PART I

# **The Foundation of Technical Analysis**

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PI: OTA JWBT634-c01 JWBT634-Grimes May 10, 2012 7:17 Printer: Hamilton Printing P1: OTA



If you would be a real seeker after truth, it is necessary that at least once in your life you doubt, as far as possible, all things.

—René Descartes

There is something fascinating and mesmerizing about price movements in actively traded markets; academics, researchers, traders, and analysts are drawn to study markets, perhaps captivated as much by the patterns in the market as by the promise of financial gain. Many people believe that price changes are random and unpredictable; if this were true, the only logical course of action would be to avoid trading and to invest in index funds. This is, in fact, what a significant number of financial advisers recommend their clients do. On the other hand, there are analysts and traders who believe that they have some edge over the market, that there is some predictability in prices. This camp divides into two groups that historically have been diametrically opposed: those who make decisions based on *fundamental* factors and those who rely on *technical* factors. Fundamental analysts and traders make decisions based on their assessment of value, through an analysis of a number of factors such as financial statements, economic conditions, and an understanding of supply/demand factors. Technical traders and analysts make decisions based on information contained in past price changes themselves.

Our work here concerns the latter approach. Few traders make decisions in a vacuum; technical traders may consider fundamental factors, and fundamental traders may find that their entries and exits into markets can be better timed with an understanding of the relevant elements of market structure, money flows, and price action. Most traders find success with a hybrid approach that incorporates elements from many disciplines, and there are very few purely technical or fundamental decision makers. The key distinction, for us, is that technically motivated traders acknowledge the primacy of price itself. They know that price represents the end product of the analysis and decision

making of all market participants, and believe that a careful analysis of price movements can sometimes reveal areas of market imbalance that can offer opportunities for superior risk-adjusted profits. Building the tools for that analysis and learning how to apply them is the purpose of this book.

# **DEFINING A TRADING EDGE**

Most of the time, markets are efficient, meaning that all available information is reflected in asset prices, and that price is a fair reflection of value. Most of the time, prices fluctuate in a more or less random fashion. Though a trader may make some profitable trades in this type of environment purely due to random chance, it is simply not possible to profit in the long run; nothing the trader can do will have a positive effect on the bottom line as long as randomness dominates price changes. In theory, in a true zero-expectancy game, it should be possible to trade in a random environment and to break even, but reality is different. Trading accounts in the real world suffer under the constant drag of a number of trading frictions, transaction costs, errors, and other risks. Together, these create a high hurdle that must be overcome in order to break even. It is even possible for a trader to work with a positive expectancy system and still lose a significant amount of money to the vig.

Newer traders especially are often drawn to focus on elements of performance psychology and positive thinking. There is an entire industry that caters to struggling traders, holding out hope that if they could just get their psychological issues resolved, money would flow into their trading accounts. However, this fails to address the core problem, which is that most traders are doing things in the market that do not work. Excellent execution, risk management, discipline, and proper psychology are all important elements of a good trading plan, but it is all futile if the trading system does not have a positive expectancy. These are essential tools through which a trading edge can be applied to the market, and without which a trader is unlikely to succeed in the long run. However, none of these is a trading edge in itself.

A *positive expectancy* results when the trader successfully identifies those moments where markets are slightly less random than usual, and places trades that are aligned with the slight statistical edges present in those areas. Some traders are drawn to focus on high-probability (high win rate) trading, while others focus on finding trades that have excellent reward/risk profiles. Neither of these approaches is better than the other; what matters is how these two factors of probability and reward/risk ratio interact. For instance, it is possible to be consistently profitable with a strategy that risks many times more than what is made, as long as the win rate is high enough, or with a much lower percentage of winning trades if the reward/risk ratio compensates. In all cases, the trading problem reduces to a matter of identifying when a statistical edge is present in the market, acting accordingly, and avoiding market environments that are more random. To do this well, it is essential to have a good understanding of how markets move and also some of the math behind expectancy and probability theory.

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#### **Expected Value**

*Expected value* (or *expectancy*) is a term from probability theory that every good trader and gambler understands intuitively. For our purposes, we need to define a number of scenarios that each have a precisely defined payout (or loss), and we also need to be able to quantify the probabilities of each scenario occurring. If we are analyzing actual trading records, this can be as simple as calculating summary statistics for historical trades, but the problem is much more complicated on a look-forward basis because we have to make assumptions about how closely future conditions are likely to resemble history. Furthermore, we also need to make sure that our calculations include every possible outcome so that the probabilities sum to 1.0; this is sometimes difficult in real-world applications where unforeseeable outlier events may lurk in the future. Leaving these practical considerations aside for a moment and focusing on the underlying math, multiplying the payout of each scenario by the probability of each scenario occurring creates a probability-weighted average of the payouts, which is also called the expected value.

#### The Expected Value Formula

Formally, for k possible scenarios, each with a payoff of x and associated probability p, the expected value E() is defined as:

$$E(X) = x_1 p_1 + x_2 p_2 + \cdots + x_k p_k$$

or, in alternate notation:

$$\mathsf{E}(X) = \sum_{i=1}^{k} x_i \, p_i$$

Consider a simplified example where a trader can either make or lose 1 point with 50 percent probability of either outcome. In this example, the relevant math is: E(X) = .5(1) + .5(-1) = 0. It is important to understand precisely what expectancy tells us, which, in the case of a simplified trading or game of chance scenario, is the average amount we should win or lose on each trial. Furthermore, and this is very important, like many things in the field of probability, expectancy is valid only over a fairly large sample size. Even though our trader was playing a zero expectancy game, it is entirely possible that the trader could have had many wins or losses in a row, and could actually have accumulated a significant gain or loss at some point. In fact, it is very likely this *will* happen because random data tends to have many more strings of runs than most people would expect. Over a larger sample, it is likely that the actual value realized will begin to converge on the theoretical expected value, but distortions can and do occur.

