The Art and Science of Technical Analysis

Market Structure, Price Action, and Trading Strategies

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ECHO POINT BOOKS & MEDIA, LLC

AUDIOBOOK SUPPLEMENT

TABLE OF CONTENTS

PART I

The Foundation of Technical Analysis

CHAPTER 1

The Trader's Edge

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

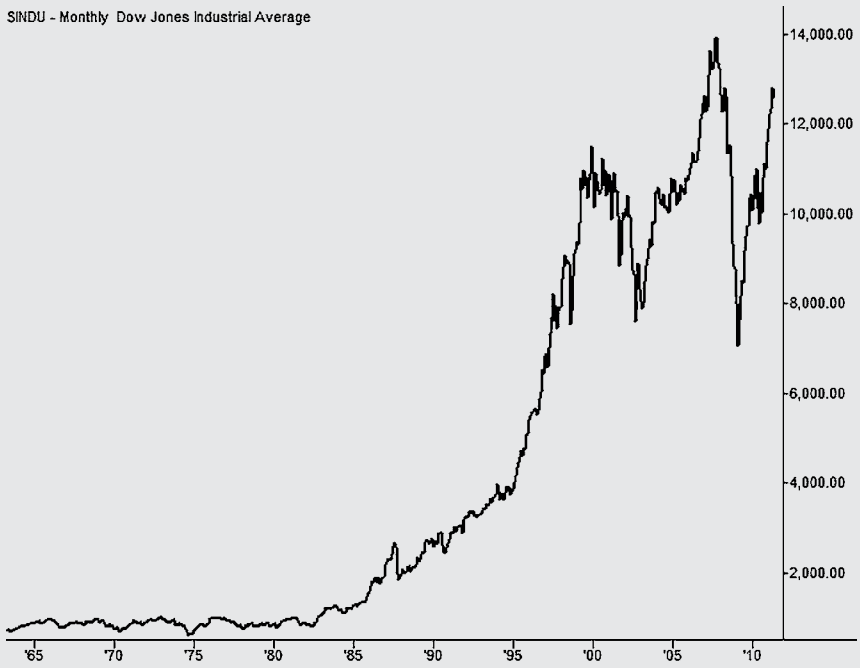


FIGURE 1.1 Nothing Seems to Matter Before 1985: DJIA on a Linear Scale

FIGURE 1.2 Investors' Actual Experiences: DJIA on a Log Scale

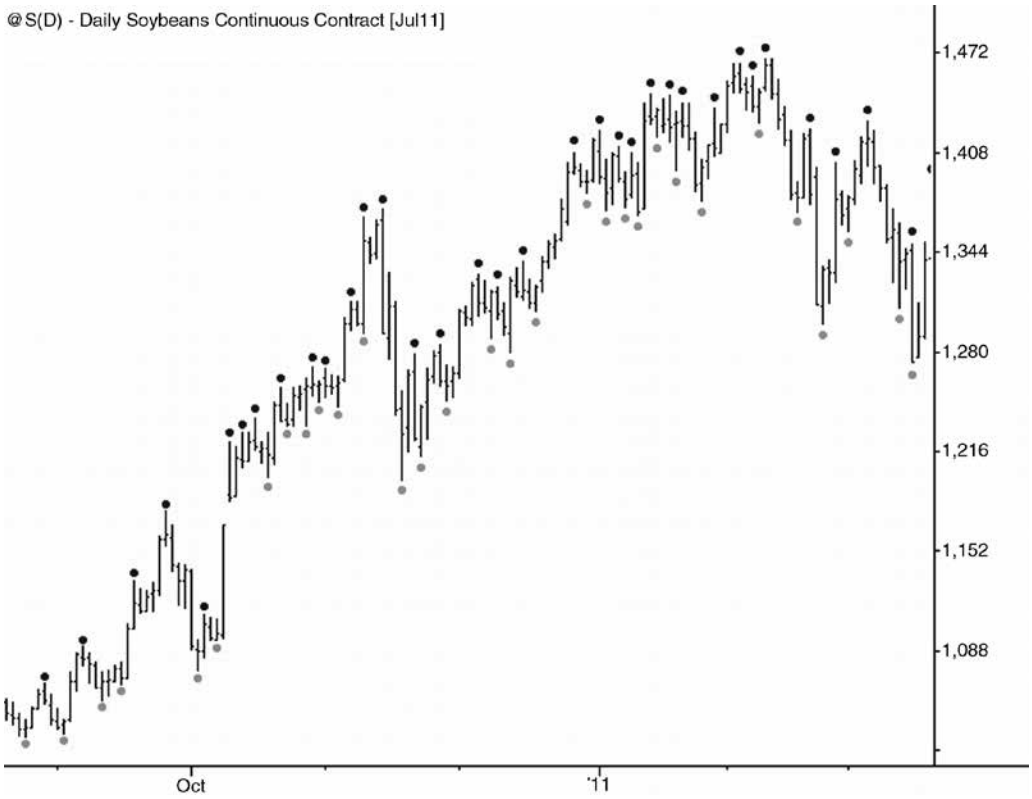


FIGURE 1.3 Every Pivot High and Low

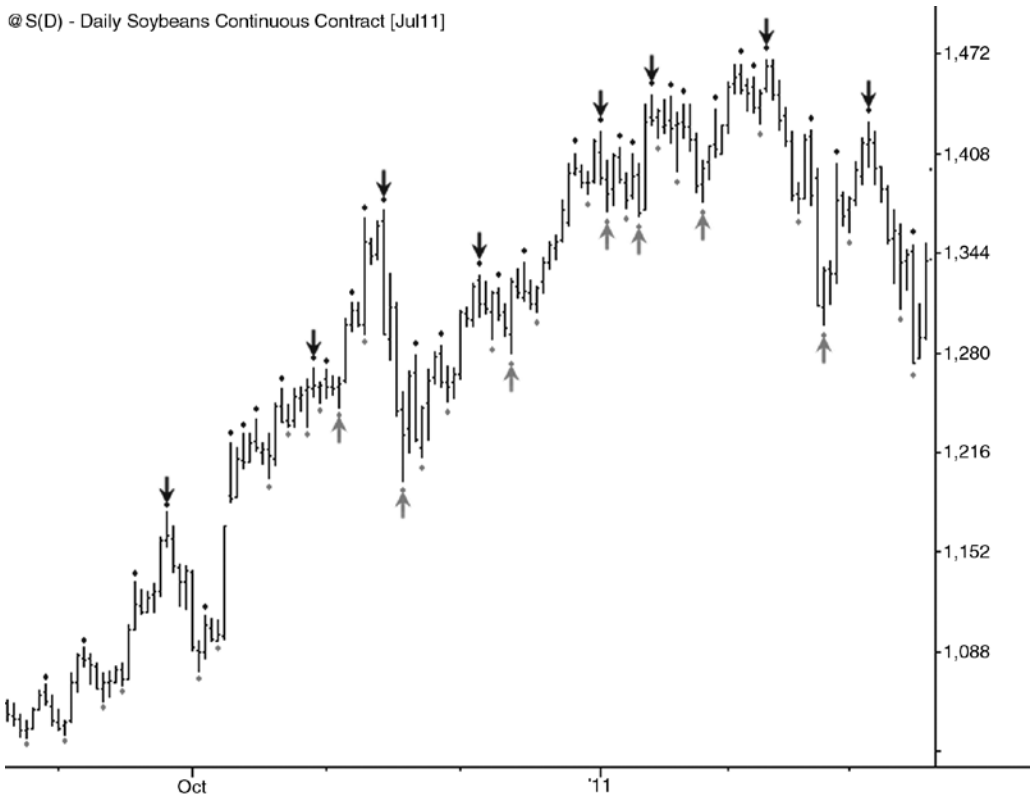


FIGURE 1.4 Second-Order Pivots (Marked with Arrows) Define More Important Market Structure

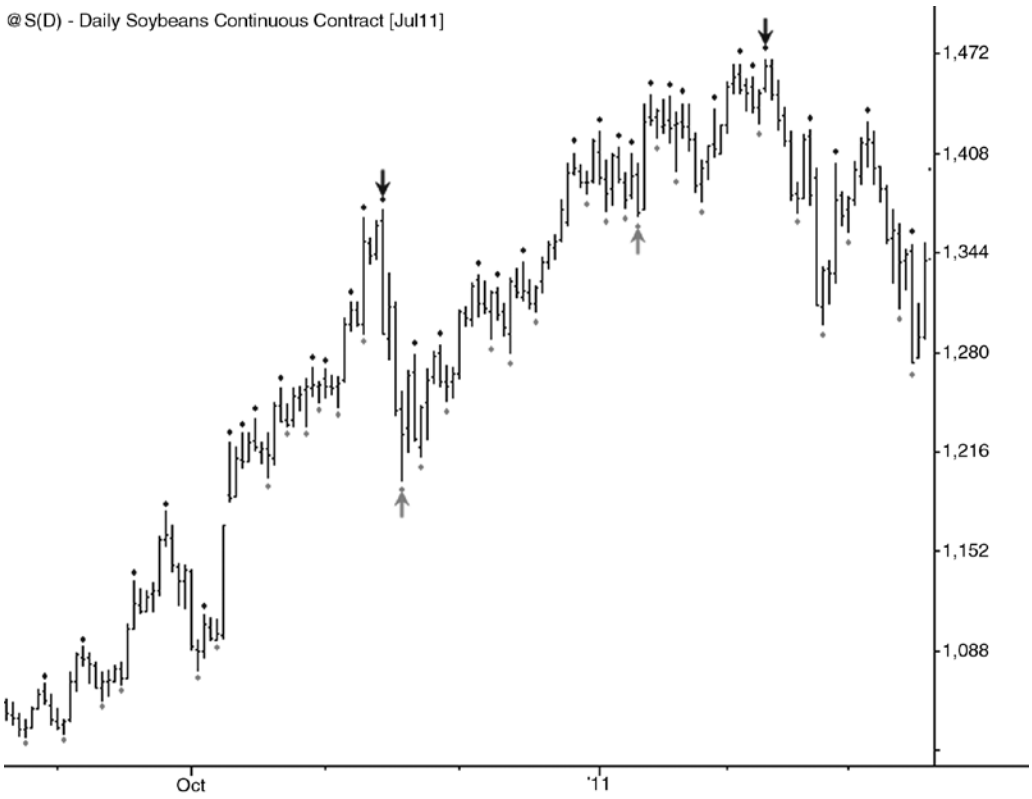


FIGURE 1.5 Third-Order Pivots Usually Define the Most Important Market Structure on Any Time Frame

FIGURE 1.6 An Uptrend

FIGURE 1.7 A Trading Range

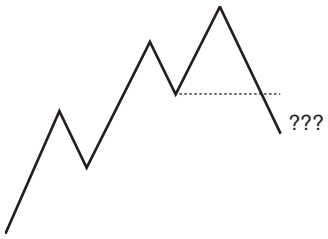


FIGURE 1.8 A Break in the Uptrend Pattern

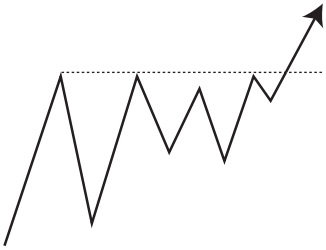


FIGURE 1.9 A Breakout of the Trading Range

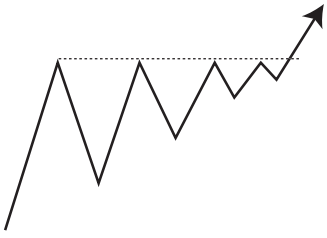


FIGURE 1.10 A Breakout Preceded by Higher Lows into Resistance

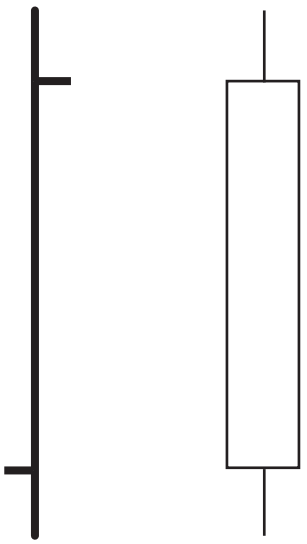


FIGURE 1.11 A Candle Is a Snapshot in Time—How Was This Candle Formed?

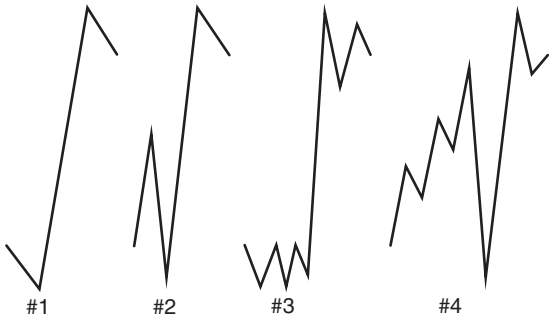


FIGURE 1.12 Some of the Many Possibilities of Lower Time Frame Action That Could Have Produced Figure 1.11

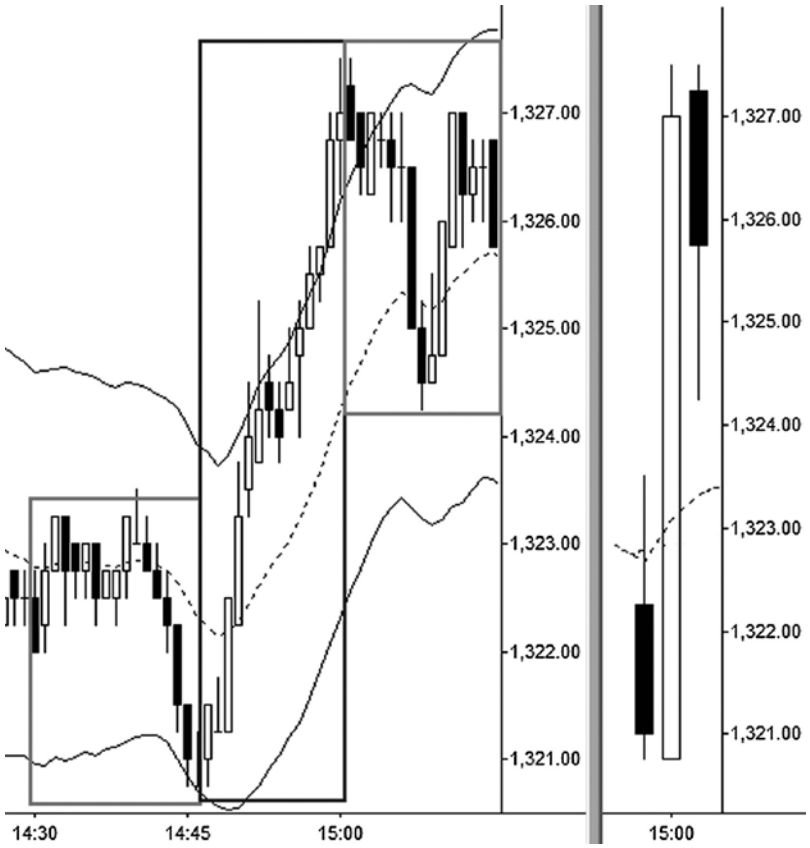


FIGURE 1.13 One- and 15-Minute S&P Bars, Showing Lower Time Frame Trading Range and Trend within Higher Time Frame Bars

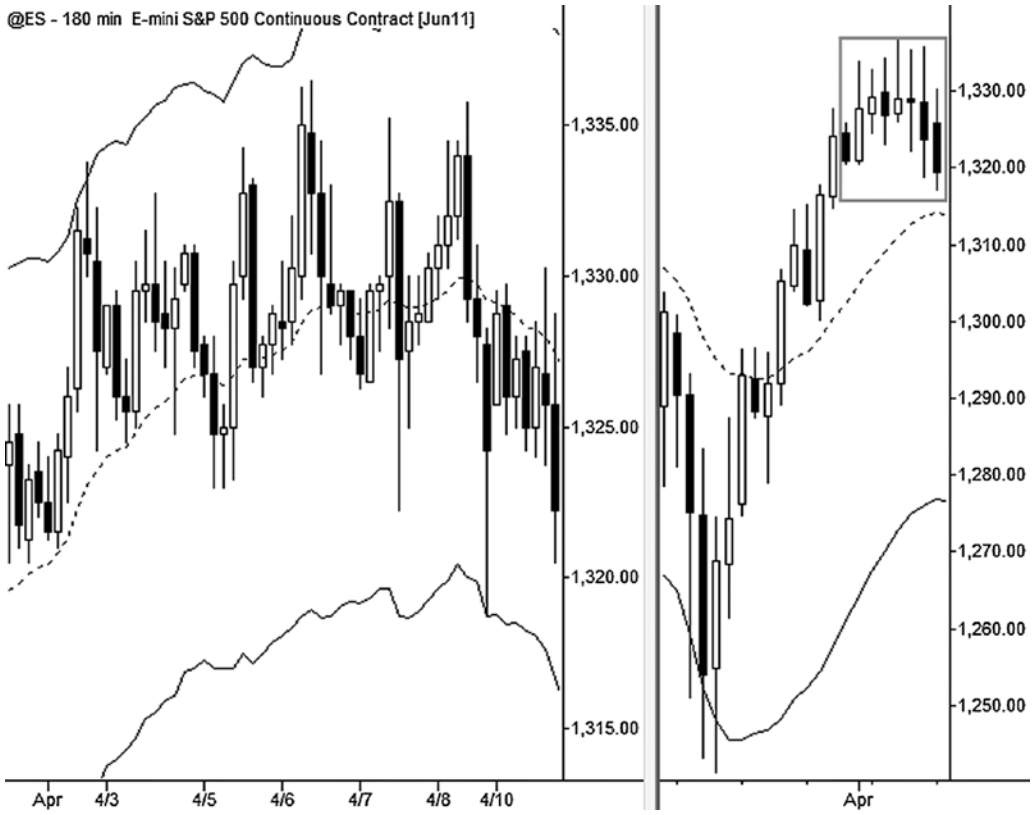


FIGURE 1.14 Three-Hour (Left Pane) and Daily S&P 500 Futures Charts

Notice that the lower time frame shows multiple tests and failures at the high. This level of resolution is lost on the higher time frame, which simply shows a gently rounding top.

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

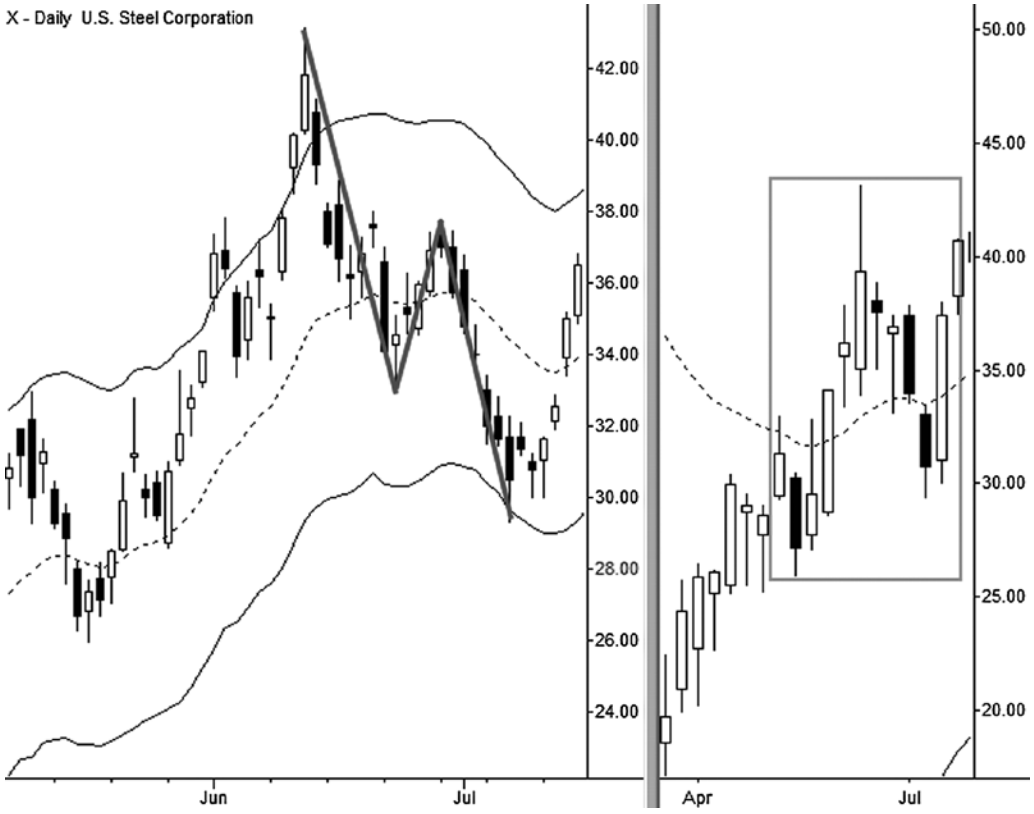


FIGURE 1.16 The Daily Chart of X (Left Pane) Shows a Clear Two-Legged Complex Pullback
The weekly chart hints at this structure, but it must be inferred from the single upward-closing candle in the middle of the pullback.

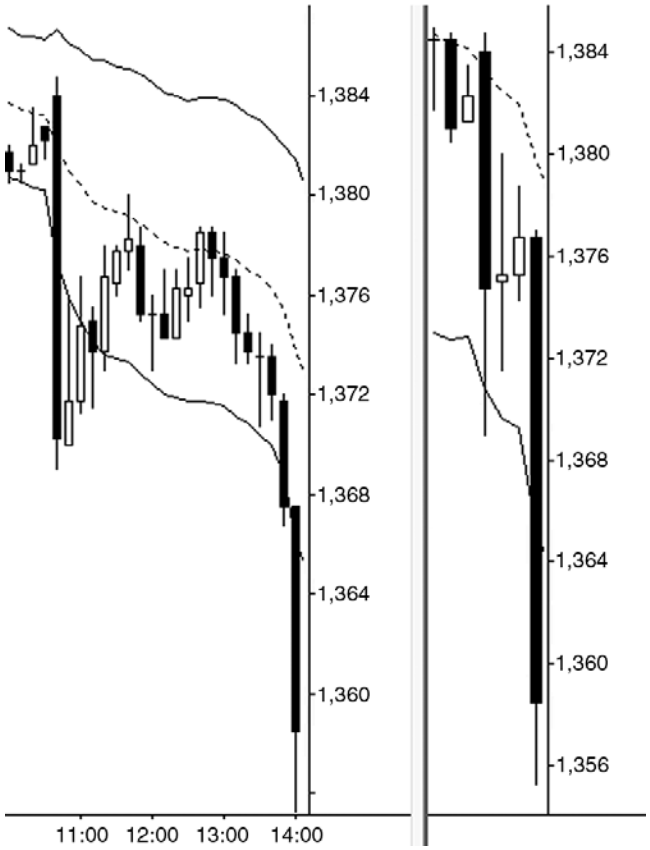


FIGURE 1.17 Multiple Inside Bars on the Hourly Chart of the E-mini S&P 500 Futures (Right Pane) Hide a Clear Lower Time Frame Triangle on the 10-Minute Chart

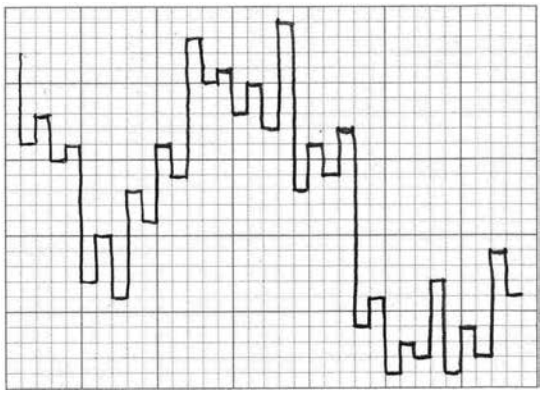


FIGURE 1.18 Example of Swing Charting (Kagi) by Hand

CHAPTER 2

The Market Cycle and the Four Trades

To every thing there is a season, and a time to every purpose under the heaven.

—Ecclesiastes 3:1, KJV

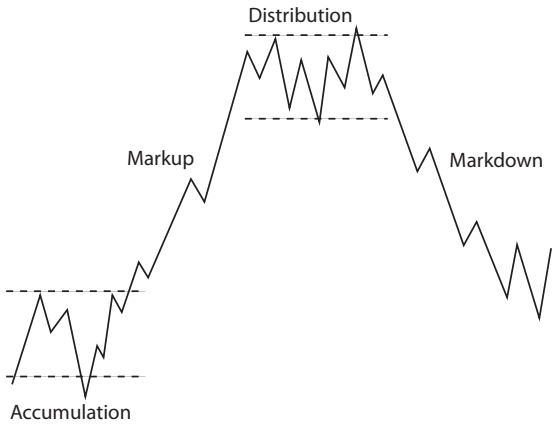


FIGURE 2.1 The Classic Wyckoff Cycle

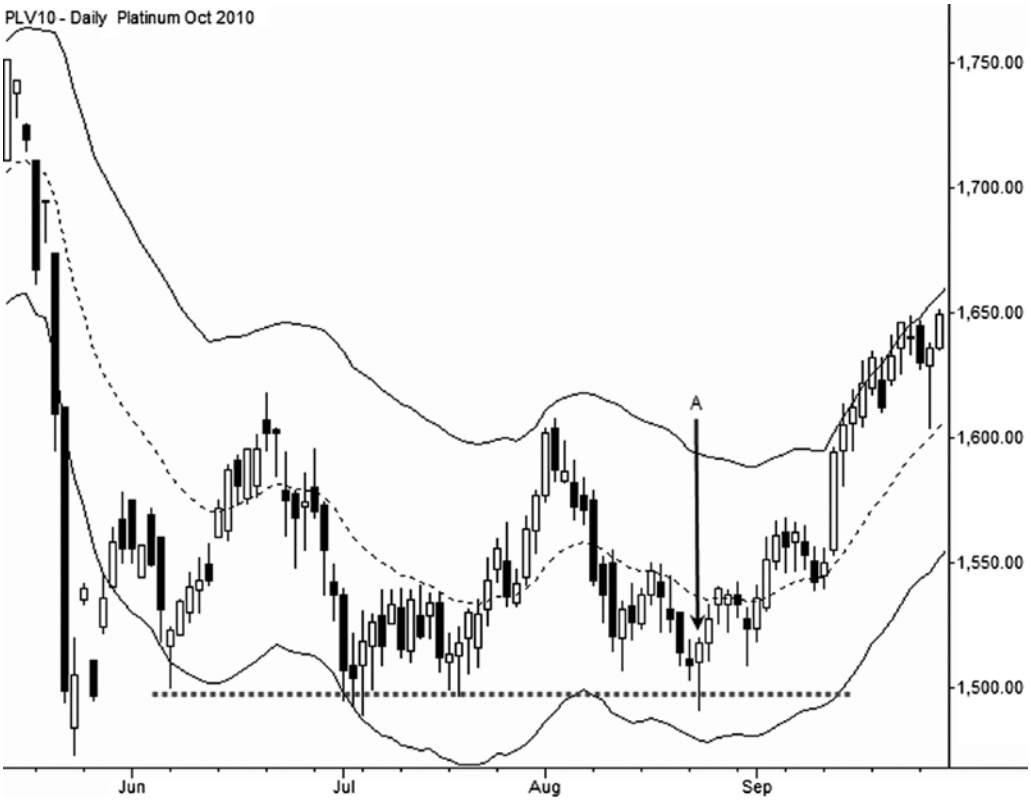


FIGURE 2.2 Accumulation in Daily Platinum Futures with a Classic Spring at A

PART II

Market Structure

CHAPTER 3

On Trends

Don't fight forces, use them.

—R. Buckminster Fuller

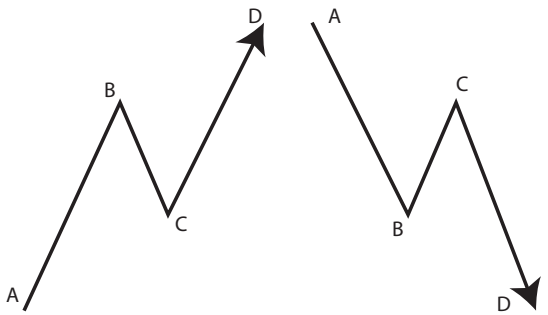


FIGURE 3.1 The Fundamental Trend Pattern: Impulse, Retracement, Impulse in an Uptrend and a Downtrend

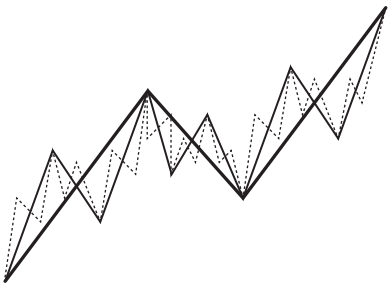


FIGURE 3.2 Each Trend Leg Breaks Down into a Three-Legged Structure on the Next Lower Time Frame

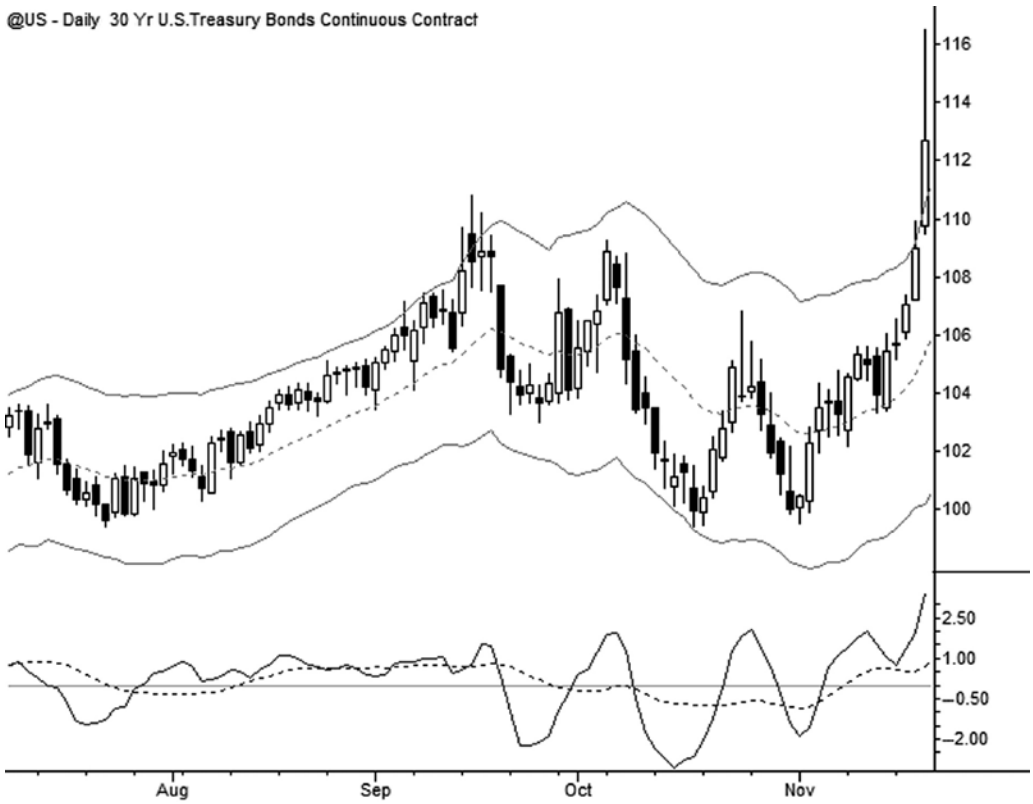


FIGURE 3.3 Thirty-Year Treasury Bond Futures, November 2008

Strong momentum emerges at the right side of the chart, penetrating the upper channel and spiking the MACD to a new high.

FIGURE 3.4 Five-Minute S&P 500 Futures, December 7, 2010

A large downward price spike (marked with an arrow on the chart) sets off an extended downtrend.

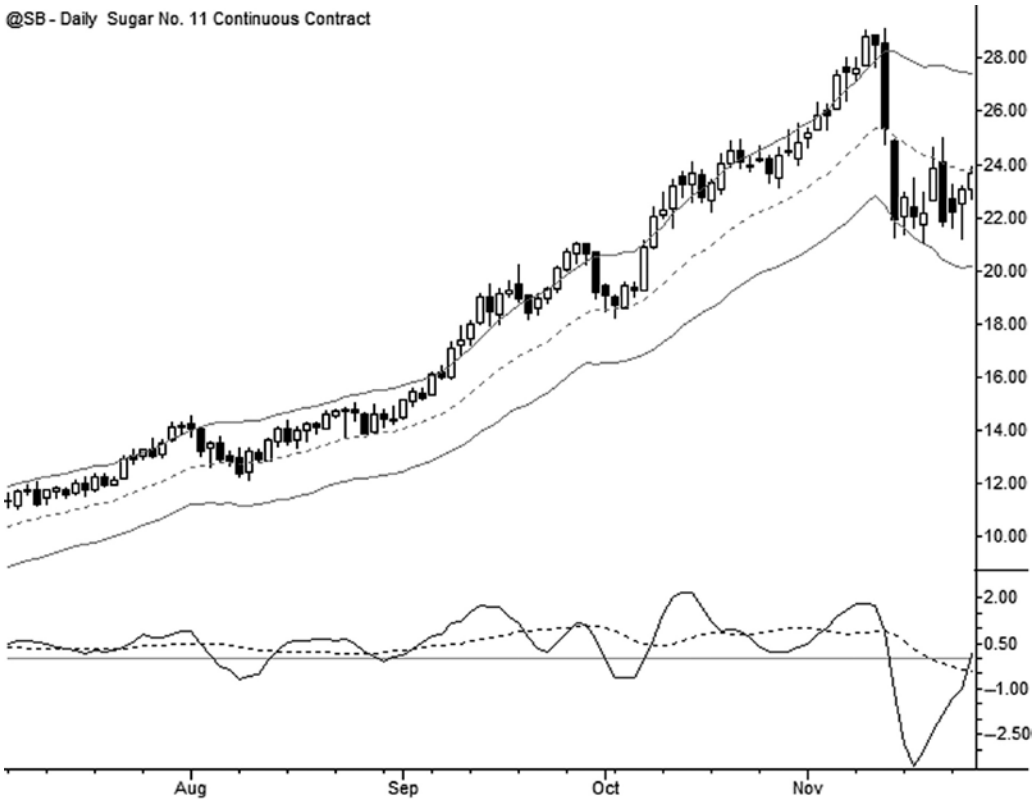


FIGURE 3.5 Sugar Futures, November 2010—Two Large Downward Closing Days Break the Trend Pattern

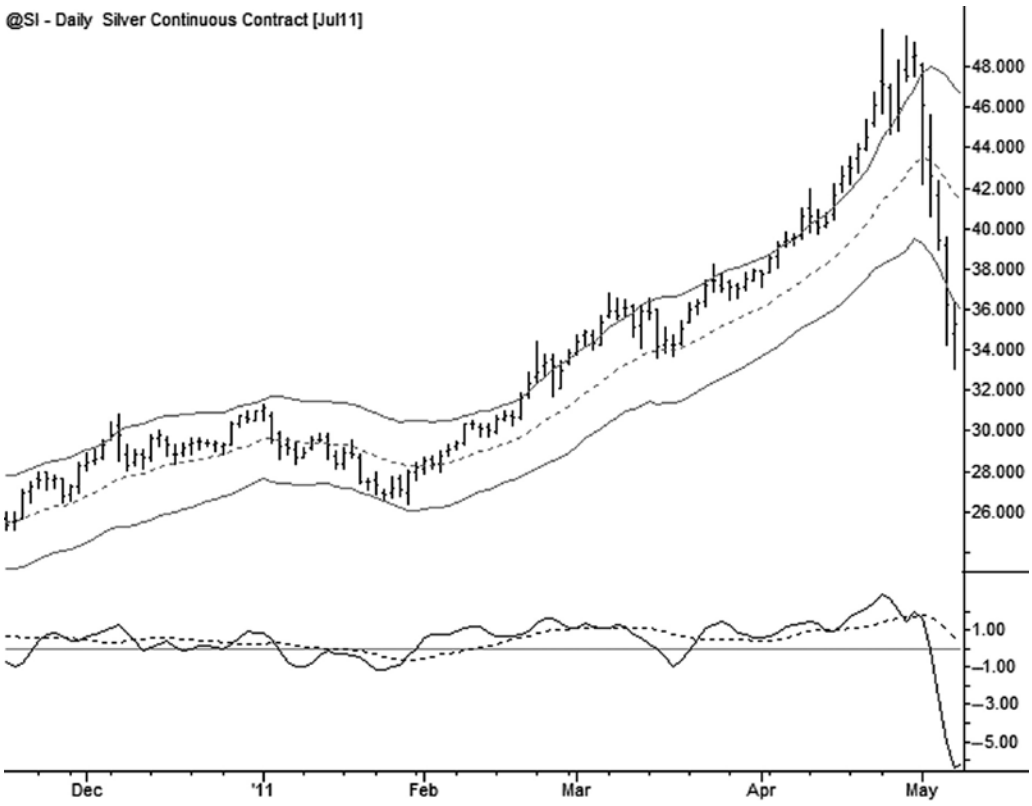


FIGURE 3.6 Daily Silver Futures, May 2011—A Near-Perfect Example of a Buying Climax

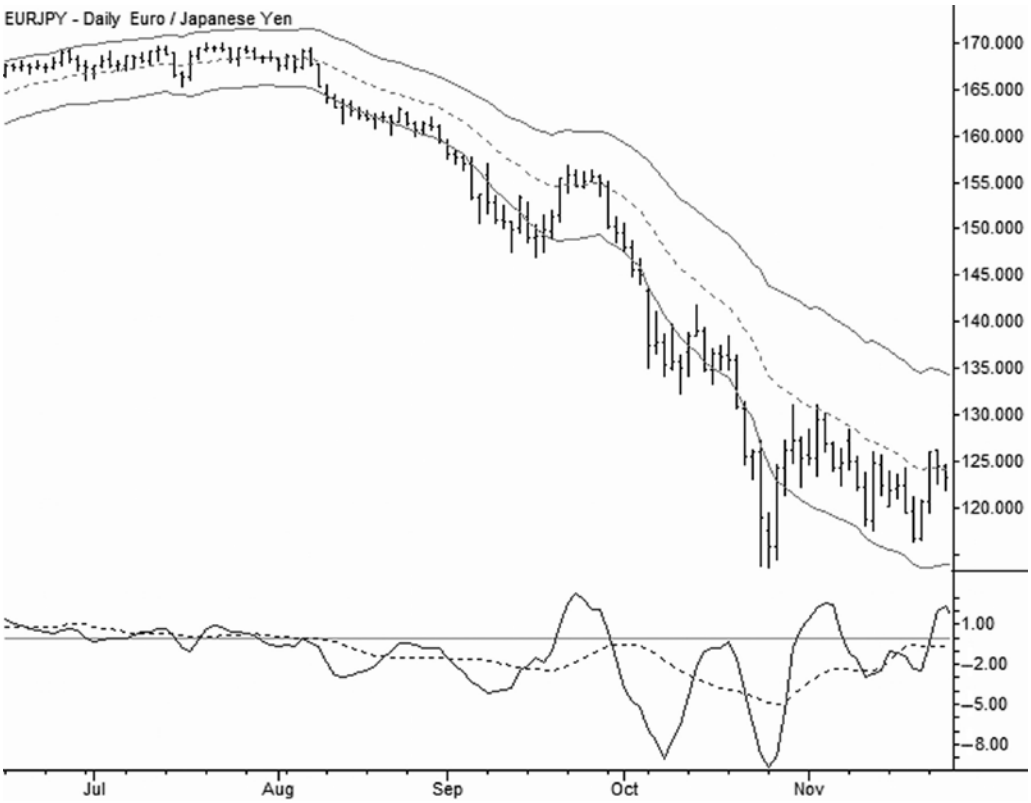


FIGURE 3.7 A Selling Climax in the EURJPY Following Multiple Downtrend Legs

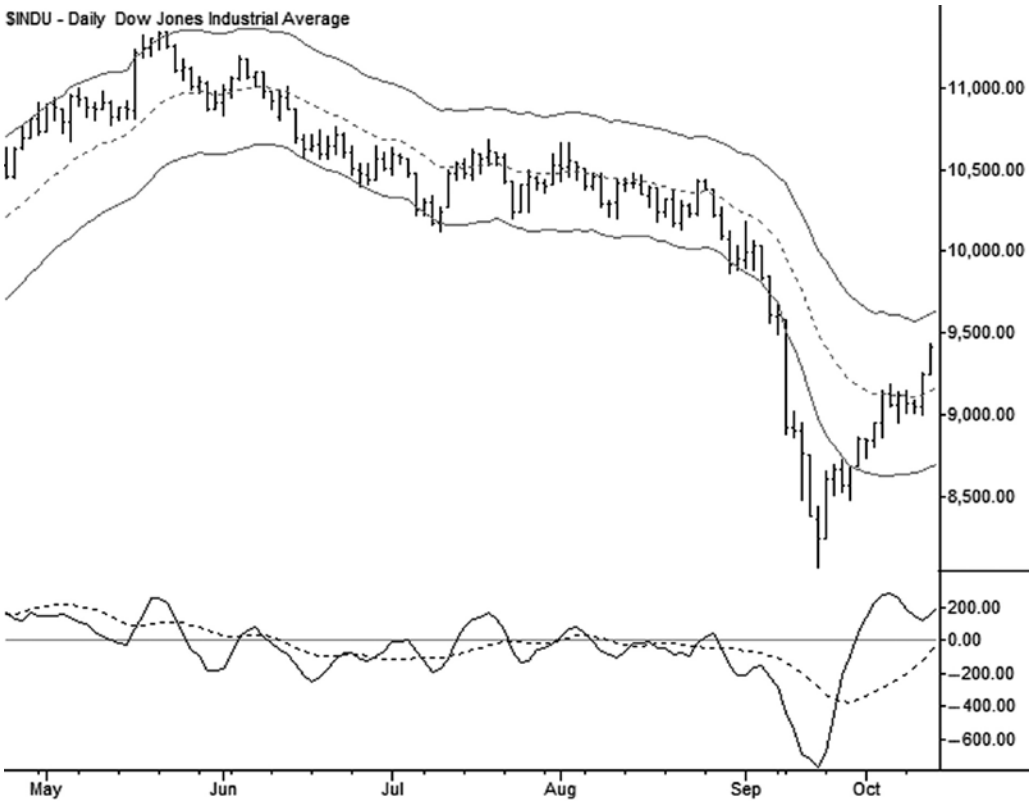


FIGURE 3.8 The Dow Jones Industrial Average Before and After the Terrorist Attacks of September 11, 2001

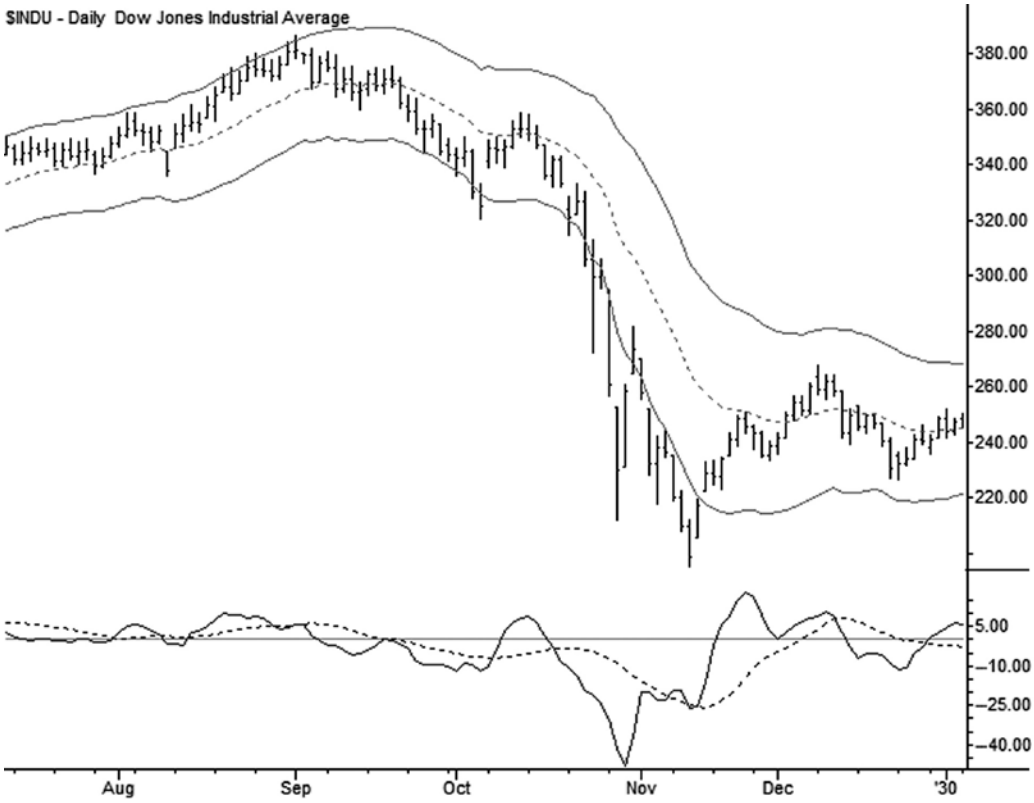


FIGURE 3.9 Dow Jones Industrial Average, Second Half of 1929
Note the same selling climax pattern.

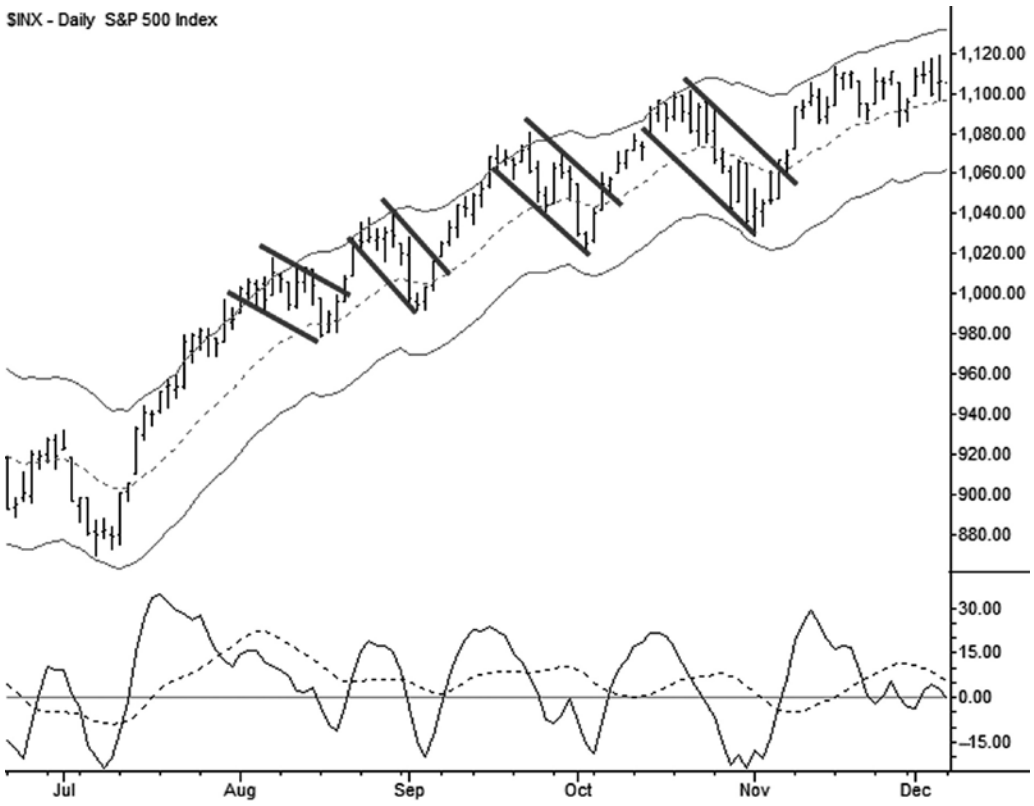


FIGURE 3.10 Pullbacks in the Uptrend—E-mini S&P 500 Futures, December 2009

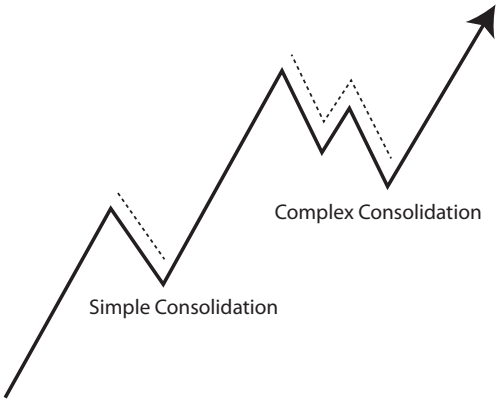


FIGURE 3.11 Simple and Complex Pullbacks

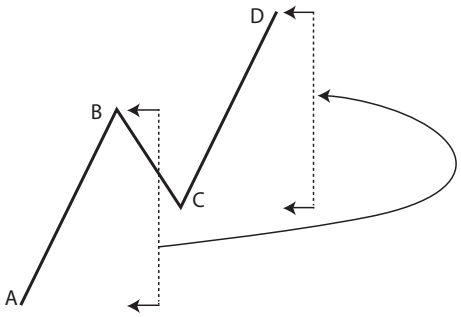


FIGURE 3.12 Measured Move Objective: Add Distance AB to Point C to Predict Approximate Location of D

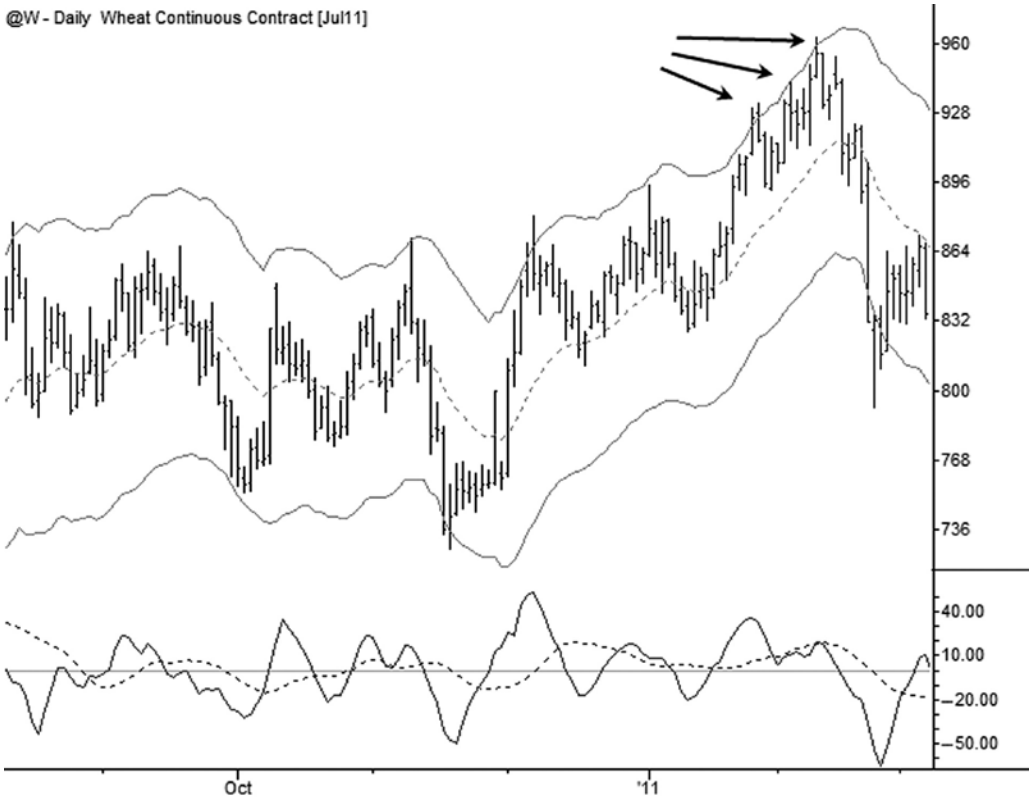


FIGURE 3.13 Daily Wheat Futures, Showing Three Drives to End a Trend

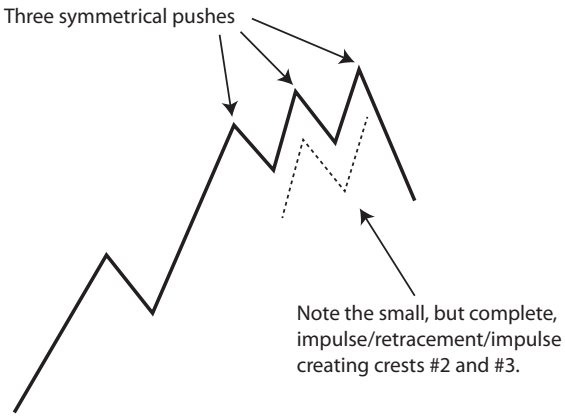


FIGURE 3.14 Schematic of the Three Pushes Pattern Showing Underlying Structure

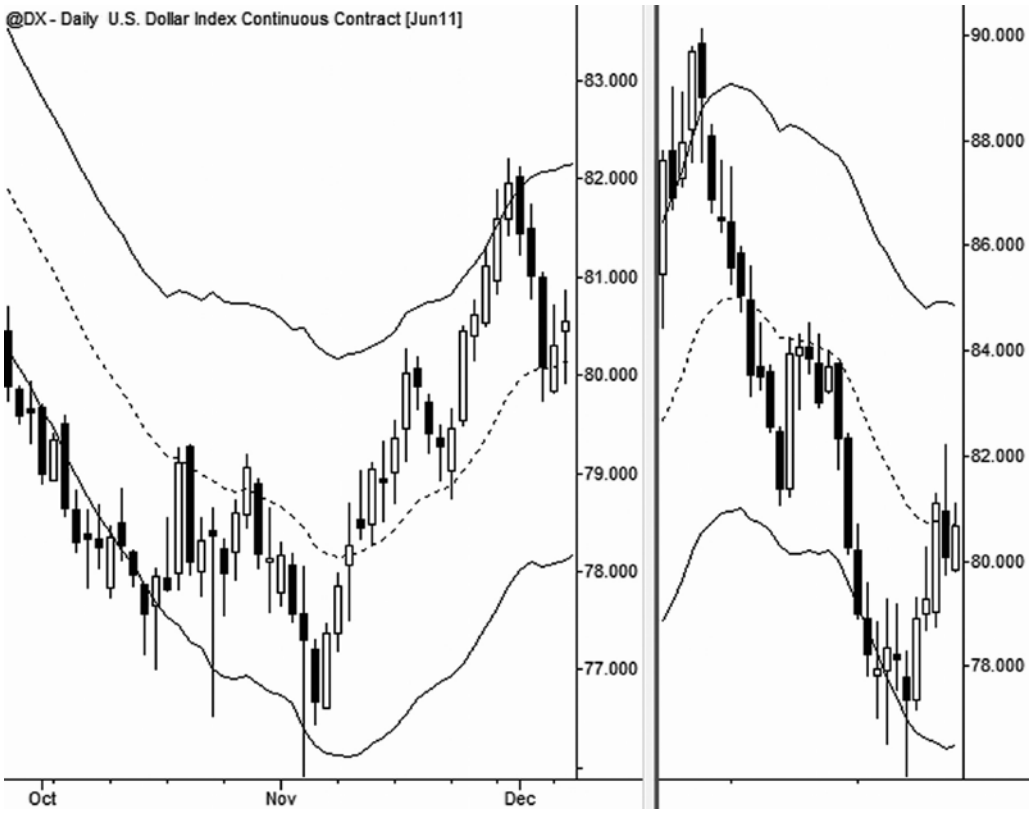


FIGURE 3.15 Conflicting Information from the Daily and Weekly Chart of the U.S. Dollar Index Futures

