Chapter 4: Structure and Mechanics of Forward and Futures Markets

A. Forward Contracts and Markets

As discussed earlier, a forward contract obliges a long position holder to purchase an underlying asset and to short position holder at a settlement price on a settlement date. Commodity and financial instrument transactions can occur in either spot or forward markets. In the spot market, the exchange of money for a commodity or instrument occurs when the agreement is made. For example, dollars might be exchanged for euros now in an agreement made now. This would be a spot market transaction. In a forward market transaction, the actual exchange of one for the other actually occurs at a date later than that of the agreement. Thus, traders could agree now on a price or rate for a delivery at a later date.[1]

Forward contracts involve two offsetting positions in each instrument:

1. *Long*: An investor has a "long" position in that instrument that she is obligate to accept delivery of at the later date.
2. *Short*: An investor has a "short" position in that instrument that he must deliver in the exchange at a later date.

Forward exchange contracts will usually involve a third party to act as an intermediary between the exchange parties. This intermediary, generally a bank, is referred to as a *market maker*. The forward price or rate is the amount of money that must be paid, exchanged or given up for one unit of currency at the delivery date. This price or rate might be quite different from the spot rate, which designates the number of currency units that must be paid for one unit of the instrument to be delivered now. Forward rates are likely to differ from spot rates simply because supply and demand conditions are expected to change over time.

There are a number of reasons for participating in forward markets. Many investors participate for the purpose of speculation; they may feel that they know which direction prices or rates will change, and therefore, take positions in contracts enabling them to profit from anticipated changes. Such speculation is often regarded as quite risky.

Corporations often take long positions in forward contracts now to lock in prices and rates for the commodities that they expect to deliver at settlement dates. Similarly, corporations often take short positions in forward contracts now to lock in prices and rates for the commodities that they expect to receive at settlement dates. In effect, such companies use forward contracts to lock in cost or revenue amounts in advance. Corporations take long or short positions in forward contracts to diminish their price risk. For example, an electricity producer might take a long position in a forward contract on oil to lock in a price for oil to be delivered at a settlement date. The forward contract locks in the price of oil needed by the electricity producer. Similarly, an oil company might take a short position in a forward contract on oil to lock in a price for oil that the company expects to have produced the same settlement date. The forward contract locks in the price of oil expected to be for sale by the oil producer. Corporations and financial institutions regularly take positions in forward contracts on financial instruments such as treasuries to manage interest rate risk, currencies to manage FX risk and indices to manage equity market risk.

Another group of investors, known as arbitrageurs, purchase forward contracts, and then

[1] Many descriptions of securities, markets, regulations and institutions here, and elsewhere in this manuscript are adapted from Teall [2018].

invest in one of a variety of offsetting securities (including offsetting forward contracts) for the purpose of profiting from market price discrepancies. These arbitrageurs are useful for maintaining price consistency in markets, and help maintain liquidity; that is, they add to market liquidity, enabling buyers and sellers confidence that they can buy and sell in that market when needed.

Futures markets permit their participants to maintain the contractual obligations until the settlement date of the contract. However, the majority of contracts are *closed out* early; that is, a long (short) position is typically offset by executing a short (long) position in a contract on the same underlying on the same settlement date. Taking such offsetting positions is said to net the position down.

Forward markets typically involve dealers executing individually negotiated transactions directly with one another through electronic trading systems or by telephone. Forward market transactions tend to be large, and involve major well-known financial institutions, sometimes acting on behalf of their clients.

Forward Market Risks

Participants in forward markets face a number of risks. Among these are:

1. *Price or rate risk*: Prices or rates may change in directions opposite to those anticipated by participants.
2. *Credit risk*: The other party to the contract (*counterparty*) may default by not delivering the commodity or instrument specified in the contract. In many instances, an intermediary such as a large reputable commercial bank may act to ensure that one or both contracting parties will honor their agreements. Dealer reputation is key.
3. *Liquidity risk*: The market participant may have difficulty obtaining the commodity or instrument she must deliver. A number of intermediaries might improve liquidity by trading and making markets for the relevant commodities or instruments.
4. *Trading system risk*: The trading platform, ECN, exchange, and other communication systems are all subject to malfunction or failure. Since many forward market hedges are created by telephone or negotiation, this problem might be less significant than in futures markets.

Forward Markets Regulation

Institutions trading in forward markets, which are mostly well-established and regarded, face regulations with respect to risk-taking, asset quality, reporting and asset type are based largely on what type of institutions they are. For example, banks are regulated by the Fed, FDIC and the Office of the Comptroller of the Currency (OCC). Most insurance companies report to state insurance regulators. Otherwise, forward markets are largely self-regulated, and institutions that trade forward contracts are dependent on maintaining their reputations, transactions themselves often fall outside the bounds of government regulators.

