Chapter 2
An Exchange and Its Value Chain

Reto Francioni

2.1 Introduction

This book covers **price discovery**[1] at **stock exchanges** with reference to both the **primary** and the **secondary market**. Markets are constructed as liquidity pools and, therefore, the main task of a stock exchange is twofold:

1. Build, maintain, and grow liquidity pools in each **listed stock**: *The fight for **liquidity**!*
2. Enable fair and adequate price discovery in every listed stock during the entire trading time (Fig. 2.1).

This is facilitated by:

- Customer-oriented market structures
- Fair rules and regulations
- Market-oriented operations of the exchange
- Highly competitive technology
- Effective surveillance
- Efficient fit into the value chain, which covers **clearing**, **settlement**, and **custody**; the customer interface; exchange members; **brokers** and **dealers**

Price discovery is a key function of the market structure, and it requires a tailor-made, customized solution for each product class to attract as much liquidity as possible (Fig. 2.2).

The value chain of a stock exchange has many elements:

[1] Cf. Glossary, which is an integral part of this book: every term and every abbreviation in **bold** are explained in the **glossary**.

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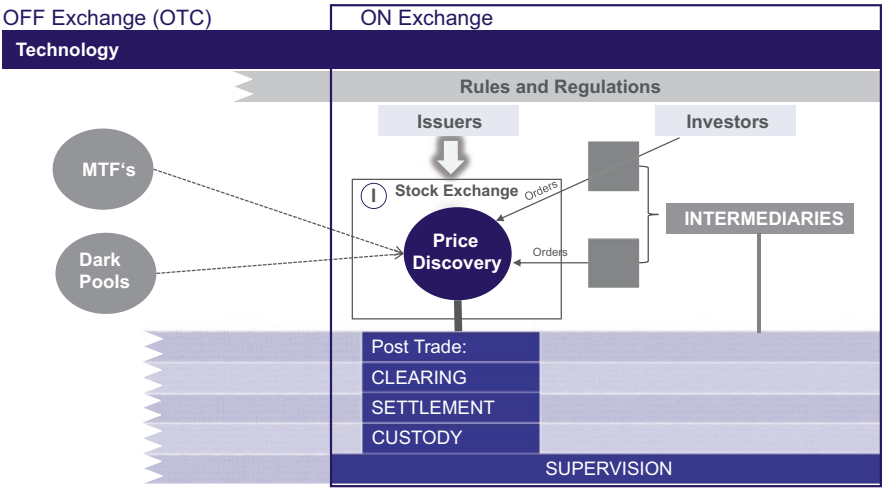

Fig. 2.1 The exchange landscape: overview

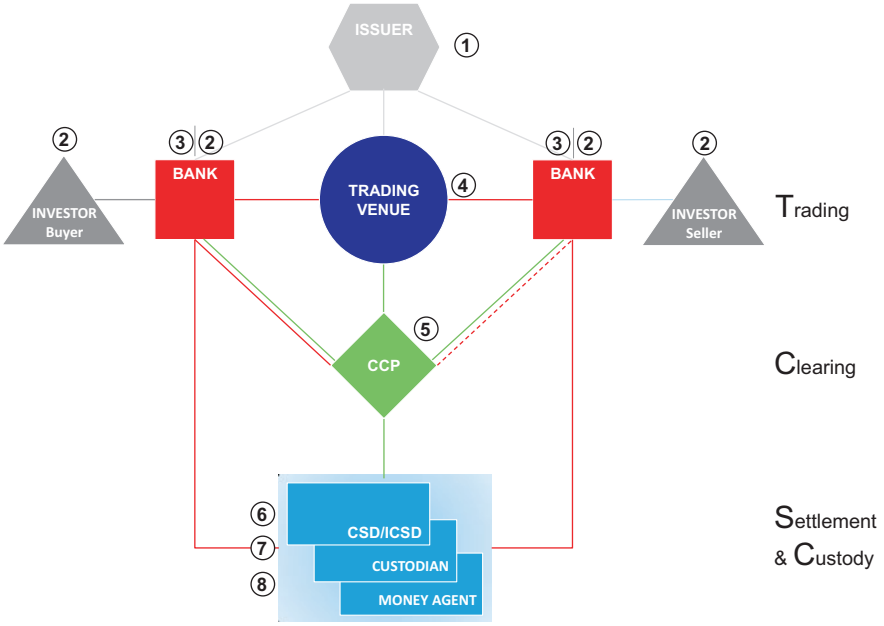

Fig. 2.2 Elements of the value chain

1. Product creators are called issuers. An issuer sells all the shares or at least a certain percentage of the share capital (depending on the listing rules of a stock exchange) to private investors through a public offer, a so-called **initial public**

offering (IPO). By placing stocks in the primary market at/through a specific stock exchange, they are listed and therefore are ready to be traded at the stock exchange in the so-called secondary market.
2. The flow and order creators: These include intermediaries, if they trade from their own account (sell-side or principal dealer); institutional investors (called the buy side) like hedge funds, insurance companies, or retail investors; and private persons buying and selling stocks.
3. The order routers: These are all stock exchange members, called intermediaries, who are acting as brokers.
4. The trading venue or the stock exchange where the central order book is monitored and the price discovery takes place.
5. The clearing house/central counterparty (CCP): The CCP mitigates counterparty and market risk, reducing costs through netting.
6. The settlement organization/central securities depository (CSD): The CSD ensures the delivery and payment of an executed order that is hedged in time, quantity (size), and quality.
7. The custody organization: Covering the administration and safekeeping of stocks.
8. The money transfer system: Facilitating the post-clearing money flow.

