

Chapter 1

STANDARD PRODUCTS AND MARKETS

This first chapter is a very gentle introduction to the subject of financial derivatives. It describes the organization of the different markets and in particular the organized markets. It also presents a trading room and the various jobs involved in it. It concludes on miscellaneous subjects like technical analysis and some notions on regulation and ethic. People already familiar with derivatives may skip this chapter.

1.1. Introduction to Financial Markets

1.1.1. *Definition of financial markets*

Financial markets are a place where buyers and sellers are ready to exchange various types of financial securities or products. Financial markets enables a variety of corporations and individuals to facilitate short- but also long-term purchase of assets and risk transfer. Financial markets are commonly divided into:

- (1) capital markets in turns divided into:
 - (a) stock markets, that facilitates equity investment and buying and selling of shares or common stock,
 - (b) bond markets, that provides financing through the issue of debt contracts and the buying and selling of bonds and debentures;
- (2) money markets, that provides short-term debt financing and investment;

- (3) derivatives markets, that provides instruments for handling of financial risks;
- (4) futures markets, that provide standardized contracts for trading assets at some forward date (see also forward market);
- (5) insurance markets, which facilitates handling of various risks;
- (6) foreign exchange markets.

Newly formed (issued) securities are bought or sold in primary markets. Secondary markets allow owners of the security or the product of securities to buy or sell the same.

1.1.2. *The different derivatives markets*

Within the financial markets, one distinguishes traditionally (see Fig. 1.1):

- (1) the organized or exchange traded markets for instance the Chicago Board of Trade (www.cbot.com), the Chicago Mercantile Exchange (www.cme.com), the London International Financial Futures Exchange (LIFFE) www.liffe.com which is a part of Euronext group since June 2002.
- (2) the non-organized markets called over-the-counter (OTC) markets.

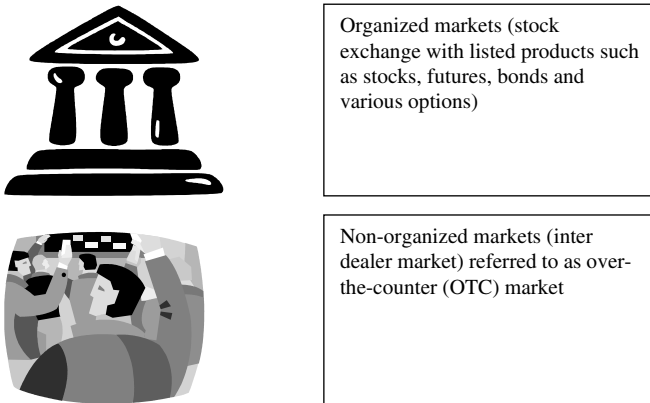


Figure 1.1: The two markets types.

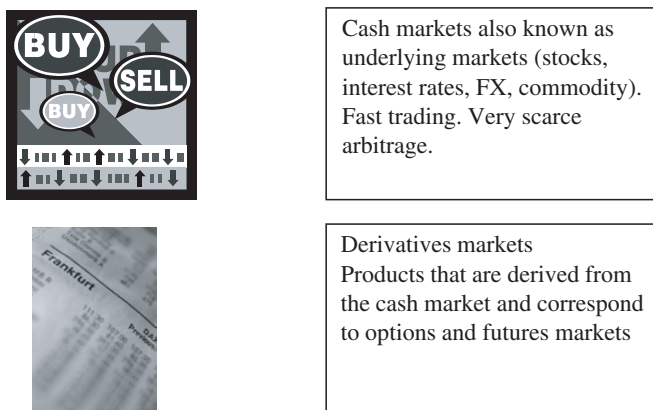


Figure 1.2: Cash and derivatives markets.

One also makes the distinction between (see Fig. 1.2).

- (1) the cash market where traditional securities, like stocks and indexes are traded;
- (2) the derivatives market, which are markets derived from the more traditional ones, as the value of their financial instruments depends on the value of other, more basic and often non-divisible underlying instruments.

Typical derivatives are futures, forward, swaps, call put and warrants. More generally, a derivative security is a financial asset whose value depends on the value of some other assets called underlying of the financial derivatives.