B. Futures Contracts and Markets

As we discussed earlier, futures contracts differ somewhat from forward contracts in that they are standardized and trade on exchanges, and typically provide for margin (sometimes referred to as *performance bonds*) and marking to the market. That is, futures contracts are traded on exchanges such as the Chicago Mercantile Exchange (typically referred to as the

"Merc"), owned by the CME Group, which is the collective successor holding group for the Chicago Board of Trade (CBOT), the CME, COMEX, KCBT and the New York Mercantile Exchange. Margin requirements are set by exchanges, though brokers generally set more stringent requirements to protect themselves from the risks associated with particular clients.

Generally, a futures market participant must vary her margin, depending on the trading environment and the prices of the underlying assets or rates. This variance of margin, which increases as the value of the investor's obligation increases and decreases as the obligation decreases, is referred to as *marking to the market*. Thus, *initial margin* is needed to establish a long or short position. Should the investor incur loss of value, *maintenance margin* is the price or position value limit at which the investor will be required to post additional margin (cash). *Variation margin* is the amount of additional margin or cash that must be submitted to top up the margin to the initial margin amount. Marking to the market is the process by which the variation margin is determined, typically on a daily basis, also referred to as daily settlement.

Futures contracts, as do spot contracts, require a significant amount of specificity to define the assets being traded. Most U.S. contracts, but by no means all of them provide for cash settlement rather than physical delivery of the asset. However, when physical delivery is required, it can be practical for the contract to allow for some flexibility, setting rules for delivery and side payments should variations be required. As we discussed earlier, futures contract specifications include the following:

- *Asset details*: the asset, its quality, its grade, its distinguishing characteristics
- *Quantity* covered by the contract: such as volume, weight, size, number of units, etc.
- *Settlement date*: Exact time of day, month and year of delivery
- *Delivery location*: Particularly relevant for physical delivery; Contract might provide for variations in delivery locations as suits the participant taking delivery. For example, as of 2020, the London Metals Exchange (LME) maintained a global network of over 650 authorized warehouses in 35 locations.
- *Settlement price*: amount of money delivered in exchange for the asset; this will vary from contract to contract

Typically, when a variation is required in the delivery of an asset, the participant will normally pay a premium or accept a discount as the contract rules specify.

In addition to these futures contracts, exchanges and clearinghouses will maintain detailed sets of rules concerning how those contracts are traded. These rules can concern position limits (maximum exposure in unhedged contracts), tick sizes (minimum trading price increments), after-hours market access, transparency, trading rules for market makers to ensure fairness in markets, short-term price fluctuation limits, etc.

These exchanges and their associated clearing corporations eliminate much of the credit risk and some of the liquidity risk associated with futures contracts. Clearing corporation obligations to clients are backed by exchanges, member brokerage firms, who seek to limit their liabilities to other client risk-taking. Of course, the price or rate risk and other forms of risk remain. Standardization of contracts limits the numbers of different types of contracts that can be created, thereby enhancing trader interest in each of those that do trade. Standardization can be very detailed, detailing the commodity to be delivered (e.g., live cattle fed to the point of harvest, typically around 1,200 pounds), contract size (e.g., 40,000 pounds), delivery (e.g., physical delivery February 2021 [for LEG21] to a pre-specified location) In addition, governments,

exchanges, and brokerage houses require that futures traders maintain deposits (margin) to ensure that they will honor their obligations. While forward contracts frequently settle with delivery of the underlying asset, U.S. futures contracts are more likely to provide for settlement by cash equivalence. Live cattle contracts are often an exception, providing for physical delivery. Table 1 below provides a sampling of index and commodity futures contracts with pricing.

Contract Name	Last	Change	High	Low	Volume	Time
S&P 500 E-Mini (Dec '20)	3,685.25	-12.75	3,705.00	3,672.25	149,893	06:19 CT
Dow Futures Mini (Dec '20)	30,092	-106	30,265	29,992	38,637	06:19 CT
S&P 500 VIX (Jan '21)	24.550	+0.325	24.660	24.100	2,479	06:14 CT
Crude Oil WTI (Jan '21)	45.74	-0.52	46.25	45.36	96,117	06:19 CT
Natural Gas (Jan '21)	2.397	-0.178	2.483	2.389	36,244	06:19 CT
Gold (Feb '21)	1,836.3	-3.7	1,846.3	1,824.8	74,054	06:19 CT
Silver (Mar '21)	23.895	-0.358	24.365	23.630	21,184	06:18 CT
Corn (Mar '21)	416-2	-4-2	419-4	415-2	20,980	06:16 CT
Wheat (Mar '21)	566-4	-9-0	575-4	566-2	13,585	06:17 CT
Soybean (Jan '21)	1151-2	-11-6	1160-4	1149-0	21,486	06:19 CT
Cotton #2 (Mar '21)	71.62	+0.05	71.93	71.35	2,871	06:19 CT
Coffee (Mar '21)	117.00	-0.55	117.50	116.45	2,848	06:19 CT

https://www.barchart.com/futures

Table 1: Major Futures Markets Overview, December 7, 2020

Futures Market Risks

Just as in forward markets, participants in futures markets face a number of risks. Among these are:

1. Price or rate risk: As with forward markets and forward market hedges, prices or rates may change in directions opposite to those anticipated by participants.
2. Basis risk: Basis risk concerns uncertainty with respect to the relationship between the cash (spot) price and forward or futures price. A futures contract might not exactly match the asset to be hedged, the date required for matching, perhaps because the date is not known. Furthermore, the price of the asset to be hedged might not shift in a manner consistent with the futures contract. Rolling the hedge forward (which is needed when the hedge is required for a longer period than the contracts used in the hedge) might be problematic as contract prices will shift each time a contract position is closed.
3. Liquidity risk: The market participant may have difficulty obtaining the commodity or instrument she must deliver. A number of intermediaries might improve liquidity by trading and making markets for the relevant commodities or instruments.
4. Trading system risk: The trading platform, ECN, exchange, and other communication systems are all subject to malfunction or failure.

Credit risk was listed as a source of risk in forward contracts. Because clearinghouses guarantee contracts by serving as counterparty to every futures transaction, credit risk is

negligible in futures markets. Since futures markets trade contracts based on expectations of strong demand for them, liquidity risk tends to be mitigated in futures markets relative to forward markets. Basis risk is likely to be more significant in futures markets than in forward markets because futures contracts cannot normally be negotiated or customized.

To help manage the various risks imposed on the variety of parties involved in futures markets, most exchanges will set speculative position limits on many contracts. These position limits set forth the maximum number of unhedged contracts that a trader might maintain. In addition, U.S. regulators, in particular, the Commodities and Futures Trading Commission (CFTC) will set position limits as it deems suitable.

Currency and Interest Rate Futures Markets

Currency and interest rate futures are traded on numerous exchanges throughout the world. Among the U.S. exchanges listing currency futures are the International Monetary Market (IMM), a subsidiary of the Chicago Mercantile Exchange (CME), NASDAQ OMX (formerly the Philadelphia Board of Trade (PBOT)), the New York Board of Trade, and the Intercontinental Exchange (ICE). Non-U.S. exchanges trading currencies and currency futures include the London International Financial Futures Exchange (LIFFE, owned by the Intercontinental Exchange Group), Euronext Paris, Eurex Frankfurt, ICE Futures Singapore, and the Tokyo Financial Exchange (TFX).

C. Order Types and Liquidity

Orders

Orders are specific trade instructions placed with brokers or directly by traders without direct access to trading arenas. The typical brokerage will accept and place a number of types of orders for clients. In fact, the various exchanges and alternative trading systems in the U.S. will accept over a hundred different types of orders, not counting permutations of the basic types. A few order types might include some specifically designed for high frequency traders (HFT), others specifically designed to protect against HFT strategies, orders designed to be executed at market opens and closes, and others intended to control which market will be used for execution. Among the more common types of orders are the following:

- *Market order*: Here, the broker is instructed to execute the order at the best price available in the market.
- *Limit order*: An upper price limit is placed for a buy order; the broker will not buy at a price above this limit. A lower price limit is placed for a sell order.
- *Stop order*: Here, the broker is instructed to place the buy order once the price has risen above a given level; in the case of the stop-sell (or stop-loss) order, the broker sells once the price of the security has fallen beneath a given level. Stop-loss orders are often intended to protect against price declines.
- *Day order*: If not executed by the end of the day, this order is canceled.
- *Good till canceled order*: This order is good until canceled.
- *Not held order*: Here, the broker is not obliged to execute while he is attempting to obtain a better price for his client.
- *Fill or kill orders* must be filled in their entirety immediately, or they are canceled.
- *Immediate or cancel* orders are immediately executed to the extent possible; unexecuted amounts are canceled.

This list of order types is far from complete and some brokers and exchanges will not accept all of these types of orders. Order types are not mutually exclusive; for example, a good-till-canceled, limit buy order is a legitimate order type as is a stop limit sell order. The stop limit sell order authorizes the broker to initiate the sell order once its price drops to the stop trigger, but only if the limit price can be realized for the sale.

Liquidity

Liquidity refers to an asset's ability to be easily purchased or sold without causing significant change in the price of the asset. Liquid assets can be traded quickly, with low transactions costs, at any time and with little impact on the asset's price. Markets with large numbers of active participants and few constraints on trade are more likely to have greater liquidity. Bid offer spreads are generally considered to be quick indicators of liquidity, with narrow spreads suggesting that price impacts of trading will not be severe. Black (1971) described liquidity as follows:

1. There are always bid and asked prices for the investor who wants to buy or sell small amounts of stock immediately.
2. The difference between the bid and asked prices (the spread) is always small.
3. An investor who is buying or selling a large amount of stock, in the absence of special information, can expect to do so over a long period of time at a price not very different, on average, from the current market price.
4. An investor can buy or sell a large block of stock immediately, but at a premium or discount that depends on the size of the block.
5. The larger the block, the larger the premium or discount. In other words, a liquid market is a continuous market, in the sense that almost any amount of stock can be bought or sold immediately, and an efficient market, in the sense that small amounts of stock can always be bought and sold very near the current market price, and in the sense that large amounts can be bought or sold over long periods of time at prices that, on average, are very near the current market price.

