
CHAPTER 2

So You Want to Be a Hedge Fund Manager

You are reading this book because of your interest in hedge funds: you want to work in one, maybe establish a new one; or you want to regulate them, write about them, perhaps even abolish them. In any case, you need to understand what they are and how they do what they do.

In this book we strive to present the essential concepts for quantitative fund management. We need to make some assumptions about our audience in order to frame our presentation. So we will assume you want to manage a fund, and we'll get you started on the basics from that viewpoint. We will also focus on stocks in the U.S. markets.

Let's first start with some context. What is *investing*, and how does that relate to *stocks*?

The Economic Role of Investing

Economies grow by applying accumulated capital, along with other resources, to produce increasing amounts of goods and services. Capital is accumulated from the savings of households when they do not consume all of their income. Savings are invested in financial instruments if they can offer an attractive return. So available capital is constrained by household savings, and the investments that households make will be those expected to have the best prospects (to offer the best prospective return). Those finite resources (savings) are used most efficiently if there are institutions that help redeploy capital from assets with a poor return to those with superior return. That is the role for the financial sector, of which hedge funds are a major part.

Investors can deploy their savings to a variety of financial instruments and institutions. The simplest version is to buy specific instruments, like *individual stocks and bonds*. The problem for small investors is that they may not have enough capital to diversify over a range of instruments to control risk. *Mutual funds* pool several investors' capital together and collectively purchase a diverse portfolio consistent with the fund's charter (e.g., large and mature companies; or small, speculative companies; or short-term corporate bonds; or long-term municipal bonds). "Mutual funds" are their American name; they go by other names elsewhere, such as unit investment trusts in the United Kingdom. Mutual funds allow small investors to achieve diversification. As such, they are heavily regulated—by the Securities and Exchange Commission (SEC) under the Investment Company Act of 1940 in the United States, for instance.

What Are Hedge Funds?

Mutual funds are restricted to investing pursuant to their charter, outlined to prospective investors in a "prospectus." Most funds aspire to be fully invested most of the time. The first hedge fund, created by ex-journalist Albert Winslow Jones in 1949, specifically undertook a more flexible investing style. Jones specifically would "pair" trades, for instance, identifying two companies whose fortunes he expected to move in opposite directions—say two competitors in a duopolistic industry. Jones would buy stock in one company ("go long" that company) and bet against the competitor ("go short" the competitor). This was a "hedged" strategy, in that his "short" hedged against the possibility that the entire market (and thus individual stocks) might move against his position. Jones, in fact, called his fund a "hedged fund" and objected to the term's bastardization into the now-common "hedge fund."

From the industry's beginnings in the mid-20th century, hedge funds grew at a relatively modest rate for the first quarter century, only passing $100 billion in assets under management (AUM) in the early 1990s. But thereafter the industry grew rapidly, passing $500 billion around 2000, and $1 trillion around 2004. The roughly 10,000 extant hedge funds now manage over $2 trillion. If these assets were distributed uniformly among funds—which they definitely are not—a typical fund would manage $200 million, and earn fees of several million dollars a year. No wonder they've piqued your interest!

How Hedge Funds Differ from Mutual Funds

Both types of funds represent pools of investors putting their capital in the hands of a manager. But mutual funds are far more transparent than hedge funds. Mutual funds have accepted SEC regulation as the price of having legal access to millions of small investors. Mutual funds must specify their strategies in their prospectus, and report their holdings and their results regularly.

Hedge funds, by contrast, are very lightly regulated. In the United States, restrictions imposed on investor qualifications serve to replace regulation: eligible investors must be "accredited," with levels of assets that put them in the upper few percent of American households. The implicit argument is that prosperous individuals can take care of themselves. Hedge funds are prohibited from advertising. (This may soon change, as outlined in the final chapter). In fact, many hedge fund managers shun publicity, in part to avoid any hint that they are engaged in backdoor advertising through the news. Hedge funds' original investors were wealthy individuals and families, but by the 1990s these were overtaken by large institutions such as charitable endowments and pension funds.