The bottom line is that you must have an edge. If you are not trading with a statistical advantage over the market, everything else is futile. Nothing will help. Discipline, money management, execution skills, and positive thinking add great value in support

of an actual edge, but they are not edges in themselves. From a statistical standpoint, the definition of an edge is simple: can you properly identify entry and exit points in the market so that, over a large sample size, the sum of the profit and loss (P&L) from your winning trades is greater than the sum of your losing trades? The question then becomes: how do you find, develop, refine, and maintain an edge? There are many answers to that question; this book shows one possible path.

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## Where Does the Edge Come From?

Many of the buying and selling decisions in the market are made by humans, either as individuals, in groups (as in an investment committee making a decision), or through extension (as in the case of execution algorithms or "algos"). One of the assumptions of academic finance is that people make rational decisions in their own best interests, after carefully calculating the potential gains and losses associated with all possible scenarios. This may be true at times, but not always. The market does not simply react to new information flow; it reacts to that information as it is processed through the lens of human emotion. People make emotional decisions about market situations, and sometimes they make mistakes. Information may be overweighted or underweighted in analysis, and everyone, even large institutions, deals with the emotions of fear, greed, hope, and regret.

In an idealized, mathematical random walk world, price would have no memory of where it has been in the past; but in the real world, prices are determined by traders making buy and sell decisions at specific times and prices. When markets revisit these specific prices, the market *does* have a memory, and we frequently see nonrandom action on these retests of important price levels. People remember the hopes, fears, and pain associated with price extremes. In addition, most large-scale buying follows a more or less predictable pattern: traders and execution algorithms alike will execute part of large orders aggressively, and then will wait to allow the market to absorb the action before resuming their executions. The more aggressive the buyers, the further they will lift offers and the less they will wait between spurts of buying. This type of action, and the memory of other traders around previous inflections, creates slight but predictable tendencies in prices.

There is no mystical, magical process at work here or at any other time in the market. Buying and selling pressure moves prices—only this, and nothing more. If someone really wants to buy and to buy quickly, the market will respond to the buying and sellers will raise their offers as they realize they can get a better (higher) price. Similarly, when large sell orders hit the market, buyers who were waiting on the bid will get out of the way because they realize that extra supply has come into the market. More urgency to sell means lower prices. More buying pressure means higher prices. The conclusion is logical and unavoidable: buying and selling pressure must, by necessity, leave patterns in the market. Our challenge is to understand how psychology can shape market structure and price action, and to find places where this buying and selling pressure creates opportunities in the form of nonrandom price action.

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# **The Holy Grail**

This is important. In fact, it is the single most important point in technical analysis—the holy grail, if you will. *Every edge we have, as technical traders, comes from an imbalance of buying and selling pressure.* That's it, pure and simple. If we realize this and if we limit our involvement in the market to those points where there is an actual imbalance, then there is the possibility of making profits. We can sometimes identify these imbalances through the patterns they create in prices, and these patterns can provide actual points around which to structure and execute trades. Be clear on this point: we do not trade patterns in markets—we trade the underlying imbalances that create those patterns. There is no holy grail in trading, but this knowledge comes close. To understand why this is so important, it is necessary to first understand what would happen if we tried to trade in a world where price action was purely random.

# FINDING AND DEVELOPING YOUR EDGE

The process of developing and refining your edge in the market is exactly that: an ongoing process. This is not something you do one time; it is an iterative process that begins with ideas, progressing to distilling those ideas to actionable trading systems, and then monitoring the results. Midcourse corrections are to be expected, and dramatic retooling, especially at the beginning, is common. It is necessary to monitor ongoing performance as markets evolve, and some edges will decay over time. To be successful as an individual discretionary trader means committing to this process. Trading success, for the discretionary trader, is a dynamic state that will fluctuate in response to a multitude of factors.

# Why Small Traders Can Make Money

This is an obvious issue, but one that is often ignored. The argument of many academics is that you can't make money trading; your best bet is to put your money in a diversified fund and reap the baseline drift compounded over many years. (For most investors, this is not a bad plan for at least a portion of their portfolios.) Even large, professionally managed funds have a very difficult time beating the market, so why should you be able to do so, sitting at home or in your office without any competitive or informational advantage? You are certainly not the best-capitalized player in the arena, and, in a field that attracts some of the best and brightest minds in the world, you are unlikely to be the smartest. You also will not win by sheer force of will and determination. Even if you work harder than nearly anyone else, a well-capitalized firm could hire 20 of you and *that* is what you are competing against. What room is there for the small, individual trader to make profits in the market?

The answer, I think, is simple but profound: you can make money because you are not playing the same game as these other players. One reason the very large funds have

trouble beating the market is that they are so large that they *are* the market. Many of these firms are happy to scrape out a few incremental basis points on a relative basis, and they do so through a number of specialized strategies. This is probably not how you intend to trade. You probably cannot compete with large institutions on fundamental work. You probably cannot compete with HFTs and automated trading programs on speed, nor can you compete with the quant firms that hire armies of PhDs to scour every conceivable relationship between markets.

This is all true, but you also do not have the same restrictions that many of these firms do: you are not mandated to have any specific exposures. In most markets, you will likely experience few, if any, liquidity or size issues; your orders will have a minimal (but still very real) impact on prices. Most small traders can be opportunistic. If you have the skills, you can move freely among currencies, equities, futures, and options, using outright or spread strategies as appropriate. Few institutional investors enjoy these freedoms. Last, and perhaps most significantly, you are free to target a time frame that is not interesting to many institutions and not accessible to some.