A buy or sell order starts with an investor before it has to be handled by an intermediary and routed to the exchange where the price discovery and therefore the actual trade take place.[2] The trade is then routed to the clearing house, where counterparty and market risks are mitigated, and the **netting** of trades takes place. Eventually, the execution of a trade is finalized and confirmed through the settlement organization. The settlement (**delivery vs. payment**: **DvP**) includes custody processes that ensure the delivery of a security, and the payment system, covering the money flow.

This process, which starts with the initial order and ends with the confirmation of the trade to the investor who bought or sold the respective stock, is called the *value chain*.

Traditionally, the trading side includes the clearing part, which is why settlement is often called the post-trade part of the value chain. But since trading and clearing are different organizations (in legal, regulatory, and surveillance terms) and have different functions, they are treated separately from each other. Therefore, everything following clearing in the value chain is defined as *post-clearing*, while at the same time everything following trading in the value chain is defined as the term *post-trading*.

[2] A trade takes place when a buy order and a sell order of the same stock are matched and executed, identically in price, time, size, and place.

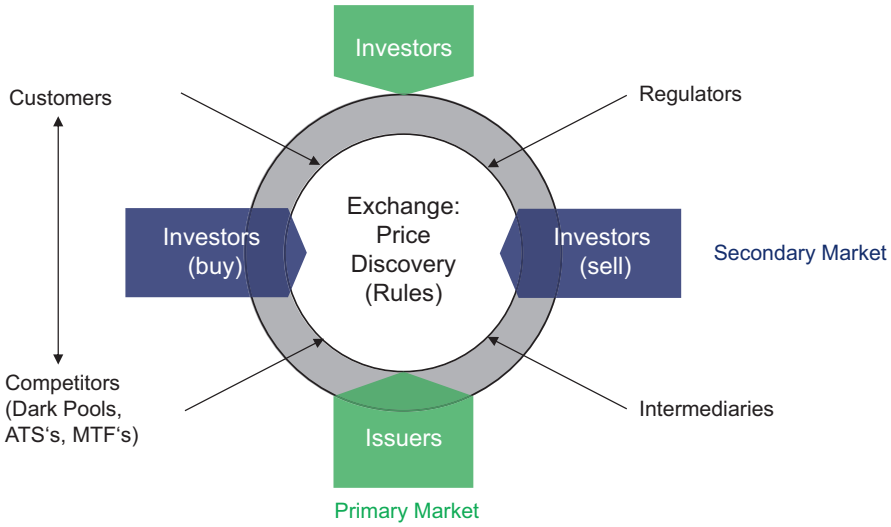

Fig. 2.3 What is an exchange?

2.2 The Exchange: Link to the Real Economy Through Investments

2.2.1 Primary and Secondary Market

A stock exchange is *the* primary liquidity pool in a stock, when its price discovery takes place (Fig. 2.3). Trading and price discovery on a stock exchange is called a secondary market since securities/stocks are already issued. Therefore, price discovery takes place with a given quantity of shares (namely **free float**), and it leads to changing prices per share based on the relative selling and buying pressures of investors. It is a neutral, regulated, and fully transparent marketplace for stocks:

- Neutral, because there is no conflict of interest, and equal treatment of the members and issuers is secured.
- Regulated, because there are laws and other regulatory acts that define how to run a stock exchange, how to handle listing and trading, and how to protect investors and the system as a whole. To enforce rules and regulations, a market supervisory authority is tracking the price discovery at the exchange itself (this is called market surveillance) as well as outside of the exchange on a national level. For instance, in the USA this is the Securities and Exchanges Commission (SEC), in the UK it is the Financial Conduct Authority (FCA),[3] in Singapore it is

[3] The Financial Conduct Authority (FCA) was formed in 2013 as one of the succeeding agencies of the Financial Services Authority (FSA) in the UK. It is a quasi-governmental agency that regulates

the Monetary Authority of Singapore (MAS), in Germany it is the Federal Financial Supervisory Authority (BaFin), and in France it is the Autorité des marchés financiers (AMF).
- Transparent, because there is an open, centralized **order book** for market orders (**COB**) and/or limit orders (**CLOB**). Market participants and—time-delayed—investors are offered an insight view of, and information about, orders in the book for every traded stock: *You see what you get and you get what you see*.

Neutrality, regulation, and transparency are essential basics for the market integrity of an exchange. Market integrity will eventually lead to trust in a market and a financial system: The higher the market integrity, the higher the trust. Market integrity is a key asset of an exchange and of the financial value of an economy, because there is, and there has to be, a close interrelationship between a capital market and its corresponding real economy. In essence, a capital market has to serve the real economy and not vice versa. In this respect, a stock exchange and its value chain are the link between capital markets and the real economy. Similarly, for cleared OTC products, the clearing house is another link to the real economy.

Differentiated from the secondary market, where price discovery takes place via the matching of investors' buy and sell orders, is the primary market. By means of an IPO and as a result of a stringently structured listing procedure, the issuer publicly offers all or parts of its shares to investors. Hence, the primary market is a syndication-supported placement of new shares at an exchange to public investors by issuing companies. If a company offers all of its shares, the free float of the listed company is 100 %. Depending on the listing segment, the free float should be at least 20 %. In both the primary and the secondary market, capital allocation takes place, thereby linking capital markets to the real economy. Due to this fact, price discovery is a process for both markets.

