

Short-Term Foreign Exchange Rate Trading Based on the Support/Resistance Level of Ichimoku Kinkohyo

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Abstract— In this study, we conducted foreign exchange rate simulated trading based on a traditional Japanese technical indicator called Ichimoku Kinkohyo, which is well-known and widely used in Japan for technical analysis on various kinds of market prices. We designed two trading strategies based on the support/resistance level of the five elements of Ichimoku and conducted simulated trading on short-term foreign exchange rate. The trading strategies are applied to five currency pairs: USD/JPY, EUR/USD, GBP/USD, USD/CHF and AUD/USD. Experimental results show that the average return of one trading strategy that based on Ichimoku Kinkohyo is extremely better than that of other baseline strategies.

Keywords— *Ichimoku Kinkohyo, Support and resistance, Foreign exchange rate, Japanese technical indicator, simulated trading*

I. INTRODUCTION

Foreign exchange (FX) rate market is the biggest financial market in the world. To predict the direction of FX rate movements and trading on it is an important research topic. Technical analysis, which uses the historical prices or volumes to forecast the movements in the near future, is widely used by traders or researchers [1, 2, 3].

There are many well-known western technical analysis methods, such as moving average or Elliott wave principle [4], which are studied by lot of researchers [5, 6, 7]. However, there are few studies published about using a Japanese traditional technical analysis method called Ichimoku Kinkohyo [8], which was developed in 1930s by Hosoda Goichi [8].

Therefore, after reading the original book [8], we designed a trading strategy and conducted simulated trading based on the support/resistance level of the elements of Ichimoku Kinkohyo.

The remainder of this paper is organized as follows. Section II describes the five elements of Ichimoku Kinkohyo and

formulates a way to calculate them. Section III presents the design of the experiments and provides the experimental results and a discussion. Section IV concludes this study.

II. BACKGROUND

There are five elements in the Ichimoku chart, in addition to the candlesticks themselves. Figure 1 shows an example of Ichimoku chart of USD/JPY weekly data from January 2012 to November 2013. In the following, the calculation steps [8] of the five elements are explained.

A. Tenkan-sen

The Tenkan-sen is derived by averaging the highest value and lowest value for the past nine periods (including the present period):

$$\text{Tenkan-sen}(T) = \frac{\max(P(t) \Big|_{t=T-8}^{t=T}) + \min(P(t) \Big|_{t=T-8}^{t=T})}{2} \quad (1)$$

where $P(t)$ is the exchange rate at time t . The Tenkan-sen is primarily used as a signal line and a minor support/resistance level: if the present price is above Tenkan-sen, Tenkan-sen is usually seen as a minor support level; otherwise it is seen as a minor resistance level.

B. Kijun-sen

The Kijun-sen is derived by averaging the highest value and lowest value for the past twenty six periods (including the present period):

$$\text{Kijun-sen}(T) = \frac{\max(P(t) \Big|_{t=T-25}^{t=T}) + \min(P(t) \Big|_{t=T-25}^{t=T})}{2} \quad (2)$$

where $P(t)$ is the exchange rate at time t . The Kijun-sen is seen as a medium support/resistance level: if the present price is above the Kijun-sen, Kijun-sen is usually seen as a support level; otherwise it is seen as a resistance level.



Fig.1 Ichimoku Kinkohyo chart for USD/JPY weekly data from year 2012 to 2013

C. Senkou span A and B

Senkou span A and Senkou span B are also called as leading span 1 and leading span 2, respectively. The Senkou span A and B are:

$$\text{Senkou-span-A}(T+25) = \frac{\text{Tenkan-sen}(T) + \text{Kijun-sen}(T)}{2} \quad (3)$$

$$\text{Senkou-span-B}(T+25) = \frac{\max(P(t)|_{t=T-51}^{t=T}) + \min(P(t)|_{t=T-51}^{t=T})}{2} \quad (4)$$

These two lines form two edges of the “kumo”, or “cloud”, which are also seen as support/resistance level.

D. Chikou span

The calculation of Chikou-span is just the “close price” at present period projected back twenty six periods (including the present period) on the chart:

$$\text{Chikou-span}(T-25) = P_{\text{close}}(T) \quad (5)$$

where $P_{\text{close}}(T)$ is the close exchange rate at period T . The Chikou span is also seen as a resistance/support level: if the Chikou span is above the “high price” of 26 periods before, it is seen as a support level. While it is seen as a resistance level if the Chikou span is below the “low price” of 26 periods before.