One solution is to focus on the three-day to two-week swings, as many swing traders do. First, this steps up out of the noise created by the HFTs and algos. Many large firms, particularly those that make decisions on fundamental criteria, avoid short time frames altogether. They may enter and exit positions over multiple days or weeks; your profits and losses over a few days are inconsequential to them. Rather than compete directly, play a different game and target a different time frame. As Sun Tzu wrote in the *Art of War*: "Tactics are like unto water; for water in its natural state runs away from high places and hastens downward ... avoid what is strong and strike at what is weak."

## **GENERAL PRINCIPLES OF CHART READING**

Charts are powerful tools for traders, but it is important to think deeply about what a chart is and what it represents. Though it is possible to trade by focusing on simple chart patterns, this approach also misses much of the richness and depth of analysis that are available to a skilled chart reader. Top-level trading combines traditional left brain skills of logic, math, and analytical thinking with the intuitive, inductive skills of right brain thinking. Charts speak directly to the right brain, whose native language is pictures and images. Part of your edge as a discretionary trader comes from integrating these two halves of your being; charts are a powerful tool that can facilitate this integration and foster the growth of intuition.

Modern software packages are a mixed blessing for traders. On one hand, they have greatly increased the scope and breadth of our vision. It is not unusual for a modern trader to examine 400 or 500 charts in the course of a trading day, sometimes more than once, quickly assessing the character of a market or a set of related markets. This would not have been possible in the precomputer era, when charts had to be laboriously drawn and updated by hand. However, charting software also encourages some potentially harmful habits. It is so easy to add various plots and indicators to charts and

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to tweak and change settings and time frames that some traders are forever experimenting and searching for the holy grail of technical indicators. Other traders bury price bars behind a barrage of moving averages and other indicators, thinking that complexity will lead to better trading results. Simplicity is often better than complexity. A chart is nothing more than a tool to display market data in a structured format. Once traders learn to read the message of the market, they can understand the psychological tone and the balance of buying and selling pressure at any point.

When it comes to chart setup, there is no one right way, but I will share my approach. Everything I do comes from an emphasis on clarity and consistency. Clean charts put the focus where it belongs: on the price bars and the developing market structure. Tools that highlight and emphasize the underlying market's structure are good; anything that detracts from that focus is bad. When you see a chart, you want the price bars (or candles) to be the first and most important thing your eye is drawn to; any calculated measure is only a supplement or an enhancement. Consistency is also very important, for two separate reasons. First, consistency reduces the time required to orient between charts. It is not unusual for me to scan 500 charts in a single sitting, and I can effectively do this by spending a little over a second on each chart. This is possible only because every one of my charts has the same layout and I can instantly orient and drill down to the relevant information. Consistency is also especially important for the developing trader because part of the learning process is training your eye to process data a certain way. If you are forever switching formats, this learning curve becomes much longer and steeper, and the development of intuition will be stymied. Keep the same format between all markets and time frames, and keep the setup of all of your charts as consistent as possible.

#### Chart Scaling: Linear versus Log

The one exception to the principle of keeping charts consistent might be in the case of very long-term charts spanning multiple years, or shorter-term charts in which an asset has greatly increased in value (by over 100 percent). In these cases, the vertical axis of the chart should be scaled logarithmically (called "semi-log" in some charting packages) to better reflect the growth rate of the market. The idea behind a *log scale chart* is that the same vertical distance always represents the same percentage growth regardless of location on the axis.

On a very long-term chart, *linearly scaled charts* will often make price changes at lower price levels so small that they disappear and they are completely dwarfed by price changes that happened at higher levels. The linear scale also magnifies the importance of those higher-level price changes, making them seem more violent and significant than they actually were. Compare Figure 1.1 and Figure 1.2, two charts of the long-term history of the Dow Jones Industrial Average (DJIA), especially noticing the differences between the two charts at the beginning and end of the series. They seem to tell completely different stories. The first chart shows a flat and uninteresting beginning followed by violent swings

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near the right edge of the chart, while the second, the log scale chart, shows more consistent swings throughout. Over this long history, the log scale chart is a much more accurate representation of what market participants would have experienced at any point on the chart. Remember, as a rule of thumb, there are two times when log scale charts should be used: any time you have greater than a 100 percent price increase on a chart, and for any chart showing more than two years of data, whether on daily, weekly, or monthly time frames.

#### **Choosing Time Frames**

Discretionary traders must clearly choose and define the time frame within which they will trade, and this choice of time frames is tied into deeper questions of personality and trading style. Most of the trading ideas and principles we examine in this book can be applied to all markets and all time frames, with some adjustments, but most traders will probably find themselves best suited to a specific set of markets and time frames. Traders switching time frames or asset classes will usually undergo a painful adjustment period while they figure out how to apply their tools in the new context. For now, let's leave these important considerations behind and focus on only the mechanical issues of setting up charts to cover multiple time frames. In the end, your charts must be a tool that serves your trading style, not the other way around.

Many authors have written about the advantages of combining multiple time frames. Multiple time frames can provide context for and inform patterns on a single time frame; skilled use of multiple time frames allows traders to better manage risk and to increase the expectancy of their trading plans. Nearly all technical traders consider action and structure in other time frames, though they do this in a variety of ways. Some traders are able to infer this information from a single chart, while many others prefer to actually look at multiple charts of the same market with each chart showing a different time frame. In a scheme like this, the primary time frame of focus is called the *trading time frame (TTF)*. A *higher time frame (HTF)* chart provides a bigger-picture perspective, while a *lower time frame (LTF)* chart is usually used to find precise entry points. Other variations, with up to five or six charts, are possible, and there are many traders who use only a pair of charts. Last, though the term *time frame* seems to imply that the x-axis of the chart will be a time scale (minutes, hours, days, etc.), the same proportional relationships can be applied to tick, volume, or any other activity-based axis scale on the x-axis.

