SMA, Tenkan-sen and Kijun-sen

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1 Model Theory

Uses 4 period simple moving average ($A(4,t)$), Tenkan-sen ($T(t)$) and Kijun-sen ($K(t)$) indicators from the Ichimoku Kinkohyo indicator set.

Simple moving average equation;

$$A(x,t) = \frac{\left(\sum_{n=t-x+1}^{t} p(n)\right)}{x} \tag{1}$$

where x is the number of periods included in the average and $p(t)$ is the price at time t (the close price will be used in this model).

Tenkan-sen equation [1];

$$T(t) = \frac{max\big(p(t')\big|_{t'=t-8}^{t'=t}\big) + min\big(p(t')\big|_{t'=t-8}^{t'=t}\big)}{2} \tag{2}$$

Qualitatively, the average of the minimum and maximum close prices over the past 9 periods including the current one.

Kijun-sen equation [1];

$$K(t) = \frac{max\big(p(t')\big|_{t'=t-25}^{t'=t}\big) + min\big(p(t')\big|_{t'=t-25}^{t'=t}\big)}{2} \tag{3}$$

Qualitatively, the average of the minimum and maximum close prices over the past 26 periods including the current one.

Certain crossings of these indicators described in the algorithm section will then give the conditions for the open and close of orders.

This model is tested on the 1 minute EUR/USD symbol.

2 Order Algorithm

2.1 Buy orders

Buy open conditions;

1. Inital condition: $A(4, t_0) < T(t_0) < K(t_0)$
2. Condition 1: $T(t_1) < A(4, t_1) < K(t_1)$
3. Condition 2: $T(t_2) < K(t_2) < A(4, t_2)$
4. Condition 3: $K(t_3) < T(t_3) < A(4.t_3)$

These must occur in order to produce a buy open signal, $(t_0 < t_1 < t_2 < t_3)$.
Buy close conditions;

1. Initial conditions:$K(t_0) < T(t_0)$
2. Condition 1: $K(t_1) > T(t_1)$

This will close the buy order, $(t_0 < t_1)$.

2.2 Sell orders

Sell open conditions;

1. Inital condition: $A(4, t_0) > T(t_0) > K(t_0)$
2. Condition 1: $T(t_1) > A(4, t_1) > K(t_1)$
3. Condition 2: $T(t_2) > K(t_2) > A(4, t_2)$
4. Condition 3: $K(t_3) > T(t_3) > A(4, t_3)$

These must occur in order to produce a sell open signal, $(t_0 < t_1 < t_2 < t_3)$.
Sell close conditions;

1. Initial conditions:$K(t_0) > T(t_0)$
2. Condition 1: $K(t_1) < T(t_1)$

This will close the sell order, $(t_0 < t_1)$.

3 Code strucutre

Elements to be built into the code to achieve the functionality described in the previous two sections.

1. Data source (`https://www.histdata.com/`).
2. Data extraction and reading into close price array.
3. Functions to calculate the 4 SMA, Tenkan-sen and Kijun-sen for each close price.
4. for loop to run through order algorithms in order to recognise entry and exits points. Profit/Loss calculations for each trade for cumulative profit/loss over time for graphing. Outputs written to a file for analysis.

References

[1] Shangkun Deng and Akito Sakurai. Short-term foreign exchange rate trading based on the support/resistance level of ichimoku kinkohyo. In *2014 International Conference on Information Science, Electronics and Electrical Engineering*, volume 1, pages 337–340, 2014.