillator (K)	-75.94	-727.75	545.92	45.45	-956.21
Stochastic Oscillator Moving Average (Z)	-350.09	-1903.91	243.24		

Turkey (n=100; differences shown in lira)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	4.52	-59.78	158.33	20 MA	RSI 30 (20/80)
Relative Strength Index (RSI)	-5.68	-456.56	240.69		
Stochastic Oscillator (K)	-2.27	-368.46	262.66	6.59	-10.70
Stochastic Oscillator Moving Average (Z)	**-0.84**	-316.47	175.18		

United Arab Emirates (n=98; differences shown in dirhams)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	1.23	-8.34	18.05	Z100 (K20)	Z100 (K100)
Relative Strength Index (RSI)	1.72	-8.62	46.42		
Stochastic Oscillator (K)	1.46	-8.20	20.31	2.76	0.07
Stochastic Oscillator Moving Average (Z)	**1.81**	-7.50	29.54		

Oceania

Australia (n=346; differences shown in dollars)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	**0.79**	-88.19	47.48	RSI 30 (20/80)	RSI 30 (30/70)
Relative Strength Index (RSI)	-1.00	-136.17	41.63		
Stochastic Oscillator (K)	-0.20	-130.45	41.95	1.44	-2.99
Stochastic Oscillator Moving Average (Z)	0.40	-117.14	42.44		

Fiji (n=16; differences shown in dollars)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	**-1.22**	-4.27	0.92	20 MA	K100 (20/80)
Relative Strength Index (RSI)	-2.05	-6.25	0.94		
Stochastic Oscillator (K)	-2.48	-5.59	-0.02	-0.49	-3.20
Stochastic Oscillator Moving Average (Z)	-1.78	-6.75	0.53		

New Zealand (n=111; differences shown in dollars)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	**1.81**	-8.68	145.30	K9 (20/80)	RSI 30 (20/80)
Relative Strength Index (RSI)	0.70	-22.13	124.96		
Stochastic Oscillator (K)	1.58	-22.48	180.76	2.57	-0.16
Stochastic Oscillator Moving Average (Z)	0.99	-31.59	114.46		

Papua New Guinea (n=12; differences shown in kina)	Average	Average Minimum	Average Maximum	Best Rule	Worst Rule
Moving Average (MA)	3.30	-12.55	52.83	K20 (20/80)	Z200 (K9)
Relative Strength Index (RSI)	**58.84**	-12.55	690.13		
Stochastic Oscillator (K)	31.57	-12.55	360.45	116.93	-7.84
Stochastic Oscillator Moving Average (Z)	0.39	-31.35	45.04		

Table 4 (continued)

The average differences, calculated for each of the 31 trading rules (using the results of the Intervention behavioral filter) and the underlying naïve long-term buy-and-hold gain of each stock are shown for each group of technical trading rules, with the best performing group highlighted. The averages of the minimums and maximums within each group report the average differences of the trading rules of the worst and best performing stocks using one of the trading rules (where $MA = 3$ rules; $RSI = 8$ rules; $K = 8$ rules; $Z = 12$ rules). Finally, the average results for the best and worst performing individual trading rules for that country are shown

trading performance of thirty-one technical trading rules across individual stocks for thirty-nine Asian markets. Our results show similar findings to that of Yu, et al (2013) and Tharavanij, et al (2015), in that technical trading rules provide enhanced profits for individual stocks in Thailand, Indonesia, and the Philippines (versus their use of market indices in these countries). In contrast to both prior studies, we find small positive differences, on average, for stocks in Singapore whereas Malaysian stocks have negative differences from the use of technical trading rules. As with Nor and Wickremasinghe (2014), we find mixed performance of trading rules when applied to Australian stocks (their use of the All-Ordinaries Index). The different trading rules applied in all these studies, as well as the application of the rules to a market index versus individual stocks may contribute to the different findings.

Although our data sample provides results for 4822 Asian stocks, these are just those included in the major market indices of each country and are but a relatively small sample of all stocks listed across all Asian markets. Future studies may find evidence within individual countries that trading performance may vary by a stock's market capitalization, its industry, the number of analysts who follow the stock, or by its trading volume (all aspects of trading which may impact the operational or informational efficiency of a stock's trading performance). Testing additional trading strategies beyond the Moving Average, Relative Strength, or Stochastic Oscillator can be attempted, as well as optimizing parameters within any trading strategy, as performed by Seiler (2001) in order to limit the number of trading rules to apply.

