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MOMENTUM: DEFINITIONS AND BASIC CONCEPTS

Before discussing a technical indicator or a trading approach, it's helpful to understand the basic concepts upon which it's based. Those indicators commonly lumped together under the banner of momentum oscillators have at their core a fundamental aspect of price behavior, *momentum,* which refers to the rate at which prices change rather than absolute price differences. It is often compared to speed (s) or velocity: $s = d/t$, where d is the distance covered and t is time. In market terms, momentum (m) can be defined by substituting the change in price of a particular asset for the change in distance in the speed formula: $m = \Delta p/t$, where Δp is the change in price and t is time. Momentum's significance lies in the information it conveys about price direction and strength; it can measure both the direction and strength of a particular price move, two key pieces of trading information.

Momentum is closely tied to the concepts of trend and directional price movement. The distinguishing characteristic of a trend is sustained price gains or losses over a particular time period. If the price of a particular instrument rises from

10 to 100, the absolute price difference is 90; this change, however, represents a completely different type of market environment if it occurs over 10 days than if it occurs over 10 weeks. The greater the directional price change over a given time period, the greater the speed, or momentum, of the market. From a longer-term perspective, strong momentum implies a healthy price trend; weak momentum suggests a price move that may be approaching its end—in the form of a temporary pause, a short-term correction, or a reversal. However, extreme momentum readings often accompany shorter-term exhaustion points, identifying places where a market may be overextended (having risen or fallen too far too fast) and is due for a correction. It's important to note that although these price/ momentum relationships are common and easily observable, they are not universal; important exceptions exist. The degree to which different momentum indicators reflect these market dynamics and the ability of traders to profit from them is at the heart of momentum analysis.

There are any number of ways to calculate momentum (as evidenced by the variety of oscillator studies available in charting and analysis software programs). The most basic calculation—and the one that usually bears the name momentum—is the difference between the current price and the price n days in the past (the closing price of a standard bar chart is most commonly used). A 10-day momentum calculation would be the difference between the close today and the close 10 days ago (any time period—month, week, hour—can be substituted). The difference between the two prices—a measurement of how much price changed over this period—will be positive or negative depending on whether the current close is higher or lower than the close 10 days ago.

Figure 1.1 shows a hypothetical price series with a 1-day momentum calculation (price today − price yesterday). Successively larger positive momentum readings reflect prices rising at an increasing rate, while successively larger negative momentum values accompany prices falling at an increasing rate. A market that rises 3 points one day, 5 the next day, 8 the next, and 12 the next, for example, is obviously moving with greater

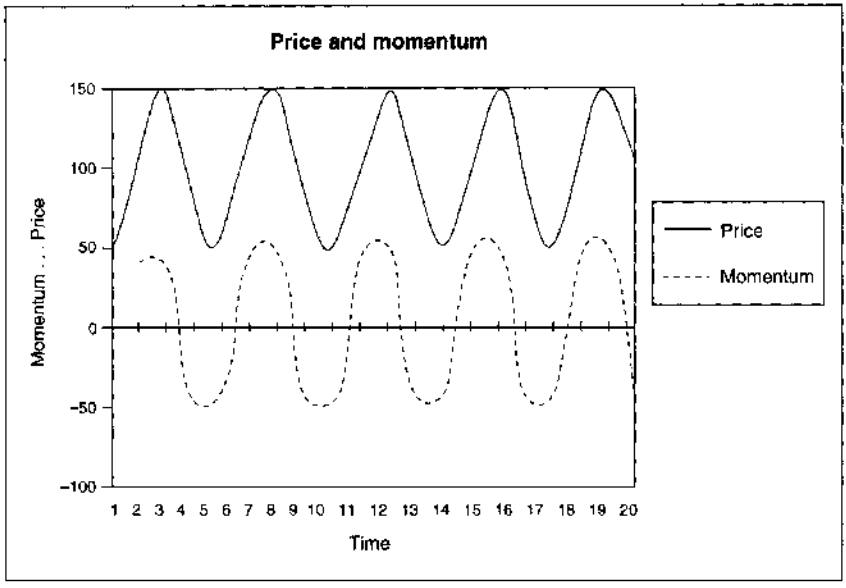
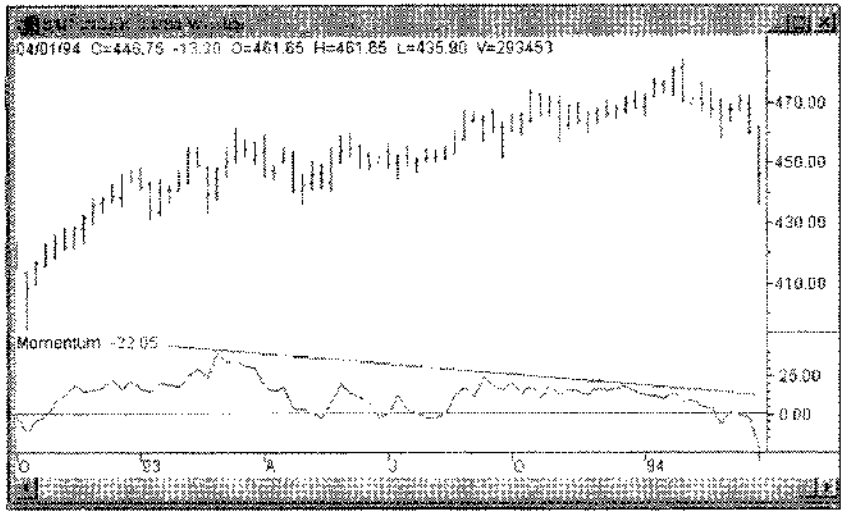


