



New Applications

Identify The Start Of A Trend With DMI

Improve on certain directional movement index signals such as identifying the start of a trending move and picking market tops and bottoms.

by BC Low, CMT

Directional movement index (DMI) is a long-accepted and popular technical indicator created by J. Welles Wilder to establish the existence of a trend in a market using three lines — ADX, +DI, and -DI. This article shows that the same three lines can be used to significantly improve on certain DMI signals to identify the start of a trending move and to pick market tops and bottoms. The new variations in this article feature clusters of three ADX lines, three +DI lines, and three -DI lines instead of the original three lines.

DIRECTIONAL MOVEMENT INDEX

ADX signal: Average directional movement index (ADX) signals a trending market when the ADX (14 periods) is above level 20 and rising. But ADX itself does not indicate whether the market is trending up or down. That signal is provided by +DI and -DI.

After ADX has risen to the 50 level and turns down, its decline represents a retracement. If there was an uptrend previously, then the declining ADX signals a correction down. If there was a downtrend previously, then the declining ADX signals a correction up.

When ADX declines to below 20 again, the market is non-trending until it rises above 20. Then the market trends again (Figure 1).

+DI & -DI Signals: The +DI and -DI indicates whether a market is trending up or down. When the ADX is rising above 20 and if +DI is positioned above ADX and rising, then the market is trending *up*. If ADX is rising above 20, and -DI is positioned above ADX and also rising, then the market is trending *down*.

Basically, when price rises,

CHRISTINE MORRISON

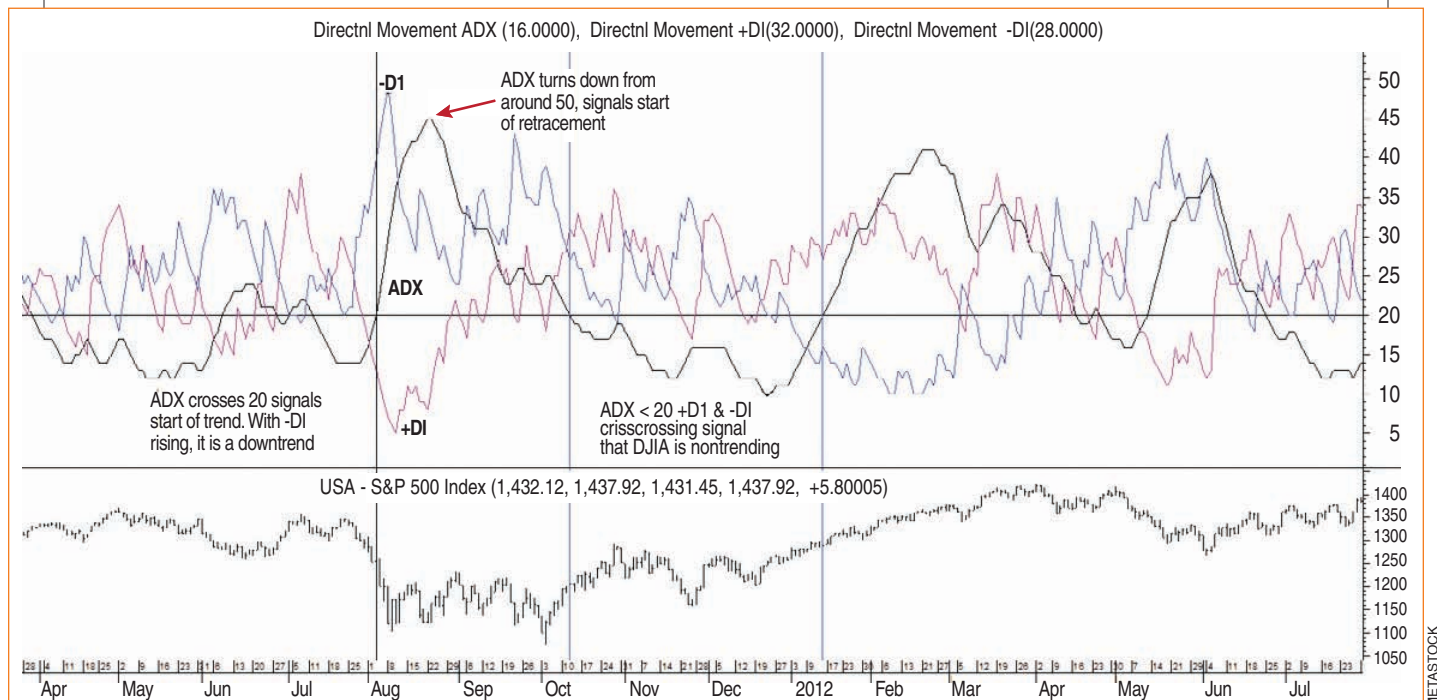


FIGURE 1: BASIC DMI SIGNALS: ADX, +DI, -DI. ADX signals a trending market when the ADX (14 periods) is above level 20 and rising. But ADX itself does not indicate whether the market is trending up or down. That signal is provided by +DI and -DI.