1.1.3. *Importance of the derivatives*

In the recent years, the derivatives business has become increasingly important in the world of finance, being for some underlying securities more liquid, that is to say, having trading volume larger than their underlying markets.

In order to give an idea of the importance of the derivatives market, let us just mention that the total notional value of derivatives

(OTC and exchange based) has been around 400 trillion dollars for the year of 2004 according to the Office of Controller of the Currency (OCC). In comparison, the total market capitalization world wide has only been around 10 trillion dollars in 2004 (*source*: the United Nations) while the GDP of the United States for the same time has only been about 10 trillion of dollars (*source*: CIA). This means that the volume of the derivatives business represents 40 times the total market capitalization and the US GDP. And as shown by Fig. 1.3, the growth of this derivatives market has been impressive over the last years. It has almost double in the last 5 years. When talking about individuals sector, we will show the different components of the derivatives business (Table 1.1).

The fact that the market has been growing very rapidly does not preclude for a bubble burst, hence a greater responsibilities from regulators and controllers to control and preserve the system.

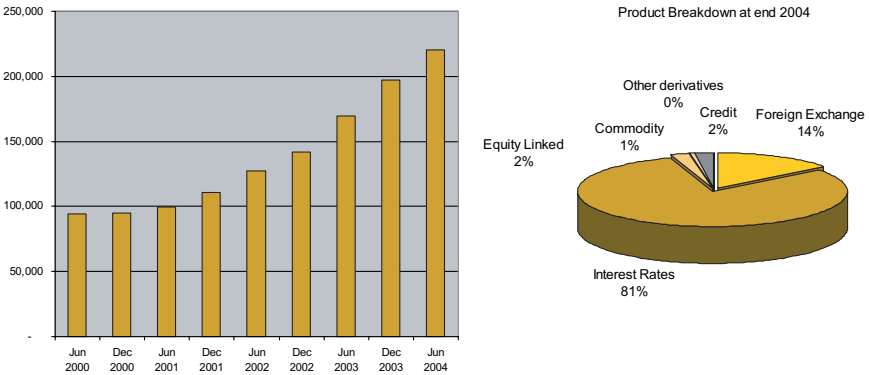


Figure 1.3: Semi-annual total volume of OTC derivatives and corresponding breakdown for end 2004 in billion dollars.

Table 1.1: Semi-annual total volume of OTC derivatives in billions dollars.

Jun 2000	Dec 2000	Jun 2001	Dec 2001	Jun 2002	Dec 2002	Jun 2003	Dec 2003	Jun 2004
94,008	95,199	99,755	111,115	127,564	141,655	169,658	197,167	220,058

1.1.4. *Cash or spot vs. derivatives markets*

A derivative (or financial derivative or financial derivative security) is a financial instrument whose value depends on the value of other more basic underlying variables. The main categories of derivatives are options, futures and forward contracts. Obviously, there exist derivatives of derivatives.

An option is a contract that gives the buyer the right, but not the obligation, to buy (call) or sell (put) some asset(s) at a specified price (the strike) for a specified period of time or point in time. The financial contract of an option contains some rights, hence the terminology. On the contrary, a forward or futures contract is a contract in which the buyer agrees to buy or sell some asset(s) at a specified time for a specified price. What distinguishes options from forwards and futures is precisely the fact that the holder is not forced to buy or sell the underlying asset(s). However, there is a cost in entering an option contract whereas there is no cost in entering a forward or futures one.

Forwards and futures represent a very large part of the derivatives industry. According to the International Swaps and Derivatives Association, Inc (ISDA) survey, forward and futures (including swaps) represent three quarters of the derivatives in notional terms. In practice, many structured deals are a combination of options and other more traditional assets, like swaps or stocks.

There are two main categories of exchange traded options: listed and futures options. Listed options are traded on organized exchange like the Nasdaq (www.nasdaq.com), New York Stock Exchange (www.nyse.com), the London Stock Exchange (LSE, www.londonstockexchange.com) (see Chapter 3 for more details on options). This concerns any type of underlying like equities, equity indexes, currencies, etc. Usually one can find the quotes in the newspaper. The contract can be settled in cash or physical underlying.

