HISTORICAL PERSPECTIVES

A Multicentennial View of Trend Following

Cut short your losses, and let your profits run on.
—David Ricardo, legendary political economist
Source: The Great Metropolis, 1838

Trend following is one of the classic investment styles. This chapter tells the *tale of trend following* throughout the centuries. Before delving into the highly detailed analysis in subsequent chapters, it is interesting to discuss the paradigm of trend following from a qualitative historical perspective. Although data-intensive, this approach is by no means a bulletproof rigorous academic exercise. As with any long-term historical study, this analysis is fraught with assumptions, questions of data reliability, and other biases. Despite all of these concerns, history shapes our perspectives; history is arguably highly subjective, yet it provides contextual relevance.

This chapter examines a simple characterization of trend following using roughly 800 years of financial data. Despite this rather naive characterization and albeit crude set of financial data throughout the centuries, the performance of "cutting your losses, and letting your profits run on" is robust enough to garner our attention. The goal of this chapter is not to quote *t*-statistics and make resolute assumptions based on historical data. The goal is to ask the question of whether the legendary David
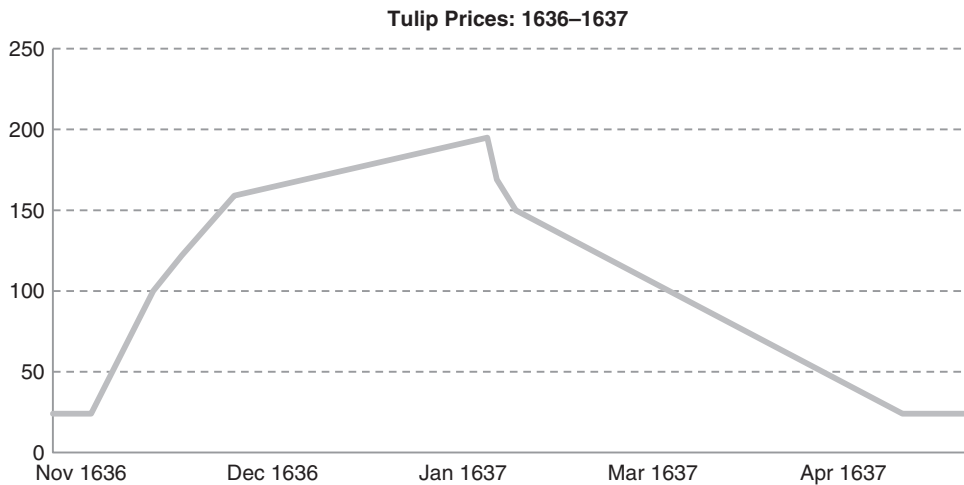
Tulip Prices: 1636–1637

FIGURE 1.1   A standard price index for tulip bulb prices.
Source: Thompson (2007).

Ricardo, the famous turtle traders, and many successful trend followers throughout history are simply a matter of overembellished folklore or whether they may have had a point.

In recent times, trend following has garnered substantial attention for deftly performing during a period of extreme market distress. Trend following managers boasted returns of 15 to 80 percent during the abysmal period following the credit crisis and infamous Lehmann debacle. Many have wondered if this performance is simply a fluke or if the strategy would have performed so well in other difficult periods in markets. For example, how would a trend follower have performed during past crises like those experienced in the Great Depression, the 1600s, or even the 1200s?

Given that this chapter engages in a historical discussion of trend following, it seems only fitting to begin with a rather controversial and relatively spectacular historical event, the Dutch Tulip Bubble of the early 1600s. Historical prices for tulips are plotted in Figure 1.1. One common type of trend following strategy is a channel breakout strategy. A channel breakout signal takes a long (short) position when a signal breaks out of a certain upper (lower) boundary for a range of values. Using a simple channel breakout signal,[1] a trend following investor might have entered

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[1] Breakout strategies and other components for building trend following systems are discussed in Chapter 3.

a long position before November 25th, 1636 and would have exited the trade (by selling tulip bulbs and eventually short selling if that was even possible) around February 9th, 1637. A trend following investor simply "follows the trend" and cuts losses when the trend seems to disappear. In the case of tulips, a trend following investor might have ridden the bubble upward and sold when prices started to fall. This approach would have led to a sizeable return rather than a handful of flower bulbs and economic ruin. Although it is one rather esoteric example, the tulip bulb example demonstrates that there may be something robust or fundamental about the performance of a dynamic strategy like trend following over the long run. It is important to note that in this example, as in most financial markets, the **exit decision** seems to be more important than the entry. The importance of *cutting your losses and taking profits* seems to drive performance. This is a concept that is revisited often throughout the course of this book.

Trend following strategies adapt with financial markets. They find opportunities when market prices create trends due to many fundamental, technical, and behavioral reasons. As a group, trend followers profit from market divergence, riding trends in market prices, and cutting their losses across markets. Examples of drivers that may create trends in markets include risk transfer (or economic rents being transferred from hedgers to speculators), the process of information dissemination, and behavioral biases (euphoria, panic, etc.). Despite the wide range of explanations, the underlying reasons behind market divergence are *of little consequence* to a trend follower. They seek simply to be there when opportunity arises. Throughout history, opportunities do arise. The robust performance of trend following over the past 800 years helps to historically motivate this point.[2]

■ The Tale of Trend Following: A Historical Study

Although almost two centuries have passed since the advice of legendary political economist David Ricardo, the same core principles of trend following have garnered significant attention in modern times. Using a unique dataset dating back roughly 800 years, the performance of trend following can be examined across a wide array of economic environments documenting low correlation with traditional asset classes, positive skewness, and robust performance during crisis periods.[3]

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[2] Chapters 4 and 5 of this book discuss theories of adaptive markets, dynamic risk taking, and the role of divergence.

[3] In Chapters 7 through 10, the modern version of systematic trend following is examined as an alternative asset class.

The performance of trend following has been discussed extensively in the applied and academic literature (see Moskowitz, Ooi, and Pedersen 2012).[4] Despite this, most of the data series that are examined are typically limited to actual track records over several decades or futures/cash data from the past century. In this chapter, an 800-year dataset is examined to extend and confirm previous studies.[5] To examine trend following over the long haul, monthly returns of 84 markets in equity, fixed income, foreign exchange, and commodity markets are used as they became available from the 1200s through to 2013.[6] There are several assumptions and approximations that are made to allow for a long-term analysis of trend following. For simplicity, an outline of assumptions and approximations as well as a list of included markets is included in the appendix.