Hedge funds' legendary secretiveness goes far beyond skittishness about running afoul of the regulators. Finance is an industry where legally protecting intellectual property (like a new financial product or investing strategy) is virtually impossible, so secrecy is the only way to prevent (or more accurately, delay) competitors from copying your innovations. Hedge funds generally do not disclose their holdings and strategies publicly—and often report them to their investors only in the broadest terms, after the fact. Pulling back this curtain is one of the main motivations behind this book.

Hedge Fund Strategies

With thousands of funds, there are many possible ways to categorize their strategies. Strategies of many funds fall into four major types:

- *Equity*—where the emphasis is on stock selection. Many equity funds follow A. W. Jones's original long/short model.
- *Arbitrage*—where managers seek instances where price relationships between assets fall outside of normal variation, and bet on the relationship returning to normal. Early practitioners plied this trade in fixed income markets, but it now occurs in any market where quantitative analysis can identify price discrepancies to exploit.
- *Momentum or direction*—where managers have a macro view of the probable direction of prices in a market.
- *Event-driven*—trades instigated based on an event, such as a war, a supply disruption, or a merger. In the 1990s, "global macro" funds gained in prominence, mainly using event-driven strategies. Several prominent funds made their reputations in merger arbitrage.

This is only one way to categorize strategies; you will encounter others. Because the industry is relatively young and innovation is so continuous, no taxonomy will last long.

Managers can be long-only (they make money only if the asset rises in price), short-only (they profit only if the asset's price falls), or (most commonly) hedged (both long and short, although usually not equally). In addition, because the profits per transaction for many of these trades will be quite small proportionally, many hedge funds borrow extensively to "leverage" their investment. (UK investors refer to "leverage" as "gearing.") So a "130/30" equity strategy, for example, has gone long with 130 percent of available capital (by borrowing 30 percent over and above 100 percent equity capital), and has shorted 30 percent of the portfolio as a hedge.

Many of these distinctions will be elaborated in later chapters. Because the investing industry is so densely populated and so heavily compensated (as discussed later), there is intense competition to identify opportunities for likely profit. The original hedge funds operated mainly on experience and instinct: funds founded by Jones, Robertson, Michael Steinhardt, or Soros are each examples. By the 1990s, quantitative finance had matured as an academic discipline and computing power had become inexpensive enough that it was possible to examine many thousands of relationships among asset prices. The statistical work was often conducted by economists, physicists, or mathematicians, who collectively came to be termed "rocket scientists." Some of the

foundations of this "quant" analysis approach will be introduced in this book.

Funds of Funds

Because hedge funds are barred from advertising (thereby making any search for a fund more challenging), choosing the right fund can be difficult for a client. Furthermore, the range of strategies is very wide, and intense competition among hedge funds and major Wall Street institutions can rapidly erode the effectiveness of any strategy. So institutional clients increasingly are turning to "funds of hedge funds"—managers who select the hedge funds into which to invest clients' money, monitor those funds' strategies and performance, and reallocate among funds as market conditions change. Funds of funds add their own fees on top of the fees charged by hedge funds themselves.

Hedge Fund Fees

Mutual funds cover their expenses based on an "expense ratio," measured as a percentage of assets under management. The median fund charges a bit more than 1 percent of assets each year. (Many funds also charge a "load"—a fee paid either at the time of original purchase or when the investor liquidates his holdings, known as a "front end load" or "back end load.") Note that the expense ratio is *not* dependent on performance—an investor pays it regardless of how his investment performed. This can be grating in a year when returns are negative: the investor is paying for the privilege of seeing their assets decline.