+DI will rise but -DI will fall. When price falls, -DI will rise, and +DI will fall. In other words, +DI and -DI are mirror images of each other.

In a strongly trending market, because the two DI lines mirror each other, the DI lines will move in opposite directions, thus opening up a sizable distance between them. In a congesting market, however, as price does not move strongly in either direction, the DI lines do not move away from each other; in fact, they tend to end up crossing each other (Figure 1).

TAC-DMI CLUSTERS

Although Wilder created the DMI and is due all credit for it, I added the acronym "TAC" to the name of this new technical tool to reflect the following modifications I incorporated into it:

- The TAC-DMI clusters feature three clusters consisting of three ADX lines, three +DI lines, and three -DI lines each plotted separately.
- The triple ADX cluster (3x ADX) gives the *timing* that signals the start of a *strong* trending move before it actually begins, and also the end of a trending move.
- Together with the triple ADX cluster, the triple +DI cluster (3x +DI) can provide the timing signal for an intermediate or major bottom of a trending move.
- Together with the triple ADX cluster, the triple -DI cluster (3x -DI) can provide the timing signal for an intermediate or major top of a trending move.

In a strongly trending market, because the two DI lines mirror each other, the DI lines will move in opposite directions.



3x ADX CLUSTER

The structure of 3x ADX: The three ADX lines are based on three, four, and five periods so as to have greater sensitivity

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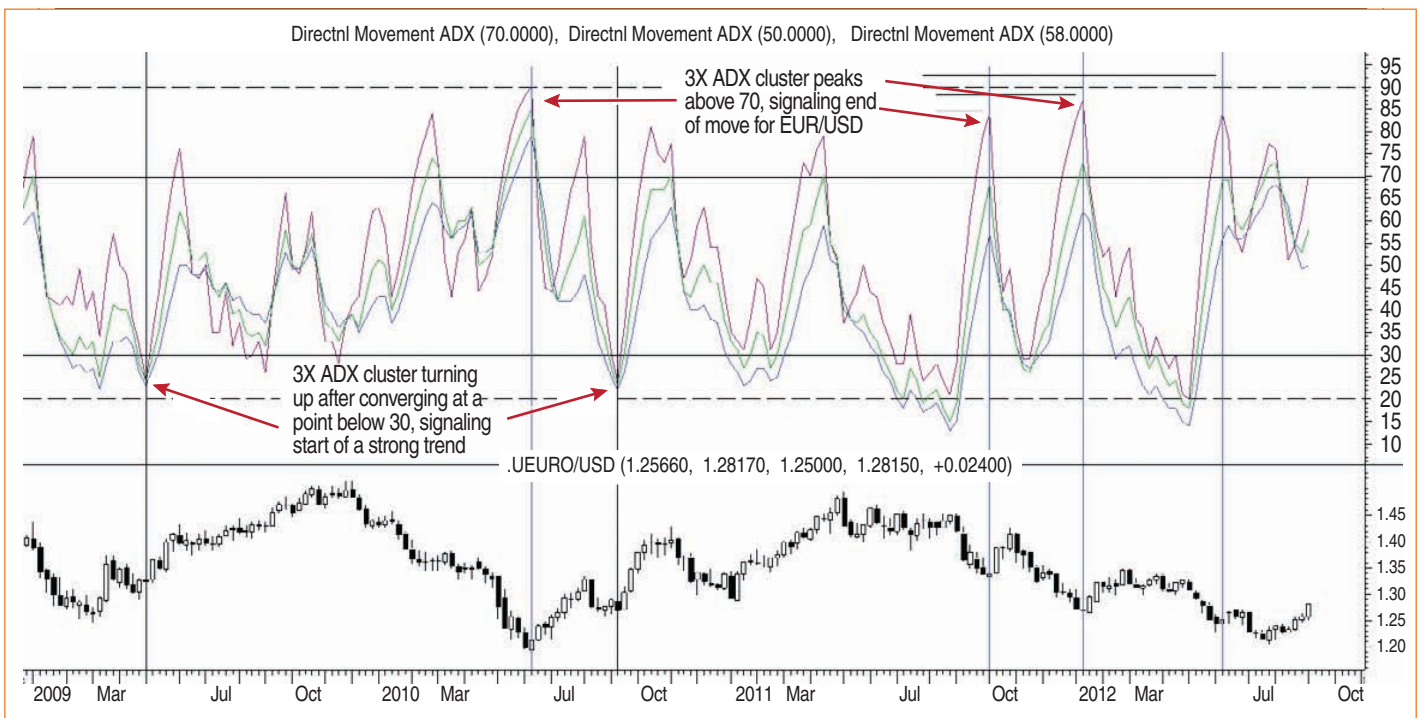


FIGURE 2: START AND END OF TRADE. When the 3x ADX cluster converges below 30 and turns up, it signals the start of a trend. When the 3x ADX cluster peaks above 70 and turns down, it signals the end of the move.

in the indicator. (Original formulation used 14 periods.) The basic Y-axis reference levels are 30 and 70, while the critical Y-axis reference levels are 20 and 90.