Market behavior has varied substantially throughout the ages. To correctly construct a representative dataset through history, it is important to be particularly mindful of dramatic economic developments. This means that the dataset should, as closely as possible, represent investment returns that could have actually been investable. For a specific example, from the early seventeenth century to the 1930s, the United Kingdom (U.K.), the United States (U.S.), and other major countries were committed to the gold standard. During this period, the price of gold was essentially fixed. As a result, gold must be removed from the sample of investable markets during this particular time period. As a second example, during most of the nineteenth century, capital gains represented an insignificant portion of equity returns. On average, U.S. investors in the nineteenth century received only a 0.7 percent annualized capital gain, but a 5.8 percent dividend per annum (see Figure 1.2). In fact, up to the 1950s, stocks consistently paid a higher dividend yield than corporate bonds.[7] As a consequence, total return indices must be used to represent equity market returns over time.

Using return data collected from as far back as 1223, a representative trend following system can be built for a period spanning roughly 800 years.[8] A representative

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[4] Moskowitz, Ooi, and Pedersen (2012) document a phenomenon they dub "time series momentum." They show that a multiasset **momentum** portfolio earns a positive premium. Time series momentum is different from the classic cross-sectional momentum of Jegadeesh and Titman (1993) and the vast academic literature that follows it.

[5] The authors note that the analysis in this chapter is meant to tell the "tale of trend following." This chapter provides a historical perspective on the concept of trend following. It is not meant to be replaced by a more rigorous analysis seen in modern academic papers or the detailed analysis later in this book. With any long-term analysis, there are many issues related to tradability, trading constraints such as short sales constraints, reliability of long-term data series, and other concerns.

[6] The data sources are Reuters, Bloomberg, and Global Financial Data.

[7] See also "The GFD Guide to Total Returns" (Taylor).

[8] Using 12-month rolling returns, a trend signal is constructed at the end of each month. A particular market (for example, corn) enters a long (short) position when its return is positive (negative) during the past 12 months. Position sizing is based on equal risk allocation between markets. This concept will be developed further in Chapter 3.
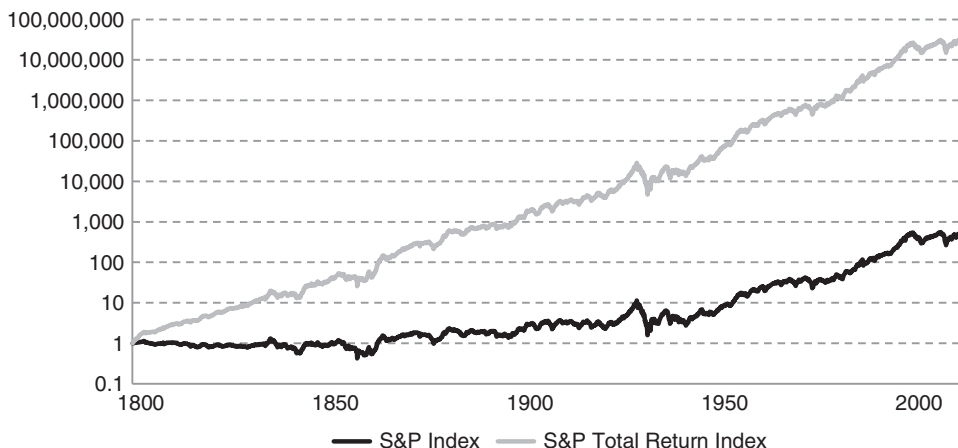
FIGURE 1.2 A historical plot of the S&P 500 Index and S&P 500 Total Return Index from 1800 to 2013 in log scale.

trend following system represents the performance of "following the trend" throughout the centuries in whatever markets might be available. Although certain commodity markets, such as rice, date all the way back to around 1000 AD, the analysis begins in 1223 when there are at least a handful of available markets. At any point in time, to calculate whether a trend exists, the portfolio consists only of the markets that have at least a 12-month history. The trend following portfolio is assumed to be allowed to go both long and short. Monthly data is used for the analysis. Based on a set of simple liquidity constraints, the portfolio is constructed of available markets. Figure 1.3
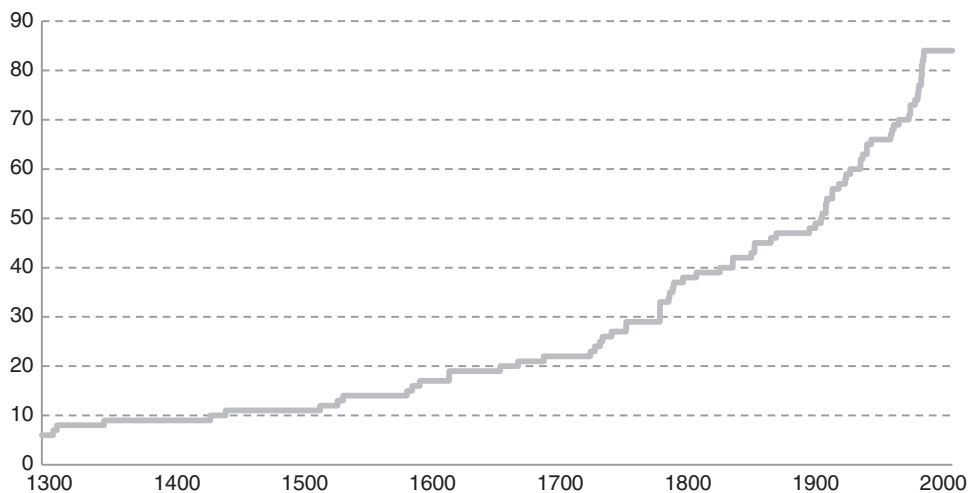

FIGURE 1.3 The number of included markets in the representative trend following program from 1300 to 2013.
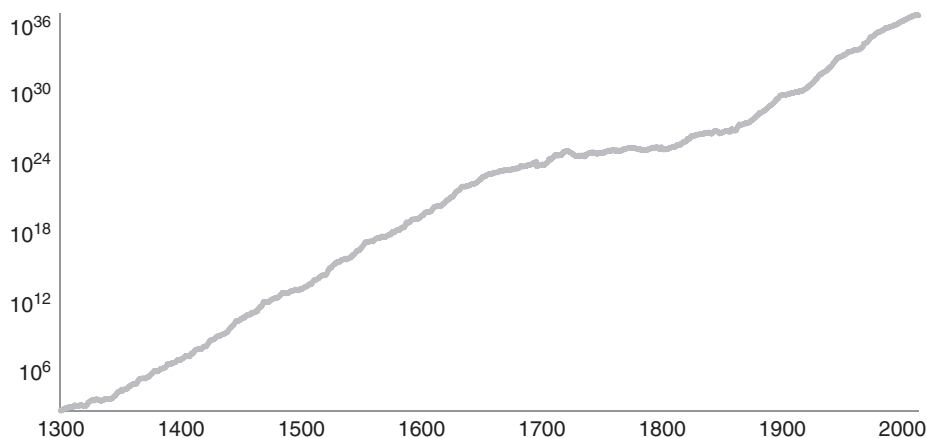
FIGURE 1.4 Cumulative (log) performance of the representative trend following portfolio from 1300 to 2013.

depicts the number of markets in the portfolio over time. The growth of futures markets has facilitated trend followers by making more markets available for trading.

