

PART

# One

## Basics

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**CHAPTER 1****Introduction**

**I**n 1980 Julian Simon and Paul Ehrlich bet \$1,000 on the future price of five metals (chromium, copper, nickel, tin, and tungsten). Simon, who believed that human ingenuity would consistently improve the lot of humanity, bet that prices would fall in real terms, while Paul Ehrlich, who believed that a growing human population would increasingly strain the Earth's resources, bet that they would go up. The Simon–Ehrlich basket of metals was not the first commodity index (that title apparently belongs to the Economist Commodity Price Index), but their bet on the future change in price may have been the first derivative on a commodity index. The prices of all five metals declined in real terms, and Simon won the bet.

Today huge numbers of investors are taking similar bets, except they are betting not thousands of dollars but billions. Passive long-only indexing in commodities has grown from very little in 1991 to probably over \$100 billion in 2007. Much of the inspiration (or sales pitch) behind the move to commodity investing is the same as Ehrlich's inspiration in taking the bet with Simon: a general belief that the world's growing population is increasingly straining the Earth's ability to supply commodities such as oil, grains, and metals. Inevitably China is mentioned. Demand is going up, supply is going down. What could be simpler? Or is it? After all, the world's population has been increasing for a long time yet, as we will show, when measured over the course of centuries, the price of commodities has gone down in real terms, not up.

When approaching commodities from an investment perspective extra care must be taken. The *prima facie* case for investing in commodities is weak. Put simply, commodities are produced to be consumed, and they do not naturally produce investment returns. Contrast commodities with the more standard investments of stocks and bonds. Stocks and bonds by design produce cash flows in the form of dividends, interest payments, or capitalized earnings. They are financial instruments, and the sole reason they exist is to provide investment returns. If they did not provide investment returns, no

one would own them. However, even if natural gas did not belong in one's 401(k), one would still buy it in order to heat one's home.

The purpose of this book is to provide those who would approach commodities from an investment perspective with information, tools, and modes of thinking that will inform their analyses. We do not take the position that commodities are going *Up! Up! Up!* nor do we take the position that they are going *Down! Down! Down!* Rather, we hope that upon completion readers will have a base of knowledge that will allow them to analyze specific commodity investments and strategies according to their individual characteristics and their own times. Undoubtedly, there will be opportunities to profit in the commodity markets for those who have the requisite skills. That being said, it is fair to say that the authors of this work are skeptical that the current rush to passive, long-only commodity investments will yield the intended results.

The selection of commodities as a major investment theme is relatively new. Of course, commodities have been around for a long time, but the notion that an investor or pension fund would allocate a substantial portion of an investment portfolio to plain old commodities such as coffee is recent. Because of this, the investment industry is still learning. There is a shortage of trained commodity analysts, and there is a shortage of good books on the subject of commodity investing. It is our goal to make this book an addition to the short shelf of good ones.

Many academics have written about commodity investing, and much of it is good and useful; on the whole, however, it is detached from the commodities themselves. Academics generally do two things when researching the commodity markets. The first is to look at the overall historical returns of a commodity portfolio and compare them with the returns of other assets such as equities. The second is to explore the shape of the futures curve with the obligatory discussion of Keynes's theory of normal backwardation. These two approaches are useful, and we will apply them to some extent in what follows, but notice that no mention was made of specific commodities. Whether the portfolio contains egg futures or oil futures is not considered interesting. The *academic approach* generally employs the same modes of analysis without regard to the specific commodities analyzed. There is no notion of how an industry is changing or what the long-term supply-demand dynamic is. One of the premises of this book is that investors should have a basic understanding of the individual commodities. If you are approached by a manager who wants you to invest in a North Pole coffee plantation, you should be able to do more than just recite the mantra that commodities have yielded equity-like returns during the past 30 years.

It is important to emphasize that this is a book on commodity *investing* and, for that reason, we will be constantly trying to bring everything back

to the theme of investing. There are many other economically interesting approaches to thinking about commodities. For instance, one might be curious how oil shocks affect the economy. This would fall under the category of the macroeconomics of commodities. One might be interested in the prices of commodities, such as coffee, because these prices affect the terms of trade in developing countries and therefore affect the prosperity of these countries. There are other perspectives, of course, many of which are interesting but none of which will be addressed here.

Another premise of this book is that investors need to understand the source of returns from commodity investments. Can commodities go *Up! Up! Up!* while investment returns go *Down! Down! Down!* Yes; they can and they have. The reason is that investment returns are composed of more than just the change in the price of the commodity. First, it must be pointed out that investors actually do not invest in physical commodities themselves but in commodity futures. Thus *commodity investing* is really short for *commodity futures investing* and *commodity index* is usually short for *commodity futures index* and so on. Since investors own futures, this puts a wedge between the change in price of the spot commodities and the change in price of the futures. This wedge is also a source of returns, and it can be positive or negative. The final source of return is the interest that investors receive for the cash and margin they put up to support their futures investments. Investors in passive, long-only indexes should understand how these different sources have affected returns historically and how they might affect them going forward. For example, commodities have earned positive returns during periods of high inflation, but these are periods when interest rates are also high, increasing the portion of return due to margin interest. Historically the distant oil futures have been priced lower than nearby oil futures, generating positive roll yield and contributing to the positive historical returns from investing in oil futures.

