

**Futures and Options Markets**

by Gregory J. Millman

About the Author

Futures Markets

In the late 1970s and early 1980s, radical changes in the international currency system and in the way the Federal Reserve managed the U.S. **MONEY SUPPLY** produced unprecedented volatility in **INTEREST RATES** and currency exchange rates. As market forces shook the foundations of global financial stability, businesses wrestled with heretofore unimagined challenges. Between 1980 and 1985, Caterpillar, the Peoria-based maker of heavy equipment, saw exchange-rate shifts give its main Japanese competitor a 40 percent price advantage. Meanwhile, even the soundest business borrowers faced soaring double-digit interest rates. Investors clamored for dollars as commodity prices collapsed, taking whole nations down into insolvency and ushering in the Third World debt crisis.

Stymied financial managers turned to Chicago, where the traditional agricultural futures markets had only recently invented techniques to cope with financial uncertainty. In 1972, the Chicago Mercantile Exchange established the International Monetary Market to trade the world's first futures contracts for currency. The world's first interest-rate futures contract was introduced shortly afterward, at the Chicago Board of Trade, in 1975. In 1982, futures contracts on the Standard and Poor's 500 index began to trade at the Chicago Mercantile Exchange. These radically new tools helped businesses manage in a volatile and unpredictable new world order. How? Futures are standardized contracts that commit parties to buy or sell goods of a specific quality at a specific price, for delivery at a specific point in the future. The concept of buying and selling for future delivery is not in itself new. In thirteenth- and fourteenth-century Europe, buyers contracted for wool purchases one to several years forward. Cistercian monasteries that produced the wool sold forward more than their own production, expecting to buy the remainder on the market (presumably at a lower price) to satisfy their obligation. In seventeenth-century **JAPAN**, merchants bought and sold rice for future delivery. And banks have long offered their customers the opportunity to buy and sell currencies forward, with both the bank and the customer contracting today and settling their obligation in the future. But the complex legal and financial arrangements that make the modern futures market possible are thoroughly modern.

In the nineteenth century, Chicago's trading pits offered an organized venue in which farmers and other suppliers of agricultural commodities, such as warehouse owners and brokers, could remove the risk of price fluctuations from their business plans. The futures exchanges were private, member-owned organizations. Members bought "seats" on the exchange and enjoyed various trading rights. It may seem strange that markets originally established to trade agricultural commodity futures in the nineteenth century should become centers of trade for financial contracts in the twentieth. But the key to success as a trader is to understand the market; traders therefore consider themselves experts on market movements rather than authorities on minerals and crops. This is why financial futures were relatively easy to introduce to markets originally designed for agricultural commodity futures: one thing interest rates and

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corn have in common is a fast-changing market.

Although the underlying risks have changed, some important futures markets still operate much as they always have, with traders standing in a ring or a pit shouting buy and sell orders at each other, competing for each fraction of a cent. But electronic trading is rapidly changing how traders trade. Computer terminals linked to each other through electronic trading systems let traders access a virtual trading floor from anywhere in the world. The need to raise capital to build these systems has led several big exchanges to go public, issuing stock to investors and operating as any public corporation providing a service—the service of a market. Exchanges compete with each other to attract traders by doing a better job of providing the benefits that traders expect from a fair market.

Take futures contracts, for example. They are not contracts directly between buyers and sellers of goods. The farmer who sells a futures contract and commits to deliver corn in six months does not make his commitment to a specific corn buyer, but rather, through a broker, to the clearinghouse of the futures exchange. The clearinghouse, another modern institution, stands between buyers and sellers and, in effect, guarantees that both buyers and sellers will receive what they have contracted for.