By contrast, hedge funds are compensated in a hybrid structure, with one part being a traditional expense ratio—usually 2 percent, not 1 percent —and the remainder being a portion of the fund's returns—customarily 20 percent. The 20 percent performance fee is of absolute performance, not for performance above a benchmark. This "2 and 20" fee arrangement is common, identical to that in private equity firms (investment firms that buy a privately held company and improve its operations in order to sell it later at a profit, usually in a public stock offering). However, it is not a universal standard: Funds with superior reputations may charge much more. In its heyday, Renaissance Capital's Medallion Fund charged 5 percent annually and 44 percent of returns, and we've heard of incentive fees as high as 55 percent of returns. However, as the industry has become more crowded and its downside protection was sorely tested in the 2008 market meltdown, some firms are dropping their fees to as low as 1 percent annually plus 10 percent performance fee.

These fees have been sufficient to make many hedge fund founders billionaires. Sometimes they have earned it, generated annual returns of the long term well in excess of 20 percent annually (well over twice the return of most stock indexes). But since the industry as a whole has disappointed lately, critics argue that hedge funds overcharge and underdeliver.

How Hedge Funds are Evaluated (I): Return

The core issues in evaluating any investment are return and risk.

Return is straightforward: Compare the value of holdings at the end of a time period (a year, or a day) to the value at the beginning. In mathematical terms

$$\text{Return} = [\text{Value}(t)/\text{Value}(t-1)] - 1, \text{ where } (t) \text{ indicates a time period.}$$

Example:

$$\begin{aligned} \text{Value}(t) &= \$110 \\ \text{Value}(t-1) &= \$100 \\ \text{Return} &= [\$110/\$100] - 1 = 1.1 - 1 = .1 = 10\%. \end{aligned}$$

For much of this book, we will be considering daily returns. Commonly, to compare investments, returns are annualized, converting days to years. This is done by compounding the daily return by the number of trading days in a year, 252 as follows (in Python):

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annual_return = cumprod(daily_returns+1) – 1
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There are 260 weekdays in a 52-week year, but generally markets are closed for about 8 days each year for holidays.

Since money left in a growing asset compounds (like interest), the right way to compute an annual return over several years is the *compound annual growth rate* (CAGR). Say, your portfolio was worth $200 in 2012, after starting at $100 in 2002. That's a 100 percent *cumulative return* over 10 years. But the annual return is not simply [100 percent/10 years] or 10 percent because that computation ignores the compounding effect.

Compounding over multiple years is captured by raising an annual return to an exponent, representing the number of years that the return compounds (in this case, 10 years). In the aforementioned example

$$\$200 = \$100 \times (1 + \text{annual return}) \wedge 10$$

Since annual return, or CAGR, is unknown, we must rearrange this equation:

$$\begin{aligned} [\$200/100] &= (1 + \text{CAGR}) \wedge 10 \\ 2 &= (1 + \text{CAGR}) \wedge 10 \\ 2\wedge(1/10) &= 1 + \text{CAGR} \\ \text{Since } 2 \wedge 1/10 &= 1.072, \text{ then} \\ 1.072 &= 1 + \text{CAGR, and} \\ \text{CAGR} &= 7.2\% \text{ (i.e., } 1.072 - 1) \end{aligned}$$

So a portfolio that grows at 7.2 percent on average each year will double in size in 10 years. We use the term *CAGR* to remind us that we need to reflect the effects of compounding in computing annual returns. In this instance, the effect of compounding was substantial: 7.2 percent compound annual growth was enough to double a portfolio in 10 years, whereas it would need to grow at 10 percent annual if the growth process was "simple" (not compounded).

Compounding, and exponential math, is very difficult to develop intuitively or to mentally calculate easily. We chose this example to introduce you to your new best friend: the *Rule of 72*. It is an approximation of compounding. This rule states that you can approximate the number of periods that will be needed for a sum to double by dividing the CAGR (in whole numbers) into the number 72. A portfolio growing at 8 percent will need about 9 years to double, because $8 \times 9 = 72$. At 6 percent CAGR, 12 years will be required to double ($6 \times 12 = 72$). Similarly, you can infer a CAGR if you know the starting and ending values of a portfolio and the time elapsed. So if a portfolio doubled over 15 years, you know that its CAGR was a bit less than 5 percent; specifically, 4.8 percent ($15 \times 5 = 75$; $15 \times 4.8 = 72$).