Signal 1: Start of a trend when 3x ADX cluster converges below 30

As a market congests, the 3x ADX cluster drifts down below level 30. Once below 30, the signals to watch for are:

- All 3x ADX lines converging at one point
- The 3x ADX lines turning up after converging at one point.

The 3x ADX cluster turning up from <30 after converging at one point represents a good signal for the start of a new trending move (see Figures 2 and 3).

If the 3x ADX cluster falls to <20 and turns up from <20

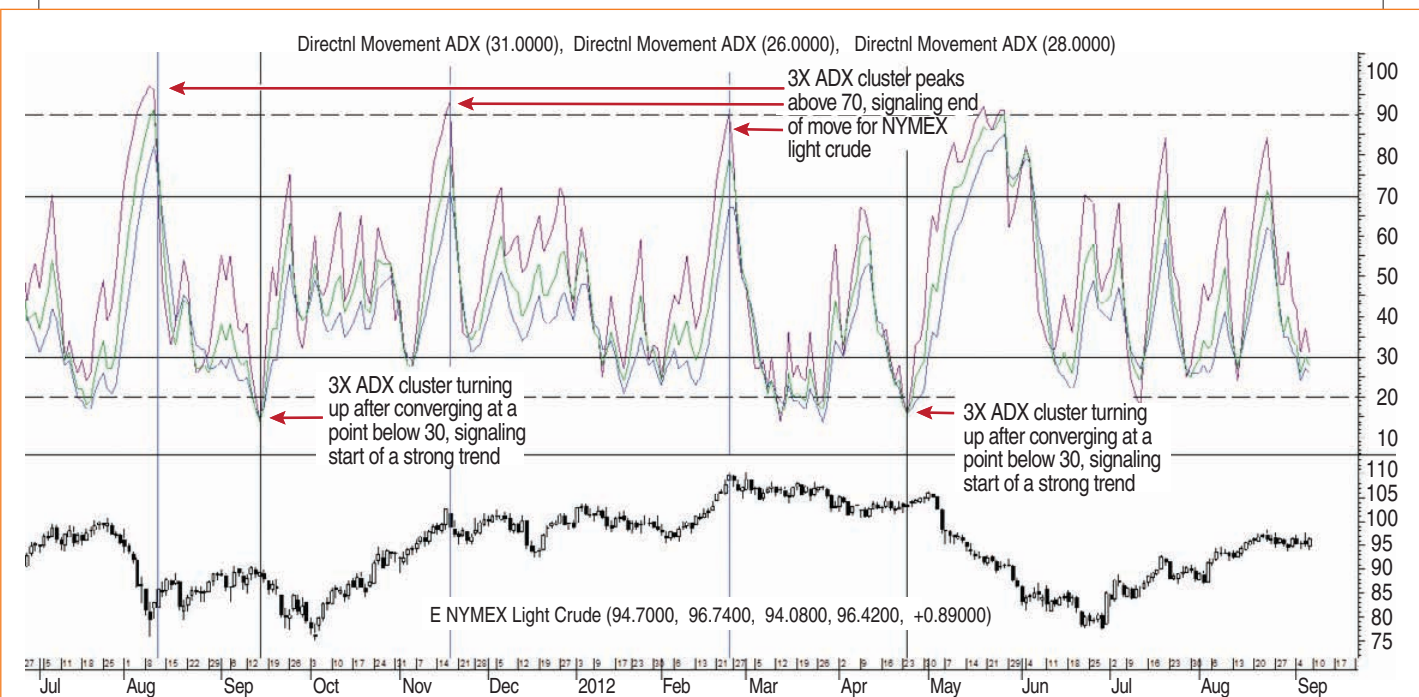


FIGURE 3: START AND END OF TREND ON THE NYMEX LIGHT CRUDE. The trend starts when the 3x ADX cluster converges below 30 and turns up. The second signal shows the end of the move when 3x ADX cluster peaks above 70 and turns down.