In the primary market the issuing price has to be discovered in an auction-like procedure. Then, as a link to (and already part of the secondary market) the first price has to be fixed at the exchange (also by means of an auction-like procedure). Following this, the secondary market is established and price discovery takes place in the CLOB. It does so in order-driven markets, either through periodic auctions or continuous trading (Fig. 2.4).

Trading in the secondary market can be carried out using different platforms:

1. On-exchange trading describes the *traditional* form of trading by means of a regulated exchange organization. Benefits of this trading form include supervised rules and regulations that guarantee system and investor protection, as well as transparent processes of price discovery within a central order book.

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retail and wholesale financial service provider. The second agency formed is the Prudential Regulation Authority (PRA). As part of the Bank of England it oversees the regulation and supervision of banks, investment firms, etc.

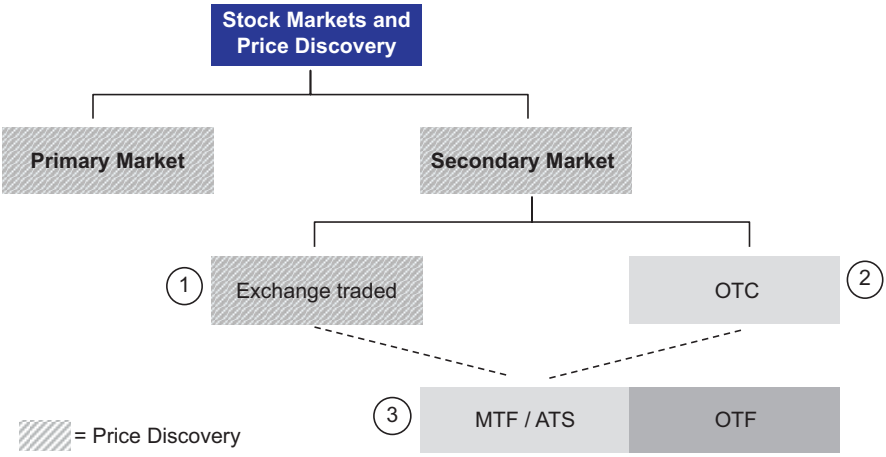

Fig. 2.4 Price discovery on exchanges

2. Off-exchange or OTC trading describes direct and relatively unregulated trading between two dealers by means of electronic trading systems. Since there is no neutral and supervised mediator between buyer and seller, and because order books are usually not accessible, no regulated price discovery takes place and transparency is limited. This form of trading bears considerably more risk than on-exchange trading.

   The OTC market compared with regulated markets may be generally characterized by:

   - Fragmented liquidity
   - Inaccurate price discovery and negotiation
   - Limited transparency and acceptability
   - Operational inefficiency
   - Expensive and slow transactions

(3) **Multilateral trading facilities** (MTF, EU)**/alternative trading systems** (ATS, USA) are non-exchange trading venues with electronic systems that are operated either by an exchange organization or other market operator. Investment services are provided by bringing together third-party buying and selling interests in the system under nondiscretionary rules resulting in contracts. **Organized trading facilities** (OTF, EU) is a term described by MiFID II[4] that subsumes all trading venues that are neither a regulated market nor an MTF. This category was introduced in order for MiFID regulations to cover *all* investment services that bring together third-party buying

[4] MiFID is short for the European Markets in Financial Instruments Directive, in force since 2007, that is currently under review. The EU Commission's proposal for a revised directive is hence called MiFID II.

and selling interests in financial instruments in a system to form a contract (especially **dark pools**).

2.2.2 Mission: Capital allocation through price discovery

2.2.2.1 Precondition: Build, maintain, and grow liquidity pools

- Macroeconomic objective: Fair capital allocation that links the real economy to capital markets

Every economy has to have a high-performing and reliable capital market structure to facilitate growth and wealth. An exchange is an essential link between the real economy and the capital market, financing growth of the listed companies through a transparent, regulated, and neutral procedure in the primary (IPO) and in the secondary market. Exchanges and their post-trade organizations reduce the **systemic risk** of markets and enhance market integrity, largely in terms of transparency, security, and stability. The neutrality of exchanges is the key to supporting fair trading and equality for all market participants.

- Microstructure objective: Effective and efficient price discovery
- Legal objective: Investor and system protection
- Operational objective: System reliability

Reliability refers to the IT trading platform with respect to availability, latency, and capacity. The service availability for a trading platform is measured by the total online time of a round trip, with all components (trading, clearing, settlement) working flawlessly. All incoming orders are time-stamped at the interface between member and exchange, and all trades are time-stamped at price discovery and as they pass back from the exchange system to the member system. All components are usually monitored 24 h and have a backup component that can take over within minutes. For Deutsche Börse Group IT, for example, the service availability for customers considering all components (e.g., network, back-end services, and application software) is considered to be *ok* if the availability is higher or equal to 99.974 % (approximately 1 h per year with 257 trading days).

Latency defines the time for a roundtrip of a **transaction**. Every transaction routing, storage, or execution of **matched** and unmatched orders is time-stamped along with their complete itinerary for the entire **straight-through processing** (STP). The latency for access to trading is the time measured from the technical interface to the member to the entrance in the COB. **Host** and **local backbone latencies** are measured round trip times between member interface and host. Latency is also measured as the time for the access of a member to the COB (e.g., leaving the interface still placed in the COB and ready to be matched).

