Do Ichimoku Cloud Charts Work and Do They Work Better in Japan?

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Abstract

This article explores the profitability of signals generated using Ichimoku cloud charts on single stocks in Japan and the United States. We construct a conservative and aggressive long-only and short-only strategy over a period from 2005–2014 and examine the profitability of the various strategies. Based on the simulation, we evaluate the ability of Ichimoku cloud charts to generate profitable trading signals in these two markets. In addition, we propose that the cloud chart exhibits characteristics typical of a momentum and breakout strategy, with returns that are positively skewed and with a small left tail due to the natural stop loss built into such a strategy.

Introduction

Ichimoku Cloud Charts

Candlestick charts have existed in Japan since the 18th century, but it was the time just before World War II that Goichi Hosoda, a journalist using the pseudonym Ichimoku Sanjin (Ichimoku meaning 'at a glance' in English), combined moving averages with candlestick charts to improve the strength of his technical analysis. Then, in 1996, Hidenobu Sasaki, who was working at Nikko Citigroup Securities, revised his method and published *Ichimoku Kinko Studies,* which formed the current methodology of the cloud chart analysis. Having been voted the best technical analysis book in the Nikkei newspaper for nine years repeatedly, this method is still considered one of the most common technical analyses in Japan.

Key research questions

In this study, we aim to apply the original specification for the cloud charts to single stocks in the United States and Japan. We design a simple trading strategy based on basic implied predictions from the cloud charts and use the profitability of the various strategies to evaluate its effectiveness. Through this study, we hope to shed some light on three key research questions:

1. *How would a simple trading strategy constructed using signals from the cloud chart perform when applied to individuals stocks?* We examine the profitability of the various strategies when compared to a strategy that simply holds or shorts the stock. In addition, we use the information ratio as a way to provide a rough measure of the different strategies' ability to add value.

2. *Do the results differ based on the market environment?* Momentum strategies typically perform best in scenarios where there is a definitive trend, such as following a crash or in a strong bull market, and have a weaker performance when prices move within a range bound environment. We examine the performance of the basic strategy over different market environments to try to identify which environments are more favourable for the use of cloud charts.

3. *Do results vary relative to geographic position?* As Cloud Charts are a tool that was first introduced in Japan and only brought to the West many years later, we thought it would be interesting to investigate if the performance of the strategy differed when applied to stocks in these two countries. One possible argument against the persistence of any performance would be that if the strategy performs better in Japan, the tools main user base, this could be evidence for the self-fulfilling hypothesis commonly levelled as a criticism of technical analysis. Hence, such an investigation can also serve as a simple robustness check of the results and can provide some high-level insight into the possible persistence of any observed outperformance.

Ichimoku Cloud Chart Construction

Ichimoku cloud charts are constructed from five lines: the Tenkan line, Kiniu line, Senkou span A, Senkou span B and Chikou line. Figure 1 provides a graphical illustration of an Ichimoku cloud chart with the various lines of interest plotted on the chart.

The Tenkan line acts like a moving average. It is calculated by averaging the highest daily high and lowest daily low in a nine-day period.