D. Futures Clearing and Settlement

In the United States, a *clearinghouse* serves as the intermediary for all futures transactions. The clearinghouse is the neutral counterparty to every trade. Futures contract participants are all obligated to the clearinghouse to settle their contracts. The general clearing process for futures contracts involves two primary tasks: trade comparison (matching of trades) and settlement (delivery of securities, commodities or book entry). *Clearing* refers to the set of activities resulting in settling claims of financial institutions against other financial institutions. The operations department of a financial institution, often referred to as the institution's back office, is responsible for handling or overseeing the clearing and settlement processes.

In all U.S. securities markets, only approximately 5% of over 5000 brokerage firms are self-clearing; that is, only 5% are capable of clearing trades for themselves. Other brokers, known as correspondent firms, forward their orders to a clearing firm. A *clearing firm* is authorized by a clearing house (defined below) to manage trade comparisons and other back office operations, acting as an intermediary between the trader and the clearinghouse. The clearing firm will guarantee its traders' transactions and will ensure that the trader's funding and

margin are sufficient for each of her transactions, and that each transaction is within the permitted sizes and price ranges and bands permitted by the exchange or market. While a very small fraction of transactions take much longer, a typical trade can be cleared in about 1 millisecond (the blink of an eye is about 300 milliseconds). Leading clearing firms include Pershing, LLC, RBC Correspondent Services, and Southwest Securities, Inc.

A clearinghouse clears transactions for a market such as the Chicago Board of Trade and is typically established by that market or members of that market. A clearinghouse facilitates the trade settlement between two clearing firms (also called as member firms or clearing participants) and seeks to ensure that the clearing firms honor their trade settlement obligations. The clearinghouse will typically guarantee the obligations of its member firms, and often require collateral to ensure that settlement obligations are fulfilled. The collateral is pooled into a clearinghouse guarantee fund.

Trade Confirmation and Comparison

Trade confirmation is the first step of the clearing process. When trades are executed, buyers and sellers record trade details. Brokers and dealers receive confirmations that the trade has been executed and pass on details of the confirmation to clients. The typical confirmation document received by the client reports the security's name and CUSIP number (the security's nine-character alphanumeric identifier issued by the Committee on Uniform Security Identification Procedures), the number of units traded, the security price, and the broker commission and other fees, along with trade and settlement dates.

Trade comparison is the second step in the clearing process. Comparison matches counterparties in transactions. Trades are compared and are said to be cleared when the counterparties' records are identical. This happens for the vast majority of trades. *Out-trades* in futures markets (like DKs [don't knows] in other markets), which are trade reports with discrepancies resulting from recording errors, misunderstanding and fraud, are sent back to traders to resolve or reconcile.

Novation and Netting

The clearinghouse will step into a transaction to be settled by its members and assume the settlement obligations of both counterparties to the transaction, in effect becoming the counterparty to both sides of every transaction, a process known as *novation*. Thus, the clearinghouse, acting as a *central counterparty*, acts as the bilateral counterparty for each party to every transaction, and assumes all credit risk associated with each party. Novation reduces the number of bilateral relationships created by transactions. Suppose, for example, each of 10 distinct participants establishes a bilateral position with each of the other 9 distinct participants leads to a total number of bilateral relationships of $100\times(100-1)/2 = 4{,}950$. A central clearing party acting as the counterparty for each transaction reduces the number of bilateral relationships to 100. This reduction simplifies the overall record-keeping process.

Unlike the case for stock markets, each futures exchange has its own clearinghouse. Clearinghouses clear and settle trades for most options, futures, and swap markets. Confirmation is the first step of the clearing process. When trades are executed, buyers and sellers record trade details. Brokers and dealers receive confirmations that the trade has been executed and pass on details of the confirmation to clients. The typical confirmation document received by the client reports the security's name and CUSIP number (the security's nine-character alphanumeric identifier issued by the Committee on Uniform Security Identification Procedures), the number

of units traded, the security price, and the broker commission and other fees, along with trade and settlement dates.

The number of securities transactions that occurs each day is huge, requiring some sort of process to simplify the process of changing title to securities and moving corresponding cash proceeds between accounts. *Netting* is the simplification process used by clearing firms, and is one of the most important functions of the clearing process and of the clearinghouse. *Netting* is the process of adding all of an institution's purchases of each security, adding the sales of each security, deducting sells from buys to determine the net change in holdings of that security for the institution and computing the net cash flows associated with all transactions.

Since most brokerage firms execute large numbers of both buy and sell transactions for the securities that they trade, netting down results in only a small percentage of the total reported matched or offsetting transactions actually having to be settled between financial institutions. At the end of the netting process, the clearinghouse delivers to each brokerage firm settlement instructions.

Trade Settlement

Trade settlement, the third step in the clearing process, occurs when buyers receive their securities and when sellers receive payment for their securities. The clearinghouse registers contracts in member names (street names, e.g., brokerage firm names) and maintains computerized records of ownership and transfers.