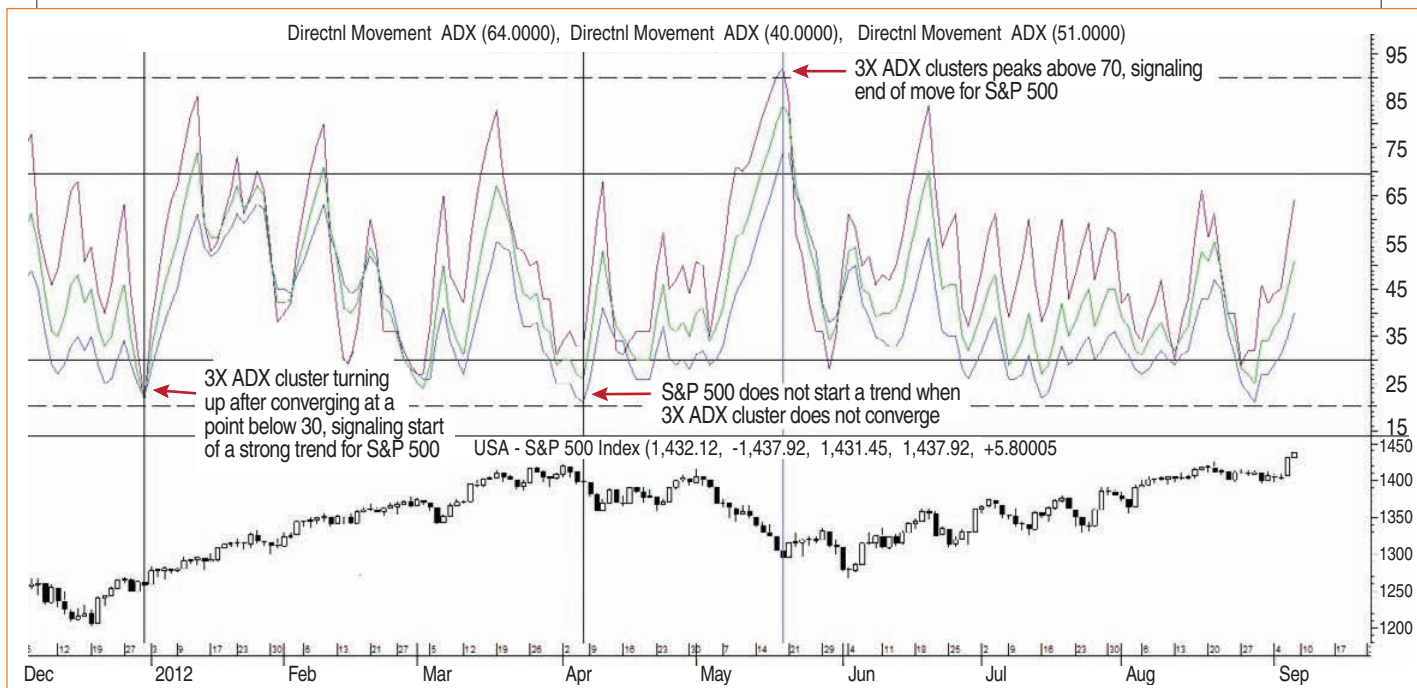


FIGURE 4: LACK OF TREND. The S&P 500 does not start a trend when 3x ADX cluster does not converge at one point.



There can be situations when the 3x ADX cluster turns up below 20 or 30, but without converging. These situations tend not to result in good trending moves.

after converging at one point, it signals the start of an even stronger trending move.

Note that when a trending move starts in any of these situ-

ations, the market is not at a low or high point; it is normally at an intermediate level.

There can be situations when the 3x ADX cluster turns up either below 20 or 30 level, but without first converging at one point. These situations tend not to result in good trending moves (see Figure 4).

Signal 2: End of a move when 3x ADX cluster turns down above 70

When the market is trending, the 3x ADX cluster is above 20 and rising. After the price has made a sizable move, the smallest ADX line (three-period) will rise above level 70. When the ADX cluster *peaks* and turns down above 70, the signal is for a retracement of the previous trending move, or even the end of the move (Figures 2 and 3).

If the market is in an exceptionally strong trend, the 3x ADX cluster may resume up after dipping below 70. This can lead to yet another 3x ADX peak before it turns down again.

Also in an exceptionally strong trend, the 3x ADX cluster will reach 90, which is a strong signal for a turn of the previous trend (Figures 2 and 3).



3x +DI AND 3x -DI CLUSTERS

The structure of 3x +DI and 3x -DI clusters: Both +DI and -DI lines are based on five, eight, and 14 periods. Five and eight are Fibonacci numbers, while 14 is the original DMI parameter used. The basic reference levels are 10 and 50, while the critical reference level is 5.