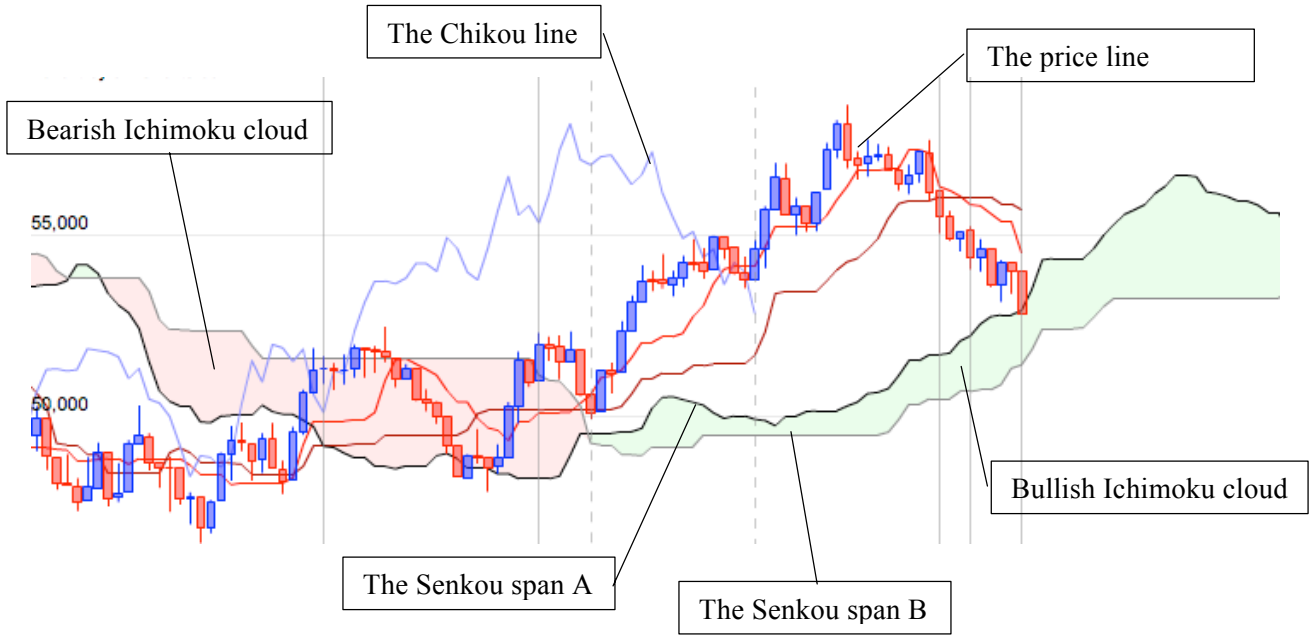
The Kiniu line is very similar to the Tenkan line except that it uses 26 days, which was originally the Japanese trading days in a month.

The Senkou span A and B are utilised to construct the Ichimoku cloud. For the Senkou span A, the midpoint between the Tenkan line and Kiniu line is calculated and shifted 26 bars forward.

For the Senkou span B, the midpoint of the last 52 sessions, which is translated as two trading sessions in the Japanese market, is calculated and shifted 26 bars forward.

The area between the Senkou spans forms the Ichimoku cloud. If span A is higher than span B, this is a bullish signal indicated with green. On the other hand, if span B is higher than span A, it is a bearish signal indicated with red. Lastly, the Chikou line is the price line shifted back 26 sessions, showing a bullish signal when it is above the Ichimoku cloud and bearish signal when it is below the cloud.

Figure 1: Illustration of Ichimoku Cloud Chart



Data Analysis

Data

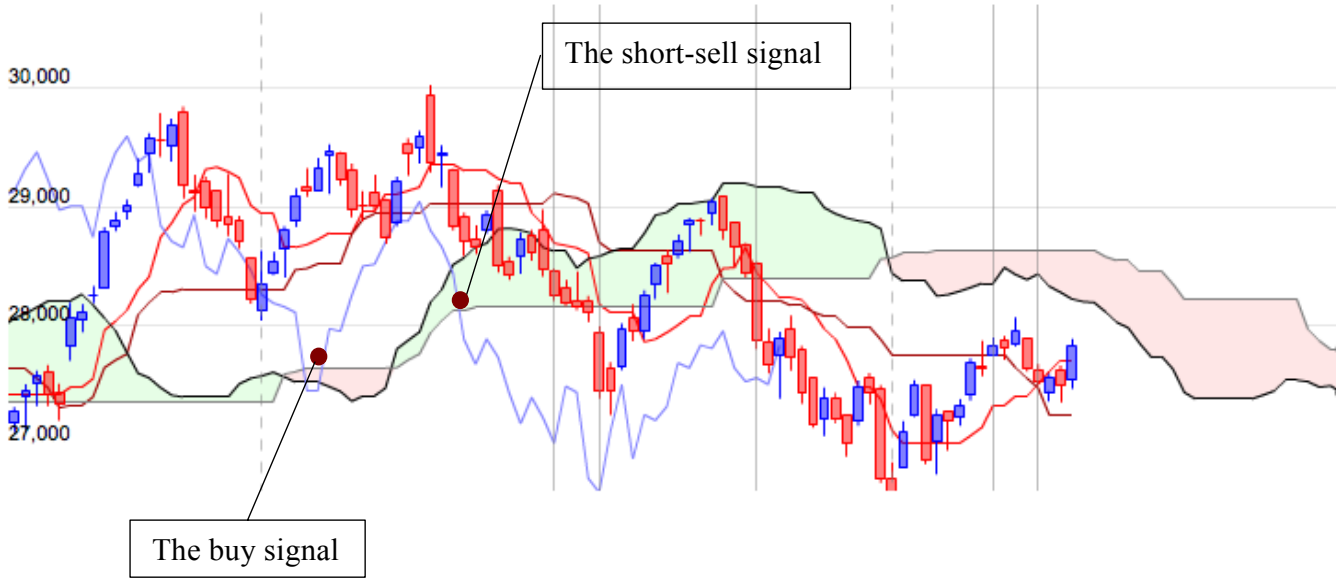
For this study, we used stock prices for the current stocks in the S&P 500 and Nikkei 225 that had data that went back to the start of 2005. For the purpose of the study, we conducted the backtest of the trading strategies over the period from 1 January 2005–31 December 2014, and the sample consisted of 202 stocks in the Japanese market and 446 stocks in the U.S. market.