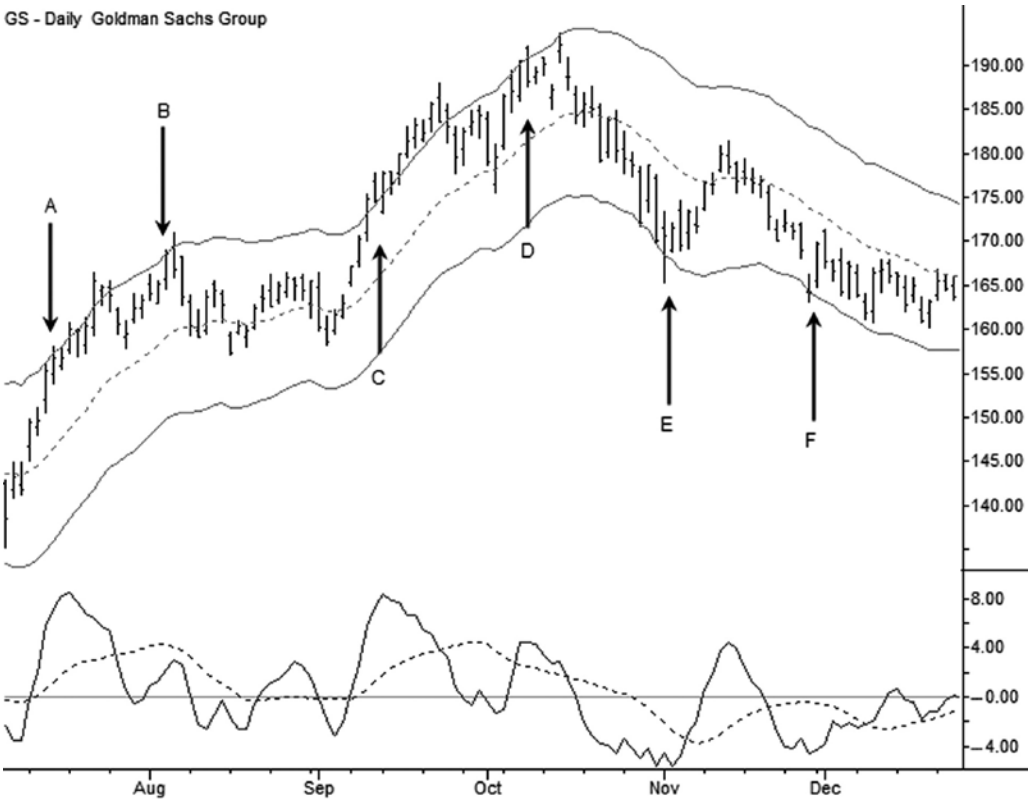


FIGURE 3.16 Trading Momentum in GS, December 2009

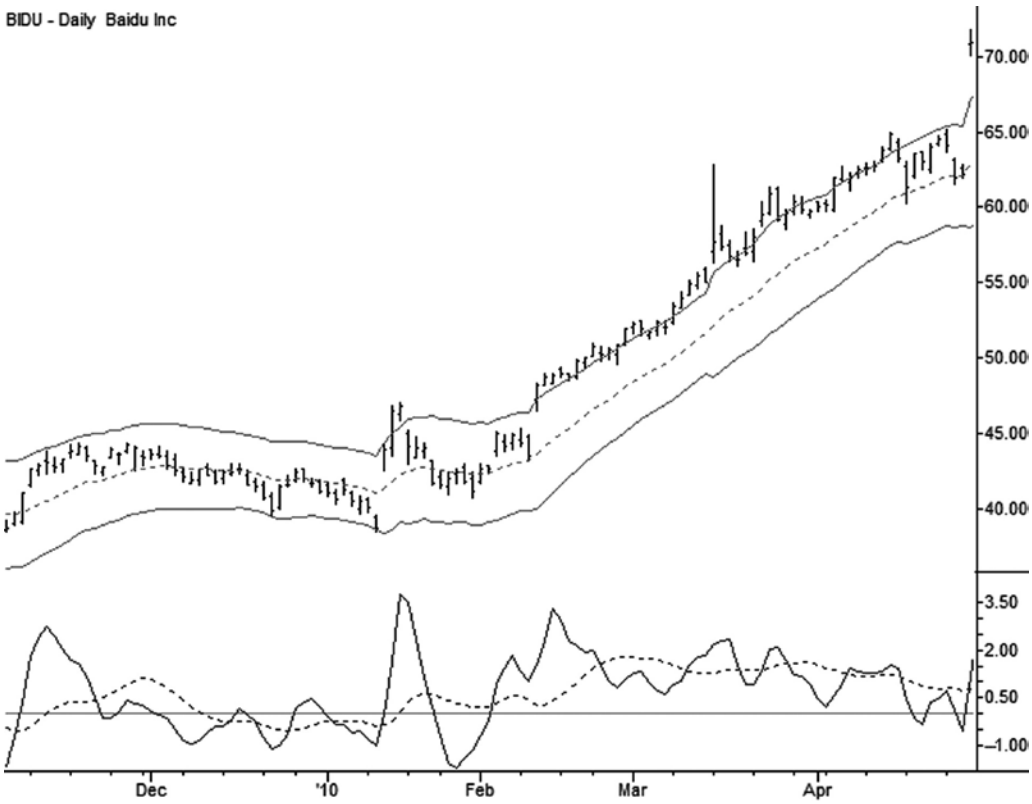


FIGURE 3.17 A Strong Trend in BIDU Holds the Stock Tight against the Upper Keltner Channel

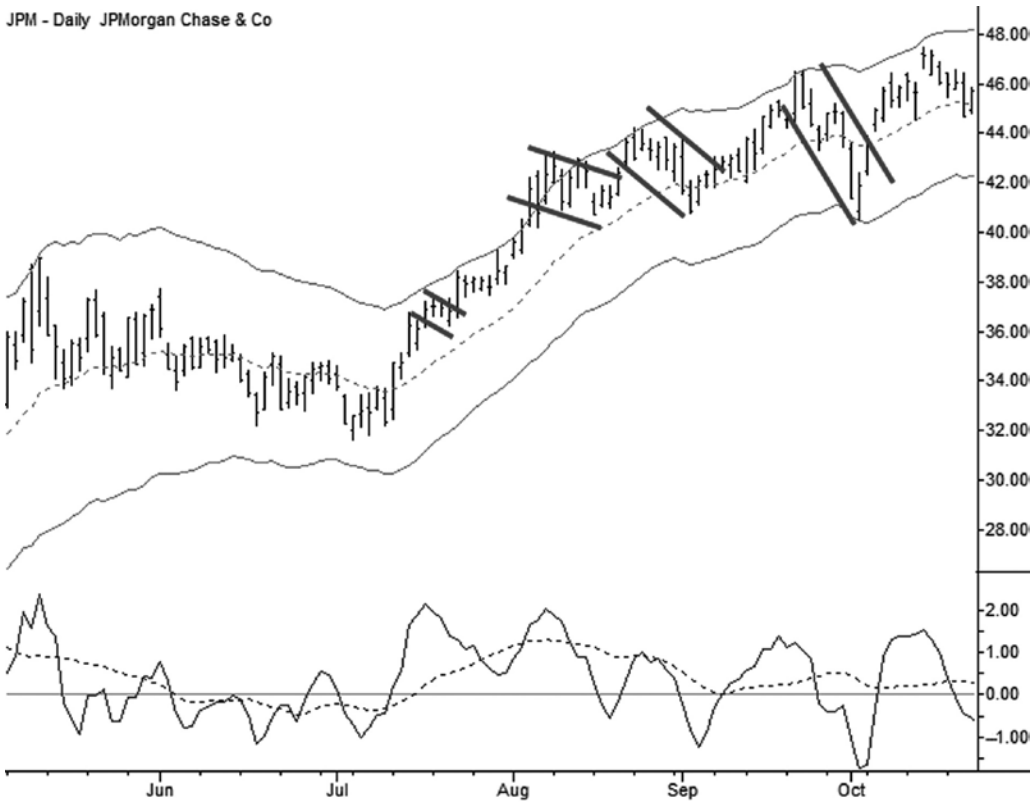


FIGURE 3.18 Erratic Pullbacks in JPM, Late 2009

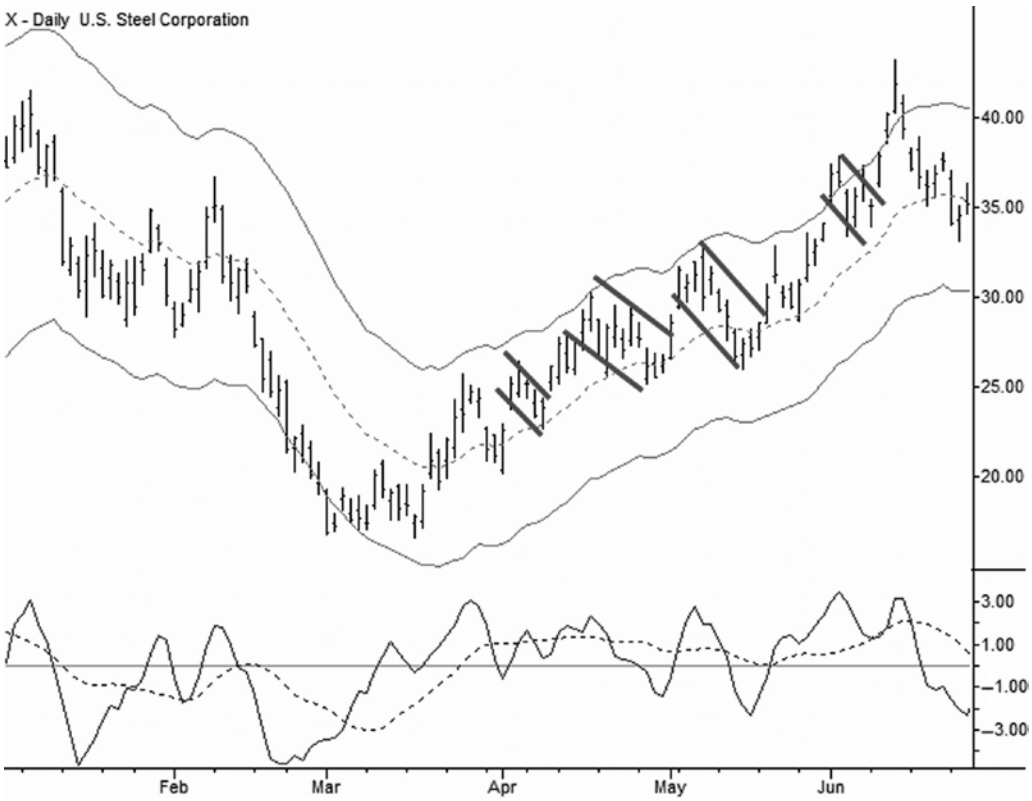


FIGURE 3.19 More Consistent Pullbacks in X, Mid-2009

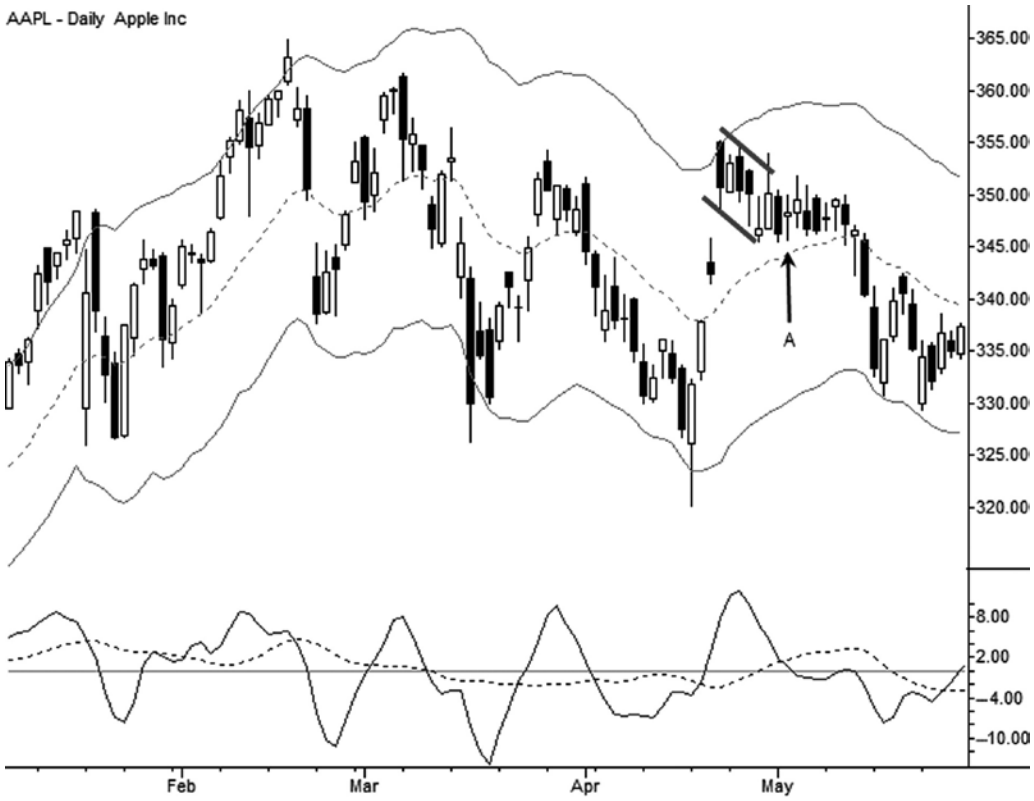


FIGURE 3.20 A Pullback in APPL That Failed by Transitioning to a Flat Trading Range

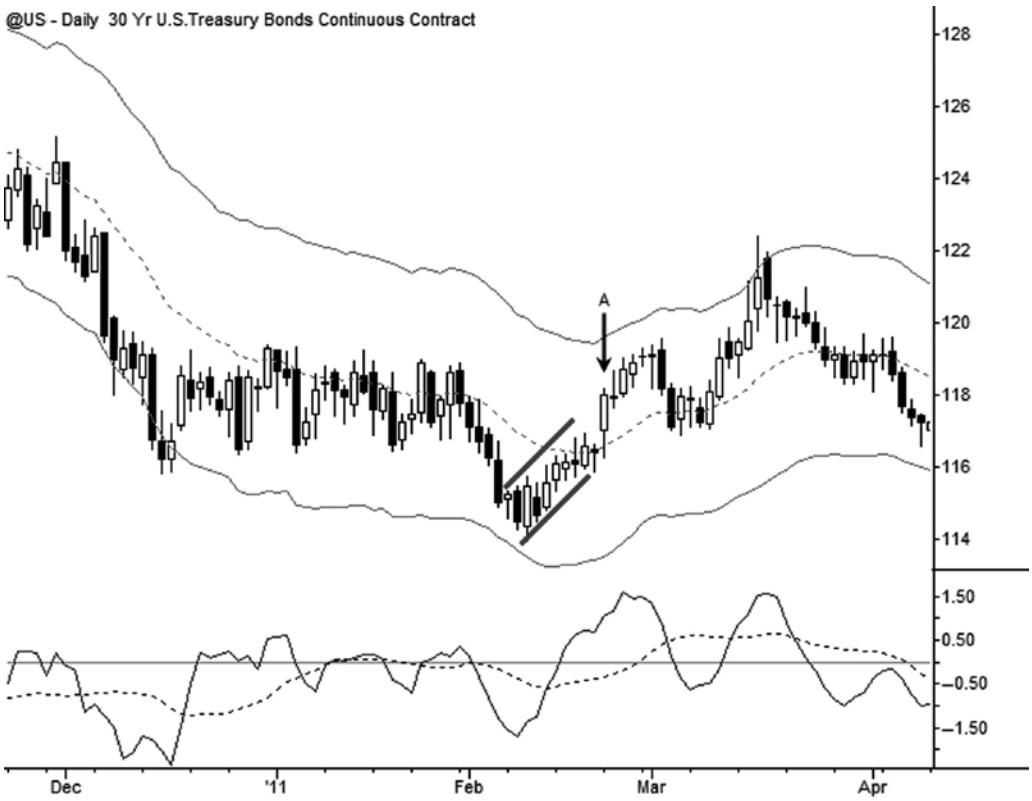


FIGURE 3.21 A Pullback in 30-Year Treasury Bond Futures That Failed via Sharp Momentum

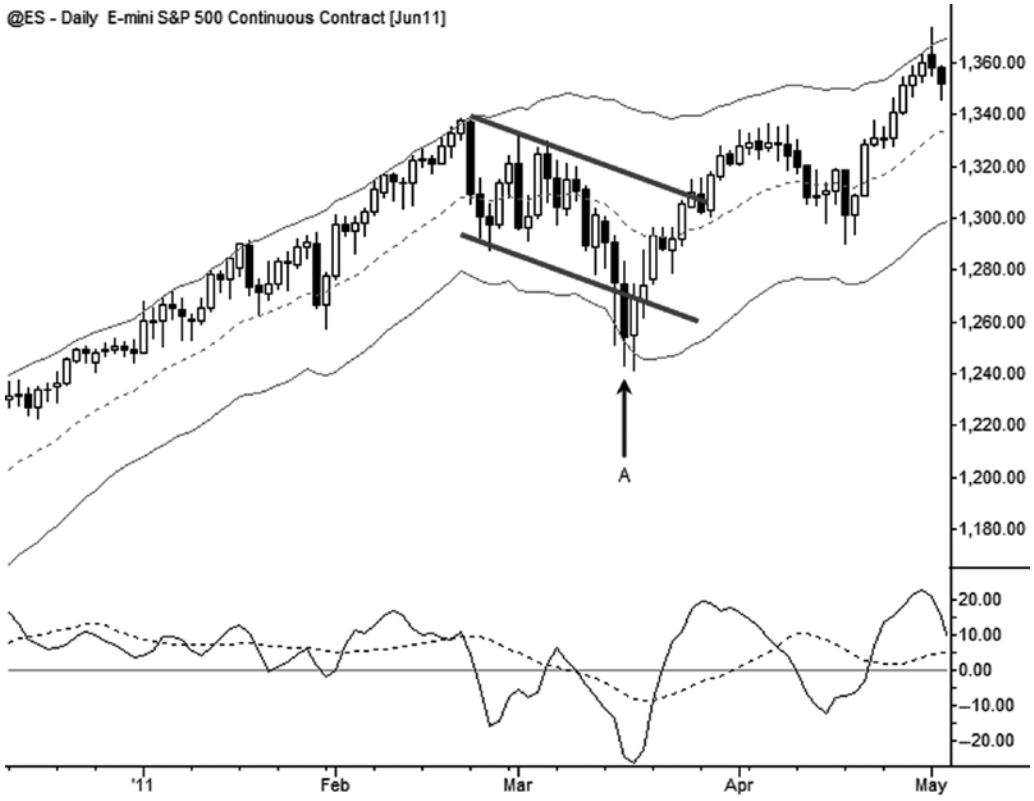


FIGURE 3.22 A Failure to Break Down Out of a Pullback in the S&P Futures Sets Up a Good With-Trend Entry

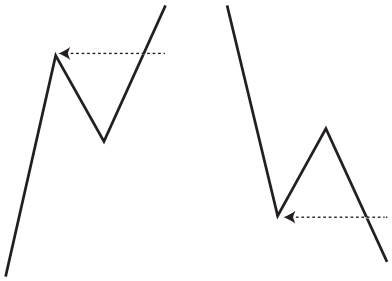


FIGURE 3.23 Profit Targets for Pullbacks In Uptrends and Downtrends

FIGURE 3.24 A Pullback in the GBPUSD Fails Near the Trend Extreme

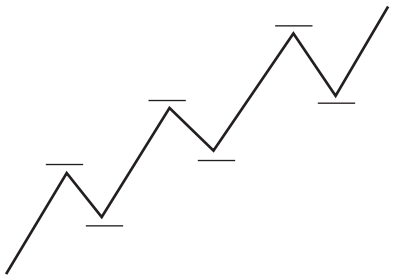


FIGURE 3.25 Higher Highs and Higher Lows in an Idealized Dow Theory Uptrend

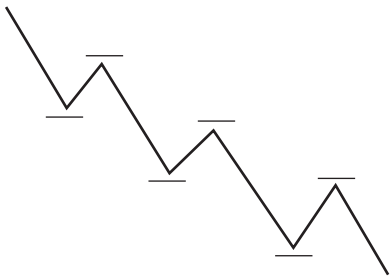


FIGURE 3.26 Dow Theory Downtrend with Lower Lows and Lower Highs

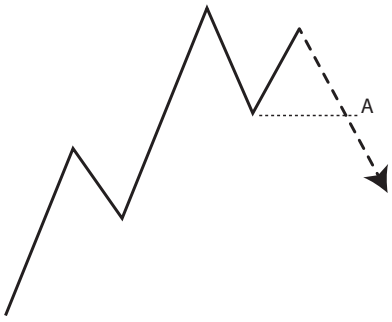


FIGURE 3.27 Dow Theory Trend Change #1

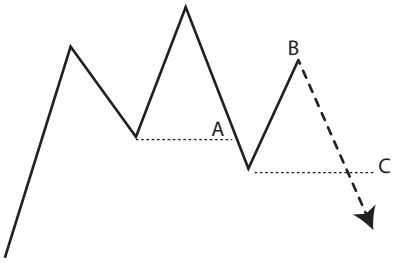


FIGURE 3.28 Dow Theory Trend Change #2

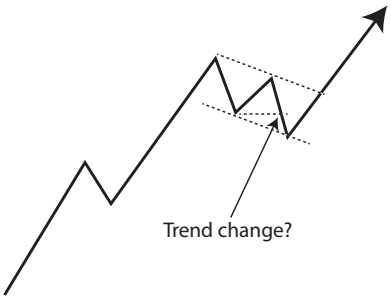


FIGURE 3.29 A Complex Consolidation Will Flag a Trend Change According to a Strict Interpretation of Dow Theory Rules

FIGURE 3.30 Trend Changes Flagged by the Slope of a 50-Period Moving Average

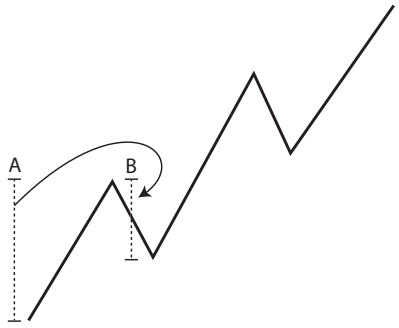


FIGURE 3.31 In an Uptrend, Upswings Are Larger than Downswings

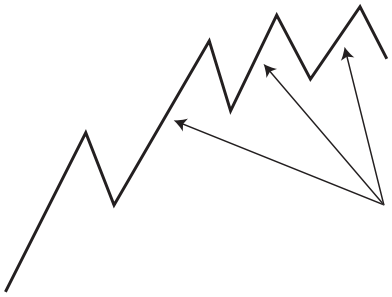


FIGURE 3.32 Shorter Upswings Can Be a Warning of Impending Trend Failure

FIGURE 3.33 The First Downswing That Is Larger than the Preceding Upswing, in Time or Price, Is a Warning to Pay Attention

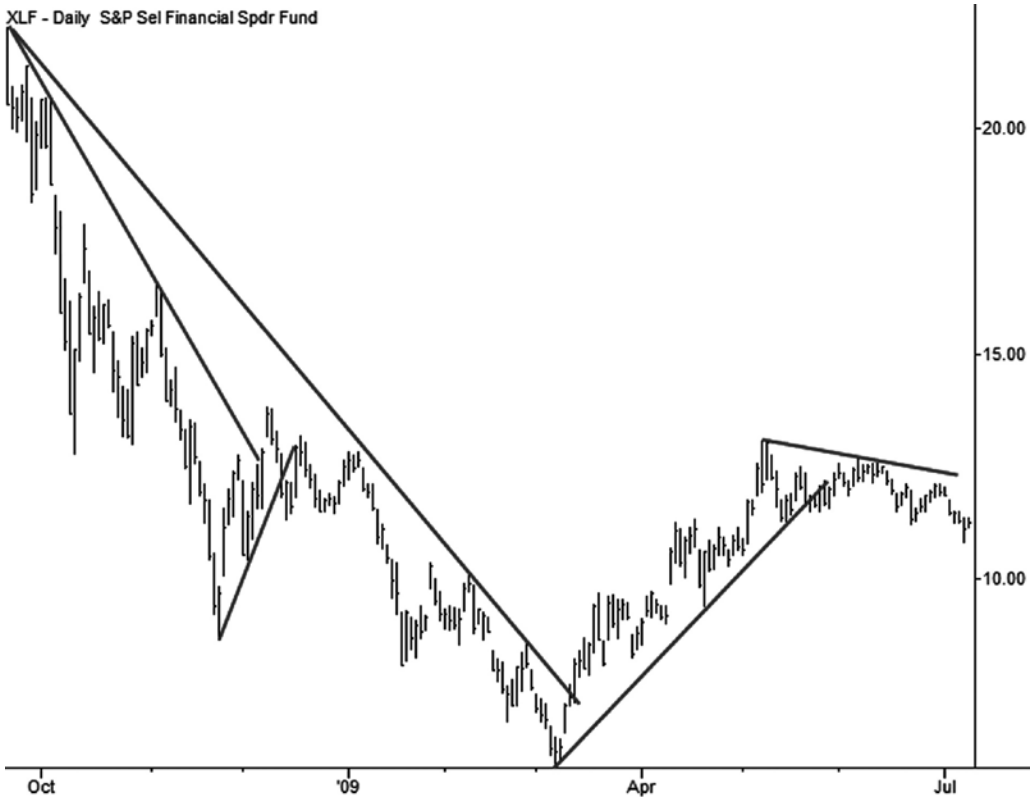


FIGURE 3.34 Standard Trend Lines in the SPDR Select Sector Fund for the Financial Sector (NYSE: XLF)

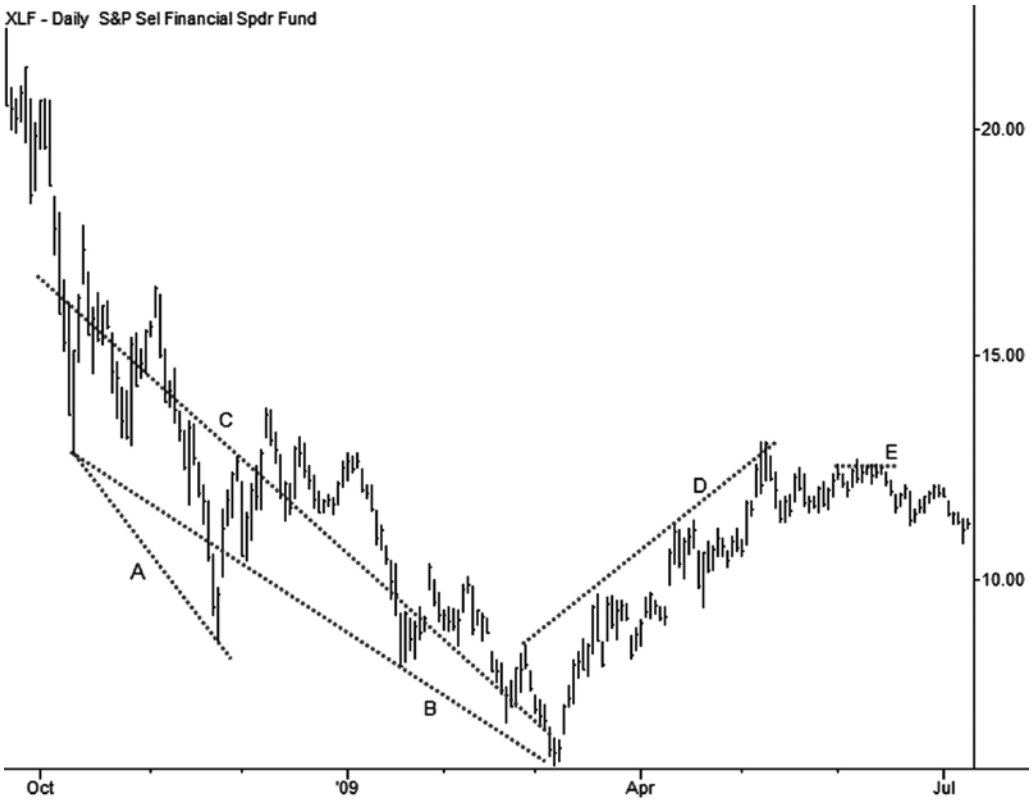


FIGURE 3.35 Nonstandard Trend Lines in XLF

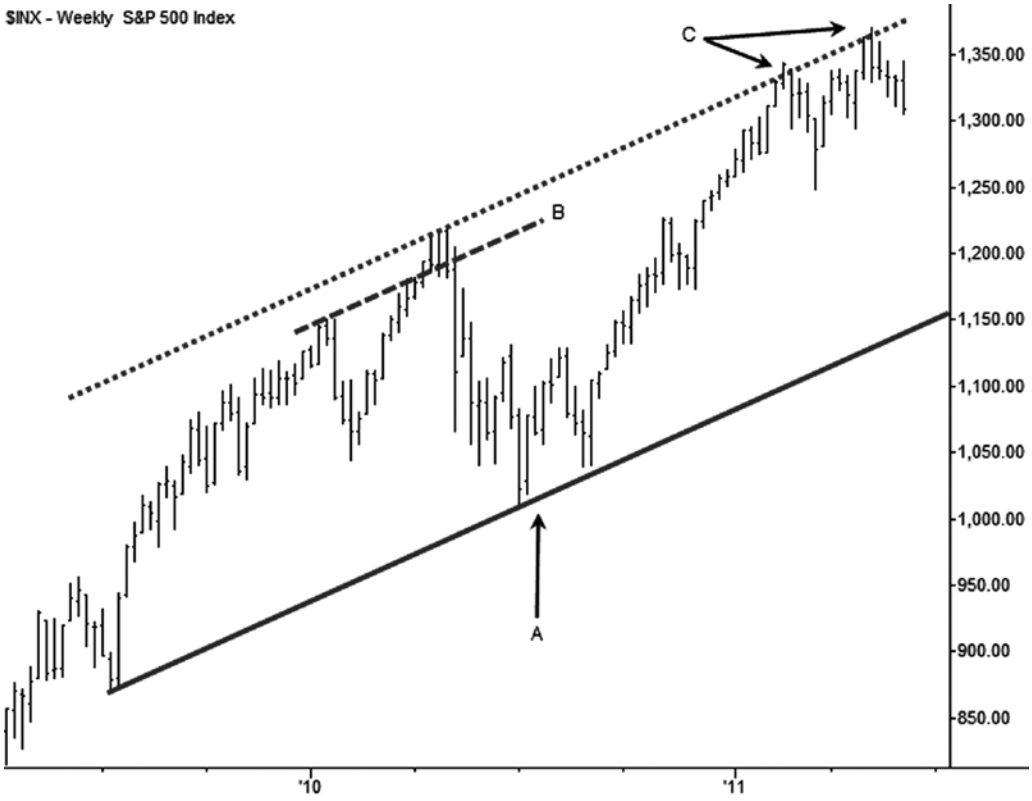


FIGURE 3.36 A Parallel Trend Line on the Weekly S&P 500 Cash Index

FIGURE 3.37 A Break of the Parallel Trend Line Can Often Lead to an Accelerated Trend (Daily Silver Futures)

FIGURE 3.38 Trend Lines Drawn between Two Bars Can Provide Good Inflections on the Next Bar

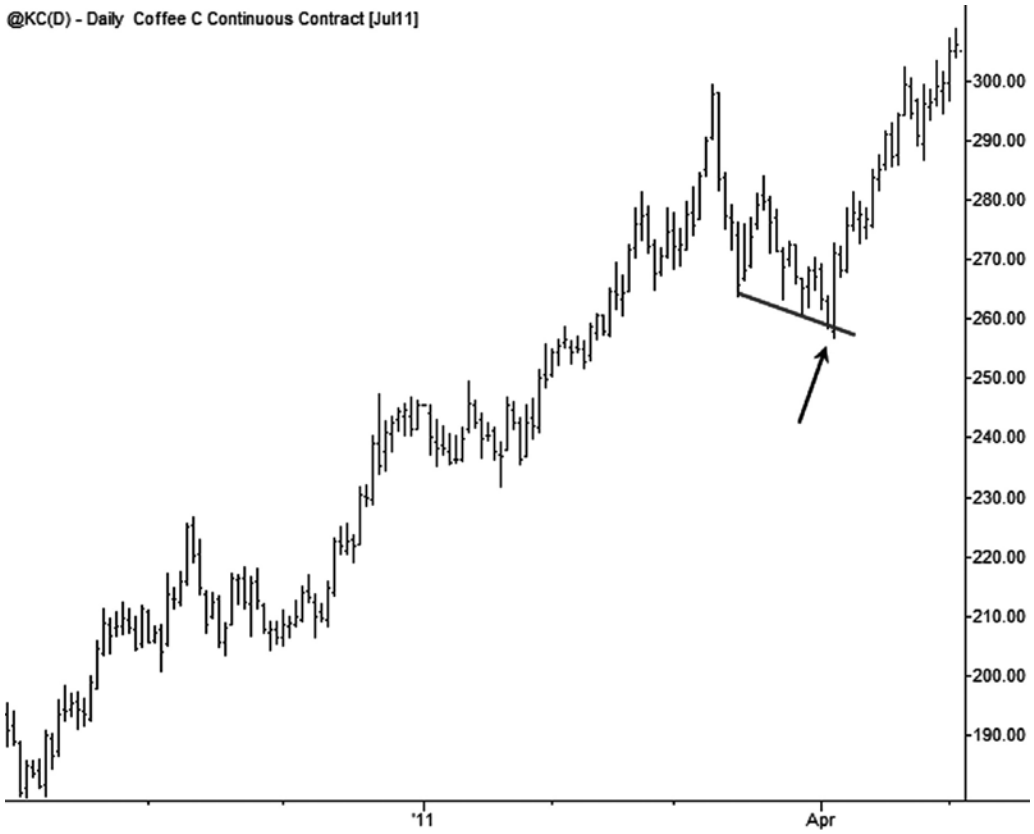


FIGURE 3.39 The Break of the Trend Line under the Pullback Was the Catalyst for the Move

FIGURE 3.40 A Fan of Trend Lines as the Intraday Russell 2000 Exchange-Traded Fund (ETF) (IWM) Finds New Rates of Trend on Small Breaks of the Trend Line

FIGURE 3.41 Steepening Trend Lines Are Needed to Define the Accelerating Trend in Cotton Futures

CHAPTER 4

On Trading Ranges

The heavy is the root of the light.
The unmoved is the source of all movement.

—Daodejing (ca. 6 BCE)

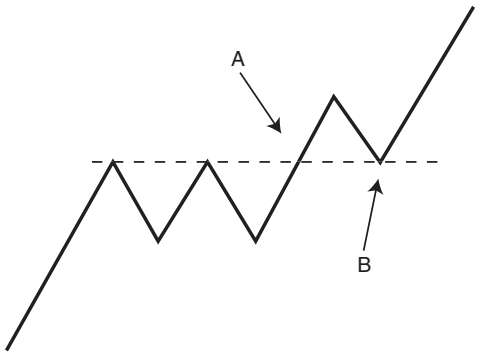


FIGURE 4.1 Resistance Becomes Support

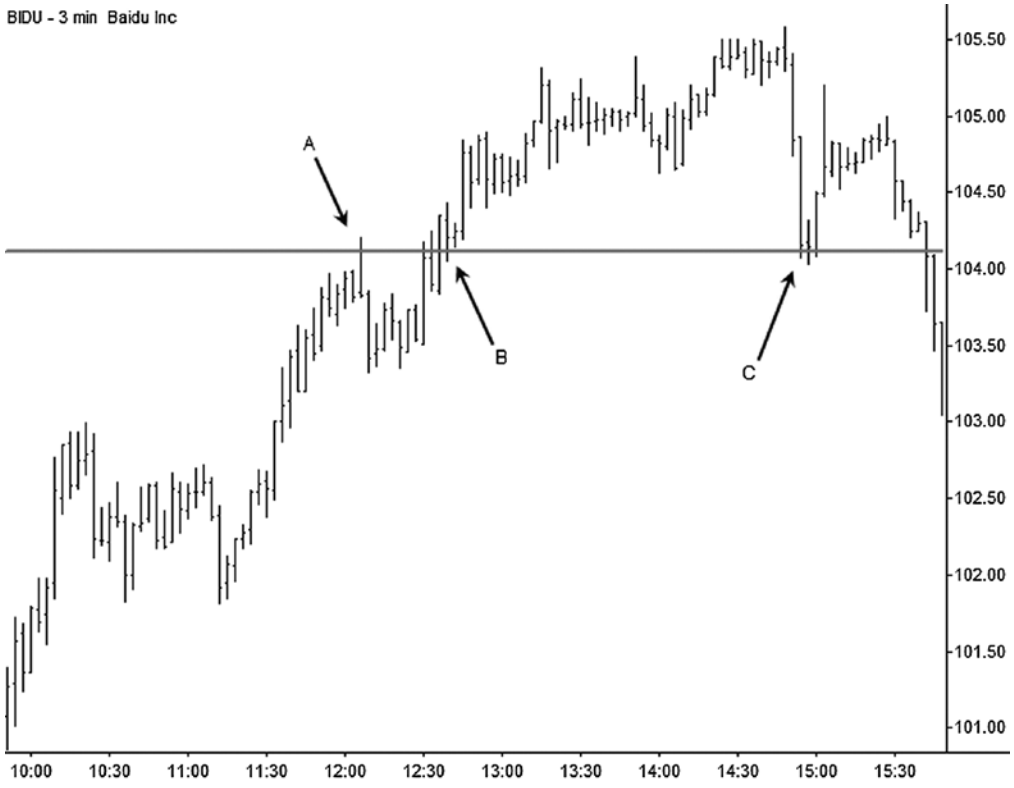


FIGURE 4.2 Resistance Breaks (B) and Holds as Support on the Retest

FIGURE 4.3 Support Breaks, but Holds as Resistance on Three Retests

FIGURE 4.4 Clear Resistance Is Tested Multiple Times, Breaks (A), and Then Holds Cleanly as Support When Retested (B)

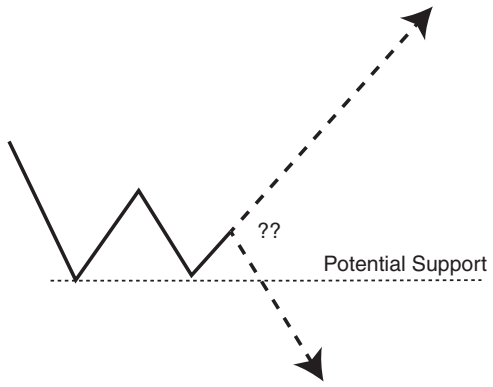


FIGURE 4.5 If Reward Is Much Greater Than Risk, Is It Always a Good Idea to Buy Here?

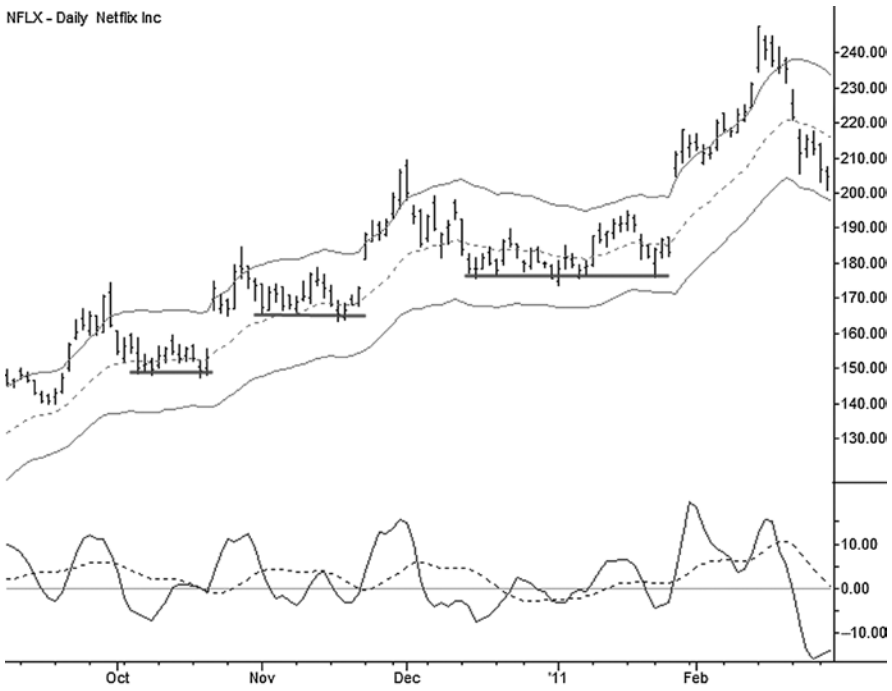


FIGURE 4.6 Sloppy Tests of Support in NFLX

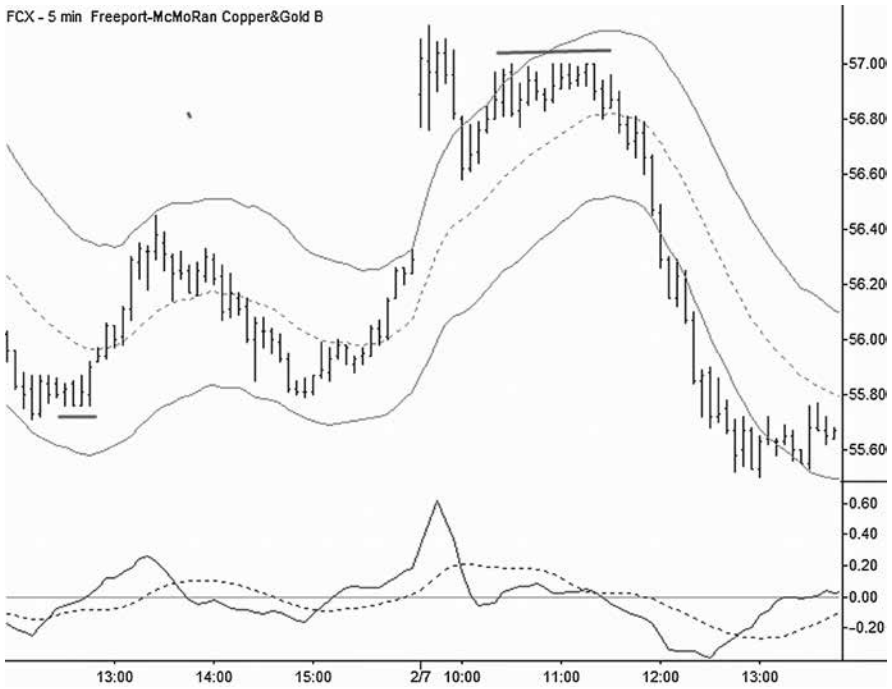


FIGURE 4.7 Clean Support and Resistance in FCX

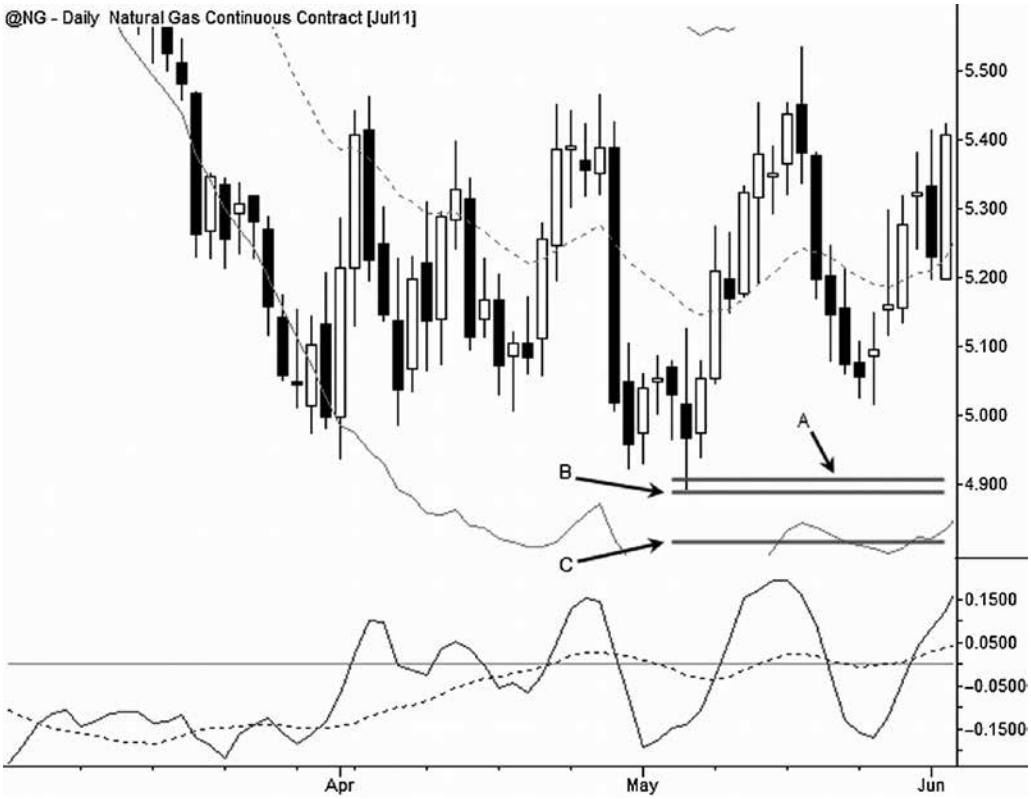


FIGURE 4.8 Three Stop Levels

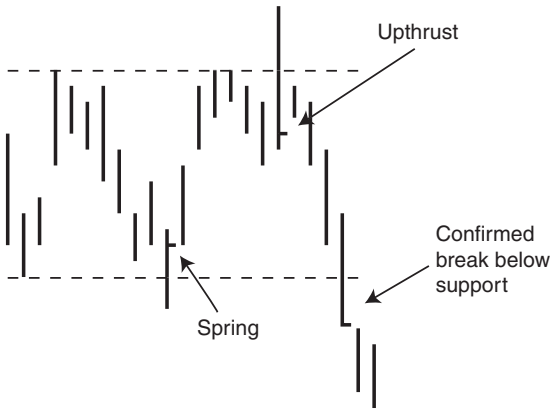


FIGURE 4.9 A Spring and an Upthrust in an Idealized Trading Range

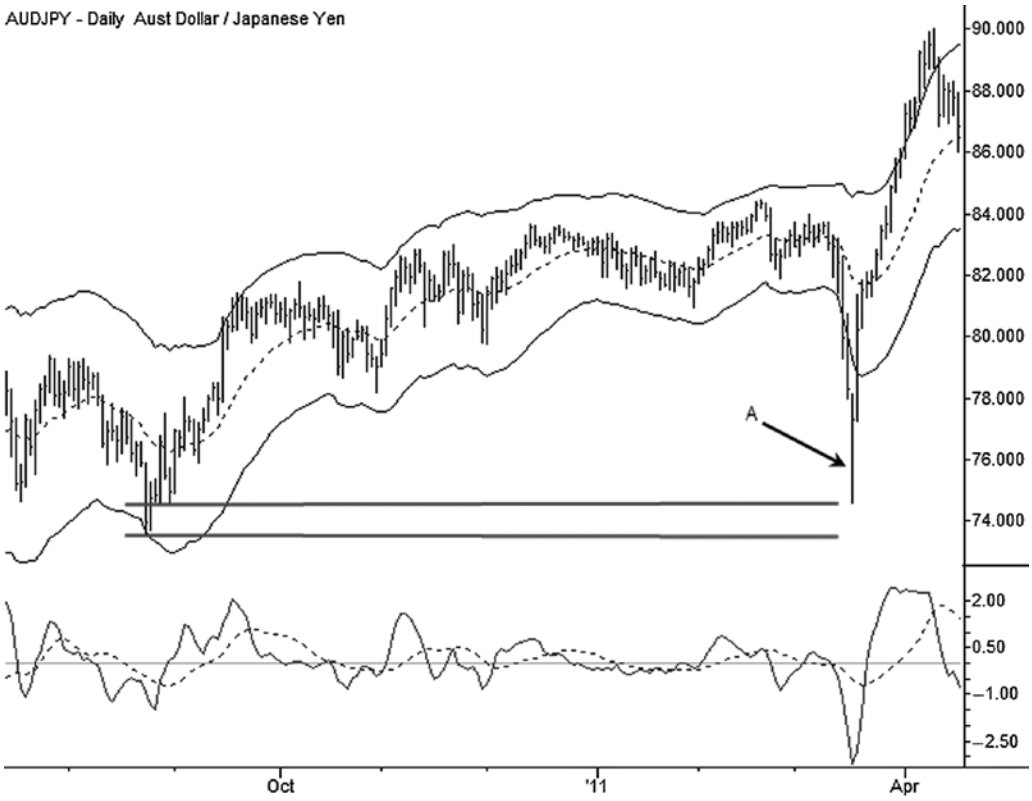


FIGURE 4.10 Price Rejection in the AUDJPY

FIGURE 4.11 Multiple Tests of Support in RIMM Precede a Failure

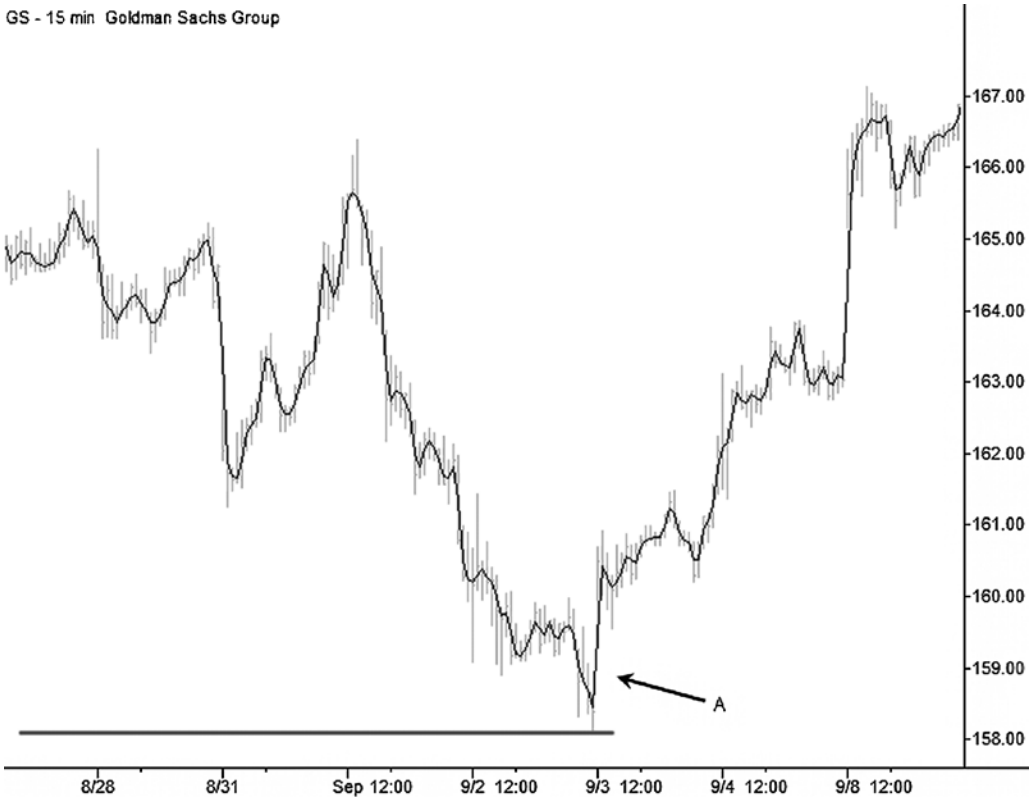


FIGURE 4.12 Price Rejection at Support

FIGURE 4.13 No Price Rejection at Resistance
Consolidation leads to a break of the level.

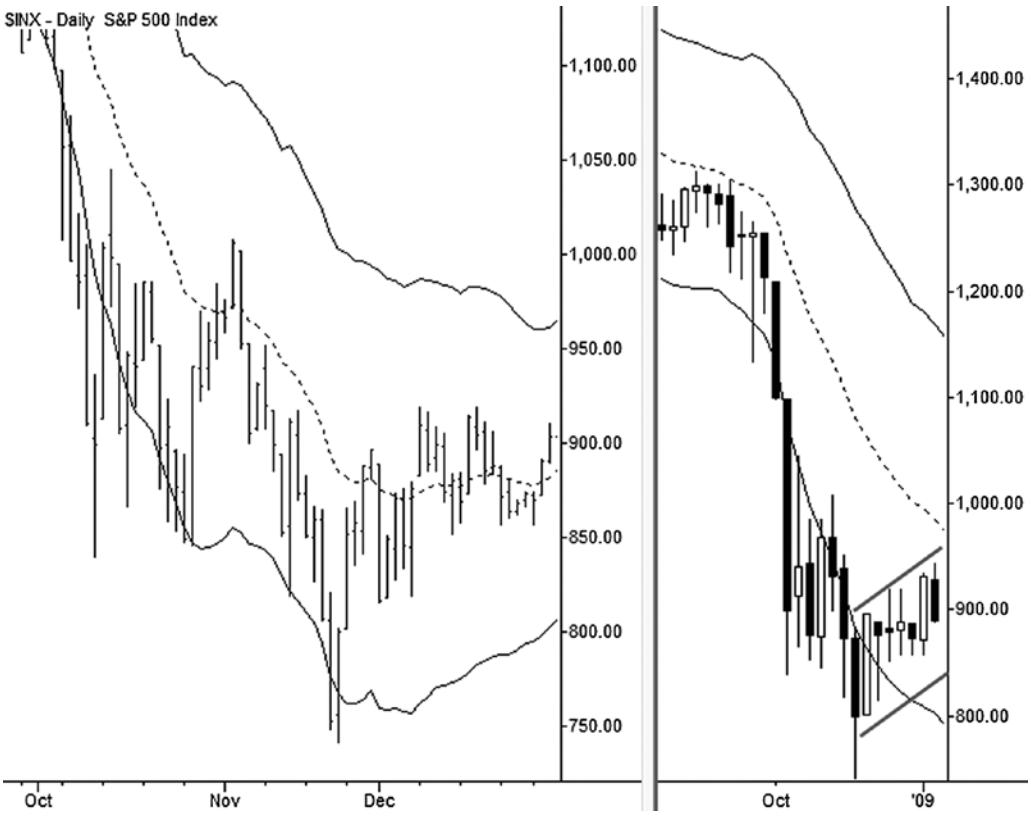


FIGURE 4.14 The Weekly Chart (Right) Clarifies an Otherwise Unreadable Situation on the Daily Chart (Left)

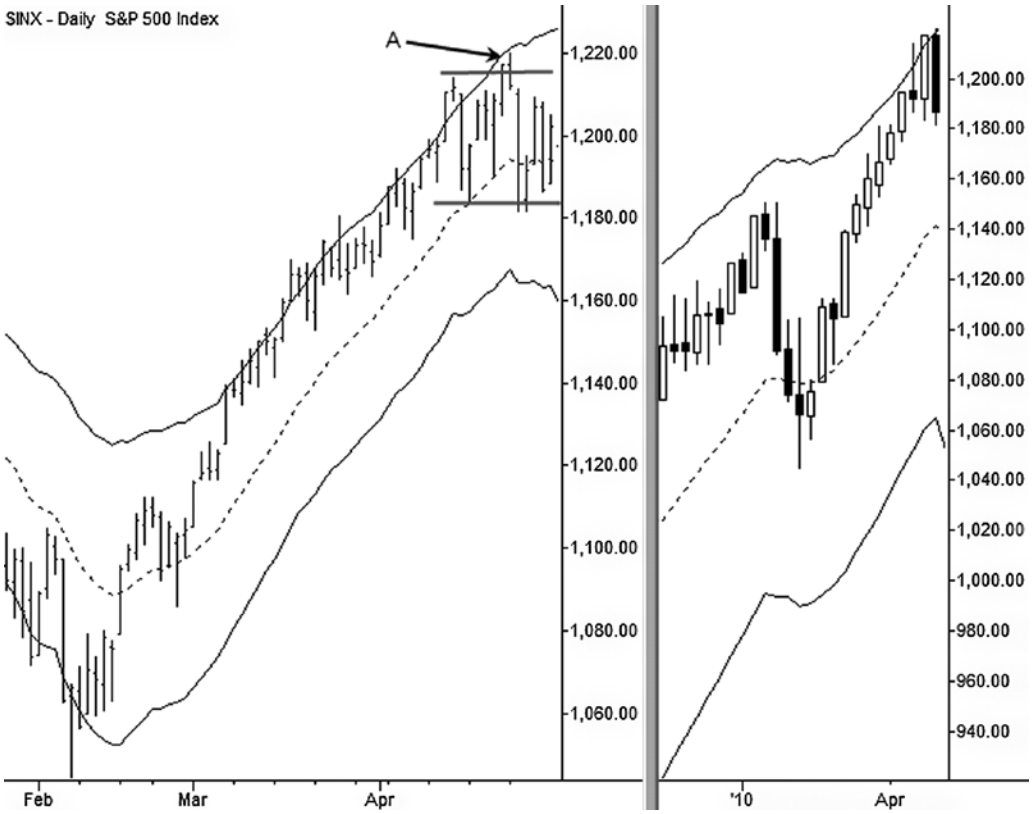


FIGURE 4.15 A Potential Reversal on the Weekly Gives a Downward Bias to the Trading Range on the Daily

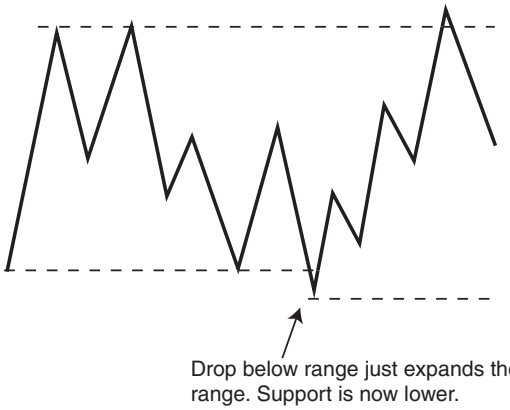


FIGURE 4.16 A Simple Parallel Range

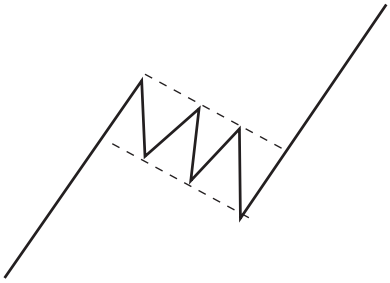


FIGURE 4.17 A Sloping Parallel Range Is a Very Common Continuation Pattern

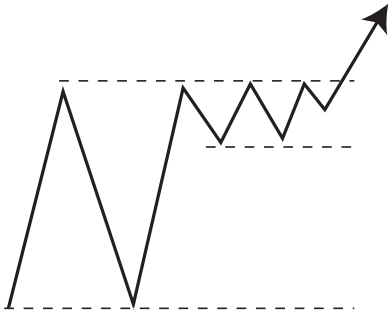


FIGURE 4.18 A Tighter Consolidation Against Resistance Often Leads to a Break of That Resistance

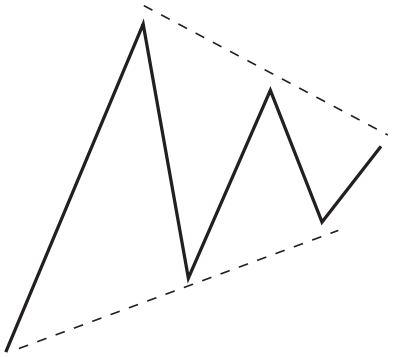


FIGURE 4.19 A Converging Range

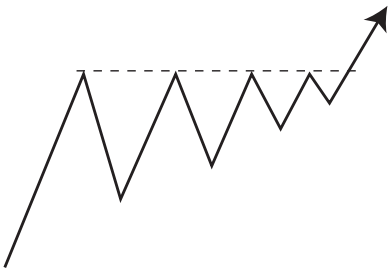


FIGURE 4.20 An Ascending Triangle. Holding Higher Lows into Resistance Is a Sign of Increasing Buying Pressure

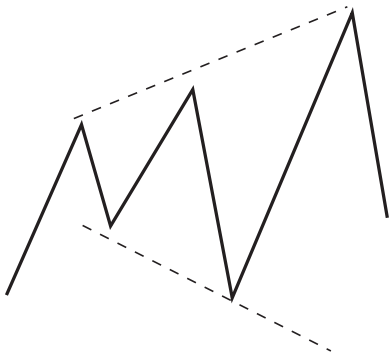


FIGURE 4.21 An Expanding Range

CHAPTER 5

Interfaces between Trends and Ranges

What we call the beginning is often the end. And to make an end is to make a beginning.