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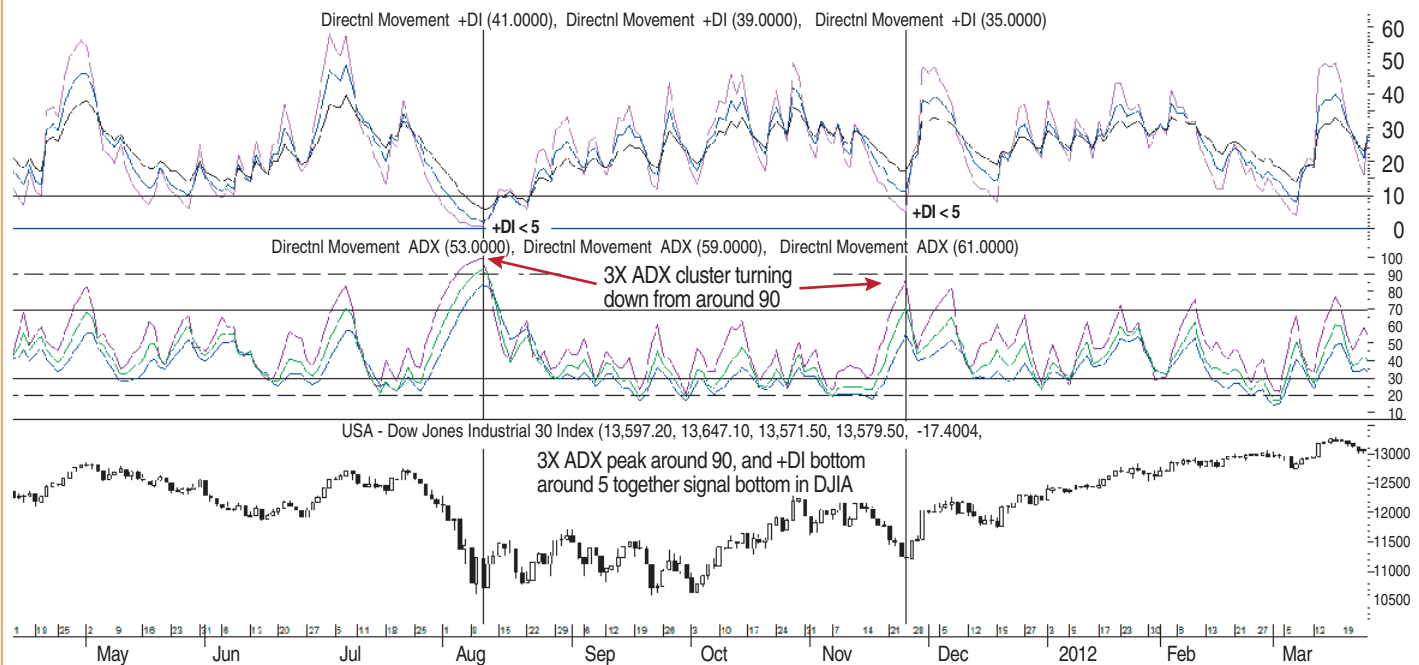


FIGURE 5: MARKET BOTTOM. The market bottom is signaled by 3x ADX cluster peak at 90 and 3x +DI cluster bottom at 5.



3x +DI CLUSTER

Signal 3: Signaling market bottom with +DI at Level 5

In a downtrend, the 3x +DI cluster declines. When the cluster reaches the basic reference level of 10, it is a signal that a market *bottom* may be reached soon. When the smallest of the 3x +DI cluster lines reaches level 5, it is a signal that a reversal *up* is imminent. This reversal is confirmed when the 3x +DI cluster actually turns up from

level 5 (Figure 5).

Signal 3: Signaling market bottom by combining 3x +DI cluster with 3x ADX cluster


The 3x +DI bottom signal described here is doubly confirmed when it is combined with the topping off of the 3x ADX cluster.

When a strong trend has brought the 3x ADX cluster to 90, watch for the 3x +DI cluster bottoming at level 5. When *both* clusters turn at the same time — that is, the 3x ADX cluster turns down from 90 — and the 3x +DI cluster turns up from level 5, it is double confirmation that a market bottom is formed, and a strong *buy* signal is in place (Figure 5).

3x -DI CLUSTER

Signal 4: Signaling market top with -DI at level 5

In an uptrend, the 3x -DI cluster falls. When the cluster reaches the basic reference level of 10, it is a signal that a market *top* may be reached soon. When the smallest of the 3x -DI cluster



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THE ADX

The calculation of the average directional movement (ADX) indicator is built on the intuitive notion that a trend is a series of price ranges extending in a consistent direction.

In sidebar Figure 1, example A, the second day's trading range is higher than the first day's trading range, indicating positive directional movement. In example B, the second day's trading range is below the first day's trading range, an indication of negative directional movement. Example C is more complicated because the second day's range is both lower and higher than the first day's range.