■ Return Characteristics over the Centuries

Trend following requires dynamic allocation of capital to both long and short trends across many different assets over time. Figure 1.4 plots the log scale performance of a trend following strategy for roughly 800 years. Over the entire historical period from the 1300s to 2013, the representative trend following system generates an annual return of 13 percent, with an annualized volatility of 11 percent. This results in a Sharpe ratio of 1.16.[9]

Many finance experts have argued for the reduction of risks in the long run or that one should just simply buy-and-hold. Trend following strategies dynamically adjust positions according to trends, making them the counter to a buy-and-hold long-only strategy. The difference between these two can give insight into the value added of active management across asset classes. Position sizes for both trend following and a buy-and-hold strategy are rebalanced on a monthly basis to achieve equal risk. In contrast with the buy-and-hold, the trend following system is free

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[9] Sharpe ratios are calculated assuming that the risk-free rate is zero. This assumption is made because risk-free lending rates are not available for the entire dataset.

	Buy-and-Hold Portfolio	Trend Following Portfolio
TABLE 1.1 Performance statistics for buy-and-hold and trend following portfolios from 1223 to 2013.		
Average Return (annual)	4.8%	13.0%
Standard Deviation (annual)	10.3%	11.2%
Sharpe Ratio	0.47	1.16

to go short.[10] For comparison, the buy-and-hold portfolio represents a diversified long-only portfolio consisting of equities, bonds, and commodities.[11] Table 1.1 displays performance statistics for the long-only buy-and-hold portfolio and the representative trend following portfolio. In terms of Sharpe ratio, the total performance of trend following over the past 800 years is far superior. This suggests that there may be a premium to active management and directional flexibility in allowing short positions. Given the spectacular outperformance of trend following over a long-only buy-and-hold portfolio, it is only natural to take a closer look at various factors that may impact this performance. The role of interest rates, inflation, market divergence, and financial bubbles and crisis are examined in closer detail in the following sections.

Interest Rate Regime Dependence

Because interest rates affect market participants' ability to borrow and lend as well as the time value of money, they are an important factor to examine for dynamic strategies. As interest rate regimes change, they can impact dynamic strategies in a plethora of ways. Interest rates are currently historically low, but interest rate regimes have varied substantially across history. Figure 1.5 plots government bond yields over the past 700 years. In this section, interest rate regimes are discussed from a 700-year perspective.[12]

Since around 1300 AD, the median long-term bond yield has averaged around 5.8 percent. Despite the intuitive/fundamental importance of interest rate regimes, the correlation between the level of interest rates and trend following returns is

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[10] Short selling is simple with futures contracts, but historically short selling would have been difficult or even impossible during many periods in history.

[11] FX markets are not included in the traditional buy-and-hold portfolio. For the buy-and-hold portfolio, monthly rebalancing is done to maintain equal risk with the corresponding trend following portfolio.

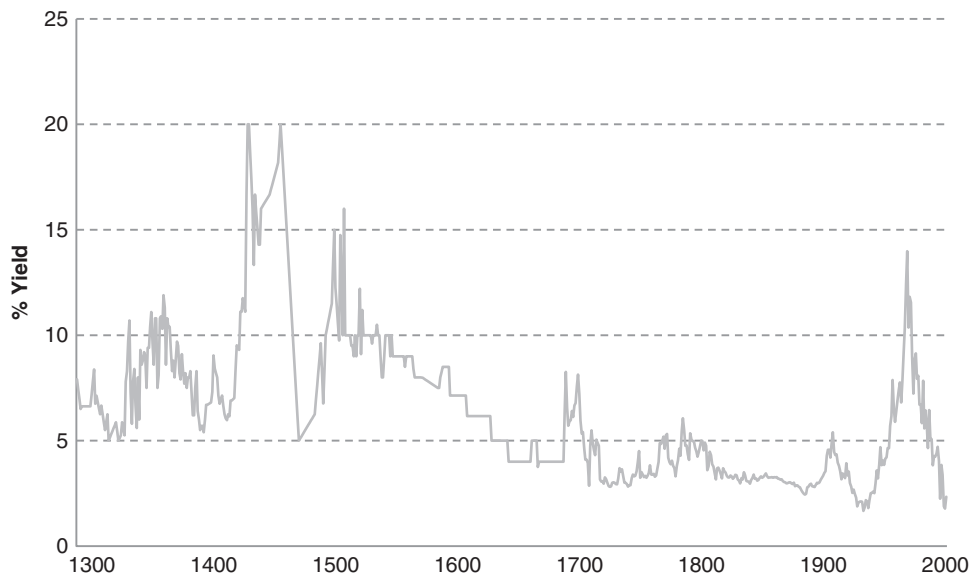[12] In Chapters 6 and 10, interest rates are discussed in a more recent context.

FIGURE 1.5 The GFD long-term government bond yield index from 1300 to 2013.
Source: Global Financial Data.

only 0.14. To see if different regimes have an impact on trend following performance, interest rate levels can be divided into high and low. A high interest rate regime can be defined by a year where the average yield is above the median, and a low-interest rate regime can be defined by a year where the average yield is below the median. Across both high- and low-interest rate regimes, on average, trend following performs better during high-interest rate regimes. This can be seen in Table 1.2.

In practice, it is not only the level of interest rates but also the relative movements in interest rates that impacts markets. To evaluate the impact of changes in interest rate, the yield differential from year-end to year-end can be computed. If the change over a time period is positive (negative), the year is defined as a rising (falling) interest rate year. The correlation between the change in yield and trend following returns is close to zero, suggesting that the difference in trend following performance, during periods of either rising or falling interest rates, does not seem to be significant.

TABLE 1.2 Performance of trend following over different interest rate regimes from 1300 to 2013.

	High IR	Low IR	Rising IR	Falling IR
Average Return (annual)	15.5%	10.6%	11.9%	14.4%
Standard Deviation (annual)	9.9%	12.2%	11.2%	11.1%
Sharpe Ratio	1.56	0.86	1.06	1.30

Inflationary Environments

Having examined the impact of interest rate environments, it is also interesting to discuss inflation. Since both the buy-and-hold and trend following strategies allocate capital across asset classes, including commodities and currencies (buy-and-hold has only commodities), the inflationary environment may play an important role over time. Even outside this long-term historical study, in current times, threats of new, high-inflationary environments are rather pertinent. In light of the current *stimulative monetary policies* undertaken across the globe since the financial crisis of 2008, it may be reasonable to anticipate that these policies may eventually lead to higher inflation globally.

To examine the impact of different inflationary environments, using consumer price index and producer price index for the United States and the United Kingdom starting in 1720, a composite inflation rate index can be constructed. This composite inflation index is plotted in Figure 1.6.