—T.S. Eliot

FIGURE 5.1 Breakout Trade in DryShips Inc. (Nasdaq: DRYS), Summer 2007

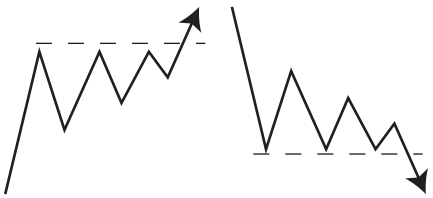


FIGURE 5.2 Shorter Swings into Support or Resistance Often Set Up Good Breakouts

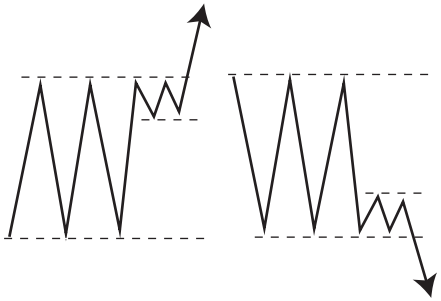


FIGURE 5.3 A Tighter Range Near the Edge of a Larger Range Often Precedes a Good Breakout of That Edge

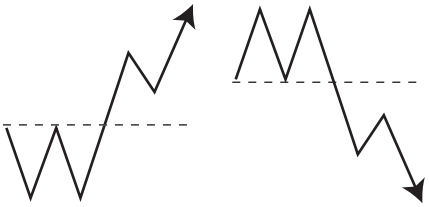


FIGURE 5.4 First Pullback Holds Outside Breakout Level

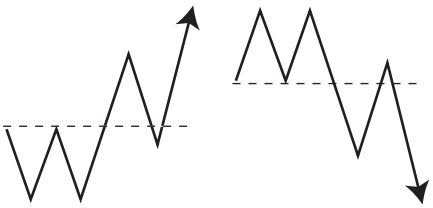


FIGURE 5.5 The Breakout Level Can Also Be Violated on the Pullback

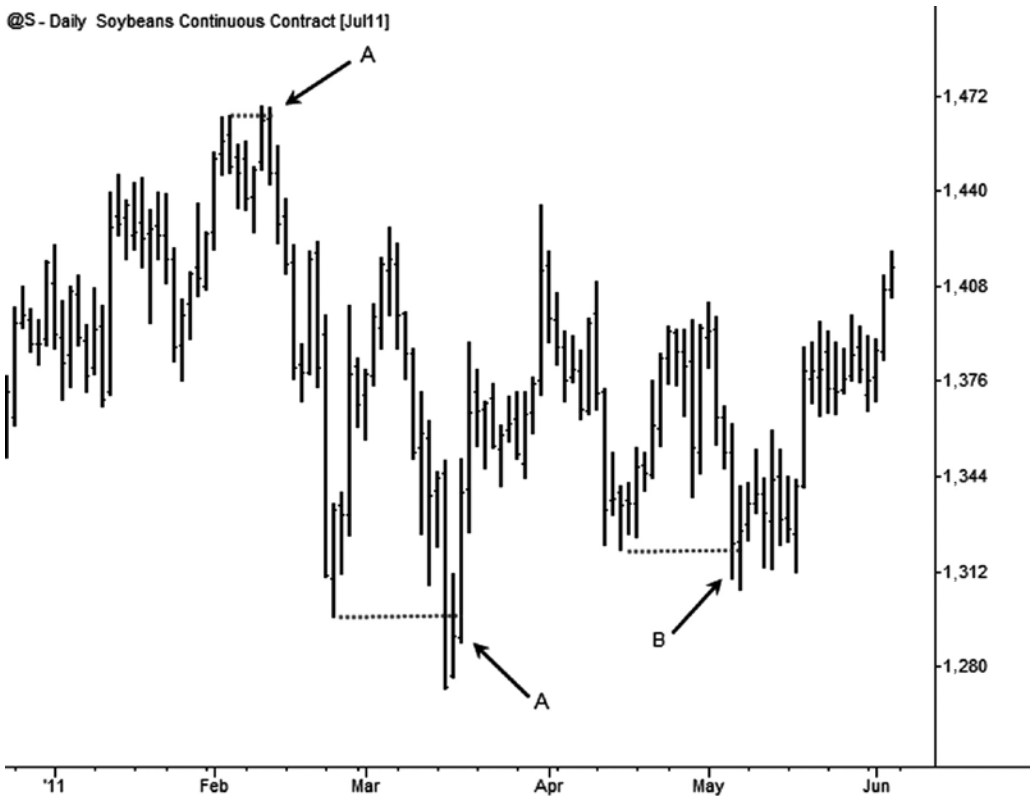


FIGURE 5.6 Points A Show Good Examples of Breakout Failures; B is More Typical of Continuation Below the Level

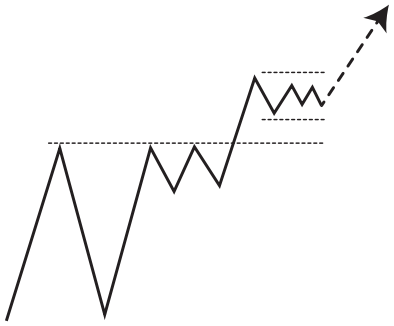


FIGURE 5.7 Consolidation Outside the Prebreakout Range Is Usually Constructive

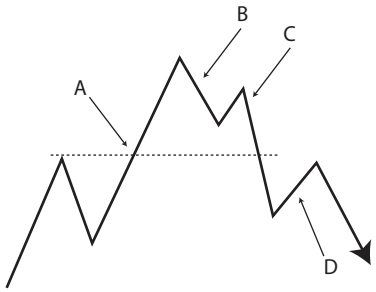


FIGURE 5.8 The Pullback Marked D Often Offers an Excellent Trade Following a Breakout Pullback Failure at C

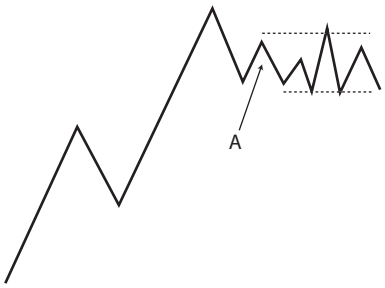


FIGURE 5.9 Trends May Terminate into Trading Ranges When Pullbacks Become Ranges

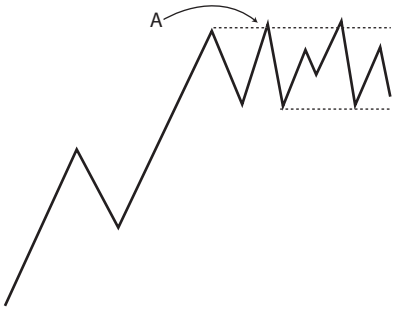


FIGURE 5.10 A Failure Test at the Previous Pivot Extreme May Be a Catalyst for the Market to Transition to a Trading Range

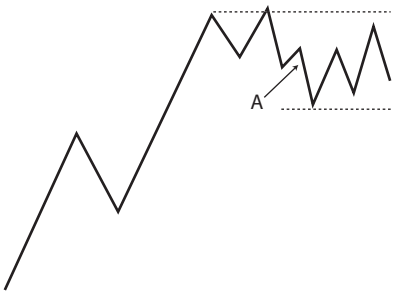


FIGURE 5.11 Sharp Countertrend Momentum May Exhaust into a Trading Range

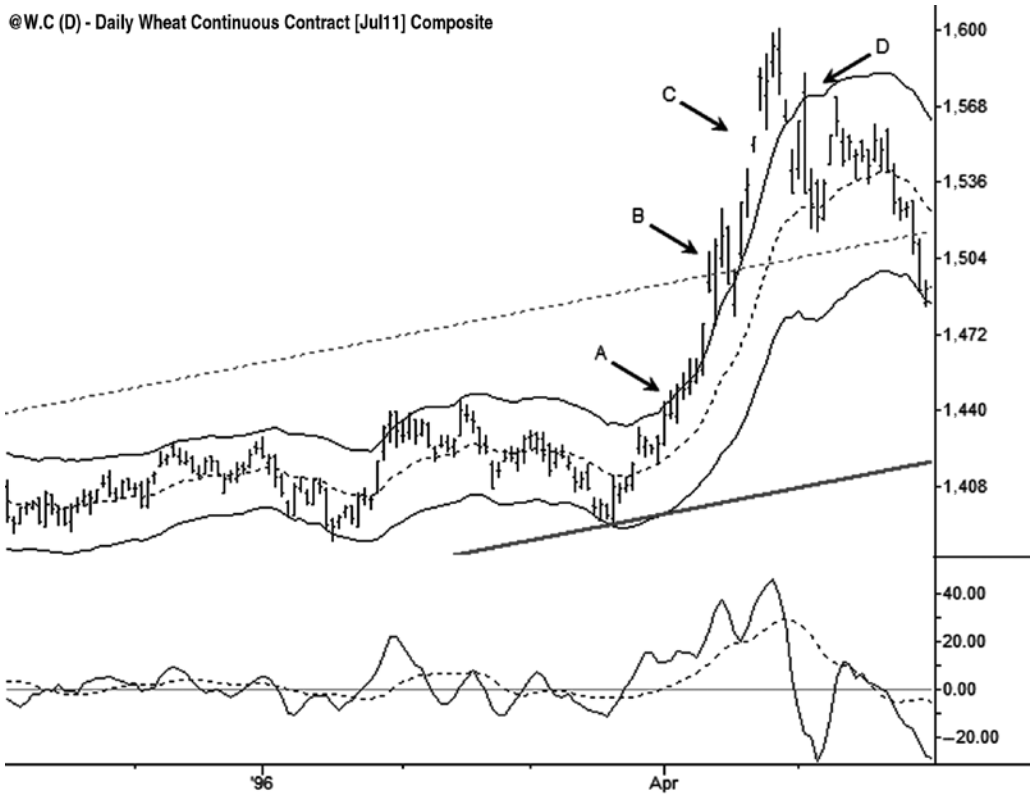


FIGURE 5.12 Wheat Futures in Mid-1996 Had a Parabolic Expansion and Subsequent Reversal into a Downtrend

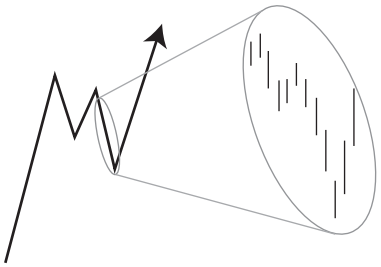


FIGURE 5.13 Watch for Parabolic Expansion and Exhaustion into Ideal Higher Time Frame Entry Points

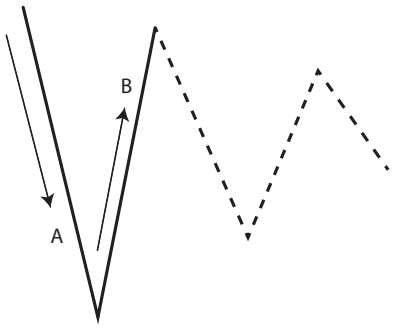


FIGURE 5.14 Two Sharp Moves in Opposite Directions Usually Lead to a Triangle

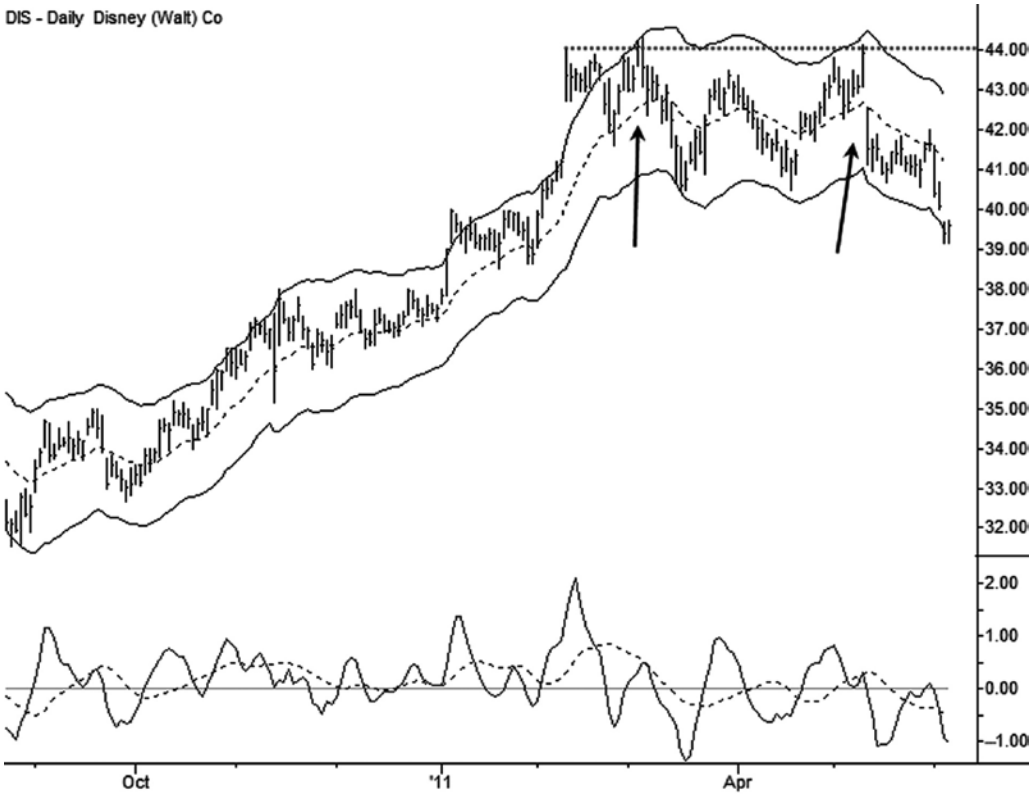


FIGURE 5.15 Two Upthrusts in Disney Cap an Uptrend

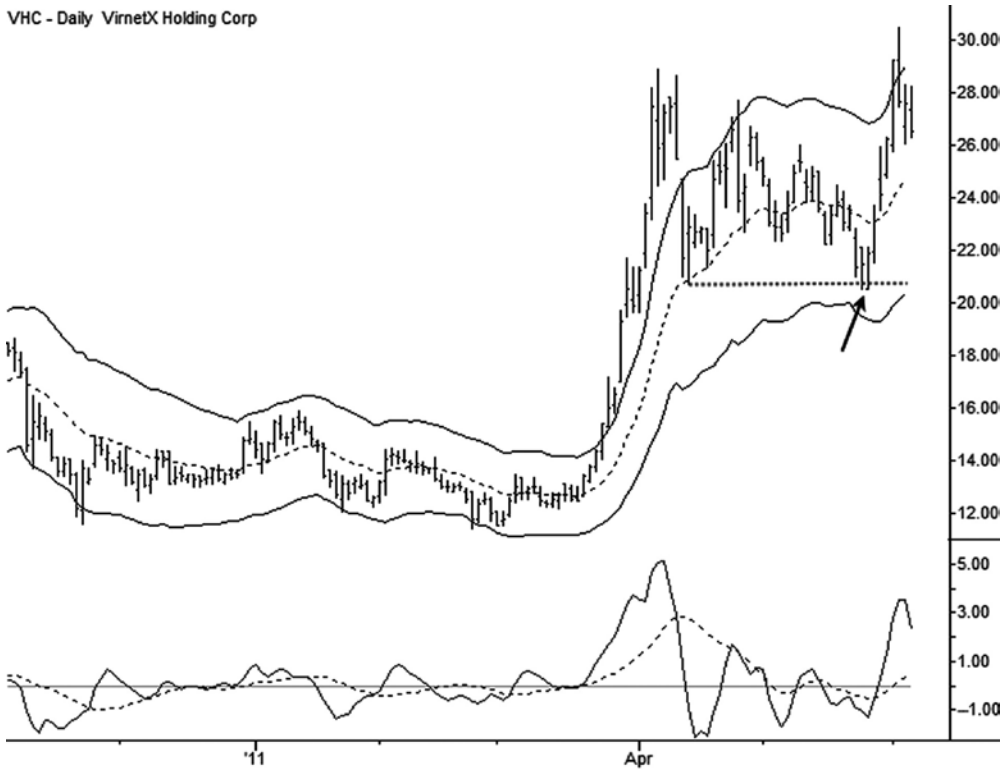


FIGURE 5.16 Failed Breakdown (Arrow) Leads to a Retest of Highs with the Possibility of Continuation into Another Trend Leg

PART III

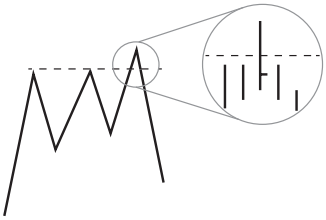
Trading Strategies

CHAPTER 6

Practical Trading Templates

Do not [just blindly] repeat the tactics which have gained you one victory, but let your methods be regulated by the infinite variety of circumstances.

—Sun Tzu, *The Art of War* (ca. 210 CE)



Trade Type

Support/resistance holding or trend termination.

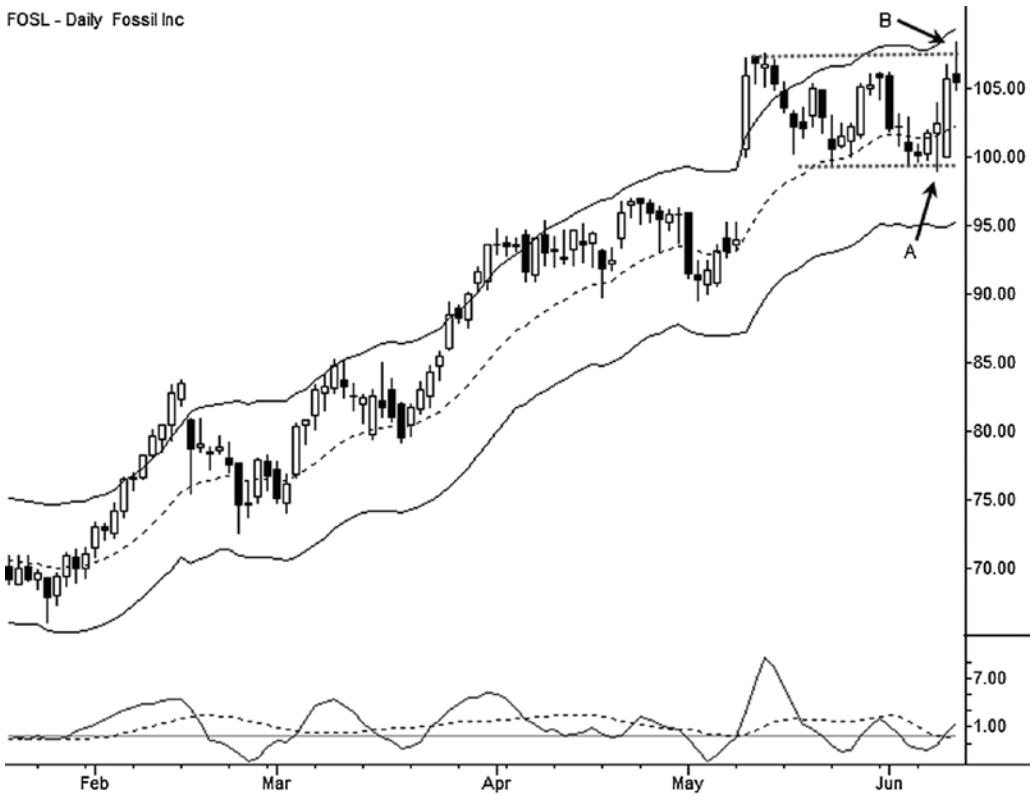
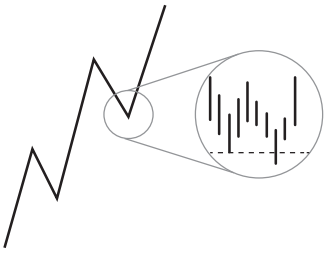


FIGURE 6.1 Two Failure Test Entries in FOSL

FIGURE 6.2 A Failure Test Short in the EURUSD

PULLBACK, BUYING SUPPORT OR SHORTING RESISTANCE



Trade Type

Trend continuation.

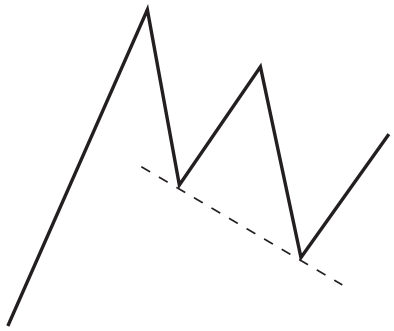


FIGURE 6.3 Support in a Pullback Is Usually Sloping, Not Flat

FIGURE 6.4 Two Entries in Pullbacks in an Uptrend

FIGURE 6.5 Three Idealized Pullback Entries in the EURGBP (One Long and Two Short) with Near and Far Stop Levels

FIGURE 6.6 Three Pullback Entries in Sugar Futures with Near and Far Stop Levels

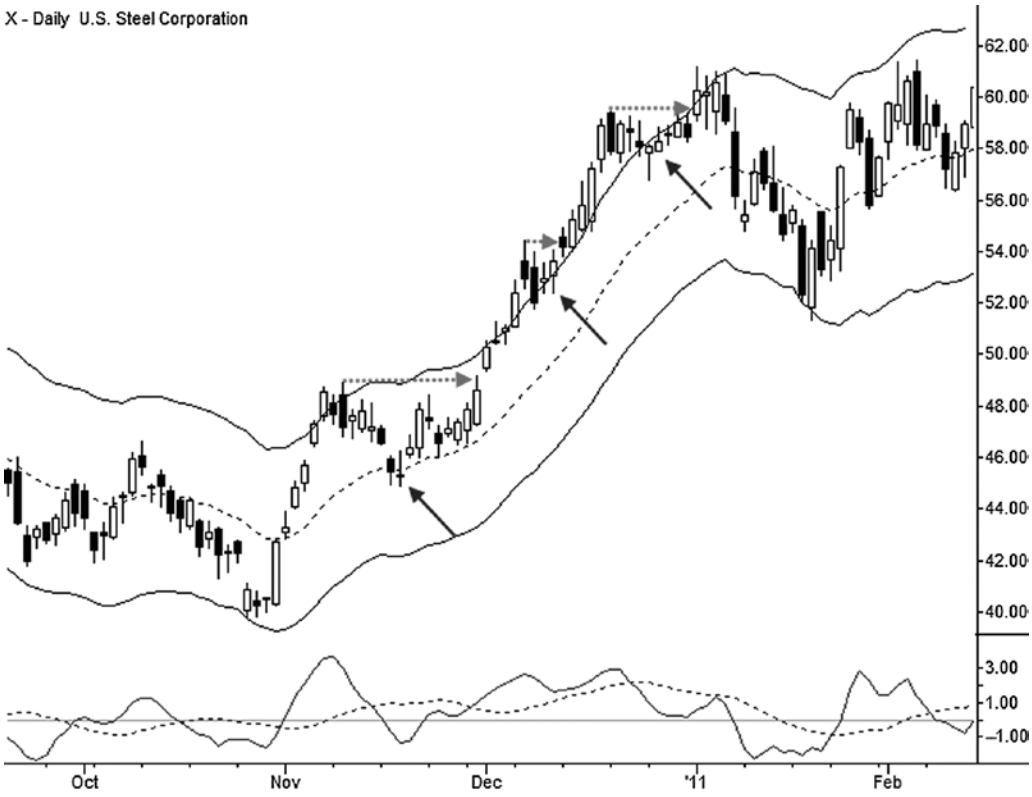


FIGURE 6.7 Three Idealized Entries in U.S. Steel Corporation (NYSE: X) with Conservative Profit Targets Marked

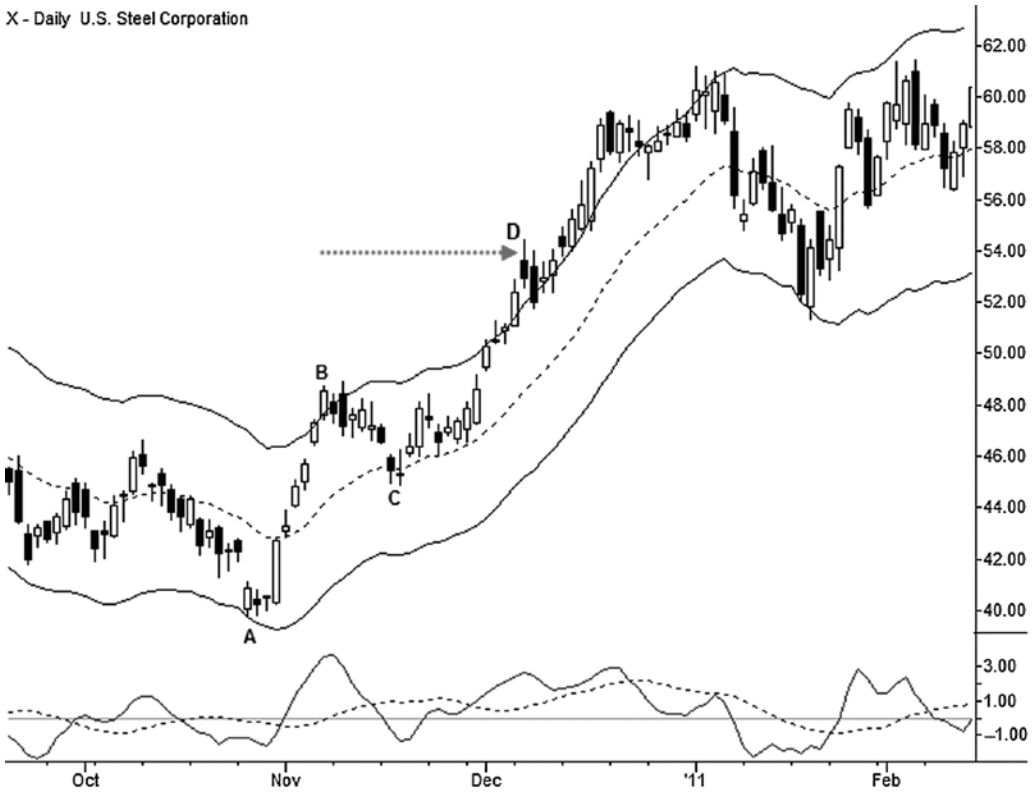
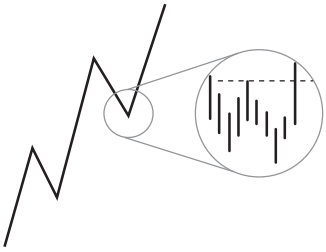


FIGURE 6.8 The MMO Price Target for the First Pullback Trade in X

PULLBACK, ENTERING LOWER TIME FRAME BREAKOUT



Trade Type

Trend continuation and breakout blend.

FIGURE 6.9 A Breakout on the Intraday (Left Pane) Serves as an Entry into the Higher Time Frame Pattern

Trade Type

Trend continuation.

FIGURE 6.10 A Complex Pullback in the EURUSD
Note two clearly visible countertrend legs (AB and CD).

FIGURE 6.11 What Appears to Be a Simple Pullback on the Daily Chart of EURUSD Resolves into a Complex Consolidation on the 120-Minute Time Frame (Inset)

FIGURE 6.12 A Hidden Complex Pullback in Sugar Futures
This would be a clear complex pullback on an intraday time frame.

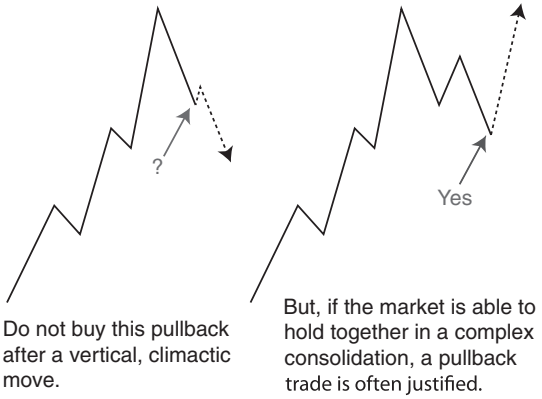
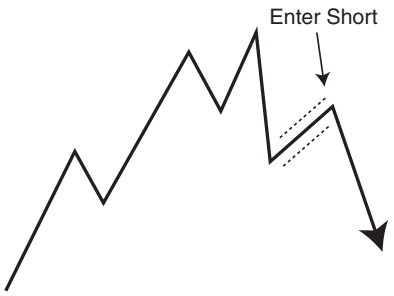


FIGURE 6.13 Complex Pullbacks Can Provide Entries Where Simple Pullbacks Should Be Avoided



Trade Type

Trend termination.

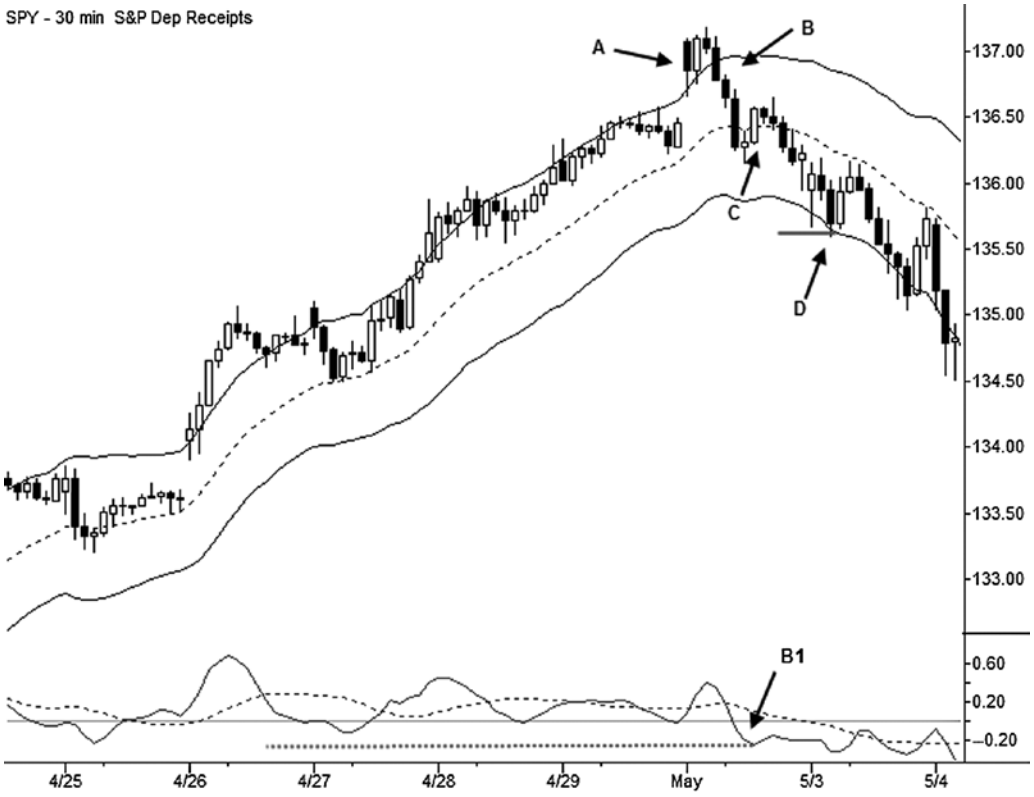
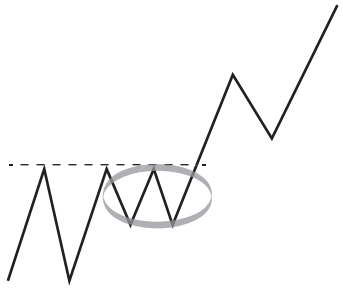


FIGURE 6.14 A Sell Anti on 30-Minute SPY Bars



Trade Type

Support/resistance breaking.

FIGURE 6.15 A Very Clean Breakout Level in XOMA

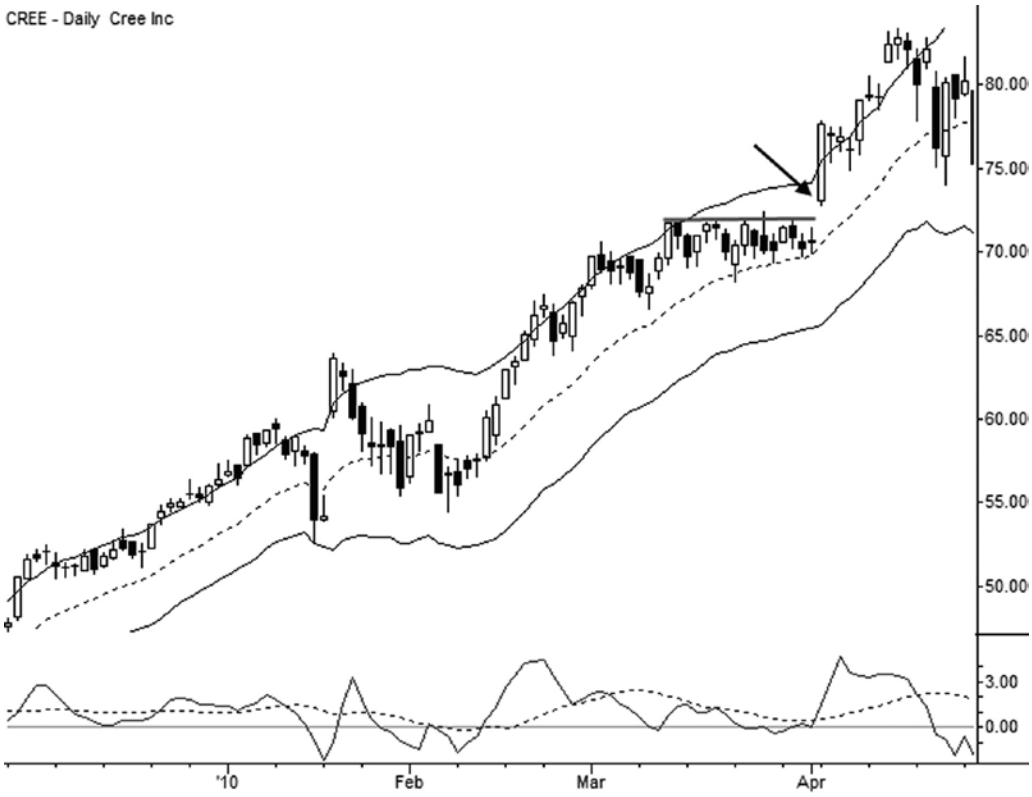


FIGURE 6.16 A Gap Opening Above a Breakout Level in CREE

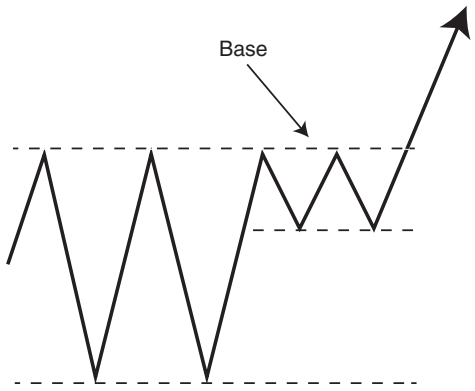


FIGURE 6.17 Schematic of a Breakout Base

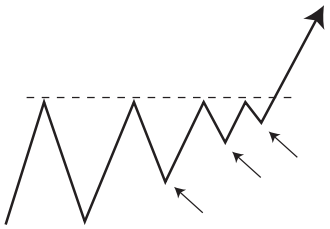


FIGURE 6.18 Higher Lows into a Resistance Level: Another Form of Prebreakout Accumulation

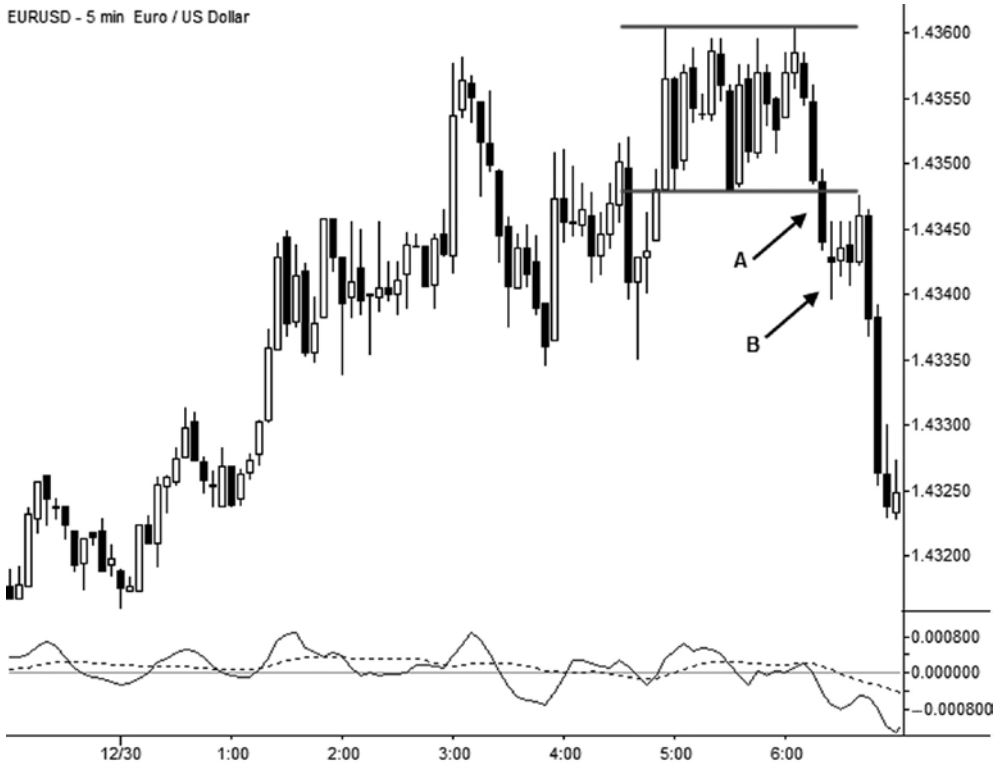
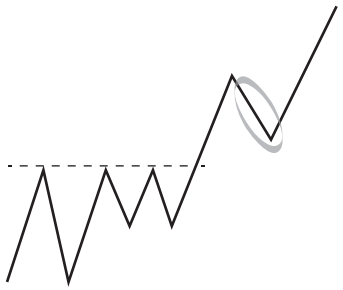


FIGURE 6.19 A Failure below the Bottom of a Range in 5-Minute EURUSD

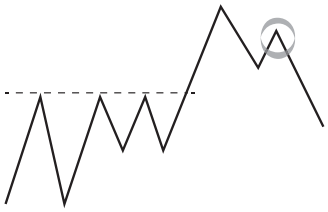
BREAKOUTS, ENTERING ON FIRST PULLBACK FOLLOWING



Trade Type

Support/resistance breaking.

FAILED BREAKOUTS



Trade Type

Support/resistance holding.

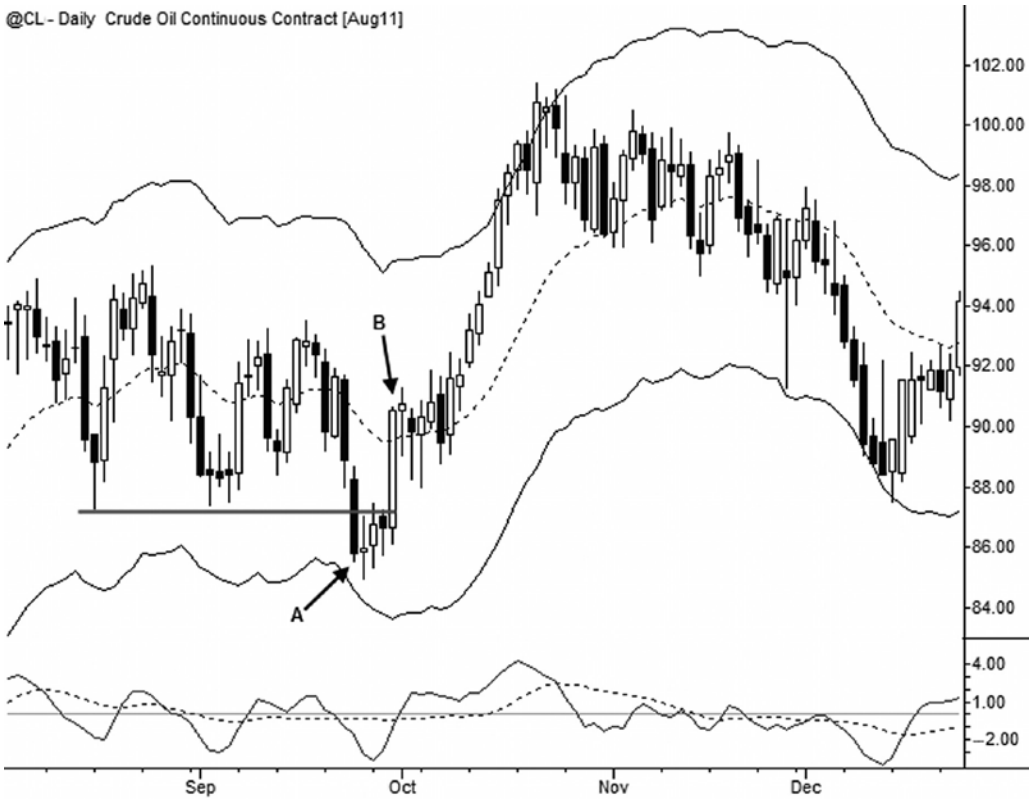


FIGURE 6.20 A Failed Breakout Below Support in Crude Oil

FIGURE 6.21 A Failed Upside Breakout Attempt in GS

CHAPTER 7

Tools for Confirmation

There are in fact four very significant stumbling blocks in the way of grasping the truth . . . namely, the example of weak and unworthy authority, longstanding custom, the feeling of the ignorant crowd, and the hiding of our own ignorance while making a display of our apparent knowledge.

—Roger Bacon

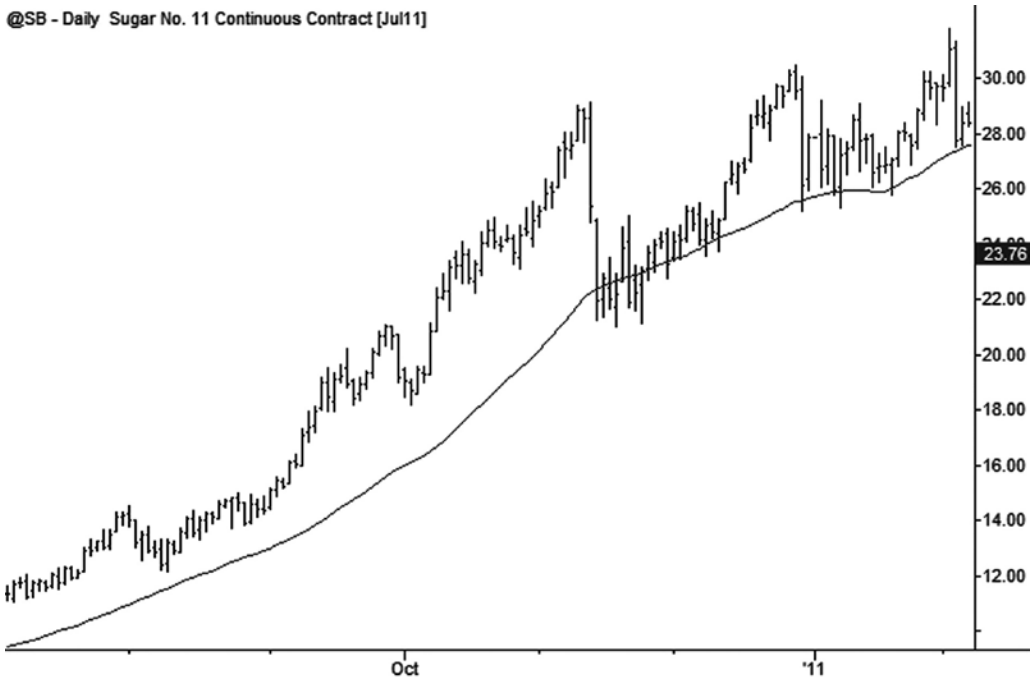


FIGURE 7.1 Price Mostly on One Side of a Moving Average Suggests a Trend in That Direction

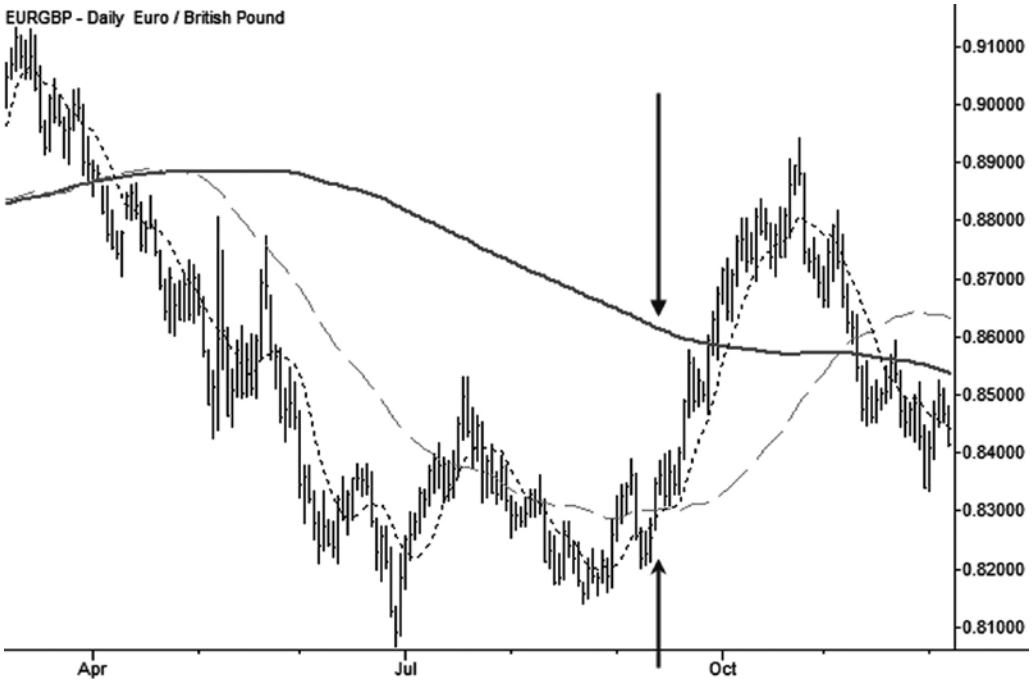


FIGURE 7.2 The Three Moving Averages Indicate Three Different Trends at This Spot

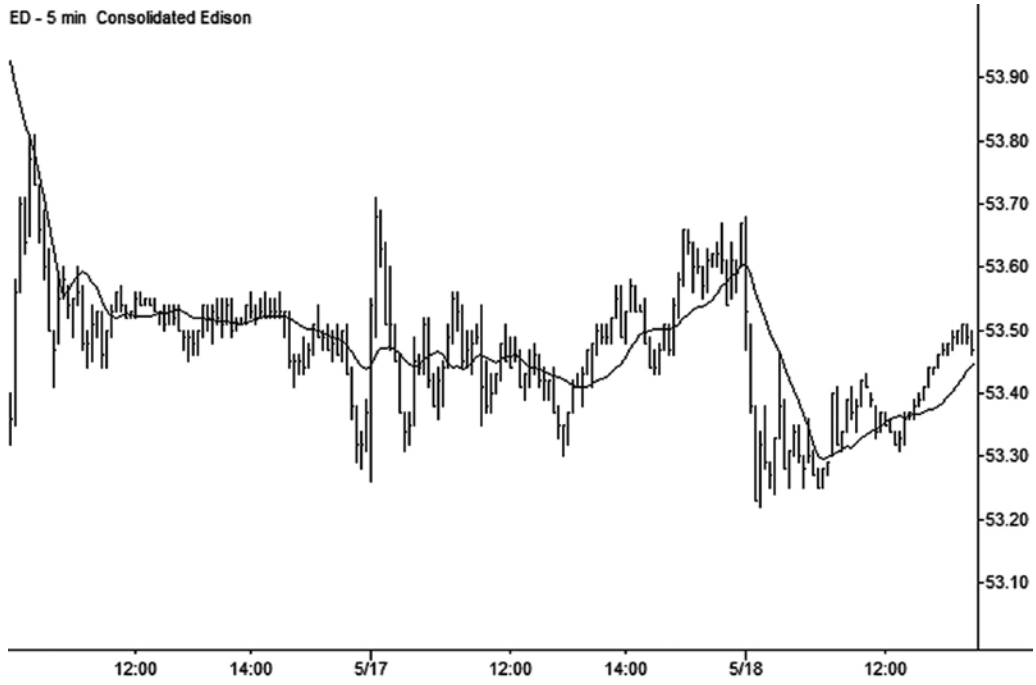


FIGURE 7.3 Avoid Trading Markets That Chop Back and Forth on Both Sides of an Intermediate-Term Moving Average

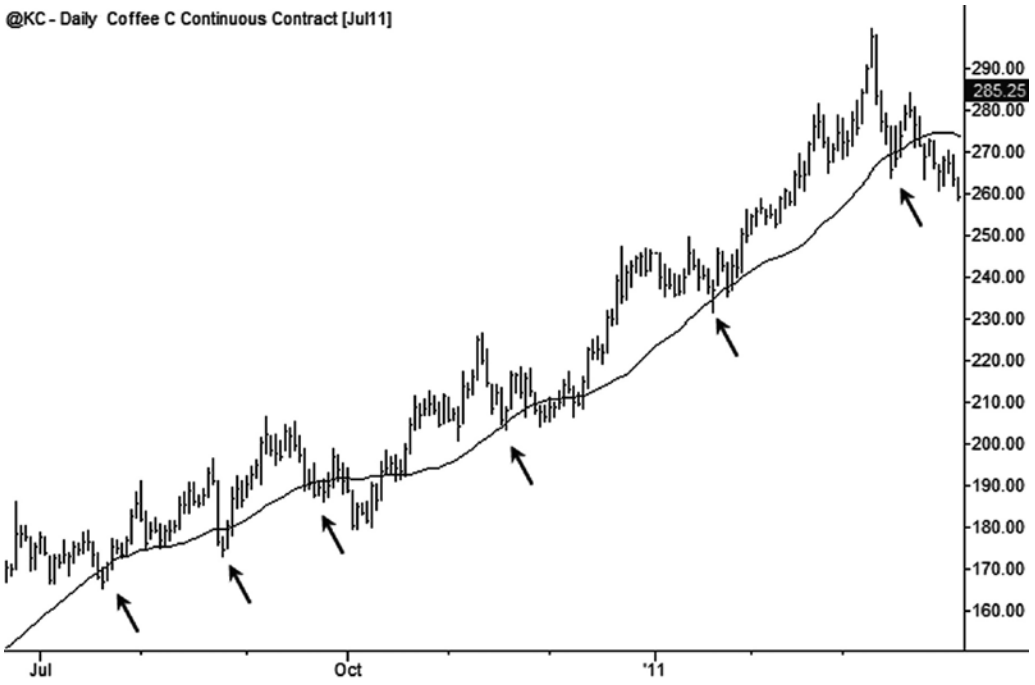


FIGURE 7.4 Using a Moving Average as a Reference for Buying Pullbacks
Do not buy when price is far away from the average.

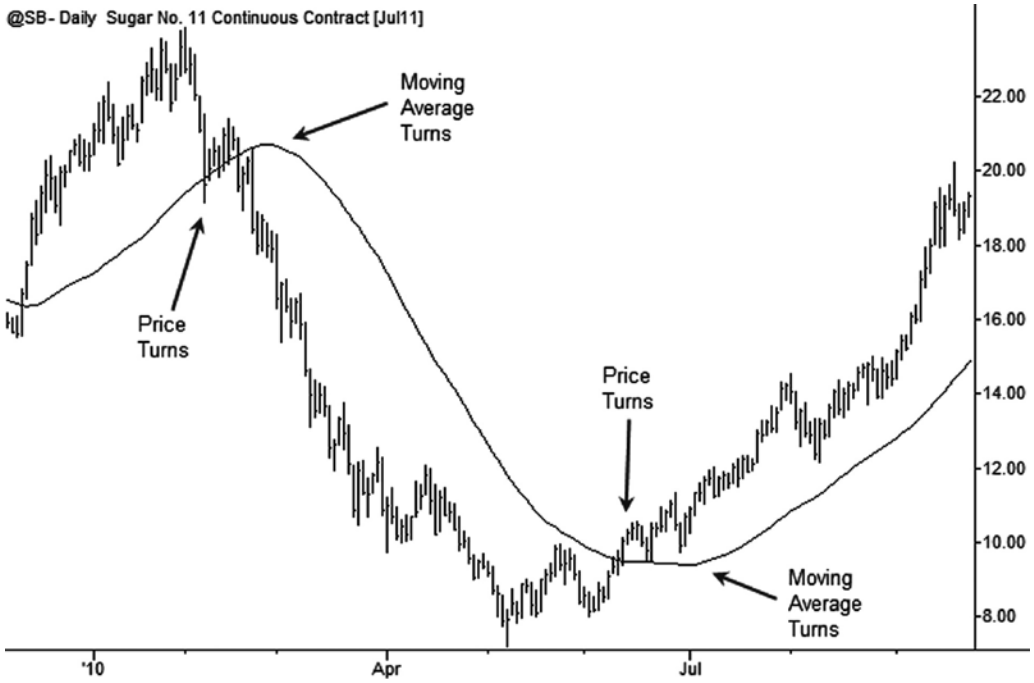


FIGURE 7.5 Though the Slope of the Moving Average Does Capture the Trend, the Trend Change Is Visible in Price Structure First

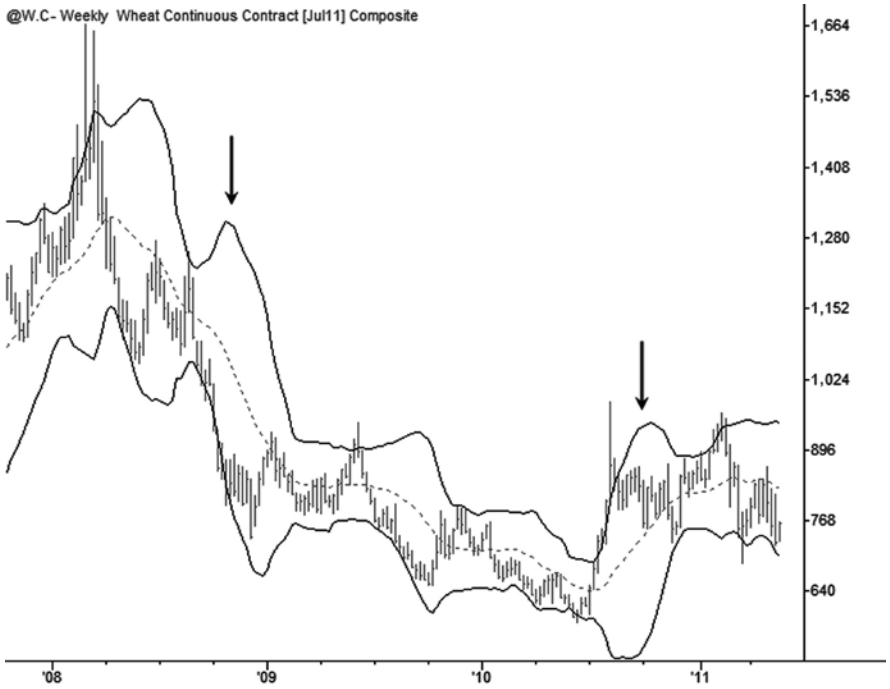


FIGURE 7.6 Bollinger Bands on Weekly Wheat: Notice How Bands Expand and Contract Very Quickly

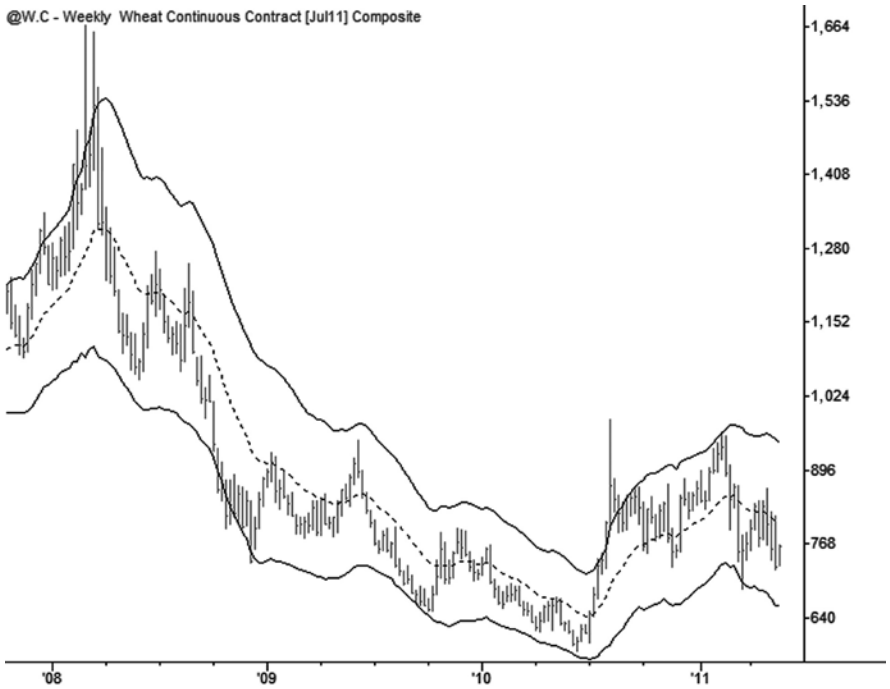


FIGURE 7.7 By Comparison, Keltner Channels on Wheat Futures Are Much More Stable

TABLE 7.1 Excursion Stats for 2.25 ATR Modified Keltner Channels

	Mean	Min	Max
	Large-Cap Stocks (496 stocks)		
Inside	87.7%	67.0%	100.0%
Free bars	3.4%	0.0%	11.7%
	Small-Cap Stocks (500 stocks)		
Inside	85.4%	36.0%	96.2%
Free bars	4.3%	0.2%	21.2%
	Futures (16 contracts)		
Inside	85.9%	77.8%	92.5%
Free bars	3.8%	0.7%	6.4%
	Forex (9 pairs)		
Inside	89.8%	87.8%	92.0%
Free bars	2.3%	1.5%	3.7%
	Randomly Generated Data (7 series)		
Inside	86.8%	85.8%	87.7%
Free bars	3.8%	3.3%	4.4%

"Inside" records the percentage of the total trading range that is inside the bands.
"Free bars" are the percentage of all bars that are completely outside the bands.
Min and Max show the lowest and highest stat for individual instruments (i.e., individual stocks, futures markets, etc.) in the sample classes.