Options on futures, traded on a futures exchange, right next to the futures pit, like in the CBOT, LIFFE, etc. concern other type of underlying like commodities (crude oils, electricity, natural gas,

aluminum), bond (US Treasury and Bunds), currency futures, etc. The major exchanges are the Chicago Board of Trades (CBOT), the Chicago Mercantile Exchange (CME) and the Philadelphia Stock Exchange (PHLX).

One can find quotes for these options in the newspaper. The big difference is that this type of options is always settled in underlying futures contracts.

Derivatives embody more risk than standard products because of their intrinsic leverage. They are also addressed to specific needs and clients. As a consequence, exchanges have been split between cash markets and derivatives. Moreover, the options and futures markets have specific requirements in terms of minimum margin capital and reserve in order to trade.

1.1.5. *History of financial markets*

Derivatives were originally used to hedge commodities products such as agricultural produce and metals. Indeed, derivatives market can be traced as far as the Antique Greece when farmers may sell in advance the olive crop on a forward basis. Indeed, options concept had already been invented and Thales used them to make a fortune as described in the book of Aristotle "Politics". In the middle age, it was not uncommon for traders in Flander and Champagne to use forward contract, by means of the so called "lettre de faire" where the quality standard and the price were agreed in advance. Later on, in the 17th century, Amsterdam grew an important financial center, which ended up in a large scale financial collapse through the burst of the tulip forward selling activity. Similarly, but with less speculation, Japan developed early derivatives markets, based in Osaka, dealing with agricultural products, especially on rice.

But the real birth of modern futures markets started in the United States, with the creation of the ancestor of the CBOT in 1848. The early expansion went fast. The idea of standardized forward dealing started to appeal to more and more people. Later on, the New York Cotton Exchange was founded in 1870, followed by the Butter and

Cheese Exchange of New York in 1972 and the Chicago Produce Exchange. The period of consolidation came during the First World War when activity was scaled down, followed by the 1929s crisis. The depression took its toll on various exchanges. This led first to more rationalization of exchanges as well as better regulation. Political pressures to regulate futures markets led in 1933 to the commodity exchange act that established more rigorous rules for futures trading exchange.

But the real birth of financial markets can be said to have come really in the 1970s. All the elements were ready for modern financial markets. First of all, the system of fixed exchange rates, which pegged the major currencies to the dollar, which in turn was pegged to gold, went burst. On 15 August 1971, President Nixon decided to abolish the Bretton Woods agreement. With this move, currencies suddenly floated free and were subject to supply and demand like any other product, pushing for more freedom to trade. Second, the exchanges like the CBOT or the CME had decided to standardize their products, making the market more liquid as well as expanding the number of products that they were trading. Options started to become more and more popular although they have been around since the early beginning of the 20th century.

Derivatives markets were ready for their explosion as futures exchanges extended from the United States to Europe and Asia in the 1980s with the opening of various derivatives exchange market such as the LIFFE, the MATTIF (Paris exchange market), which later on merged with the Amsterdam, Bruxelles and Lisbonne exchange markets into the Euronext market, the German market (the Deutsche Börse) which later on merged with the Swiss Exchange into the Eurex.

Undoubtedly, derivatives markets have an important role in the financial markets as they complete underlying markets, enabling us to have more tailor made transactions for hedgers and risk speculators. Because of the complexity of those products, models are needed to try linking and complementing the available information in order to build a consensus of all market players' opinion about the Market's future evolution.

1.1.6. *Listed markets vs. OTC markets*

Exchange traded markets have been created to standardize contract and support the counter party risk through their compensation rooms. On the contrary, in the OTC markets, market players bear the full counterparty risk. The main listed markets are:

- (1) EUREX: German's (Frankfurt) future contracts (Bobl, Bund...);
- (2) CBOT: American's (Chicago) future contract market;
- (3) LIFFE: English's (London) future contract market (Swapnote);
- (4) Euronext: previously (Paris) future contract market (Pibor, Notionnel).

Deposit account vs. capital allocation: Deposit account and margin calls process ensure listed markets system to cover for liquidity risk and default risk; mechanism of limit stop quotation prevents the system to derive in a bad spiral.