Directional movement is only considered to be up, down, or not present. Therefore, the larger part of the day's range extending beyond the previous day's range is used to identify directional movement. In example C, the largest part of the second day is higher; consequently, the directional movement is positive. In example D, the largest part of the second day's range is lower so that the directional movement is negative. In example E, the second day's range is within the first day's range so the directional movement is zero.

Directional movement for the ADX is expressed as a function of true range (TR). True range is the largest of the following:

- 1 The difference between today's high and today's low
- 2 The difference between today's high and yesterday's close
- 3 The difference between today's low and yesterday's close.

In the Excel 4.0 spreadsheet (sidebar Figure 2), the first calculation for ADX is the true range value. This is performed in column E. The formula for cell E3 is:

`=MAX(B3-C3,ABS(B3-D2),ABS(C3-D2))`

Next, column F determines the positive directional movement or returns zero if there is no positive directional movement. The formula for cell F3 is:

`=IF(B3-B2>C2-C3,MAX(B3-B2,0),0)`

Column G calculates the negative directional movement or returns zero if there is no negative directional movement. The formula for cell G3 is:

`=IF(C2-C3>B3-B2,MAX(C2-C3,0),0)`

The daily calculations are volatile and so the data needs to be smoothed. First, sum the last 14 periods for TR, +DM and -DM. The formula for summing the TR is in cell H16:

`=SUM(E3:E16)`

The formula for summing the +DM is in cell I16:

`=SUM(F3:F16)`

The formula for summing the -DM is in cell J16:

`=SUM(G3:G16)`

The smoothing formula for the TR14 column begins at cell H17:

`=Round((TRUNC((H16-(H16/14)+E17),3),2)`

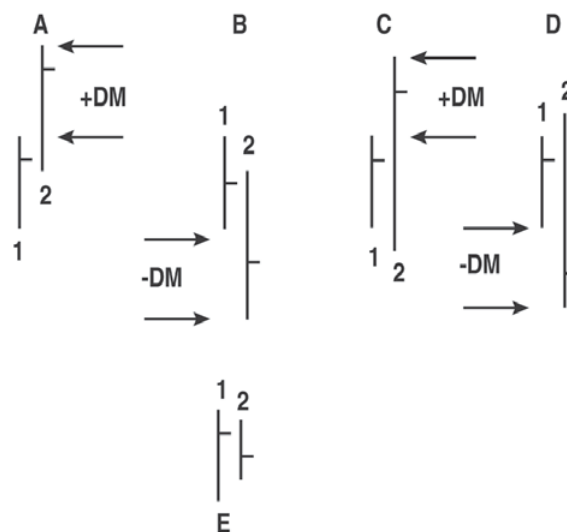
The smoothing formula subtracts 1/14th of yesterday's TR14 from yesterday's TR14 and then adds today's TR value. The rounding (truncating function is used to calculate the indicator as close as possible to the developer of the ADX's original form of calculation (which was done by hand).

The smoothing formula for the +DM14 column begins at cell I17:

`=Round((TRUNC((I16-I16/14)+F17),3),2)`

The smoothing formula subtracts 1/14th of yesterday's +DM14 from

Directional Movement Examples



SIDEBAR FIGURE 1: DM EXAMPLES

yesterday's +DM14 and then adds today's +DM value. The smoothing formula for the -DM14 column begins at cell J17:

`=Round((TRUNC((J16-(J16/14)+G17),3),2)`

The smoothing formula subtracts 1/14th of yesterday's -DM14 value from yesterday's -DM14 and then adds today's -DM value. Now we have a 14-day smoothed sum of TR, +DM and -DM. The next step is to calculate the ratios of +DM and -DM to TR. The ratios are called the +directional indicator (+DI) and -directional indicator (-DI). The formula for the +DI column begins at cell K16:

`=Round((100*(I16/H16)),0)`

The formula for the +DI column begins at cell L16:

`=Round((100*(J16/H16)),0)`

The INT (integer function) is used because the original developer dropped the values after the decimal in the original work on the ADX indicator. The next step is to calculate the absolute value of the difference between the +DI and the -DI. This is done in column M and the formula for cell M16:

`=ABS(K16-L16)`

The next column calculates the sum of the +DI and -DI. The formula for cell N16:

`=K16+L16`

The next step is to calculate the DX, which is the ratio of the absolute value of the difference between the +DI and the -DI divided by the sum of the +DI and the -DI. This is done in column O. The formula for cell O16:

`=Round(100*(M16/N16),0)`

The final step is smoothing the DX to arrive at the value of the ADX. First, average the last 14 days of DX values. The formula for cell P28:

`=AVERAGE(O15:O28)`

The smoothing process uses yesterday's ADX value multiplied by 13, and then add today's DX value. Finally, divide this sum by 14. The formula for cell P29:

`=Round((((P28*13)+O29)/14),0)`

—S&C

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Date	High	Low	Close	TR	+DM	-DM	TR14	+DM14	-DM14	+DI14	-DI14	DI	DI	DX	ADX
2	920102	417.27	411.04	417.26									DIFF	SUM		
3	920103	419.79	416.16	419.34	3.63	2.52	0.00									
4	920106	419.44	416.92	417.96	2.52	0.00	0.00									
5	920107	417.96	415.20	417.40	2.76	0.00	1.72									
6	920108	420.23	415.02	418.10	5.21	2.27	0.00									
7	920109	420.50	415.85	417.61	4.65	0.27	0.00									
8	920110	417.62	413.31	415.10	4.31	0.00	2.54									
9	920113	415.36	413.54	414.34	1.82	0.00	0.00									
10	920114	420.44	414.32	420.44	6.12	5.08	0.00									
11	920115	421.18	418.79	420.77	2.39	0.74	0.00									
12	920116	420.85	415.37	418.21	5.48	0.00	3.42									
13	920117	419.45	416.00	418.86	3.45	0.00	0.00									
14	920120	418.86	415.80	416.36	3.06	0.00	0.20	TR14	+DM14	-DM14	+DI14	-DI14	DI	DI	DX	ADX
15	920121	416.39	411.32	412.64	5.07	0.00	4.48						DIFF	SUM		
16	920122	418.13	412.49	418.13	5.64	1.74	0.00	56.11	12.62	12.36	22	22	0	44	0	
17	920123	419.78	414.36	414.96	5.42	1.65	0.00	57.52	13.37	11.48	23	19	4	42	9	
18	920124	417.27	414.29	415.48	2.98	0.00	0.07	56.39	12.41	10.73	22	19	3	41	7	
19	920127	416.84	414.48	414.99	2.36	0.00	0.00	54.72	11.53	9.96	21	18	3	39	7	
20	920128	416.41	414.54	414.96	1.87	0.00	0.00	52.69	10.70	9.25	20	17	3	37	8	
21	920129	417.83	409.17	410.34	8.66	0.00	5.37	57.58	9.94	13.96	17	24	7	41	17	
22	920130	412.17	409.26	411.62	2.91	0.00	0.00	56.38	9.23	12.96	16	22	6	38	15	
23	920131	412.63	408.64	408.78	3.99	0.00	0.62	56.34	8.57	12.65	15	22	7	37	18	
24	920203	409.95	407.45	409.53	2.50	0.00	1.19	54.82	7.96	12.94	14	23	9	37	24	
25	920204	413.85	409.28	413.85	4.57	3.90	0.00	55.47	11.29	12.02	20	21	1	41	2	
26	920205	416.17	413.18	413.84	2.99	2.32	0.00	54.50	12.80	11.16	23	20	3	43	6	
27	920206	414.55	411.93	413.82	2.62	0.00	1.25	53.22	11.88	11.61	22	21	1	43	2	
28	920207	415.29	408.04	411.09	7.25	0.00	3.89	56.67	11.04	14.67	19	25	6	44	13	10
29	920210	413.77	411.07	413.77	2.70	0.00	0.00	55.32	10.25	13.62	18	24	6	42	14	10
30	920211	414.38	412.24	413.76	2.14	0.61	0.00	53.51	10.12	12.65	18	23	5	41	12	10

SIDEBAR FIGURE 2: MICROSOFT EXCEL

lines reaches level 5, it is a signal that a reversal *down* is imminent. This reversal is confirmed when the 3x -DI cluster actually turns up from level 5 (Figure 6).

Signal 4: Signaling market top by combining -3x ADX cluster with 3x ADX cluster

The 3x -DI bottom signal described is doubly confirmed when it is combined with the topping off of the 3x ADX cluster.

When the 3x ADX cluster peaks at 90 and turns down, watch for the 3x -DI cluster bottoming at level 5. When *both*

clusters turn at the same time — that is, the 3x ADX cluster turns down from 90 — and the 3x -DI cluster turns up from level 5, it is double confirmation that a market top is formed, and a strong *sell* signal is in place (Figure 6).

CONCLUSION

These signals are applicable in all time frames: daily, weekly, and beyond. But in the weekly and larger time frames, the impact of the signals is far greater, as you can see from Figure 6.