Wall Street interviewers routinely ask the interviewee compounding math problems that most people cannot calculate mentally without a shortcut like this. It is also effective for portfolio growth that is a multiple of two, even a large one. For example, an asset that grew from $100 to $400 has grown four-fold, or 2×2 ($2 \wedge 2$); to $800 is eight-fold ($2 \wedge 3$), and so forth. This can be very helpful when considering portfolio growth over long time periods: A 100-fold increase is a bit less than $2 \wedge 7$; 1000-fold is almost exactly $2 \wedge 10$ ($2 \wedge 10 = 1{,}024$).

Hedge funds typically receive an incentive or performance fee based on return: 20 percent of the investor's return over and above a 2 percent management fee. So, for example, if the hedge fund returns 4 percent in a year, the fund managers will receive 2 percent fee plus ($0.2 \times [4\% - 2\%] = 0.4\%$), or a total compensation of 2.4 percent of AUM. In that example, the managers kept 60 percent of the portfolio's return (2.4%/4%). If the portfolio earned 10 percent in a year, the fund's compensation would be 2 percent plus [$0.2 \times (10\% - 2\%) = 1.6\%$], or 36 percent of the portfolio's return. In other words, all (100 percent) the first 2 percent of the portfolio's return goes to the fund manager, then 20 percent of any returns above 2 percent. Note that if the portfolio's returns are negative, the manager will earn no incentive fee, but the 2 percent management fee will represent far more than the (negative) return the client earned.

As you can see, hedge fund fees are very generous to fund managers.

How Hedge Funds Are Evaluated (II): Return Versus Benchmark (Relative Return)

Compensating managers based on absolute return implies that no positive return could have been earned otherwise: that the only alternative would be to put your money under your mattress. But realistically, investors have a vast array of alternatives, from short-term fixed income instruments such as commercial paper or treasury bills to a range of equities (stocks). Investment managers

are commonly compared to a *benchmark:* a nonmanaged investment that presents a relevant comparator. For funds that invest in equities, the most common benchmark is a stock *index* such as the S&P 500 (the 500 largest companies, measured by market capitalization, traded on U.S. stock exchanges). Funds that use narrower strategies can be compared to narrower and more pertinent indexes or a weighted combination of more than one index (with the weights based on the asset class weights in the strategy). Finally, a few research firms such as Hedge Fund Research, Inc. compile an index of hedge fund performance (HFRX). However, this index has significant drawbacks, which are outlined later.

Decades of financial academic research, drawn mainly, although not solely, from mutual funds, has demonstrated that very few active investment managers produce consistent performance that exceeds their benchmark. (Exceeding a benchmark constitutes *alpha*, a measure of investing skill, defined later.) This is a major investor relations problem for active managers: Activity imposes management and trading costs, which are only justified if they produce superior returns to "passive" (unmanaged) investing. Many studies by finance academics have found such justification very hard to come by: Active management at best matches, and more typically underperforms, benchmark indexes *before* management costs. Frequent trading—common for active managers—and fees pose a considerable further drag.

With hedge funds, those fees are significantly higher than with mutual funds. Studies of hedge funds have found that managers can frequently generate positive alpha (outperform their benchmark), but their compensation absorbs at least half of the portfolio's annual excess return over the benchmark. One recent analysis found that over the life of the industry for which performance data were available (1998 to 2010), managers absorbed between 84 and 98 percent of the total profits earned. In other words, clients kept only one-fiftieth to one-sixth of total return. And in one-fourth of those years, total profits were negative—but fund managers were still paid 2 percent of AUM. John Bogle, the founder of Vanguard mutual funds, which originated indexed investment, has famously said about mutual funds that investors "get what they *don't* pay for." The analog for hedge funds would be "no gain without at least equal pain": investors will pay high fees regardless, so that in a good year they will share returns about equally with their managers. In a bad year, the client will bear all of the pain—negative returns, depressed further by the 2 percent management fee.