Settlement of a trade is completed when the clearinghouse transfers the ownership of the underlying commodities or financial instruments from the selling firm to the buying firm in its automated book-entry recordkeeping system and transfers money between firms with net credits and net debits. Most U.S. futures contracts provide for cash settlement, though a fairly small proportion provide for physical delivery. Firms that have a net credit after end-of-day netting are owed more by other brokers than they owe. The clearinghouse in the U.S. transfers money to banks of these net credit firms from accounts of brokers and institutions with net debits through the Fedwire system, normally within three days after the transaction. In addition, the clearinghouse provides cost basis information and other information services. Clearing services are provided at a very low cost, averaging less than $0.03 per trade.

Modern settlement of trades normally takes place in electronic book entry form. However, during most of the 19th century, each transactions required delivery of paper certificates and checks and had to be settled within one day (T+1), creating significant pressures as messengers rushed to make deliveries after transactions. Failure to make timely delivery impaired the performance of counterparties, intensifying contagion risks. In response to these pressures and several financial market panics, several exchanges introduced netting to the clearing processes with the founding of their own clearinghouses. The central clearinghouse would serve as the central counterparty for every transaction and provide for novation. This meant that market participants needed to have checks and securities delivered daily only to a single central counterparty.

Central Counterparties

A *central counterparty*, typically a clearinghouse, serves the role of buyer to every seller and seller to every buyer in each market. The derivatives exchange or clearinghouse performs this role. The central counterparty drastically simplifies relative to bilateral settling (parties to each transaction settle) record-keeping and securities transfer, guarantees contractual obligations,

and reduces the risk of market failure. The central counterparty also provides for delivery of assets associated with each futures contract upon settlement. Members of the clearinghouse, or clearing members, interact directly with the central counterparty both as principal and as agent for their clients, which include brokerage firms, institutional traders, smaller financial institutions, insurance companies, etc.

In addition to producing obvious efficiency gains, central counterparties serve another important function; they improve market resilience by increasing transparency and reducing counterparty risk. For example, the OTC derivatives markets faced unprecedented risk levels and contagion (spread of economic crisis) in September 2008 due partly to the huge number of bilateral (no central counterparty) derivative contracts involving Lehman Brothers, the giant dealer in the brink of bankruptcy. The market's inability to net and settle the roughly 930,000 outstanding bilateral derivatives contracts with Lehman threatened to cascade and bring down the entire financial industry. On the other hand, LCH Swapclear, the clearing house for 66,000 trades with notional value of $9 trillion in 5 currencies, successfully managed contracts that it served in the wake of the collapse (Loader [2013]). Within a month, the losses to LCH and its default fund were zero and surplus Lehman margin was returned to Lehman's bankruptcy administrators. Thus, the Lehman crisis might have been mitigated with novation and use of a central counterparty for its OTC transactions, due to the ability to net down individual trader settlement obligations more easily. Use of central counterparty spreads and mutualizes risk among market participants, while standardizing margin and other trading requirements reduces market abuses and improves transparency through improved monitoring and efficiency of information-gathering. Numerous studies, including Bernstein, Hughson and Weidenmier (2019) have found empirical results confirming both risk-reduction effects and share price improvement resulting from use of clearinghouses and central counterparties.

Margin, Collateral and Hypothecation

As mentioned earlier, client account risk with brokers is reduced through the imposition of margin requirements on clients. Margin requirements are normally imposed on the purchase of equity and other securities with borrowed funds, positions in futures contracts, writing of options contracts, etc. These margin requirements are analogous to the posting of returnable collateral on open positions, ensuring that clients fulfill their trading obligations; that is, settlement risk in the market is mitigated through the imposition of margin or collateral requirements. As discussed earlier, central counterparties further reduce settlement risk by requiring collateral from their members, who are mostly brokers and dealers. Posted collateral for each member is a function of member trading activity, the volatility of member-traded securities, imbalances between member buying and selling and the member's financial condition. Brokers require variation (maintenance or mark to market) margin of their clients, typically adjusted daily depending on the risks associated with the client accounts. Similarly, clearinghouses normally require daily adjustment of collateral requirements since client trading account values and activity change daily. Broker collateral with clearinghouses will be netted across client accounts and positions and will also vary daily. Both initial margin and variation margin amounts are determined by relevant clearinghouses and can vary as market volatility changes.

While minimum margin requirements are often dictated by a relevant regulatory agency such as the Fed or CFTC, brokers and clearinghouses are generally free to impose higher requirements on their traders and members. Margin requirements will vary among brokers, instruments, etc., and will often be set based on the perceived risk of client accounts or clients

themselves. Margin obligations for futures and options positions can be covered with cash and can sometimes be covered with other assets, contracts or securities, such as government treasury instruments, bank guarantees, FX, CDs and equities. Again, various clearinghouses and brokerage firms set their own rules for acceptance, subject to requirements imposed on them by higher authorities.