Fig. 2.5 Price discovery process in the secondary market

Capacity is the ability of an IT platform to handle a specified load, a given percentage above the highest observed daily peak. The percentage should include foreseeable changes of the system load, as well as business volume estimates due to expected market developments (e.g., changes in rates, or due to new products or services).

2.2.2.2 Price Discovery

After a company (the issuer) is publically listed and admitted through an IPO in the primary market, the stock of this company is traded publically at the exchange in a central order book (COB): This is the secondary market. In the secondary market investors value the opportunity to participate as co-owners in value creation for a company. Secondary market means trading and trading means the execution of an investment decision. An investment decision is eventually made by the owner of the asset and therefore the order flows (Fig. 2.5).

Buyers and sellers meet in the central order book. The central order book may be transparent or closed; if the latter, this means no insight for investors or intermediaries. The transparency of a COB may differ in:

- Time (data postponed for the public)
- Scope (accumulation in all or bid by bid, and ask by ask, anonymous with market participants)
- Segment

All buy and sell orders for a stock are collected, brought into the central order book, and either executed or stored in the book. The matching of the bid and ask sides takes place, thereby creating the execution price and the trade. The overriding principle is always to match as many orders as possible. There are different matching procedures to get this result:

- **Auctions** with predefined algorithms
- **Market making** with predefined rules

When a market is opened, it changes its mode from *opening* into *continuous*. In **continuous trading**, orders are executed against the spread or, if no execution is possible, stored in the COB. A COB contains market orders and limit orders;

if it contains limit orders only it is called central limit order book (CLOB). An IPO or the primary market can also be viewed from a price discovery angle: The evaluation or fixing of the first price starts the secondary market by applying a special *price discovery procedure*.

2.2.3 Performance Criteria

The following performance criteria set the stage for liquidity creation:

- Effectivity[5]: High quality
  - Optimal market structure: Customized and tailor-made
  - Competitive regulation: Ockham's razor[6]
- Efficiency[7]: Low cost
  - Information
  - Clearing
  - Transaction costs: Implicit and explicit, market impact, commissions, margin, fees, investor costs, clearing costs, surveillance costs
- Integrity: Trust—Protection of investors, system protection and protection of functionality, fair price discovery, protection against insiders, market transparency, data consistency
- Reliable surveillance
- Attractive product range: Products and markets, single and innovative segmentation
- Distribution power through the trading platform
- Neutrality, no conflict of interests and equal treatment
- Robust and performing technology (volume and time)

2.2.4 Home Markets

A home market is the domestic stock exchange for domestically listed companies, and it is usually the biggest single liquidity pool in this stock. German companies (i.e., Daimler, Deutsche Bank, Lufthansa) are listed on the main German exchange Frankfurter Wertpapierbörse (FWB) and traded on its principal trading platform XETRA.

Elements of a home market are (generally):

[5] Do the right things!

[6] Ockham's razor is a principle of logical problem solving stating that out of a selection of hypotheses, the simplest or the one with the least assumptions should be used to proceed.

[7] Do the things right!

- Biggest single liquidity pool in domestic stocks
- One law per subject
- One set of accounting principles
- One market authority and surveillance
- One tax regime
- Local investment community
- Local banking community
- A single STP that covers the whole value chain
- Link to domestic real economy

2.2.4.1 The Home Market Principle

Every cash market is the *(world) champion* in turnover and therefore in price discovery for its domestically listed stocks (e.g., SIX for Swiss stocks, NXT for French stocks, Frankfurt XETRA for German stocks). This is especially the case for **Blue Chips** (e.g., France: CAC 40, UK: FTSE 100, Germany: DAX 30, Switzerland: SMI).

Because the home market is the biggest liquidity pool in a domestic stock, everybody is trading against it as a reference market. For a stock, this is necessary, because the reference to the home market price is a component of the secondary market strategy of a (listed) company.

2.2.4.2 Reference Functions

Reference function in the EU:

- The post-MiFID situation in trading securities is coined by the fragmentation of market liquidity to exchanges, MTFs, dark pools, and other off-exchange trading venues.
- Home markets are used as a reference source for price discovery on third-party trading venues.
- Off-exchange vendors as well as exchange-traded retail offerings are often focused on limited product offerings.
- Regulatory differences allow for a wide range of trading models even in exchange offerings, while substantive trading surveillance is sometimes questionable.
- Flow providers (retail) are looking for incentives to control the flow of orders to certain places/venues; different models have been established on-exchange as well as off-exchange.
- Institutional flow provides the main share of sales volumes on the trading platform. High liquidity, neutrality, transparency, and execution quality are principal reasons for the leading market position of a trading platform.

Reference functions in microstructure are for example price discovery in the primary and secondary market, price reference for indices/ETFs/mutual funds/

structured products/futures, and options or OTC markets/trades for MTFs, dark pools, and other off-exchange trading venues. Details are described in course of Chap. 4.

2.3 Layers of an Exchange

A layer of an exchange describes the complete scope and contents of an exchange under a specific point of view or criteria. In this book an exchange is described from four different points of view, namely:

1. Organization
2. Technology
3. Regulation
4. Stakeholder

2.3.1 Organization

Every exchange has its corporate governance structure. If listed, this governance has to fulfill listing criteria and conditions. In addition, especially in Europe, there are still exchange councils regulated by public law.

In addition to its corporate structure, every exchange has an organizational module in the following areas: market surveillance, market supervision and control, order and trade management, information dissemination, and master data.