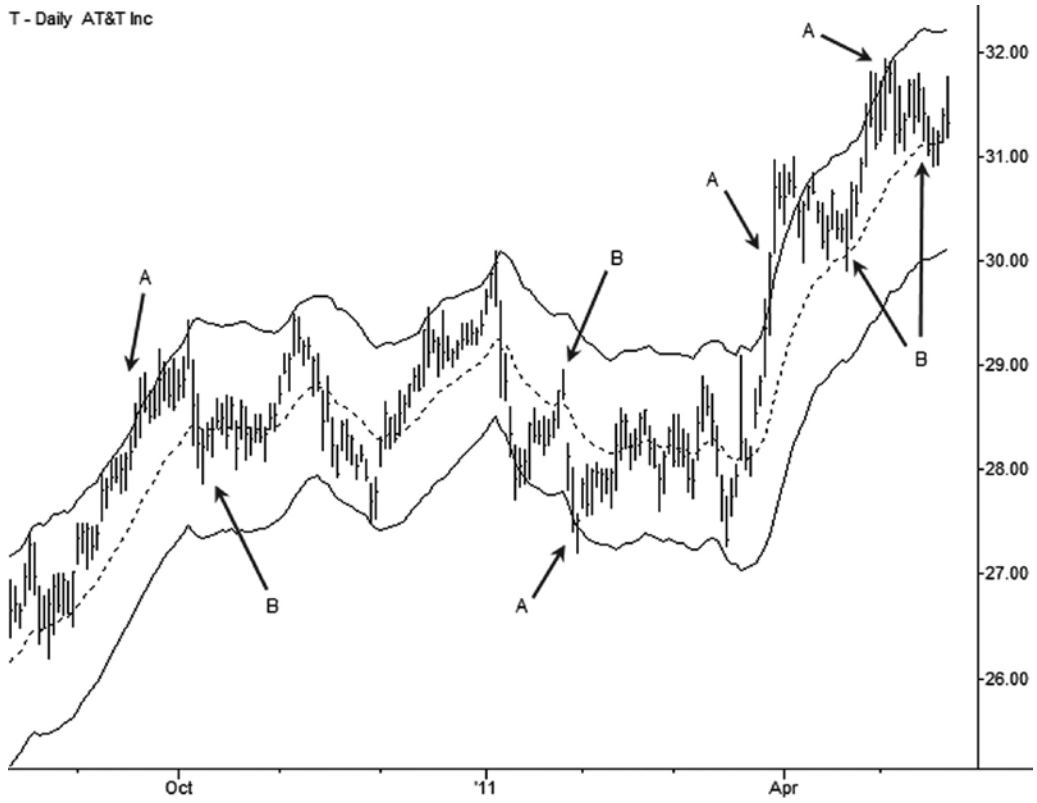


FIGURE 7.8 Fading Closes Outside the Keltner Channel (Marked A) or Entering at the Moving Average (Marked B)

Both of these are reliable trades that capitalize on basic elements of price behavior.

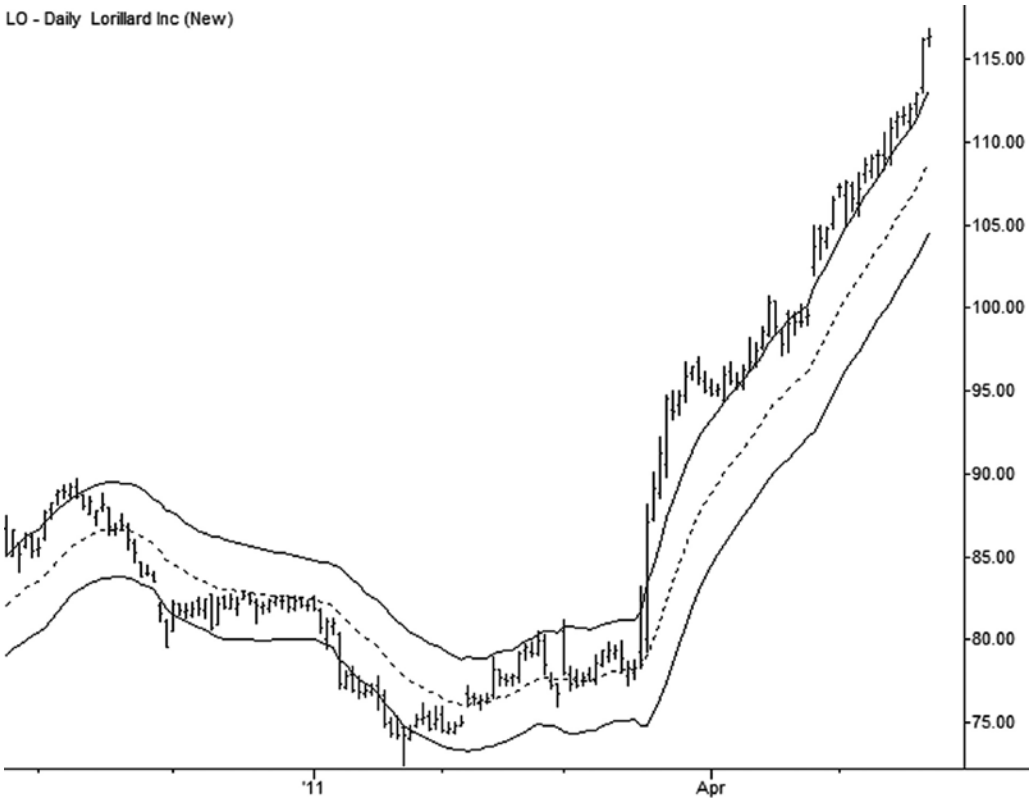


FIGURE 7.9 A Market Pressing into One of the Channels Is Indicative of a very Strong Imbalance This is also usually a difficult trading environment.

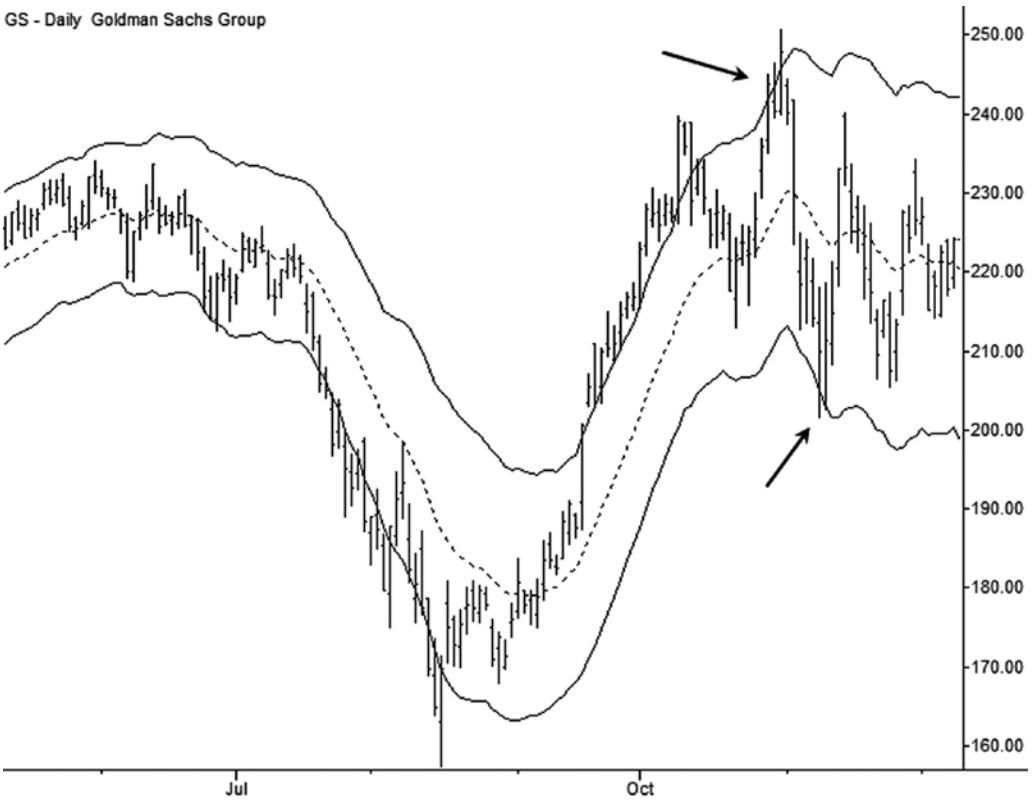


FIGURE 7.10 A Spike through the Upper Band Immediately Followed by a Spike through the Lower Band Usually Leads to a Triangle-Type Consolidation—Avoid This Environment

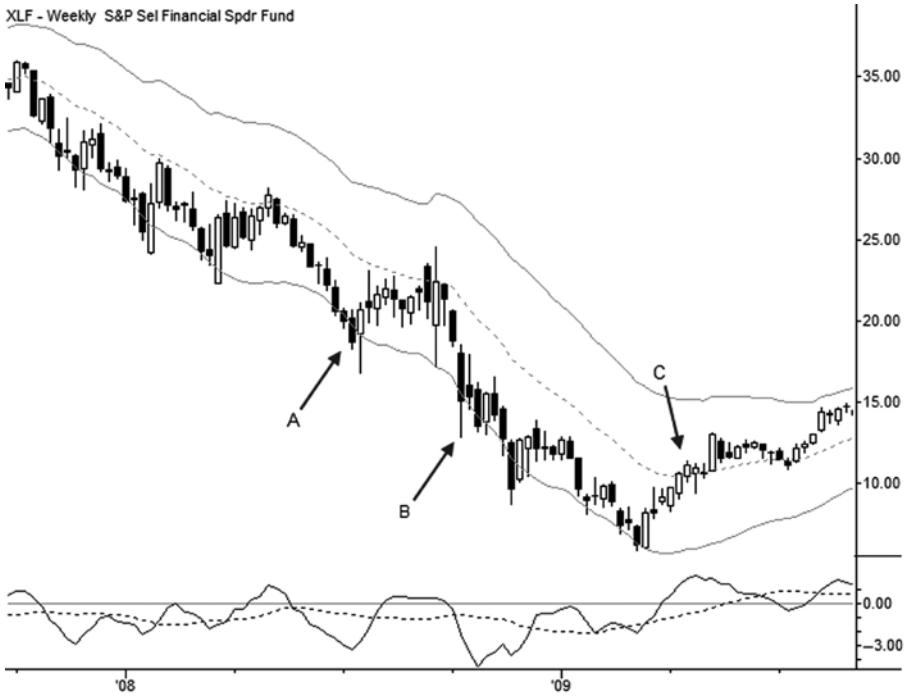


FIGURE 7.11 New Extremes on the MACD Precede New Price Extremes

FIGURE 7.12 The MACD In a More Complex Environment

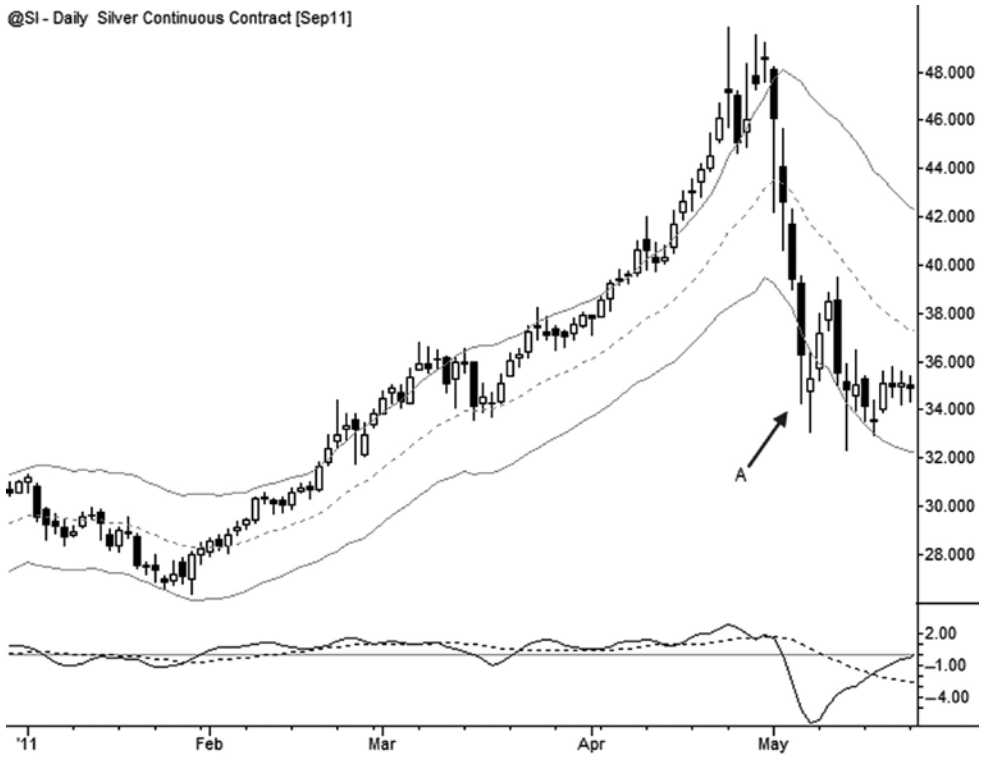


FIGURE 7.13 It Is Important to Understand the MACD's Reaction to a Climax

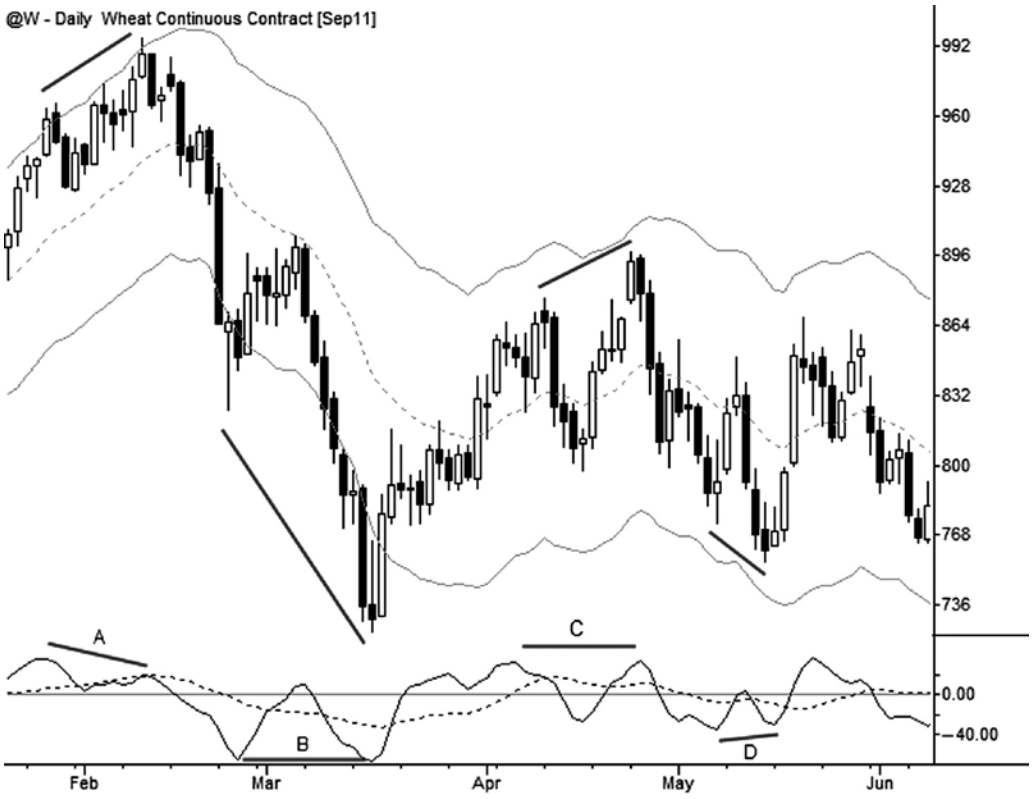


FIGURE 7.14 Momentum Divergences in Wheat Futures

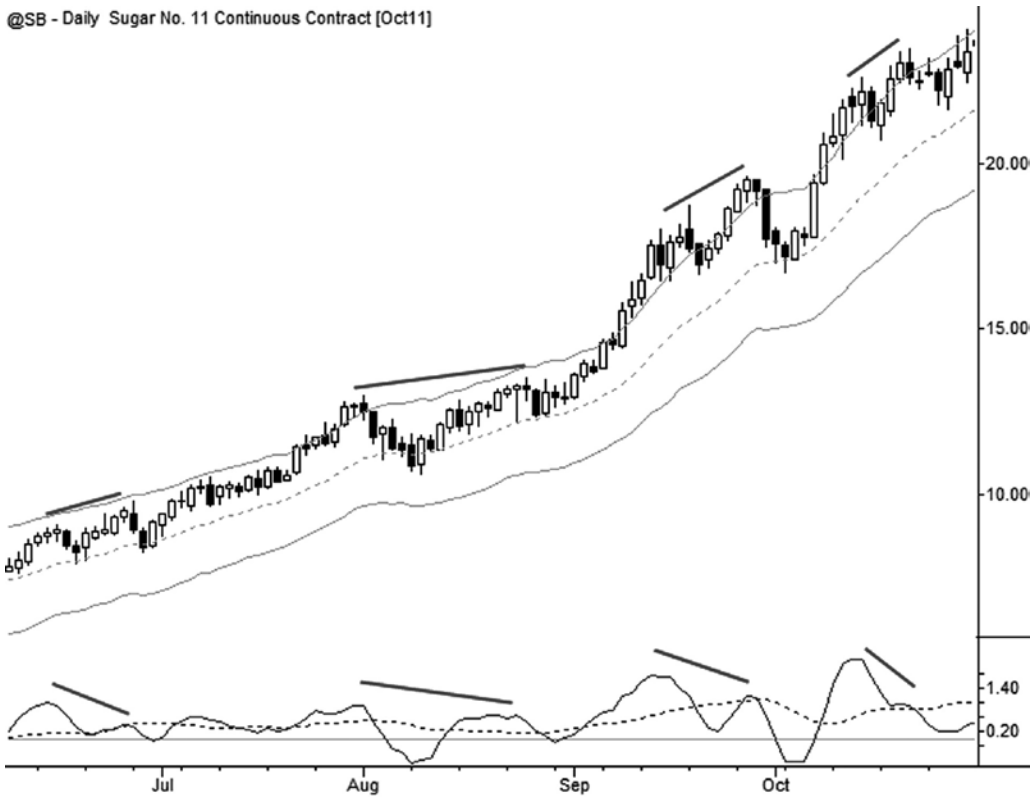


FIGURE 7.15 Strong Trends Result in Failed Momentum Divergences

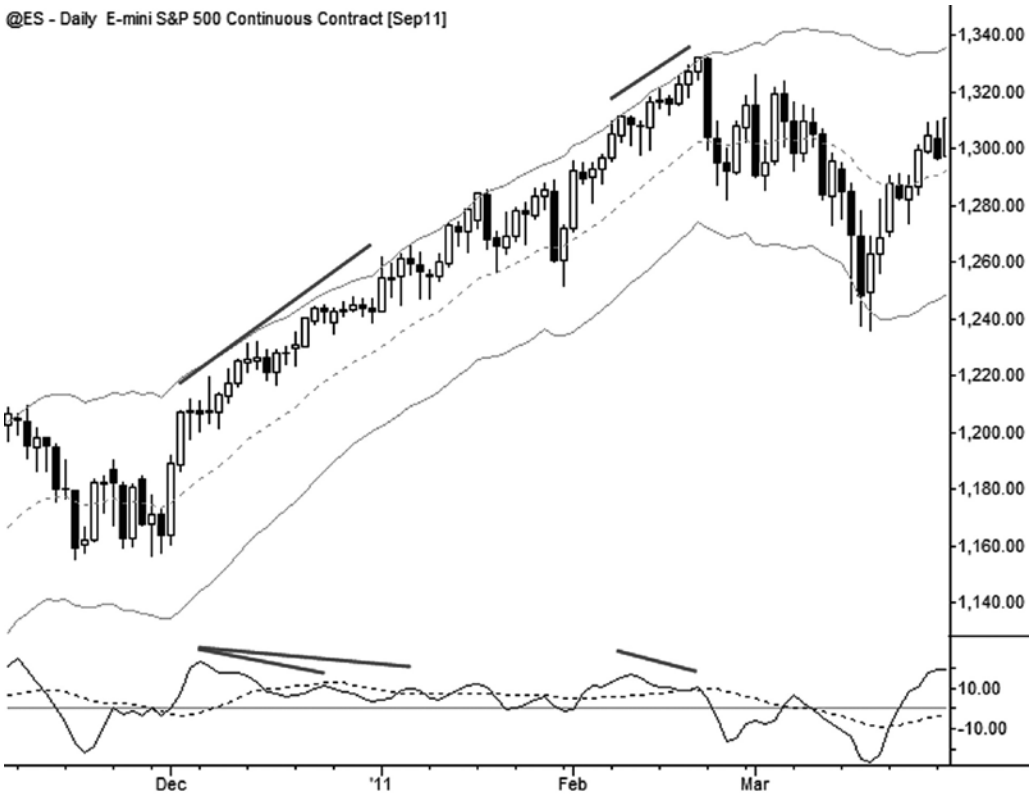


FIGURE 7.16 These Are Not Valid Divergences

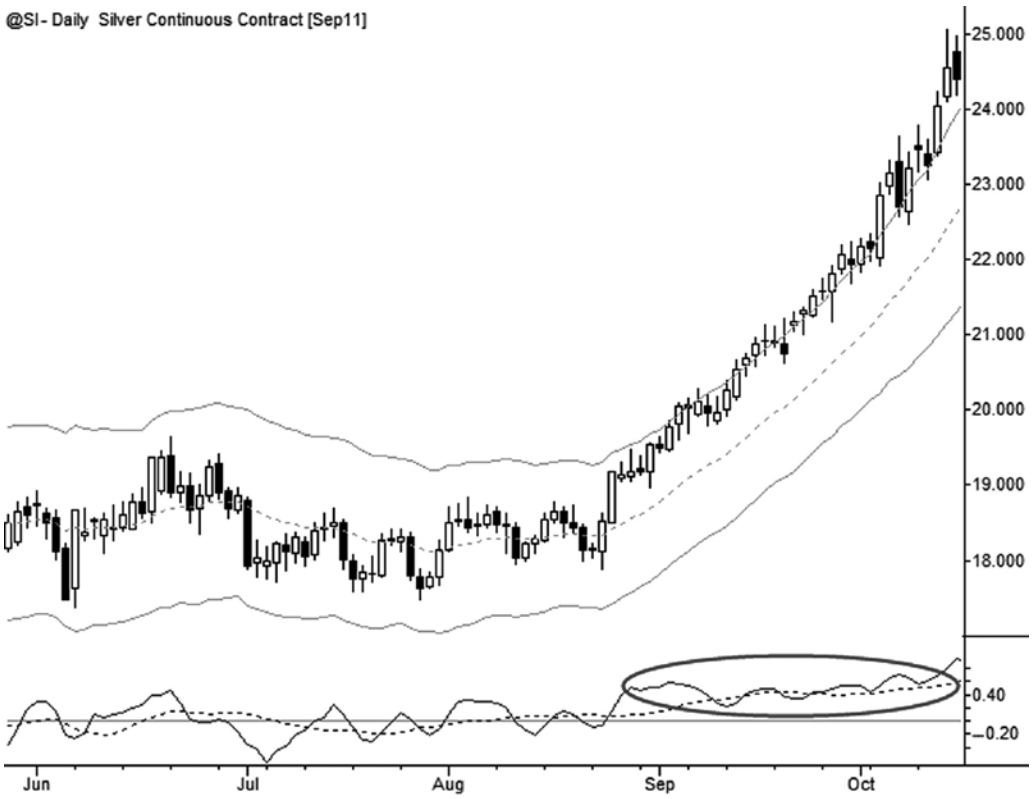


FIGURE 7.17 A Strong Trend Will Peg the MACD Fast Line

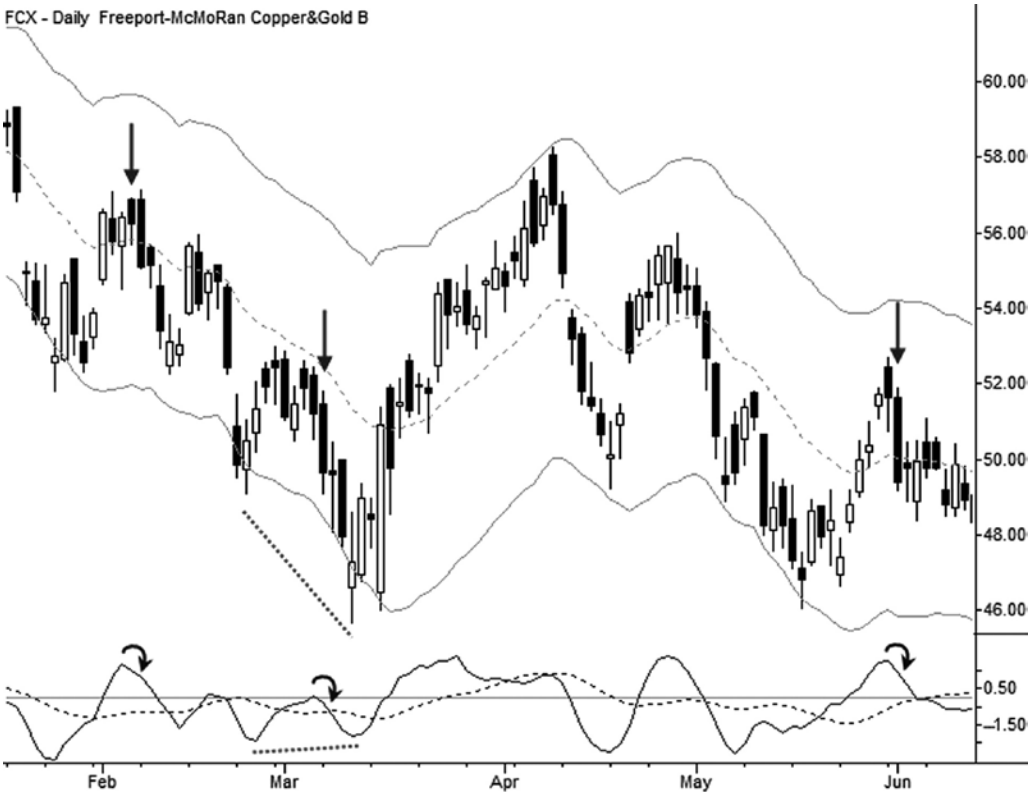


FIGURE 7.18 Shorts Generated by a Systematic Application of the MACD

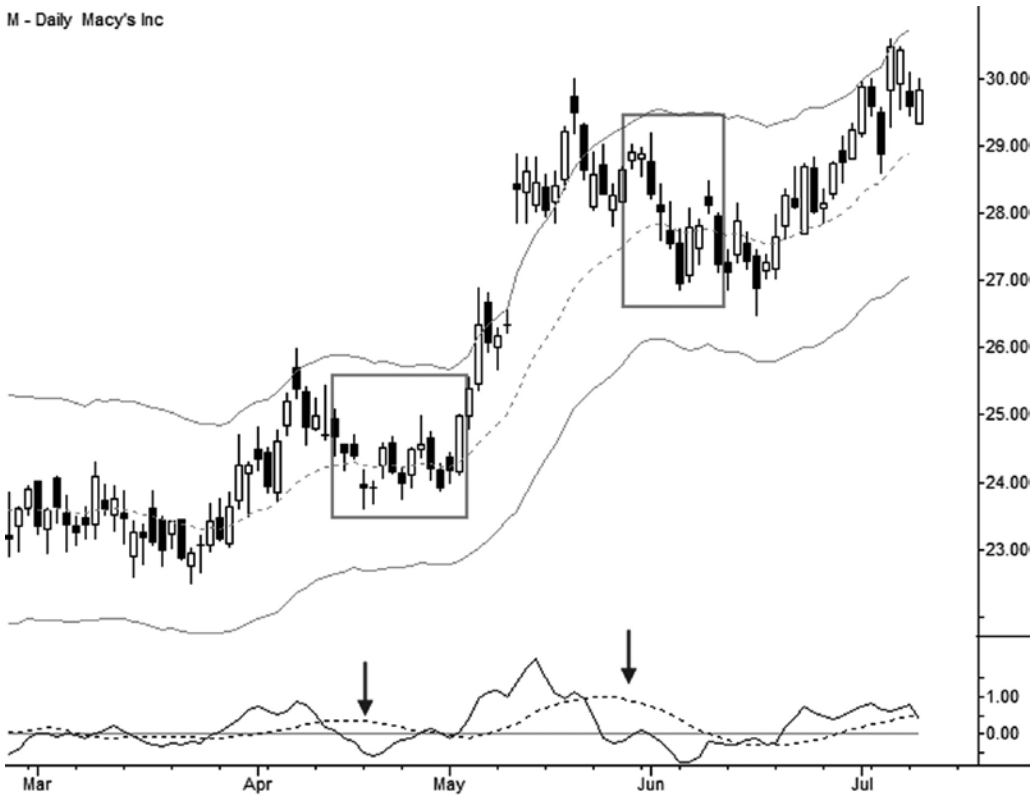


FIGURE 7.19 Avoid Buying When the Slow Line Has Been Extended Upward and Has Now Turned Down

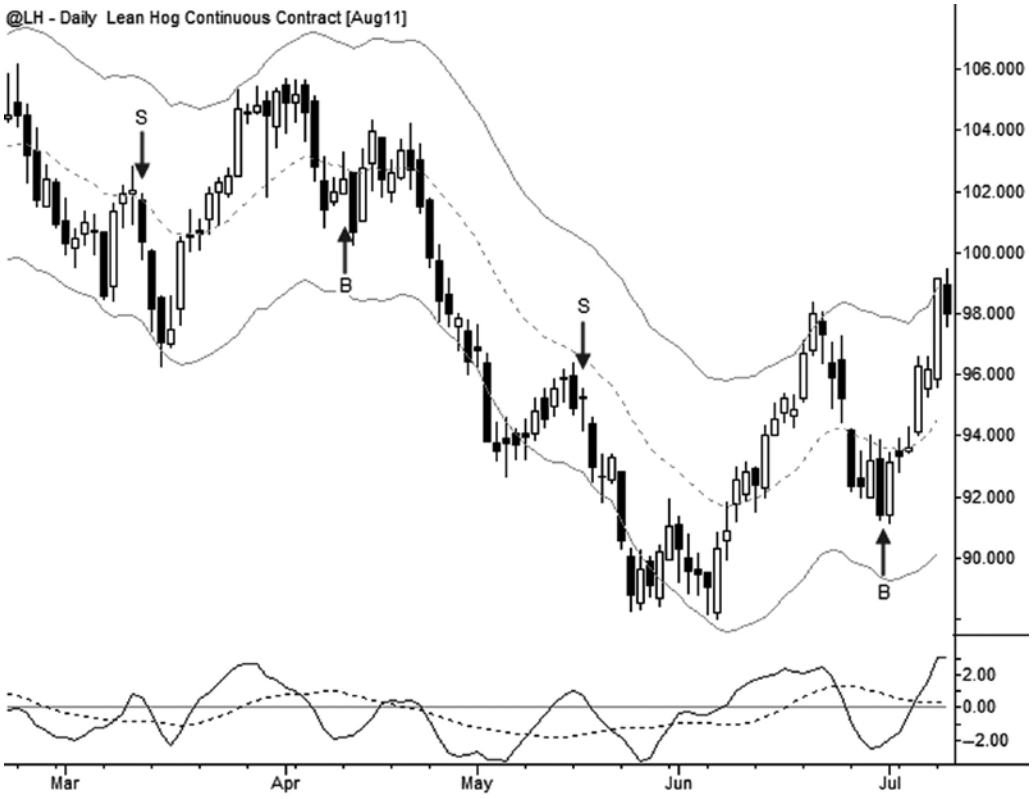


FIGURE 7.20 Fast Line Hook Entries Qualified with Fast/Slow Line Spread

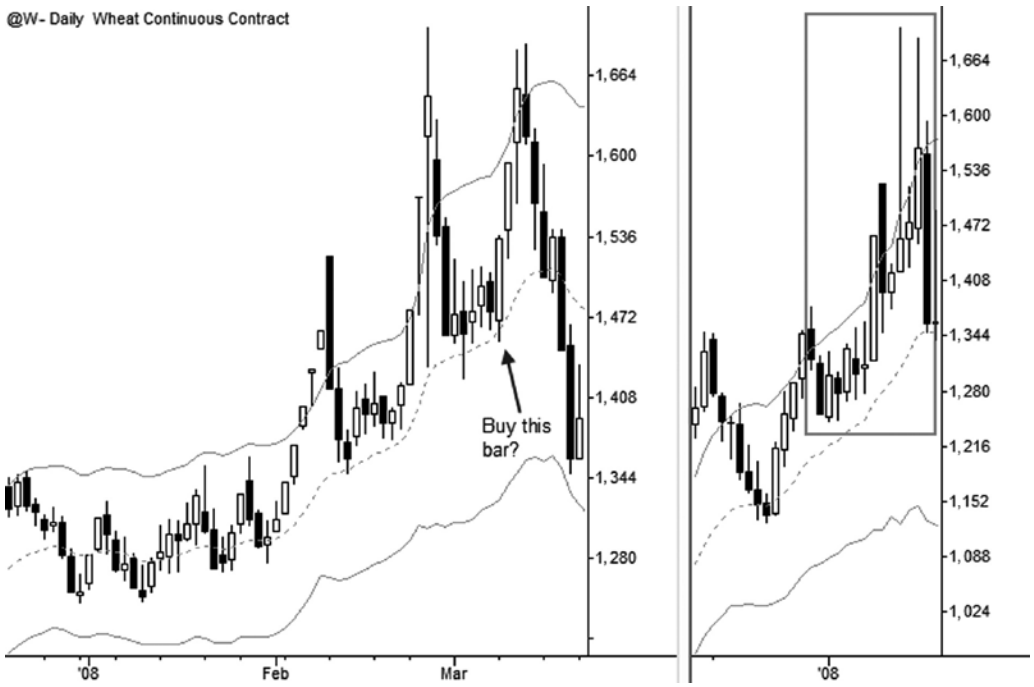


FIGURE 7.21 Exhaustion on the Weekly Chart Suggests Passing on This Buy Signal

FIGURE 7.22 Several Factors on the Weekly Chart Contradict a Potential Short on the Daily

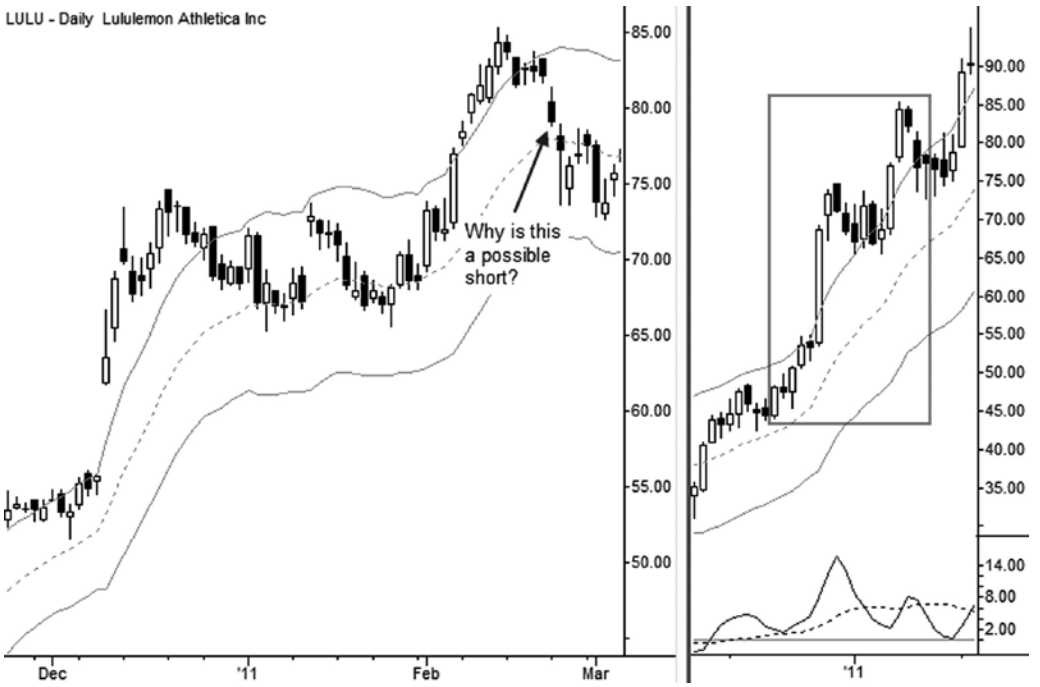


FIGURE 7.23 Why Short *under* a Bull Flag on the Daily Chart?

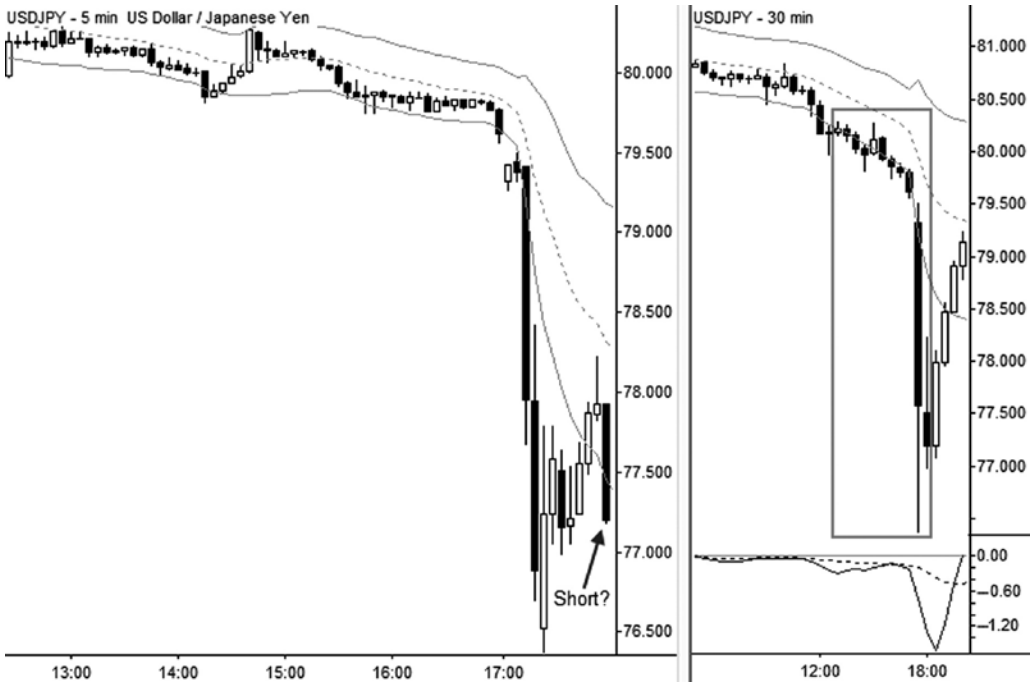


FIGURE 7.24 The Higher Time Frame Suggests That the Lower Time Frame Short Will Be Difficult

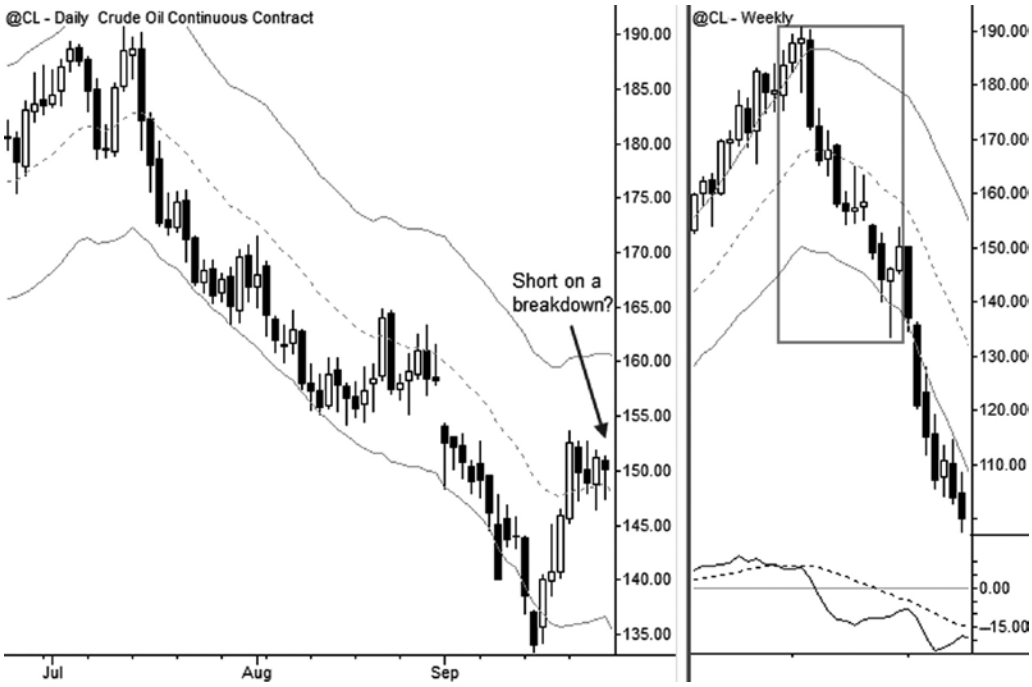


FIGURE 7.25 A Mediocre Pullback on the Daily Chart Is an Excellent Pullback on the Weekly Chart

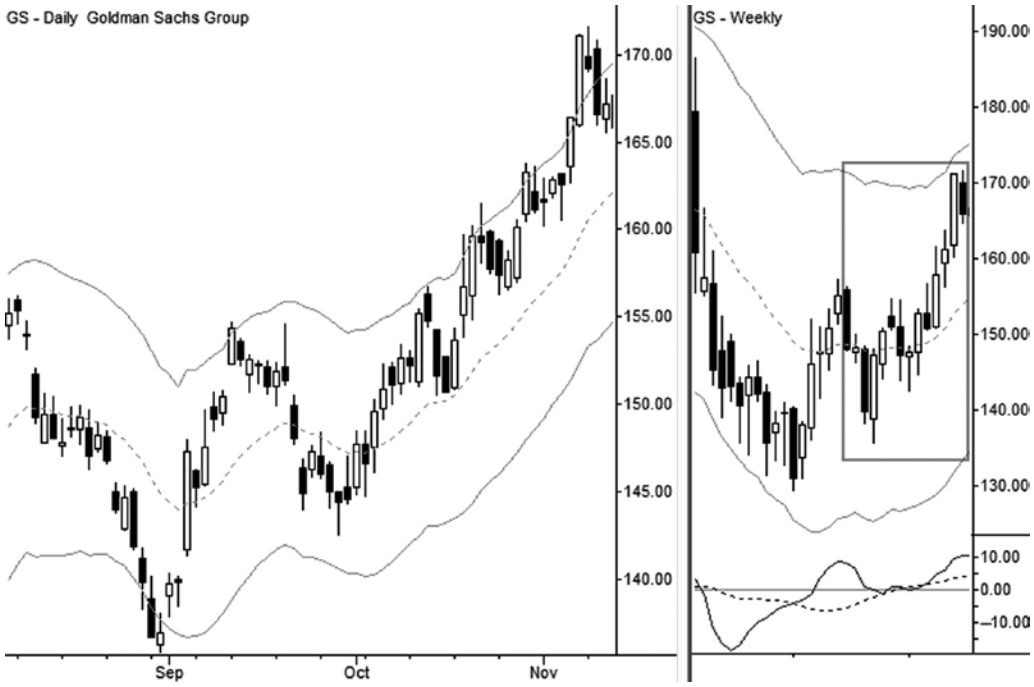


FIGURE 7.26 The Weekly Anti Provides Bullish Context to the Daily Chart

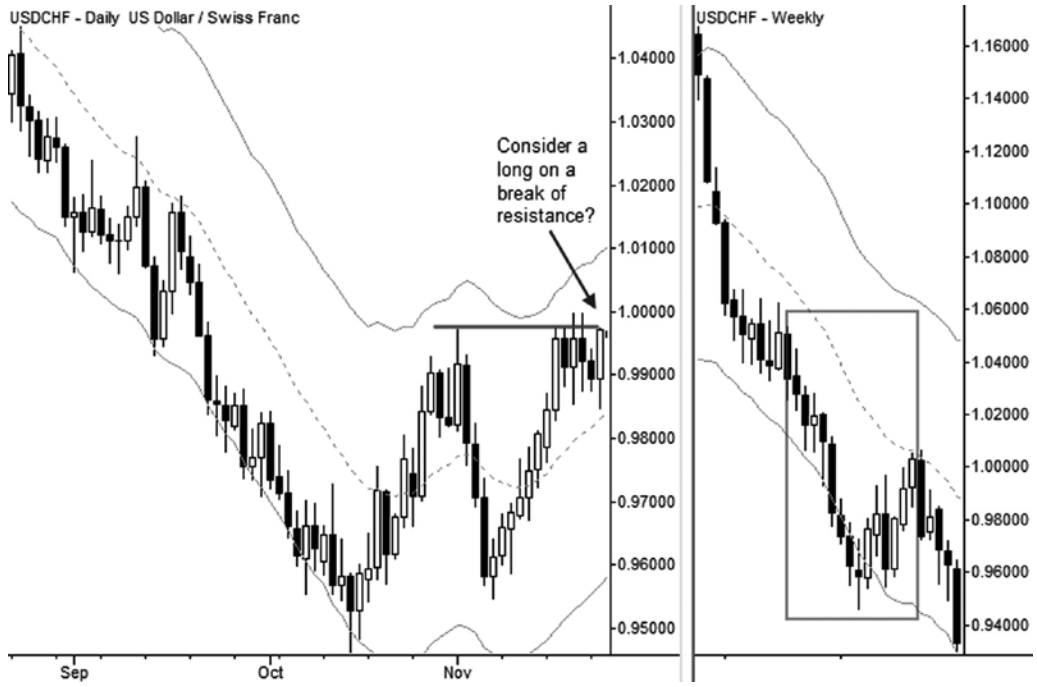


FIGURE 7.27 The Potential Breakout on the Daily Is Contradicted by the Weekly Complex Consolidation (Bear Flag)

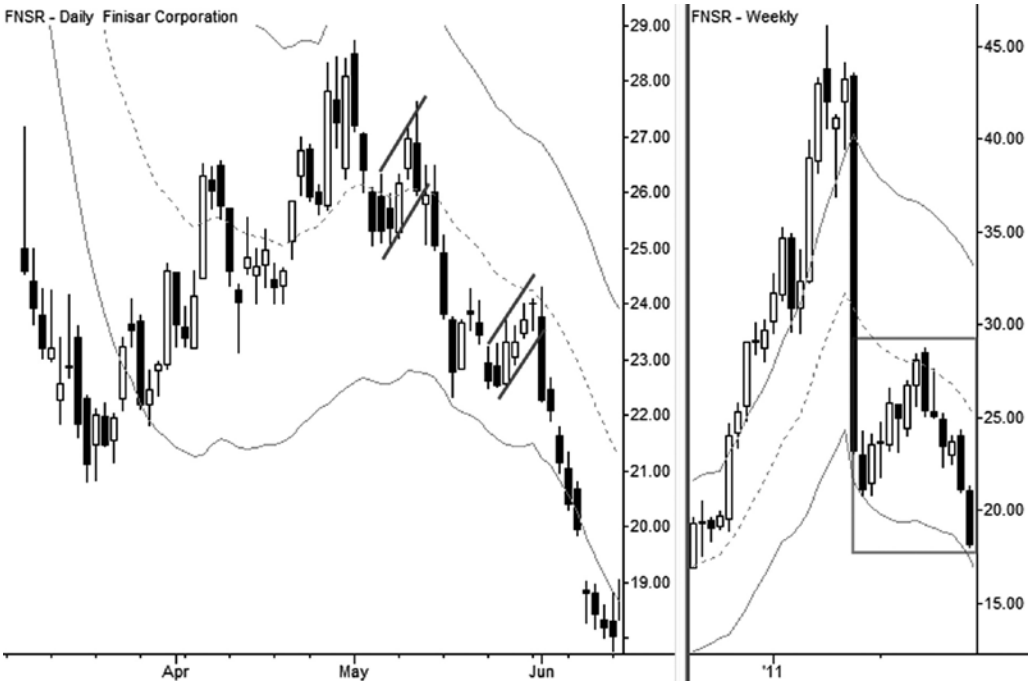


FIGURE 7.28 The Weekly Flag Adds Power to Small Consolidations on the Daily Chart

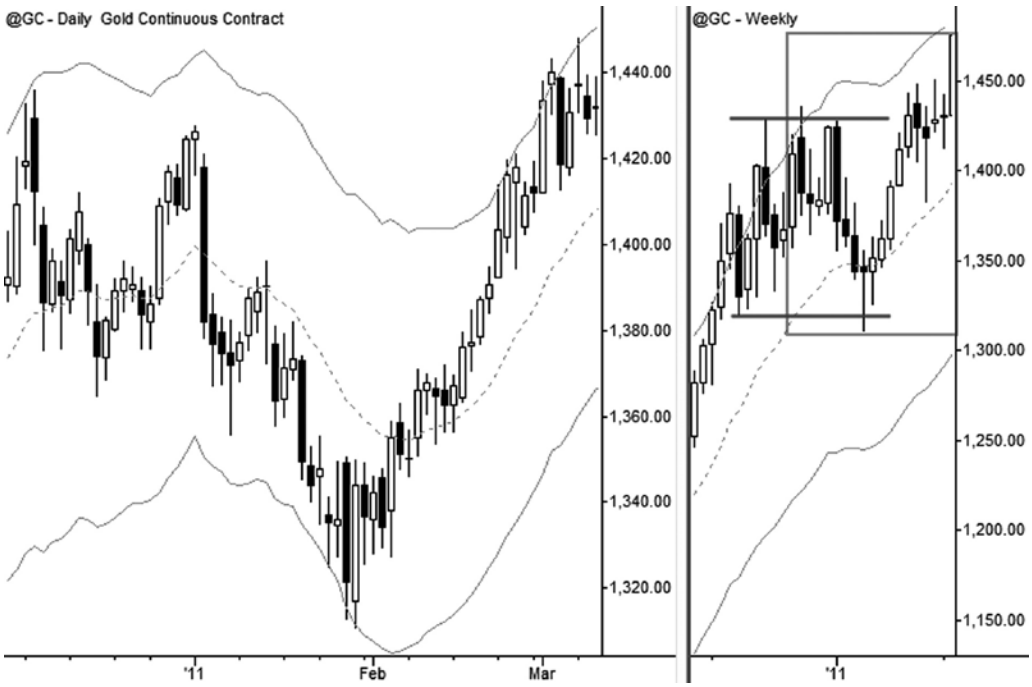


FIGURE 7.29 A Clean Daily Uptrend While the Weekly Chart Is in a Trading Range

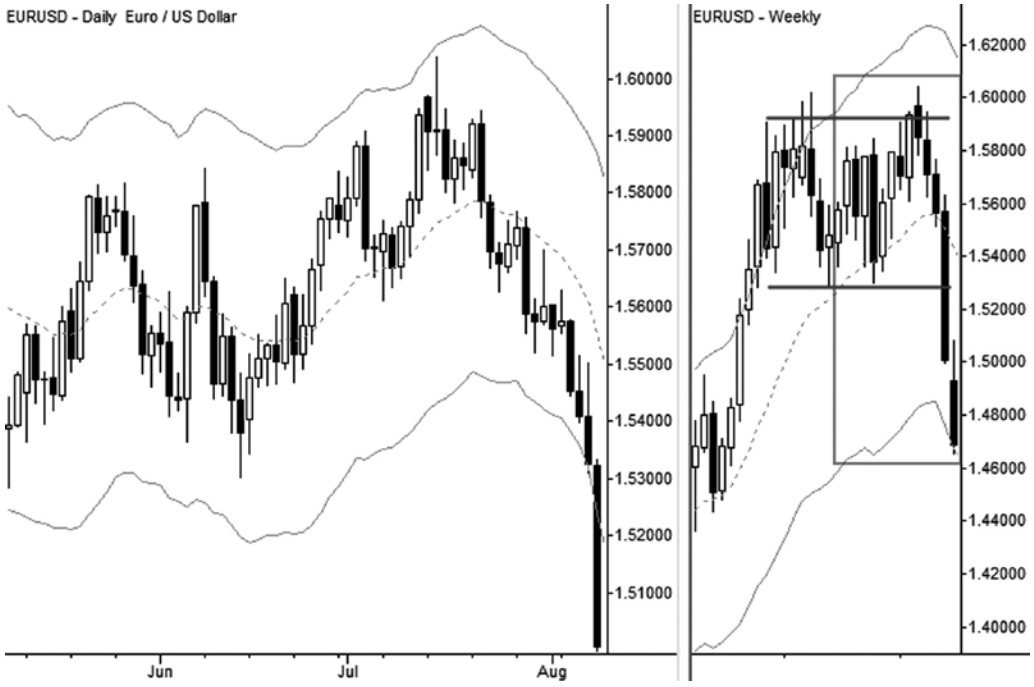


FIGURE 7.30 Another Example of a Lower Time Frame Trend While the Higher Time Frame Is in a Trading Range

CHAPTER 8

Trade Management

Choices are the hinges of destiny.

