

Strong Trends = Strong Profits

Trend Intensity Index

How strong is the trend? Find out using this index.

by M.H. Pee

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n my previous article I discussed the *trend detection index* (TDI) and showed its ability to signal the beginning of trends. In this article, I will describe another new indicator, the *trend intensity index* (TII), which is used to indicate the strength of a current trend in the market. The stronger the current trend, the more likely the market will continue moving in its current direction instead of changing course. It is during a strong trend that you should enter the market and ride along until the TII shows signs of an imminent reversal. When this happens, you should abandon your positions and prepare to place a trade in the opposite direction.

DEFINITION

To calculate a 30-day trend intensity index (TII), follow these steps:

- 1 Obtain the 60-day simple moving average by adding the closes for the past 60 days and dividing the result by 60.
- 2 Find the deviation of each of the recent 30 closes from the 60-day moving average. The deviation is up if the close is above the moving average, and down when the close is below the average. Up deviation values are obtained by subtracting the moving average from the close, while down deviations are calculated by subtracting the close from the moving average. The TII allows you to find out what percentage of these deviations is up or down. For a 30-day TII, you should have 30 deviations from the 60-day moving average.

The index formula is:

$$30\text{-day TII} = (SD+) / ((SD+) + (SD-)) * 100$$

In which:

SD+ = Sum of up deviations of the last 30 days

SD- = Sum of down deviations of the last 30 days

INTERPRETING THE TREND INTENSITY INDEX

The values of the TII show the percentage of the recent 30-day closes that are up from the 60-day moving average. The TII fluctuates between a lower limit of zero and an upper limit of



MARKETS	NET PROFIT	MAXIMUM DRAWDOWN	AVERAGE TRADE	NO. OF TRADES	% WINNERS	P/L RATIOS
T- BONDS	36,037.45	32,693.75	693.03	52	46.15	1.67
BRITISH POUNDS	28,600.00	31,825.00	572.00	50	38.00	2.11
COFFEE	92,230.00	38,868.75	1,962.34	47	46.81	1.93
CRUDE OIL	28,780.00	14,615.00	599.58	48	43.75	2.12
COPPER	13,432.50	22,062.50	268.65	50	30.00	2.83
COTTON	65,115.00	8,045.00	1,759.87	37	54.05	2.46
DEUTSCHEMARKS	10,900.00	25,687.50	253.49	43	32.56	2.35
EURODOLLARS	18,555.00	6,375.00	371.10	50	50.00	1.62
GOLD	-28,880.00	36,400.00	-555.39	52	30.77	1.31
HEATING OIL	-9,356.00	17,520.60	-173.26	54	29.63	2.07
YEN	103,250.00	14,987.50	2,458.33	42	42.86	3.10
OATS	-4,300.00	13,862.50	-91.49	47	38.30	1.39
ORANGE JUICE	48,015.00	6,210.00	1,412.21	34	50.00	3.03
SWISS FRANCS	18,862.50	28,162.50	384.95	49	44.90	1.44
SILVER	36,975.00	16,350.00	880.36	42	38.10	2.70

FIGURE 1: APPLYING THE TREND INTENSITY INDEX (TII). Applying the TII to these 15 markets using a 30-day parameter resulted in profitable trades.

100. For example, a TII value of 80 indicates that 80% of the total deviations are up. When the TII is above 50, it signals an uptrend; the sum of the up deviations is greater than that of the down deviations. When it falls below 50, a downtrend is probably occurring. The intensity of the current trend is indicated by the distance of the TII value from its neutral value of 50. The closer it is to 100, the stronger the current trend.

However, the downtrend gets stronger as the TII approaches zero. To enter the market during a strong trend, you should make a long trade at the open on the following trading day only when the TII value today is above 80. Similarly, you should open a short trade next day if the value today is below 20. Then remain with the position until the TII issues a signal to enter in the opposite direction.

THE THEORY BEHIND THE INDEX

For an ideal uptrend, each day's prices will be higher than those of the previous day. For example, a 60-day uptrend means prices were at their lowest 60 days ago and are at their highest today. The average price of this 60-day period will likely be about 30 days before today. Since it is an uptrend and each day's prices have a tendency to be higher, you can say that prices for the recent 30-day period of the 60-day uptrend are mostly above the average price formed 30 days ago. Hence, there will likely be more up deviations than down ones in the recent 30-day period. This will result in the TII having a value greater than 50, and thus indicate an uptrend. The reverse is true for a downtrend.

The trend intensity index is a profitable indicator that can trade a diverse portfolio of markets using a range of parameter values.