In general, time frames should be related to each other by a factor of 3 to 5. There is no magic in these ratios, but the idea is that each time frame should provide new information without loss of resolution or unnecessary repetition. For instance, if a trader is watching a 30-minute chart, a 5- or 10-minute chart probably provides new information about what is going on inside each 30-minute bar, whereas a 1-minute chart would omit significant information. Using a 20-minute chart in conjunction with a 30-minute chart probably adds no new information, as the two charts will be very similar. One lesser-known relationship is that all vertical distances on charts scale with the square

root of the ratio of the time frames. This has implications for risk management, profit targets, stops, and volatility on each time frame. For instance, if a trader has been trading a system on 5-minute charts with \$0.25 stops and wishes to transfer that to 30-minute charts, the stops will probably need to be adjusted to about \$0.61 ( $$0.25 \times \sqrt{30/5}$ ). This relationship does not hold exactly in all markets and all time frames, but it is a good rule of thumb and can give some insight into the risks and rewards of other time frames.

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The rule of consistency also applies to choice of time frames. Once you have settled on a trading style and time frame, be slow to modify it unless you have evidence that it is not working. This story will be told with the most clarity and power in a consistent time frame. In addition, if you catch yourself wanting to look at a time frame you never look at while you are in a losing trade, be very careful. This is often a warning of an impending break of discipline.

#### Bars, Candles, or Other Choices

Most traders today seem to be focused on using candlestick charts, but the more oldfashioned bar charts should not be overlooked. Both chart types display the same data points but in a slightly different format; they have the same information on them, so one is not better than the other. The main advantage of bar charts is that they can be cleaner visually and it is usually possible to fit more data in the same space because bars are thinner than candles. For many traders, the colors of candlestick charts make it easier to see the buying and selling pressure in the market, providing another important visual cue that helps the trader process the data faster.

Another issue to consider, particularly with intraday charts, is how much importance should be attached to the closing print of each period. Historically, this was *the* price in many markets, and it still has significance in some contexts. Profits and losses (P&Ls), margins, and various spreads are calculated off daily settlement prices; exchanges have complex procedures for calculating these prices, which are rarely simply the last print of the session. However, times are changing. In currencies, most domestic platforms report a closing price sometime in the New York afternoon, and we have to wonder just how important that price is for the Australian dollar or the yen, whose primary sessions ended many hours earlier. As more and more markets go to 24-hour sessions, the importance of this daily settlement price will continue to decline. The problem is even more significant on intraday bars, bar as closing prices on intraday bars are essentially random samples and may differ from platform to platform. If you are trading candlestick patterns, which attach great significance to the close, you are trading the patterns you see on your screen. If you switched to a different data provider, the data might be time-stamped differently, and you would see different patterns. How important can those patterns really be?

# **INDICATORS**

Indicators are calculated measures that are plotted on price charts, either on top of the price bars or in panels above or below the bars. There are many different indicators in

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common usage, and traders have a wide range of approaches and applications for these tools. Some traders are minimalists, using few or no indicators at all, while others will use multiple indicators in complex relationships. In addition, some indicators are extremely simple calculations, while others are very complex, perhaps even using complex calculations borrowed from other applications such as radar or digital signal processing. There is certainly no one right way to set up or use indicators, but, here again, consistency is paramount. Few traders find success by constantly switching between indicators. There is no holy grail or combination of tools that will lead to easy trading profits.

One other important point is that you must intimately understand the tools you use. Know how they will react to all market conditions, and know what they are saying about the market structure and price action at any time. Focus on tools that highlight and emphasize important elements of market structure, because your main focus should be on the price bars themselves. Intuition comes from repeated exposure to structured data in well-planned and consistent contexts; make your chart setups serve this purpose. Much of this book—and Chapter 7 and Appendix B in particular—focuses on these ideas and reinforces the importance of fully understanding every tool you use.

# THE TWO FORCES: TOWARD A NEW UNDERSTANDING OF MARKET ACTION

*Price action* is a complex and imperfectly defined subject. There are many traders who believe that price action is something nebulous that cannot be quantified. To other traders, trading price action means trading the patterns of price bars on charts, without the addition of indicators or other lines. In this book, price action simply means how markets usually move, which, frankly, is, usually randomly. Be clear on this point: markets are *usually* random and most of the patterns markets create are also random. However, we can sometimes identify spots where price movement is something less than random and is somewhat more predictable, and these less-than-random spots may offer profitable trading opportunities.

*Price action* is the term used to describe the market's movements in a dynamic state. Price action creates *market structure*, which is the static record of how prices moved in the past. Think about a finger tracing a line in the sand. Market structure is the line left in the sand; price action describes the actual movements of the finger as it drew the line. In the case of a finger, we would talk about smooth or jerky, fast or slow, and lightly or with deep pressure into the sand. In the case of actual price action, we would look at elements such as: How does the market react after a large movement in one direction? If aggressive sellers are pressing the market lower, what happens when they relax their selling pressure? Does the market bounce back quickly, indicating that buyers are potentially interested in these depressed prices, or does it sit quietly, resting at lower levels? How rapidly are new orders coming into the market? Is trading one-directional, or is there more two-way, back-and-forth trading? Are price levels reached through continuous motion, or do very large orders cause large jerks in prices? All of these elements,

and many more, combine to describe how the market moves in response to order flow and a myriad of competing influences.

