A MORE EFFICIENT CALCULATION OF THE RELATIVE STRENGTH INDEX

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ABSTRACT

The relative strength index *(RSI)* is one of the most widely used technical indicators in technical analysis. This indicator tells the trader when market is said to be overbought or oversold. In this paper an efficient calculation of the RSI is proposed.

***K*eywords** RSI · Relative Strength Index · Technical Indicators · Technical Analysis · Stock Market

1 Introduction

In technical analysis, traders can make use of technical indicators in order to get insight about the market price, most technical indicators process past data, thus the user must support the hypothesis of dependency, where future values are dependant of past ones. One of the most used technical indicators is the relative strength index, proposed by J Wells Wilder [1], this technical indicator allow the user to know when an asset is overvalued and thus interesting to sell, or under evaluated, thus interesting to buy.

The RSI is in a range of $[0, 100]$, and is based on the Wilder moving average *(SMMA)* which is a standard exponential filter with smoothing constant $1/length$, many papers use instead the exponential moving average *(EMA)*, who instead use $2/(length + 1)$ as smoothing constant. The use of exponential averaging allow for an efficient calculation of the indicator, however in this paper we propose a shorter and efficient calculation of the RSI.

2 Standard Calculation

Let C_t be the closing price. The *RSI* of period $length$ is calculated as follows :

$$RSI_t = 100 - \frac{100}{1 + RS_t}$$

where RS_t is defined as the relative strength and is calculated as follows :

$$RS_t = \frac{SMMA_{length}(Up_t)}{SMMA_{length}(Dn_t)}$$

with $Up_t = max(\Delta C_t, 0)$ and $Dn_t = max(-1\Delta C_t, 0)$.

3 Proposed Calculation

We first simplify the RSI calculation by removing the relative strength RS_t, this lead to :

$$RSI_t = 100 - \frac{100}{1 + RS_t} = \frac{100 \times SMMA_{length}(Up_t)}{SMMA_{length}(Up_t) + SMMA_{length}(Dn_t)}$$

The Wilder moving average posses the form of a standard exponential filter with notation : $y_t = y_{t-1} + \alpha(x_t - y_{t-1})$ where $\alpha = 1/length$, therefore the Wilder moving average satisfies the properties of superposition, which lead to :

$$RSI_t = \frac{100 \times SMMA_{length}(Up_t)}{SMMA_{length}(Up_t + Dn_t)}$$

We can see that $Up_t + Dn_t$ simply involve taking the absolute change in the closing price C_t, therefore :

$$RSI_t = \frac{100 \times SMMA_{length}(max(\Delta C_t, 0))}{SMMA_{length}(|\Delta C_t|)}$$

4 Conclusion

In the paper an more efficient calculation of the RSI is proposed, although the original calculation is relatively efficient, the importance of indicators computation time force the trader to consider the fastest solutions for their trading system.

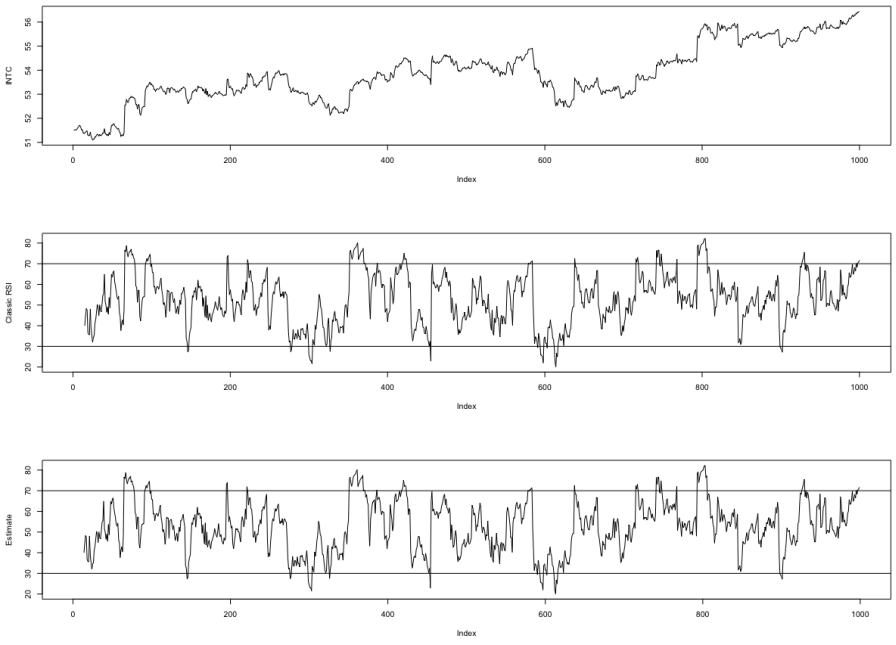

Figure 1: *The original RSI and our proposed estimate below, with both period 14 using INTC closing price*

References

[1] J. Welles Wilder, New Concepts in Technical Trading Systems, ISBN 0-89459-027-8