FIGURE 1.1 Hypothetical Price Series with a One-Day Momentum Calculation

force—greater momentum—than a market rising 1 point per day. Figure 1.2 shows how a 20-period momentum study highlights waning trend strength in a weekly chart of the S&P 500 stock index. The momentum values remain positive for most of the example, meaning prices have stayed above their levels of 20 days earlier. As time passes, however, the degree to which they are higher decreases, indicated by the down-sloping momentum peak trendline. Momentum is weakening.

MOMENTUM CHARACTERISTICS

A common momentum analogy is the behavior of a ball or some other object launched into the air. Consider an arrow shot skyward: Its momentum is greatest just as it leaves the bowstring and gradually decreases until reaching zero at the height of its trajectory—immediately before the arrow returns to earth.



Source: Omega Research

FIGURE 1.2 Twenty-Period Momentum Study

A price trend often (but not always) exhibits the same momentum characteristics. At the beginning of a trend, as price reverses the previous trend or breaks out from an extended trading range, a market will frequently exhibit its strongest momentum. As the trend progresses, it may do so at a slower rate—prices continue to rise or fall, but in smaller increments from day to day (or week to week, etc.). Like the arrow that gradually loses speed until its velocity reaches zero at the peak of its flight, a price trend may exhibit flattened or even declining momentum as it approaches its conclusion—sometimes *reversing before price itself reverses*. Such momentum characteristics, which may not be immediately evident through basic trend analysis or price chart inspection, can provide advance warning of a trend change or pause.

Unlike an arrow shot into the sky, however, price trends do not follow smooth lines or curves; in all but the most perfect situations, they advance and retrace, or pause, before resuming the previous trend or beginning a new one in the opposite direction. As mentioned, a basic function of momentum studies is to identify points (shorter-term points, especially)

where a market has become overextended or exhausted (*overbought* or *oversold*). This type of analysis is based on the concept that a market rising or falling too far too fast—that is, a market exhibiting extremely strong momentum—cannot sustain its pace indefinitely and will at least temporarily pause or reverse, providing the trader with advantageous points at which to enter or exit positions. The most basic interpretation is to sell a market that is overbought and buy a market that is oversold. This is, in essence, contrarian, or countertrend trading. It implies anticipating future price direction and establishing a position against the current trend.

Any number of technical studies called *momentum oscillators* quantify this aspect of price behavior. They are referred to as oscillators because they generally fluctuate (in idealized form like a sine wave) above and below a horizontal line that represents equivalent price levels and zero momentum (i.e., a momentum equilibrium point, where momentum is neither increasing nor decreasing). In contrast to trend-following tools like moving averages, which identify the direction of the market and allow traders to participate in the trend, momentum oscillators are generally used as countertrend tools to find market extremes or exhaustion points—or to identify the end of trending moves as momentum dissipates. (As we will see, however, momentum oscillators can also function as trend indicators.) Accordingly, they are commonly recommended for use in markets swinging in fairly defined trading ranges rather than in strongly trending markets.