—Pythagoras

FIGURE 8.1 Two Stop Levels for a Long Position Entered on the Last Candle of the Chart

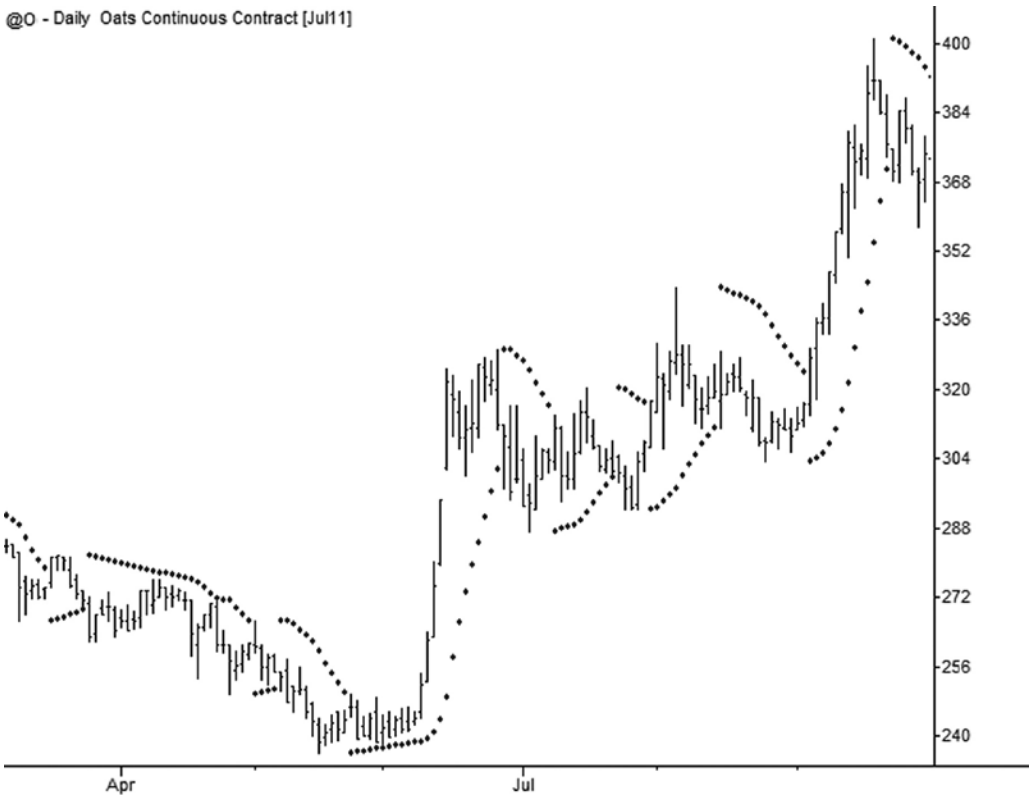


FIGURE 8.2 The Parabolic System Applied to Oat Futures

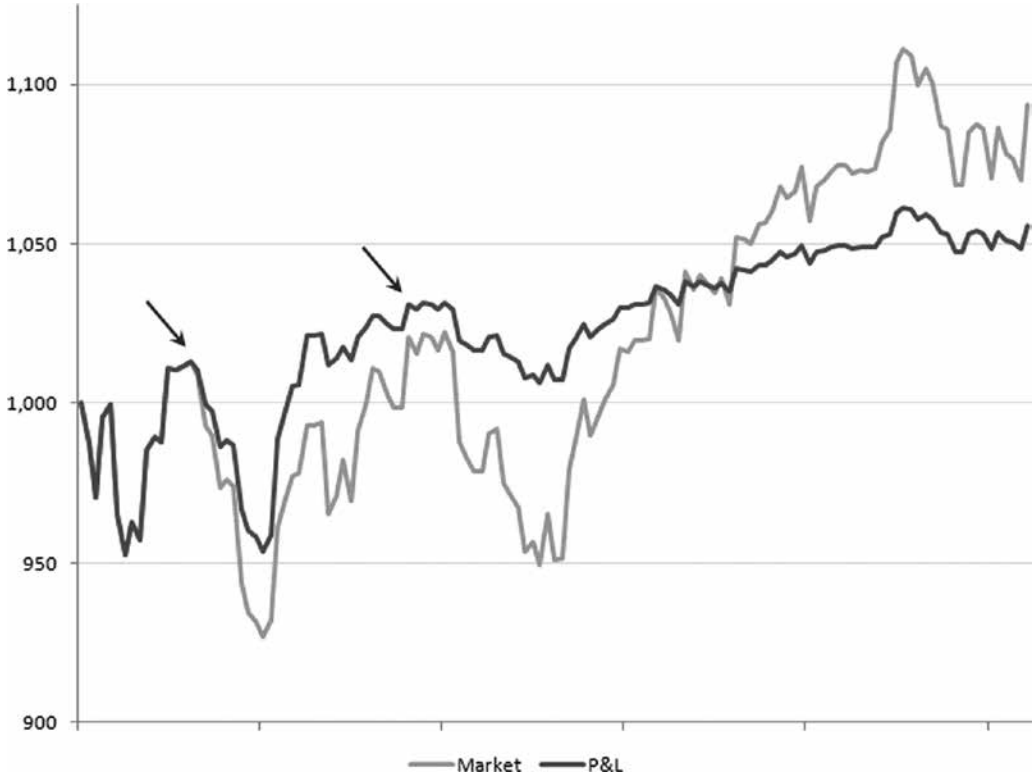


FIGURE 8.3 Partial Exits (Marked with Arrows) at Two Optimal Points Early in the Trade

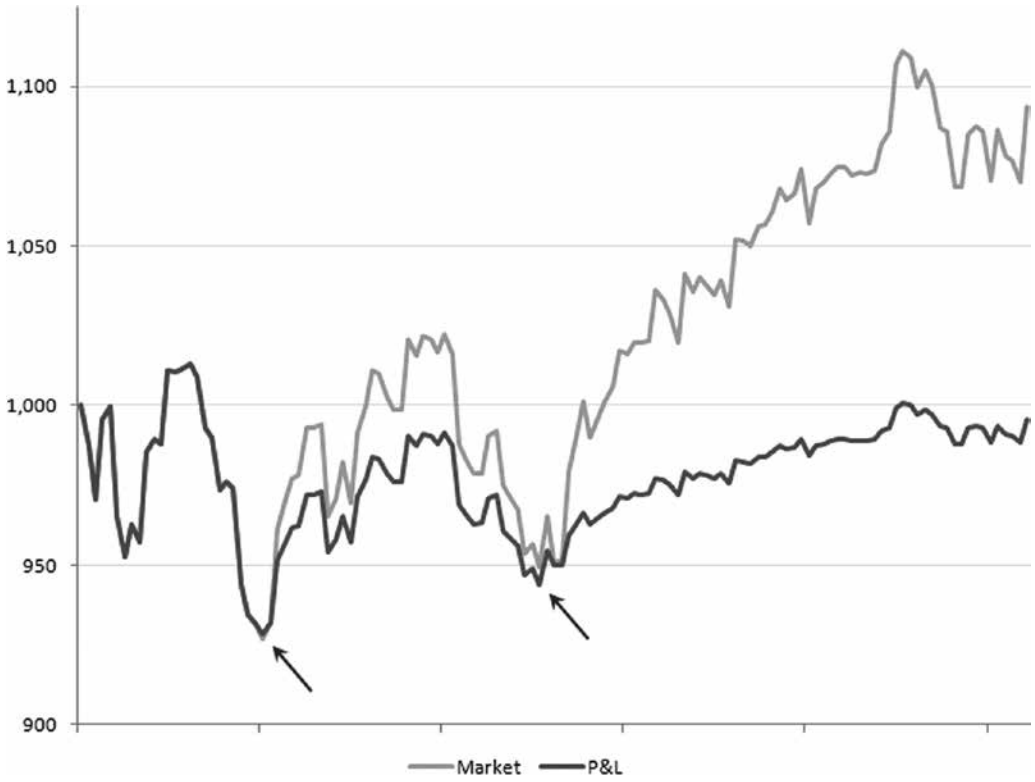


FIGURE 8.4 The Same Market, with Partial Exits at the Two Worst Points Early in the Trade

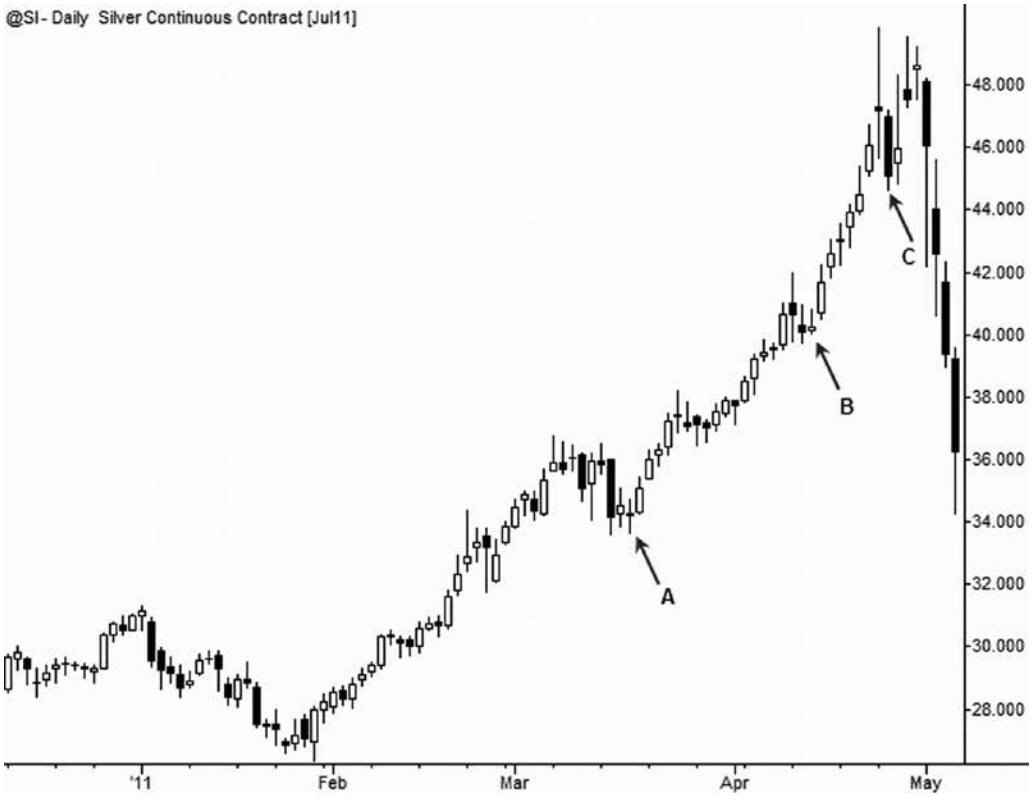


FIGURE 8.5 A Stop Under the Previous Day's Low Is Appropriate in a Parabolic, Runaway Trend

							P&L				Risk			
DateIn	Patt	Ticker	L/S	#	PriceIn	Close	OpenPL	ClosedPL	TotalPL	PL%R	Stop	Risk	PLStop	1StDev
6/14/11	PB	WX	L	800	72.08	71.63	(360)	0	(360)	−0.1X	67.25	(3,504)	(3,864)	1,328
6/13/11	Sup	CDE	L	1,000	41.43	41.62	193	(208)	(15)	−0.0X	40.05	(1,570)	(1,585)	740
6/10/11	Anti	ZZZ	L	750	11.05	12.55	1,125	2,865	3,990	1.1X	11.35	(900)	3,090	405
6/13/11	PB	ABC	S	375	105.89	106.64	(281)	0	(281)	−0.1X	115.00	(3,135)	(3,416)	(1,076)
6/10/11	PB	XYZ	S	2,750	29.93	29.19	2,032	771	2,803	0.7X	29.46	(742)	2,060	(2,200)
5/24/11	Res	BB	S	500	22.99	19.04	1,976	3,175	5,151	1.4X	20.50	(730)	4,421	(310)
						Total	4,684	6,603	11,287	3.0X		(10,582)	706	(1,113)

FIGURE 8.6 A Basic Daily Risk and P&L Sheet

CHAPTER 9

Risk Management

It is important to see distant things as if they were close and to take a distanced view of close things.

—Miyamoto Musashi, *The Book of Five Rings* (1645 CE)

TABLE 9.1 Results of 1,000 Monte Carlo Runs Risking $2,000 per Trade in $100,000 Account

Mean Terminal Value	149,259
Median Terminal Value	152,000
Standard Deviation of Terminal Value	33,760
Coefficient of Variation	0.23
Mean of Maximum Value	159,070
Mean of Minimum Value	89,254
Highest Terminal Value	253,200
Lowest Terminal Value	50,800
Percent Terminal Drawdown ≥75%	0.0%
Percent of Accounts Bankrupt	0.0%

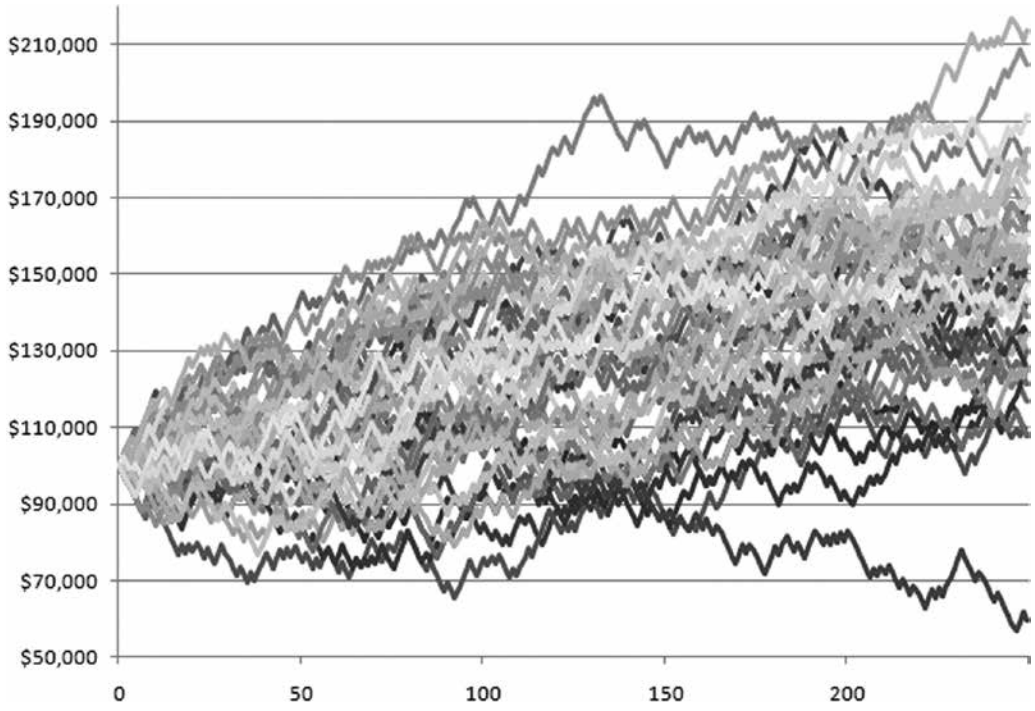


FIGURE 9.1 Fifty Sample Runs through the Monte Carlo Tree

TABLE 9.2 Monte Carlo Risking $*x* per Trade

	***x* = 2,000**	***x* = 3,000**	***x* = 4,000**	***x* = 5,000**
Mean Terminal Value	149,259	173,854	198,286	221,894
Median Terminal Value	152,000	178,000	204,000	230,000
Std Dev of Terminal Value	33,760	50,746	68,107	86,911
Coefficient of Variation	0.23	0.29	0.34	0.39
Mean of Max Value	159,070	188,604	218,139	247,448
Mean of Min Value	89,254	83,912	78,650	73,638
Highest Terminal Value	253,200	329,800	406,400	483,000
Lowest Terminal Value	50,800	(1,400)	(3,200)	(4,000)
Percent Terminal DD ≥75%	0.0%	0.1%	0.8%	2.3%
Percent of Accounts Bankrupt	0.0%	0.1%	0.7%	2.2%
Terminal Value − *E*()	(741)	(1,146)	(1,714)	(3,106)

TABLE 9.3 Aggressive Risk Levels in the Monte Carlo

	$x = 6{,}000$	$x = 8{,}000$	$x = 10{,}000$	$x = 25{,}000$
Mean Terminal Value	243,140	281,387	314,822	463,980
Median Terminal Value	242,800	290,400	338,000	310,000
Std Dev of Terminal Value	108,326	153,502	200,806	519,633
Coefficient of Variation	0.45	0.55	0.64	1.12
Mean of Max Value	275,360	327,832	376,324	610,805
Mean of Min Value	68,993	61,058	54,662	28,480
Highest Terminal Value	559,600	712,800	866,000	2,015,000
Lowest Terminal Value	(5,600)	(7,200)	(8,000)	(20,000)
Percent Terminal DD ≥75%	5.2%	11.0%	17.6%	47.7%
Percent of Accounts Bankrupt	5.0%	11.0%	17.6%	47.7%
Terminal Value − *E*()	(6,860)	(18,613)	(35,178)	(261,020)

TABLE 9.4 Fixed Fractional and Fixed Position Sizes Compared

	Fixed 2,000	2% of Equity
Mean Terminal Value	149,259	163,033
Median Terminal Value	152,000	158,317
Std Dev of Terminal Value	33,760	56,266
Coefficient of Variation	0.23	0.35
Mean of Max Value	159,070	179,236
Mean of Min Value	89,254	89,385
Highest Terminal Value	253,200	434,738
Lowest Terminal Value	50,800	57,654
Percent Terminal DD ≥75%	0.0%	0.0%
Percent of Accounts Bankrupt	0.0%	0.0%

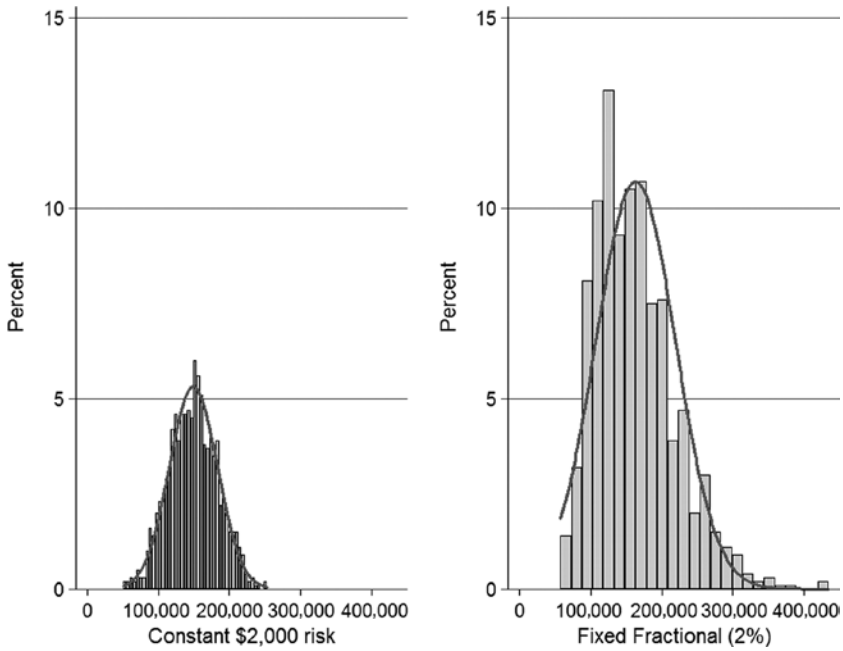


FIGURE 9.2 Distribution of Terminal Values for Fixed-Dollar and Fixed-Fractional Position-Sizing Plans

TABLE 9.5 Several Fixed Fractional Monte Carlos

	4%	8.333%	10%	12%	25%
Mean Terminal Value	263,545	711,375	1,014,163	1,508,351	5,280,790
Median Terminal Value	222,225	307,825	300,832	262,485	5,630
Std Dev of Terminal Value	193,846	1,431,904	2,821,550	6,005,588	79,775,366
Coefficient of Variation	0.74	2.01	2.78	3.98	15.11
Mean of Max Value	316,875	1,046,380	1,636,924	2,781,394	62,017,391
Mean of Min Value	79,046	58,366	51,237	43,292	9,444
Highest Terminal Value	1,670,569	20,392,572	46,000,315	109,597,717	1,757,129,394
Lowest Terminal Value	29,561	4,647	1,967	629	0
Percent Terminal DD ≥75%	0.0%	4.6%	8.0%	15.6%	66.5%

TABLE 9.6 Examples of the Effect of Randomly Varying Bet Sizes

	4% Nonrandom	Rand1 [0%–8%]	Rand2 [0%–8%]	Rand3 [0%–8%]
Mean Terminal Value	263,545	262,190	257,249	254,106
Median Terminal Value	222,225	192,474	198,389	187,049
Std Dev of Terminal Value	193,846	239,548	211,231	220,697
Coefficient of Variation	0.74	0.91	0.82	0.87
Mean of Max Value	316,875	333,660	326,773	324,438
Mean of Min Value	79,046	74,116	74,063	73,836
Highest Terminal Value	1,670,569	2,062,297	1,886,388	2,001,251
Lowest Terminal Value	29,561	14,833	18,562	20,599
Percent Terminal DD ≥75%	0.0%	0.4%	0.2%	0.3%
Percent of Accounts Bankrupt	0.0%	0.0%	0.0%	0.0%

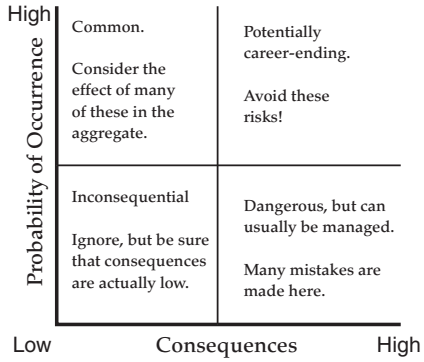


FIGURE 9.3 Probability/Consequence Risk Grid

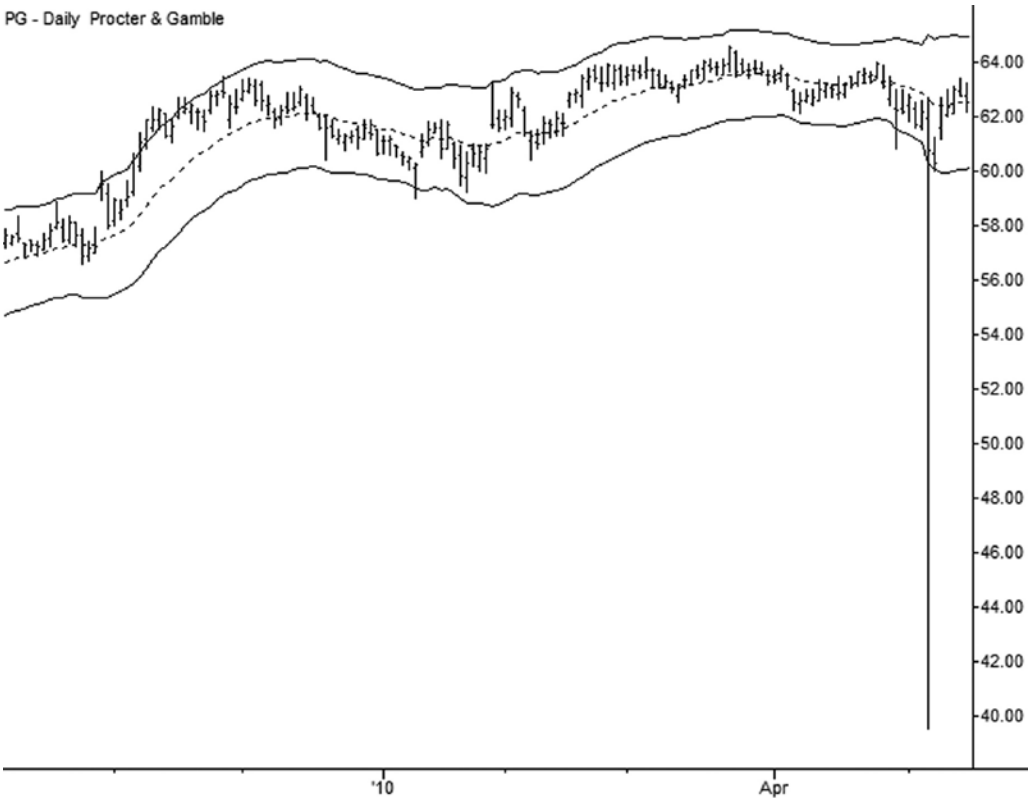


FIGURE 9.4 Daily Chart of PG During the 2010 Flash Crash

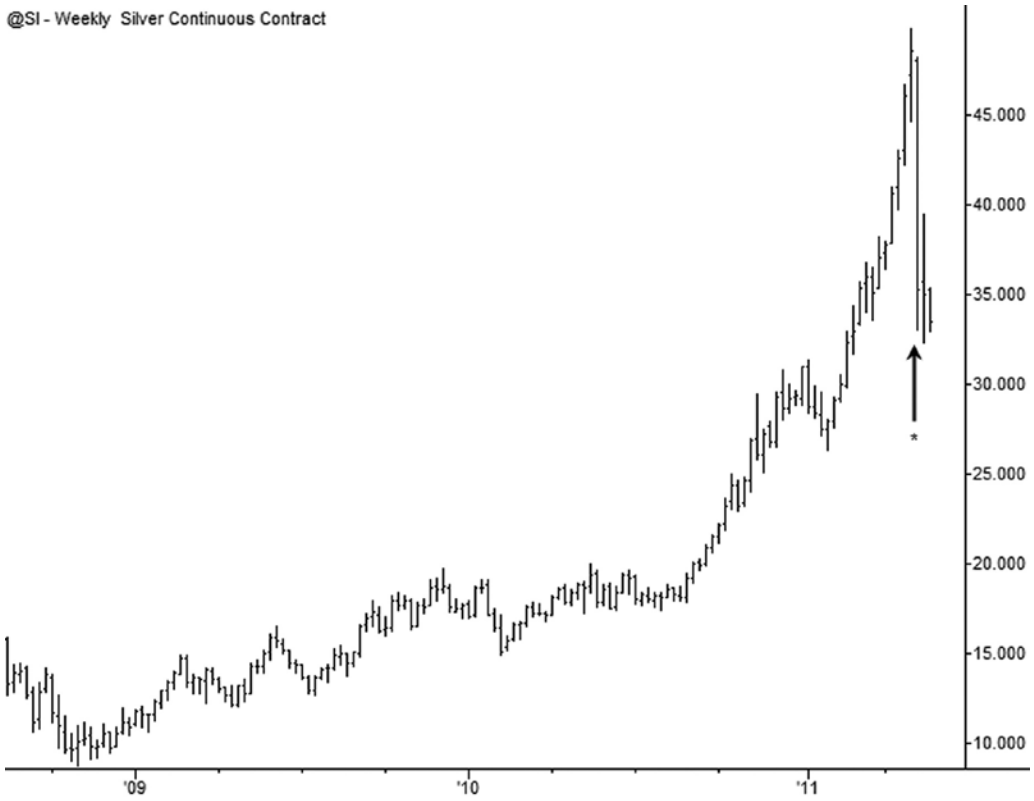


FIGURE 9.5 A Margin Hike in Weekly Silver Futures Breaks an Already Overextended Trend

CHAPTER 10

Trade Examples

The main part of intellectual education is not the acquisition of facts but learning how to make facts live.

—Oliver Wendell Holmes

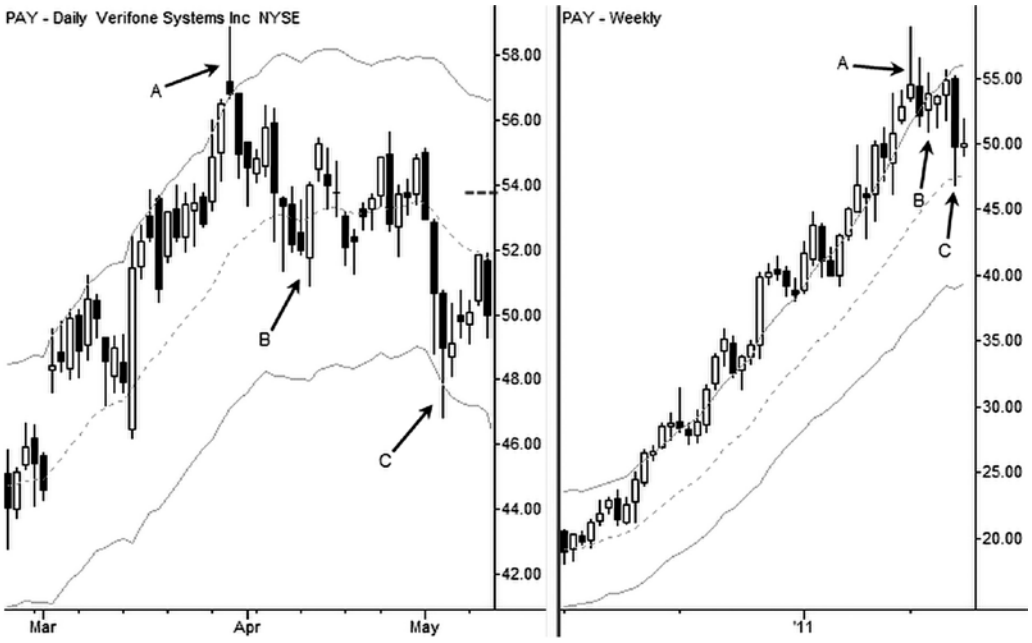


FIGURE 10.1 Short Entry in Verifone Systems Inc. (NYSE: PAY)

FIGURE 10.2 A Successful Short Trade

FIGURE 10.3 A Simple Pullback Entry in Zagg, Inc. (Nasdaq: ZAGG)

FIGURE 10.4 A Successful Pullback Trade

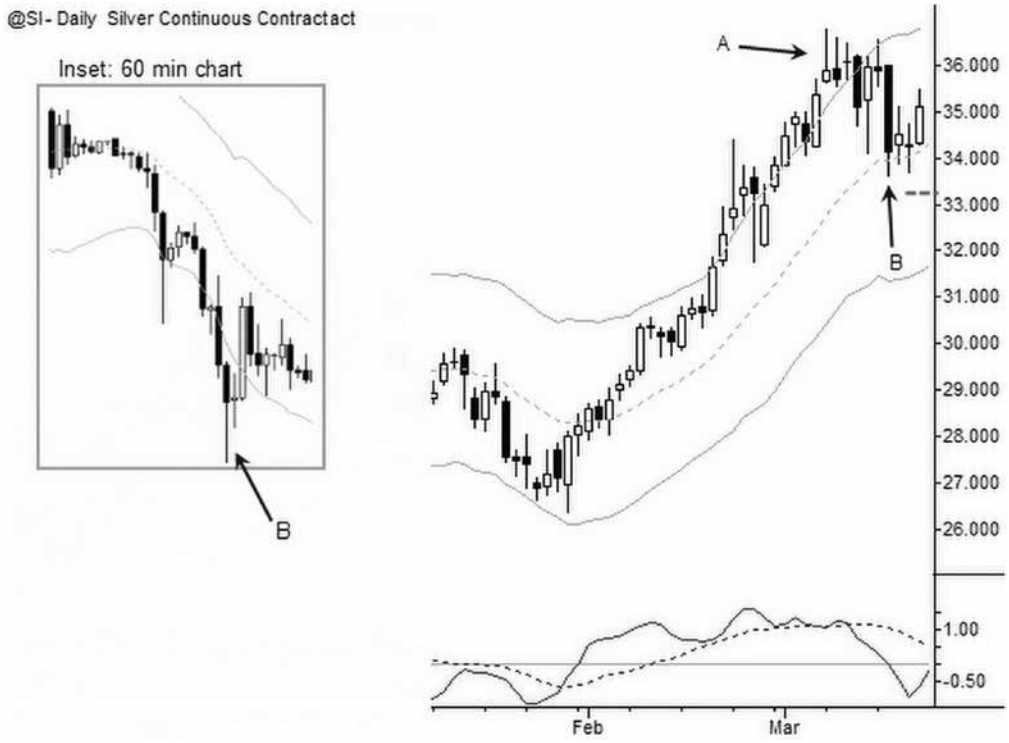


FIGURE 10.5 Lower Time Frame Climax Sets Up a Pullback Entry in Silver Futures

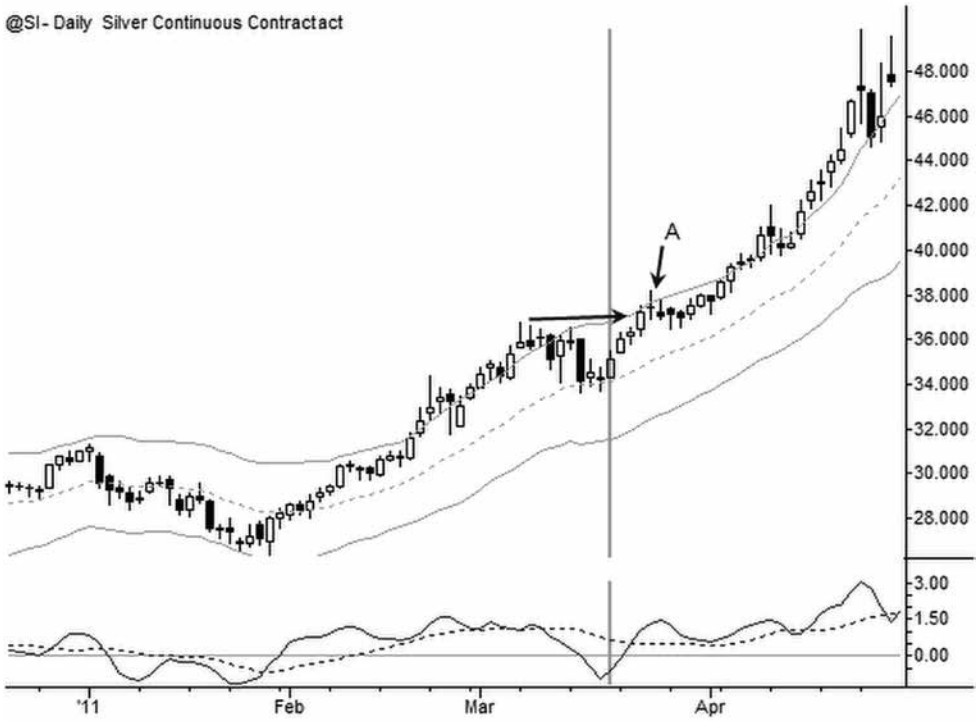


FIGURE 10.6 A Pullback Entry Leads to a Multileg Trend

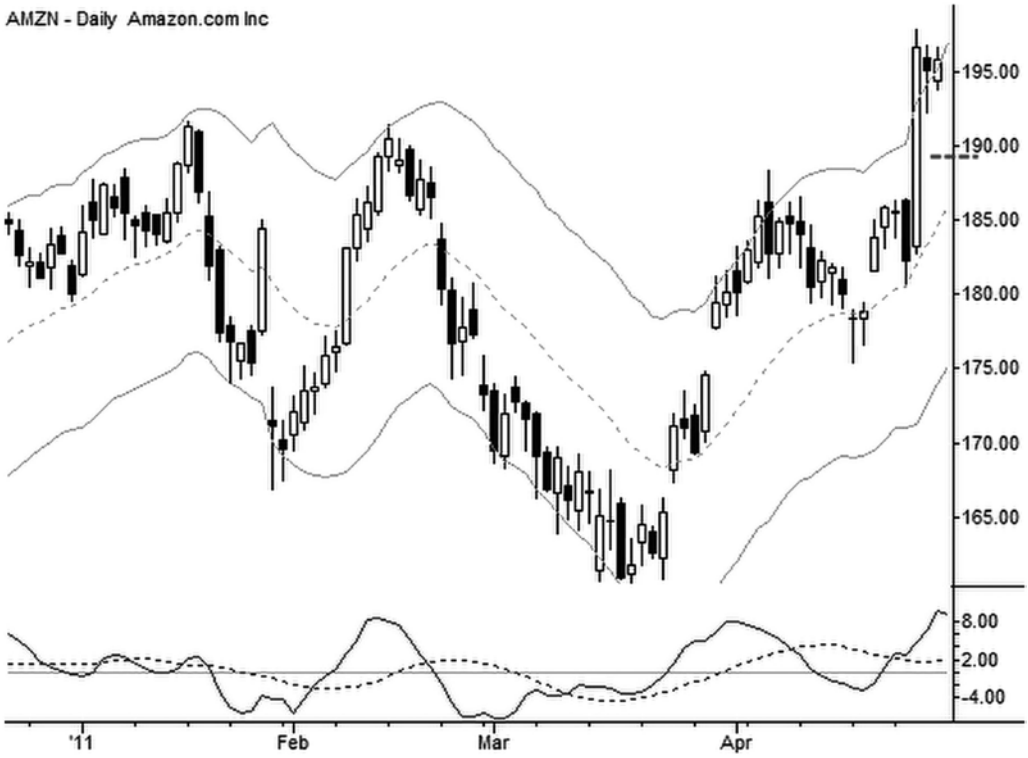


FIGURE 10.7 A High and Tight Flag in AMZN

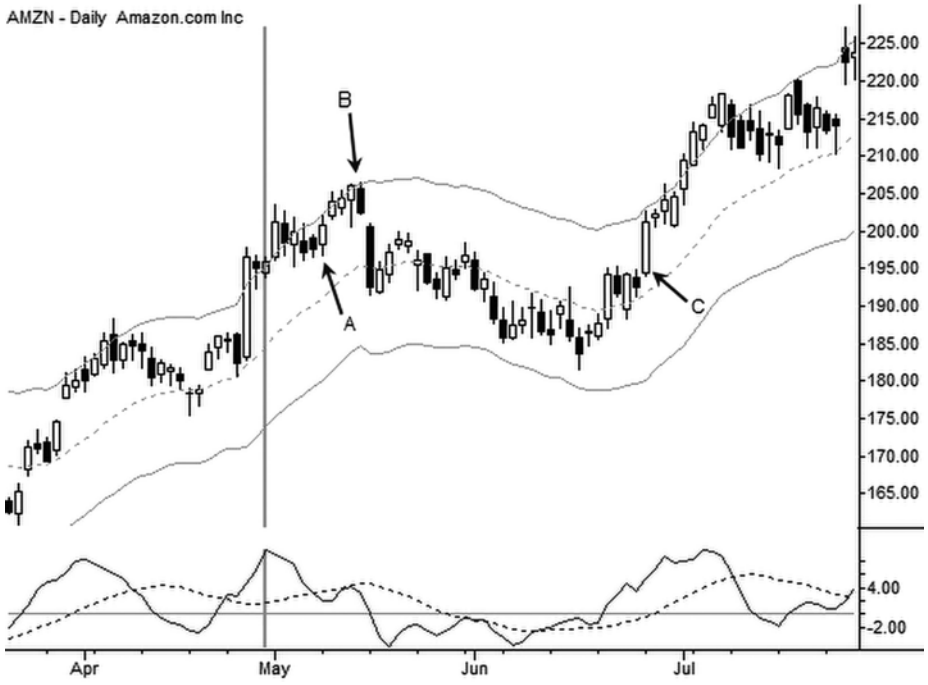


FIGURE 10.8 Targets Are Hit, but the Move Is Weak

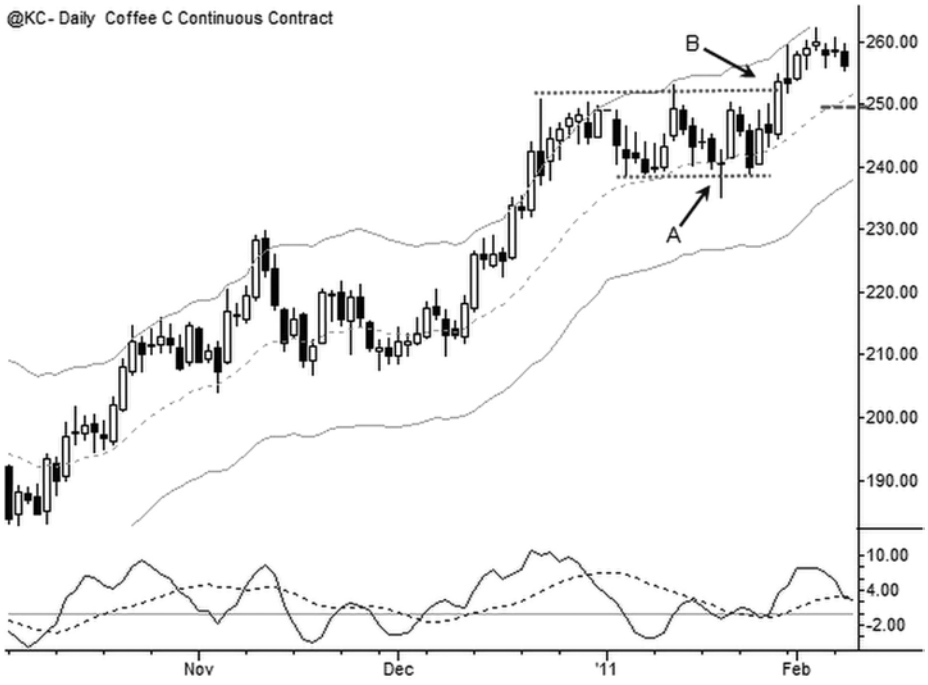


FIGURE 10.9 A Nested Pullback in Coffee Futures

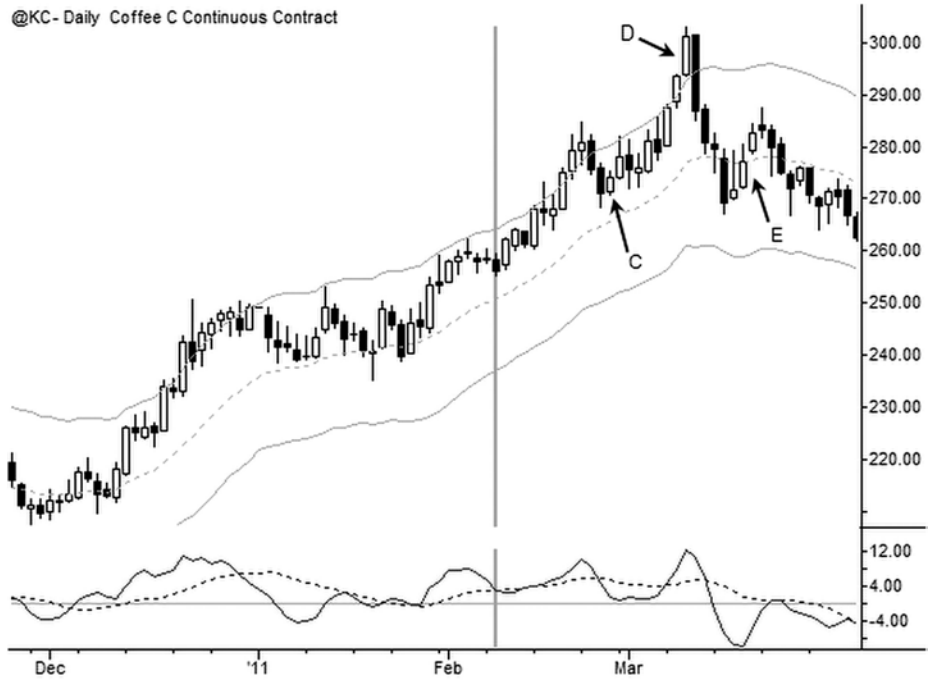


FIGURE 10.10 Two Strong Trend Legs Follow the Nested Pullback

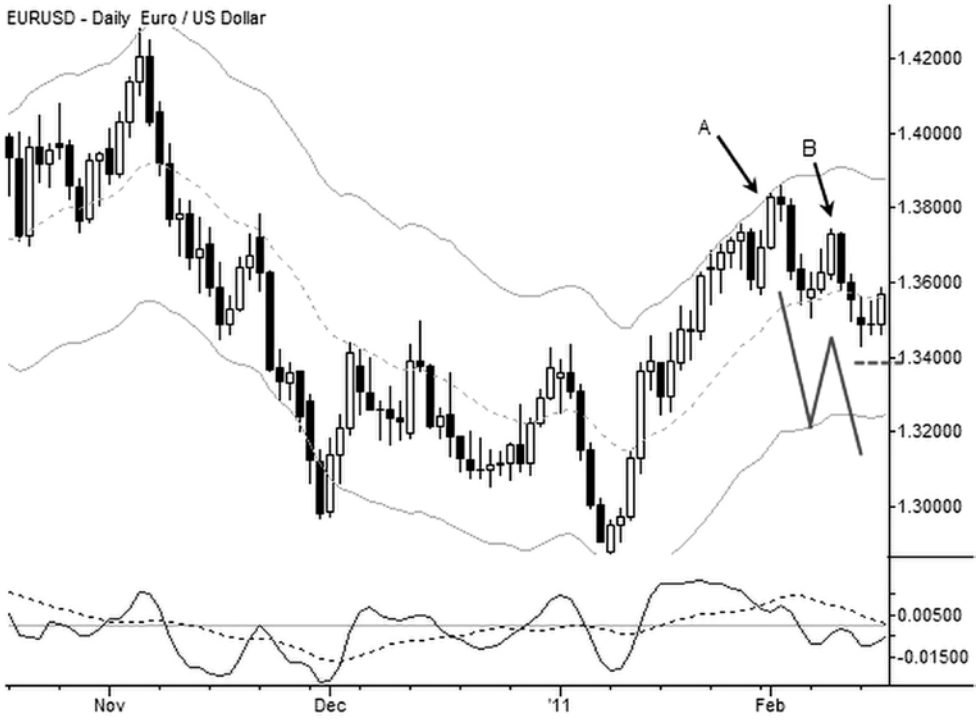


FIGURE 10.11 A Complex Pullback in the EURUSD

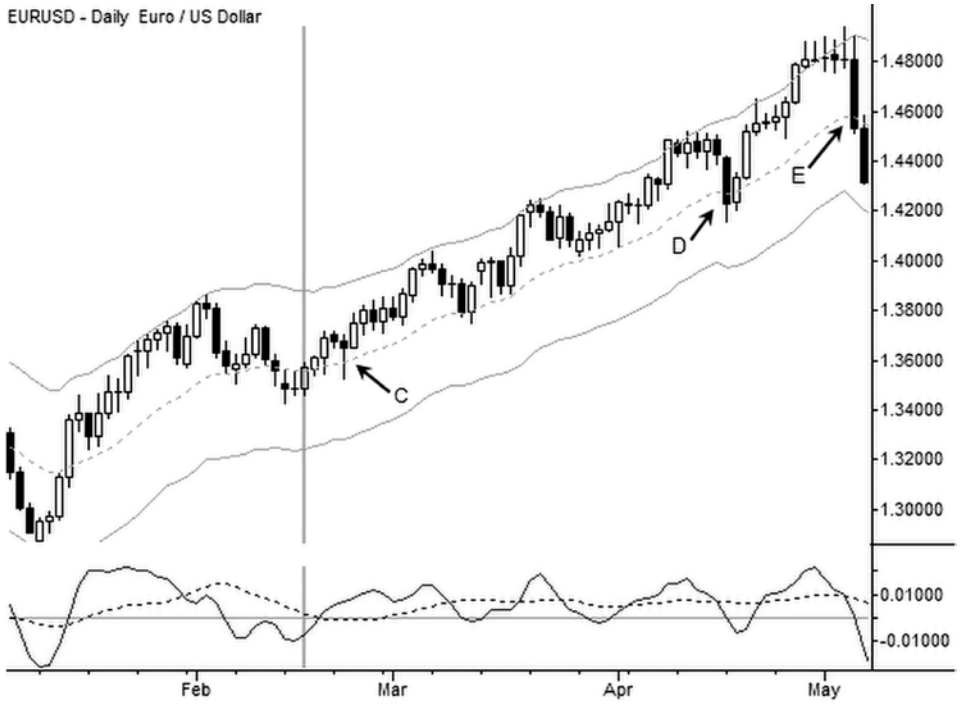


FIGURE 10.12 A Complex Consolidation Leads to Significant Upside

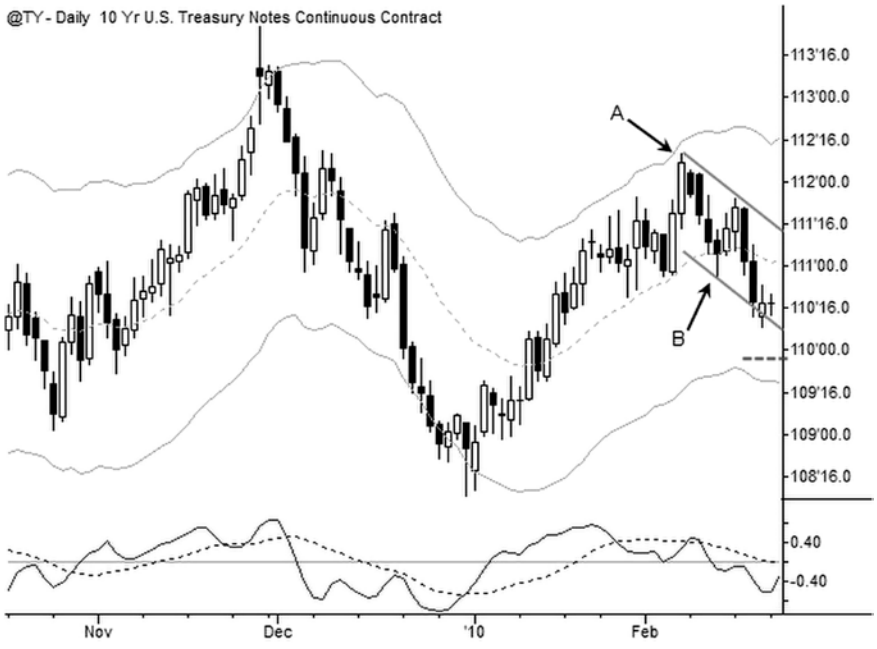


FIGURE 10.13 A Complex Pullback in Treasury Note Futures

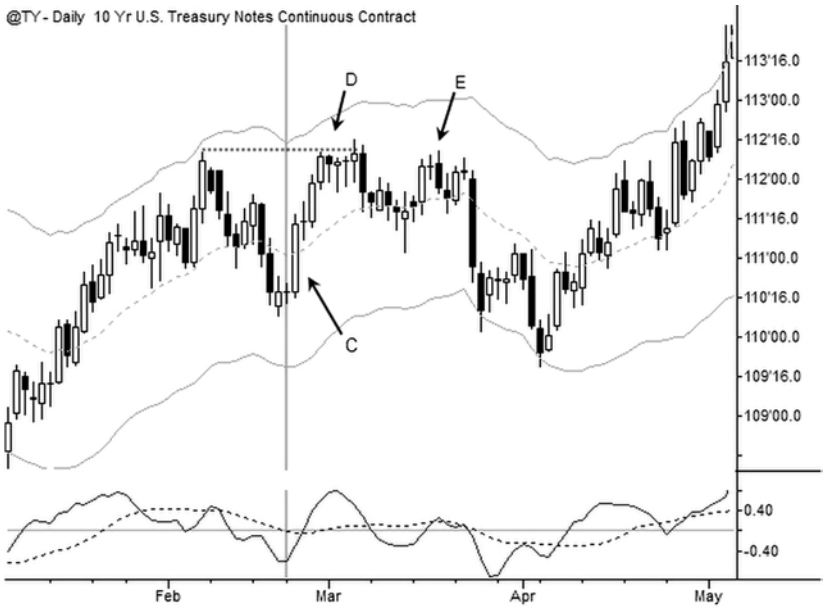


FIGURE 10.14 Is This a Failed or Successful Pullback Trade?

FIGURE 10.15 A Pullback Failure at Previous Swing

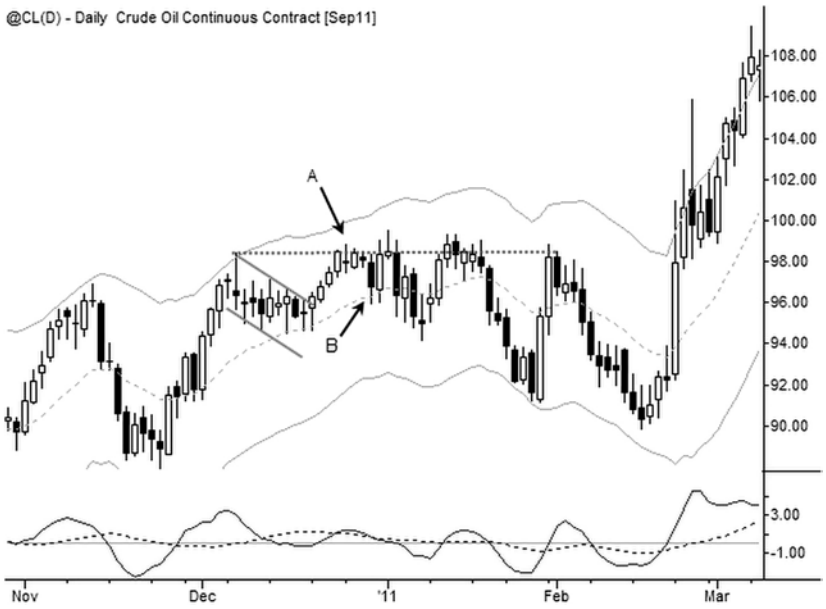


FIGURE 10.16 A Pullback Failure in Crude Oil

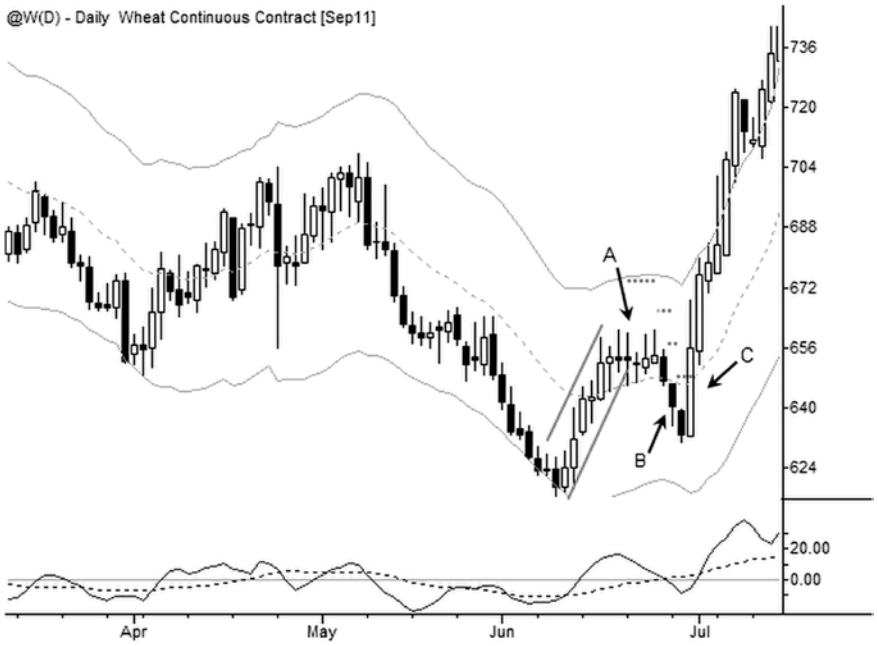


FIGURE 10.17 A Bearish Pullback in Wheat Fails When Strong Upside Momentum Emerges

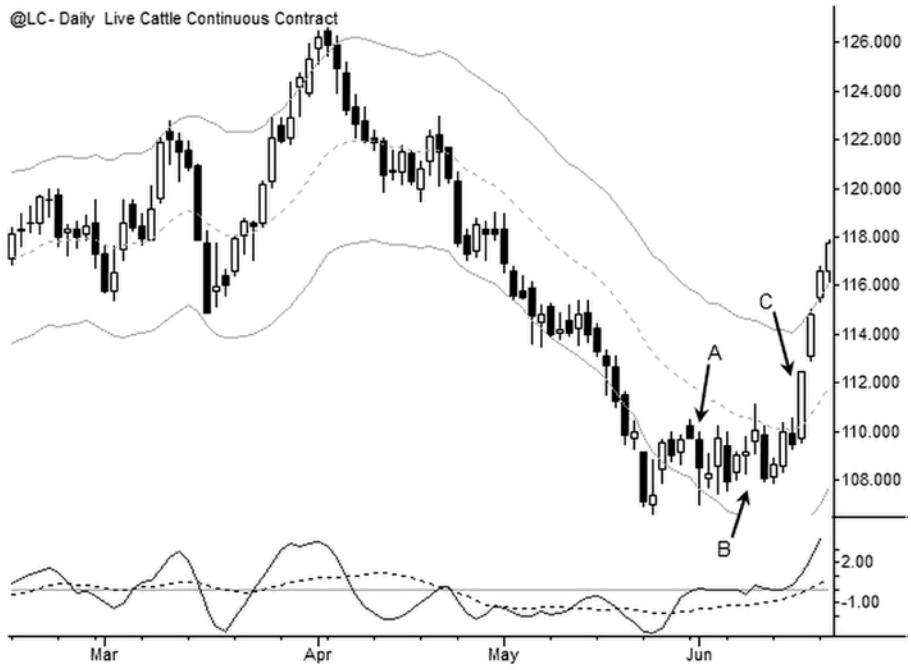


FIGURE 10.18 A Pullback in Live Cattle Futures Goes Flat

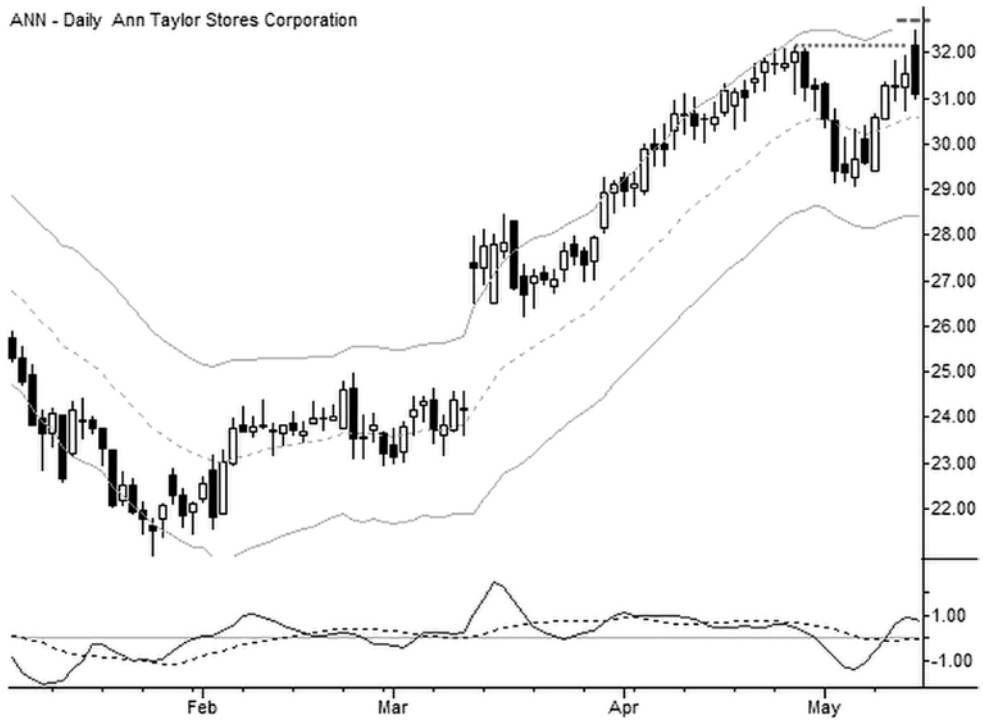


FIGURE 10.19 A Failure Test in Ann Taylor (NYSE: ANN)