How Hedge Funds Are Evaluated (III): Risk

Hedge funds' rationale is not solely to maximize return but also to control risk—that's the reason for the term "hedge." Risk is operationalized as **volatility** of a portfolio's returns. Figure 2.1 illustrates two portfolios of differing volatility: the Dow Jones Industrial Average (an index of 30 stocks) versus a particular fund, over the period from March 2009 to July 2012. Both earned similar cumulative returns (a cumulative 43 percent for the Dow and 33 percent for the fund, or 11.6 percent and 9.2 percent annually, respectively), but the fund did so with significantly less volatility: short-term spikes and dips in price were less frequent and less pronounced. This is what investors seek when they pay for hedge fund management: reduced volatility.

The most common statistical measure of volatility is the *standard deviation* in per-period returns. Standard deviations are the square root of the sum of the squared deviations in per period prices versus the mean for all periods in the sample. If a given mean daily return was 0.1 percent and return on June 1 was 0.3 percent, its squared deviation (also known as "variance") for the day would be .04% = 0.2% ^ 2. (The squaring is to correct for negative values—days when the portfolio shrank in value.) For the two portfolios discussed in the previous paragraph, the Dow's standard deviation was 1.23 percent and the fund's was 0.58 percent—the fund was less than half as volatile as the index.