Thanks to the clearinghouse, the farmer does not have to be concerned about the financial stability of the buyer of the futures contract, nor does the buyer need to be concerned about the progress of any particular farmer's crop. New information about changes in supply and **DEMAND** causes the prices of futures contracts to fluctuate, sometimes moving them up and down many times in a trading day. For example, news of drought or blight that may reduce the corn harvest, cutting future supplies, causes corn futures contracts to rise in price. Similarly, news of a rise in interest rates or a presidential illness can cause stock-index futures prices to fall as investors react to the prospect of difficult or uncertain times ahead. Every day, the clearinghouse tallies up and matches all contracts bought or sold during the trading session. Parties holding contracts that have fallen in price during the trading session must pay the clearinghouse a sort of security deposit called "margin." When the contracts are closed out, it is the clearinghouse that pays the parties whose contracts have gained in value. Futures trading is what economists call a zero-sum game, meaning that for every winner there is someone who loses an equal amount.

But in a fundamental economic sense, futures trading is positive sum. Both sides expect to gain, or they would not trade. Another way of saying this is that the loser may be perfectly happy to lose. That is because many businesses use futures markets as a form of **INSURANCE**. A candy maker, for example, might buy sugar and cocoa futures contracts to lock in a price for some portion of its requirement for these important ingredients. The contracts are as good as physically buying the commodities and storing them. If prices rise, the futures contracts will also be more valuable. The company can choose to sell the contracts and pocket the cash, then buy the commodities from its usual suppliers at market prices, or else accept delivery of the ingredients from the seller of the contract and buy less on the market. Either way, its cost of raw materials is lower than if it had not bought the contracts. The company has cushioned itself against a price risk and does not have to worry that its production and marketing strategy will be disrupted by a sudden price increase. But what if prices fall? In that case the company loses some money on its futures contracts. But the same price decrease that causes that loss also caused something good: the company pays less for its ingredients. Remember, the purpose of buying the futures contract was to protect against something bad happening—a price rise. The bad thing did not happen; prices fell instead. The loss on the futures contract is the cost of insurance, and the company is no worse off than a person who purchases fire insurance and then does not have a fire.

The biggest users of the futures markets rely on them for risk management. That is surely one reason

why defaults are rare. But there is an additional security measure between the individual trader and the clearinghouse. Buyers and sellers of futures must do business through intermediaries who are exchange members. Instead of standing between two individual traders, therefore, the clearinghouse stands between two exchange member firms. Each firm monitors its own customers and makes a “margin call” when the customer’s losses make additional margin necessary. If the customer cannot pay the margin, the firm closes the account, sells off the positions, and may have to take a small loss. While firms pay attention to the credit of their customers, the clearinghouse pays attention to the credit of the firms. The clearinghouse needs to make good on a trade only if losses are so great that the exchange member firm itself fails. This happens occasionally when firms badly mismanage their risks or when a major financial crisis occurs.

Because futures contracts offer assurance of future prices and availability of goods, they provide stability in an unstable business environment. Futures have long been associated with agricultural commodities, especially grain and pork bellies, but they are now more likely to be used by bankers, airlines, and computer makers than by farmers—at least in North America and Europe. By the early 2000s, although commodities remained the mainstay of futures markets in Asia, in the developed countries of the West financial futures contracts had almost totally eclipsed commodities. The Chicago Mercantile Exchange claimed in 2004 that financial futures accounted for 99 percent of its business, and financial futures also accounted for the lion’s share of business at the Chicago Board of Trade and at Euronext.liffe. (Euronext.liffe is the international derivatives business of Euronext, comprising the Amsterdam, Brussels, London, Lisbon, and Paris derivatives markets. It was formed following Euronext’s purchase of the London International Financial Futures and Options Exchange [LIFFE] in 2001.) In Japan, by contrast, commodity futures trading dwarfed financial futures. This does not mean that commodities were more important than finance in the Japanese economy, of course. Financial futures got a slow start in Japan because Japanese regulations discouraged them. Traders who wanted to trade such futures had to—and did—trade them elsewhere. Thus, the first futures on Japan’s Nikkei stock index traded in Singapore, and the first yen futures traded in Chicago.