Description of Key Trading Signals

Although there are different types of signals that can be produced by the cloud charts, anedoctal evidence suggests that the most reliable and consistent one is the Chikou line crossing the Ichimoku cloud. Hence, we have used that as the basis for the generation of signals for the different trading strategies proposed in this paper.

In this paper, we propose series of long-only and short-only strategies based on the crossing of the Chikou line with the cloud. The key buy signal is classified as the Chikou line crossing the higher span of the cloud from below. The key short-sell signal is classified as the Chikou line crossing the lower span of the cloud from above. Figure 2 provides a graphical illustration of the key buy and short-sell signal.

Figure 2: Illustration of Buy Signal and Short-Sell Signal



Implementation of Buffer

It is largely accepted that if price moves within the cloud area, it could represent trading in a range bound environment, leading to false signals that would prove unprofitable. Hence, to reduce the number of false signals around the cloud and to slow down the model, we implemented a 1% buffer around the cloud for the generation of signals. Hence, the Chikou span would have to move 1% higher than the price of the cloud for a buy signal to be triggered and would have to move 1% below the price of the cloud for a short-sell signal to be initiated.

Trading Strategies

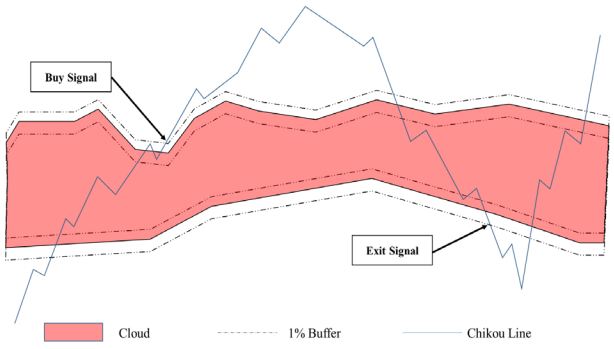
We constructed four different trading strategies for our study: a conservative long-only strategy, an aggressive long-only strategy, a conservative short-only strategy, and an aggressive short-only strategy. The conservative strategies are slower and should capture fewer false-signals, while the aggressive strategies are faster and more reactive to price movements.

Conservative Long-Only Strategy

The rules for this strategy are illustrated in Figure 4 and are as follows:

- Initiate a long position when the Chikou line crosses the top of the cloud from below.
- Close the long position when the Chikou line crosses the bottom of the cloud.

Figure 4: Illustration of Conservative Long-Only Strategy

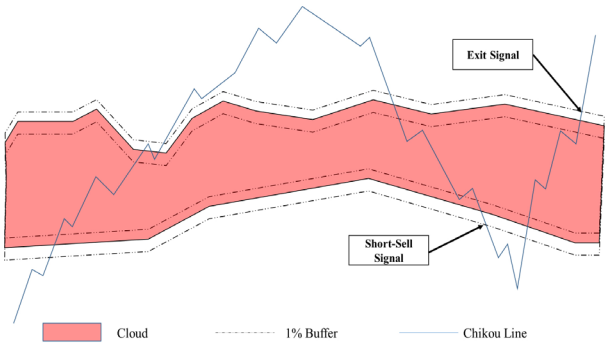


Conservative Short-Only Strategy

The rules for this strategy are illustrated in Figure 6 and are as follows:

- Initiate a short position when the Chikou line crosses the bottom of the cloud from above.
- Close the short position when the Chikou line crosses the top of the cloud.