HYPOTHETICAL TESTING RESULTS

The TII is tested as a reversal system, which means that after entering long or short, the position is held until a reverse entry is given by the index. To enter long, the TII must be above 80, and to enter short, the index must be below 20. I tracked TII from January 4, 1982, to December 31, 1998. The results are displayed in Figure 1. During this 16-year period, only one contract was allowed per entry, and a deduction of \$75 was made for each trade as a compensation for commissions and slippage. The close on December 31, 1998, was automatically taken as the exit for all positions still open at the end of this testing period.

To avoid curve-fitting the TII to past data, the same parameters were used to trade all 15 markets. Continuous contracts were used to simplify the testing, eliminating the need to roll over from the expiring contract to an active one while retaining the validity of the testing results. All performance statistics presented here are corrected to two decimal places.

Trading a portfolio of the 15 markets tested resulted in a total of 697 trades with 40.6% TII accuracy. The average trade was \$657.41, total net profit was \$458,216.50, profit/loss ratio was 2.13, and the maximum closed trade drawdown

was \$85,310.60. This produced an annual compounded rate of return of about 25%, if the account size used to trade the portfolio for the 16 years equals the sum of the maximum closed trade drawdown and the portfolio total margin of \$29,433.

CALCULATING THE RULES

The trend intensity index (TII) can be calculated using an Excel spreadsheet (sidebar Figure 1). The data given in the spreadsheet following, which stretches from September 23, 1998, to December 31, 1998, is from the yen and is in continuous contract format. Hence, these values may not reflect the actual prices on those dates. This, however, does not in any way affect the trading signals and testing results. Daily data is used with the date, open, high, low, and close recorded in columns A, B, C, D, and E, respectively. Other values vital for the calculation of the TII are also included in the other columns for easy reference. The date is recorded using six digits, with the first two representing the year, the next two the month, and the last two the year. As an example, the number 980923 represents September 23, 1998.

To calculate the 30-day TII, you must first obtain the 60-day simple moving average. You will be able to find this by summing the closes (shown in column E) of the last 60 days and dividing the result by 60. The 60-day moving average is recorded in column F. Enter the formula below in cell F61 and copy it down to the bottom of the spreadsheet:

$$=AVERAGE(E2:E61)$$

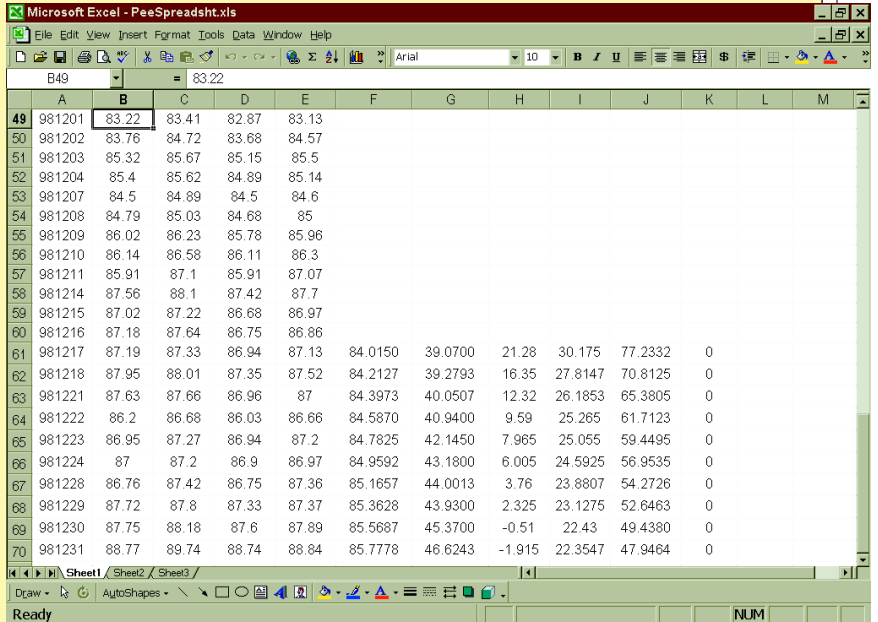
Column G indicates the sum of the up and down deviations for the past 30 days. These up and down deviations are the difference between the closes of the last 30 days and the 60-day moving average obtained in column F. It actually shows the denominator of the TII equation. In Excel format, it is represented by the formula below. Enter it in cell G61 and copy it to the bottom of the spreadsheet:

$$=ABS(E32-F61)+ABS(E33-F61)+ABS(E34-F61)+ABS(E35-F61)+ABS(E36-F61)+ABS(E37-F61)+ABS(E38-F61)+ABS(E39-F61)+ABS(E40-F61)+ABS(E41-F61)+ABS(E42-F61)+ABS(E43-F61)+ABS(E44-F61)+ABS(E45-F61)+ABS(E46-F61)+ABS(E47-F61)+ABS(E48-F61)+ABS(E49-F61)+ABS(E50-F61)+ABS(E51-F61)+ABS(E52-F61)+ABS(E53-F61)+ABS(E54-F61)+ABS(E55-F61)+ABS(E56-F61)+ABS(E57-F61)+ABS(E58-F61)+ABS(E59-F61)+ABS(E60-F61)+ABS(E61-F61)$$