In the past, many authors have used a wide range of analogies to describe financial markets. Ideas and models have been borrowed from the physical and mathematical sciences, so terms like momentum, inertia, vectors, and trajectories have crept into the vocabulary. More recently, some thinkers have applied the tools of digital signal processing to market data, so we have a new vocabulary that includes cycles, transforms, and waves. Markets are confusing enough in their natural state; some of the analytical frameworks traders use add to the confusion. I propose a simpler model: that market action appears to be the result of two interacting forces: a *motive force* that attempts to move price from one level to another and a *resistive force* that opposes the motive force. These forces represent the sum of all analysis and decision making at any one time.

The normal state of existence in most markets most of the time is equilibrium. The two forces are in balance. Buyers and sellers have no sharp disagreement over price; the market may drift around a central value, but there are no large trends or price changes. Market action in this environment is highly random; if we were to analyze this type of action statistically, we would find that it conforms very closely to a random walk model. This is also precisely the type of environment that technically motivated traders must strive to avoid, as there can be no enduring statistical edge in a randomly driven market.

Markets in this state of equilibrium will have varying degrees of liquidity and ability to absorb large orders. Eventually, there is a failure of liquidity on one side, and the market makes a sudden, large movement in one direction. Perhaps this movement is in response to new information coming into the market, or it can simply be a result of a random price movement setting off further movement in the same direction. No matter the reason behind the movement, in theoretical terms, the motive force has, at least temporarily, overcome the resistive force. In the parlance of technical analysis, this type of sharp movement is called an *impulse move* or a *momentum move*.

From this point, there are basically two options. In many cases, the resistive force is quickly able to overcome the motive force, and the market finds balance again. This may be at a new level, or prices may immediately retrace their course and return to the preshock levels. Psychologically, market participants have chosen to view this large price movement as a temporary aberration, and new liquidity comes into the market that will dampen any future distortion. However, it is possible that the large price spike will lead to continued movement in the same direction. In this scenario, a feedback loop develops where the market makes a large movement, which, in turn, provokes another large price movement, and the market trends.

In most cases, the market structure of this trending movement will be a series of directional moves alternating with nondirectional periods in which the market essentially rests and absorbs the previous move. In the bigger picture, the motive force has overcome the resistive force, but there is still a subtle interplay of balance and imbalance on shorter time frames. Prices trend because of an imbalance of buying and selling pressure. (This is often, but not always, indicative of nonrandom action, as trends exist in completely random data.) Once prices are trending, at some point they will have

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moved far enough that the resistive force is once again able to balance the motive force, and the market again finds a new balance.

This interplay of motive and resistive forces, from a very high-level perspective, is the essence of price action and the root of technical analysis. The patterns we see in the market are only reflections of the convictions of buyers and sellers. They are useful because we can see them, trade them, and use them to define risk, but always remember that they are manifestations of deeper forces in the marketplace.

# PRICE ACTION AND MARKET STRUCTURE ON CHARTS

Charts are a way to organize and to structure the flood of information the market generates and can reveal clues about the strength of the underlying forces. There is no one right way to read a chart, but I will share the basic elements of an approach that has been very useful to me over the years. These tools and this framework have shown themselves to be reliable time and time again, but these are *my* tools and *my* method. You must make them *your own* tools. Use everything here as a collection of ideas from which you can begin to build your own approach to the markets.

*Market structure* refers to the static structure visible on charts, made up of previous movements in the market and places where those movements stopped. The key elements of market structure are *pivot points* and the *swings* connecting them, both of which may be evaluated either in price (the vertical axis on a chart), in time (the horizontal axis), or in a combination of the two.

*Price action* is the dynamic process that creates market structure. Price action is also more subjective; in most cases, market structure is concrete. Market structure is static and is clearly visible on a chart, but price action usually must be inferred from market structure. Also, both are specific to time frames, though price action is often visible as the market structure of lower time frames. These definitions and their implications will become clear over the next chapters.

#### **Pivot Points**

The basic units of market structure on any time frame are pivot highs and lows (also called swing highs or lows). A *pivot high* is a bar that has a higher high than the bar that came before it and the bar that comes after it. At least in the very short term, the bar's high represents the high-water mark past which buyers were not able to push price, and can be considered a very minor source of potential resistance. A *pivot low* is the same concept inverted: a bar with a lower low relative to both the preceding and the following bars. Figure 1.3 shows a chart with every pivot high and pivot low marked. Note that it is possible for a bar to be both a pivot high and a pivot low at the same time, and that pivot highs and pivot lows are very common.

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FIGURE 1.3 Every Pivot High and Low

Another name for the type of pivot in Figure 1.3 is a *first-order pivot*. Though these first-order pivots do sometimes coincide with major turning points in the market, they are so common that they cannot be extremely significant. Every major turning point, by definition, comes at a pivot, so it is easy to overstate their importance; once you see a chart with every possible pivot marked, it becomes obvious that this structure is so common that it is nearly insignificant. It is also interesting to consider that most pivots on one time frame mark significant market structures on lower time frames, but this is a complication that we will save for later. As a stand-alone concept, first-order pivot highs and lows have limited utility; their power comes from their relationship to other pivots and their ability to define market structure. They are like a single brick in a building—not that interesting or useful by itself.

Second-order pivot highs (also called intermediate-term pivots) are first-order pivot highs that are preceded and followed by lower first-order pivot highs; again, this structure is inverted for second-order pivot lows. In Figure 1.4, notice that these second-order pivots begin to define some more significant structural points. It is much more likely that second-order pivots will come at important turning points, but remember that there is no predictive power because this is a pattern that is defined post hoc. They always look far



FIGURE 1.4 Second-Order Pivots (Marked with Arrows) Define More Important Market Structure

more significant in the middle of a chart than they do on the right edge. It is also worth noting that there is no law that says second-order pivot highs and lows have to alternate; it is possible to have three second-order pivot highs or lows in a row. If you are going to use this concept systematically, make sure your rules plan for this situation.