Other products need to be treated with another designed market player. As the deal engaged the two contractors in future exchange (swap flows, option exercise,...) it can be stopped by the default of one the two before its expiry. To prevent this risk, additional fee, depending mainly of the credit quality of the counterparty and the exposure involved, is charged in these deals.

1.1.7. *Shares and dividends*

A stock, an equity or a share stock is a financial product that provides the ownership of a small piece of a company. When raising capital, company sells the future profits in the form of a stake in the new company. The investor, the share holder, who may be a private investor, institutional, or investment company own the company. There are many types of shares. It is only when a company has satisfy a certain number of criteria, like their capitalization, the number of shares issued and the official publication of information

that it can be listed in a given stock market. Typical examples of stocks are Microsoft, Cisco, IBM, General Motors, etc.

Stock markets have often different levels or submarkets to allow for different market capitalization and company types. The advantages of raising capital via the stock market are the low cost and the efficiency. Another constituent of the stock is its dividend. Since the shareholder has a stake in the ownership of the company, he/she is entitled to receive parts of the profits of the firm, which are materialized by the dividends. The value of a portfolio invested in stocks will therefore be not only affected by the change of the price of the stock but also its dividend.

The amount of dividend varies from year to year according to the benefits of the company and its financial strategy. It is decided by the board of directors of the company, usually set a month before being paid. The date at which the amount of dividend is publicly known is called the fixing date. The two others important dates are the settlement date and the pay date. The stock trades-cum-dividend up to the settlement date, meaning that a stock holder will receive the dividend if he/she holds the stock up to the settlement date. He/she will be paid at the pay date. Obviously, after the settlement date, the price of the stock needs to reflect that the dividend will not be paid. As a consequence, after the settlement date, the equity price will drop to offset the disadvantage of receiving not the dividend. The drop will in practice be somehow different from the dividend to reflect the different tax treatment of dividends and stocks. Dividends are considered to be income whereas stocks are considered to be capitals. Stocks trading with dividend are called cum-dividend, whereas when without, ex-dividend. Last but not least, dividends are considered to be a signal about the health of the company. As a rule of thumb, companies try to maintain a constant level of dividend. The price per earning (PER) is the percentage of the dividend compared to the equity price. It indicates whether a company is offering a high dividend or not. We will describe in more details the dividends in the chapter about modeling as it affects substantially the price of equity option. As the price of the stocks evolves, it may reach levels that are very far from its

original level. To readjust for this growth, it is not rare to see stock splits. A stock split (like a three-for-one) consists in giving to each stock holder for each share a multiplicative number of shares (three in the example). Stock split should be considered in a derivatives contract.

The total number of stocks is the outstanding number of shares. The outstanding number measures the number of shares potentially in circulation in the financial markets. The open interest is the total number of transactions (buy and sell). It indicates the depth and in a sense the liquidity of the market. The market capitalization of a company is the value of the outstanding number of shares.

Obviously, the behavior of the stock is far from being predictable, leading to major trading successes and losses. We will see that to model a financial derivative, we will assume that the behavior of a stock is somehow predictable (in its drift term) and somehow random, accounting for the fact that no one can really predict perfectly a market.

Last but not the least, buying a stock (and in general a financial asset) is said to assume a long position, while selling it is said to assume short position.

1.1.8. *Typology of the markets participants*

First of all, it is interesting to make the difference between market players and controllers, internal and external, basically regulators. We will see in the following section in more details the market players through an overview of the trading room. But very rapidly, market players (and their staff) are divided into:

- investor
- broker
- trader
- sales
- structurers
- quants and IT
- middle and back office.

1.2. Presentation of the Trading Room and Group Description

- (1) *Sales/marketers/originators, traders*: They are the trading room's interface with clients and brokers.
- (2) *Support departments*: They work closely with the traders for pricing and hedging: quantitative research, macro economic research, IT platform.
- (3) *Middle-Office*: They help to confirm by checking with the counterparty the deal terms and help the trader to plug it in the pipe.
- (4) *Back-Office*: They are following the deal until its maturity (repository, cash-flows, ...).

1.2.1. *Different functionality of the trading room*

The trading room is the interface between final client and financial markets. It uses the investment bank's fund to make money out of it. There are three categories of traders: speculators, hedgers and arbitrageurs.