From 1720 to 2013, the composite inflation rate is above 5 percent more than 25 percent of the time and above 10 percent more than 13 percent of the time. Inflation can be divided into *low* (less than 5 percent), *medium* (between 5 percent and 10 percent), and *high* (above 10 percent). Performance can then be examined across different inflationary environments. Despite the large differences in inflationary environments, trend following performs roughly the same across all three types of inflationary environments: low, medium, and high. Table 1.3 summarizes the performance of trend following across different inflationary regimes. The robust performance for trend following across these inflationary regimes suggests that the strategy seems to be able to adapt to different inflationary regimes.
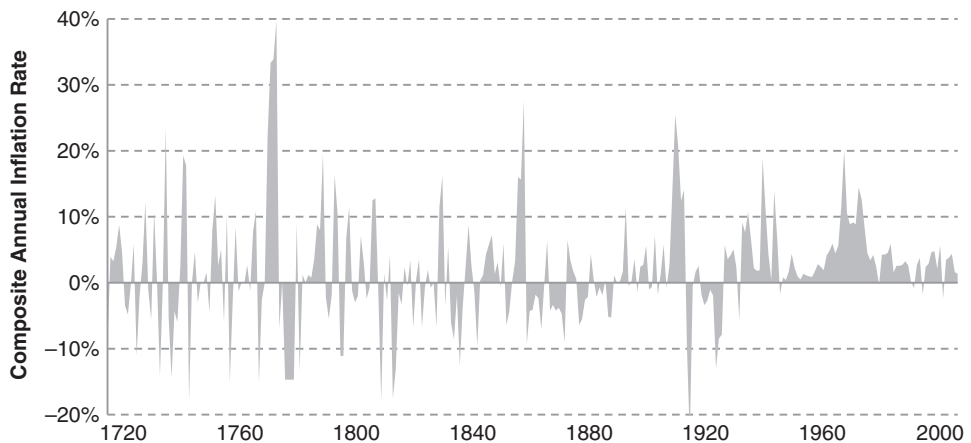
FIGURE 1.6 A composite annual inflation rate for the United States and the United Kingdom from 1720 to 2013.
Source: Global Financial Data.

TABLE 1.3 **Performance for trend following in different inflationary environments during the period from 1720 to 2013.**

	Inflation <5%	5%< Inflation <10%	Inflation >10%
Average Return (annual)	10.4%	10.1%	14.9%
Standard Deviation (annual)	12.0%	9.90%	14.6%
Sharpe Ratio	0.87	1.02	1.02

Financial Bubbles and Crisis

As an illustrative example, the Dutch Tulip Bubble of the 1600s was briefly discussed in the chapter introduction. Over the centuries, numerous financial crises (or market bubbles) have plagued financial markets. Based on its global impact and severity, the 1929 Wall Street Crash (the notorious Black Monday of October 28, 1929) is another good example. Figure 1.7 plots the two-year period surrounding this date. Black Monday is the spectacular day when the Dow Jones Industrial index lost 13 percent.

Figure 1.8 plots the cumulative performance of the representative trend following system over the same period from Figure 1.7. During the month of October 1929, a month where the Dow Jones lost approximately half of its value, the representative trend following system had a slightly positive return. Even more astonishing during the two years pre- and post-crash, trend following earned a roughly 90 percent return with much of this return coming post-crash during the start of the Great Depression.