The expanded structure of the three-line clusters makes the

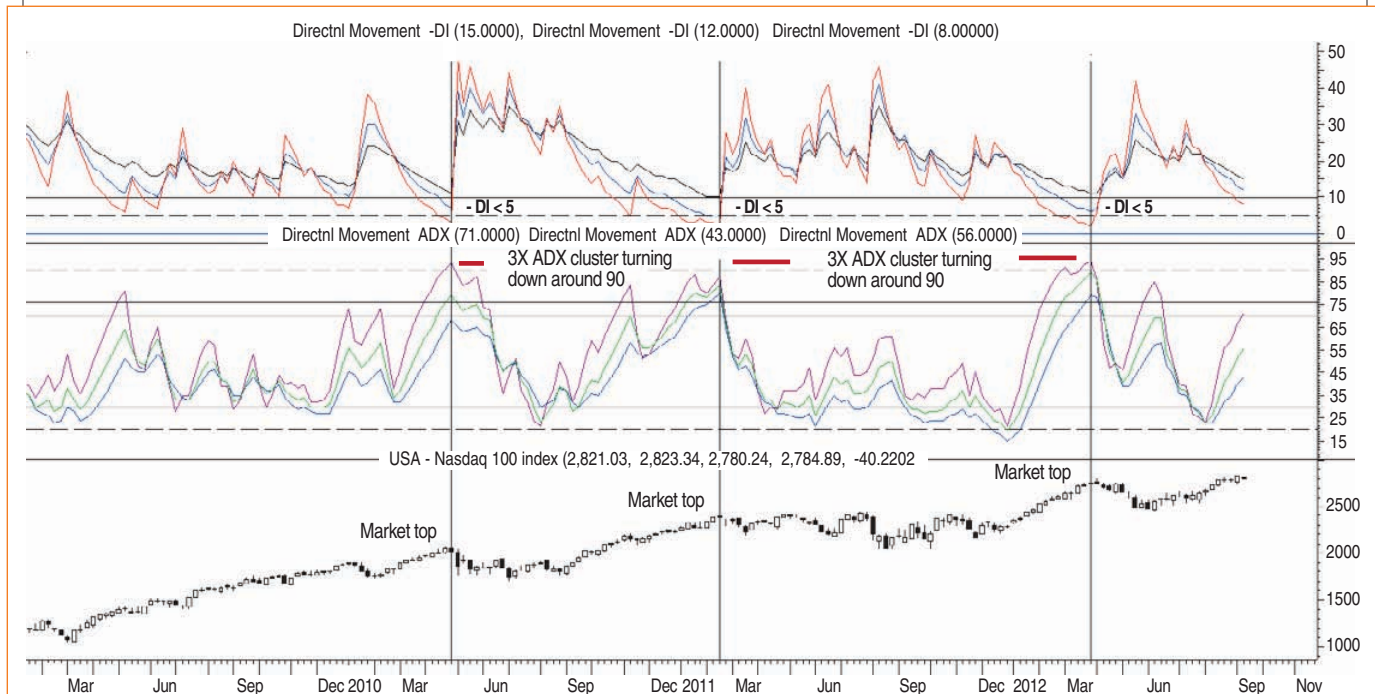
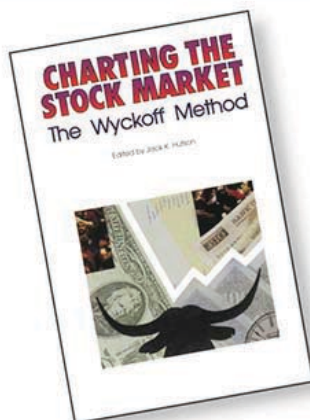


FIGURE 6: MARKET TOP. On this weekly chart of the NASDAQ Composite, the market top is signaled by the ADX cluster peak at 90 and the 3x -DI cluster bottom at 5.



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turning points of all three clusters much clearer. In the case of the ADX cluster, it is only with the cluster that we can differentiate the single-pointed turn from the “looser” turn. And with this difference, a new signal is created.

The combination of the +DI and -DI clusters with the ADX clusters also reduces the risk when you rely on only one set of indicators. These new applications of DMI should help traders achieve a more accurate reading of the markets and better trading results.

BC Low has been a teacher and practitioner of technical analysis since 1990. He was previously a technical analyst at Merrill Lynch International Bank in Singapore and a senior lecturer in Singapore Polytechnic, where he pioneered the teaching of technical analysis. He is currently the president of the Singapore Technical Analysts & Traders Society, and president of Technical Analysis Consultancy. He may be reached at bclow83@yahoo.com.sg.

SUGGESTED READING

Evens, Stuart [1999]. “Directional Movement,” *Technical Analysis of STOCKS & COMMODITIES*, Volume 17: February.

Low, BC [2010]. “Trading, Time Frames, And Trends,” *Technical Analysis of STOCKS & COMMODITIES*, Volume 28: September.

‡MetaStock (Thomson Reuters)

See Traders’ Tips section beginning on page 66 for commentary and implementation of BC Low’s technique in various technical analysis programs. Accompanying program code can be found in the Traders’ Tips area of Traders.com.

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