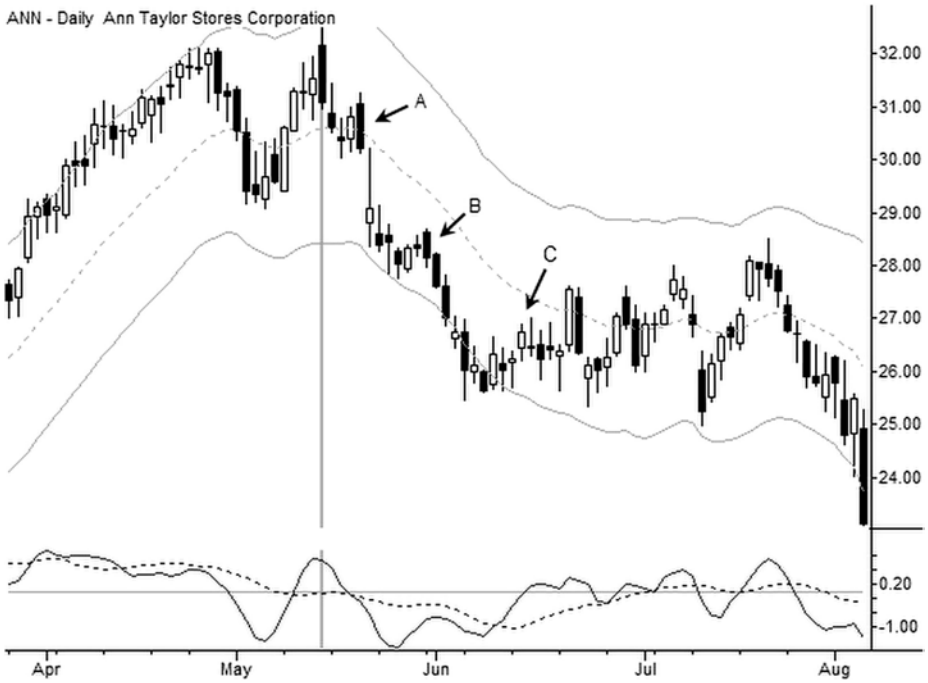


FIGURE 10.20 A Best-Case Failure Test Outcome

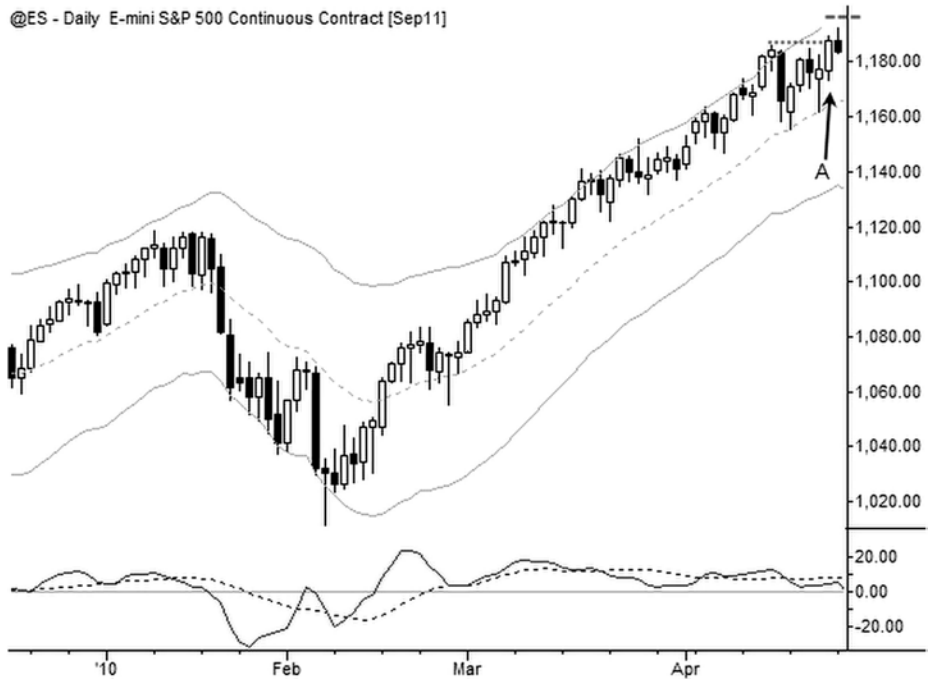


FIGURE 10.21 A Second-Day Failure Test Entry

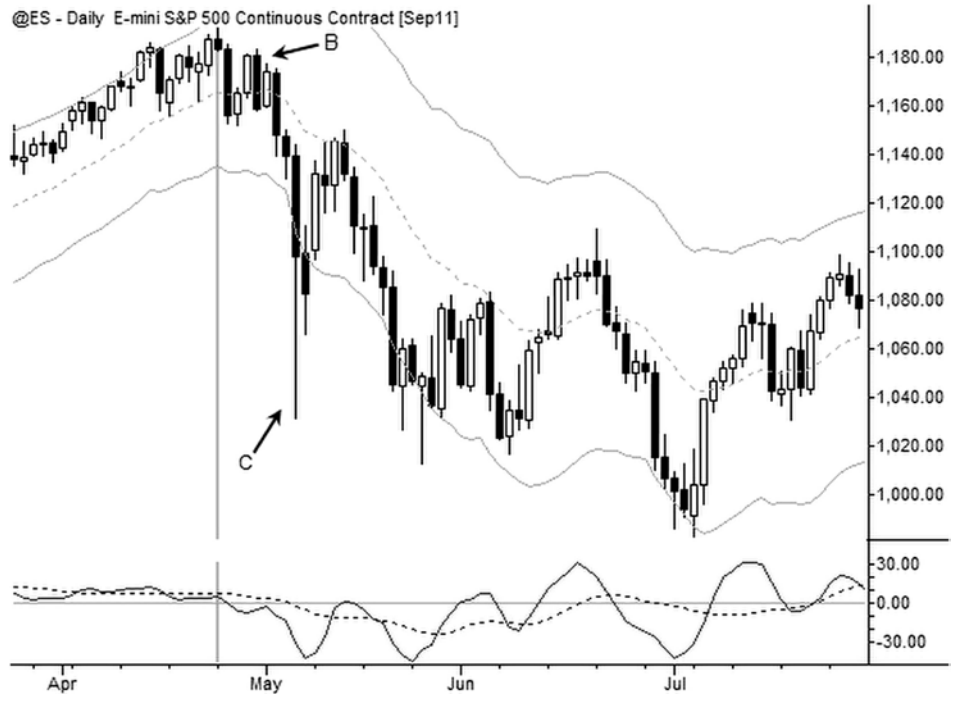


FIGURE 10.22 First Profit Target Is Quickly Hit

FIGURE 10.23 A Failure Test Fails by Consolidation

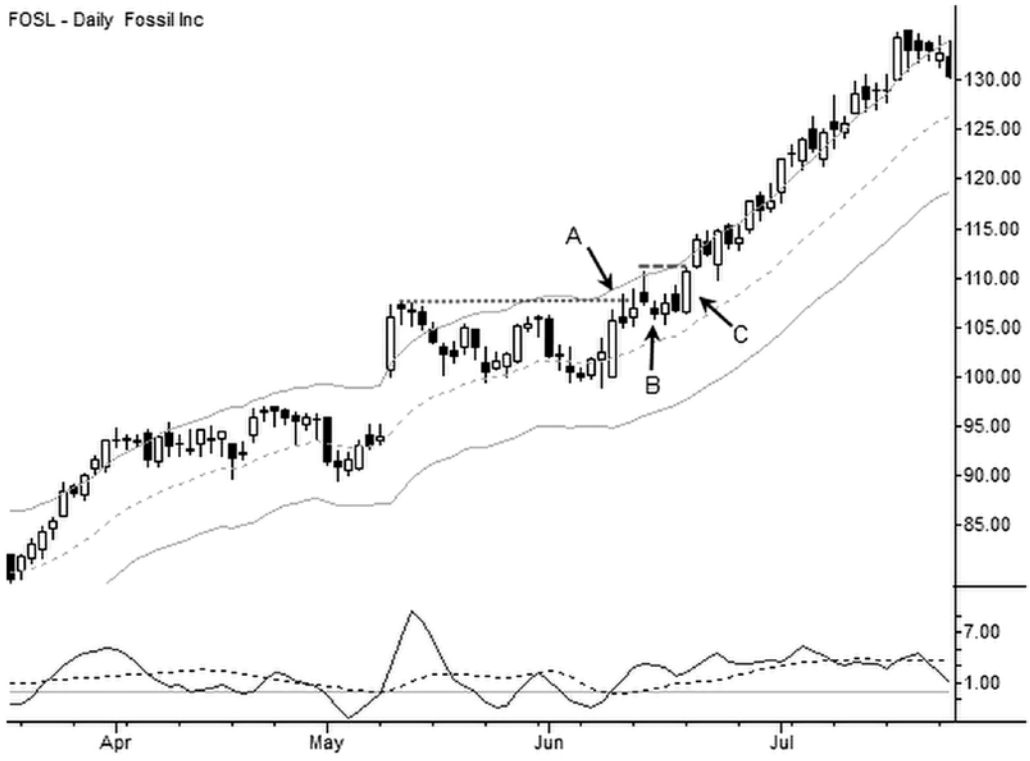


FIGURE 10.24 Another Example of Failure by Consolidation

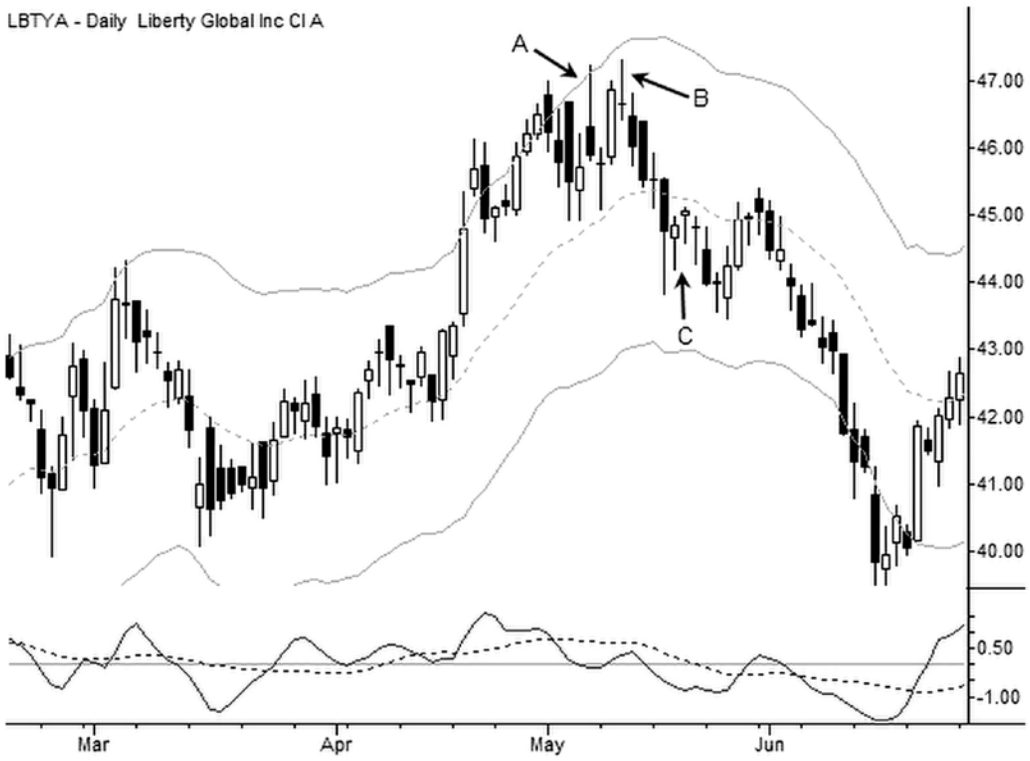


FIGURE 10.25 A Failure Test with Obligatory Second Entry

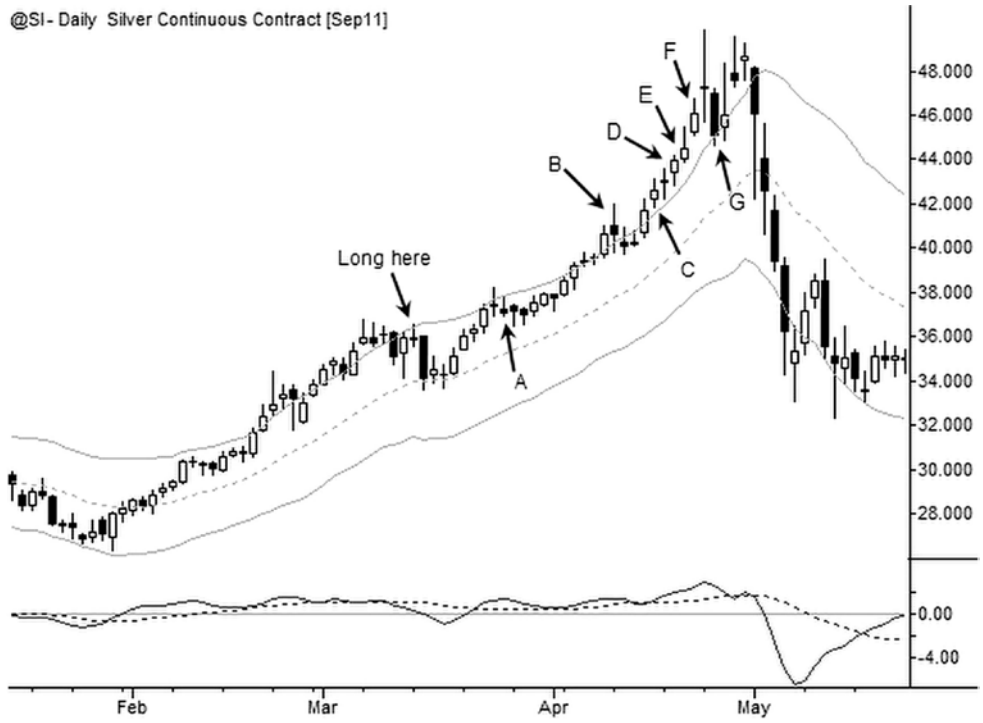


FIGURE 10.26 A Developing Climax in Silver Futures

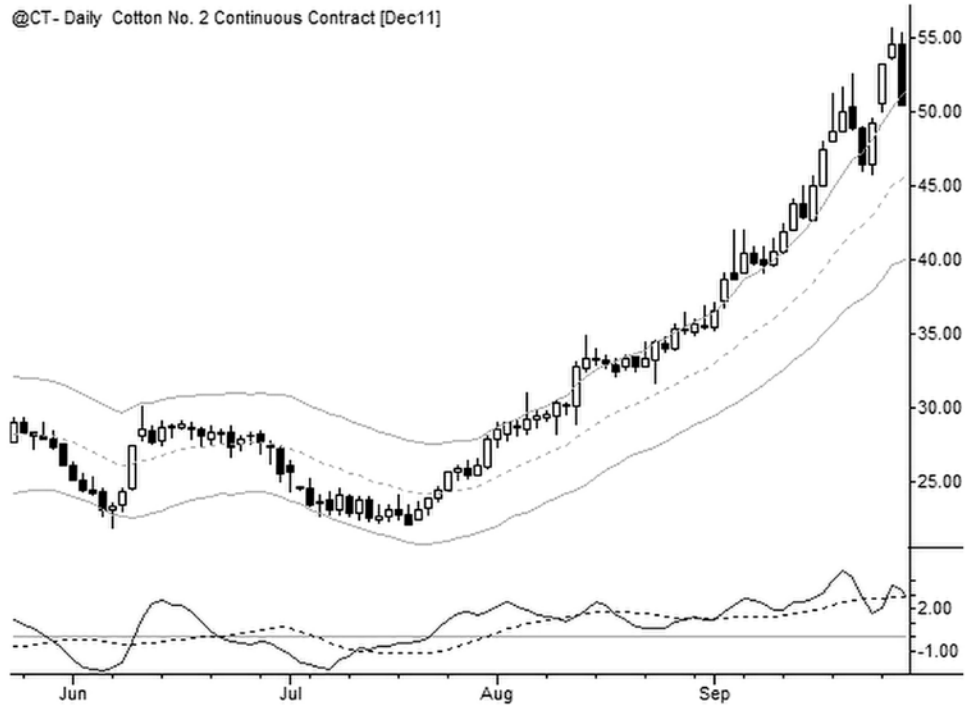


FIGURE 10.27 Does This Climax in Cotton Set Up a Short Trade?

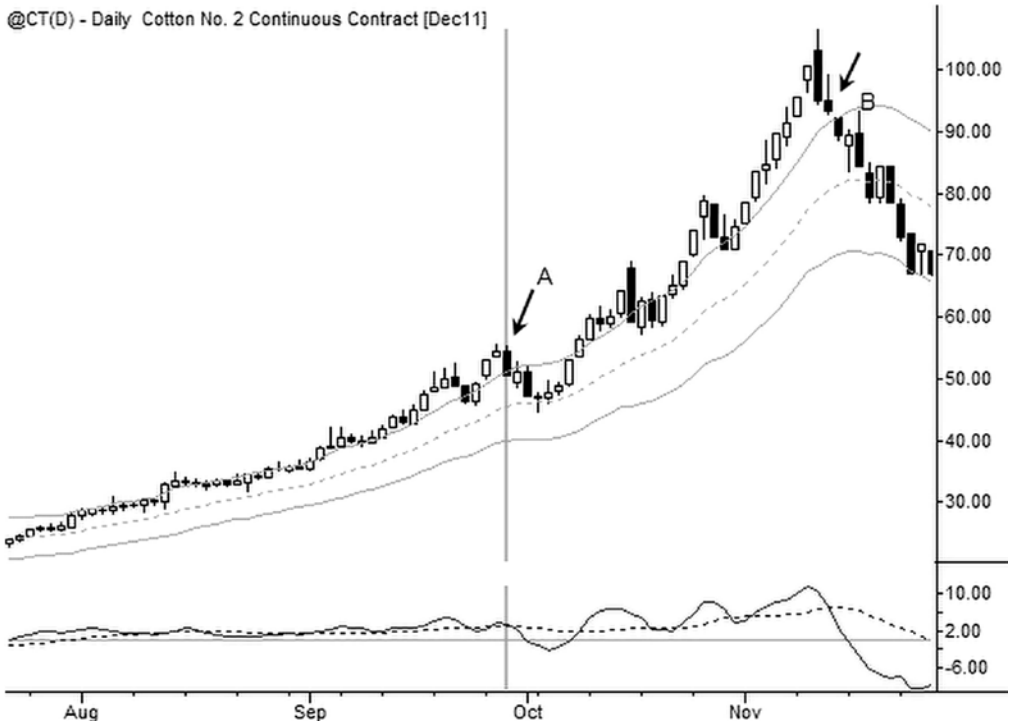


FIGURE 10.28 A Parabolic Climax Can Extend Much Further Than Anyone Would Expect

FIGURE 10.29 A Parabolic Expansion Sets Up a Sell Anti in First Majestic Silver Corporation (NYSE: AG)

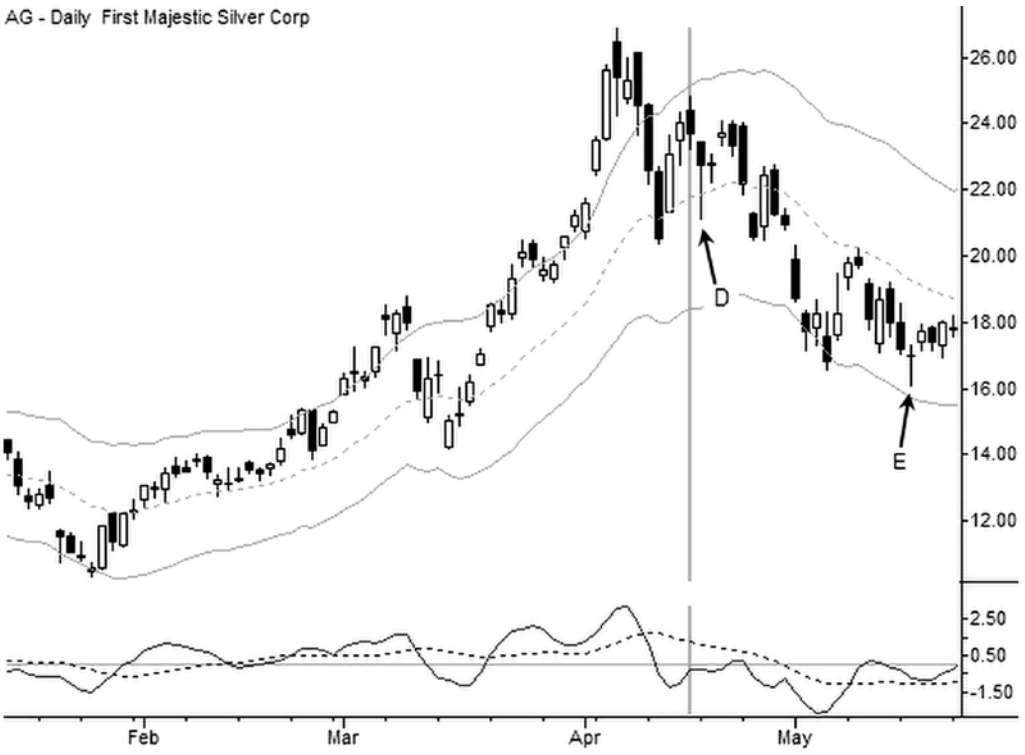


FIGURE 10.30 A Successful Sell Anti

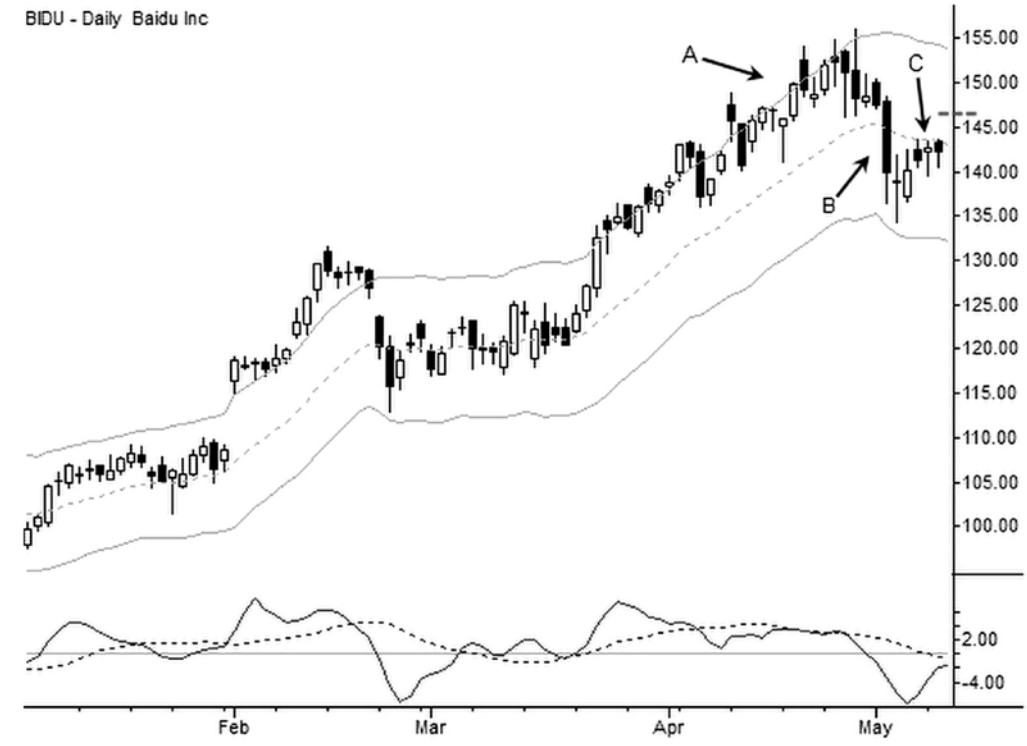


FIGURE 10.31 A Sell Anti in Baidu Inc. (Nasdaq: BIDU)

FIGURE 10.32 A Clean, Sharp Breakdown out of a Sell Anti

FIGURE 10.33 A Buy Anti Setup in the EURUSD

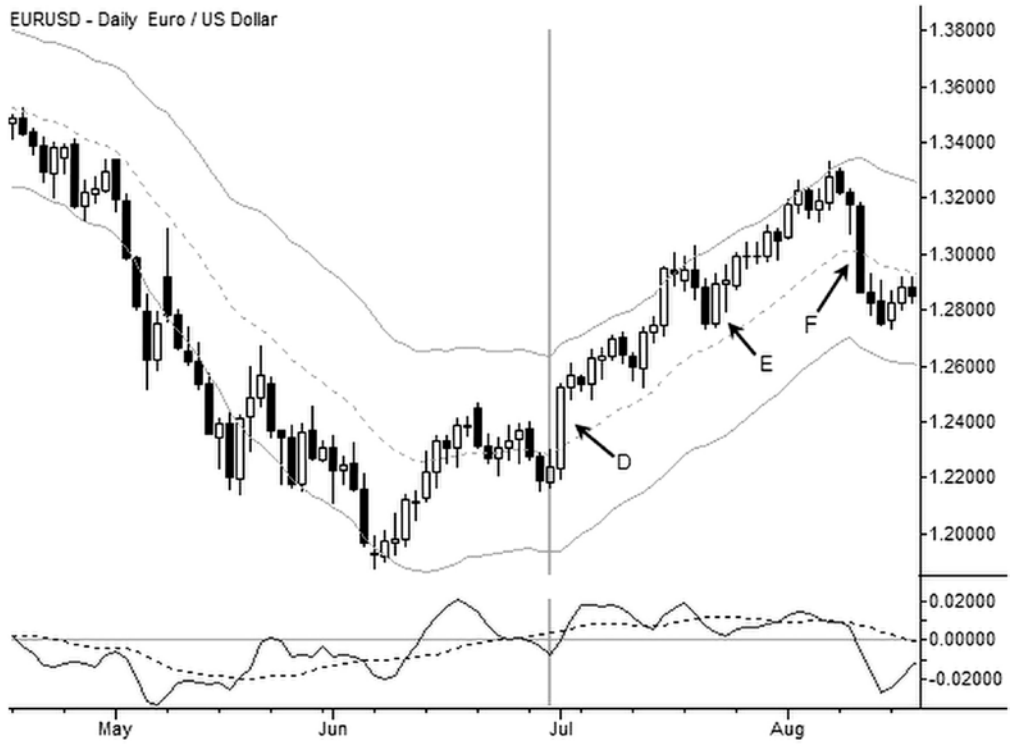


FIGURE 10.34 A Strong Uptrend Develops off the Buy Anti

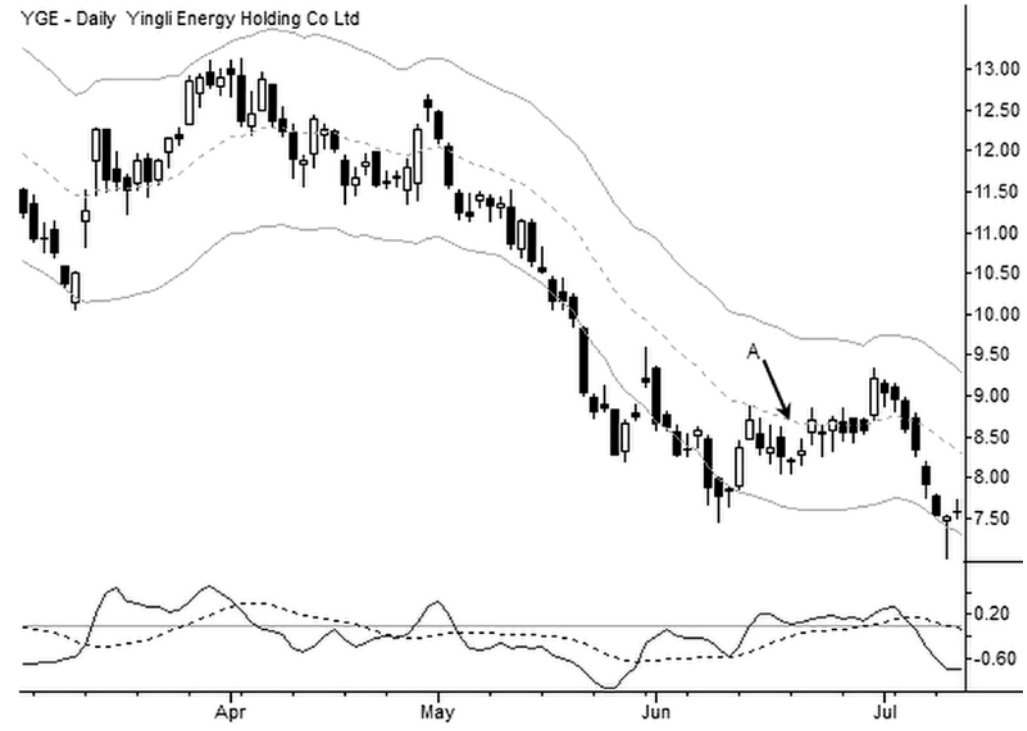


FIGURE 10.35 A Buy Anti Fails into Consolidation in YGE

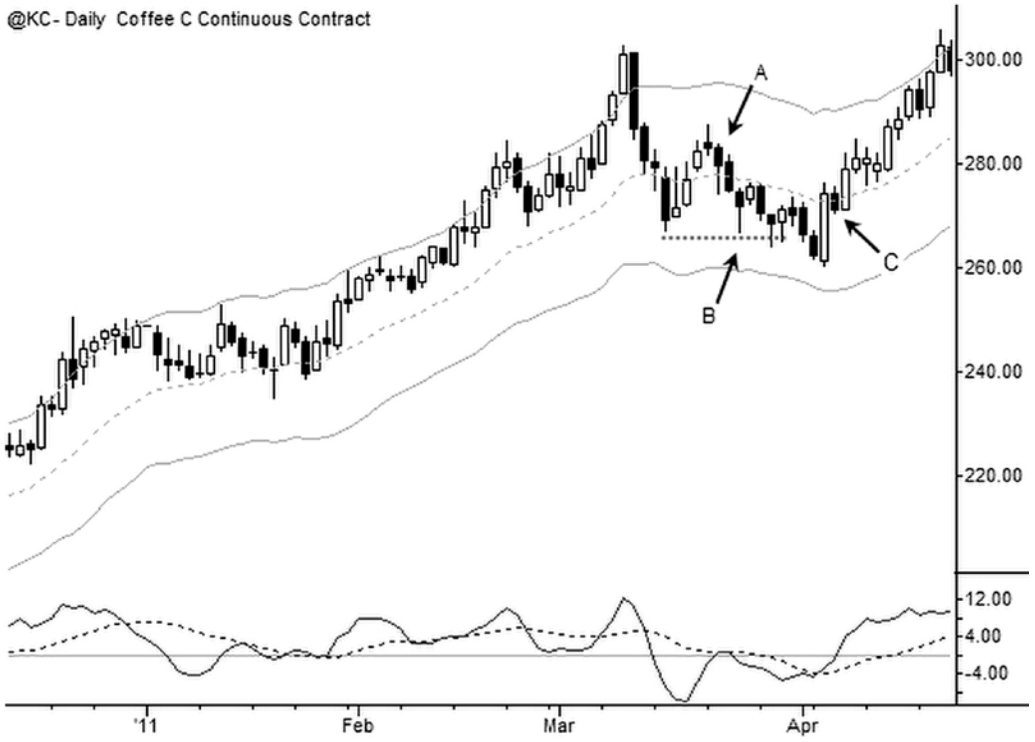


FIGURE 10.36 A Sell Anti Finds Support at Previous Swing

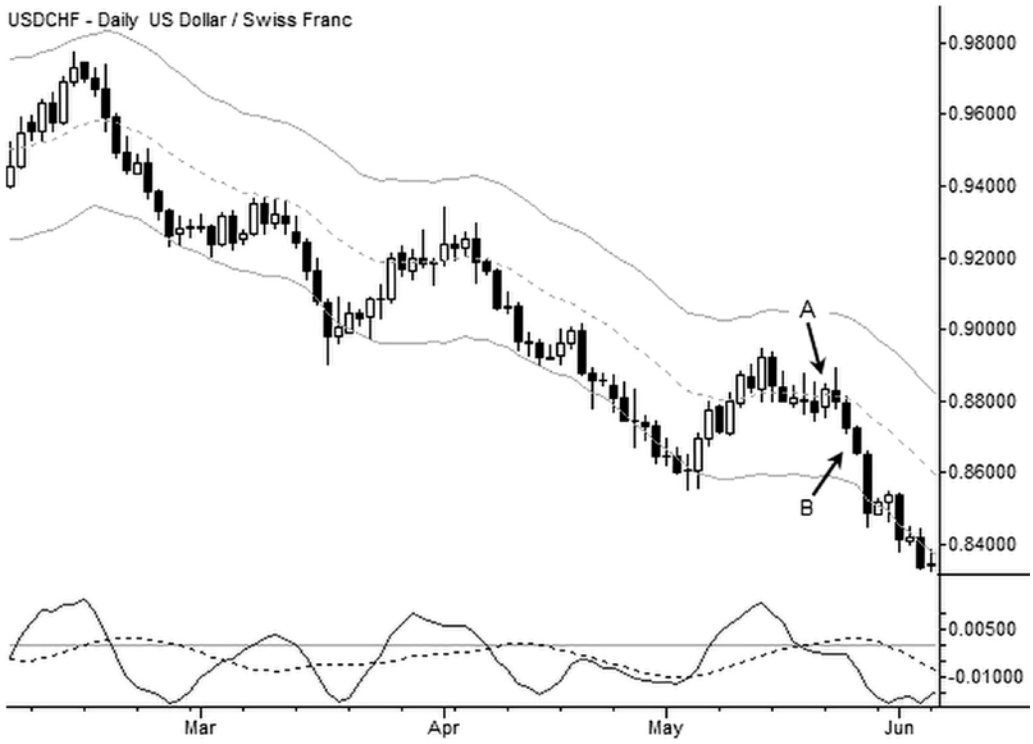


FIGURE 10.37 A Buy Anti Fails with Strong Momentum

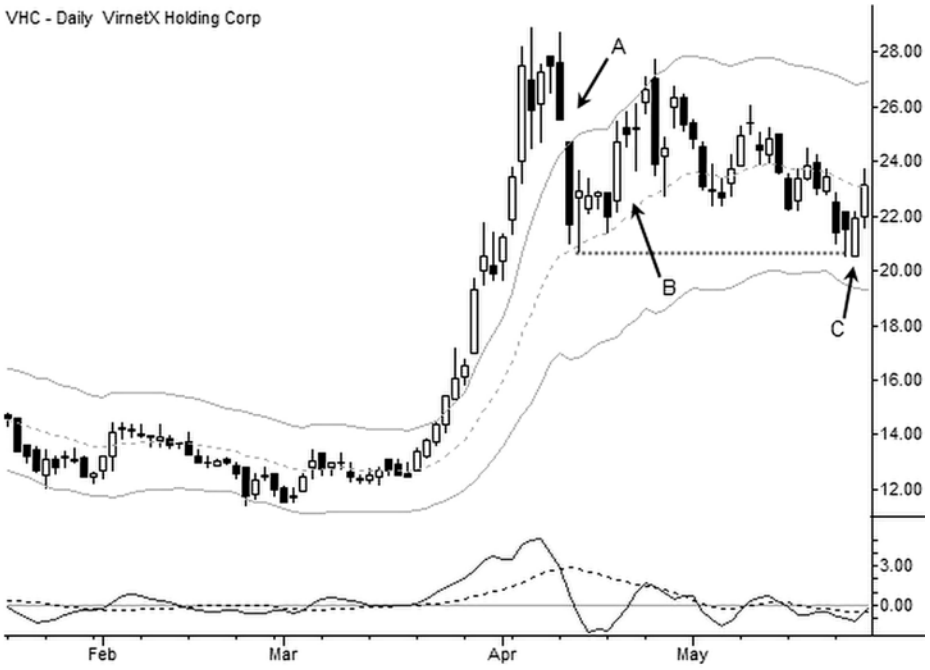


FIGURE 10.38 Buying a Spring at Support in VHC

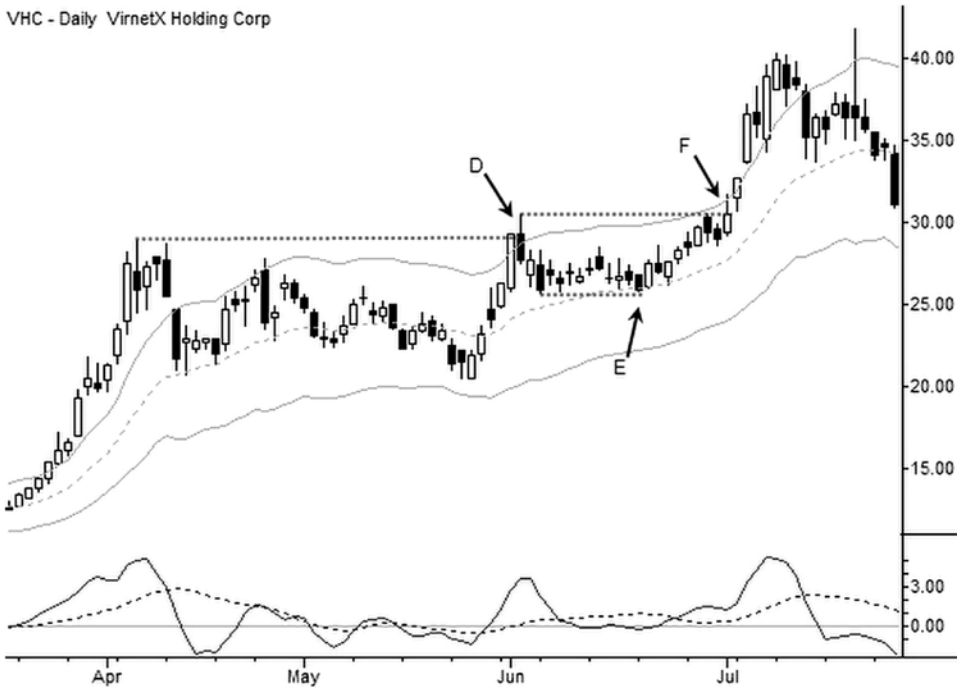


FIGURE 10.39 A Complicated Winning Breakout Trade

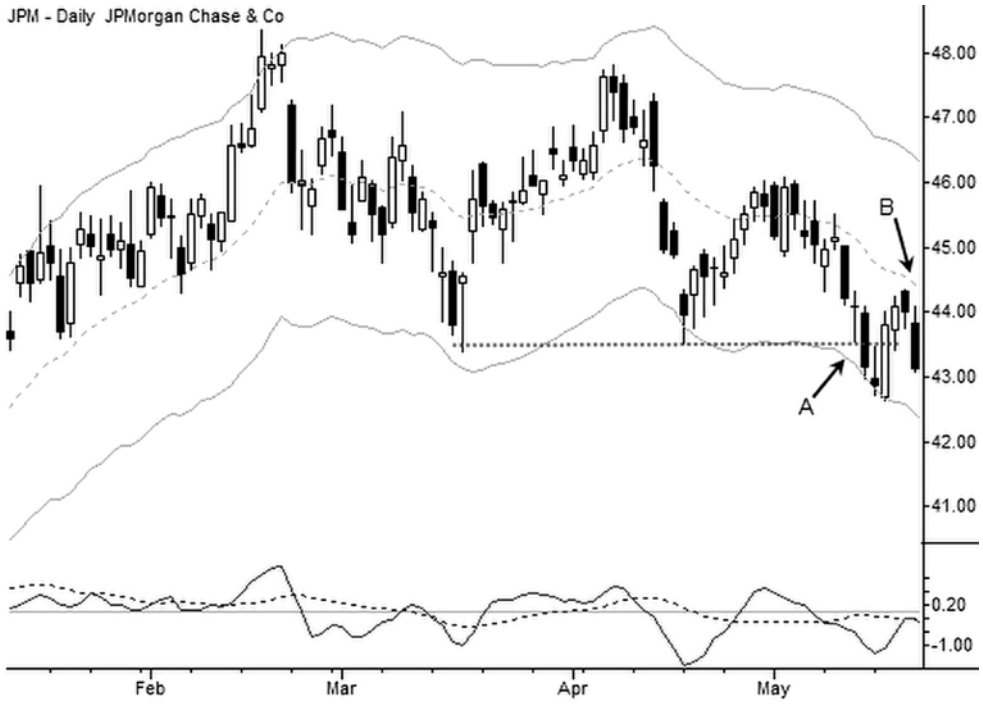


FIGURE 10.40 A Complicated Breakout Trade in JPMorgan Chase & Company (NYSE: JPM)

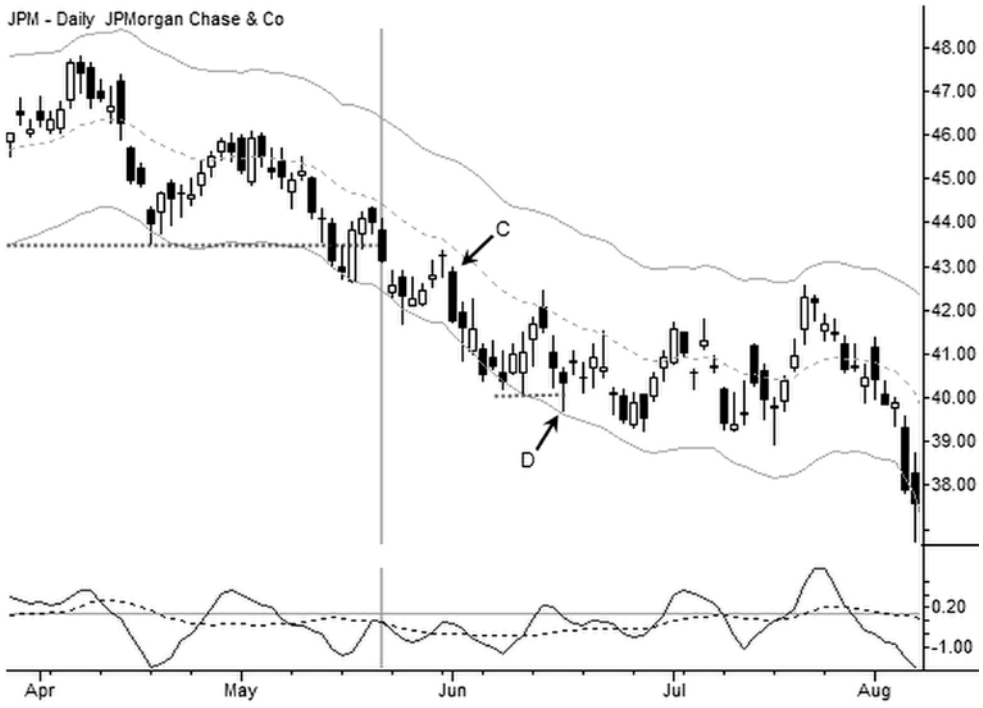


FIGURE 10.41 A Downtrend Follows a Downside Breakout

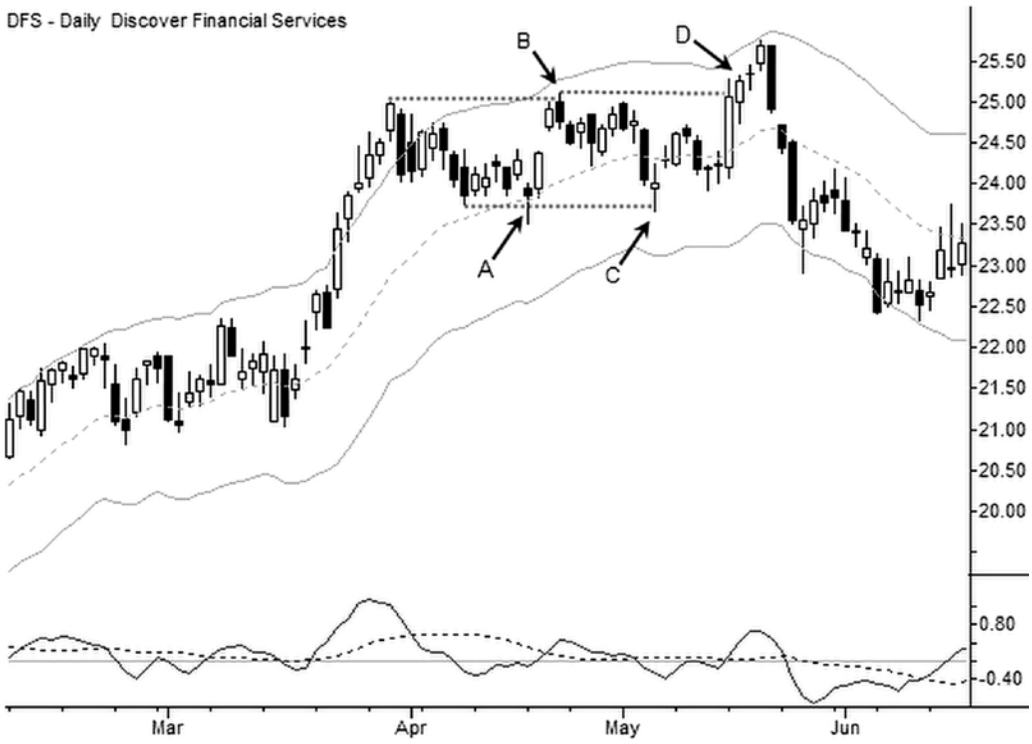


FIGURE 10.42 A Breakout Failure in Discover Financial Services (NYSE: DFS)

PART IV

The Individual, Self-Directed Trader

CHAPTER 11

The Trader's Mind

If you open yourself to insight, you are at one with insight and you can use it completely.

If you open yourself to loss, you are at one with loss and you can accept it completely.

—Daodejing (ca. 6 BCE)

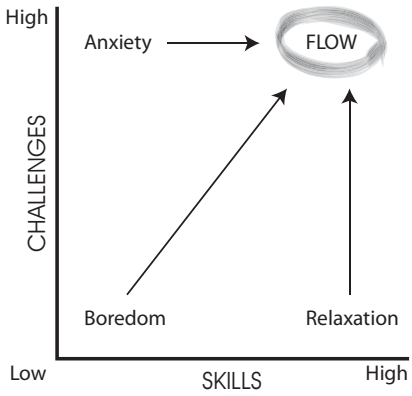


FIGURE 11.1 Csíkszentmihályi's Performer State as a Function of Challenges and Skills
Source: Adapted from Mihály Csíkszentmihályi, *Finding Flow* (New York: HarperCollins, 1997).

CHAPTER 12

Becoming a Trader

Intention, good or bad, is not enough.

—John Steinbeck

TABLE 12.1 Summary Statistics for Net P&L

System	*N*=	Sum	Mean	StDev	AvgWin	AvgLoss	Win%	*p*=
A	29	(2,531)	(87)	616	456	(528)	44.8%	0.226
B	17	5,109	301	515	557	(314)	70.6%	0.014
C	16	1,109	69	653	361	(1,194)	81.3%	0.339
D	6	(529)	(88)	479	468	(366)	33.3%	0.336
All	68	3,158	46	600	456	(538)	58.8%	0.263

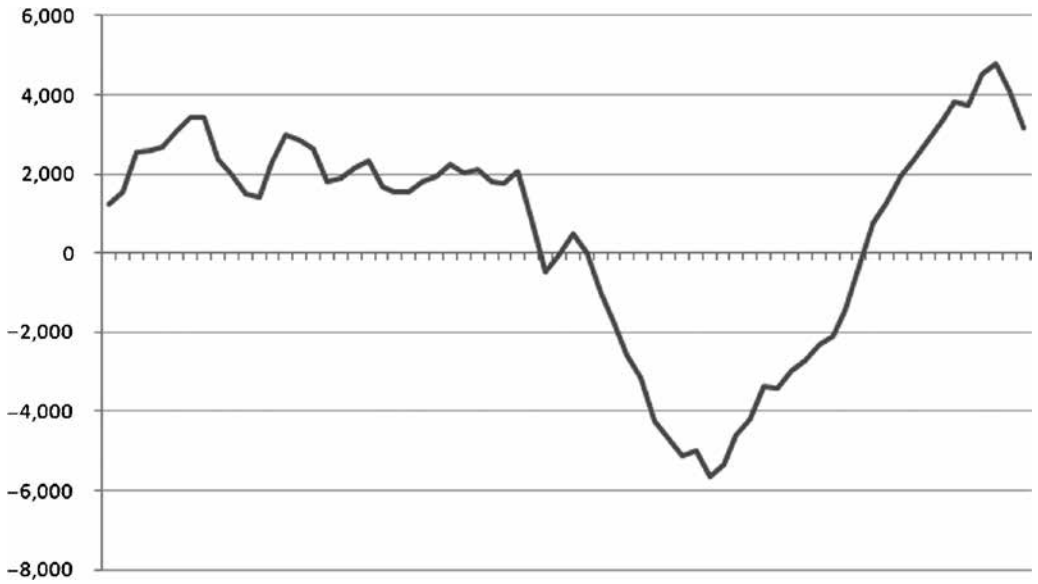


FIGURE 12.1 Cumulative P&L by Trade

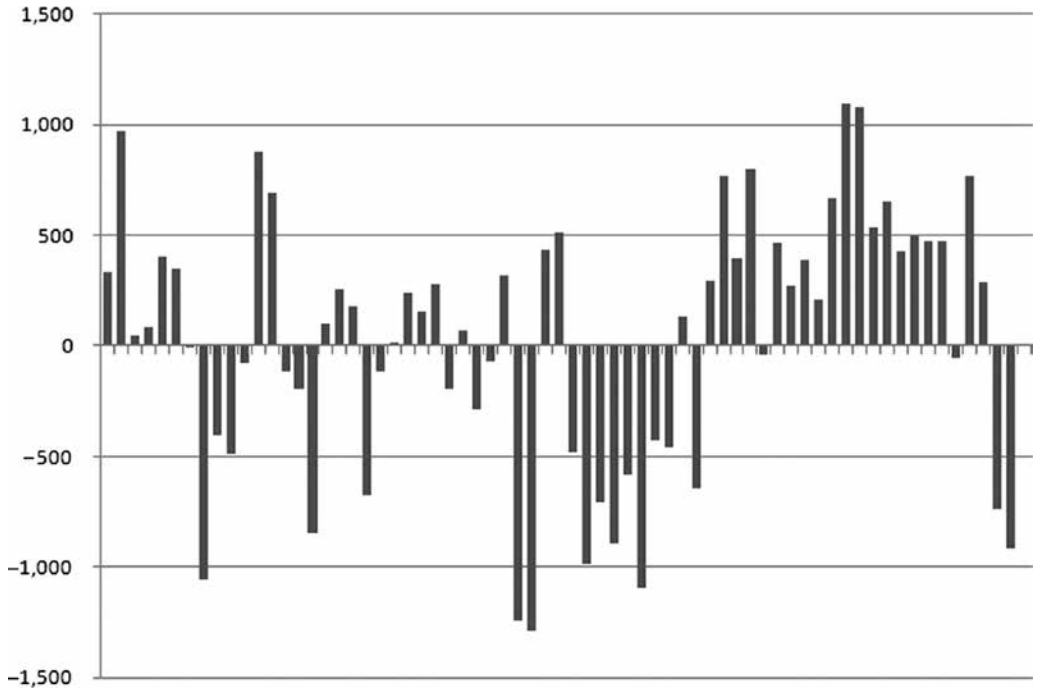


FIGURE 12.2 Trade-by-Trade Net P&L

TABLE 12.2 Summary Statistics for %R P&L

System	*N*=	Sum	Mean	StDev	AvgWin	AvgLoss	Win%	*p*=
A	29	2.9X	0.1X	0.8X	0.8X	−0.5X	44.8%	0.249
B	17	13.5X	0.8X	0.8X	1.2X	−0.3X	70.6%	0.001
C	16	6.7X	0.4X	0.7X	0.7X	−0.8X	81.3%	0.013
D	6	0.1X	0.0X	0.6X	0.6X	−0.3X	33.3%	0.463
All	68	23.2X	0.3X	0.8X	0.9X	−0.4X	58.8%	0.000

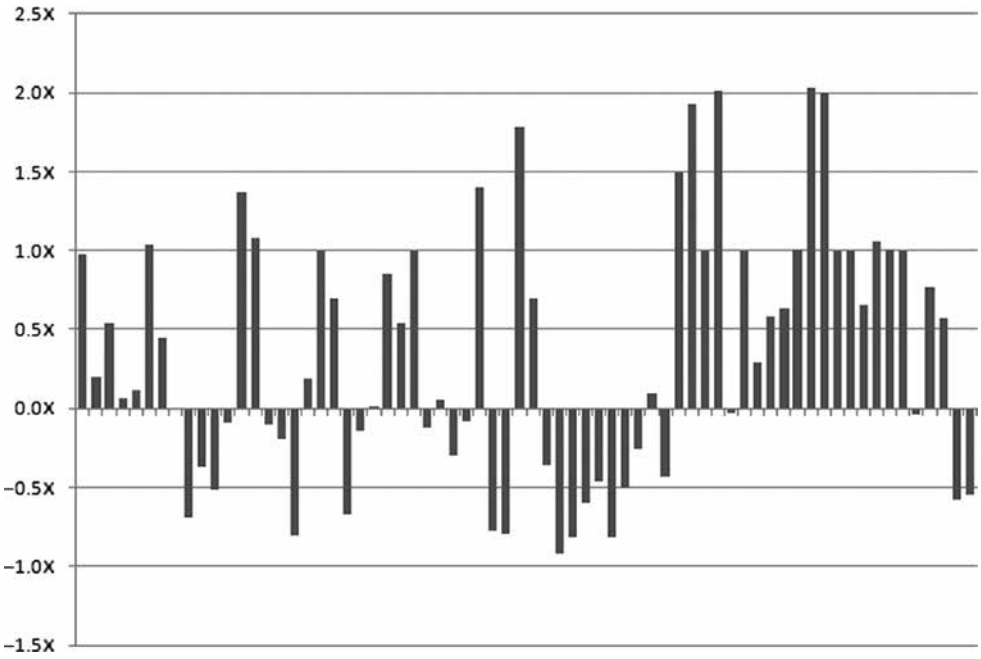


FIGURE 12.3 Trade-by-Trade %R P&L

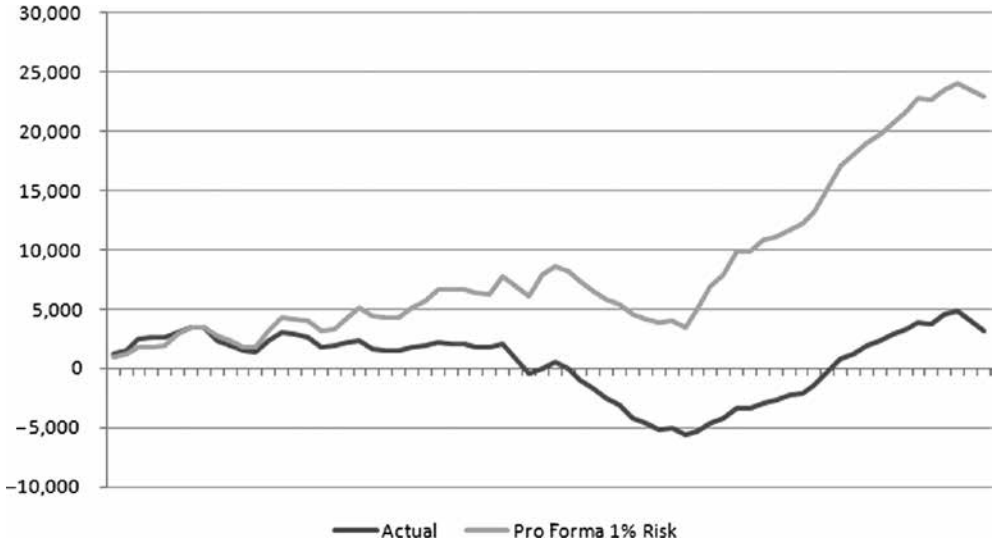


FIGURE 12.4 Cumulative Actual and Pro Forma P&L

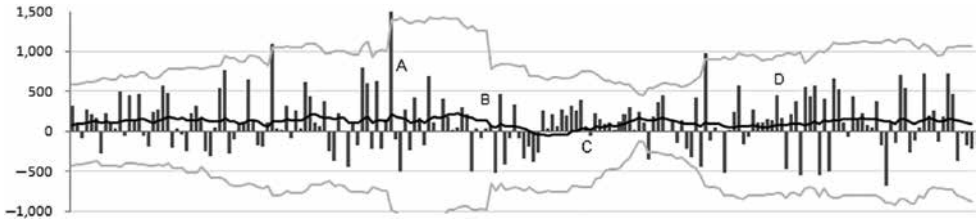


FIGURE 12.5 A Standard Deviation Control Chart

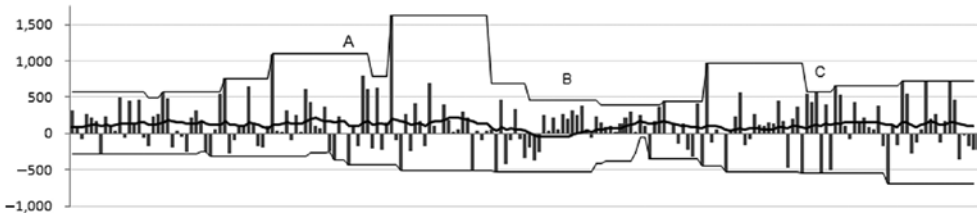


FIGURE 12.6 Range Control Chart

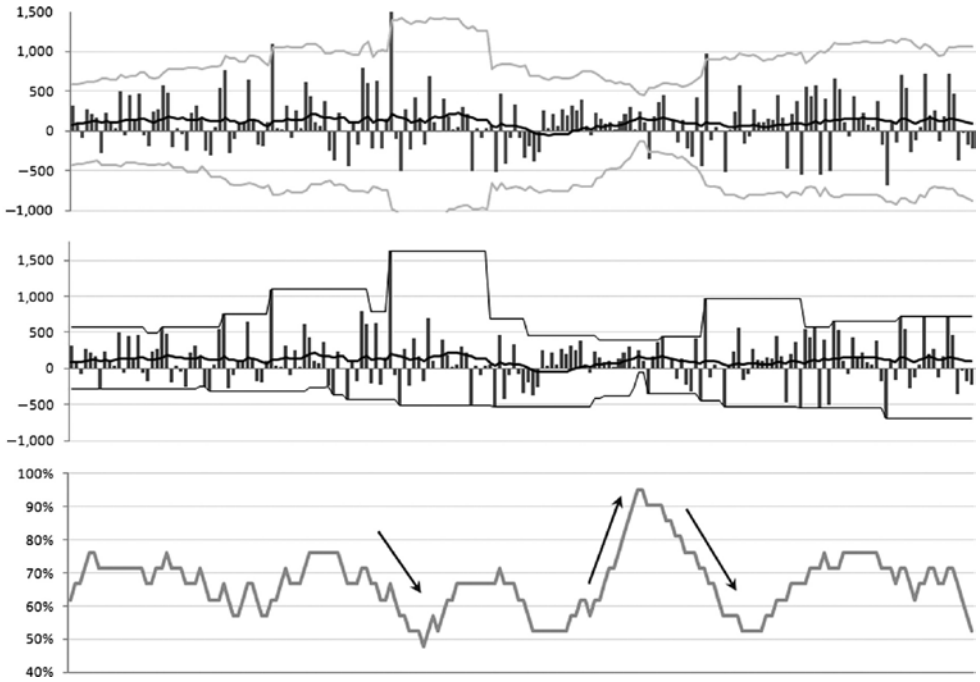


FIGURE 12.7 Three Control Charts

APPENDIX A

Trading Primer

At first glance, the process of making a trade seems to be simple. Someone wanting to buy an item meets with a potential seller, they agree on a price, and money is exchanged in return for the item. Even the most complex trading ideas begin with this concept. The mechanics may be much more complicated—perhaps the buyer and seller negotiate through a sophisticated electronic medium. Perhaps the item is actually a sophisticated financial instrument or set of instruments. Perhaps there are complications such as currency adjustments or financing costs to be considered, or perhaps the transaction is merely arranged to occur at a future point in time. Regardless, this basic meeting of buyer and seller—weighing of value against value— is the very essence and the root of all market activity.

Many books begin by saying that a trade occurs when a buyer and a seller agree on value, but this is not entirely correct. If this were so, if the parties truly agreed that the price represented the fair value of the asset, that one was equal to the other, wouldn't they each be willing to immediately unwind the trade and even to take the other side? This is almost never the case. In simple buying or selling transactions (excluding spreading and hedging, which we will get to in a minute) the buyer is willing to part with the money because he believes the asset will offer him more value in the future than the money he gave up. The seller has made a decision that the utility value of the money she will receive exceeds the value she would get from continuing to own the asset, so each participant has made an assessment of value that might be unique to his or her particular situation at that point in time. Rather than an agreement, each and every trade that occurs in the market represents a *disagreement* over the value of the money and the assets being exchanged.

