

CALCULATING TSI

Calculating the true strength index requires an introduction to exponentially smoothed moving averages (EMA):

Exponential Moving Average—The EMA for day D is calculated as: $EMA_D = \alpha PR_D + (1-\alpha)EMA_{D-1}$ where PR is the price on day D and α (alpha) is a smoothing constant ($0 < \alpha < 1$). Alpha may be estimated as $2/(n+1)$, where n is the simple moving average length.

The one-day changes in price are smoothed using an EMA for calculating the TSI. Momentum (column C) is the net change in price for today from yesterday. Column D is the absolute value of the one-day change in price. The first smoothing is a 14-day exponential moving average. The constant for the smoothing is $2/(14+1) = 0.1333$. First, the constant is subtracted from 1, with the result multiplied by yesterday's EMA value. Then the constant is multiplied by

the change in price today and then added to the new EMA value. The result is listed in column E. The next step toward calculating TSI is to smooth the 14-day EMA smoothed value with a three-day EMA (column F). The three-day EMA uses a new constant $2/(3+1) = 0.50$. The steps to the smoothing are the same, except the 14-day EMA values are being smoothed—hence, the term double smoothing. This result is the numerator for the TSI. The numerator is also used as the standalone directional indicator. The denominator is calculated by smoothing the absolute value of the momentum (column D) with, first, the 14-day EMA (this result is shown in column G). The results of this smoothing is smoothed a second time with a three-day EMA (column H). The final calculation to TSI (column I) is to divide column F by column H. Each cell's formula is shown at the bottom of each column. —*Editor*

A	B	C	D	E	F	G	H	I
Date	Close	Momentum	Absolute Value (Mtm)	14-day EMA of (Mtm)	3-day EMA of (14-day EMA of (Mtm))	14-day EMA	3-day EMA	TSI
910121	335.75	-0.9	0.9	-0.90	-0.90	0.9	0.9	-1.00
910122	332.55	-3.2	3.2	-1.21	-1.05	1.21	1.05	-1.00
910123	334.15	1.6	1.6	-0.83	-0.94	1.26	1.16	-0.82
910124	339.60	5.45	5.45	0.00	-0.47	1.82	1.49	-0.32
910125	340.75	1.15	1.15	0.16	-0.16	1.73	1.61	-0.10
910128	339.55	-1.2	1.2	-0.02	-0.09	1.66	1.63	-0.05
910129	339.60	0.05	0.05	-0.01	-0.05	1.44	1.54	-0.03
910130	345.20	5.6	5.6	0.73	0.34	2.00	1.77	0.19
910131	347.60	2.4	2.4	0.96	0.65	2.05	1.91	0.34
910201	346.20	-1.4	1.4	0.64	0.65	1.96	1.94	0.33
		=B12-B11	=ABS*(B12-B11)	=0.1333*(C12) + (1-.1333)*E11	=0.5*(E12) + (1-.5)*F11	=0.1333*(D12) + (1-.1333)*G11	=0.5*(G12) + (1-.5)*H11	=F12/H12