A popular risk and margin calculation system used and adapted for use by many clearinghouses and clearing firms is *SPAN* (Standard Portfolio Analysis of Risk), created by the CME in 1988, particularly for use with futures and options portfolios. The SPAN system is structured to analyze a grid or array comprised of 16 possible changes in market conditions within boundaries of the risk parameters set by the clearinghouse. The array is structured for use with an algorithm to calculate "scanning risk," which is considered to be the worst possible loss scenario for the portfolio. This analysis is then used to set the margin requirement for the portfolio. The OCC developed a somewhat similar methodology for risk assessment and margin calculation system used with options portfolios known as the *Customer Portfolio Margin System* (CPM), based largely on its older TIMS (Theoretical Intermarket Margining System) structure.

In general terms, *hypothecation* is the pledge of assets as collateral for debt or other obligations, typically in scenarios involving mortgages, margin, short sales and repo agreements. With respect to the hypothecation of securities, the asset owner typically does not give up ownership rights such as voting in corporate affairs and dividend or interest payments unless the owner defaults on her obligations. For example, should the broker issue a margin call that the client fails to meet, the pledged assets can be seized and sold. *Rehypothecation* occurs when the securities broker re-uses assets pledged by a client as collateral as its own collateral; that is, the same asset is being used as collateral for both the client's loan and the broker's loan.

Delivery

In most cases, only a small fraction of futures and options contracts involve physical delivery of assets or even cash delivery at settlement or expiry as most positions are be closed out earlier so that no further obligations are outstanding. Futures and options exchanges and clearinghouses establish rules and manage the processes for physical delivery of assets underlying contracts or cash delivery. Contract specifications set forth delivery obligations, including the settlement figure for futures contracts, sometimes referred to referred to as the *Exchange Delivery Settlement Price* (EDSP). When the delivery procedures and policies are violated, clearinghouses impose fines and other penalties, which can include trading suspensions and revocations of trading privileges, in addition to adverse publicity and trading member reputational costs.

E. Regulation of Futures Markets

The regulation of futures markets is far more comprehensive than regulation for forward markets. This comprehensive body of regulation enables a much larger number of participants to engage other market participants regardless of reputation. In the United States, much regulation is based on legislation, which is then interpreted and implemented by federal agencies such as the CFTC and self-regulatory organizations such as the NFA.

Major Legislation

The Commodity Exchange Act of 1936 provided for regulation of commodities and futures trading markets by the Department of Agriculture and required all futures and commodity

options to be traded on organized exchanges. Ultimately, the Act led to the 1974 establishment of the *Commodities Futures Trading Commission* (CFTC), which regulates futures trading in the United States, including the trading of FX contracts. In many respects, the CFTC functions similarly to the SEC in stock markets. In 1982, the CFTC provided for the creation of the *National Futures Association* (NFA), a self-regulatory organization (SRO) for commodities and futures traders.

An effort to deregulate futures markets and better coordinate their regulation with securities markets was undertaken in the late 1990s. These efforts culminated in the *Commodity Futures Modernization Act* of 2000, which exempted most OTC nonagricultural derivatives and transactions between "sophisticated parties" from regulation under the Commodity Exchange Act (CEA) or as "securities" under other federal securities laws. This act excluded most OTC energy trades from CFTC oversight and financial derivatives from SEC and CFTC oversight. These exemptions formed the so-called "Enron loophole" that contributed to massive fraud and the failure of the Enron company. The exemptions further contributed to the role that credit default swaps would play in the 2008 financial crisis. In part, the Act was intended to resolve disputes between the SEC and CFTC concerning overlapping jurisdictions, particularly with respect to certain types of contracts including single equity futures (futures contracts on shares of a single firm's stock). The Act led to retail trading of these contracts in 2003, though without major incident.

The Commodity Futures Trading Commission

As mentioned above, the CFTC was created as an independent agency in 1974 after the enactment of the Commodity Futures Trading Commission Act to regulate U.S. commodity futures and option markets. Its creation was delayed in comparison to that of the SEC (established in 1934) because most futures and options trading were related to agricultural commodities and thus were overseen by the Department of Agriculture, more specifically, the Grain Futures Administration, created by the Grain Futures Act of 1922 as the predecessor regulatory body to the much later CFTC. A number of market developments, including the 1973 opening of the Chicago Options Exchange, led to the 1974 enactment of the Commodities Futures Trading Commission Act.

In a manner similar to the SEC, the CFTC has five commissioners including its chair appointed by the president to staggered five-year terms, with no more than three commissioners from any one political party. Its mission is to protect market participants and the public from fraud, manipulation, and abusive practices related to futures and options, and to foster open, competitive, and financially sound markets. The CFTC maintains a number of essential offices and divisions, including the following:[2]

- The CFTC Office of the General Counsel is the Commission's legal advisor, represents the Commission in appellate litigation and certain trial-level cases, including bankruptcy proceedings involving futures industry professionals, and advises the Commission on the application and interpretation of the Commodity Exchange Act and other administrative statutes.
- The Office of the Executive Director formulates and implements the management and administrative functions of the CFTC and the agency's budget.