Figure 1.3 shows a series of hypothetical closing prices with a 10-day momentum calculation, computed by subtracting the price 10 days earlier from the current price. This example illustrates several important momentum characteristics.

While the momentum line mirrors the general swings of the price action (the peaks and troughs of both lines coincide), important differences are evident. First, the momentum line does not mimic the broad upward price trend (although the momentum peaks are farther above the equilibrium line than the momentum troughs are below it); it does, however, underscore the shorter-term price swings or trends. Second, momentum at

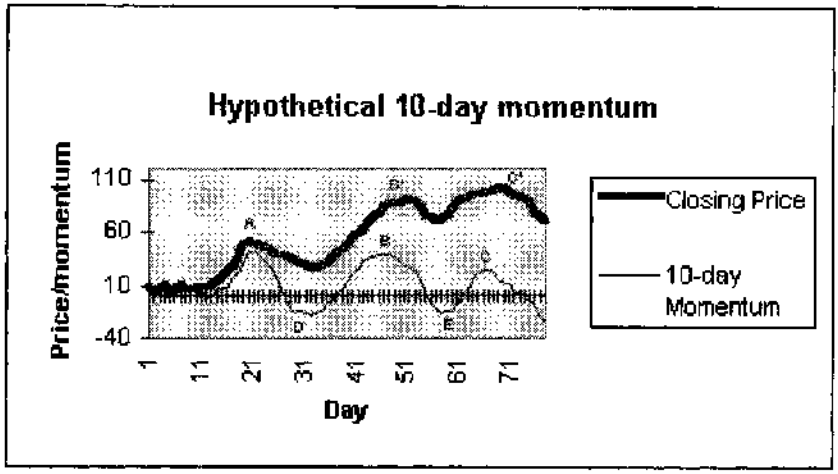


FIGURE 1.3 Price with a 10-Day Momentum Calculation

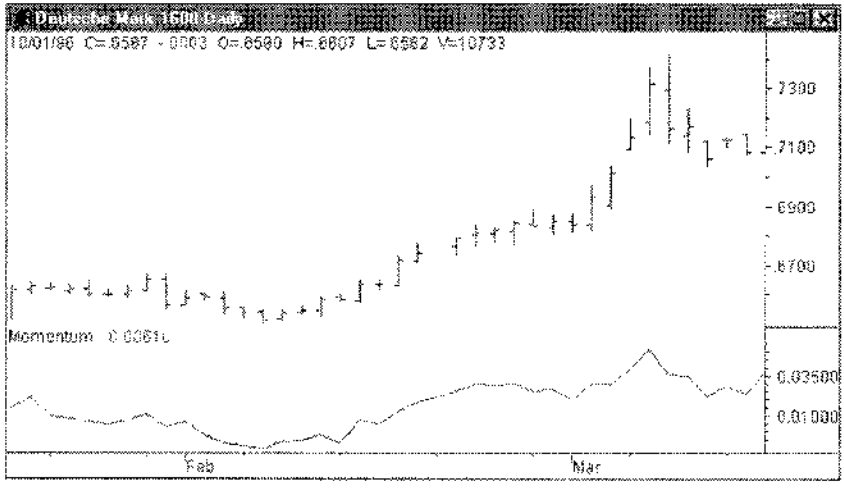
times appears to change direction ahead of price—its important leading characteristic. Both price and momentum reverse at roughly the same time at the conclusion of the first major upswing at point *A*. After price and momentum both reverse to the downside, a second up move commences. This time, however, the momentum peak at point *B* occurs *before* the corresponding price peak at point *B'*, and momentum has, in fact, begun to noticeably diminish—flatten out—while this leg of the uptrend is still in full force. Again, comparing points *C* and *C'*, it is evident that momentum peaks earlier than price. For momentum to continue to advance or decline, price gains or losses must continue to increase in size. If prices rise or fall at a constant rate, the momentum line will be flat; if price increases or decreases at a slower rate, momentum will reverse. Falling momentum can, for example, accompany rising prices in an uptrend. (Momentum—change in price—is the first difference, or derivative, of price. The second derivative is the change in the change of price, referred to as *acceleration*. When a price series moves from 20 to 22 to 24, momentum is steady at 2 points per day and is exhibiting no acceleration; when prices moves from 20 to 22 to 25 to 32, both momentum and acceleration are in-

creasing.) Also note that momentum equilibrium line crossings function as general trend signals. When the momentum line reaches the equilibrium level in this example, the current price is equal to the price 10 days earlier.