1.2.2. *Job description*

1.2.2.1. *Trader*

The trader is the trading room's interface with brokers on line (and/or with other trading rooms). He has to handle trading room's book positions and its proper hedging. He/she can take view on the market according to certain risk limit agreed in advance with senior management, to deliver a certain objective. The issue at stake for hedgers is to reduce the risk due to the different movements of market variables whereas speculators take short/long positions because they think prices will go up or down. Arbitrageurs make profit by making transactions into several markets without an initial setting. In practice, there are just a few of arbitrage opportunities. Thereafter, in this book, most of arguments are built on the hypothesis that there are no arbitrage opportunities. Traders are closely monitored

not only by the internal risk control group through daily VAR limits, agreement on new products and risk committee but also by the trading group's heads. It is his mandate to control the trading group position and to take strategic decision on risky positions.

1.2.2.2. *Sales/originators/structurors*

They are the trading room's interface with client. This can be in the two ways as clients may be interested in both buying and selling. They handle offer and demand between the final client's supply and the traders' book. On the one hand, sales want to help client to access to financial markets, through its trading room. On the other hand, they also take into account trader's will to certain risk and exposition of their book and try to convince clients to have the opposite position. In a sense, they make the market more fluid by intermediating risk takers.

1.2.2.3. *Quant/IT/analyst support*

Quants, IT, analyst and strategist work ahead of the process to provide traders with a variety of tools for a better assessment of their risk and the preferred hedging strategy. They are strategic assets to promote new products both through their pricing and hedging and the measurement of this new product in terms of aggregated risk with the current one of book positions.

Quants and IT department are deeply involved in the trading orientation of the bank by providing models and system tools.

Another strategic department is micro/macro analysts. They provide global micro/macro economic views to forecast trends and market momentum. They use forecasting indicators to help traders to handle specific position.

1.2.2.4. *Middle office/back office support*

They handle the confirmation of the deal, by checking it with the counterparty, ensuring the proper booking of the deal and following the deal's life in the systems till its end.

1.3. Flow Business, Prop Trading and Exotic

1.3.1. *Definition*

Flow business refers to trading done for the client's account that concerns large trading volume and plain vanilla products. Plain vanilla products refer to mainstream product. It alludes to the vanilla flavor that is the most common one for ice cream. By contrast, complex derivatives are referred to as exotic. Proprietary trading refers to any transactions done by a securities firm that affects its accounts and not the one of its client.

1.3.2. *Hedge fund business*

Over the last 10 years, a growing business has become hedge funds business. Those companies are small ones (usually only a tens of people) that collect and invest client's funds as well as their own funds with specified and agreed long-term strategy. They exhibit usually a high risk/reward profile as they are taking huge bets on various markets. They act in various markets and have much more freedom in terms of investing their funds than their mutual funds counterpart.

1.3.3. *Key differences*

Books are mainly driven by clients supply. Bid/ask quotation spreads are tight when flows are great, frequent and two ways sided. P&L is built on small margin based on huge cumulated flows.

On the contrary, when flows are rare or one sided, positions cannot be hedged statically or netted in a book so its hedging process should be done more frequently and/or imperfectly. The bid/ask spread should be larger to take in account transaction costs and/or imperfect hedging.

Books are initiated by the prop trader's opinion of the evolution of the market. Positions can be easily marked to markets. For complex transaction, these may need to be marked to model, as opposed to marked to model to point out that the mark to market given daily is bound to a specific model. In this particular case, there is some

risk that the model may be misleading and this is referred to as model risk.

Exotic business needs power models to handle market players about their consensus of what the future should tend to. Some risks cannot be easily sold to the market (and have to be provisioned and scrutinized quite carefully).

Bid/ask quotations should be larger to take account of imperfect day by day Greeks hedging (transaction costs and/or unexplained P&L). Positions are hedged with liquid instruments (case of vanilla products) directly or through its Greeks projection (exotic case).

Generally positions need more capital allocation. This is why prop trading business requires usually more capital than client-oriented business.

1.3.4. *Market making*

Market makers make the commitment to be seller or buyer position on specified range of products. They stand ready to buy and sell a particular stock on a regular and continuous basis at a publicly quoted price. Their engagement is generally expressed as small, bid/offer published quotation. Brokers are good medium of exchange for market makers.