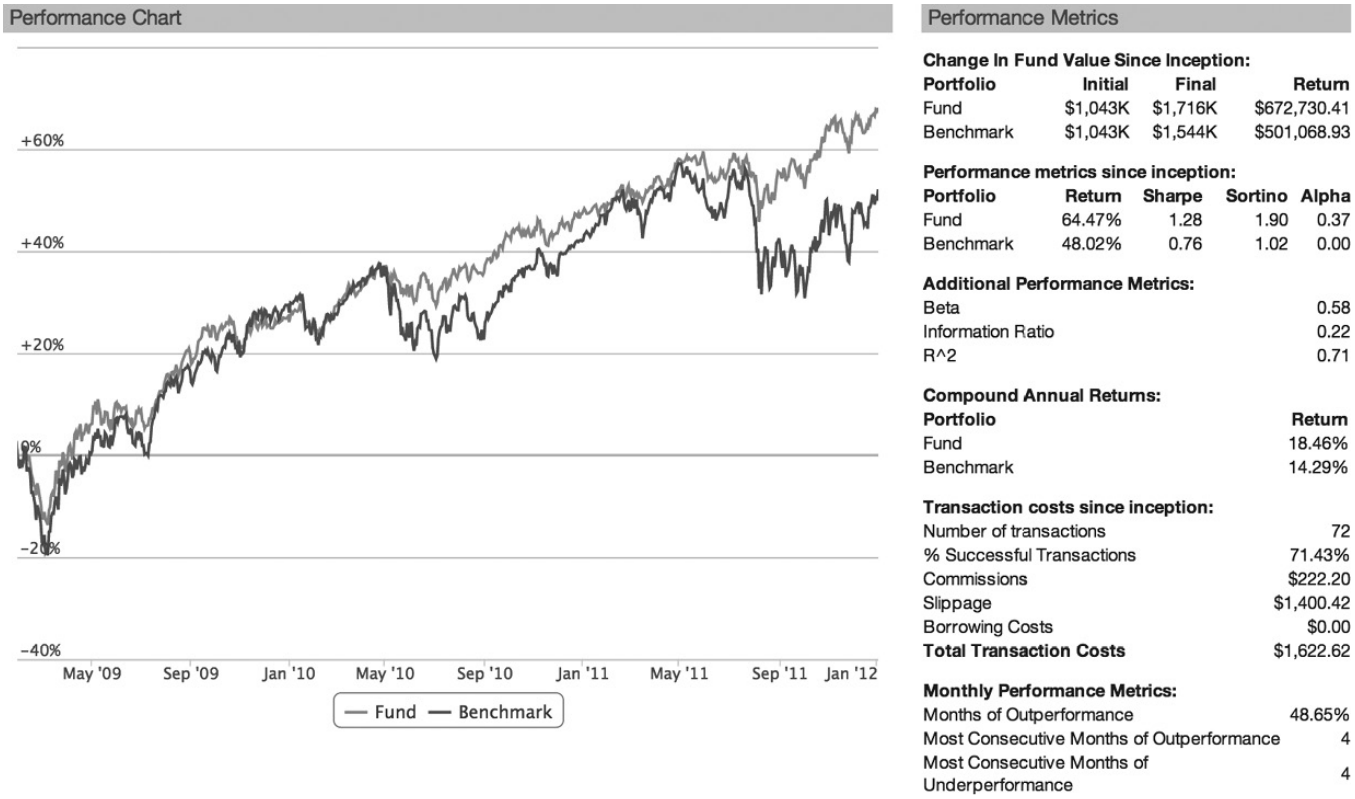

Figure 2.1 Price of fund versus benchmark, 2009 to 2012

Source: Courtesy Lucena Research, LLC

Critics argue that standard deviation is a measure that only an academic could love, because it does not differentiate upward deviations—the kind we seek!—from downward deviations. "Drawdown" is a supplemental measure often used to address this. It is simply the maximum drop from peak to trough, measured as a percentage of the peak level. The Sortino ratio focuses on the downside, whereas the more commonly used Sharpe ratio is indifferent between upward and downward deviations.

Sharpe Ratio: Combining Return and Risk

The Capital Asset Pricing Model, discussed in Chapter 7, observes that across different asset classes it is virtually impossible to increase return without also increasing risk. This unavoidable trade-off between risk and return encourages us to consider measures that combine the two: one that we wish to maximize, and one we wish to minimize. Among different portfolios (or different managers), which one offers the lowest risk for a given return or the highest return for a given risk? This is analogous to "cost–benefit analysis" in public projects: Scarce resources mandate that we spend them on those that will produce the most benefit per dollar, or that will produce a given benefit most cheaply.

Nobel Prize winner William Sharpe developed his namesake ratio to measure the efficiency of a portfolio in these terms. The *Sharpe Ratio* puts return—the thing we wish to maximize—in the numerator and risk—what we want to minimize, as measured by the standard deviation of the portfolio's return—in the denominator. The only wrinkle is that "return" is excess return above the risk-free rate—usually the rate offered by short-term Treasury bills. (This is because we can get that return with no risk at all.) The formula is therefore:

$$\text{Sharpe Ratio} = (r[\text{portfolio}] - r\,[\text{risk free}])/\text{standard deviation (portfolio)}$$

As an example, the long-term (since 1926) nominal return for the S&P 500 has been close to 10 percent. During this period, the average risk-free rate has been about 2.5 percent. The S&P 500's

standard deviation has been about 15 percent. So its Sharpe Ratio over the past 80 years has been:

$$(10\% - 2.5\%)/15\% = 7.5\%/15\% = 0.5$$

High Sharpe ratios indicate high return per unit of risk, so 0.5 doesn't look particularly appealing, but you'll need to calculate this figure for some other assets or time periods to put it in perspective. (A value of 1.0 can be thought of very loosely as being fairly compensated for risk—that is, each unit of risk generates an equal number of units of return. But a less loose interpretation of the Sharpe Ratio is simply that higher numbers are better than lower ones. It is important to note that Sharpe ratios at or above 1.0 are *very* uncommon.) For the two portfolios mentioned earlier, their Sharpe ratios were, respectively, .63 for the Dow and .94 for the fund. So on a risk-adjusted basis, the fund was superior by about half again over the Dow.

Drawdown ratios and Sortino ratios measure a portfolio's exposure to downdrafts and are especially relevant to hedge funds, whose *raison d'etre* is that they aspire to minimize falls in down markets, at the cost of reduced upside exposure in rising markets.