The positive performance of trend following during crisis periods is not specific to the 1929 Wall Street Crash or the performance during the Dutch Tulip mania. In fact, the strategy seems to perform well during most of the difficult periods throughout history. Taking a closer look at negative performance periods for both fixed income and equity markets, the average performance for trend following is plotted in Figure 1.9. In this figure, the conditional average returns for trend following are positive for months when the equity index experienced negative performance. For
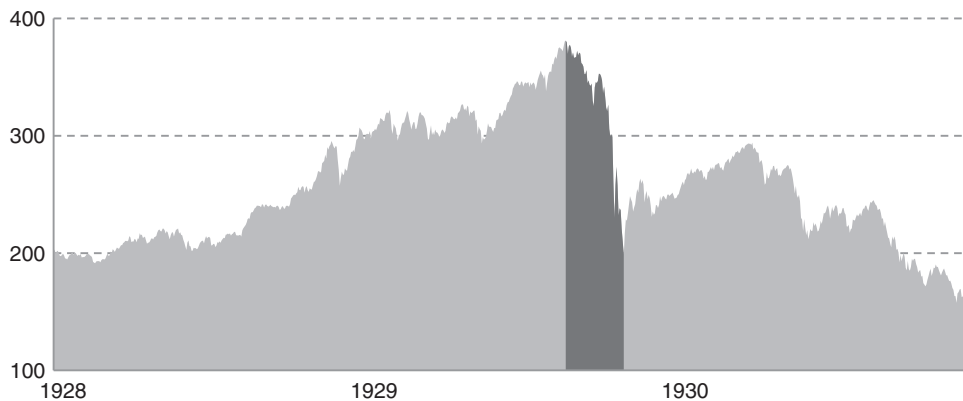
FIGURE 1.7 The Dow Jones Industrial Index during the 1929 Wall Street Crash (Black Monday). *Source:* Global Financial Data.
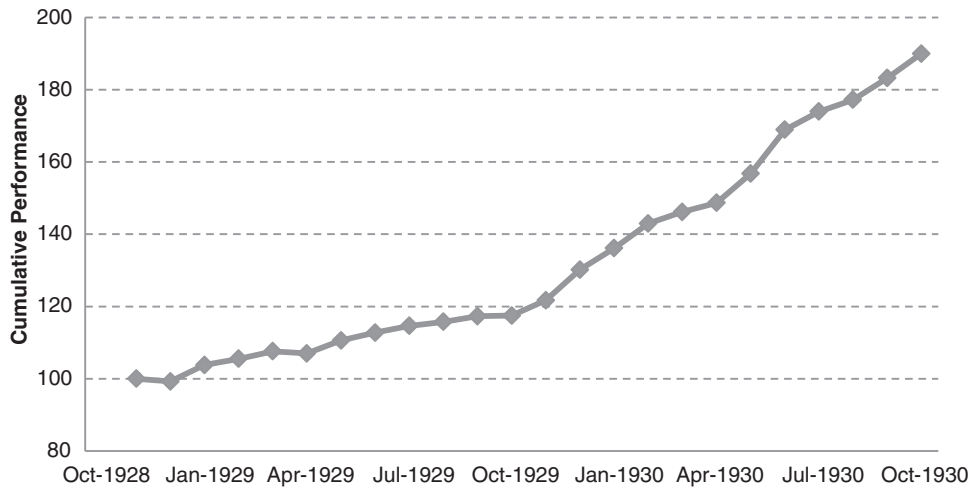
FIGURE 1.8 Cumulative performance for the representative trend following system pre and post the 1929 Wall Street Crash (Black Monday). The data period is October 1928 to October 1930.
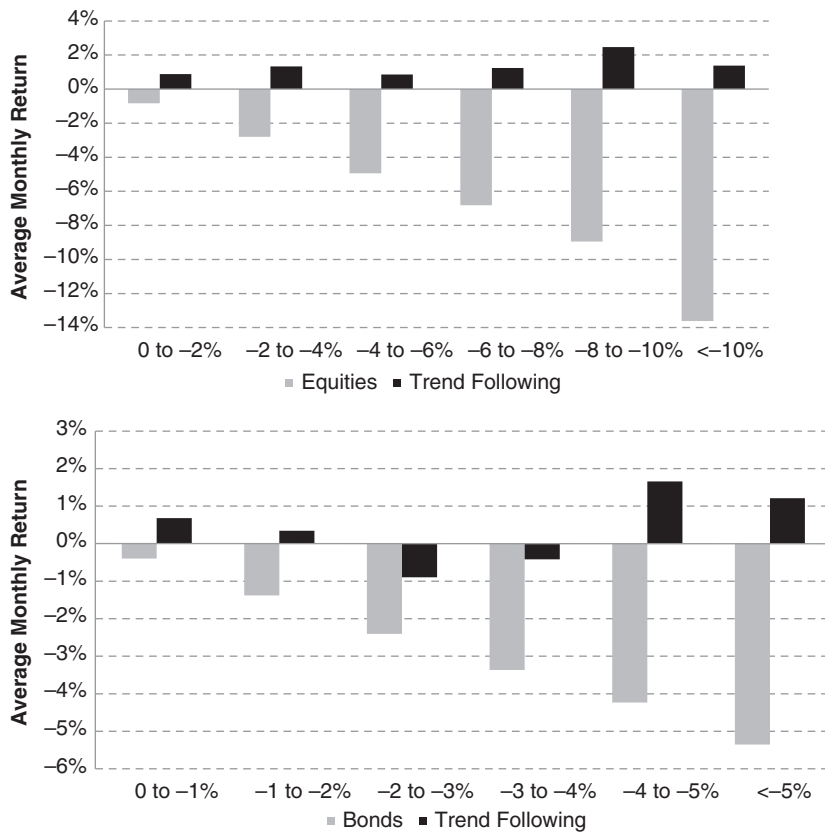
FIGURE 1.9 Average monthly returns for the representative trend following system during down periods in equity and bond portfolios.
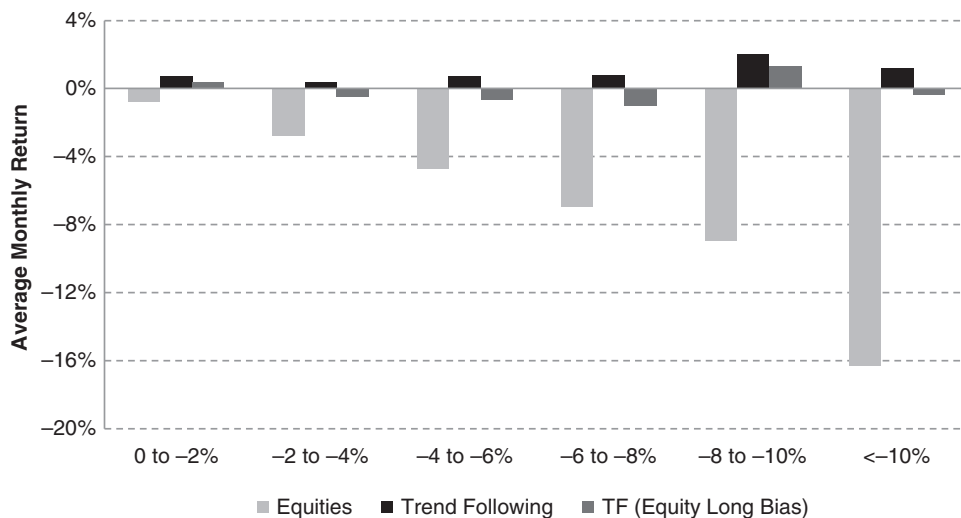
FIGURE 1.10 Average monthly returns for trend following when the equity index is down. Conditional performance is plotted for both with and without a long bias to the equity sector.

example, in the top panel of Figure 1.9, the average trend following return is 0.2 percent for the 98 months when the equity portfolio return is between –4 and –6 percent. The bottom panel in Figure 1.9 shows a less consistent pattern with reference to the bond index. The mean return for trend following is positive for months when bond returns are negative. The performance of trend following seems to be good even when equity and bonds perform at their worst.[13]

In addition to capturing trends outside equity markets, a portion of trend following performance during down periods can also come from the ability to short sell. For example, if short sales are restricted in equities, trend following will have a long bias in equities, the performance (with and without the long bias) during down months in equities can be discussed for the past 300 years of the dataset. Figure 1.10 plots a comparison of with-and-without long bias to equities for down periods in equities. This figure demonstrates that a long equity bias reduces the performance of trend following during down equity months. For a concrete example, for months when the equity index was down more than 10 percent, the standard (balanced) trend following system returned 1.2 percent on average historically, while the system restricted to long equities returned a slightly negative average return. Slightly negative may seem disappointing, but putting this into the perspective of a pure long portfolio, slightly negative pales in magnitude when compared with the unfortunate long only equity investor who lost roughly 14 percent.

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[13] In Chapter 4, the concept of adaptive markets and crisis alpha are explained at length. Crisis alpha, performance during crisis periods, is a key characteristic of trend following. This concept is discussed throughout the rest of this book.