2.3.2 Regulation

1. The principle of legal empowerment: Eventually, every legal action needs an underlying law; for example, in the USA the legislative power lies with congress as derived from the US Constitution (see Article I, Section I). Penal code (Fig. 2.6).
2. The legal principle of competence delegation: The delegation of power to a regulated exchange by means of national or federal legislation (a securities or stock exchange law) allows the exchange to set its own rules and regulations. The law in question must explicitly delegate this power to establish rules. The competencies must be clearly specified and covered by the delegating legislation.
3. The principle of self-regulation: For example, in the USA, securities exchanges are required to register with the Securities and Exchange Commission (SEC) as laid out by the Exchange Act.[8] The Act also lists the requirements exchanges must meet in order to register with the SEC, including the obligation to provide a set of rules that regulate the conduct of their members (for example, listing and

[8] http://www.law.cornell.edu/uscode/text/15/chapter-2B [1].

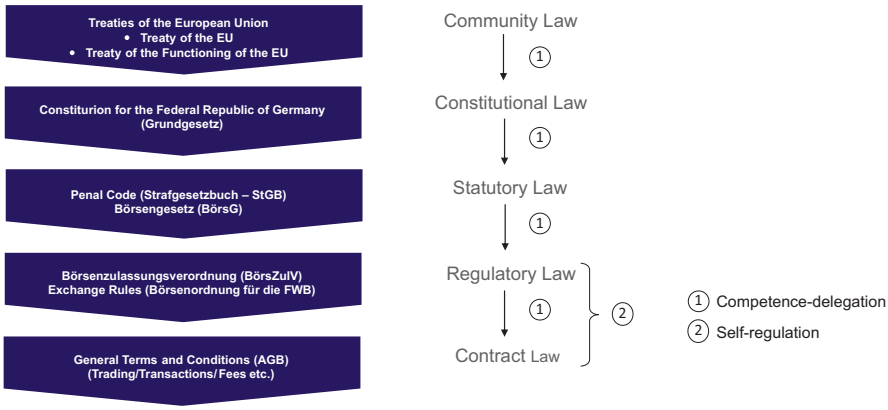

Fig. 2.6 Regulatory framework of Frankfurt Stock Exchange (Frankfurter Wertpapierbörse)

trading procedures). The overall objective of these exchange rules is the provision of a fair and orderly market, as well as investor and system protection. Thus, exchanges, in so far as they set, supervise and enforce their own rules, so-called **self-regulatory organizations** (SRO).

4. Application to local markets: Rules and regulations are specified by the exchange organization in consultation with market participants (the general assembly, board of directors, user groups, traders, back-office and IT staff, external experts, lawyers, market architects, etc.). The exchange's draft rules may be subject to approval by its general assembly or board of directors and the national or federal securities exchange commission, or other appropriate supervisory authority (or authorities in the case where supranational bodies are involved). Where government supervisory authorities are involved in the approval, they check the proposal in legal, market, and technology terms and decide to either approve or reject. If approved, the rules and regulations are implemented within a determined period of time. If rejected, they must be amended to include, change, or remove provisions as required.

2.3.3 Technology

Exchange organizations are high-tech organizations that enable their members to participate directly in the price discovery process. IT performance and reliability are a key success factor for any exchange organization worldwide. Essential for a fully fledged exchange platform is the concentration of liquidity in one single order book per product. The order book must be transparent, market access must be decentralized, and monitoring and surveillance must be centralized (Fig. 2.7).

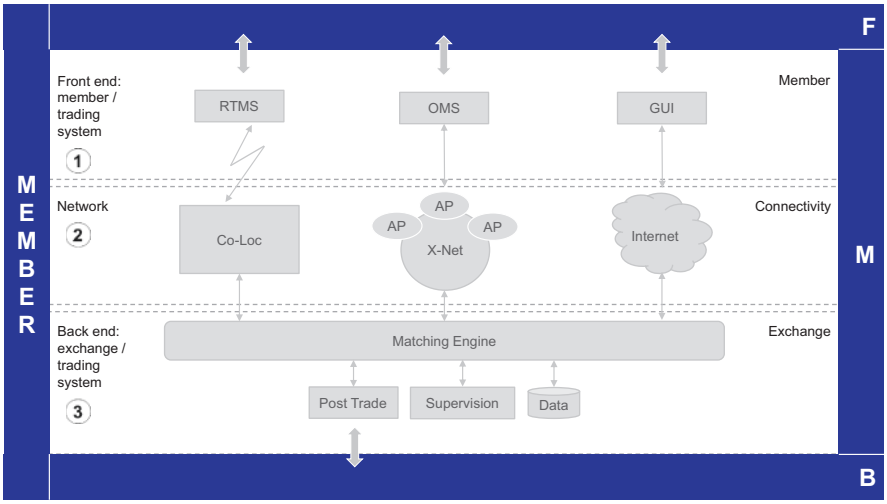

Fig. 2.7 Technological layer

The advantages of IT in the exchange business include the following:

- IT enables the exchange to go international, to integrate the value chain vertically and horizontally.
- IT allows members a decentralized access to price discovery around the globe.
- IT grants transparency and an effective and efficient market surveillance.
- IT assures better member support, more user-oriented functionality, and better overall risk management.
- IT can allow for extended trading hours (the three time zones).
- IT offers economies of scale and scope.