Predictably, this concept can be extended on many levels, but in actual practice, most of our focus is on third-order pivots, which usually mark major inflections (see Figure 1.5). Almost without exception, a trader who could identify these third-order pivots in advance would have nearly perfect entries on both sides of the market. This cannot be done, but it does point out that these third-order pivots delineate the market structure very clearly. It is worth your time to train your eye to see these pivots quickly; the value in this structure is in providing context for the market's movements. Once you understand the basic ideas behind this concept, it is probably a good idea to not be too rigid with these structures and definitions. If you see something on a chart that is fulfilling the basic role of one of these structures but for one reason or another does not exactly fit the criteria, it often makes sense to bend the rules for that case. The goal is to define meaningful market structure, not to blindly follow a set of rules. 7:17

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FIGURE 1.5 Third-Order Pivots Usually Define the Most Important Market Structure on Any **Time Frame** 

It also should be obvious that this is a backward-looking analytical method. This is a problem with all swing or wave methods: they offer fantastic explanations of past market action, but have little or no predictive power at the right edge. This pivot structure is not intended to be a trading methodology; it is context. For instance, a sharp down move might be interpreted differently if it comes at a point where the market had been making consistently higher second-order pivot highs and lows compared to an environment where they were more randomly distributed. As another example, a movement that penetrates a significant third-order pivot high or low can sometimes significantly change the market environment. The purpose of this tool is to provide that structure and context, not actual trade entries.

#### Length of Swing

Once we have defined the second- or third-order pivot structure of the market, we can connect the pivot highs and lows with lines to outline the swing structure of the market. (In the spots where highs and lows do not alternate, take the lowest low of the series

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or the highest high of the series as the anchor point.) If this type of analysis is new to you, it is probably a good idea to draw the structure on a few hundred charts until it becomes somewhat intuitive; eventually you want to be able to glance at a chart and see this structure immediately. Like everything else, it gets easier only with continued practice and familiarity. It is impossible to overstate the importance of this skill.

Once the individual swings are delineated, we can start to consider what the market structure actually tells us about the balance of buying and selling pressure in the market. The core concepts are simple:

- When buyers are stronger than sellers, upswings will be longer, both in price and in time, than downswings.
- When sellers are in control, downswings will be longer than upswings.
- Significant support and resistance levels are visible as rough areas (not precise lines) beyond which pivots have been unable to penetrate.
- When there is relative equilibrium, there is no clear pattern to the swings.

There is nothing mysterious about market structure and price action. They grow from these simple patterns, which then combine in a nearly infinite number of variations. Focusing on the variations is difficult because they are legion—it is an exercise in futility to try to catalog all of the complexities and variations of patterns, though this attempt has been repeated many times throughout history. Understand the root. Understand the market structure. There are a handful of common patterns and templates that provide the foundation for most of the significant patterns in the market. We will spend much of the rest of this book refining these templates, looking at specific ways to trade around them, and considering how to manage the risk of those trades. Here is a brief introduction to a few of the most important of these patterns. Commit them to memory; you will be seeing them again.

Figure 1.6 shows the basic uptrend template: upswings are longer than the downswings, creating a consistent pattern of higher pivot lows and higher pivot highs. This pattern, inverted, would become a downtrend.

Figure 1.7 shows a market in a trading range. This is a random environment in which the conviction of buyers and sellers is relatively equal and there is no clear pattern to



FIGURE 1.6 An Uptrend







FIGURE 1.8 A Break in the Uptrend Pattern

prices. There can be sudden, sharp moves within trading ranges, but they are often more or less unpredictable.

Figure 1.8 shows a pattern that gives a warning of a break in an uptrend's established pattern. This is often the first step of a trend change, but you cannot trade based only on this pattern; this is a warning sign to pay careful attention to what comes next. There is great value in knowing when patterns have broken, as this suggests a potential change in the balance of buyers and sellers in the market.

Figure 1.9 shows an example of a classic breakout above resistance. This suggests one of two things: On one hand, markets in trading ranges (see Figure 1.7) are highly random and this type of move may be nothing more than a random (and temporary) move beyond previous levels. On the other hand, it could be an early warning that buying



FIGURE 1.9 A Breakout of the Trading Range



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FIGURE 1.10 A Breakout Preceded by Higher Lows into Resistance

pressure is now stronger than selling pressure in this market, and it is possible that prices could trend significantly higher from this point.

Figure 1.10 shows a particular pattern that often precedes the best breakouts. If buyers are able to hold the market higher on successive declines, a pattern of higher pivot lows pressing against the resistance area will result. This suggests real buying conviction supporting the move and the potential breakout.

This is certainly not a complete encyclopedia of swing patterns, but it does highlight the basic concept: the length of swings and the relative position of pivot points can give insight into the character of the market.

#### **Market Structure versus Traditional Chart Patterns**

There are two broad schools of thought in technical analysis. One approach is to catalog every possible chart pattern and variation of those patterns. A trader using this approach might look for wedges, pennants, flags, boxes, ledges, head and shoulders patterns, and double tops and bottoms—these are only a few of the traditional patterns, and many more have worked their way into modern practice. These traders spend a lot of time studying these patterns and variations, and they usually have specific trading plans for each pattern. Richard Schabacker was the first writer to codify this approach, in the late 1920s, and it was crystallized in his landmark 1932 *Technical Analysis and Stock Market Profits*.

Upon his early death in 1935, his brother-in-law, Robert Edwards, took over the company he had founded and continued his work of market analysis. Later, Edwards teamed up with John Magee, and the two wrote *Technical Analysis of Stock Trends* (1948; 4th ed., 1964), which is now considered to be the ultimate, authoritative source on chart patterns. The Schabacker approach (which is not known by that name because few people know the history behind Edwards and Magee) is the predominant school of modern technical analysis, but there is another path.