III. EXPERIMENTS

A. Data

The exchange rate data used in this study were obtained from ICAP. The ICAP data comprises a list of best offers, best bids, and dealt prices for every second. We constructed 2-hour time horizon data from the ICAP data for currency pairs USD/JPY, EUR/USD, GBP/USD, USD/CHF and AUD/USD. For every 2-hour time horizon, it has “High, Low, Open and Close” prices. We conducted experiments on these five currency pairs.

B. Trading strategy

In this research, we designed two trading strategies based on the support/resistance level of the five Ichimoku elements: “Ichimoku with cloud” and “Ichimoku without cloud”. The details of the conditions of trading signals are shown in Table 1.

TABLE 1. Trading signals of two trading strategies based on Ichimoku ($P(T)$ is the close price at period T)

Trading strategy	Trading signal	Condition ($P(T)$ is the close exchange rate in period T)
Ichimoku with cloud	Buy signal	$P(T) > \text{Tenkan-sen}(T) > \text{Kijun-sen}(T)$ & $P(T) > \text{Senkou-Span A}(T) > \text{Senkou-Span B}(T)$ & $\text{Chikou span}(T) > P(T-25)$
	Sell signal	$P(T) < \text{Tenkan-sen}(T) < \text{Kijun-sen}(T)$ & $P(T) < \text{Senkou-Span A}(T) < \text{Senkou-Span B}(T)$ & $\text{Chikou span}(T) < P(T-25)$
Ichimoku without cloud	Buy signal	$P(T) > \text{Tenkan-sen}(T) > \text{Kijun-sen}(T)$ & $\text{Chikou span}(T) > P(T-25)$
	Sell signal	$P(T) < \text{Tenkan-sen}(T) < \text{Kijun-sen}(T)$ & $\text{Chikou span}(T) < P(T-25)$

TABLE 2. A list of trading strategies used in this study

No.	Trading strategy	Description
1	Buy and Hold (BAH)	Buy a currency pair and hold until the end of an experiment
2	Sell and Hold (SAH)	Sell a currency pair and hold until the end of an experiment
3	Ichimoku without cloud (IWOC)	Trade by Ichimoku but without considering the cloud
4	Ichimoku with cloud (IWC)	Trade by Ichimoku with considering the cloud

TABLE 3. Return results based on four trading strategies for five currency pairs

	USD/JPY	EUR/USD	GBP/USD	USD/CHF	AUD/USD	Average return
BAH	11.49%	8.15%	4.27%	8.01%	-9.92%	4.40%
SAH	-11.49%	-8.15%	-4.27%	-8.01%	9.92%	-4.40%
IWOC	-6.18%	13.33%	-6.05%	-0.53%	5.87%	1.29%
IWC	32.06%	14.08%	10.81%	58.04%	-21.31%	18.74%

In addition, we conducted experiments based on two important baseline trading strategies: “Buy and hold” and “Sell and hold”. The details of the four trading strategies are shown in Table 2. Note that we do not consider transaction cost in the experiments.

C. Experiment results

Table 3 shows the experiment results of “Buy and hold”, “Sell and hold”, “Ichimoku without cloud”, and “Ichimoku with cloud” for five currency pairs. We found IWOC yielded negative return for three currency pairs, and the average return of it is just 1.29%, which is not better than that of BAH (4.4%). However, with considering the cloud, the IWC yielded extremely better returns for all currency pairs except AUD/USD. Although the IWC made a big loss (-21.31%) for AUD/USD, the average return 18.74%, which is still extremely better than that of SAH(-4.4%), IWOC (1.29%) and BAH (4.4%).

IV. CONCLUSION AND FUTURE WORKS

In this study, we designed two trading strategies based on the support/resistance level of Ichimoku, and conducted a simulated trading for five short term currency pairs. The experimental results show that the trading strategy IWOC yielded positive average return (1.29%), and it is extremely

improved when support/resistance level of “cloud” are considered (IWC).

In the future works, we will use some machine learning methods as we did in our previous researches [9, 10, 11, 12, 13, 14, 15, 16] to design more profitable trading strategies based on Ichimoku Kinkohyo, or design some trading strategies by the five elements of Ichimoku Kinkohyo in addition to the support/resistance level.

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