Evaluation of Super-Trend indicator's parameters for major FOREX pairs over 12 years

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Abstract

The Super-Trend indicator used in technical chart analysis provides signals whenever a rate change appears that excess an upper or lower border. The borders are defined by the Average-True-Rate of a given past-period-window times a defined multiplier-parameter. The Super-Trend indicator is frequently used in chart analysis like in FOREX trading, but no systematic and large-scale analysis of the parameters influence was available yet.

In this study, we used real daily rate date of major FOREX pairs of the last 12.5 years and calculated trading performance for 9,200 Super-Trend parameter pairs each. A long trade was open whenever the indicator signals an up-trend and closed if a change to down-trend occurred and vice versa for short trades.

Our analysis revealed that for some currency pairs like EUR/USD a huge parameter range delivers good results, whereas for some markets like GBP/JPY the parameter range is quite limited. Beyond, we provide an overall impression of Super-Trend's parameter robustness and suggest this methodology as a framework for further indicator evaluations. In addition, we provide optimal parameters of the Super-Trend indicator for major markets on daily basis evaluated over a time period of more than 12 years for the first time.

Introduction

Technical chart analysis (TA) tries to predict future movements of financial markets based on chart data (Wikipedia, Technical Analysis, 2011). A corner stone of TA is the use of indicators that are supposed to give relevant information of current and future price developments (Wikipedia, Technical Analysis, 2011). A multitude of indicators are available, an overview of basic concepts is given for example in (Wikipedia, Technical Analysis, 2011) or in the (VTAD Wiki).

Here, we analyzed the relatively new Super-Trend indicator as published on mql4.com (Robinson, 2008) and further described for example by Kolier (Kolier, 2010). Briefly, the indicator is a break-out indicator which provides a signal for an up- or down trend whenever the break-out border is crossed by the current price. The borders are calculated by the current price plus the Average-True Range (ATR) (Wilder, 1978) times a multiplier parameter. The ATR is an average of the True Range (Wilder, 1978) and provides a measure of the volatility. Therefore, the Super-Trend indicator gives a signal if sudden price movements exceed the expected market movements.

The Super-Trend indicator experienced an astonishing attraction with more than a million web pages (Google search 'super trend indicator', 2011/08) already. However, although widely used, no systematic and no large-scale analysis of the Super-Trend indicator is available so far. Here, we simulated trading based on Super-Trend indicators' signals for major FOREX pairs of real daily rates of the last 12.5 years. We evaluated about 10,000 Super-Trend parameters for 12 major FOREX pairs and provide novel insights into the applicability of the indicator as well as best parameter setting for the first time.

Methods

Data

Daily rate data was downloaded end of July 2011 using the History-Center of Metatrader 4 (MetaQuotes) for 12 major FOREX pairs and for the maximum available time period as shown in Table 1. Here, the open, close, high and low prices were used.

Table 1 Data used in this study.

FOREX currency pair	Oldest time point	Latest time point
AUD/USD	16/06/2003	29/07/2011
EUR/AUD	05/12/2006	29/07/2011
EUR/CHF	04/01/1999	29/07/2011
EUR/GBP	04/01/1999	29/07/2011
EUR/JPY	04/01/1999	29/07/2011
EUR/USD	04/01/1999	15/07/2011
GBP/CHF	05/01/1999	29/07/2011
GBP/JPY	04/01/1999	29/07/2011
GBP/USD	04/01/1999	29/07/2011
USD/CAD	04/01/1999	29/07/2011
USD/CHF	04/01/1999	29/07/2011
USD/JPY	04/01/1999	29/07/2011

Historical daily charts rates (Open, High, Low, Close and Volume) were available for more than 12.5 years for all pairs except AUD/USD and EUR/AUD.

Performance Evaluation

The Super-Trend indicator algorithm as published by (Robinson, 2008) was used to define an up- or down trend based on historical daily rates data. The indicator's parameter "window size" and "multiplier" were analyzed between [5 to 50] step size 1 and [0.1 to 20] step size 0.1, respectively. Shorter windows than five are hardly informative. Thus, in total 46*200 = 9,200 parameter pairs were tested for each currency pair.

Trades were opened upon any trend change indicated by the indicator and closed at the next trend change. For example, the trend is predicted to change to an up-trend a long order was opened and closed as soon as the trend is signaled to change to down-trend according to the Super-Trend indicator. If a closed order yields a loss of more than 10% of its open price than the parameter pair's performance is labeled with -1. Likewise, any simulation in which more than 30% drawback (relative to the order open price) occurs during the holding time is denoted with a performance of -1. Parameter pairs that are labeled with -1 are referred as "failed" parameter pair.