The second broad school of technical analysis is Richard Wyckoff's approach. The core concept here is that chart patterns have very limited utility, and what predictive power they do have is highly dependent on the context in which they appear. The only real purpose of

(Continued)

chart patterns is to quantify and to define the buying and selling pressure in the market. In many cases, traders using both approaches will arrive at similar conclusions. These are two different means to the same end, but many traders find a richness and depth in the Wyckoff approach that surpasses a simplistic focus on chart patterns. We trade the underlying buying and selling imbalance, which is what will move price in our favor if we are correct.

# **Reading Inside the Bars**

One skill that is often overlooked in chart reading is the ability to look at a bar on a chart and to infer what price action might have created that bar. In practical terms, this means being able to look at a bar on one time frame and immediately understand the most likely lower time frame scenarios that could have created that bar. In almost every case, there are multiple possibilities, but some are much more likely than others. It is not necessary to be 100 percent correct on this; sometimes we will simply guess wrong, but working to develop this skill will greatly increase the trader's intuitive grasp of price charts. For instance, consider the single candle in Figure 1.11 with an empty body (meaning that the close was higher than the open) and with moderately small shadows on the top and bottom. There are three things we know with certainty about this candle: the close was higher than the open; at some point, the market traded lower than the open; and, at some point, it traded higher than the close.

Most people with a little bit of trading experience would assume the candle opened, traded down to put in the low, trended up to make a high, and backed off to close under



FIGURE 1.11 A Candle Is a Snapshot in Time—How Was This Candle Formed?



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FIGURE 1.12 Some of the Many Possibilities of Lower Time Frame Action That Could Have Produced Figure 1.11

that high. This is the most obvious possibility (scenario #1 in Figure 1.12), but there are many others, some of which are also shown. Traders developing a sense for price action need to spend a lot of time contemplating all of the lower time frame scenarios that could produce each bar. Being locked into a single interpretation without considering the context can blind us to what might really be going on in the market.

Though charts contain a lot of noise and random action, there are points where structures within individual bars, or a small set of bars, are very important. One simple pattern to think about is that the location of the closing point relative to the high and the low of the bar may give some insight into the buying or selling conviction within that bar. For instance, a close near the high of the bar usually shows that buyers were in control going into the end of the time period. Yes, there are other possibilities and patterns that could have created the close near the high, but, more often than not, buyers were in control. Conversely, closes near the middle of the bar, visible as long shadows on candle charts, show a certain neutrality and lack of conviction. It is also worth considering the extreme case where several bars in a row close on their absolute highs. Many traders would assume that this is indicative of a very strong market, but, statistically, this condition more often indicates short-term exhaustion and at least a slight reversal—be careful of entering with the trend after several bars close on their highs.

**Trend and Trading Range Bars** Large bars relative to recent bars on one time frame most likely contain trends on the lower time frame, especially if the close and open are near opposite ends of the bars. Small bars on one time frame are probably trading ranges on lower time frames, and, in general, bars that have their opens and closes nearer to the center point of the bar are also more likely to have been trading ranges. This is a simple concept, but understanding this dynamic is a key to building intuition about price action and the interaction of time frames. There is much subtlety here, but these are the essential concepts. Figure 1.13 shows lower time frame trends and trading ranges within the three boxes in the left panel that correspond to the three higher time frame bars in the right panel. Do not accept price bars at face value. Always think deeply about what is going on behind the scenes, on lower time frames.

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FIGURE 1.13 One- and 15-Minute S&P Bars, Showing Lower Time Frame Trading Range and Trend within Higher Time Frame Bars

The right panel of Figure 1.14 shows a daily chart of the E-mini S&P 500 futures at a time when the trend on that time frame was losing momentum. What are the signs on this time frame that suggest a loss of momentum? Each bar continues to make a higher high up into mid-April, but at a declining rate. We could characterize these as "reluctant highs," to indicate waning momentum. In addition, the bars are becoming smaller, indicating that trading interest is drying up, and there are no more large trend bars (that open near the lows and close near the highs) in April. On each of the multiple time frame charts in this book, the lower time frame in the left pane expands on the highlighted area of the higher time frame chart on the right. In this case, the lower time frame tells the same story of loss of momentum, but in much more vivid detail. There are multiple failure tests above the highs, as the market spikes to new extremes and is unable to find the buying pressure to support itself there. Note that this reversal on the lower time frame could simply be subsumed into a trading time frame consolidation, but the lower time frame clearly shows the change in the buyers' conviction.





Many traders focus on trading *pullbacks*. A pullback (also called a *flag* or *consolidation*) is a move against the prevailing trend. For instance, a pullback in a downtrend bounces against the trend and is an opportunity to enter a short position; a pullback in an uptrend is a decline. Most traders train themselves to see these structures easily, but pullbacks can also be hidden in higher time frames: one or two small bars that hold near the extreme of a trend leg (near the lows in a downtrend or the highs in an uptrend) are often a complete lower time frame pullback. As such, these simple one- or two-bar pullbacks (*high and tight flags*) are tradable structures in very strong trends, as in Figure 1.15. This is a common and important pattern.

Another important pullback pattern in an uptrend has several bars with downward closes separated by a single bar with an upward close. This pattern usually hides a complex pullback on the lower time frame, which is a three-legged structure consisting of an initial pullback followed by a small, failed attempt to resume the initial trend. From that second leg, the market turns down again to make another countertrend leg that is usually approximately as long as the first one. This is a very common pattern, especially



FIGURE 1.15 The Small Bars on the 15-Minute EURUSD Chart (Right Pane) Hide a More Significant Pullback on the 2-Minute Lower Time Frame

in extended trends, and will be explored in much more detail later. Figure 1.16 shows an example of a two-legged complex pullback. On the higher trading time frame, it is not so obvious and has to be inferred from the presence of one or two with-trend candles in the middle of the pullback, but the complete structure is clearly visible on the lower time frame.