Figure 6: Illustration of Conservative Short-Only Strategy

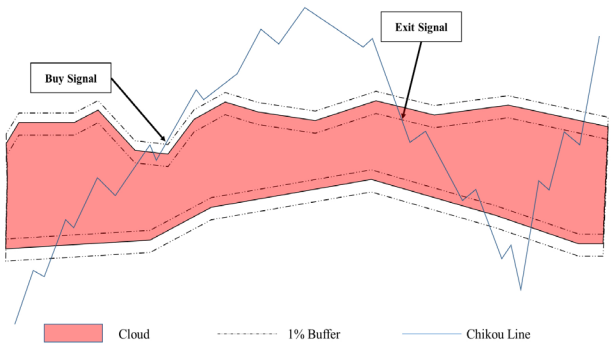


Aggressive Long-Only Strategy

The rules for this strategy are illustrated in Figure 5 and are as follows:

- Initiate a long position when the Chikou line crosses the top of the cloud from below.
- Close the long position when the Chikou line crosses the top of the cloud.

Figure 5: Illustration of Aggressive Long-Only Strategy

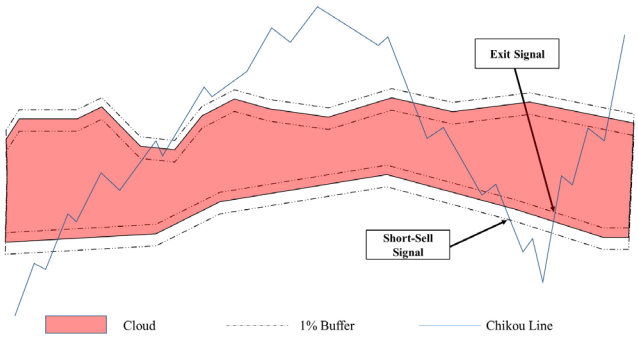


Aggressive Short-Only Strategy

The rules for this strategy are illustrated in Figure 7 and are as follows:

- Initiate a short position when the Chikou line crosses the bottom of the cloud from above.
- Close the short position when the Chikou line crosses the bottom of the cloud.

Figure 7: Illustration of Aggressive Short-Only Strategy



Evaluation of Trading Strategies

The Information Ratio (IR) was calculated to determine the profitability of our trading strategies against a benchmark. The benchmark for the conservative and aggressive long-only strategies was a long position in the stock throughout the period, and the benchmark for the conservative and aggressive short-only strategies was a short position in the stock throughout the period. This method was to attempt to quantify the additional value generated from our long-only/short-only trading strategy and to provide a proxy that could be used for an ordinal ranking of the different trading strategies. The IR was calculated over the entier period and based on a tracking error that was calculated based on monthly returns.

The calculation for the Information Ratio is as follows:

$$IR = (R_p - R_i) / \sigma p\text{-}i$$

where Rp is the return of our trading strategy portfolio, Ri is the return of the individual stock and σp-i is standard deviation of the difference between returns of the trading strategy portfolio and the returns of the individul stock.

Key Results

Overview of Results

Table 1: Overview of Trading Strategy Results

Long-Only Strategies	Conservative		Aggressive	
	US	Japan	US	Japan
Mean return (annualized)	23%	22%	11%	12%
Median return (annualized)	9%	10%	5%	5%
Median highest return	96%	107%	57%	85%
Median largest loss	-4%	-5%	-6%	-6%
Median number of trades	17	19	36	35
Median days per trade	130	105	52	46
Median information ratio	6.64	6.40	1.26	1.64

Short-Only Strategies	Conservative		Aggressive	
	US	Japan	US	Japan
Mean return (annualized)	20%	20%	13%	12%
Median return (annualized)	5%	8%	2%	3%
Median highest return	91%	112%	84%	107%
Median largest loss	-6%	-7%	-8%	-9%
Median number of trades	17	18	26	29
Median days per trade	77	95	42	52
Median information ratio	6.48	6.33	6.09	5.96

The simulation suggests that cloud charts are indeed successful at adding value and can be used to construct trading strategies that outperform simple long-only or short-only strategies.