To avoid any tampering that the account-currency and its exchange rate to the currency pair and lot size is influencing the performance evaluation of the indicator, only the absolute rate difference between open and closing of the orders is noted. Just as well, swaps and further costs like commission were not considered. Therefore, the performance evaluation results need to be multiplied by a usual leverage like 100 and a margin for example like 100. With this example leverage, margin and a 0.1 lot, a performance of 0.70619 for the best parameters in EUR/USD would yield around 70,619 EUR net winnings.

Implementation

The Super-Trend indicator as well as the performance test was implemented in Delphi 2009 (CodeGear). Since the original Super-Trend indicator repaints the last bar, i.e. in MetaTrader (MetaQuotes) bar 1, we used the open price of the following bar as trading open price. In addition our simulation executes the indicator every time a new bar is started. Here, this means that each day the indicator is run upon its open time. In a MetaTrader back test this is reflected by an Open-Price simulation. The rationale here is that a sudden out-break which leads to a Super-Trend indicator signal is frequently followed by a rebound and a immediate order opening is of often found to be less efficiency than waiting until the next bar (here day).

Results

In this study, we analyzed the influence of the parameters "multiplier" and "window size" of the Super-Trend indicator (Robinson, 2008). We tested almost 10,000 parameter pairs on the 12 major FOREX currency pairs for a time frame of about 12.5 years (Table 1). Any parameter settings that yielded a draw-back of more than 30% or a single loss of 10% or more were noted as "failed". Simulated trading was based on opening an order upon a trend-change and closing it on the next trend change i.e. every time a signal of the Super-Trend indicator was issued. Leverage and margin was assumed to be 1, therefore the resulting performance values need to be multiplied to represent real net winnings. For example a leverage and margin of 100 each would means to multiply the performance value by 10,000.

Best parameters of the Super-Trend indicator for each currency pair

We found that i) for all 12 currency pairs an optimal parameter pair can be found and ii) there are striking differences with regard to the optimal parameters between the currencies. The best parameters and the best performance for the major FOREX pairs are shown in Table 2.

Table 2 Performance of Super-Trend indicator with its best parameters

Currency pair	Multiplier[1]	Window[1]	Performance[2]	Trends[3]	Failed[4]
AUD/USD	6.1	37	0.5353	25	5499
EUR/AUD	3	6	0.65311	26	1731
EUR/CHF	6.3	14	0.39043	12	0
EUR/GBP	12	28	0.20115	14	1376
EUR/JPY	12.2	10	100.623	7	4208
EUR/USD	4.4	5	0.70619	46	3680
GBP/CHF	6.3	29	0.92112	22	2042
GBP/JPY	10.6	16	171.995	9	3986
GBP/USD	8.3	10	0.81825	13	1794
USD/CAD	10.2	50	0.64825	24	1301
USD/CHF	3.1	41	0.69481	76	5227
USD/JPY	1.4	6	58.507	196	2535

[1] Multiplier and window denotes the best multiplier and window size parameter of the Super-Trend indicator
[2] Performance shows a raw net win of the simulated trading given the best parameters. As outlined in the Methods sections this raw value needs to be multiplied according to real life leverage and margin as well as lot size. For a leverage and margin of 100 and a lot size of 0.1 the multiplier would be 10,000. The best Super-Trend indicator parameters for EUR/USD would thus yield around 70,619 EUR net winnings.
[3] Trends show the number recognized trend phases i.e. how many up- and down episodes were predicted.
[4] Failed shows the number of parameter pairs that yield either more than 30% draw-back or a single loss of more than 10%. A low number indicates that the indicator is very applicable to this currency pair no matter which parameters were tested and may serve as indicator for parameter robustness.

The differences in the best parameters reflect the underlying characteristics of the markets. We further found that for the currency pairs EUR/CHF, USD/CAD, EUR/GBP only 0% to 15% of the tested parameters were reported to yield a draw back or loss beyond acceptance. In contrast in AUD/USD 59.8% of the parameter pairs failed. This gives an overall impression of the parameter robustness of

Super-Trend in each market. We suggest that this empirical measure of parameter robustness may serve to judge the indicators “trustworthy” on a given market.

A more detailed view of the parameter space and the resulting winnings is shown for EUR/USD in Figure 1. The large violet areas show parameter pairs that lead to loss, or inacceptable draw-backs.