One of the quantifiable tendencies of price motion is for markets to make directional moves out of periods of contracted volatility. Even if the normal expectation for a market is mean reversion and reversal (as it is in the short term for equities), there is usually at least a slight edge for continuation out of areas of volatility compression. One simple way to quantify volatility contraction is by looking for inside bars, which are bars whose entire range is enclosed within the range of the previous bar—in other words, a bar whose high is equal to or lower than the previous high and whose low is above or equal to the previous low. A series of multiple inside bars on one time frame usually contains a



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**FIGURE 1.16** The Daily Chart of X (Left Pane) Shows a Clear Two-Legged Complex Pullback The weekly chart hints at this structure, but it must be inferred from the single upward-closing candle in the middle of the pullback.

triangle on the lower time frame, which is a visual pattern that strongly suggests volatility contraction. Trading *within* triangles is usually a losing proposition, as the market is in equilibrium and the actual movement within the pattern is highly random. However, they can set up good breakouts with expectations for strong, extended moves away from the pattern. It is easy to overlook multiple inside bars (see Figure 1.17), but this is a powerful and subtle pattern that is worth some attention.

The examples in this section were deliberately chosen to be less than perfect because it is important to start thinking about these concepts in the context of actual market action, which is always less clear and noisier than we wish. Remember that charts are artificial structures that we impose on market data. They are useful because they organize the data, but we are always dealing with a trade-off between effective summarization and loss of detail. There is no perfect answer, but many of the limitations can be overcome if we work to constantly remember what the chart actually is, and to try to understand the buying and selling pressure that each bar represents. The chart is not the market; the chart is a *representation* of the market.

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**FIGURE 1.17** Multiple Inside Bars on the Hourly Chart of the E-mini S&P 500 Futures (Right Pane) Hide a Clear Lower Time Frame Triangle on the 10-Minute Chart

# **CHARTING BY HAND**

I started trading in the 1990s, in the twilight years of the old, classic paper chart books. A book would come in the mail at the beginning of the week, printed on newsprint; each day it was up to the trader to track down prices for each of the markets and update the charts by drawing a new price bar. At the beginning of the next week, a new book would arrive with the past week's prices filled in, and the process would repeat. Actually, in my very early trading days I did not even have the chart book, but I bought a pad of graph paper, went to the library, and started building charts from histories I found in back issues of newspapers. I did not realize the value of what I was doing at the time, but this process immersed me in patterns as they were emerging. There is something about physically drawing lines that engages a different part of the brain than looking at a screen does. Because of this work, I assimilated patterns quickly and developed a sense of the forces at work behind the patterns early in my development. When you are drawing open, high,

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low, and close on each price bar, you will spend time during the day wondering what new configurations could appear at the end of the day, and thinking about how the day's trading might unfold to create those patterns.

Most readers are probably shaking their heads and laughing at this point, thinking that this is a quaint and hopelessly anachronistic practice, but I beg to differ. Modern computer charting has the advantage of breadth. It would simply not be possible to review a large number of charts every day without the aid of a computer to generate those charts; however, there is still great value in pencil and paper. This is not a practice that will reward you with immediate results and profits; it works on a much deeper and more profound level of perception, and it takes time. I would suggest that interested traders commit to doing this for a period of not less than two months, consistently, and then evaluate the impact of the exercise on your ability to read the market. I know of no better exercise to help a developing trader assimilate the patterns of the market and to begin building intuition. You will be amazed at the transformation in your vision.

There are two specific ways to do this exercise. One is to simply plot standard bar or candle charts, by hand, for whatever time period is under consideration. Every trader can at least do daily charts, but intraday traders might be able to do 15- to 30-minute time frames. Lower time frames will give much more exposure to patterns, but the time for contemplation is reduced. Above all, you want to pick a time frame that will allow you to make an unfailing commitment to this exercise. Doing it for a few days and then giving up will result in nothing but wasted time.

The other way is to construct a swing chart, which is also known as a kagi chart. In this type of chart, vertical lines indicate price movement (along the y-axis of the chart), while short horizontal lines illustrate the breaks between upswings and downswings. These breaks are defined according to some rule set, the specific choice of which is not that important. Traditionally, you may look for a specific dollar or point amount of a reversal off a high, and then flip direction, as in a standard point and figure chart. For instance, suppose a trader is working with a \$1.00 reversal; if the stock trades up to



FIGURE 1.18 Example of Swing Charting (Kagi) by Hand

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\$60.00 and then backs off to \$59.25, this is only a \$0.75 reversal off the high, so the only line on the chart is currently a vertical line that stops at \$60.00. If the market turns back up from \$59.25 and trades up to \$65.00, that original line is now extended to \$65.00 on the chart. Assume now that the market falls back to \$63.00, which exceeds the \$1.00 reversal threshold, so now a short horizontal line is plotted at \$65.00 (the high of the previous swing) to connect to the next downward vertical line, which now extends to \$63.00. This process is repeated, so the x-axis is not scaled for time or activity, but rather for specific reversal amounts off previous swings. (Consider what this type of chart tells us in relation to the previous discussions on pivots and length of swings.) It is also possible to define the reversal with other tools, such as reversing a specific multiple of the average range off the previous swing, J. Welles Wilder Jr.'s Parabolic SAR (stop and reverse), moving average crossovers, or whatever trend indicator you find appropriate. Figure 1.18 shows an example of this type of chart, drawn by hand. Do not underestimate the power of this simple charting exercise.