[2] Most of these CFTC operating unit descriptions were paraphrased from the Commission's website at http://www.cftc.gov/About/CFTCOrganization/index.htm.

• The Division of Clearing and Risk oversees derivatives clearing organizations (DCOs), the clearing of swaps, futures, and options on futures, and market participants that may pose risk to the clearing process.
• The Division of Market Oversight is responsible for fostering markets that accurately reflect the forces of supply and demand for the underlying commodity and are free of abusive trading activity, oversees trade execution facilities, and performs market surveillance, market compliance, and market and product review functions.
• The Division of Enforcement investigates and prosecutes alleged violations of the Commodity Exchange Act and Commission regulations. Violations may involve commodity futures or option trading on U.S. futures exchanges or the improper marketing and sales of commodity futures products to the general public.
• The Office of the Chief Economist provides economic support and advice to the Commission, conducts research on policy issues facing the agency, and provides education and training for Commission staff.

F. Prediction Markets

Price discovery is one of the most important functions of trading, particularly in more transparent markets such as the NYSE. This price discovery is of vital importance to investors and business decision making. What is the essence of trading that produces this information? Several of the models that we have discussed in this book allow for market frameworks where informed traders communicate information (perhaps reluctantly) through their trading activities. Might gambling serve the same essential purpose as trading in the price discovery and information production processes? Similarly, what might gambling be able to teach us about information dissemination in financial markets? Bear in mind that prediction markets encourage and reward participation by more knowledgeable traders and punish noise *traders* (traders who lack useful trading information).

Consider the recent presidential elections, where an increasing number of online betting markets offered tradable securities on election outcomes.[3] Among the most visible of these markets have been PredictIt and the Iowa Electronic Markets (IEM) at the Tippie School of Business, University of Iowa. Both have created "futures" contracts that can be purchased and sold by "investors," whose values fluctuated as perceived election chances of various candidates and referendums varied. Thus, a contract that pays $1 if a given candidate is elected might sell for a price less than $1. For example, if a contract sells for $0.50, one might roughly infer that the market believes that the candidate has a 50% chance (ignoring discount factors and other complications) of getting elected. In effect, futures contract prices (another similar type of contract in the financial marketplace is the digital option) might have been interpreted as the market's assessment of the probability that a given candidate would be elected. Hence, such a site might serve as a prediction market.

Prediction markets are markets created for the purpose of making predictions or benefiting from correct predictions. The Iowa Electronic Markets and PredictIt have been more successful at predicting election outcomes than many opinion polls. Consider, for example, the report by *Time Magazine* (Saporito, 2005) of a prediction market's contract making payment contingent on the capture of Saddam Hussein suddenly changing price two days before he was

[3] Organized betting markets in political elections preceded the Internet, even on Wall Street. Although such gambling has recently been either illegal or prohibited by NYSE and AMEX rules (but not always), though well-organized "underground" markets had existed for over a hundred years on the major U.S. exchanges.

captured on December 13, 2003. Other prediction markets such as Betfair, Cantor Fitzgerald's Hollywood Stock Exchange, Centrebet (now, William Hill), Goldman Sach's, and Deutsche Bank's Economic Derivatives and TradeSports (which became InTrade, but is now defunct) have served as useful prediction devices in other arenas, and have been very useful in making nonfinancial predictions. On the other hand, prices on some particularly high-volume prediction markets seemed inconsistent with actual outcomes. The 2016 Brexit (Britain's exit from the European Union) and the 2016 U.S. presidential election, in the Republican primaries and the general election, both ended in results contrary to apparent market predictions on PredictIt and IEM. At a minimum, we need to remember that these were not the only prediction markets operating at the time, markets produce implied probabilities rather than actual forecasts and that both actual voting contests were quite close. A number of research papers have discussed use of prediction markets for a variety of types of predictions (e.g., Wolfers and Zitzewitz,2004, 2007).[4] Security markets are excellent aggregators of information. Security prices have been used for many years to estimate a variety of types of probability distributions. For example, currency traders have for many years used futures prices to estimate future currency exchange rates.

Similarly, commodity traders have used commodity futures prices to predict commodity prices. Latane and Rendleman (1976) proposed used market prices of put and call options to estimate implied volatilities (return standard deviations) for underlying stocks (we will discuss this in detail later). Bodurtha and Shen (1995) and Campa and Chang (1998) used similar statistical methods to estimate implied correlations between two underlying variables such as exchange rates using derivative contracts written on each underlying currency as well as contracts written on both currencies.

[4] Wolfers and Zitzewitz (2004) was the source for some of the information in this section.

References

Black, F. (1971). Towards a fully automated exchange, part I. *Financial Analysts Journal*, 27, 29-34.

Bodurtha, J.N., & Shen, Q. (1995). Historical and implied measures of "value at risk": The DM and yen case. Unpublished working paper. Ann Arbor: University of Michigan.