Market Divergence

Markets move and adapt over time. Periods when markets move the most dramatically (or periods of elevated market divergence) are those that provide "trends" suitable for trend following strategies. At the monthly level, the simplest way to demonstrate this is to divide performance into quintiles (five equal buckets). These buckets represent the worst equity return performance (1) to the best equity performance (5). Figure 1.11 and Figure 1.12 plot the conditional performance of trend following for each of the five quintiles. Figure 1.11 plots the past 100 years of the dataset divided into two subperiods: 1913 to 1962 and 1963 to 2013. Figure 1.12 divides these two periods into two further 25-year subperiods: 1913–1937, 1938–1962, 1963–1987, and 1988–2013. These figures demonstrate a phenomenon practitioners often call the "CTA smile." Trend following returns tend to perform well during moments when market divergence is the largest. For example in the four 25-year time periods, the first period, which includes the Great Depression and the 1929 Wall Street Crash, exhibits the well-known "CTA smile": the best performance is during the best and worst moments for equities. The period after the Great Depression is a period when the best periods for equities were the best for a trend following strategy. The third time period also exhibits the smile. Finally, the past 25 years, a time period including the credit crisis and the tech bubble and other crises, is a time period when the most opportunities have come during the worst periods for equity markets. The convex performance (performance on both extremes)
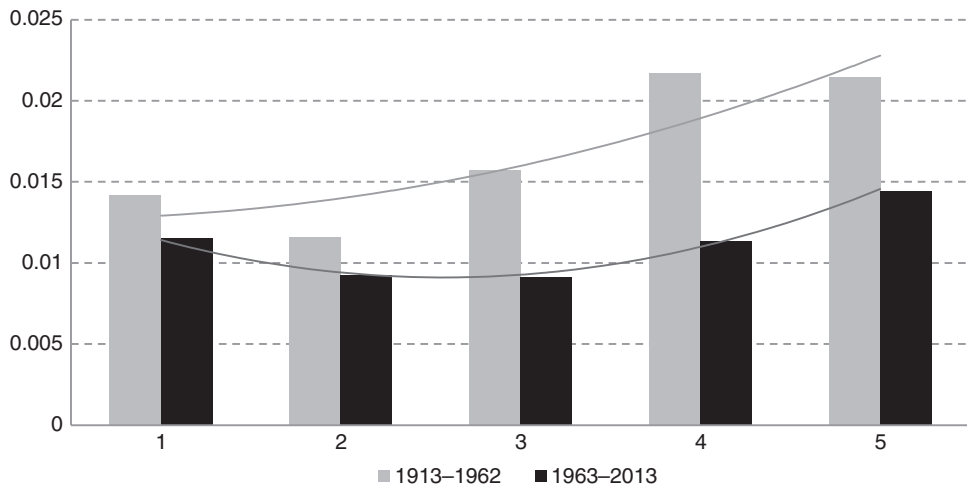
FIGURE 1.11 The "CTA Smile": Quintile analysis of trend following for 1913–1962 and 1963–2013. Returns are sorted by quintiles of equity performance from 1 (worst) to 5 (best).
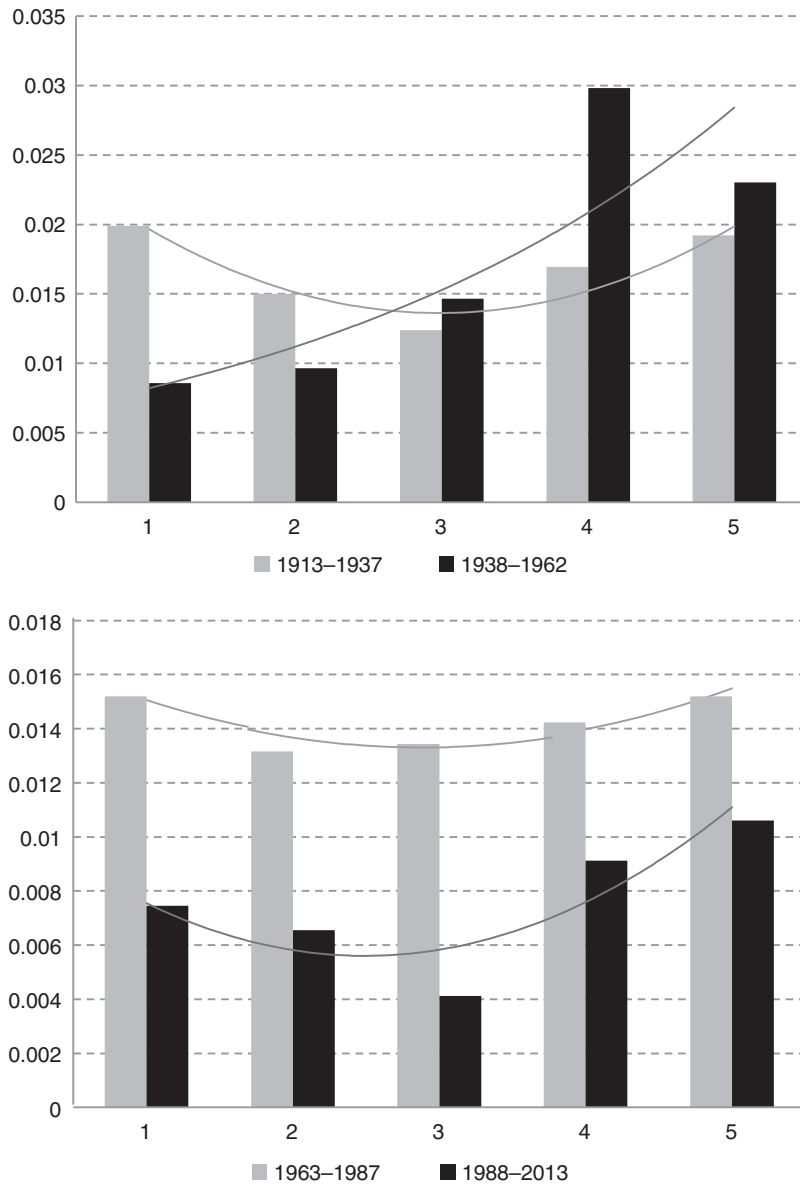
FIGURE 1.12 The "CTA Smile": Quintile analysis of trend following for 1913–1937, 1938–1962, 1963–1987, and 1988–2013. Returns are sorted by quintiles of equity performance from 1 (worst) to 5 (best).

of trend following demonstrates the role of divergence or dislocation in markets (for good or for bad). Divergence is discussed at length in Chapter 5 of this book. This concept helps to motivate an index based on divergent risk taking principles, setting the scene for benchmarking and style analysis from a modern perspective in Chapters 12 and 13.

Because the "CTA smile" demonstrates a convex relationship between trend following and equity markets, it is not surprising that many investors label trend following as "long volatility." Although trend followers perform well at the extremes, not all volatility is created equal. If volatility increased and there were trends across markets, trend followers are long volatility. If volatility increases and there are no trends, trend followers may be flat or even look like short volatility.[14] Put more simply, trend following is long market divergence. Market divergence and volatility are related but they are by no means the same. Market divergence will be explained in further detail in Chapter 5.[15]

■ Risk Characteristics over the Centuries

The principle of "let profits run and cut short your losses" enables trend following to achieve a desirable risk profile with more small losses as opposed to large drawdowns.[16] In statistical terms, trend following returns exhibit positive skewness. Over the roughly 800-year period, the skewness for monthly returns is 0.30. Positive skewness indicates that the chance for left tail risk or large drawdowns in trend following is relatively small. This characteristic is somewhat unique to trend following. Most asset classes and strategies exhibit negative skewness.[17]

In addition to positive skewness for the same roughly 800-year period, trend following has low correlation with traditional asset classes. To quantify the relationship between trend following and the traditional asset classes, a simple equity index and a simple bond index can be constructed by averaging the monthly returns of several global equity indices and bond markets.[18] The overall correlation between the monthly returns of the representative trend following system and the equity index is 0.05, and 0.09 with the bond index. Given that these correlations are a proxy for the relationship between trend following with bond and equity markets, it is not surprising that the betas for trend following with both equity and fixed income are generally extremely low.

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[14] For further discussion of this topic from a behavioral finance perspective, see Kaminski (2012).

[15] Market divergence takes into account the price trend and volatility. Volatility takes into account only relative price movements. See Chapter 5.

[16] The concept of divergent risk taking is explained in Chapter 5.