As can be seen from Table 1, the median holding period for the conservative long-only strategy is around three to four months, whereas the median holding period for the aggressive long-only strategy is around one to two months. This is similar on the short-only side, where the median holding period for the conservative short-only strategy is two to three months, while for the aggressive short-only strategy, it is around one to two months. The number of trades generated is also significantly less for the conservative strategy compared to the aggressive strategy, with the conservative strategies generating around one to two trades annually and the aggressive strategy generating on average around three to four annual trades per stock.

This is in line with the expectation that the conservative strategy should trade less frequently than the aggressive strategy and capture longer-term trends. It is also worth noting that the conservative strategies performed better than the aggressive strategies on both an absolute return basis as well as on a relative basis, as can be seen from the higher IRs across all markets. This suggests that the cloud charts are more effective at generating signals to capture medium-term trends.

Secondly, the strategies all exhibit a positive skew with a much smaller left tail, as can be inferred from the high maximum return and positive median return compared to the much smaller maximum loss for all of the strategies for the median stock in each market. This is consistent with the type of returns we would expect from trend-following strategies, an idea that is explored further in Section 4.4 of this paper.

Performance Comparison by Geography

From Figure 8, we can see that the cloud charts tend to generate profitable signals on both the long and short side across the two different markets. The long-only strategies tend to be more successful at generating profitable signals than the short-only strategies, and the conservative strategies tend to be more successful than the aggressive strategies. However, when we evaluate the performance across geographies, it appears to be broadly similar, with no clear advantage when the strategy is applied in either geography.

Figure 8: Median Percentage of Profitable Trades for Different Trading Strategies

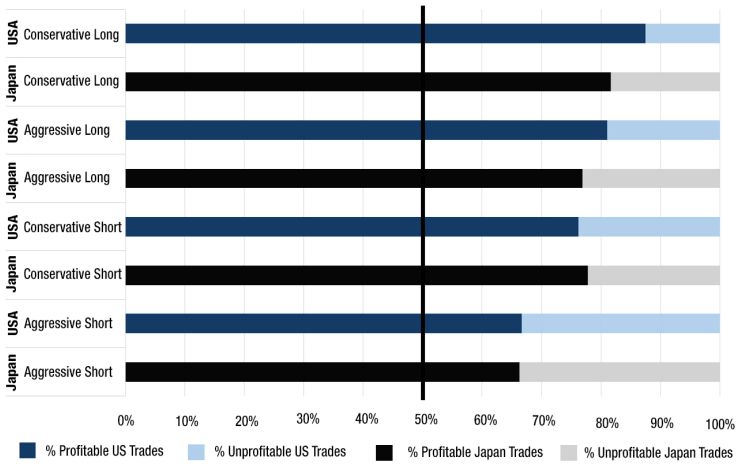


Figure 9: Relative Frequency of Information Ratios for Conservative Long-Only Strategies

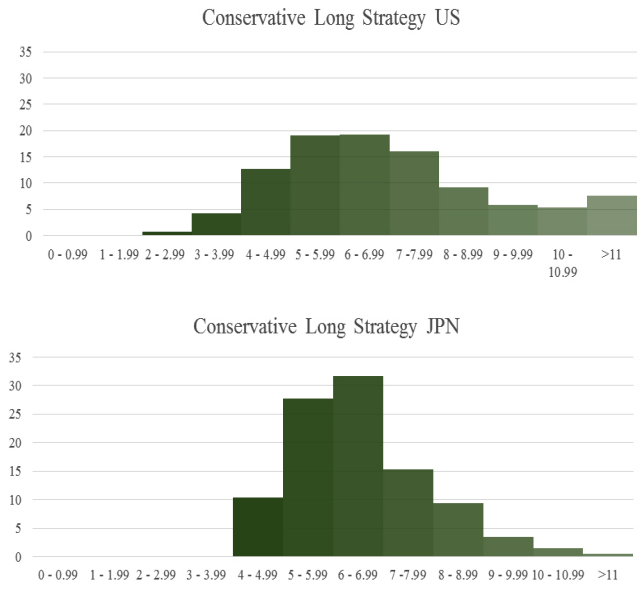


Figure 11: Relative Frequency of Information Ratios for Conservative Short-Only Strategies