1.3.5. *ECN and electronic trading platform*

Electronic platform, as well as e-trading, is the recent ways to fluidize inter-market players links. The key points are:

- (1) insurance that real-time trader's quotation platform has no bug and is correctly fed;
- (2) each new deal, once entered, should alert the trader and update its position;
- (3) limits (stop loss, cumulated nominal amount, cumulative risk position . . .) should be present and activated, when needed, on the traders platform.

1.4. Ethic and Deontology

1.4.1. *History*

Bankruptcies history highlights the systemic links risk in the financial industry. We will review some famous derivatives stories.

1.4.1.1. *Barings*

The collapse of Britain's premier bank Barings bank in 1995 is probably one of the most spectacular debacles in the derivatives industry as it took one man to make a solid bank bankrupt. The failure was completely unexpected. This struck the financial community by complete surprise as this happens in a couple of days. Barings was the Britain's oldest merchant bank. It has a strong reputation. And it has been a single man, Nick Leeson, that made this giant collapse.

Lesson had done some good work in the Jakarta office of Barings and was rapidly promoted to be simultaneously head of trading and head of back office for Barings in their Singapore office. Such a position should have rung alarm bells, but the conflict of interest and lack of control went unnoticed within the Barings' senior management.

Leeson and his traders had authority to perform two types of trading:

- (1) transacting futures and options orders for clients or for other firms within the Barings organization;
- (2) arbitraging price differences between Nikkei futures traded on the SIMEX and Japan's Osaka exchange.

Perhaps it was the inherent lack of risk in such trading that prompted people to not to be concerned about Leeson wearing multiple hats.

Leeson took unauthorized speculative positions primarily in futures linked to the Nikkei 225 and Japanese government bonds (JGB) as well as options on the Nikkei. He hid his trading in an unused BSS error account, number 88888. Exactly why Leeson was speculating is unclear. He claims that he originally used the 88888 account to hide some embarrassing losses resulting from mistakes made by his traders. However, Leeson started actively trading in the

88888 account almost as soon as he arrived in Singapore. The sheer volume of his trading suggests a simple desire to speculate. He lost money from the beginning. Increasing his bets only made him lose more money. By the end of 1992, the 88888 account was under water by about GBP 2MM. A year later, this had mushroomed to GBP 23MM. By the end of 1994, Leeson's 88888 account had lost a total of GBP 208MM. Barings management remained blithely unaware. On February 23, 1995, Leeson hopped on a plane to Kuala Lumpur leaving behind a GBP 827MM hole in the Barings balance sheet.

As a trader, Leeson had extremely bad luck. By mid February 1995, he had accumulated an enormous position — half the open interest in the Nikkei future and 85% of the open interest in the JGB future. The market was aware of this and probably traded against him. Prior to 1995, however, he just made consistently bad bets. The fact that he was so unlucky should not be too much of a surprise. If he had not been so misfortunate, we probably would not have ever heard of him. What really grabbed the world's attention was the fact that the failure was caused by only one man, a trader based in Singapore.

1.4.1.2. *ENRON*

The history of ENRON lies in wrong corporate statement rather and misuse of marked to model that was reported as marked to market. It is more a story of false accounting report than derivatives misuse.

The bankruptcy came in 2001 when the whole Enron empire collapsed. It had been the largest one in US history just 7 months before WorldCom's spectacular bankruptcy.

Bankruptcy came because of various problems:

- (1) First, the buying of new power plant and companies consisted in huge investment whose profitability or losses would only be realized 10 or 20 years afterwards.
- (2) Second, the large trading activity plus the launch of Enron Online fostered by the internet booming environment made the Enron share price skyrocket giving the company even more cash to invest into dubious and very expensive projects.

- (3) Third, complex trading position were marked to model but these were reporting to be marked to market, with very little questioning by the internal risk control group.
- (4) Fourth, ENRON, leveraging on its client power with regards to its external auditor Arthur Andersen, forced it to write off his accounting report although the accounting firm has been aware of some wrong reporting.
- (5) Fifth, ENRON accumulated large trading bullish position that led to huge losses when the market turned off from the technology bubble to the bear market, bursting the Internet euphoria bubble.