THE SPREAD

We often hear language like "The stock of company XYZ is at $50," but even here we have an issue, for there is rarely only one price to consider; usually there are at least three. In active, liquid markets, there is a *bid* price at which buyers are willing to buy an asset, an *offer* (or *ask*, from *asking price*) at which sellers are offering to sell, and usually a *last print* (or simply, *last*) price where a trade was made. In a typical market, bids will be lined up below the market (more buyers are willing to buy at lower prices), and offers will be stacked at higher prices. The *inside market* refers to the highest bid price and the lowest offer, representing the best available price at any time, and the distance between those two prices is often referred to as the *spread*.

In the hypothetical case of XYZ that just traded at $50, we might find that the best available bid is $49.95 and the lowest offered price is $50.05. A trader would verbalize this situation as "49.95 bid, offered at 50.05," which is usually shortened in practice to "49.95 at 50.05." If the trader is reasonably sure the person he is speaking to knows the approximate price, he may drop the *handle* (the whole number) part of the price and just give the decimal pricing. As prices change rapidly, this can lead to a dialogue like "95 at 05 [meaning .95 and .05], at 7, at 9, 98 bid, now at 06." Though the last trade may have been at $50, there is a reasonable chance that we could not execute at that price in this situation with the market "95 at 05." In fact, it is even possible that the last print was 50.00, and now the market may have moved to 50.50 at 50.60. A buyer, in this case, has little hope of executing at any price under 50.50; the spread is often a better reflection of actual value than the last print.

Some traders glean a lot of information from the spread. For instance, the size of the spread is often a measure of the uncertainty in the market; when prices are changing rapidly, market participants often react by widening the spread. Buyers are not aggressive in paying high prices because they know the market could move against them in the next instant, so bids tend to drop lower. At the same time, sellers also react by lifting their offers to higher prices. There is other information in the spread: how rapidly it moves, exactly how it moves (do sellers lift offers higher or do buyers aggressively bid higher?), how much size is displayed, and many other subtleties.

If this seems like a lot of time spent on something very basic, you're right; it is, and it is also very important. The spread represents a very real cost of trading. Imagine that a buyer pays the offer, and then immediately realizes he has made a mistake and wants to get out of the trade. This can be done only by turning around and selling to the buyers on the bid, so the spread is a source of risk and a cost of trading in every transaction. It is also usually the best estimation of the actual market value of an asset. In the case of a very active stock that prints a trade every few seconds, the inside market is rarely very far from the last print, so the last trade is a very good approximation of value. (This kind of stock will usually tend to have a relatively tight spread as well.)

However, there are some instruments that may go days without trading (some stocks, options, distant months of futures contracts, for instance). In these cases, the last

price may be completely irrelevant because it happened so long ago that the market has moved. To further complicate matters, very inactive, illiquid instruments will often have extremely wide spreads. If stock XYZ last printed 50.00 three weeks ago, but is now bid at 30.00 and offered at 49.00, what is it actually worth? Researchers studying price patterns need to be careful because printed price records in illiquid markets can be very misleading. As an interesting aside, a major factor in the 2007–2008 financial crisis was the importance of many financial instruments representing very significant financial commitments that did not have liquid markets. Spreads were wide, or in some cases, nonexistent, so it was impossible to derive a market value for many of these assets. In the absence of a market price, traders resorted to building complex models with many moving parts (if that sounds a lot like guessing, you're not wrong), and many of these models gave very misleading values for these instruments. This complete breakdown in understanding the value and risk of these instruments was one of the major contributors to the crisis.

Liquidity is a misused and often imprecisely defined term, but it usually means the availability of willing buyers and sellers. Liquid instruments tend to have tighter spreads and *deeper books*, meaning that there are many buyers and sellers at price levels beyond the inside market. Going back to XYZ, which is now 49.95 at 50.05, we might find there are 1,000 shares on the bid at 49.95, and many thousands at 49.94, 49.93, and so on for many pennies below the market. Imagine a very large sell order comes into the market. These buyers would easily be able to absorb that order, meaning that XYZ would trade on the bid at 49.95, then maybe 49.94 and 49.93—all in all, very little price change. However, imagine a second scenario where there are again 1,000 shares on the bid at 49.95, but now a few hundred at 49.91, a few more at 49.87, and so on. If a large sell order hits this market, it will "clear the bids" and the price will drop much lower.

Market makers are a specific group of traders whose job is basically to provide liquidity. A market maker will usually have both a bid and an offer in the market, though they are free to adjust those levels as needed. For instance, if market makers are getting hit on the bid so that they are accumulating large long positions, they may choose to still bid for the stock, but to drop their bid to lower levels. If they keep their offer price on the inside market (meaning that they adjust their offer so that it is the lowest offer), eventually they will be able to sell some of their inventory, and in this way manage their exposure. Floor traders in open-outcry markets were the original market markers. Early electronic markets had designated market makers, but this role has now passed to many firms who run computer programs (algos) that function as market makers.

Market makers incur significant risks at times because they will always be on the wrong side of big moves driven by informed traders. If a group of traders comes into the market with many buy orders, the market maker will be forced to short to take the other side of that trade. In extreme cases (e.g., the crash of 1987), market makers could be forced out of business by adverse price moves. Market makers are typically offered various incentives to compensate them for these risks; otherwise, no one would take this job! (As of this writing, in 2011, liquidity rebates, which pay the firm a very small fee for executing via limit orders, are one of the primary forms of compensation for most traders functioning as market makers.)

TWO TYPES OF ORDERS

Traders wishing to buy this market have, broadly speaking, two options. A buyer who is not really in any hurry might focus on getting the best (lowest) price he can get, so he can *bid* for the stock. (In this case, bid is used as a verb meaning "to place an order lower than current prices.") Consider the case of XYZ with the market bid at 49.95 and offered at 50.05; a buyer could *join the bid* and put his order at 49.95. Of course, the buyer can also place orders lower, but they will be filled only if the market moves down to the level where he is bidding. If the buyer is feeling a little more urgency, he can *step in front of the bid* and put his order at 49.96 or 49.97. Note that in this case, the inside market would now be 49.97 (still offered at 50.05). This is a natural force that tends to compress spreads as buyers bid slightly higher and sellers offer lower in competition for fills, and is one of the main reasons why active, liquid markets tend to have tight spreads. However, if the buyer is really motivated and must have stock XYZ now, he may choose to *pay the offer* (other common language is *take the offer*, and the reverse is to *hit the bid*). Though much simplified, these are the two options available to traders and they correspond to the two most commonly used order types.

Limit orders are orders where buyers try to buy at a cheaper price than the offer and sellers offer to sell at prices above the bid. A trader wanting to buy XYZ with a limit order might say, "Bid for it" or "Join the bid," as in "We're in no hurry here—just bid for it." A seller might say, "Okay, fine, offer it out. Put it up on the offer." *Market orders* are orders that will execute immediately. Buyers will pay the offer and sellers will end up hitting the bid. These orders usually reflect some degree of urgency—the order must be done immediately and a better price (trade location) is sacrificed for speed of execution. Though the buyer bidding with a limit order will get a better price if filled, the trade-off is that the order may never be filled if the market moves higher.

Now we have arrived at something subtle and very important. Imagine XYZ is again 49.95 at 50.05, and then it trades at 50.05. What just happened? A buyer wanted to buy the stock so much that he was willing to *pay the spread* or take the offer; we can say that this is a buyer-motivated trade. By analyzing the number of orders that hit the bid (seller-motivated trades) compared to those that take the offer (buyer-motivated trades), whether through computer-aided analysis or careful observation, traders can get a deeper sense of the conviction levels and urgency behind price moves. For instance, a stock may move from 50 to 51 in a series of back-and-forth motions with orders printing on both the bid and the offer. At another time, the same price change could occur in a straight line as buyers keep paying the offer and keep that buying pressure on the offer for the entire move. Simple observation would note that both moves began at 50 and ended at 51, and perhaps even occurred in the same amount of time and with the same amount of volume being done, but each of these moves suggests something different about the underlying conviction in the market.

A trader who buys something in anticipation of it going higher is said to be *long* that instrument. For most people, this is a natural and intuitive concept: buying something relatively cheaply, planning to sell it later for a higher price, and pocketing the difference (minus any costs of financing or insurance incurred in the interim). One of the divisions

between professional and amateur traders is that professionals are often just as willing to *go short* (or just to *short*) a market, but the public often has a bias against shorting. There are several reasons for this; most equity traders have a natural inclination toward owning stocks, and think that shorting is a very complex transaction, or that it is somehow immoral to bet on a company's value going down. (In some markets it is theoretically complex, as the instrument must first be borrowed, then sold, later bought back, and finally returned to the lender.) This prejudice is unfounded and is one of the key differences between the public and most professionals. Shorting is nothing more than the opposite of being long. Whereas the buyer seeks to make a profit as prices rise, the short seller anticipates falling prices and hopes to *cover the short* (buy it back) at lower prices. Short selling is an important part of the trader's tool set.

Spread Trading

It is also worth considering that a certain amount of the buying and selling pressure in the market represents more complex interests than simple buying and shorting. Imagine a farmer who knows he will have a grain crop coming in September. This farmer might sell his grain in the futures market before the harvest comes in (technically, a short sale), but this does not in any way mean that he expects that prices will be going down. This is a simple example of a *hedging* transaction, and more complicated examples exist in all markets.

Spread trading is another type of transaction involving buying one asset and selling another, looking to profit from the change in value between the two. Imagine that a trader feels that Assets A and B should trade in a more or less predictable relationship, perhaps with Asset A at a premium due to production costs and so forth. This trader could track the spread, or the difference between Assets A and B. If she feels that the premium is too small, she can go long the spread by buying Asset A and shorting Asset B. This is not a bullish or bearish bet on either of the assets, but a bet that the spread between the two will widen. She will make money if A goes up and B goes down, if they both go up but A goes up more, or even if they both decline as long as B declines more. The key is that the percentage change of A must be greater than the percentage change of B (assuming an equal-weighted position) from the time the trade is entered. Conversely, if the trader felt the spread was too wide, she could short the spread by doing the reverse of this transaction.

This just scratches the surface of these complex, multileg transactions, which exist in and between all markets in virtually unlimited combinations. The message here is that much of the buying and selling we observe in markets may be part of spread trades like this. In this case, we might see the trader buying Asset A and assume she was bullish on it, when in fact, she does not care if it goes up or down—all she cares about is the spread relationship. Spreads can be created between different asset classes, regional markets, or international markets, and these trades can even be initiated with different timings on each leg. Do not assume that buying is always bullish and selling is always bearish; there may be much more going on behind the scenes.

The most basic language of the market is price changes, perhaps with associated volume. In the case of XYZ, we might see 500 shares done at 50.00, 300 @ 50.03, 500 @ 50.04, and so on. (A more complete record would include a time stamp and whether the order was executed on the bid, on the offer, or in between.) This record is sometimes referred to as the "prints on the tape" in memory of the old-style ticker tape machines, which really did print prices on paper tape. A very active instrument can "print" hundreds or thousands of trades in a single minute, so a trader would quickly become lost without some reference of historical activity. A chart of these price changes is the natural solution, and many discretionary traders find that charts present market information in a way that is both intuitive and useful.

Tick Charts

The most primitive type of chart would simply be the information in the prints plotted on a graph with price on the y-axis and trade number on the x-axis. The chart in Figure A.1

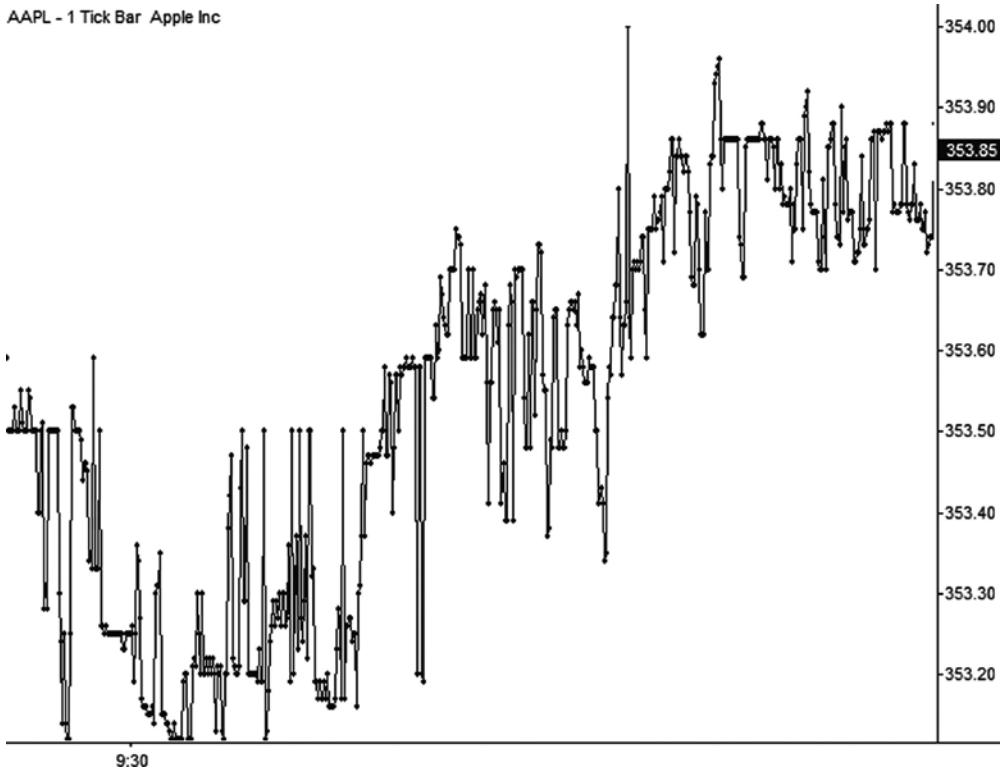


FIGURE A.1 A Single-Tick Chart of AAPL

is a *single-tick* chart of the market's opening for Apple, Inc. (Nasdaq: AAPL) on 7/12/2011 (trade numbers not shown). The single-tick chart is interesting from an intellectual perspective because it is the most fundamental language of the market—every single trade, every transaction that hits the *consolidated tape*, is displayed on the chart. From a practical perspective, a single-tick chart is not very useful, for the simple reason that it is difficult to fit much trading history on a single chart. This AAPL chart shows only the first 30 seconds of the trading day. In an extremely active stock, it is even possible that less than a single second's trading could fit in the same space; it is not possible for the human eye and brain to process this information in a meaningful manner.

The obvious solution is to aggregate many ticks into a single space on the chart. When this is done, we refer to the chart by how many ticks (trades) are put together into a single space on the x-axis. In Figure A.2, each bar represents 25 individual trades, and, now, approximately five and a half minutes of activity fit on the same chart space. It is important to remember that the x-axis is not scaled to time. This is one of the main advantages of aggregate tick charts: as the market becomes more or less active the x-axis expands or contracts to accommodate the activity. In many cases, this can

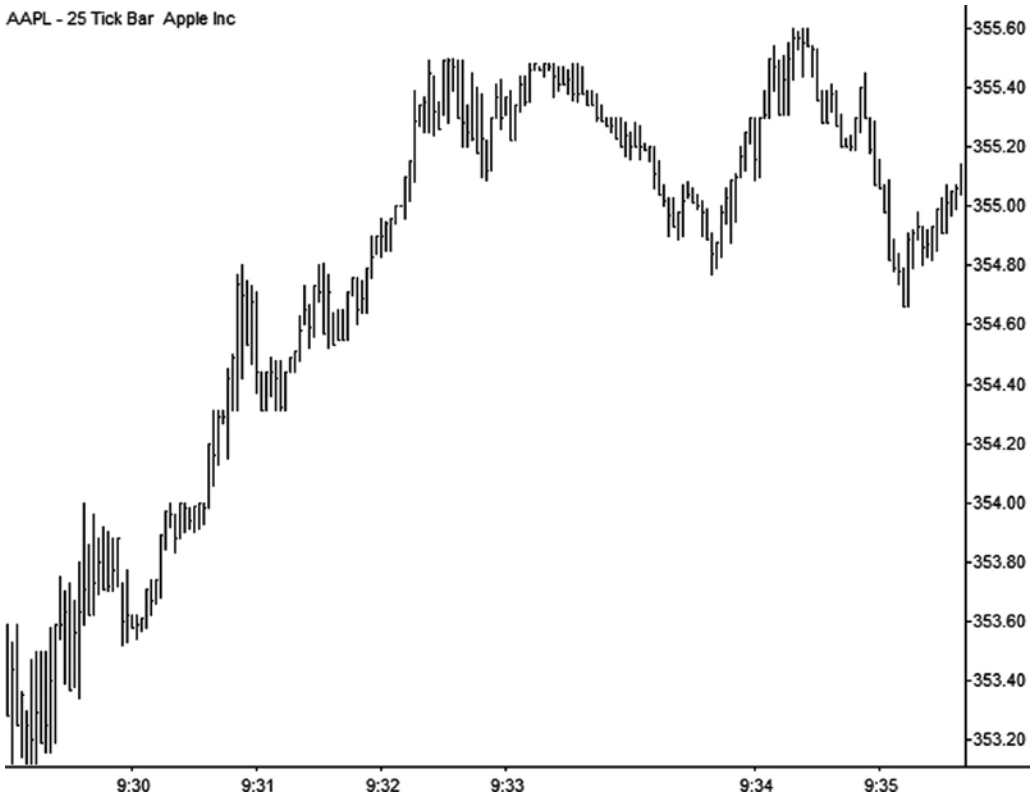


FIGURE A.2 A 25-Tick Chart of AAPL

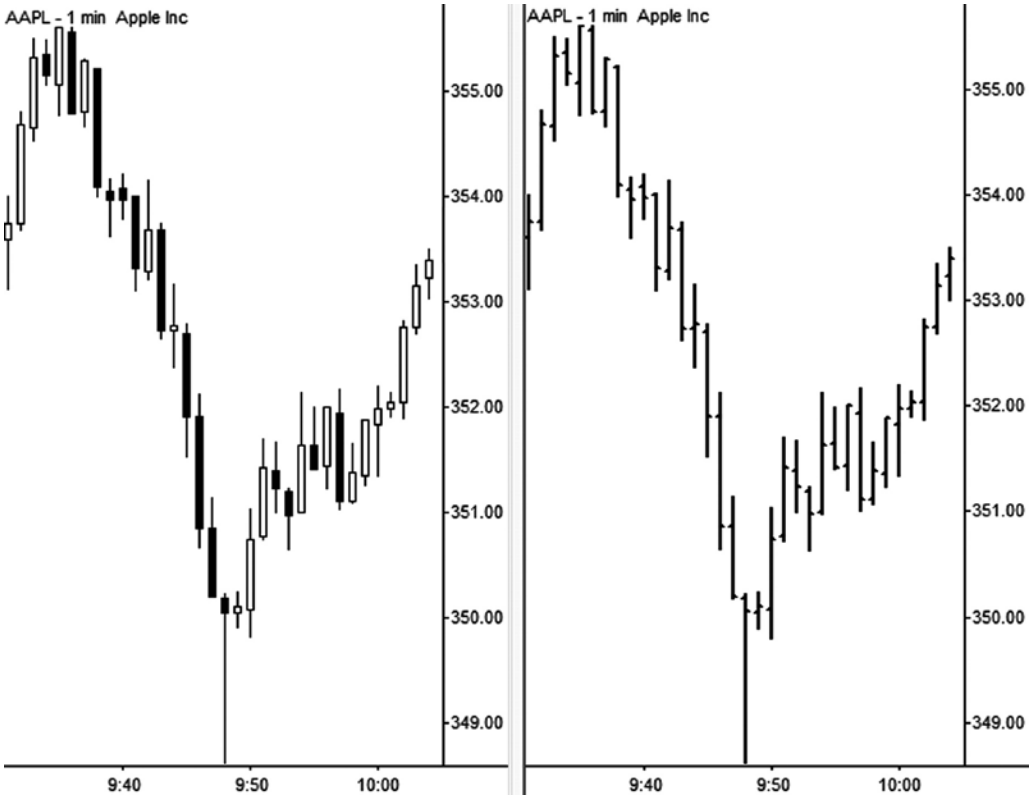


FIGURE A.3 Comparison of Bar and Candlestick Charts

create some advantages over simple time-scaled charts by making readable patterns out of very illiquid or extremely volatile markets.

Bars and Candles

Once we start aggregating trades on the x-axis, a graphical device is needed to explain the activity in that space. One logical solution is simply to plot a vertical bar, with the top and bottom of the bar representing the high and low extremes reached during the period (right panel in Figure A.3). Traders often find it useful to mark the first trade of the period with a tick on the left side of the bar (the *open*) and the last trade of the period with a tick on the right side (the *close*). These four data points, plotted like this, create the classical bar chart. An alternate format is the *candlestick chart*, which prints a wide body between the open and close of the bars, with thinner *shadows* (also called "tails" or "wicks") above and below the body, reaching to the high and low of the period (left panel in Figure A.3). Candlestick charts were first used in medieval Japan for rice trading, so much of the terminology associated with patterns of candles is also Japanese. Traditionally, the body of the candle is filled in if the close is lower than the open and left empty if the close is

higher than the open. Modern charting software packages usually fill the body of every candle but change the color to something intuitive like red for downward-closing candles and green or blue for upward-closing candles.

Time Charts and Other Options

Though the strength of tick charts is their ability to adapt to activity levels in the markets, traders and analysts often prefer a format where each bar corresponds to a predictable unit of time. These time charts are by far the most commonly used in most applications, and are especially useful for traders looking at daily and longer time frames. The chart is referred to by the length of each time unit (as in a 5-minute chart), which may also be called the *time frame* of the chart. Many traders choose to look at different time frames (for instance, 5-minute, hourly, and daily charts) for the same market to get a better sense of the forces affecting prices at any time.

There are other possibilities for scaling the x-axis, but these tend to be less used except in certain specific contexts. It is possible to aggregate bars not by ticks (transactions) but by trading volume. In this case, a bar would contain a certain number of

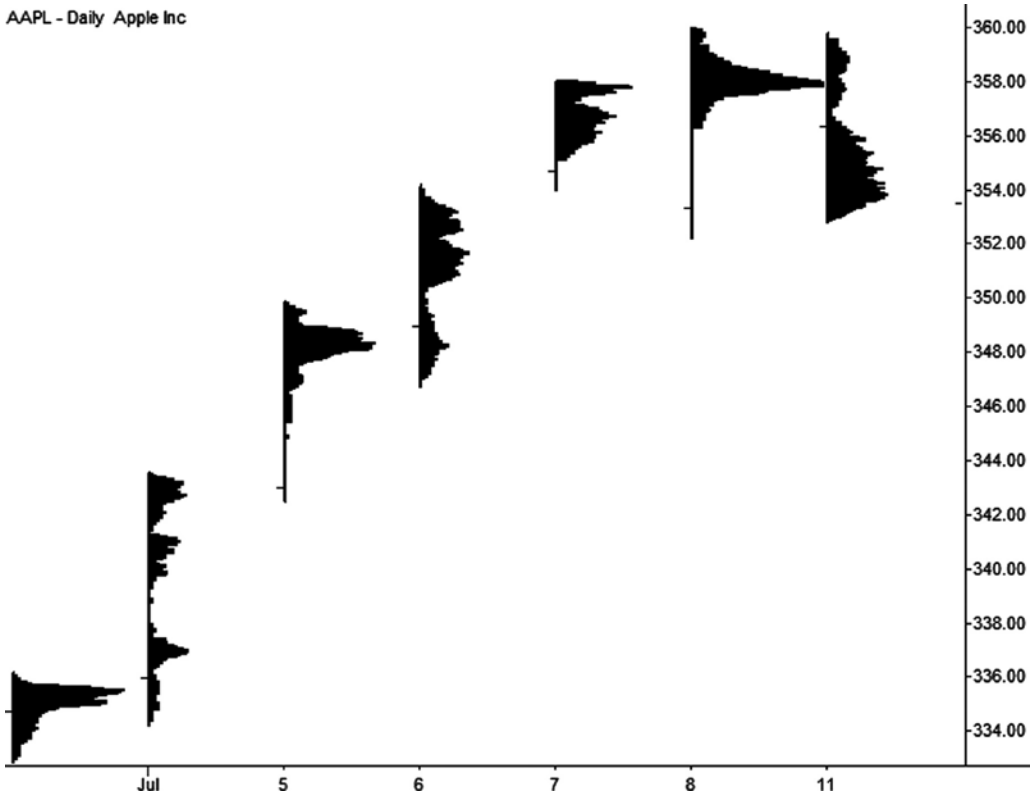


FIGURE A.4 Market Profile Chart of AAPL

shares or contracts, after which the next bar would begin. Another possibility is to have each bar end after a certain range is reached, so that, for instance, each bar would be 0.25 wide. (Be aware that the range bars created at the end of a trading day will be different from the ones created as the market unfolds. This makes backtesting and analysis on range bars virtually impossible.)

Other types of charts include swing charts, point and figure charts, kagi charts, line charts, and many others, but these are much less common and are outside the scope of this primer, with one exception. One other chart worth mentioning is Market Profile, created by Peter Steidlmayer in the 1980s. Market Profile charts essentially allow the trader to look inside the bar to see where most volume and trading activity occurred in the time period. Market Profile displays this information in a graphical format attached to the right of each bar, with wider horizontal bars indicating more trading activity at that price level. (See Figure A.4.) While most charting methods only reprocess the same open, high, low, and close (OHLC), volume, and open interest information, Market Profile is an important innovation—it adds detail and perspective that is not visible on a standard chart.

APPENDIX B

A Deeper Look at Moving Averages and the MACD

The charts and the discussion that follow may look a little strange, but the thought process is important. Too many times, traders use indicators or tools on their charts that they do not understand. Rules are developed based on the action of a squiggly line without fully understanding what that line measures and represents. Though some traders will find some success with an approach like this, it misses much of the potential in these tools. To fully understand a technical tool, it is useful to peer deeply into its construction, and to understand how it reacts to changes in the underlying market. One of the best ways to do this is to "feed" an indicator an artificially created dataset that focuses on specific types of market action. Think of this as a way to look at the indicator in a laboratory environment, isolating and controlling for various influences.

MOVING AVERAGES

If you want to really understand the tools you are using and how they will react to extreme situations, it helps to understand how they will react in the most simple, basic contexts as well. Of course, everyone grasps the basics of moving averages: add higher prices and the average will go up. When price flattens out, the average eventually will flatten, too. When price turns down, it will cut through the moving average, and, at some point, it will start pulling the average down with it. This is all simple, but it is not the point. The point is to build an intuitive and intimate understanding of the behavior of the average as it responds to changing market data. One of the best ways I have found to foster this intuition with any technical tool is to generate simple price patterns in artificial price series, and then to plot the indicator on this synthetic price data. (Nearly all charting packages allow users to import ASCII data, but if this is not possible, the indicator may be calculated directly in an Excel spreadsheet and graphed there.) Think of this as a

controlled laboratory experiment: you are controlling the data that is fed to the indicator so you can begin to understand the details of the indicator's reactions to that data. This process, along with careful thought and reflection, will build an understanding that goes beyond a simple understanding of the patterns on the screen.

The charts that follow are examples of this process. There is value in these specific examples, but it is even more important that you can take the procedure and adapt it to your own use. These examples show both 20-period *simple moving averages (SMAs)* and *exponential moving averages (EMAs)* to compare their behavior and fluctuations. The formulas required to build these indicators are already available from many books or the Internet, so they will not be a focus in this chapter, but you must have a clear conceptual understanding of the behavioral differences between the two. The simple moving average simply averages the price over a look-back window. It is completely blind to any data outside of that window, which creates the first potential issue: a simple moving average moves *twice* in reaction to any single large event. The value of the moving average has a change both when the event occurs and when it passes out of the left side of the evaluation window.

The EMA is a considerably more complex animal. Recent data are weighted more heavily in an EMA, and, technically, no data points are *ever* dropped from the average. Rather than being dropped, past data is rolled off with an exponential decay. In actual practice, the effect of distant past data far out of the evaluation period of the average is so small that it is insignificant, but it is still there. It is important to realize, though, that this effect smoothes the left-hand side of the evaluation window—an EMA will not jump twice as a simple moving average will. This is one of the main advantages of the EMA over the SMA.

Comparing EMA and SMA Behavior

Consider first how the moving averages react to a sudden shock in the market. Figure B.1 shows an artificial data series that is flat, then suddenly breaks into a precise linear trend, which just as abruptly comes to an end as prices flatten out again. Both the SMA (dotted line) and the EMA (solid line) are 20-period averages, but the front-weighting effect of the EMA causes it to react more quickly to the initial price shock. After a period of time, both averages settle into a steady relationship to the price trend, but the simple moving average is much quicker to return to the center after the trend stops. This effect is due to the decay in the EMA, which sees *all* data to the left of the average; the SMA is just a simple average of the past 20 data points. Once the market has been flat for 20 bars, the simple moving average exactly equals the close. There are two important lessons here. Most traders know the first, but few know the second. For an SMA and an EMA of the same length:

- The EMA will react faster to a large price change because it front-weights the data.
- However, the EMA is also slower to react to stabilizing prices because it has a very long look-back window.

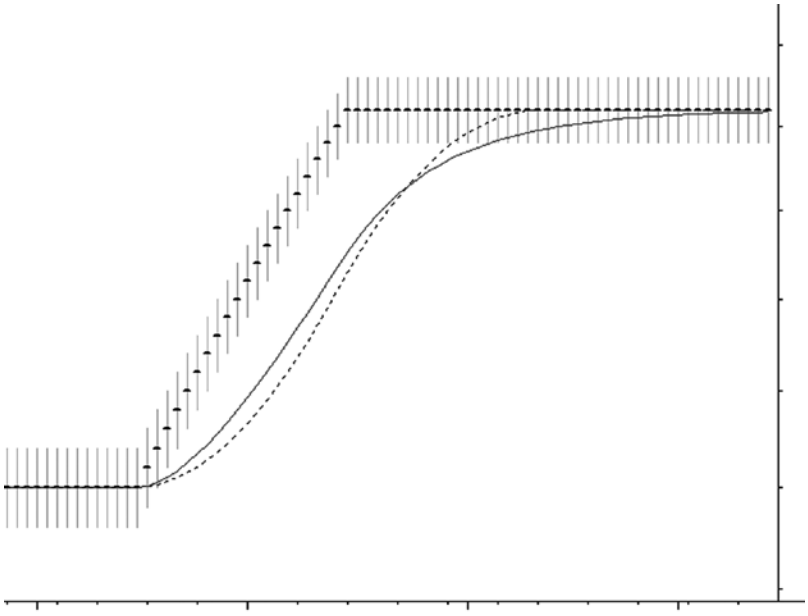


FIGURE B.1 Twenty-Period Simple (Dotted Line) and Exponential Moving Averages in a Market That Cleanly Shifts from Trading Range to Trend and Back

Many traders are convinced that moving averages provide support and resistance. Chapter 16 investigates this claim in some depth, and shows that there is no proof that any moving average is any better than any random number. One reason that so many traders remain convinced of this support/resistance effect is because it looks so convincing on charts. It is easy to find example after example of places where price touched a moving average and then shot away, but this is a result of two effects: One, we tend to attach more significance to lines on charts and to perceive patterns in random relationships. Two, there is a mathematical reason for this, as moving averages will approach prices as they pause in trends due to simple math. Figure B.2 illustrates this effect in an idealized market moving in stair-step trend legs.

If the rate of a trend is constant (arithmetically, not geometrically), a moving average will eventually settle into a consistent visual relationship with that market, tracking it at the same rate below, for an uptrend, or above in the case of a downtrend. If the rate of the trend increases, or if there is a shock in the opposite direction, the EMA will react before the SMA, but, as before, the SMA will react more quickly to stabilizing prices. It is also not well known, but the EMA will approach price more closely than a SMA in a stable trend, again due to the front-weighting in the EMA calculation. Essentially, the EMA catches turns a bit faster, but is much slower to come into the new, stable value when the trend ends and transitions into a new trading range. This is expected behavior, as the EMA should respond quickly to recent data while maintaining a memory of the long data history. Figure B.3 shows a trend with two inflection points and a clear ending

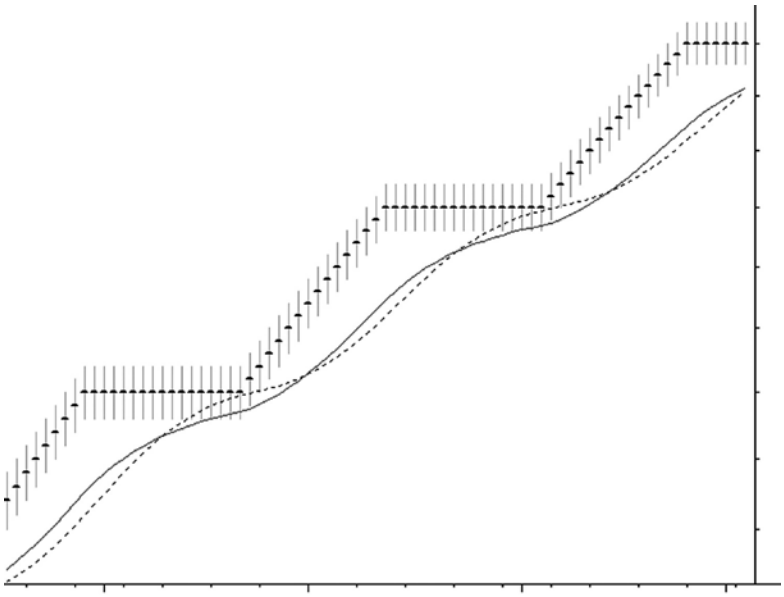


FIGURE B.2 Are the Moving Averages Supporting Prices?

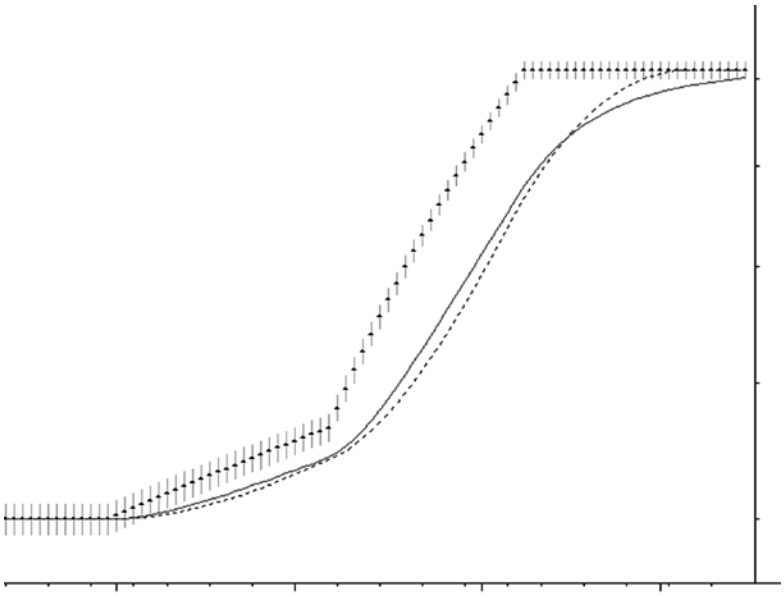


FIGURE B.3 Notice the Different Behavior of the EMA and the SMA at Inflection Points and at the End of the Trend

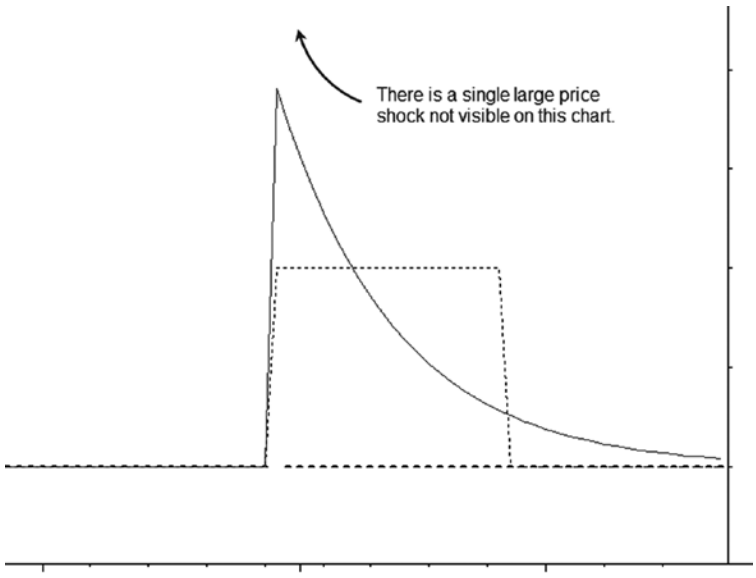


FIGURE B.4 Notice the Different Behavior of the EMA and SMA in Response to a Single Large Price Shock

point. Spend some time thinking about how the SMA and EMA react differently at these inflections; if you are using the slope of a moving average, or a moving average crossover, to define trends, you need to be aware of these issues. One average is not better than the other, but you need to be mindful of the differences.

Figure B.4, which has a single price bar that is not visible far above the top of the chart, is useful for building intuition about how the averages react to a sudden shock. Note that the SMA shows *two* inflection points when there was actually only *one* event on the chart. The second inflection (the drop) in the SMA was merely an artifact created as the price spike moved out of the average's evaluation window. In this particular case, the EMA probably more accurately reflects what is going on in the market. Traders using an SMA in an intuitive fashion are not likely to be misled, because they are focusing on the bigger picture, but systematic approaches or tools (such as trend indicators) derived from an SMA may have some issues with outliers. Particularly in intraday data, where the overnight gap is significant, or longer-term equities, which have frequent price shocks due to earnings announcements, systematic tools based on simple moving averages are subject to distortion.

Few traders realize that simple moving averages are low-pass filters, meaning that they will filter out (eliminate) higher-frequency oscillations and cycles. Figure B.5 shows a situation that will probably not be encountered in actual trading: a market that is moving in an idealized 20-period sine wave, with 20-period SMA and EMA applied. Though it may be very counterintuitive, the SMA is completely flat. When the SMA length matches the sine wavelength, there are always as many values above as below the moving average,

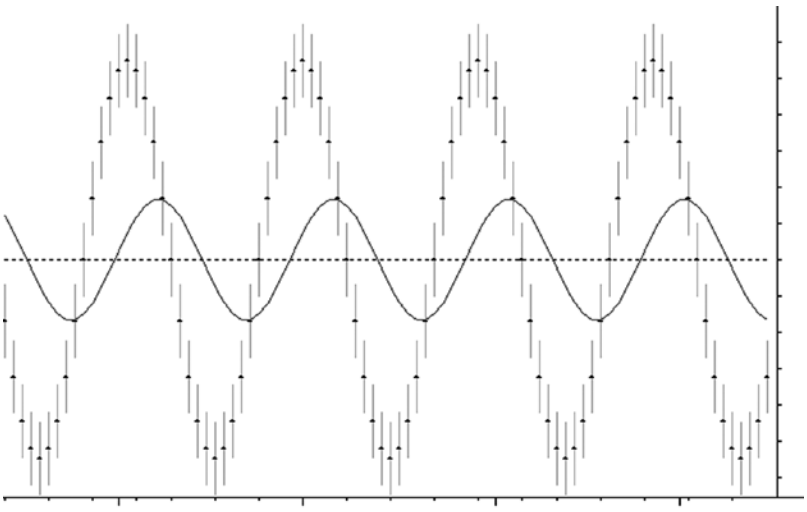


FIGURE B.5 Twenty-Period EMA and SMA Applied to a Theoretical 20-Period Sine Wave
Notice that the SMA (dotted line) is completely flat on the zero line.

so the average nets to zero—an SMA will always hide any cycles that are whole-number multiples of the SMA length. You might think that this is pure theory and that it would not have any application to a real trading situation, but extraordinary situations do occur. I once had a trader I was working with point out that his moving average on a 1-minute chart was not "working right" on part of the chart because it was not reacting to the market's movements. For about 45 minutes, this stock had settled into a very dependable cycle that just happened to match the length of the moving average he was using, so, while the market was oscillating fairly wildly, his average wouldn't budge. There are cycles in the market. It is difficult to trade them because they are ephemeral and they shift frequently, but they will sometimes line up with your moving averages with seemingly bizarre results. Trade long enough and you will see pretty much everything.

Let's end this section with an example that is important for longer-term investors to keep in mind. The natural language of the market is percentage changes and growth rates, which is why finance math is based on discounting cash flows and compound interest, and why the first task of any research project is converting prices into returns. Shorter-term traders tend to think in differences (e.g., "I made a point and a half in that stock."); longer-term investors think more often in percentages. Figure B.6 shows a market that is growing at a constant rate; each data point is a 5 percent increase over the previous one. On a linearly scaled chart, a market appreciating at a constant growth rate will describe a *curve*, not a straight line. On a linear chart, moving averages will seem to lag behind the price curve at an ever-increasing distance.

What is actually happening, however, is that the moving averages lag a *constant percentage* behind prices. The linear chart does not misrepresent anything, but it is not the right tool to look at percentage-based relationships. Figure B.7 is exactly the same as

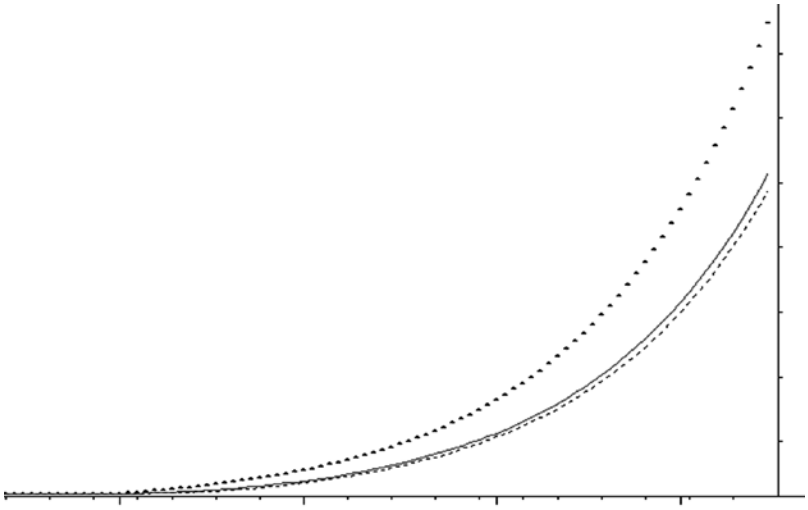


FIGURE B.6 Moving Averages Applied to a Market Growing at 5 Percent Constant Rate, Linear Scale

the previous chart; the only difference is that the y-axis is log scale rather than linear. Remember, log scale charts are designed so that equal distance intervals on the y-axis are equal percentage changes, not equal price changes as on a linear chart. Note the ticks on the right side of the y-axis, which are evenly spaced prices on the linear chart, become compressed near the top of the axis when log scaled. Be clear on this effect: straight lines on log charts are curves on linear charts. If you are drawing trend lines on

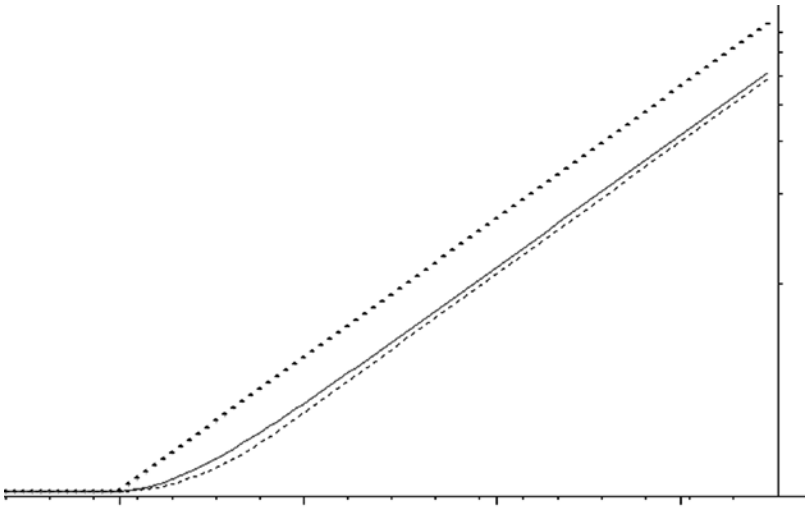


FIGURE B.7 Moving Averages Applied to a Market Growing at a Constant 5 Percent Rate, Log Scale

Note that curves on previous chart are straight lines here.

log scale charts, you are actually drawing curves on normal, linearly scaled charts. This may be perfectly correct in the context of a longer-term chart where the curve faithfully represents the growth rate, but it is something that must be fully understood.

THE MACD

Moving average convergence/divergence (MACD) was one of the early technical tools developed by Gerald Appel in the mid-1970s. As an interesting aside, this is one of the few commonly used indicators whose name actually says something accurate about the tool. Consider some other indicators: stochastics have nothing at all to do with stochastic processes; the Relative Strength Index (RSI) neither measures relative strength nor is it an index; the Commodity Channel Index (CCI) is not commodity-specific, nor does it deal with channels, nor is it an index. This is not an exhaustive list, but you get the idea. The standard MACD consists of four elements: a fast line (the MACD proper), a slow line (the signal line), a zero line for reference, and a histogram (bar chart) that shows the difference between the slow and fast lines. The standard MACD is constructed from exponential moving averages, but this modified version uses simple moving averages and dispenses with the MACD histogram altogether, resulting in a cleaner indicator.

Basic Construction of the MACD

The fast line of the MACD measures the distance between a shorter-term and a longer-term moving average. To understand exactly what this measure says about price action, think about how different periods of moving averages will respond to price movement. A moving average with a short look-back window (period) will track price movements more closely than an average with a longer period. Figure B.8 shows 3-period and 10-period simple moving averages applied to a daily chart of two-year Treasury notes. The line plotted below the price bars is the fast line of the MACD, which is simply the value of the slow moving average subtracted from the value of the fast average. When the fast average is above the slow average, this line is positive and vice versa. Notice the important behavior at the points marked A and B on this chart. Though price was higher at B, the distance between the moving averages was actually smaller, so the indicator registers a lower level at B. The distance between these two averages is one way to measure the momentum behind a market's movements, and this lower peak in the indicator suggests that the second price high was made on lower momentum.

Another important point is that the fast line of the MACD will register zero when the two averages cross; this highlights a condition of relative equilibrium on the time frame being measured. Figure B.9 marks spots where the fast line crosses the zero line, and shows that this happens when the moving averages intersect.

Figure B.10 shows the slow line (sometimes called the signal line) of the MACD, which is simply a 16-period moving average of the fast line. It is important to note that,

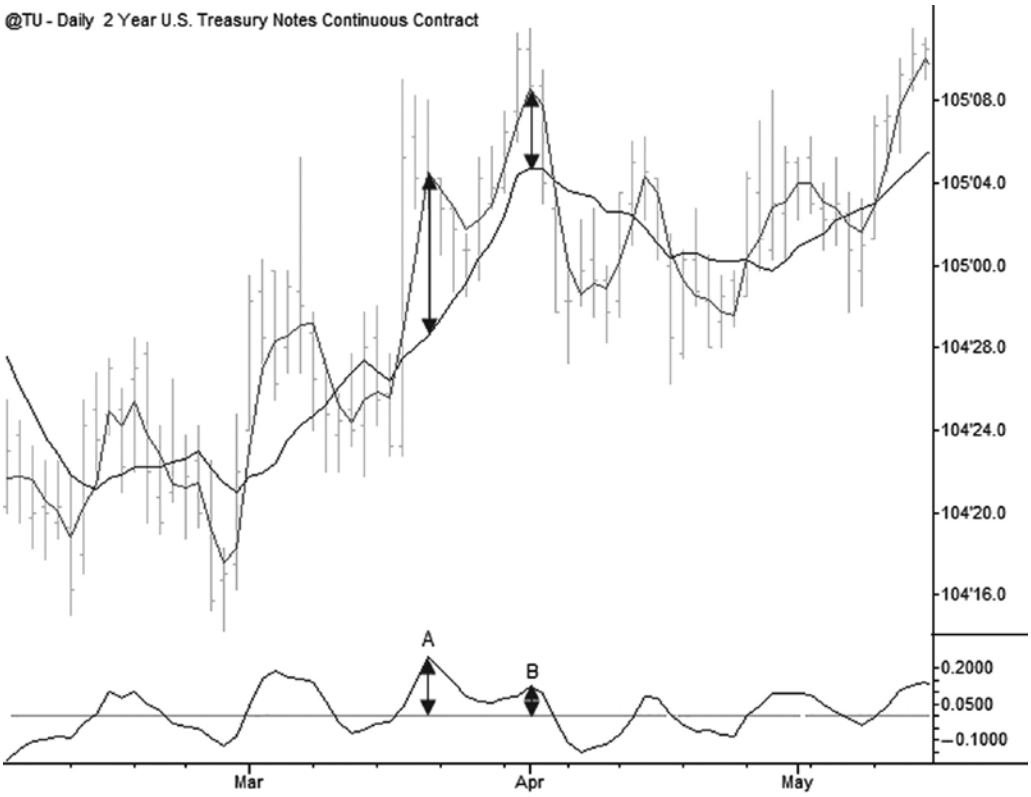


FIGURE B.8 The Fast Line of the MACD Measures the Distance Between Two Moving Averages

being a smoothed version of the fast line, it lags the fast line considerably, but also generally reflects the trend of the fast line—if the fast line is far above zero, the slow line will usually be sloping upward and vice versa. There are several ways to use the slow line, but the general concept tying them all together is that it reflects the trend on an intermediate-term time frame.

This is the construction of the particular variation of the MACD that I use. For each bar, calculate:

- Fast line: 3-period SMA minus 10-period SMA.
- Signal line: 16-period SMA of the fast line.
- Histogram: none.
- Plot a zero line for reference.

Using the same (3, 10, 16) settings in a standard MACD will give similar results, but, in my experience, the long memory of the exponential moving averages (EMAs) does make a difference at times. You will certainly be able to apply the same concepts to the standard MACD, but make sure you understand the differences between the two

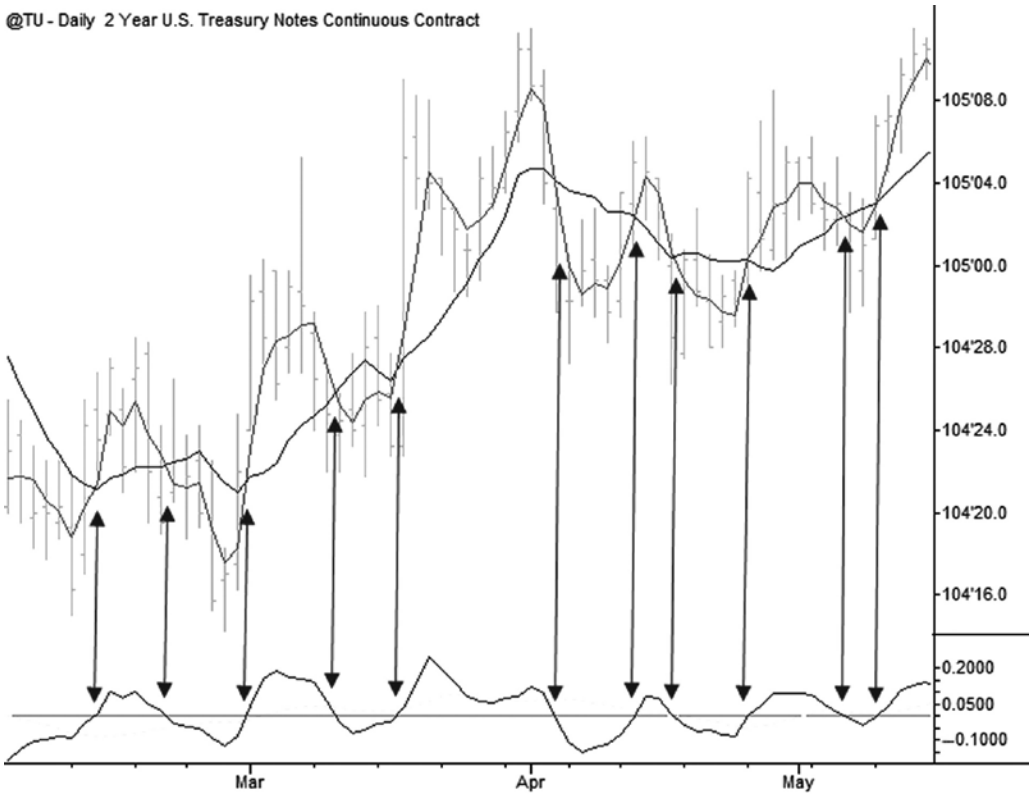


FIGURE B.9 The Fast Line of the MACD Crosses Zero When the Moving Averages Touch

indicators. Figure B.11 compares the modified with the standard MACD (3, 10, 16). Notice that the standard tool adds another plot, usually plotted as bars behind the indicator. This plot, the MACD histogram, shows the difference between the fast and slow lines of the MACD histogram, so it is actually the MACD of the MACD. Some traders find this to be a useful component, but it is possible to extract much of the same information from a careful reading of the fast and slow lines themselves.

A Deeper Look

The fast line is very sensitive to changes in the rate of change of prices. Read that again, carefully: the fast line swings up in response to the second derivative, or the rate of change of the rate of change of price. When we actually work with this tool, we usually think of it a little more loosely, as simply measuring the momentum of prices, but it is a good idea to be as precise as possible here at the beginning—this tool measures *changes* in momentum, not momentum itself. To begin to build some intuition about this tool, Figure B.12 shows a modified MACD applied to an idealized price series that breaks into

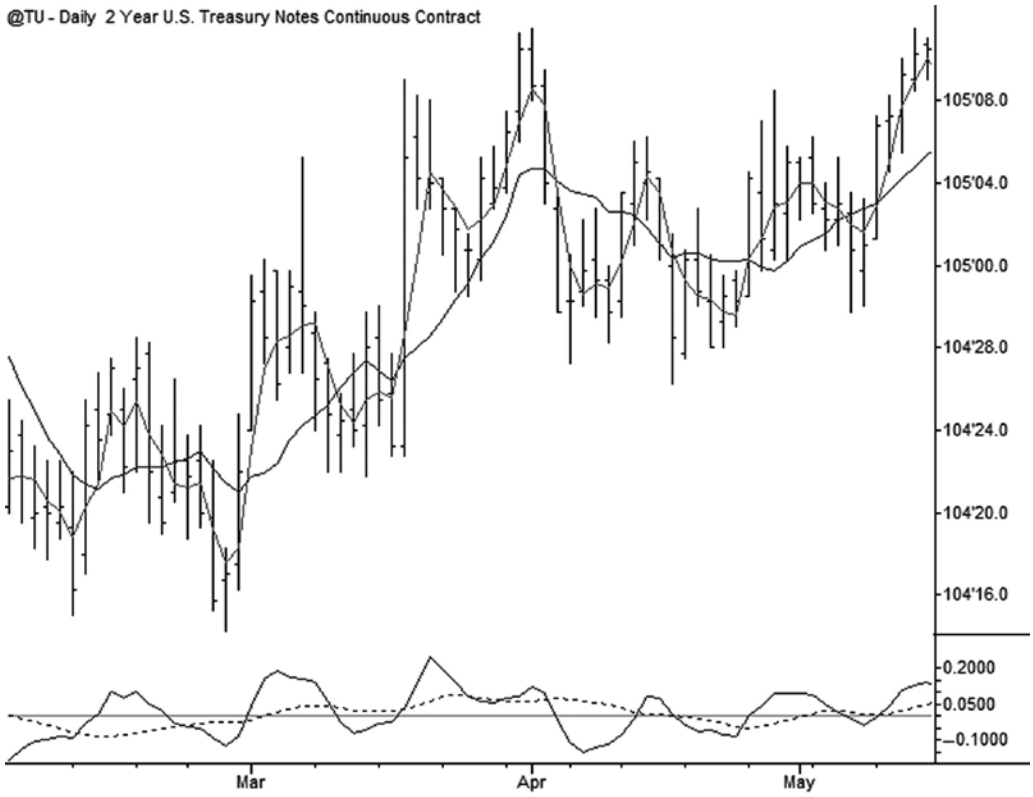


FIGURE B.10 The Slow Line of the MACD Is a Smoothed Version of the Fast Line

a steady-state uptrend and then cleanly transitions to a sideways market. Consider the inflections in the MACD:

- A: The fast line responds immediately to the change in the market by hooking higher on the first price bar of the uptrend.
- B: Everything between points A and B is an artifact of the indicator. Though the slope of the fast line changes in a curve, this does not reflect any change in the rate of trend in the market, which is trending steadily higher. At B, 10 bars into the uptrend, the 10-period moving average is now trending steadily with prices (remember, the fast line measures the difference between a 3-period and a 10-period moving average), so the indicator goes flat.
- C: The fast line again responds immediately to the shift in the market by hooking down on the first bar that breaks the trend pattern. Note that the MACD fast line going down does not mean that prices are going down, but that the rate of change of prices has gone down, in this case to zero.
- D: The fast line levels out, again 10 bars following the change in the market.