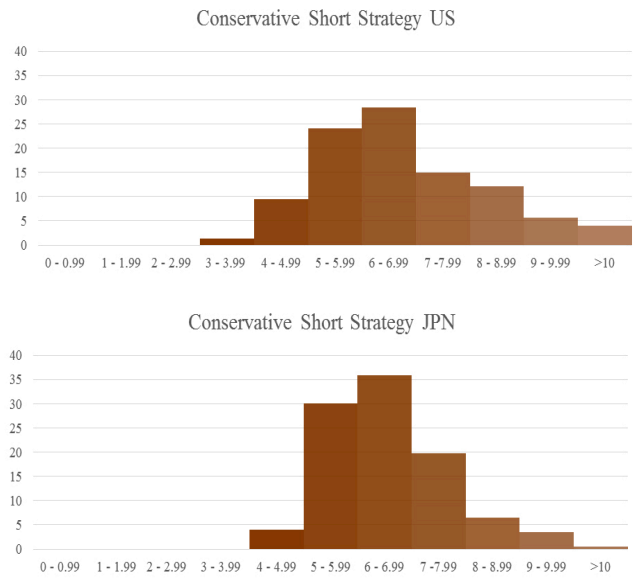


Figure 10: Relative Frequency of Information Ratios for Aggressive Long-Only Strategies