References

Arnold, C. (1994). Reading between the (chart) lines. *Futures, the Magazine of Commodities and Options, 23*, 36–38

Ben-Zion, U., Klein, P., Shachmurove, Y., & Yagil, J. (2003). Efficiency differences between the S&P 100 and the Tel-Aviv 25 indices: A moving average comparison. *International Journal of Business, 8*, 267–284

Bessembinder, H., & Chan, K. (1995). The profitability of technical trading rules in the Asian stock markets. *Pacific Basin Finance Journal, 3*, 257–284

Bessembinder, H., & Chan, K. (1998). Market efficiency and the returns to technical analysis. *Financial Management, 27*, 5–17

Brock, W. A., Lakonishok, J., & LeBaron, B. (1992). Simple technical trading rules and the stochastic properties of stock returns. *Journal of Finance, 47*, 1731–1764

Colby, R. W. (2003). *The encyclopedia of technical market indicators*. (2nd ed.). McGraw-Hill

Elder, A. (1987). Using stochastics to catch early trends and reversals. *Futures, the Magazine of Commodities and Options, 16*, 68–72

Etzkhorn, M. (1995). Getting an indication. *Futures, the Magazine of Commodities and Options, 24*, 38–39

Fama, E. (1965). The behavior of stock market prices. *Journal of Business, 38*, 34–105

Gencay, R. (1996). Non-linear predictions of security returns with moving average rules. *Journal of Forecasting, 15*, 165–174

Kahn, Michael (2019). How investors can prosper with technical analysis. *Kiplinger's Personal Finance*. https://www.kiplinger.com/article/investing/t052-c008-s001-how-investors-can-prosper-with-technical-analysis.html

Khand, S., Anand, V., & Qureshi, M. N. (2020). The predictability and profitability of simple moving averages and trading range breakout rules in the Pakistan stock market. *Review of Pacific Basin Financial Markets and Policies*. https://doi.org/10.1142/S0219091520500010

Kwon, K., & Kish, R. J. (2002). Technical trading strategies and return predictability: NYSE. *Applied Financial Economics, 12*, 639–653

Lai, M.-M., & Lau, S.-H. (2006). The profitability of the simple moving averages and trading range breakout in the Asian stock markets. *Journal of Asian Economics, 17*(1), 144–170

Mitchell, C. (2020). Trend trading: the four most common indicators. https://www.investopedia.com/articles/active-trading/041814/four-most-commonlyused-indicators-trend-trading.asp

Nor, S. M., & Wickremasinghe, G. (2014). The profitability of MACD and RSI trading rules in the Australian stock market. *Investment Management and Financial Innovation, 11*(4), 194–199

Papathanasiou, S., & Samitas, A. (2010). Profits from technical trading rules: The case of Cyprus stock exchange. *Journal of Money, Investment and Banking, 13*, 35–43

Poterba, J. M., & Summers, L. (1988). Mean reversion in stock prices: Evidence and implications. *Journal of Financial Economics, 22*, 27–59

Ratner, M., & Leal, R. P. C. (1999). Tests of technical trading strategies in the emerging equity markets of Latin America and Asia. *Journal of Banking and Finance, 23*(12), 1887–1905

Seiler, M. J. (2001). Optimizing technical trading strategies: Making the ludicrous lucrative. *American Business Review, 19*, 20–25

Shefrin, H., & Statman, M. (1985). The disposition to sell winners too early and ride losers too long: Theory and evidence. *Journal of Finance, 40*(3), 777–790

Stein, J. (1989). What divergence indicates about real price value. *Futures, the Magazine of Commodities and Options, 18*, 32–34

Tharavanij, P., Siraprapasiri, V., & Rajchamaha, K. (2015). Performance of technical trading rules: evidence from Southeast Asian stock markets. *Springerplus*. https://doi.org/10.1186/s40064-015-1334-7

Wilder, J.W. (1978) *New concepts in technical trading systems*. Trend Research

Wong, W., Manzur, M., & Chew, B. (2003). How rewarding is technical analysis? Evidence from Singapore stock market. *Applied Financial Economics, 13*, 543–551

Yoon, F. (2021). A 'Mind-Boggling' Individual Investor Boom Stirs Up Markets in Asia. *Wall Street Journal*. March 4, 2021 https://www.wsj.com/articles/a-mind-boggling-individual-investor-boom-stirs-up-markets-in-asia-11614853804. Accessed April 10, 2021

Yu, H., Nartea, G. V., Gan, C., & Yao, L. J. (2013). Predictive ability and profitability of simple technical trading rules: Recent evidence from Southeast Asian stock markets. *International Review of Economics and Finance, 25*, 356–371

Yu, T., and Chen, S-H (2004). Using genetic programming with lambda abstraction to find technical trading rules. *Computing in Economics and Finance*. Society for Computational Economics, https://EconPapers.repec.org/RePEc:sce:scecf4:200