Obviously, the idea of hedging against an unstable financial environment has great appeal. Companies like Caterpillar, Microsoft, or Citibank can now protect themselves against currency shifts by buying and selling futures contracts or similar instruments. Investors use contracts on interest rates, **BONDS**, and stock indexes to protect against a decline in the value of their **INVESTMENTS**, just as farmers have long used futures to protect against a drop in the price of corn or beans.

Farmers who planted corn in the spring had no way of knowing what the price of their crop would be when they harvested in the fall. But a farmer who planted in the spring and sold a futures contract committed to deliver his grain in the fall for a definite price. Not only did he receive cash in the spring in return for his commitment, but he also received the contract price for his crop even if the market price subsequently fell because of an unexpected glut of corn. In exchange the farmer gave up the chance to get a higher price in the event of a drought or blight; he received the same fixed price for which he had contracted. In the latter case, the farmer would have netted more if he had not sold the future; however, most farmers prefer not to gamble on the corn market. Farming is risky enough, thanks to uneven rainfalls and unpredictable pests, without adding the risk of changes in market prices.

Farmers thus seek to lock in a value on their crop and are willing to pay a price for certainty. They give up the chance of very high prices in return for protection against abysmally low prices. This practice of removing risk from business plans is called hedging. As a rule of thumb, about half of the participants in the futures markets are hedgers who come to market to remove or reduce their risk.

For the market to function, however, it cannot consist only of hedgers seeking to lay off risk. There must be someone who comes to market in order to take on risk. These are the "speculators." Speculators come to market to take risk, and to make money doing it. Some speculators, against all odds, have become phenomenally wealthy by trading futures. Interestingly, even the wealthiest speculators often report having gone broke one or more times in their career. Because speculation offers the promise of astounding riches with little apparent effort, or the threat of devastating losses despite even the best efforts, it is often compared to casino gambling.

The difference between speculation in futures and casino gambling is that futures market speculation provides an important social good, namely liquidity. If it were not for the presence of speculators in the market, farmers, bankers, and business executives would have no easy and economical way to eliminate the risk of volatile prices, interest rates, and exchange rates from their business plans. Speculators, however, provide a ready and liquid market for these risks—at a price. Speculators who are willing to assume risks for a price make it possible for others to reduce their risks. **COMPETITION** among speculators also makes hedging less expensive and ensures that the effect of all available information is swiftly calculated into the market price. Weather reports, actions of central banks, political developments, and anything else that can affect supply or demand in the future affect futures prices almost immediately. This is how the futures market performs its function of "price discovery."

There seems to be no limit to the potential applications of futures market technology. The New York Mercantile Exchange (NYMEX) began to trade heating oil futures in 1978. The exchange later introduced crude oil, gasoline, and natural gas futures. Airlines, shipping companies, public transportation authorities, home-heating-oil delivery services, and major multinational oil and gas companies have all sought to hedge their price risk using these futures contracts. In 1990 the NYMEX traded more than thirty-five million **ENERGY** futures and option contracts.

Meanwhile, international **STOCK MARKET** investors have discovered that stock-index futures, besides being useful for hedging, also are an attractive alternative to actually buying stocks. Because a stock-index future moves in tandem with the prices of the underlying stocks, it gives the same return as owning stocks. Yet the stock-index future is cheaper to buy and may be exempt from certain taxes and charges to which stock ownership is subject. Some large institutional investors prefer to buy German stock-index futures rather than German stocks for this very reason.

Because stock-index futures are easier to trade than actual stocks, the futures prices often change before the underlying stock prices do. In the October 1987 crash, for example, prices of stock-index futures in Chicago fell before prices on the New York Stock Exchange collapsed, leading some observers to conclude that futures trading had somehow caused the stock market crash that year. In fact, investors who wanted to sell stocks could not sell quickly and efficiently on the New York Stock Exchange and therefore sold futures instead. The futures market performed its function of price discovery more rapidly than the stock market did.