The functional elements of an exchange platform include the following:

1. The *member area*, where trades are generated either through a trading decision, an investment decision, or a decision made via a software component (e.g., program trading). In this area, the orders are handled by entering, deleting, changing, and holding orders. Also the position-keeping, basket-trading, and handling of conditional orders usually take place in this area. The necessary trading information is delivered directly from the exchange.
2. The *network* ensures constant connectivity that is managed by the respective exchange organization, sometimes in nanoseconds (latency matters!). There are three fundamental types of connectivity:

   (a) *Wide area networks*, sometimes covering all times zones: Access points enable members to locally access these networks, which are usually customized and tailor-made to fulfill the requirement of exchanges for high-

volume data transfer as well as low latency, reliability, transparency, and—most important—fairness.
(b) The *Internet* is used to route orders.
(c) A *member's co-location* is installed as close as possible to the matching engine—this is the fastest way to be connected with price discovery.

(3) In the back end, actual price discovery takes place, driven by the central system of an exchange. It is the place where trading and trade management as order management are conducted as well as market control and market supervision.

The main elements of a back end are the following:

(a) *Trading*. Building up and maintaining the central order book is the main task. The trading module provides various market models, such as the order book and its related matching algorithms. This includes all of the functions that relate to the capture, processing, and execution of orders. The trading module also provides facilities for off-order book, bilateral trading (e.g., indications of interest and addressed offers), and trade and transaction reporting.

(b) *Trade management*. This module covers all of the post-trade facilities provided by an exchange. All trades (both those matched and reported) are handled. This module allows enquiry; the entry, limited modification, and deletion of trades; trade publication; and the management of trade reversals and other post-trade correction facilities. This module also passes trades on to the CCP and settlement organization for clearing and settlement.

(c) *Information dissemination and management*. This module immediately disseminates, from the exchange, all information that results from trading activity (recalculated indices, news, etc.) to the marketplace (members, surveillance personnel, data vendors, etc.). Most stock exchanges provide their own value-added information services that complement raw market data.

(d) *Market supervision and control*. This module includes monitoring and controlling the market on a day-to-day basis. It also provides features for handling exceptional situations. The main focus here is on the order book and trading activity.

(e) *Data and statistics*. This module maintains data, and it ensures statistical completeness, accuracy, and consistency of all data concerning members, issuers, and products. It also enables the production of a wide range of reports and statistics. And, most importantly, because this data are disseminated to members in real time, they can be used for real-time risk management and programed trading.

2.3.4 Stakeholders

A stakeholder is any party with an interest in the stock exchange as part of its internal and external environment. On the customer side the relevant stakeholders are:

- Issuers
- Intermediaries
- Investors

Relevant stakeholders on the regulatory side are:

- Regulators
- Administrators
- Surveillance authorities
- Legislators
- Politicians

And the relevant stakeholders on the governance side are:

- Shareholders through general assembly
- Exchange councils and other exchange-related committees

2.4 Customers of an Exchange

2.4.1 Issuers and Intermediaries

Critical success factors for *market participants* to trade on an exchange, and respective deliverables of the exchange operator and clearing house are as follows:

- Liquid and attractive product offerings: In the form of a diversified range of asset classes with a distribution network that is balanced between market makers and flow providers, and a competitive fee and pricing mechanism for all market participants.
- Reliable and high-performance IT infrastructure: Providing top performance in trading and networking as well as high stability, competitive service pricing, and a flexible architecture that also allows for short time-to-market product launches.
- Market integrity ensured by reliable rules and regulations: Covering all regular and extraordinary trading events—especially exchange rules mirroring international regulatory standards that allow for trading in different time zones.
- Mitigation of counterparty risk and efficient risk management: Guaranteed by the CCP that manages the fulfillment of obligations between participants and that ensures market integrity through the highest standards in real-time risk and default management.

Issuers create and deliver their product (the listed stock) by conducting an IPO. An issuer can have various reasons for a listing:

- Strengthening its equity basis for organic projects (big strategic projects) and inorganic growth (mergers and acquisition)
- Getting easier access to equity through capital increases
- Realizing capital gains and/or exit possibilities for existent shareholders
- Increasing public awareness: branding, image, etc.

In conducting an IPO, every issuer is pursuing a secondary market strategy centered around the stock price. This strategy may include additional elements like becoming part of an index or being represented in the derivatives markets. It may also be considered an option to get cheapest shareholder's equity. Regarding the secondary market, issuers evaluate marketplaces and/or segments based on criteria such as:

- Fast and inexpensive execution (high liquidity, low transaction costs, prompt and reliable settlement)
- High trading comfort (user-oriented functionality, good governance, attractive product range, reknown image/brand)
- Market integrity (fair pricing and regulation, optimized transparency and publicity, high investor protection, strong insider security, and effective surveillance)

The intermediary, being a member of an exchange, has to permanently fulfill certain criteria regulated by both law (Exchange Act) and the rules and regulations of the exchange. The following list summarizes the criteria that are exemplary for the Frankfurt Stock Exchange[9]:

- Guarantee a reliable management with at least one management member in possession of the professional qualification necessary for the exchange business.
- Ensure the orderly settlement of transactions concluded at the exchange.
- Provide evidence of equity capital in the amount of at least 50,000 EUR (such capital requirement does not apply for credit institutions and financial service institutions).
- Have the necessary economic capacity to participate in an orderly manner in exchange trading.
- Name at least one trader admitted to trading at the exchange.
- Settle its exchange trades via a CSD and provide an accounting connection to either Deutsche Bundesbank or any other central bank within the EU with direct connection to the EU payment system **TARGET2**.
- Clear its exchange trades via Eurex Clearing as CCP either as a direct (**general clearing member**) or an indirect (**clearing member**) member.