[17] Positive skewness for trend following is discussed directly in Chapter 7.

[18] The equity index is the average of monthly total returns of FTSE 100 index, S&P 500 index, CAC 40 index, and the Japanese Nikkei 225 index, and the bond index is constructed by the average monthly returns of U.S. 10-Year Treasury Note, French 10-Year Bond, and the Japanese 10-Year Bond and GFD long-term government bond index. Before the existence of these several individual stock indexes or bond markets, the returns of equivalent markets were used to extend the data. The equity index starts in 1693. The bond index starts in 1300.
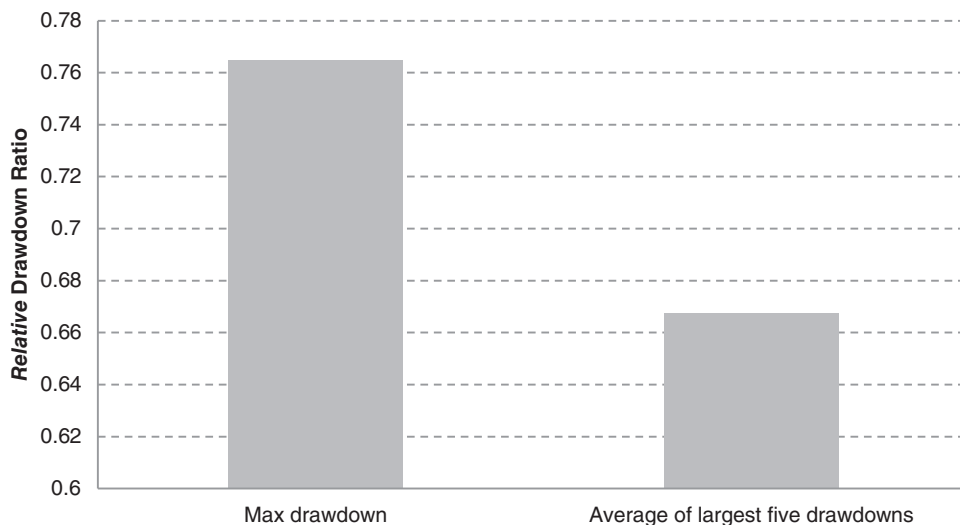
FIGURE 1.13 The maximum and average of the largest five relative drawdowns as a percentage for trend following relative to the buy-and-hold portfolio. The maximum drawdown of trend following is 75 percent of the magnitude of the maximum drawdown for the buy-and-hold portfolio.

Outside of skewness and correlation, drawdown is another important concern for most trend following investors. Figure 1.13 plots the maximum drawdown and the average of the five largest drawdowns for the representative trend following system relative to the corresponding largest drawdowns of the buy-and-hold portfolio. Drawdowns for trend following are significantly lower relative to the buy-and-hold portfolio. The maximum drawdown for trend following is approximately 25 percent lower than the maximum drawdown of the buy-and-hold portfolio. The average of the top five drawdowns for trend following is roughly a third lower than the average of the top five drawdowns for buy-and-hold.

As shown in Figure 1.14, the drawdown durations for trend following are also substantially shorter than those experienced by the buy-and-hold portfolio. During the past 700 years, when compared to the buy-and-hold portfolio, the duration of the longest drawdown and the average duration of the longest five drawdowns are 90 percent and 80 percent shorter, respectively. The superior drawdown profile of trend following is related to the positive skewness of returns and the negative serial correlation.[19] Issues related to drawdown in trend following portfolios will be discussed further in Chapter 8, and again from a portfolio perspective in Part VI of the book.

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[19] For a more detailed theoretical analysis of drawdown, see Bailey and Prado (2013).
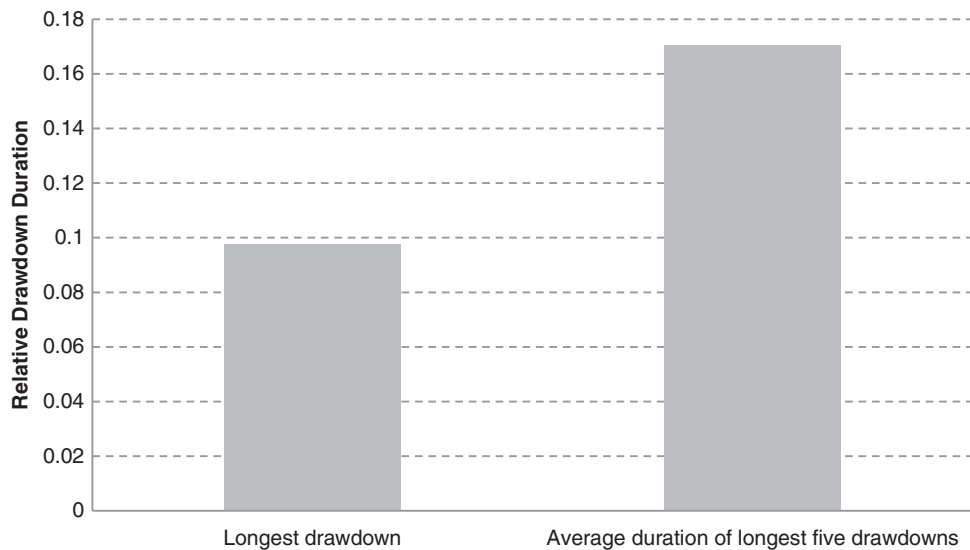
FIGURE 1.14 The relative size of the longest duration and average duration of the longest five drawdowns for trend following relative to the buy-and-hold portfolio. The longest drawdown duration is less than 10 percent of the length of the longest drawdown length for the buy-and-hold drawdown.

■ Portfolio Benefits over the Centuries

The previous sections discussed the return and risk characteristics of trend following over the centuries. Over an extensive 800-year period, trend following portfolios exhibit robust performance with a Sharpe ratio of 1.16. The strategy has low correlation with traditional asset classes, interest rate regimes, and inflation. In addition, performance during crisis periods is positive across the entire sample. A rough look across quintiles in equity markets demonstrates that divergence in market prices is a driver of trend following performance. The strategy also exhibits positive skewness and smaller drawdowns than buy-and-hold strategies. All of these characteristics make trend following a good candidate to diversify traditional portfolios.

During the period beginning in the 1690s up until 2013, the equity index achieves a reasonably high Sharpe ratio of 0.7.[20] For an even longer period beginning in the 1300s up until 2013, the bond index also has a positive Sharpe ratio. Despite the fact that both indices are positive, the Sharpe ratio for trend following is still much higher than a combined buy-and-hold strategy. This suggests that adding some trend following may improve upon a buy-and-hold strategy. Table 1.4 displays the portfolio benefits created by combining the buy-and-hold portfolio (incorporating either the equity or

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[20]The equity index is the same index from the previous section.

TABLE 1.4 Performance for the equity index, bond index, trend following, and combined portfolios. The sample period is 1695–2013 for the equity index and 1300–2013 for the bond index.