The firm's bankruptcy was the largest in US history, it was only surpassed 7 months later by the WorldCom's bankruptcy.

1.4.1.3. *LTCM*

The long-term capital management (LTCM) is the story of the burst of a star hedge fund. Its founder, a star trader, John Meriwether, had made a strong reputation as one of the best Salomon Brothers bond's trader. Encouraged by its previous trading success, he started his own hedge fund called LTCM. The fund was taking very high leverage position, using sophisticated product as well as sharp quantitative models. But when the crisis in Russia blew up, their highly leveraged position wiped up all the cash of the fund and making it bankrupt.

Their main trading strategy, convergence trades involved buying cheap security and selling the expensive one, betting on the convergence between the two assets. These trades were of four types:

- (1) convergence among the US, Japan, and European sovereign bonds;
- (2) convergence among European sovereign bonds;
- (3) convergence between on-the-run and off-the-run US government bonds;
- (4) long positions in emerging markets sovereigns, hedged back to dollars.

Because of tiny differences in prices, the fund was forced to take large and highly leveraged positions as well as to bet on the convergence through complex model. But the fund had underestimated various risk such as:

- (1) accounting for liquidity as a real risk and have cash in case of large market moves;
- (2) making the difference between marked to model and marked to market;
- (3) accounting for large market movement through stress test of their model;
- (4) accounting for systemic risk and market collapse by aggregating exposure to common risk factors.

Finally, LTCM's bankruptcy was caused by massive leverage and lack of liquidity. At the end of September 1998, the fund had lost most of investor equity capital and to avoid the threat of a major systemic crisis of the financial market, the Federal Reserve Bank bundled a \$3.5 billion rescue package from various investment and commercial banks in exchange for 90% of LTCM equity. *When Genius failed*, by Roger Lowenstein, is the story of LTCM's failure. The Genius mentioned in the title refers to Myron Scholes and Robert Merton (Nobel Prize in economics in 1997).

1.4.2. *Insider trading*

Key indicators calendar announcements: source of bet. There is great temptation to try having in advance indications on the market evolution: history can help detecting an abnormal situation or trend change (charting activity).

Some are tempting to get directly information from those who are building it! If this happened it gives asymmetric information around players and that is no good for the long-term market equilibrium.

"Insider trading" is usually associated with illegal conducts by most investors. But this is not exactly true. Corporate insiders,

officers, directors and employees, can buy and sell stock in their own companies as long as they report their trades to the SEC.

Illegal insider trading refers generally to buying or selling a security, in breach of a fiduciary duty or other relationship of trust and confidence, while in possession of material, nonpublic information about the security. Insider trading violations may also include “tipping” such information, securities trading by the person “tipped”, and securities trading by those who misappropriate such information.

1.4.3. Money laundering

With the recent emphasis on terrorism, money laundering has become a major focus of financial regulators. The sources of money laundering come many illegal activities such as drugs, terrorism financing and other illegal business.

Deontology information and rules are provided to each market player to prevent the proliferation of this plague. Now compliance has been identified by regulatory instance to be full part of the information system beside risk control.

1.5. Summary

Financial markets have been growing for the last 25 years. They are commonly divided into capital markets, derivatives markets, money markets, futures markets. They provide a wide range of instruments from the standardized contracts (forwards, options,...) to more exotic ones.

In this chapter, we have seen briefly the organization of those markets and the different participants of a trading room: traders, brokers, sales, structurers, quants and IT, middle and back office. Bankruptcies history shows that the mechanism of financial markets is not so easy and can lead to the crash or the collapse of a hedge fund or a bank. The development of market institutions would diminish the extent of market manipulation and systemic risk.

References

- [1] Chance D (1997). *An Introduction to Derivatives*, 4th edn. Dryden Press.
- [2] Hull J (2002). *Options, Futures, and other Derivative Securities*, 5th edn. New York: Prentice Hall.
- [3] Lowenstein R (2001). *When Genius Failed: The Rise and Fall of Long-Term Capital Management*. Random House Trade Paperbacks.
- [4] Wilmott P (2000). *Paul Wilmott Introduces Quantitative Finance*. New York: Wiley.