If the intermediaries are not the owners of an exchange, the exchange is called **demutualized**. Most of the existing big, regulated exchange organizations are partly or fully demutualized, and are themselves listed on a stock exchange.

Both issuers and intermediaries have specific contractual and legal relationships to an exchange, as first described in Sect. 1.8 and then, more thoroughly, in Chap. 8.

[9] Bullets 1–4: 19 Abs. 4 BörsG; bullets 5–7: §§ 12–14 BörsO FWB.

2.4.2 *Investors: The Investment Process*

In a stock market, an investor puts money to buy a stock to create more money when selling it, thereby taking risk to result in positive return, called profit or capital gain. An investor in a stock applies fundamental principles, e.g., the risk return principle and the principle of diversification. The investment process in the investor's view in general follows the structure shown in Fig. 2.8.

Professional investors, e.g., asset managers, are called the buy side. At the core of every asset manager's business is the investment process.[10] The investment process is a discipline that is still subject to continuous efforts for professionalization and standardization. The reasons are manifold. First, clients are becoming more demanding and the evaluation of the investment process is an integral part in their choice of the investment manager. Furthermore, in Europe an increasing number of institutional clients rely on consultants in their choice of asset manager, a development pioneered in the Anglo-Saxon investment business. These consultants also put the quality of the investment process at the top of their priority lists, when it comes to evaluating asset managers. And finally, asset managers themselves recognise the benefits of a rigorous investment process for their business.

The investment process seen as information flows is shown in Fig. 2.9.

First, information is created at the exchange through price discovery. Then this information is disseminated as market data by companies like Reuters and Bloomberg. Data as "raw material" are also used for new products like indices, which might then be used for structured products or derivatives, e.g., on an index.

Next step is data management, which feeds the software running investment solutions. The product of this software is then used either by asset advisors consulting asset owners or directly by the latter within the investment process.

2.5 The Elements of the Value Chain

A trade takes place through price discovery (1), is next cleared between the clearing house (2) and the intermediary, and is then settled between the settlement organization (CSD/ICSD: (3), including custody: (4)) and the intermediary or the (end)investor. This process defines the value chain (Fig. 2.10).

(1A) The **investor** in a specific stock is the flow creator. There are different types of investors:

- Retail investors: private persons

[10] The investment process is described in detail in Book II, Chapter XII.