	Equity and Trend Following: 1695–2013			Bond and Trend Following: 1300–2013		
	Equity	TF	Equity+TF	Bond	TF	Bond+TF
Average Return (annual)	7.85%	10.74%	9.68%	6.57%	12.97%	7.74%
Standard Deviation (annual)	11.28%	12.91%	8.81%	7.31%	11.21%	5.44%
Sharpe Ratio	0.7	0.83	1.1	0.9	1.16	1.42

bond indices) with an equal allocation to the representative trend following portfolio.[21] The start dates for this analysis correspond to the first availability of data for equity and bond markets. In an equal risk allocated portfolio, the performance improvement (over both the traditional equity and bond portfolios) is relatively substantial.

Adding trend following to a traditional equity or bond portfolio improves the Sharpe ratio of both indices. To examine this from the perspective of a traditional investment portfolio, trend following can be added to a typical 60/40 equity bond portfolio. For example, a combined portfolio can be constructed such that it consists of 80 percent of a traditional 60/40 portfolio and 20 percent trend following. In this case, this translates to 48 percent of equities, 32 percent of bonds, and 20 percent of trend following.[22] Figure 1.15 plots the performance in terms of Sharpe ratio for

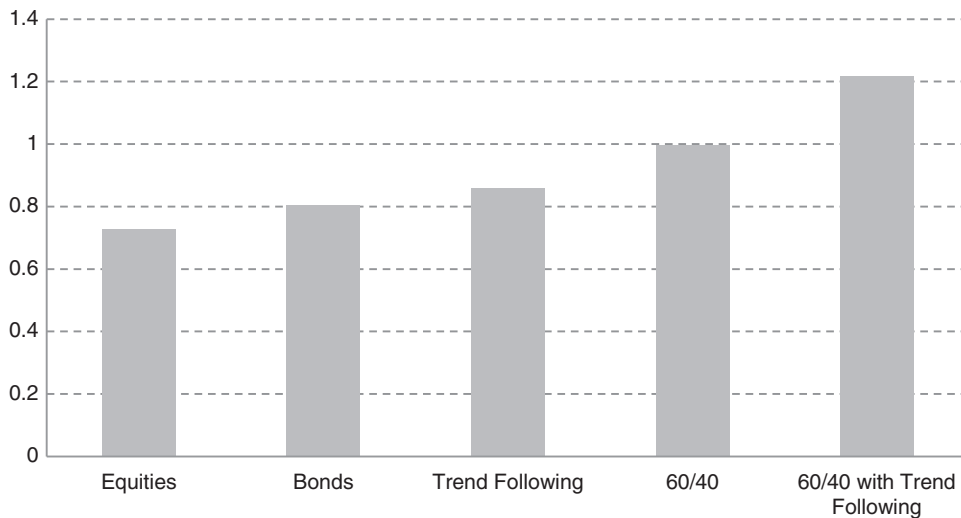**FIGURE 1.15** Sharpe ratios for individual asset classes including equity and combinations of the three asset classes from 1695 to 2013.

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[21] When trend following is combined with the equity or bond portfolio, the trend following strategy is levered to the same volatility as the equity or bond portfolio.

[22] Before combining them, the different asset classes are normalized to the same volatility.

the individual portfolios, the trend following portfolio, the 60/40 portfolio, and the combined 60/40 and trend following portfolio. During the period of 1695 to 2013, a 20 percent allocation to trend following is able to boost the Sharpe ratio of a 60/40 portfolio from 1.0 to 1.2.

■ Summary

The use of trend following as an alternative investment strategy has certainly grown over the past 30 years. Using roughly 800 years of market data, trend following can be viewed from a long-term perspective. Over the centuries, empirically, trend following has provided distinctly positive returns, a high Sharpe ratio, as well as low correlation with traditional asset classes, inflation, and interest rate regimes. The strategy provides consistently positive performance during crisis periods and the performance seems to be linked to divergence across markets. From a portfolio perspective, the combination of trend following with traditional portfolios such as a 60/40 portfolio significantly improves risk adjusted performance.

■ Appendix: Included Markets and Relevant Assumptions

Sector	Market	Sector	Market
Commodities	Aluminum	Commodities	Hops
	Brent Crude Oil		Iron Ore
	Butter		Lean Hogs
	Cheese		Live Cattle
	Coal		Malt
	Cocoa, NY		Manufactured Iron
	Cocoa, London		Natural Gas
	Coffee		Nickel
	Copper		Oat
	Corn		Orange Juice
	Cotton		Platinum
	Crude Oil		Rice
	Feeder Cattle		Rye
	French Gold Coin Mintage in Livres Tournois		Silver
			Soybeans
	French Silver Coin Mintage in Livres Tournois		Soyameal
			Soyaoil
	Gas Oil-Petroleum		Sugar #11
	Gold		Sugar, White
	Heating Oil		Tobacco

(Continued)

Sector	Market	Sector	Market
Commodities	Wheat	Currencies	Canadian Dollars per British Pound
	Wheat, Hard Red Winter		CHF/USD
	Wood		Dutch Guilders per British Pound
	Wool		EUR/USD (DEM/USD)
	Zinc		GBP/USD
Bonds	Bankers Acceptance Canada		Hamburg Mark for Paris Francs
	Canadian 10-Year Bond		Hamburg Mark for Vienna Crowns
	Euro-BUND		JPY/USD
	Eurodollar		Portugal Escudo per US Dollar
	France 10-Year Bond		Swedish Krona per British Pound
	Gilts		
	Japanese Bond	Equities	Australian SPI200 Index
	Long-Term Government Bond		CAC 40
	Netherlands 10-Year Bond		DAX Index
	Short Sterling		E-Mini Nasdaq 100 Index
	UK Consolidated		E-Mini Russell 2000 Index
	U.S. 10-year T-Note		E-Mini S&P 500 Index
	U.S. 2-year T-Note		FTSE 100 Index
	U.S. 30-year T-Note		Hang Seng
	U.S. 5-year T-Note		Italy All Index
	Venice Prestiti		Nikkei
Currencies	AUD/USD		Singapore MSCI Index
	CAD/USD		Taiwan MSCI Index
			Tokyo Stock Exchange Index

Assumptions and Approximations

There are several assumptions and approximations, which are made to allow for a long-term analysis of trend following. For simplicity, these are listed below.

1. Futures Prices First: When available, futures market returns are used.
2. Equity and Fixed Income: Prior to the availability of futures data, index returns are used for both equity and fixed income markets. Total returns are constructed using the appropriate short-term interest rates.
3. FX: For currency markets, spot price returns are adjusted by the interest rates differential of the two relevant currencies. When interest rates are not available, spot returns for currencies are used without adjustment.

4. Commodities: For commodities in the absence of futures price data, cash market returns are used.

5. Excess Cash Return: The interest earned on collateral and cash returns are excluded from this analysis.

■ Further Reading and References

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