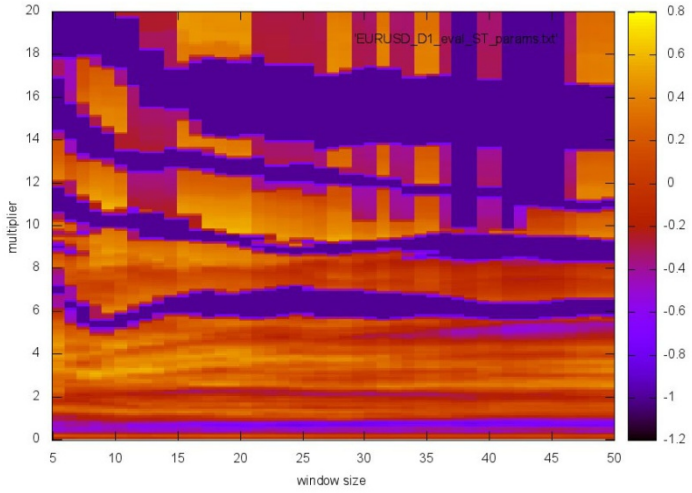

Figure 1 Super-Trend performance on EUR/USD for all tested parameter values.
Positive values indicate a net win and are colored yellow to red, negative values show a loss, inacceptable draw-backs or single losses (violet colors). It can be seen that multipliers between about 1.5 and 4 lead to winnings almost independent of the window size. In contrast larger multiplier values depend strongly on the window size and usually lead to a loss or to huge draw-backs / single negative order results. Performances need to be multiplied, e.g. with 10,000 for a leverage and margin of 100 and lot size of 0.1.

In contrast to the parameter performance of EUR/USD, for the currency pair EUR/CHF almost all larger multiplier values lead to significant net wins. Parameter space evaluation figures for all currency pairs are given in the supplements. Traders should take these characteristics under consideration whenever using the Super-Trend indicator.

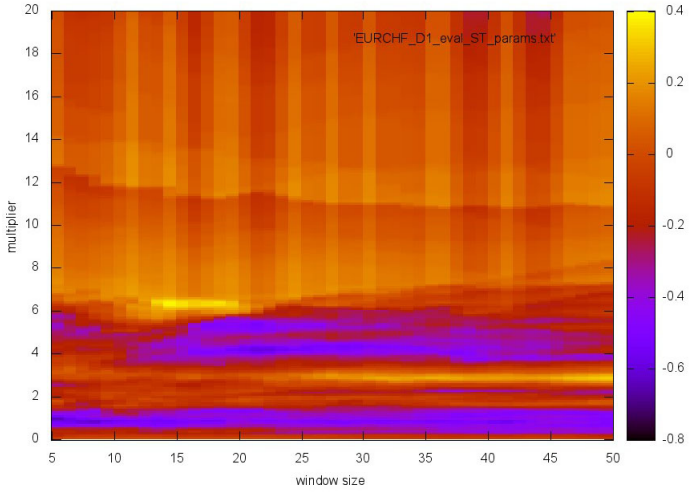

Figure 2 Super-Trend performance on EUR/CHF for all tested parameter values.
Positive values indicate a net win and are colored yellow to red, negative values show a loss, inacceptable draw-backs or single losses (violet colors). Performances need to be multiplied, e.g. with 10,000 for a leverage and margin of 100 and lot size of 0.1.

A single best parameter pair for all currency pairs

We further questioned whether a single parameter pair would be applicable to all currency pairs analyzed in this study and over the total time of the last 12.5 years. We defined an overall best performance by the averaged net wins of all currency pairs for a given parameter pair. JPY currencies were excluded here since their absolute value range would bias the average net wins of the other currencies. We found that the multiplier 7.9 and a window size of 9 provided on average the best net wins. Details of the application of this parameter setting are shown in Table 3. It can be seen that the absolute wins are significantly less if a global best parameter is used.

Table 3 Performance for overall optimal Super-Trend parameter

Currency pair	Performance[1]
AUD/USD	0.11059
EUR/CHF	0.1206
EUR/GBP	0.02121
EUR/USD	0.32266
GBP/CHF	0.57063
GBP/USD	0.44759
USD/CAD	0.3972
USD/CHF	-0.1427

[1] Performance shows a raw net win of the simulated trading given the best parameters. As outlined in the Methods sections this raw value needs to be multiplied according to real life leverage and margin as well as lot size. For a leverage and margin of 100 and a lot size of 0.1 the multiplier would be 10,000. The best Super-Trend indicator parameters for EUR/USD would thus yield around 70,619 EUR net winnings.

Discussion

We showed that the Super-Trend indicator can be a powerful indicator given right parameter settings. In our large-scale and systematic analysis, we provided its optimal parameters for 12 major FOREX currency pairs for the first time and longest time period. Further research extending the presented study may add evaluations on different time scales, randomized start/end points and different asset classes. Here, the back test simulations (on daily rate data) exceeded more than 12.5 years and showed significant differences in the characteristics of the parameter space performance. The percentage of parameter combinations that led to inacceptable results may serve as measure to estimate the parameter robustness of the Super-Trend indicator. Additionally, the presented idea of parameter robustness could be extended to further address the dependency of indicators on their parameters in general. Our presented results hopefully help to replace gut feeling with rationale in regard to parameter choice. We further give an overall best parameter recommendation and visualizations of the effects of the parameter selection.

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Supplementary Material

http://www.scientific-trading.com/research/params_ST_daily1/EURAUD_D1_eval_ST_params.jpg

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