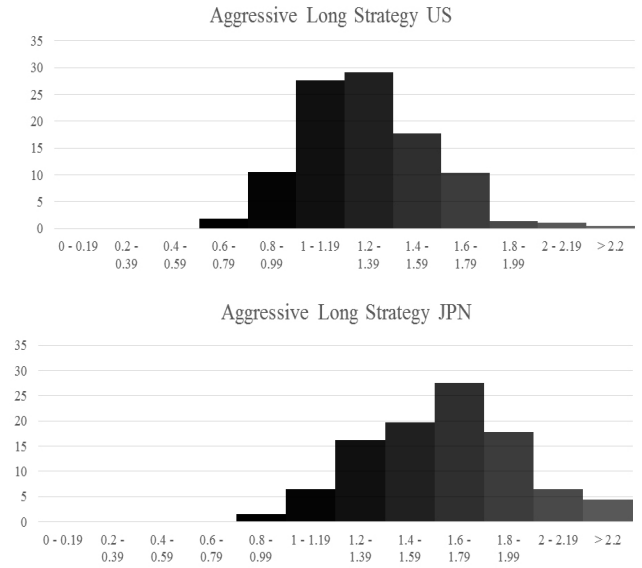
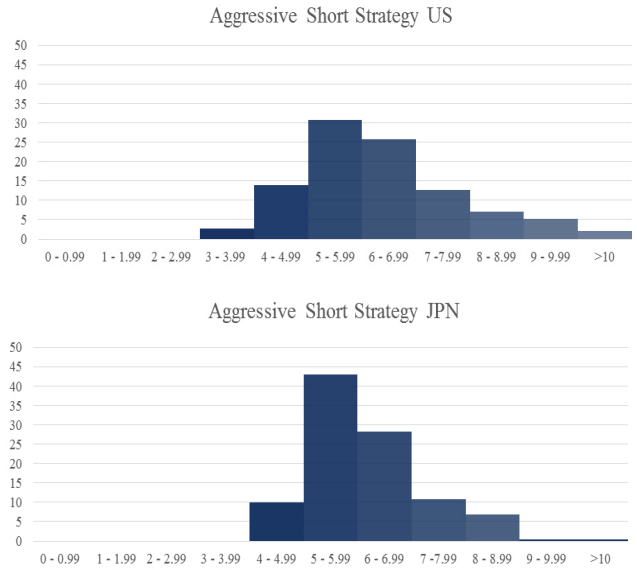
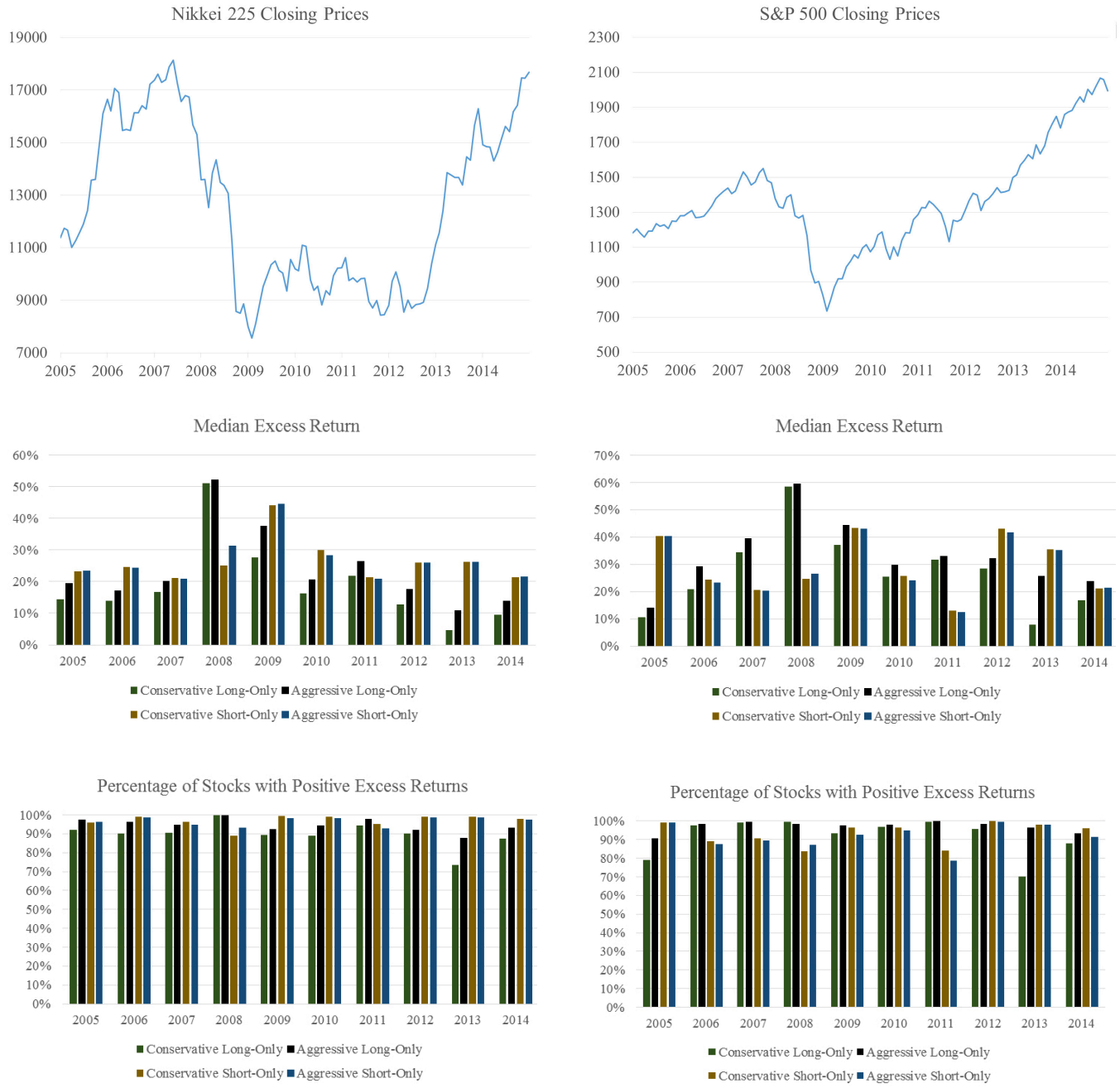


Figure 12: Relative Frequency of Information Ratios for Aggressive Short-Only Strategies



This is consistent when we compare the IRs as well, as can be seen from Figures 9 through 12. These charts plot the distribution of IRs across all the stocks traded for the entire time period. Between the two geographies, there does not seem to be a clear winner, with the signals for the conservative long-only signals performing better when applied in the U.S. market, while the aggressive long-only signals performed better when applied in Japan.

Figure 13: Performance of Trading Strategies by Year in the U.S. and Japan



From Figure 13, we can see that the majority of stocks generated positive excess returns across all the time periods in both geographies. From the chart on median excess return, we can see that the strongest returns in the United States were generated in 2008 and 2009. This is largely due to the long-only positions being cut once the crisis hit, while the short-only positions benefited from being short the stock. This is consistent with the concept of Crisis Alpha often associated with managed futures strategies, which are often based on trend-following models as well.