Campa, J. M., & Chang, P. H. K. (1998). The forecasting ability of correlations implied in foreign exchange options. *Journal of International Money and Finance*, 17, 855-880.

French, K., and Roll, R. (1986). The arrival of information and the reaction of traders. *Journal of Financial Economics*, 13, 547-559.

Latane, H., & Rendleman, R. (1976). Standard deviations of stock price ratios implied by option prices. *Journal of Finance*, 31, 369-381.

Saporito, B. (2005). Place your bets! *Time Magazine*, October 24, 76.

Teall, John L. (2018): *Financial Trading and Investing*, 2nd ed., Waltham, Massachusetts: Elsevier, Inc.

Wolfers, J., and Zitzewitz, E. (2004). Prediction markets. *Journal of Economic Perspectives*, 18, 107-126.

Wolfers, J., and Zitzewitz, E. (2007). Interpreting prediction market prices as probabilities. Unpublished working paper, University of Pennsylvania.

Exercises

1. What are the differences between forward and futures contracts?

2. How does a stop order differ from a limit order?

3. Exactly what does an investor expect from her broker when she places a stop limit order with a stop price to buy at 50 and a limit price of 50.10? Why might an investor place such an order?

4. *Netting* and *novation* are important activities of most clearing firms. What is the difference between these two activities?

5. The table below represents transactions executed during a given trading day in a given futures exchange market:

Trader	**Broker**	**Contract**	**Long/Short Contracts**	**Margin Cash Amount**	**Settling Bank**
A	Merrill	Corn	Buy 100	$5,000	City
A	Morgan	Corn	Sell 200	$10,000	Chase
B	F-Trade	Oil	Buy 100	$6,000	BoB
C	F-Trade	T-Bills	Buy 100	$8,000	BoB
C	Schwalb	Oil	Sell 100	$6,000	Chase
D	Schwalb	T-Bills	Sell 100	$8,000	Chase
D	Schwalb	Corn	Sell 300	$15,000	Chase
D	Schwalb	Corn	Buy 400	$20,000	Chase

a. What is the net change of contracts in each of the broker accounts with the clearinghouse?
b. What is the net change of contracts in each of the client accounts with each broker?
c. What is the net change of the clearinghouse's cash account with each settling bank?
d. What is the net-net cash amount due or paid to the clearinghouse?

Solutions

1. Futures contracts differ from forward contracts in that they are standardized and trade on exchanges, and typically provide for margin and marking to the market. That is, futures contracts are traded on exchanges such as the Chicago Board of Trade and the New York Mercantile Exchange. In order to ensure liquidity in futures markets, exchanges limit the number that they trade and maintain standardized terms to ensure demand for each of the contracts that they elect to trade. Margin requirements are instituted to ensure that contract participants fulfill their obligations to the exchange, whereas forward market participants rely on good faith, reputation and the court system. Generally, a futures market participant must vary her margin, depending on the trading environment and the prices of the underlying assets or rates. This variance of margin, which increases as the value of the investor's obligation increases and decreases as the obligation decreases, is referred to as marking to the market.

2. A limit order sets an upper price for a purchase or a lower price limit for a sell, preventing the broker from paying more or accepting less for the security. A stop order instructs the broker to place the buy order once the price has risen above a given level or place the sell order once the price of the security has fallen beneath a given level. The limit order restricts the price; the stop order triggers the order execution.

3. This stop-limit order triggers the buy once the price rises to 50, but is executed only if the stock can be purchased for no more than 50.10. Stop orders to buy are often placed when the investor wants to buy the stock on upward price momentum, but the limit is typically placed when the investor wants protection from paying more than she wants for the stock.

4. *Novation* is the process by which a clearing house steps into each transaction to be settled by its members and assumes the settlement obligations of both counterparties to the transactions, in effect becoming the counterparty to both sides of every transaction. *Netting* is the simplification process used by clearing institutions of adding all of a given firm's purchases of each security, adding the sales of each security, deducting sells from buys to determine the net change in holdings of that security for the firm, then finally computing the net cash flows associated with all transactions. The net reflects what each clearing member receives or pays.

5. For all parts of this problem, we will aggregate trades for clients and then for members of the DTC for the trading day.

a. Merrill: +100 contracts of Corn; Morgan: -200 contracts of Corn; F-Trade: +100 contracts of Oil and -100 contracts of T-Bills; Schwalb: -100 contracts of Oil, -100 contracts of T-Bills and +100 contracts of Corn
b. A: +100 contracts of Corn through Merrill and -200 contracts of Corn through Morgan; B: +100 contracts of Oil through F-Trade, C: +100 contracts of T-Bills through F-Trade and -100 contracts of Oil through Schwalb, D: -100 contracts of T-Bills through Schwalb and +100 contracts of Corn through Schwalb
c. City: $5,000 paid to the DTC; Chase: $19,000 received from the DTC; BoB: $14,000 paid to the DTC
d. 0; Always zero to the central clearing party (or CME or other exchange) on each end of day settlement; the net amounts paid out equal net amounts received.