Another important point is the relationship between the successive price peaks at *A*, *B'*, and *C'* and their corresponding momentum peaks. The long-term price uptrend is countered by a general downward slope in the momentum peaks. When price makes successive higher highs at *B'* and *C'*, momentum actually makes successive *lower* highs at points *B* and *C*, suggesting that while price is pushing to higher levels, it is doing so with weaker momentum—behavior that signals a trend running out of steam and a possible directional change. This phenomenon is called *divergence* because the price action and the indicator are moving in opposite directions; the indicator fails to confirm higher highs or lower lows in price. Divergence is one of the most important characteristics of momentum studies. (And as will be evident later, it is also one of the more difficult signals to interpret.)

The final characteristic to note is how important the issue of trend is when working with momentum. The momentum peaks at points *A*, *B*, and *C* did in fact accompany price downturns. However, the first two of these moves at any rate were revealed to be temporary corrections in a longer-term uptrend. The potential profit of selling these relatively overbought levels must be weighed against the potential profit of participating on the long side of the longer-term uptrend. The oversold levels at points *D* and *E*, however, were much less extreme than their overbought counterparts, although they represented much more desirable trading points.

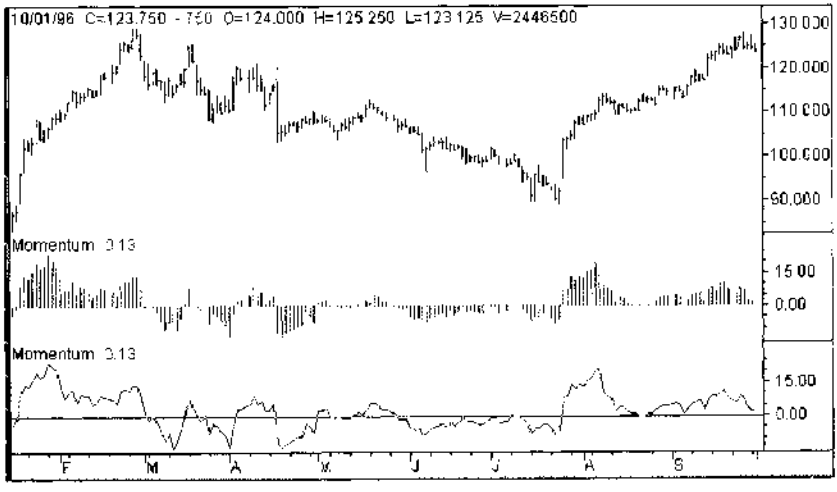
A strongly trending market that accelerates into a top or bottom, however, may present a much different picture. Dynamic shorter- to intermediate-length trends may not exhibit much momentum decay. Figure 1.4 provides an example of such a situation. The market accelerates strongly into its peak (after a brief price pause and slight momentum downturn), matched by a momentum spike. (Note: Momentum indicators



Source: Omega Research

FIGURE 1.4 Simultaneous Price and Momentum Peaks

are usually plotted below a price chart for easy visual analysis and alignment of peaks and troughs. Depending on the indicator, these studies take the form of lines or histograms. Figure 1.5 shows 10-day momentum plotted in both formats for comparison.)



Source: Omega Research

FIGURE 1.5 Ten-Day Momentum in both Line and Histogram Formats

The characteristics illustrated in the earlier hypothetical example are common to virtually all oscillators and form the basis of their importance in price analysis and technical trading. Despite the variety of names and myriad formulas, most momentum indicators are variations on a few major themes. The next chapter will look more closely at how the concepts in this chapter are reflected in several calculations that form the basis of most oscillators.