Column H indicates the difference between the sum of the up deviations of the last 30 days and the sum of the down deviations of the same period. This is done by multiplying the moving average in column F by 30 and subtracting the result from the sum of the recent 30 closes. To perform the calculation, enter the formula below in cell H61 and copy it down to the bottom:

$$=SUM(E32:E61)-30*F61$$

Column I shows the sum of the up deviations from the last 30 days. This is the numerator of the TII formula. Enter the



SIDEBAR FIGURE 1: TREND INTENSITY INDEX

formula below in cell I61 and copy it down the bottom of the spreadsheet:

$$=IF(H61>0,(G61-H61)/2+H61,(G61+H61)/2)$$

Finally, column J represents the 30-day TII. This is obtained by dividing the value in column I by that in column G and then multiplying the result by 100. The Excel code given below should be entered into cell J61 and copied down to the bottom of the spreadsheet.

$$=I61/G61*100$$

Column K shows the position that should be in the market the very next day, with the number 1 indicating a long position, -1 a short position, and zero a neutral one. Enter the following formula in cell K61 and copy it down to the bottom:

$$=IF(J61>80,1,IF(J61<20,-1,K60))$$

Column L indicates the entry price of a trade for the following day. A blank indicates that no trade is being made that day. Enter the code below in cell L61 and copy it down to the very last row of the spreadsheet:

$$=IF(K60=K61,"",B62)$$

Column M displays the trading signals for the next day. A trading signal will appear only in the row of the last data input. All the other cells will be blank. Enter the following lines in cell M61 and copy it down to the end of the spreadsheet:

$$=IF(A62="",IF(A61="",IF(M61=M60,"REMAIN WITH CURRENT POSITION",IF(M61=1,"ENTER LONG AT TOMORROW OPEN",IF(M61=-1,"ENTER SHORT AT TOMORROW OPEN"))),"$$

—MHP

FIGURE 2: USING DIFFERENT PARAMETERS. The system proved that it is robust by remaining profitable when different parameters were used.

	20 DAYS	25 DAYS	30 DAYS	35 DAYS	40 DAYS
NET PROFIT	504,964.90	537,683.50	458,216.50	395,568.50	348,429.80
MAXIMUM DRAWDOWN	80,908.00	68,638.85	85,310.60	65,492.45	79,655.60
% RETURN	28.60	34.27	24.96	26.04	19.96
NO. OF PROFITABLE MARKETS OUT OF 15	15	13	12	13	11
AVERAGE TRADE	465.83	624.49	657.41	638.01	615.60
NO. OF TRADES	1084	861	697	620	566
% WINNERS	39.85	39.26	40.60	38.23	39.58
P/L RATIO	2.15	2.35	2.13	2.28	2.11

ROBUSTNESS OF THE INDEX

The TII is profitable for trading most of the 15 markets, but how does it perform using other parameter values? If the results are constantly profitable across other parameter values, there is a higher probability of TII being favorable, since it would prove that the index is robust across markets and across parameters. Thus, even if you do not use the optimal parameter value for trading, you still will not suffer losses, since the index itself is profitable over a range of parameter values. Moreover, it is almost impossible to know what the optimal parameter value for the future will be, since the best-performing parameter in the past will not necessarily be the most profitable in the future.

Figure 2 shows the results of testing the TII using parameter values of 20, 25, 35, and 40 days using identical rules for entry and exit. Using the same portfolio of 15 markets, it is evident that using different parameter values still results in profitability. This shows that the trend intensity index is robust across parameters and does not have to be curve-fitted to past data. If you look at the number of profitable markets out of the 15 tested, the best performance is when the parameter value is set at 20 days; with this parameter, all 15

markets are profitable. The worst performance is when a 40-day parameter is used, and 11 out of 15 markets are profitable — approximately 75%.

CONCLUSION

Although the testing results of the TII are somewhat inferior to the TDI, it is still a robust and profitable indicator that can trade a diverse portfolio of markets profitably using a range of parameter values. Treat it as another indicator to add diversity to your collection of trading tools. By exercising your creativity, you may even come up with a better way of using the TII.

M.H. Pee specializes in system development and has developed numerous systems, some of which are tracked by Futures Truth (www.futurestruth.com).

SUGGESTED READING

Pee, M.H. [2001]. "Trend Detection Index," *Technical Analysis of STOCKS & COMMODITIES*, Volume 19: October.

†See *Traders' Glossary* for definition

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