This is similar for the performance in Japan, with strong excess returns being generated in years with large price movements in the overall equity market and the range bound environments being associated with lower excess returns.

Possible Explanation for Outperformance

One of the key differences between the Ichimoku clouds and standard moving averages is that it averages the highest daily high and lowest daily low to construct the clouds, whereas moving averages incorporate all the prices from each day. Therefore, if there is a new high/low on that day compared to the past nine-day period, then the cloud will react more quickly than moving averages, as that new high/low price is weighted more in the cloud method, capturing important price changes faster. This also means that the clouds are not responsive to the prices that are not higher/lower than the highest/lowest price used to construct the cloud. Only the Chinkou line would respond to those weaker changes, not the clouds, making the Ichimoku method more reactive to breakouts than a standard

moving average, while smoothing smaller changes compared to a system of moving averages.

Using the Ichimoku cloud charts is a way of constructing a trend-following strategy, which essentially involves buying the stocks that have been performing well in the past months and selling them as the trend begins to fade (and doing the opposite on the short-selling side). The cloud chart strategy prevents large losses by closing a signal after a stock has been performing poorly for a period of time and by not initiating a position before a trend is clearly established. The other aspect of this similarity is that a strategy based on the cloud charts allows for gains to accrue if the stock has been performing well over a long period of time by not closing the position unless the performance of the stock drops (i.e., the Chikou line crosses the cloud). However, once the trend turns against the position, the clouds and the Chikou line begin to converge, and the position is quickly closed, thus limiting losses. Therefore, large losses are prevented, but large gains are allowed to accrue over time. This natural stop-loss is consistent with our results that show that the simulated returns are positively skewed and have a large right tail but a markedly smaller left tail.

Key Limitations

There are two key methodological limitations that need to be kept in mind when evaluating the absolute performance results from the strategy. First, we have not included transaction costs in the trading strategy simulation, a factor that would have reduced the outperformance when compared to the low-turnover buy and hold or short and hold strategy. However, as the strategies primarily capture trends over a few months, the turnover each year is fairly low. Hence we would contend that the inclusion of transaction costs would lower the absolute outperformance of each strategy, but the overall conclusion that the strategies can result in outperformance would remain unchanged.

Secondly, we have not included short-selling costs or taken into account short-selling constraints in our simulation, and this could be a possible reason for the strong performance of the short-only strategies. However, we believe that while the absolute returns might be higher than what can be achieved in practice after those constraints are incorporated, it still highlights to an extent the ability of the charts to capture downtrends successfully. We believe this is still useful information for a practitioner in spite of the possible short-selling constraints and costs that might prevent one from fully extracting the value of such information.

When interpreting and evaluating the IRs reported, it is worth keeping in mind that, while IRs are typically reported against a market-based benchmark like the whole market index, we have chosen instead to use the long-only or short-only strategy of each individual stock as its own benchmark for this study. This was an intentional choice, as it highlights the ability of the charts to generate signals for each individual stock more clearly and in a comparable manner across geographies and strategies. However, as the stock is its own benchmark, this is likely to result in a lower tracking error and hence, the absolute values of the IRs observed would be higher than what would typically be achieved (as the denominator will be lower). Therefore, we would suggest that these ratios be used mainly as a way to construct an ordinal ranking of performance of these strategies against each other and not as a measure of absolute outperformance, as is common in a portfolio performance measurement context.

Conclusion

In this study, we present evidence of the ability of Ichimoku cloud charts to generate profitable trading signals in single stocks in the United States and Japan. This effect appears to be fairly persistent, and the return profiles of such a trading strategy exhibit a positive skew with a small left tail, consistent with the characteristics of other trend-following strategies.

When we compare the performance in the United States vs the performance in Japan, we find little evidence for the tool working better in one market. The continued ability of the cloud charts to generate profitable trading signals is probably a key reason this tool has remained popular amongst technical analysts decades after these concepts were first proposed. Through this study, we have provided some empirical evidence for the characteristics of the information provided and would encourage further empirical work on the other signals that can be generated from the charts as well as ways that the cloud charts can be optimised for each market to deliver better signals.

Software

Charts for Figures 1 and 2 taken from www.ichimokutrader.com.

Stock price data was obtained from Bloomberg, and market data for Figure 13 was obtained from Yahoo Finance.

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