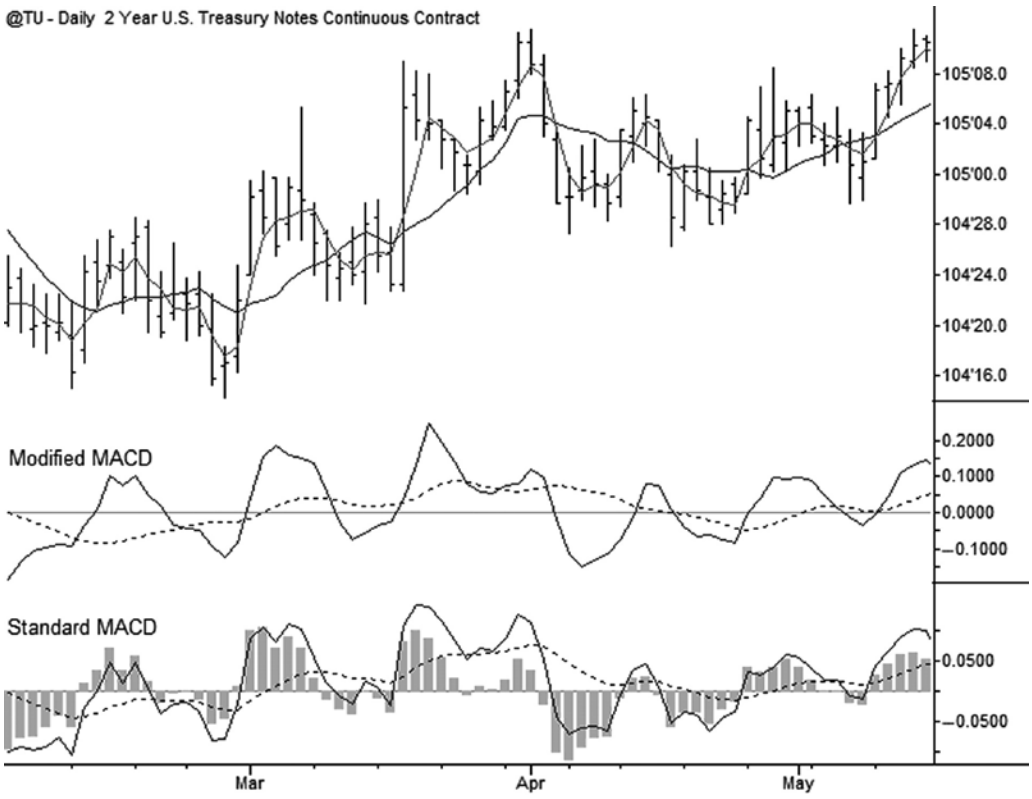


FIGURE B.11 Modified and Standard MACDs (Both 3, 10, 16) Compared

If you are looking at Figure B.12 and thinking that this could never be relevant in actual trading, consider the daily chart of Apple Inc. in Figure B.13. After a downtrend, the market transitioned to an uptrend at the point marked A, and the MACD fast line immediately responded by hooking upward, just as in the inflection marked A in the previous chart. Real market action, of course, contains much more noise and variation than our simplified example, but much of the downturn in the line at point B in Figure B.13 is due to this 10-bar artifact. A trader paying too much attention to the indicator's line at this point might surmise that momentum had turned downward. Prices did take a small pause at this point, but the indicator's reaction was out of proportion to that change. Point C is also interesting; a large move up is required to hook the fast line up after an extended trend. Half of the battle with using indicators is knowing when to use them and when to ignore them. If you are reacting to every jot of the indicator, you are missing the point. It is much better to use the tool only at potential inflections to add another layer of confidence to analysis that focuses primarily on the price bars themselves.

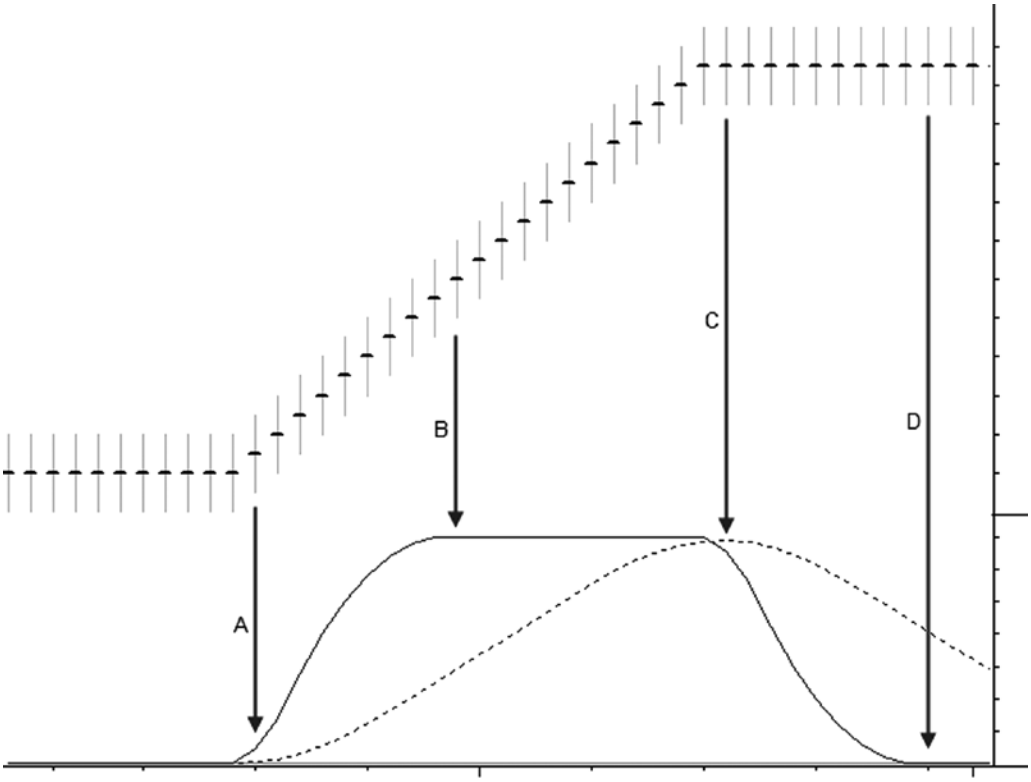


FIGURE B.12 Note That Inflections in the Fast Line of the MACD Include Some Artifacts Due to the Indicator's Construction

The modified MACD is constructed from simple moving averages, so it suffers from the problem of dual inflections to single price shocks. In fact, the multiple moving averages result in a complex reaction to single large events. This is rarely a significant problem when we are actually using the tool, but it can be an issue in some situations—for instance, in applying the tool to intraday data following a large overnight gap. Figure B.14 shows a situation that would be absurd in a real market: an otherwise absolutely flat market with a single large price shock, immediately reversed the following day. Note that the MACD's two lines have 12 inflections in response to this single bar! Again, this is not a tradable feature, but it does highlight the folly of trying to follow every move of the indicator too closely. In a real market situation, the indicator is nearly always irrelevant after a large price shock, and attention should be focused on other factors such as price action following the movement.

So far, these theoretical data sets have been so clean that it may be difficult to relate them to situations that are likely to occur in actual trading. Consider next what happens when the MACD is applied to a data set that begins to more closely approximate real market conditions, as in Figure B.15. This data set alternates uptrending and

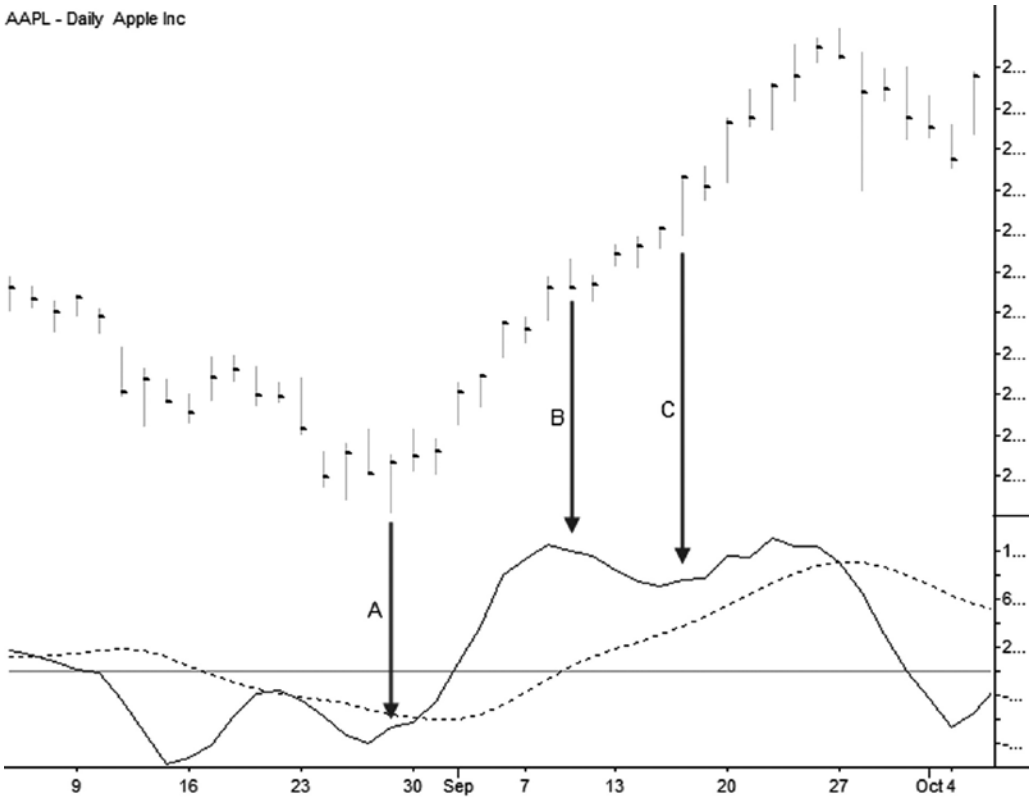


FIGURE B.13 Consider the Inflections of the MACD Applied to an Actual Market

downtrending legs, though it reduces them to consistent, idealized linear changes. Specifically, the down legs (BC and DA) are the same rate and length, while the up leg CD moves at a rate equal to 75 percent of AB's changes. The indicator registers a lower peak at D compared to B, which would suggest to many traders that trend leg CD, though it made a new high relative to the point B, did so on lower momentum; this is an example of a so-called *momentum divergence* on the MACD. This example shows precisely what lower momentum means for the MACD: here it means that the lower-momentum leg had smaller daily changes compared to the higher-momentum leg. Note that, in this case, both legs were the same length in terms of number of bars, so the lower-momentum leg, overall, covered a smaller range of prices than the higher-momentum leg. If the lower-momentum leg had continued for more days it would eventually have moved the same distance as the higher-momentum leg, but it still would have shown a divergence with the indicator at the second peak.

There is, however, another possibility, shown in Figure B.16, which has two uptrending legs (AB and CD) that both move with the same rate of change. Here, the second leg (CD) is shorter, including fewer bars than the longer leg, and the indicator again registers

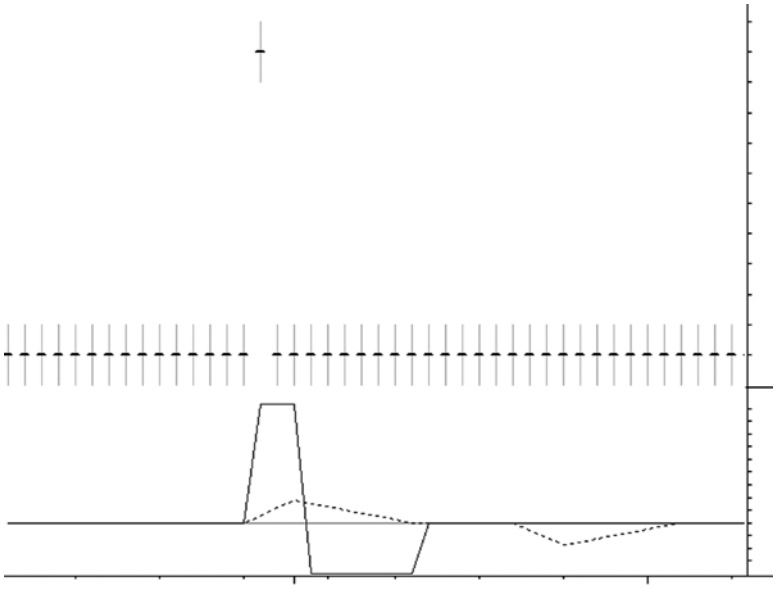


FIGURE B.14 Multiple Inflections on the MACD Following a Single Price Shock

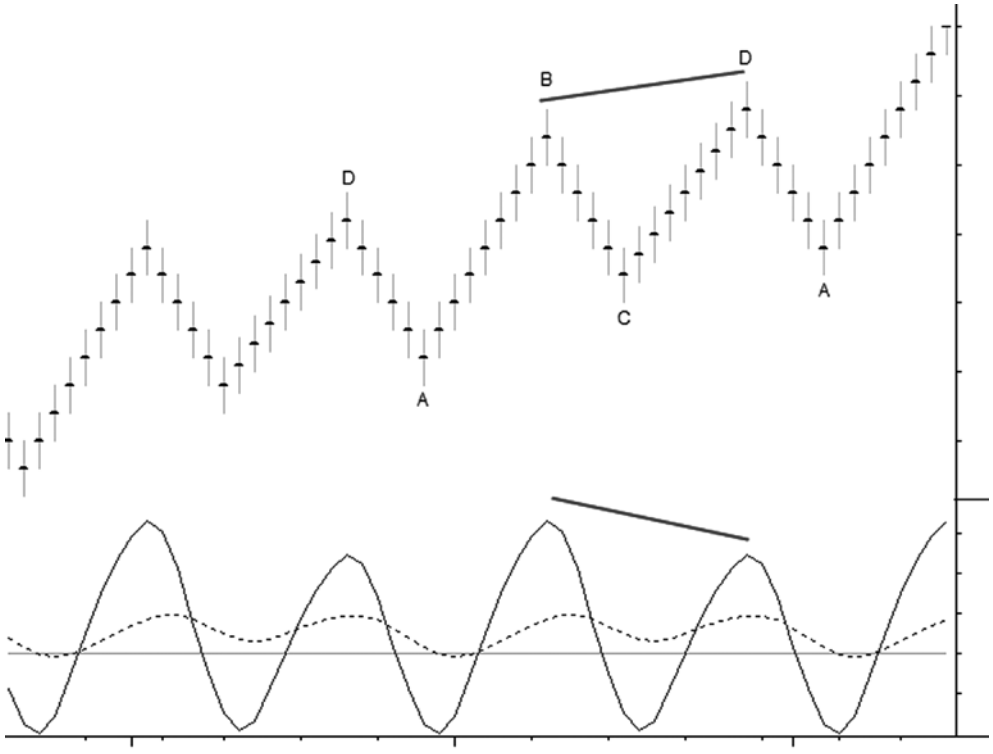


FIGURE B.15 Momentum Divergence Due to Lower Rate of Change on the Second Leg

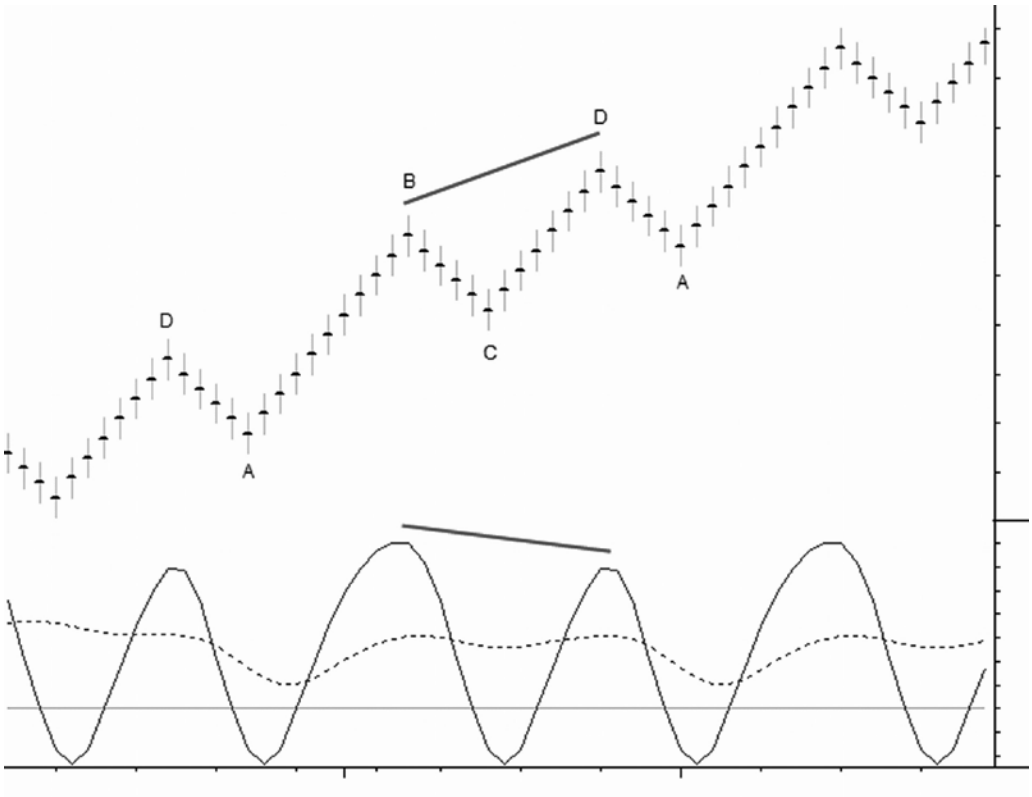


FIGURE B.16 Momentum Divergence Due to a Shorter Second Leg

a divergence. This is fundamental to divergence on momentum indicators: divergences will register with trend legs that either move at a lower rate of change or extend for fewer bars relative to the higher-momentum leg. In actual practice, the presence of additional noise and fluctuation obscures these simple tendencies, but this is the underlying truth of momentum divergence. Very few traders think about these concepts with precision.

APPENDIX C

Sample Trade Data

This table contains the trade data for the "Statistical Analysis of Trading Results" section in Chapter 13. These data, and the data for the control chart analysis in that same chapter, are available from the author's web site at www.adamhgrimes.com/ in CSV format.

Trade ID	System	Position Value	Initial Risk	Account Net Liq	Net P&L	P&L as %R	P&L as % Position Val	Pro Forma P&L
1	A	17,320	(1,260)	100,000	1,228	1.0X	7.1%	975
2	C	11,245	(1,655)	100,000	335	0.2X	3.0%	202
3	A	8,210	(1,790)	100,000	972	0.5X	11.8%	543
4	A	13,984	(736)	100,000	48	0.1X	0.3%	65
5	C	13,984	(736)	100,000	88	0.1X	0.6%	120
6	C	4,610	(390)	100,000	405	1.0X	8.8%	1,038
7	C	9,220	(780)	100,000	350	0.4X	3.8%	449
8	A	18,634	(1,154)	100,587	(5)	−0.0X	(0.0%)	(4)
9	C	53,563	(1,538)	100,829	(1,056)	−0.7X	(2.0%)	(693)
10	A	9,292	(1,068)	100,000	(400)	−0.4X	(4.3%)	(375)
11	D	18,189	(941)	100,000	(486)	−0.5X	(2.7%)	(517)
12	B	32,048	(884)	104,137	(80)	−0.1X	(0.2%)	(94)
13	B	26,959	(641)	103,406	878	1.4X	3.3%	1,417
14	C	26,959	(641)	103,406	694	1.1X	2.6%	1,120
15	B	16,250	(1,150)	102,016	(114)	−0.1X	(0.7%)	(101)
16	A	32,258	(1,018)	103,072	(198)	−0.2X	(0.6%)	(200)
17	A	14,091	(1,059)	102,706	(849)	−0.8X	(6.0%)	(823)
18	A	11,173	(511)	102,706	99	0.2X	0.9%	198
19	A	5,587	(255)	102,706	255	1.0X	4.6%	1,027
20	C	5,587	(255)	102,706	179	0.7X	3.2%	721
21	B	8,830	(1,008)	102,588	(676)	−0.7X	(7.7%)	(688)

Trade ID	System	Position Value	Initial Risk	Account Net Liq	Net P&L	P&L as %R	P&L as % Position Val	Pro Forma P&L
22	A	7,200	(850)	103,215	(120)	−0.1X	(1.7%)	(146)
23	A	17,888	(938)	103,215	15	0.0X	0.1%	17
24	B	5,242	(282)	103,215	240	0.9X	4.6%	878
25	B	5,242	(282)	103,215	152	0.5X	2.9%	556
26	C	5,242	(282)	103,215	282	1.0X	5.4%	1,032
27	A	35,552	(1,552)	100,605	(196)	−0.1X	(0.6%)	(127)
28	C	8,404	(1,196)	104,007	66	0.1X	0.8%	57
29	A	32,556	(956)	103,644	(284)	−0.3X	(0.9%)	(308)
30	A	25,103	(848)	103,162	(68)	−0.1X	(0.3%)	(82)
31	B	8,425	(225)	103,162	315	1.4X	3.7%	1,444
32	C	37,818	(1,602)	103,389	(1,242)	−0.8X	(3.3%)	(802)
33	C	14,340	(1,620)	102,812	(1,285)	−0.8X	(9.0%)	(816)
34	A	8,248	(243)	98,902	433	1.8X	5.2%	1,764
35	A	24,743	(728)	98,902	510	0.7X	2.1%	693
36	D	33,370	(1,350)	98,902	(480)	−0.4X	(1.4%)	(352)
37	A	54,095	(1,083)	99,862	(989)	−0.9X	(1.8%)	(912)
38	A	64,135	(865)	99,862	(705)	−0.8X	(1.1%)	(814)
39	A	29,880	(1,480)	99,862	(890)	−0.6X	(3.0%)	(601)
40	A	76,153	(1,247)	99,845	(581)	−0.5X	(0.8%)	(465)
41	A	63,936	(1,344)	98,076	(1,096)	−0.8X	(1.7%)	(800)
42	A	42,655	(845)	97,992	(425)	−0.5X	(1.0%)	(493)
43	D	29,970	(1,770)	97,992	(458)	−0.3X	(1.5%)	(253)
44	A	129,240	(1,470)	98,839	135	0.1X	0.1%	91
45	B	36,449	(1,505)	100,979	(645)	−0.4X	(1.8%)	(433)
46	A	4,801	(199)	98,238	298	1.5X	6.2%	1,471
47	A	9,602	(398)	98,238	768	1.9X	8.0%	1,896
48	B	9,602	(398)	98,238	398	1.0X	4.1%	982
49	B	9,602	(398)	98,238	802	2.0X	8.4%	1,980
50	D	53,445	(1,534)	97,640	(41)	−0.0X	(0.1%)	(26)
51	B	25,659	(466)	96,863	466	1.0X	1.8%	969
52	D	51,319	(931)	97,329	269	0.3X	0.5%	281
53	A	17,325	(666)	96,863	390	0.6X	2.3%	567
54	C	8,663	(333)	96,863	210	0.6X	2.4%	611
55	D	17,325	(666)	96,863	668	1.0X	3.9%	971
56	B	18,826	(539)	96,863	1,094	2.0X	5.8%	1,966
57	B	18,826	(539)	96,863	1,078	2.0X	5.7%	1,937
58	C	18,826	(539)	96,863	538	1.0X	2.9%	967
59	C	27,310	(650)	96,863	650	1.0X	2.4%	969
60	C	27,310	(650)	96,863	425	0.7X	1.6%	633
61	B	8,060	(470)	100,213	500	1.1X	6.2%	1,066
62	B	8,060	(470)	100,213	473	1.0X	5.9%	1,007
63	C	8,060	(470)	100,213	470	1.0X	5.8%	1,002
64	B	29,383	(1,547)	104,570	(57)	−0.0X	(0.2%)	(39)
65	A	16,676	(1,004)	102,317	772	0.8X	4.6%	787
66	B	8,338	(502)	102,317	286	0.6X	3.4%	583
67	A	63,520	(1,280)	102,484	(736)	−0.6X	(1.2%)	(589)
68	A	76,263	(1,662)	103,257	(912)	−0.5X	(1.2%)	(567)

Glossary

acceleration factor In the Parabolic SAR, an input that controls how quickly the stop and reverse level is moved toward price. Normally, this factor increases with each bar, moving the stop closer at an ever-accelerating rate.

accumulation One of the classic market phases in which large buyers establish positions without moving the market, but also can refer to the presence of underlying buying in other contexts. Accumulation is usually seen as constructive and supportive of prices.

adaptive markets hypothesis (AMH) A theory of market behavior pioneered by Andrew Lo that proposes that markets can be described by a process of evolving efficiency.

always-in A colloquialism for styles of trading that seek to always have a position in the market, reversing from long to short based on technical signals. Perhaps more useful as a research/backtesting methodology than an actual trading style.

Anti A trade setup that attempts to enter the first pullback following a potential change of trend.

ask Also called the offer. The price, almost always above the bid and often above the last print, in an order book at which people are willing to sell the market.

asynchronous trading A problem in evaluating indexes, pairs trades, or some systems in which prices that occur together in the data series may not have actually occurred at the same time.

ATR% Average True Range (ATR) as a percentage of the last price, or ATR standardized for price. This is a volatility measure that can be compared across assets with different price levels.

autocorrelation The correlation of a time series to itself at different time points, as a function of the time between them. Autocorrelation can often cause trends in price series.

Average Directional Index (ADX)/Directional Movement Index (DMI) Technical indicators that measure strength of trend.

average range A simple volatility measure that averages the range of a set of bars. In practice, Average True Range (ATR) is more commonly used to capture overnight gaps, but average range may be more applicable in some intraday applications.

Average True Range (ATR) A measure of volatility. True range is the bar's range (high minus low) plus any overnight gap from the previous bar's close.

backtesting Applying a rule set to historical prices to see how it would have performed in terms of returns, volatility, and stability. This is a complex and involved process; many traders who attempt it make some critical errors.

basis point One hundredth of a percent. 1 basis point (bp) = 0.01 percent.

bell curve An informal term for the shape of the normal distribution curve.

bid In financial markets, the price, often below the last price and always below the offer, where buyers are willing to purchase the asset.

binomial tree A useful tool in understanding random walks. A visual representation of the possible values a random walk or asset price could take at various steps in time.

black boxes A term usually reserved for completely computerized and rule-based trading systems.

breakout trades A class of trades that seeks to enter on moves above resistance or below support, looking for continuation in the direction of the break. Equity-centric traders are more likely to use the term *breakdown* for a move below support; futures traders tend to use *breakout* for both trades.

candlestick chart A type of chart that pictures the space between the open and the close of a period as an empty or full rectangle, depending on whether the close was higher or lower than the open, with thin "shadows" extending to the high and low of the period.

capital asset pricing model (CAPM) A model to determine the theoretical price of an asset as a function of the risk-free rate and market return. CAPM was an important step in the evolution of academic thinking about markets, but has little, if any, utility in actual practice.

causation In financial markets, it is very difficult to determine causative links between markets and exogenous factors. Classically, researchers in other fields try to isolate potential causative factors to understand their influence, but this is difficult to do in market settings. It is important to avoid assumptions and to learn to think carefully about this important issue.

central limit theorem A theorem that informally states that the outcome of many random events will tend to follow the normal distribution. For instance, if a set of dice is rolled many times and the rolls recorded, the data set will eventually approximate the normal distribution. The central limit theorem is very important to many statistical tests.

central tendency The term that describes how values in a probability distribution tend to cluster around one or more values. Mean, median, and mode are common measures of central tendency.

chandelier stop A trailing stop technique that hangs a stop a certain distance under the highest point the market has reached since the position was initiated. (The technique is mirrored to the downside.) Many variations are possible.

climax Usually refers to a move near the end of an extended trend in which the trend accelerates into a steeper move, usually accompanied by an increase in volume. Climaxes on higher time frames can mark major inflection points in markets, but smaller climaxes are common on lower time frames. One of the central problems of technical analysis is discerning climax from strength (or weakness, in the case of a downside climax).

close Many financial markets report official closing prices at the end of the session. These are usually not simply the last price traded (though they may be in some markets), but are set through several different methods. This price is important to traders because daily P&Ls are marked to this price. Also, many traders will use close to refer to the last price of any time interval (e.g., "the close of this current 5-minute bar or candle").

coefficient of variation Obtained by dividing the standard deviation by the mean—conceptually this is similar to the reciprocal of the Sharpe ratio with the risk-free rate set to zero. While not a meaningful measure by itself, it is useful when comparing different trading techniques, systems, or patterns, as it shows how much variability is being assumed per unit of return.

complex pullback A two-legged pullback that is a complete ABCD trend structure. These are common, especially in mature trends.

compound loss Compound gains or losses take into account the compounding effect of interest. For instance, two consecutive 10 percent losses do not total a 20 percent loss, because the second was made on a smaller capital base.

conditional probability If Prob(A) is the probability of event A occurring, then Prob(A|B) is read as "the probability of A occurring, given that B has occurred." Conditional probability is one of the techniques used to ascertain independence in trading systems and market patterns. Many traders make errors in thinking about probabilities because they do not understand this important subject.

cone of uncertainty A term that describes the future distribution of asset prices for a given level of volatility. Useful in a theoretical sense to visualize some specific problems relating to uncertainty, but most applications assume that the normal distribution holds. Since it almost never does in financial markets, there is limited practical utility for this tool.

confluence Some methodologies assume that support and resistance levels are more meaningful if levels from several different time frames line up at a specific price. This lining-up of levels is called confluence.

consolidated tape A high-speed system that electronically reports the last price and volume data on sales of exchange-listed equities.

consolidation A general term to describe a condition in which markets are not trending. In general, consolidation areas are seen as resting points in a trend, usually leading to continuation in the direction of the original trend. For practical purposes, pullbacks, flags, and consolidations are equivalent terms.

day trade A trade entered and exited on the same day and not held overnight.

demand line Richard Wyckoff's term for uptrend lines drawn below prices that show where buyers' demand has been sufficient to stop the downward movements of prices.

dependent variable In regression analysis, the variable whose values are assumed to change in response to the other variable(s).

disaster risks A term used to refer to risks from nearly completely unforeseeable events such as fire, flood, or a large-scale failure of the exchange network. These risks are extremely rare, could have catastrophic consequences, and are very difficult to hedge.

discretionary trading A style of trading that allows varying degrees of human input in trading decisions.

distribution The opposite of accumulation; traditionally, a price area where holders of an asset are seen to be selling their inventory carefully, so as to avoid causing prices to break down. In practice, often taken as a sign of impending price weakness.

drawdown In trading system design or application, the amount lost from the high-water mark for the system/account. This is an underutilized measure of risk.

economically significant Statistical significance is a reasonably well-understood subject, but there can be patterns that are statistically significant without being economically significant. For instance, perhaps a pattern shows a very consistent edge, but it would be impossible to capture that edge because it is smaller than transaction costs. It is often difficult to truly evaluate economic significance because costs will vary from firm to firm and from trader to trader—what might not be economically significant to one trader could be a steady income for another.

Efficiency Ratio (ER) A measure developed by Perry Kaufman also known as the Fractal Efficiency Ratio, the Efficiency Ratio varies from 0 to 1 and is a measure of price movement compared to noise in the market. If price moves in an unbroken line for the period, the ER would be 1. If price returns to unchanged after moving away from the starting price, the ER would be 0.

efficient markets hypothesis (EMH) Perhaps the cornerstone of academic thinking about markets, the EMH essentially says that all available information is immediately incorporated into asset prices, and that there is no edge available to traders doing analysis based on that information. The EMH is a useful theoretical construct, but rests on a number of assumptions that are severely violated in practice.

excess return In general, the return of an asset or system minus the risk-free rate. (The most common proxy for risk-free rate is a Treasury instrument of similar duration to the investment's holding period.) In many of the tests in this book, excess return is used in a slightly different context: the mean return of a signal group (defined as having the entry condition to be studied) over the baseline return for the control group.

execution risk A risk of trading in which the actual prices received for executions may differ from backtested results. In practice, liquidity conditions, execution skill, and trading size are primary contributors to this risk.

exhaustion See *climax*.

expectancy or expected value Mathematically, the expected payout of a scenario that has several possible outcomes is the sum of the probability of each outcome occurring times their payoffs.

exponential moving average (EMA) A type of moving average that weights recent data more heavily than past data.

extension In trend analysis, the third leg of the impulse-retracement-impulse unit that comprises the basic trend structure. Gauging the strength of the extension leg is one of the main ways to judge strength of the trend.

fading A general term for styles of trading that seek to trade *against* the direction of price movements. A trader fading an uptrend, for instance, would be shorting into that uptrend.

failing Usually used in reference to a support or resistance level, meaning that the level is failing to contain prices. This term, and *holding*, are more often used to describe dynamic price action than static market structure. See *holding*.

failure test A type of trade in which price penetrates previous support or resistance, and then fails to continue beyond that level. This is a potentially volatile trade, but it also offers very clear risk points and profit targets.

fast Fourier transforms (FFTs) A mathematical technique for finding cycles in data.

Fibonacci ratios The idea that ratios derived from the so-called Fibonacci series {1, 2, 3, 5, 8, . . .} describe price movements in financial markets.

first-order pivots A pivot high is a bar that is preceded and followed by lower highs; a pivot low has higher lows before and after. These pivot points are called first-order pivots to differentiate them from more significant pivots in the market structure.

fixed fractional risk A position-sizing plan that seeks to always risk a consistent fraction of the account's value (also called "equity" or "net liq") on each trade.

flag Another term for a pullback or consolidation in a trend.

flow A term coined by Mihaly Csíkszentmihályi to describe the state reached by elite performers in many disciplines in which the performer's mental capacity is completely absorbed in the task. Flow is a characteristic of top-level performance.

free bars Bars that are entirely outside bands or channels set on price charts—that is, with the low of the bar above the upper band or the high below the lower band.

fundamental Traditionally, technical analysis is the discipline of understanding market movements based on information contained in the price changes themselves. Fundamental analysis is the discipline of using financial statements, economic data, or other information to try to determine what the fair value for an asset should be.

futile traders A term coined by Larry Harris to describe traders who do not make money in markets, and who have no hope of doing so. Harris speculates that one reason they cannot understand the difference between their expectations and their results could be that they are "of limited mental capacity."

good till canceled (GTC) A qualifier attached to an order to indicate that it should not be canceled at the end of the current trading session. A good till canceled order may not work indefinitely; some brokers cancel these at specific times (e.g., end of quarter).

handle A term used to describe the whole numbers in futures markets. For instance, a move from 1,038.00 to 1,040.00 in the S&P 500 futures is a two-handle move. The equivalent term in stocks is a point.

hedging A term with many meanings, but generally to hedge means to take positions to protect against risks in another instrument. For instance, buying a put option is a classic hedging strategy for long positions. Proper hedging is trivial and can be expensive.

high and tight flags A specific type of flag that holds near the high of a sharp up move (or near the low of a sharp decline) that often suggests strong buying (or selling) pressure behind the move. These often lead to sharp continuation.

higher time frame (HTF) The highest time frame in a normal lower/trading/higher time frames scheme. Time frames are typically related to each other by a factor between 3 and 5.

high-frequency trading (HFT) algorithms Computer programs that rapidly execute orders, either for their own profit or to fill orders for clients.

histogram chart A type of chart that is useful for visualizing probability distributions. Events are placed into bins, and the height of those bins is graphed to show the shape of the distribution.

historical volatility Annualized standard deviation of returns. A common measure of volatility.

hit the bid Vernacular for selling (whether initiating a short or selling an existing long position) to the price on the bid. This is usually done when a trader needs to sell quickly, because she could possibly have gotten a better (higher) price by putting offers in rather than hitting the bid.

holding A term used to describe a market that is unable to trade beyond a specific level or point in the market, or to the action of that level on the market. See *failing*.

illusion of control A term that describes a person's assessment of his own skill at a task that offers random reward. If the person appears to have some influence on the process, he will rate his contribution to the outcome as more important, even if there is no actual connection (e.g., a disconnected button that does nothing).

impulse move In technical analysis, a strong movement in the market, usually sharp and in one direction. Also called a momentum move.

independent variable In regression analysis, the variable(s) that is/are assumed to cause changes in the other variable.

indicator variable A variable that assumes the value of 0 or 1 depending on some condition. For instance, an indicator variable could assume the value of 1 if today's close is higher than the previous day's, or 0 otherwise. Averaging this variable across the data set would then give the percentage of days that closed up.

inefficient traders In Larry Harris's words: "Inefficient traders lack the skills, analytic resources, and access to information to trade profitably. They may do everything that profitable traders do, but they do not do it well enough to trade profitably."

interfaces The areas between trends, trading ranges, or trends in the opposite direction. These areas can be difficult to read, but they offer some attractive trading opportunities if the risks can be properly managed.

interquartile range (IQR) A nonparametric measure of dispersion calculated by taking the difference of the third and first quartiles. Also called the middle 50 because half (50 percent) of the data set's values will fall in this range.

Kelly criterion A position-sizing plan designed to maximize equity growth if some simplifying assumptions hold. Violations of these assumptions can have catastrophic consequences, and violations are common in actual trading. If you choose to use a Kelly-style position-sizing scheme, make sure you understand the issues involved.

Keltner channels Originally invented by Chester Keltner, these bands were drawn around a 10-day simple moving average of the *typical price*, and offset by a 10-day moving average of the bars' ranges. Various modifications exist today.

last print The most recent transaction price in a market. May update very rapidly during the time the market is open. The last print of the trading session may not be the closing print in many markets.

limit orders A type of order to buy or sell with a price limit attached. The order will be executed only at the limit or at a more favorable price (i.e., limit buy orders will be filled at or under the limit price, and limit sell orders at or above the limit).

linear regression A mathematical technique for modeling the relationship between a set of variables.

linearly scaled charts Price charts in which the y-axis (vertical axis) is scaled so that equidistant ticks are equal-sized price movements.

log scale chart Price chart with the y-axis scaled so that equidistant tick marks on that axis are the same *percentage* distance apart.

long-term investors Typically, individuals or firms that buy assets intending to hold them for multiple quarters or years. As a general rule (and one that is not entirely correct), these players tend to be more focused on fundamental analysis than on technical factors.

lower time frame (LTF) In the standard three time frames scheme, the lowest time frame, below the trading time frame. Most traders use the LTF to time entries and to manage risk rather than for idea generation and analysis.

markdown The classic Wyckoff market stage following distribution, corresponding to a downtrend in modern terminology.

marketable limit orders Limit orders placed on the wrong side of the market. In other words, marketable buy limit orders will be placed *above* the offer. These orders will immediately execute at the offer, as would a market order. However, if they remove sufficient liquidity from the book to drive prices higher, they will not be filled higher than the limit price. This order offers a compromise between urgency of execution and protection from adverse fills. See *market orders*.

market makers A set of market participants who, generally, are mandated to always be willing to buy and sell an asset in order to maintain an orderly market. Historically, many of these were floor traders, but this function is now generally fulfilled by computers and algorithms. Note that market makers have discretion to set the distance between their bids and offers, and they adjust this in response to market conditions.

market orders A type of order that will be executed immediately, theoretically at the best possible price. In most markets, customers have no recourse in the event of a bad fill on a market order, so these should be used with caution. Nearly all traders will find *marketable limit orders* to be preferable.

market structure The patterns of prices as revealed by swings connecting important pivot highs and lows. Skilled analysts and traders can use market structure to understand the balance of buying and selling pressure, and sometimes to derive an edge for the future direction and/or volatility conditions.

markup In Wyckoff's terminology, the market stage following accumulation, corresponding to an uptrend in modern terminology.

mean A measure of central tendency. In practice, this is what most people mean when they say "average": the sum of the values in a data set divided by the number of elements in that set.

mean reversion The tendency for markets to reverse large movements and to come back to a middle or average value. This does not necessarily mean that markets will pull

back to moving averages. Different markets display different degrees of mean reversion at different points in the market cycle.

mean-reverting See *mean reversion*.

measured move objective (MMO) A technique used to set an approximate price target for a swing out of consolidation, based on the assumption that future volatility will resemble past volatility. This, and all other ratio-based measures, is better used as a guide than a precise target.

measures of dispersion Measures such as standard deviation, variance, range, and IQR that describe how data points spread out from a central value or set of values in a probability distribution.

median A measure of central tendency. If a data set is ordered from smallest to largest, the median is the middle value in the set. If there is an even number of data points, the median is between the middle two points, and is the mean of those two points.

Micro Trendlines A term used by Al Brooks to describe very small, short-term trend lines usually drawn between two to five bars.

Modern Portfolio Theory (MPT) A mathematical concept that deals with diversification and risk in a portfolio context, seeking to maximize portfolio return for a given unit of risk. The term *modern* in the name is a misnomer, because MPT comes from work Harry Markowitz did in the 1950s.

modified MACD indicator The moving average convergence/divergence (MACD) is a standard technical indicator. This book advocates the use of a simplified, modified MACD based on 3/10/16-period moving averages.

momentum divergence There are several variations of this technical tool, but most of them look for a new high or low in price (relative to its recent history) that is not accompanied by a new high or low on a momentum indicator, such as the MACD. The assumption is that there was less conviction behind the move, so it is more likely to fail to continue.

momentum move See *impulse move*.

Monte Carlo modeling or simulation A mathematical technique, particularly useful in situations with many uncertain inputs that have many degrees of freedom or that are highly path-dependent. Monte Carlo methods essentially run multiple simulations and evaluate the results. A working understanding of these tools can help traders to bridge the gap to thinking in probabilities.

motive force A term used to describe the tendency of price to move from one level to another. This appears to be offset by the resistive force. Though there are no easy applications of these forces, they provide the theoretical backdrop for all technical analysis and technically motivated trading. In some sense, these two forces are the purest expression of buyers' and sellers' intentions in the market.

moving averages Tools used in technical analysis and signal processing that average values over a look-back window, called moving averages because the window moves forward with each new data point. There are many variations of moving averages used in technical analysis.

multiplicative rule of probability The probability of two independent events occurring is the product of their individual probabilities. This can also be adapted for dependent events, but in this case the relevant math is: $\text{Prob}(A \cap B) = \text{Prob}(A) \times \text{Prob}(B|A)$.

next trend leg The trend leg following a consolidation.

noise traders Traders who have no reason or motivation for trading, and whose interactions with the market are irrational and erratic, known informally as the "idiot traders." In reality, the actions of many small traders essentially resolve into noise on most time frames, and cause slight deviations between price and value, even in efficient markets.

normal distribution A probability distribution that describes many events and conditions in the natural world. Unfortunately, it is also frequently applied to market situations, with potentially disastrous results. Normal distributions rarely hold in asset prices or returns.

null hypothesis In statistical hypothesis testing, the null hypothesis is the default assumption, usually that there is no effect or relationship in the data being examined. Note that this hypothesis can never be proven. Rather, the technique is to look for information that would contradict this hypothesis and cause it to be rejected in favor of the alternative hypothesis.

O%Rng A measure of where the open lies within the trading session's range, expressed as a percentage of that range. For instance, O%Rng of 100 percent means the open is at the high of the day's range, while 0 percent indicates the open is the low tick of that session.

offer See *ask*.

open In intraday data, the first tick of the bar. In daily data, opens are usually set by an auction process and may not be the first trade of the day. Also, most markets have electronic sessions that precede their official opens, so the instrument may have traded for many hours before the opening print.

opening range A term used to describe the range price trades within a specific time following the open. Traders may use opening ranges from a few minutes to an hour.

opening skew The tendency of the opening print to cluster near the high or low of the session, rather than to be somewhere in the middle. This is commonly assumed by traders to be evidence of a market inefficiency when in fact, it is completely explainable by the properties of random walks.

optimal f An alternative to the Kelly criterion. Optimal f is another answer to the position-sizing problem. Developed by Ralph Vince, it may be more robust in some trading applications than the Kelly criterion.

out-of-sample testing In system development or backtesting, part of the data set is usually held back for an out-of-sample test once development is complete. For instance, if you have 10 years of price data, perhaps you would do development on eight of those years and hold the last two for an out-of-sample test. Note that out-of-sample testing can be done only once; after that, the data set is contaminated and should be considered part of the sample.

outliers Events that fall far outside the range of normal events.

overbought/oversold indicators A class of technical indicators that try to identify markets that have moved too far in one direction and are poised for reversal. These indicators could provide entries for mean-reversion trades, but careful testing is needed.

pairs strategies A term usually reserved for spread trades between different stocks. See *spread trading*.

paper trading A tool sometimes used by developing traders that involves placing trades in a simulated environment. (The term does not imply literal use of pencil and paper.) Paper trading has limited utility because it cannot replicate the psychological challenges of having money at risk.

Parabolic SAR A trading system originally developed by Welles Wilder that was designed to always be in the market, reversing long or short according to signals generated from price movements. (SAR stands for stop and reverse.)

path-dependent Refers to a scenario that can have different values or outcomes depending on decisions or outcomes at different steps in the process.

pay the offer A term that means to buy an asset directly at the offered price, without attempting to bid for a lower (better) price. Market orders should equivalently pay the offer, but there is the danger of large and uncontrolled slippage.

per-unit risk The difference between the entry and exit price on a trade, or the risk to be taken on one unit (share, contract, etc.) of the instrument.

pivot high or pivot low See *first-order pivot*.

pivot points See *first-order pivot*.

point and figure charts A charting technique, mostly obsolete, that charts reversals from pivot points. The x-axis is not scaled for any fixed unit; rather, it moves forward when the specified reversal from the pivot has occurred. This was a technique historically used by floor traders that still finds some applications in computerized trading.

population In statistical testing, usually considered to be the set of all possible events or items with the characteristic being studied. The population is usually unseen and unknowable, so the central problem of inferential statistics is to try to understand the characteristics of the population based on samples taken from that population.

positive expectancy See *expectancy* or *expected value*. A positive expected value suggests that a trader is likely to make a profit over a large enough sample size of trades, provided there is good execution and the expected value is larger than transaction costs.

post hoc From the Latin term meaning "after this." Refers to events usually defined after the analysis or experiment is concluded.

preceding trend leg In the impulse/consolidation/impulse framework, this is the initial trend leg that sets up the consolidation.

price action A term that refers to a formalized understanding of how prices move. Price action is usually most visible on lower time frames, and price action creates market structure. In the terminology of a certain subset of retail traders, "price action trading" refers to trading without any indicators or moving averages, but this is mostly a meaningless distinction.

price rejection The characteristic pattern of support and resistance holding: price makes an immediate (in the context of the time frame) and sharp move away from the level. The absence of price rejection suggests a higher probability of the level breaking.

profit target Some technical systems set profit targets for part or all of the position. In general, traders using systems like this should develop the discipline of entering their profit-taking orders as soon as the trade is initiated.

proper pyramids Pyramids that start with the largest number of units they will ever have at a level. These strategies can usually endure volatility at the end of a trend much better than reverse pyramids.

pullback A general term for a consolidation pattern in a trend. Many of the traditional distinctions of technical analysis (flag, pennant, box, etc.) are not meaningful, as all pullback patterns can be traded according to similar rules.

pyramiding plans Plans for adding additional units to a trade once the trade has moved a specific distance into profit.

random walk hypothesis (RWH) A theory that says that asset prices can be described by random walks. Various forms and dimensions of random walks exist. In practice, the RWH seems to hold reasonably well for some assets and some time frames.

range The high-low of a bar or trading session.

range expansion A term to indicate more directional movement in markets. A market undergoing a range expansion phase will probably trend in one direction, the range of bars will probably expand, and measures of volatility will increase on some time frames.

real trend line (RTL) A technique for drawing a trend line that marks the important inflections in trends, usually best-suited to application on longer time frames.

relative strength A term used to describe relative price movements between markets. Skilled traders and analysts can find clues to institutional conviction and large-scale money flows in relative strength.

Relative Strength Index (RSI) A technical indicator that seeks to identify overbought or oversold markets by measuring the relative distribution of up and down closes. Note that it does not measure relative strength, nor is it an index.

resistance A term attached to price areas that may provide a barrier to advancing prices, or areas where sufficient supply may exist to stop prices.

resistive force See *motive force*.

retracement Another general term for consolidation, pullback, or a pause in an established trend.

return series Most financial markets generate data as a series of price changes. It can be difficult to compare price changes across different price levels (e.g., a $5 change in a $10 asset is very different from a $5 change in a $1,000 asset). The first task of any market analysis is usually to convert the price changes into a return series. This can be either a percent return ($P_{today}/P_{yesterday} - 1$) or a continuously compounded return: $\log(P_{today}/P_{yesterday})$.

reverse pyramid A type of pyramid plan common in marketing literature for trading systems, but unacceptable for practical application. In these plans, the trader starts with

a small position and then adds more units as profits from the trend allow the trader to pay for new units. For instance, a trader might start with one contract, adding two, four, and then eight at successive steps. These plans incur unmanageable volatility and drawdowns.

reward/risk ratio This ratio has many uses and applications, but a few points must be kept in mind. First, much of the literature uses "risk/reward ratio" when authors actually mean reward/risk ratio in nearly all cases. This book's terminology, while perhaps slightly awkward, is precise. Second, there is no innate bias to high reward/risk trades; this ratio must be understood in the context of expected value. Last, it is meaningful only over a large set of trades.

risk-adjusted returns It is possible to increase returns in a portfolio or trading system by increasing leverage, but true outperformance must come on a risk-adjusted basis, meaning that returns increase more than risk. Simplistic measures like the Sharpe ratio can help to build intuition about this concept.

risk-free rate In finance, the rate an investor could have realized in a theoretically risk-free investment. In practice, a U.S. Treasury bond, bill, or note with a maturity approximately equal to the intended holding period of the investment is usually used as a proxy for the risk-free rate. An investor must achieve higher returns than what she could have attained in a risk-free investment, so this is used as a hurdle rate in many applications.

R multiple If the risk (R) for every trade is known before the trade is entered, the profit and loss (P&L) can be expressed as an R multiple. For instance, 1× (one times R) would mean that the profit was exactly equal to the initial risk taken on the trade.

R-squared or R^2 In a regression or correlation analysis, a measure of goodness of fit that shows how well the line fits the data. Often understood to be the percentage of the dependent variable's changes that are explained by the model.

rule of alternation In Elliott wave theory, the idea that retracements in trends tend to alternate between simple and complex consolidations.

sample In inferential statistics, samples are smaller sets taken from populations.

scaling in Refers to a style of trade entry where the trader builds a position, usually as it moves against the intended trade direction. For instance, a trader scaling into a long trade will usually be buying small pieces (perhaps 20 percent to 33 percent at a time) of the total position size into declines. This can be an effective entry technique for some styles of trading, but firm risk management rules are essential.

scalping A style of trading that takes very small but consistent profits. Scalpers need to focus on low transaction costs and on avoiding sizable losses, as a single large loss can wipe out many profitable trades. This term is also sometimes generalized to other time frames and styles of trading if the profits and losses are a small percentage of the average range on that time frame.

scatterplots A tool used to visualize the relationship between data sets.

seasonal Many markets exhibit somewhat predictable tendencies at certain times. Traditionally, this term applies to, for instance, grains at harvest time or natural gas spreads at certain times of the year. However, it can be generalized to time of month (are some

markets strong or weak near the beginning or end of the month?) or even time of day for some markets.

second-order pivot A pivot point that is preceded and followed by lower *first-order pivots* for a second-order pivot high (reversed for pivot lows).

semistrong form EMH A variant of the efficient markets hypothesis that postulates that all publicly available information is incorporated in price. If this is true, it would not be possible to achieve superior risk-adjusted returns based on any publicly available information.

setup leg Another term for the preceding trend leg, or the leg that sets up a retracement.

Sharpe ratio A simplistic measure of risk-adjusted performance.

short To short or sell short is to sell an asset with the idea of buying it back later at a lower price. For most new traders, buying and selling higher is intuitive, but most professional traders are as comfortable shorting and buying back lower. (In this case, the sequence is "sell high, buy lower," which is still profitable.)

significance testing A statistical testing technique that attempts to evaluate the probability that the results could be due to chance and not to the presence of an actual signal in the market. (*Note:* This is a complex topic. This explanation is market-specific.)

simple moving average (SMA) A tool commonly used in technical analysis that averages prices over a lookback window, moving this window forward with each trading bar. For example, a 20-period SMA would average the past 20 bars' prices.

size effect Smaller stocks (in terms of market cap) tend to outperform larger stocks, but there may be offsetting risks.

slippage The difference between the intended and achieved execution prices. A cost of trading or an element of transaction costs.

spread This term is used in two different contexts: First, it is the distance between the bid and the ask in markets; wider spreads usually indicate less liquidity and higher costs of trading. Second, see *spread trading*.

spread trading A type of trading strategy that seeks to profit from changes in the relative value of a set of markets by being long and short different assets. This technique is an important part of most professional traders' tool kits.

springs The opposite of upthrusts: Price trades below support and immediately fails to carry lower. The quick recovery shows underlying buying pressure and potential accumulation.

standard deviation A measure of dispersion, also used as a (potentially poor) proxy for risk in many financial analyses.

Standard Deviation Control Chart A tool to visualize the variation in a trader's returns over time. Can be used to highlight potential problems and issues with changing performance.

standard deviation spike An indicator that standardizes each bar's price change for current volatility conditions.

stationary In a stationary time series, the properties of the distribution do not change over time. Note that this is not the same as saying prices do not move or trend;

stationarity refers to the shape and location of the return distribution. There is debate about whether financial markets exhibit stationarity.

Stoller Average Range Channels (STARC) A modern variation of the Keltner Channel concept.

stop and reverse A trading strategy that, rather than exiting the market, flips from long to short and vice versa when a stop level is hit.

stop-loss point An initial point for directional trades, established at the time the trade is entered, where a loss will be booked on the trade. Stop-loss points must be placed outside the noise level of the market and at price levels where the trade is decisively wrong. Setting correct stop-loss points is a combination of art and science.

strong form EMH A form of EMH that states that all information, even secret inside information, is incorporated in the price. Used today as a theoretical concept only, and well refuted by a number of events and empirical studies.

supply line Another name for a downward-sloping trend line, drawn above prices. So-called because it represents an area where supply has been sufficient to meet demand and stop the upward movement of prices in the past.

support A price area where it is anticipated buyers might offer enough buying interest to hold prices above the level. The study of how price acts around support and resistance is one of the building blocks of technical analysis.

survivorship bias Survivorship bias covers a range of logical errors and mistakes that may come from examining the surviving members of a game of chance or another selection process. It is almost always better to examine the entire group before the selection process, as the survivors can give misleading impressions about the process and the probabilities involved.

swings Price movements from one level to another. This is an imprecise term with some overlap between swings and trends. (Chapter 2 offers a structured approach to defining swings based on pivot points and market structure.)

swing trading Formally, a style of trading that seeks to profit from the next swing in the market. Swing traders generally do not scale in, and do not attempt to hold through large, adverse price movements. Informally, many writers use this term to describe the trader who focuses on three-day to two-week holding periods, but this is a faulty definition of the term.

systematic trading Usually refers to a style of trading that is rule-based and that could be at least partially computerized.

tail risk The risk of large outlier events at the tails of a probability distribution. These risks are mostly unhedgable except at great cost, and they create serious problems for traders and risk managers.

technical analysis Technical analysis is the discipline of gauging the probabilities of future price movements and/or volatility conditions based on information contained in price changes themselves.

theory of mind (ToM) The ability to attribute mental states and emotions to others, and to understand that they have beliefs, desires, and intentions different from our own. Some researchers postulate that this theory also forms the basis for market intuition.

three pushes A typical end-of-trend pattern consisting of three symmetrical (in both price and time) pushes to a new high or a new low, followed by a reversal that shows a distinct change of character.

time frame Usually means the time period of the bars on the chart. For example, the 5-minute time frame would refer to a chart with 5-minute bars. Can also be used to describe a scheme where a trader looks at several time frames of the same market, and refers to them as lower, higher, and trading time frames.

trading time frame (TTF) In the three time frames scheme, this is the main, or focus, time frame. Lower and higher time frame charts may support decisions made based on the trading time frame.

trailing stop A system of trade management that moves the stop to lock in profits as the trade moves in the intended direction.

transaction costs The costs involved in participating in a market. They cover all financing, commissions, fees, the bid-ask spread, and any adverse effect your own order has on prices. Most traders, particularly retail traders, have a poor understanding of transaction costs.

trend continuation A class of trades that seeks to enter an established trend in the direction of that trend. Many trend continuation trades are based on entering in consolidation areas or pullbacks.

trend following An entire industry has been built around the term *trend following*. Many adherents of this school claim that trend following is far superior to other methods of trading, that it is easier than other types of trading, and that it essentially is the holy grail. None of these things are true. Trend following is a style of trading that usually attempts to position with a trend, with the idea that the trader may have to sit through significant whipsaws and drawdowns.

trend termination A class of trades that seeks to enter an established trend *against* the direction of that trend, with the idea that the trend is coming to an end. Note that these trades are not simply plays for trend reversal, as many of them will simply transition into trading ranges.

true range The range of the bar plus any gap from the previous close. In other words, if the low of the current bar is above the previous bar's close, the *range* of the current bar is the high-low. The *true range* of the bar is the range + (current bar's low − previous bar's close).

***t*-test** A common statistical significance test.

typical price The average of the high, low, and close for any trading bar.

upthrusts The opposite of Wyckoff's springs: price thrusts above resistance and immediately fails to carry through. This is also a type of failure test and a sign of classic distribution.

variance The square of standard deviation, and a measure that is not particularly useful in most market applications because the units are units squared. (For instance, variance of price changes in USD would be in units of USD^2.)

volatility clustering The tendency of high and low volatility areas to cluster together in market-derived time series. This is also a reflection of markets moving through different volatility regimes.

walk-forward testing A complement to backtesting, in which rules are applied to historical prices. In walk-forward testing, the rules are applied to fresh market data as it is generated. This is essentially a form of papertrading.

weak form EMH A form of the EMH that holds that information contained in past prices cannot be used to predict future prices. If this form of EMH is true, then the discipline of technical analysis is invalid.

whipsaws The tendency for many technical tools, systems, or indicators to accumulate many small losses while markets chop back and forth in trading ranges. For many of these systems, whipsaws are an unavoidable fact of life and must be offset by profits from trending markets.

z-score Also called a standard score, normal score, or a z-value: the number of standard deviations above or below a mean that a variable lies.

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About the Author

Adam Grimes has nearly two decades of experience in the industry as a trader, analyst, and system developer. He began his trading career with agricultural commodities, a reflection of his roots in a Midwestern farming community, and traded Chicago Mercantile Exchange (CME) listed currency futures during the Asian financial crisis. Later, he managed a successful private investment partnership focused on short-term trading of stock index futures, and swing trading of other futures and options products. He spent several years at the NYMEX, and has held positions for a number of firms in roles such as portfolio management, risk management, and quantitative system development.

Adam is the CIO of Waverly Advisors, LLC, an asset management and advisory firm specializing in tactical allocation and risk management in liquid markets. Adam is an expert in applying quantitative tools and methodology to market data, particularly in modeling volatility and complex intra-market relationships. In addition to his ongoing research and trading, Adam is also a prolific writer and educator. His personal website and blog (www.adamhgrimes.com) extends the work of this book with examples and applications to live market data. He has been a contributor on CNBC's "FastMoney," and his work and research have been quoted in major media outlets such as the *Wall Street Journal*, *Investor's Business Daily*, TheStreet.com, SmartMoney.com, *SFO Magazine*, and many others.