There are various approaches to investing in commodities. The most common, of course, is to invest in an index. But there are others. For example, one could buy commodity-based equities, invest with a trend-following commodity trading advisor (CTA), use judgment to assess the commodity environment and to make the appropriate decision, or construct a quantitative strategy that uses many pieces of information. It is desirable that investment strategies pass two tests: (1) that they make sense and (2) that they have worked historically. For passive indexing there is a debate as to whether condition 1 is satisfied. Certainly many people are convinced that it is. Condition 2 can be addressed more firmly, and we provide that analysis.

The conclusion one draws as to the historical performance of commodity indexing depends on the time period selected. Since 1500, the price of wheat has gone down substantially in real terms and not up all that much in

nominal terms. The commodity price index with the longest history is the Economist Commodity Price Index which dates to the mid-1800s. Since its introduction, it has also gone down in real terms and has been completely inferior to equities as an investment. The Economist Commodity Price Index also dropped in value when the U.S. stock market crashed in the late 1920s, something that should be kept in mind by those who consider commodities a hedge in their equity portfolio.

Most analyses of commodity market returns focus on recent years, say from the middle of the twentieth century onward. This is simply because there is more and better data available in recent decades. The New York Mercantile Exchange (NYMEX) crude oil future was not listed until 1983, for example. Thus, most of what we know or *know* about commodity returns is based on analyses from this time period. When looked at in this way commodity investments have done better. They have provided equity-like returns with little correlation to equities.

The authors of this book specialize in the construction of quantitative investment models and have included sections on it. We are quite forward in saying that we do not give away the shop, but we do not tease either. We provide some specific variables to consider, ones we use, and offer insight into methodologies that investors may find helpful. For example, when constructing a model it is always comforting to have an *anchor variable*, a factor to which the commodity of interest should be attracted. Examples might be the price of substitutes or the price of inputs.

The remainder of this book is laid out as follows: Chapters 2 and 3 assess the historical performance of commodities. Chapter 2 presents an analysis of commodity returns over the recent period of modern financial markets with its tremendous richness of futures contracts to use. The available data is more than ample for detailed statistical analysis. We can test how commodities have done compared with equities and bonds. We can explore how commodities performed during periods of inflation and recession. We can see how profitable buying commodities was relative to buying commodity-based equities. For example, would an investor have done better by buying oil futures or by buying shares in Exxon? Chapter 3 uses long-term histories of wheat and the Economist Commodity Price Index to construct long histories of commodity returns as measured by these series. This approach has the advantage of reaching far back into time, but the disadvantage of having only a small number of series to analyze.

The middle section of the book is devoted to the commodities themselves. It can be read through or referred to for the commodities of interest. It is here that the reader will come to understand the commodities, the state of their industries and, where we have something useful to say, the long-term outlook. For example, how much oil is out there? Are we running out soon?

Are we sliding down Hubbert's peak? Will it last forever? We collect the data from the primary sources and summarize it in a useful way. Along with the big-picture issues we present the nuts-and-bolts information that investors will need to understand, such as why the natural gas futures curve has a bumpy shape? There are chapters on energies, grains and oilseeds, the softs (coffee, sugar, and cocoa), and base metals. One category of commodity we do not cover is the precious metals. Precious metals are fundamentally different from other commodities in that they are not produced primarily to be consumed. They are more like currencies and stores of value. Consequently we have less to say about them. Readers interested in gold, for example, can refer to Peter Bernstein's excellent book *The Power of Gold*.

Chapter 20 is titled "Some Building Blocks of a Commodity Trading System," and in this chapter we begin to pull together and explain various components that may prove useful in either constructing an investment strategy or in evaluating a commodity-based investment strategy. Most of the chapter deals with the shape of the futures curve. Next to the price movement of commodities, the shape of the futures curve is the most important factor in determining the outcome of a buy-and-hold strategy. This chapter introduces the theories that are typically used to understand the shape of the futures curve. They include arbitrage, Keynes's theory of normal backwardation, and Hotelling's theory of the economics of exhaustible resources. None of these can provide the complete answer, but that is because there is no complete answer. Commodity markets differ, and there is no one-size-fits-all explanation. Taking the shape of the curve as a given, it is shown that the shape of the futures curve can substantially affect investment returns. Also presented in this chapter are trend-following strategies, anchor variables, and a simple trading strategy. The chapter concludes with a discussion of risk control. So that focus does not drift too far away from commodities the discussion is kept brief (fortunately, because this is a very tedious subject). We focus on two risk control methodologies that are commonly used: value-at-risk and maximum drawdown.

The final chapter deals with the boom in passive, long-only commodity indexes. The amount of money invested in these indexes has dramatically increased in recent years. The king of these indexes is the S&P GSCI Index (S&P GSCI). Originated in 1991, this index now has investments of around \$60 billion linked to it. Many investors might be surprised to learn that there is much more to the return of these indexes than just the change in the price of commodities.

To summarize some of the main themes and findings of this book, from the perspective of what makes a good investment, the case for owning commodities is not clear. Therefore investors must be both careful and thoughtful when evaluating commodity investments. Commodities have performed

well in recent years, but their long-term performance has not been so good, especially when compared with equities. There is information available to investors that can help them improve returns and avoid investments that are likely to have a poor return profile. Chief among these is the shape of the futures curve. Nobody knows definitively what commodity prices are going to do in the future, but if the futures curves are steeply contangoed (i.e., spot prices below futures prices) it is going to be difficult for passive, long-only indexes to yield attractive returns. In such an environment, an investor who desires exposure to commodities may want to explore other opportunities, such as investments in commodity-based equities.