Futures contracts have even been enlisted in the fight against air pollution and the effort to curb runaway **HEALTH INSURANCE** costs. When the Environmental Protection Agency decided to allow a market for sulfur dioxide emission allowances under the 1990 amendments to the Clean Air Act, the Chicago Board of Trade developed a futures contract for trading what might be called air pollution futures. The reason? If futures markets provide price discovery and liquidity to the market in emission allowances, companies can decide on the basis of straightforward economics whether it makes sense to reduce their own emissions of sulfur dioxide and sell their emission allowance to others, or instead to sustain their current emission levels and purchase emission allowances from others.

Without a futures market it would be difficult to know whether a price offered or demanded for emissions allowances is high or low. But hedgers and speculators bidding in an open futures market will cause quick discovery of the true price, the equilibrium point at which buyers and sellers are both equally willing to transact. Similar reasoning has led to some decidedly unconventional applications of futures technology. The Iowa Electronic Market introduced political futures in 1988, and this market has generally beaten the pollsters at predicting not only the winner of the White House but also the winning margin. This makes sense because people are much more careful with information when they are betting money on it than when they are talking to a pollster. Economist Richard Roll showed that the orange juice futures market is a slightly better predictor of Florida temperatures than the National Weather Service. And in 2003, the **DEFENSE** Department stirred up controversy with plans to launch what was quickly dubbed a "terrorism futures" market. The idea was to let people speculate on events in the Middle East and win real money if they made the right bet. Congressional outrage nipped that plan in the bud, but the underlying logic was sound. If futures markets are an efficient mechanism for assimilating information and assessing probabilities, why not use them for statecraft and military applications?

Option Markets

Options are among the most important inventions of contemporary finance. Whereas a futures contract commits one party to deliver, and another to pay for, a particular good at a particular future date, an option contract gives the holder the right, but not the obligation, to buy or sell. Options are attractive to hedgers because they protect against loss in value but do not require the hedger to sacrifice potential gains. Most exchanges that trade futures also trade options on futures.

There are other types of options as well. In 1973 the Chicago Board of Trade established the Chicago Board Options Exchange to trade options on stocks. The Philadelphia Stock Exchange has a thriving business in currency options. The options market owes a good deal of its success to the development of the Black-Scholes option pricing model. Developed by economists Fischer Black, **ROBERT C. MERTON**, and **MYRON SCHOLES**, it was first published in 1973. The model considers factors including the current price of the stock or currency, its volatility, the price at which the option allows the buyer to buy the stock or currency in the future, interest rates, and time to calculate what the option is worth. In 1997, Merton and Scholes received the Nobel Prize for this breakthrough. Fischer Black had died, and the prize cannot be awarded posthumously, but the Nobel citation said,

Black, Merton and Scholes thus laid the foundation for the rapid growth of markets for derivatives in the last ten years. Their method has more general applicability, however, and has created new areas of research—inside as well as outside of financial economics. A similar method may be used to value insurance contracts and guarantees, or the flexibility of physical investment projects.

Not all options trade on exchanges. There is also a large, so-called over-the-counter (OTC) market in options. Participants in the OTC market include banks, investment banks, insurance companies, large **CORPORATIONS**, and other parties. OTC options differ from exchange-traded options. Whereas exchange-traded options are standardized contracts, OTC options are usually tailored to a particular risk. If a corporation wants to hedge a stream of foreign currency revenue for five years, but exchange-traded options are available only out to six months, the corporation can use the OTC market. An insurance company or bank can design and price a five-year option on the currency in question, giving the company the right to buy or sell at a particular price during the five-year period.

Although users of the OTC options market do not access the futures exchange directly, the prices discovered on the futures exchanges are important data for determining the prices of OTC options. The liquidity and price discovery elements of futures help to keep the OTC market from getting far out of line

with the futures market. When futures markets do not exist or cannot be used, hedgers pay steeply for the protection they seek.

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Gregory J. Millman is a journalist and author.

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