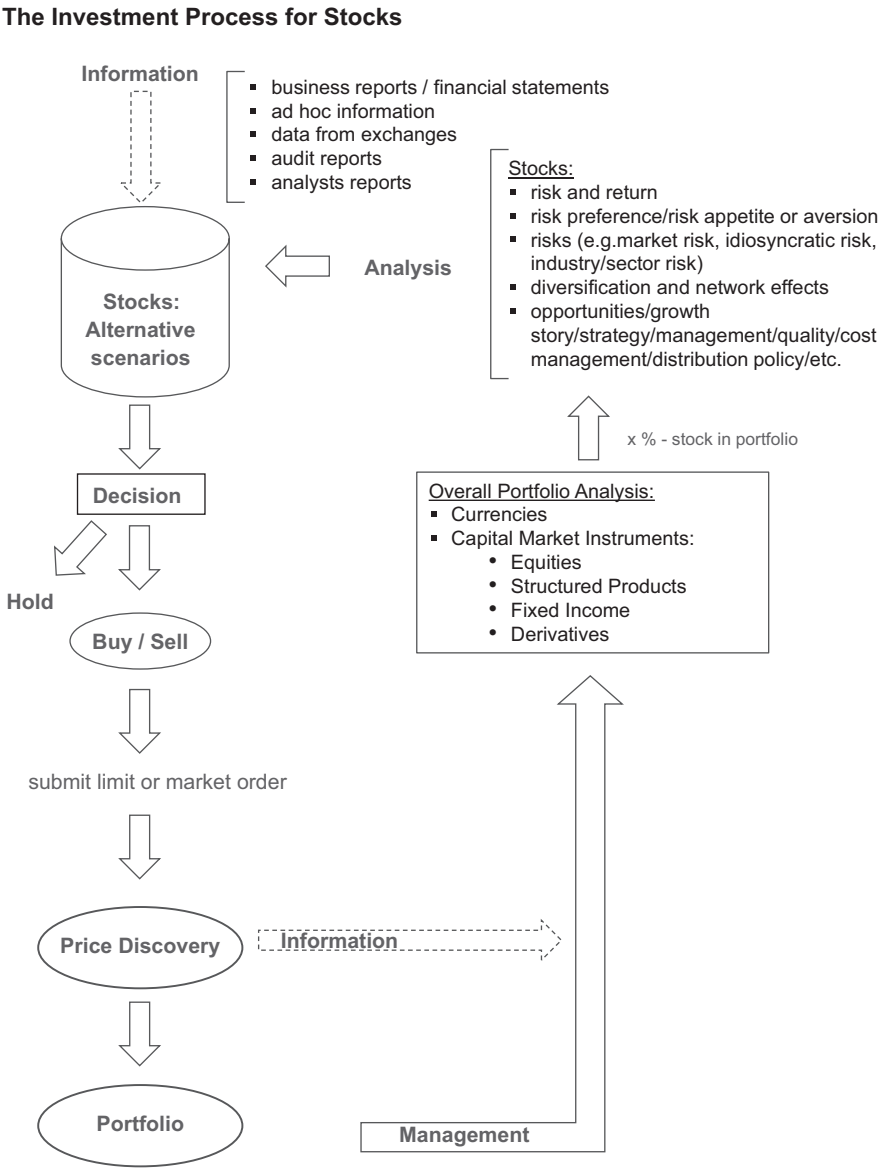

Fig. 2.8 The investment process for stocks

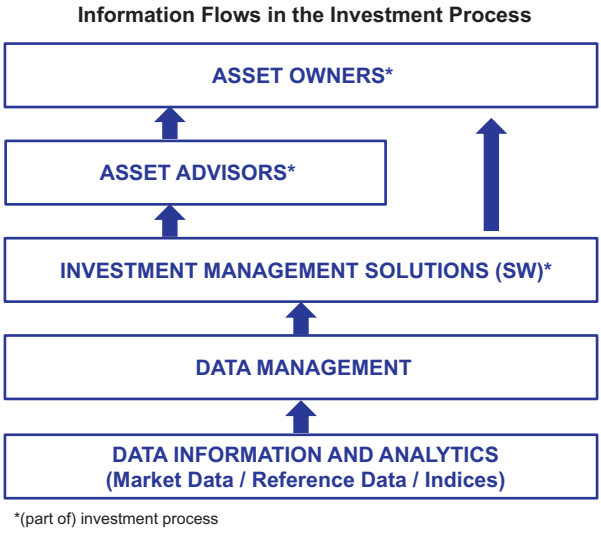

Fig. 2.9 Buy-side flow: data, software, and services

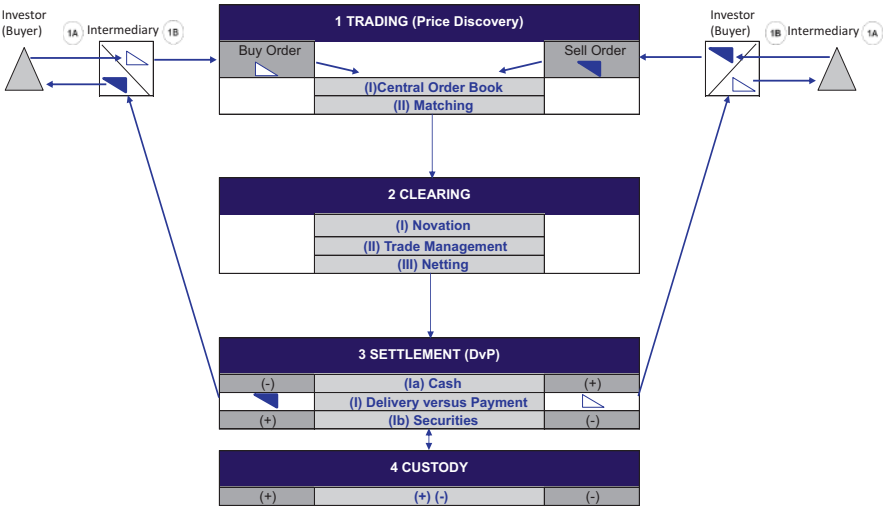

Fig. 2.10 The value chain: functionalities and flows

- Buy side: institutional investors (pension funds, insurance companies, hedge funds, etc.)
- Sell side: intermediaries (see 2) trading on their own account

(1B) The **intermediary** between an investor and a stock exchange is a bank or a broker. A bank as intermediary may act from its own account as a dealer or proprietary trader (intraday or long-term/strategic), or as a broker, simply routing the orders directly to the stock exchange. A broker does only order routing and therefore does not have a proprietary position in a trade.

The intermediary is a customer and a member of the stock exchange and therefore:

Regulated by securities and stock exchange laws

Surveyed by a stock exchange authority as well as respective organizational units (i.e., market supervision and market monitoring)

Controlled by banking supervision

Monitored by a clearing house

The functions of the core elements of the value chain are as follows:

(1) The **stock exchange** is the marketplace where bid and offer orders are collected and cumulated in a central order book, and where the price discovery takes place. In an order-driven market, this is done by predefined matching algorithms; in a quote-driven market, it is done by one or several market makers. Price discovery is at the heart of what an exchange does, and it requires that the market be fully transparent, monitored, and surveyed so as to create trust.

(2) The CCP or clearing house is legally the counterpart to the intermediaries, directly to the general clearing members (GCM) and indirectly (namely through the GCM) to the regular clearing members which are all trading participants (and sometimes also intermediaries for trading participants). The main tasks of CCPs are:

- Multilateral netting: to reduce transfer volume
- Risk management:

– Counterparty risk: ideally real time for all members through margins and other post-default backings
– Market risk: managed by monitoring *all positions* in a specific stock in *all stocks* listed at the exchange
– Ensuring through **margin calls** that all market participants fulfill their margin requirements promptly and permanently
– Protect the rest of the market in the event of default by (a) terminating the membership (e.g., Lehman Brothers) and (b) default management process

- System protection:

– Liquidity management

  - Trade management: risk reports, tool, etc. (some of which might be on exchange side)

  • Operability:

  - STP and standard auction
  - Processing of transactions
  - Post-trade actions

(3) The CSD assures delivery versus payment of a trade in a stock for local markets (CSD) or cross border (ICSD). The securities accounts and the safekeeping of the shares are managed within a separate custody company and electronically interfaced with the CSD/ICSD.
(4) The **custodian** covers safekeeping and administration for the intermediaries. The administration includes accounting and also all necessary actions connected to a stock, like capital increase and dividend payment.

Value chain organizations, i.e., exchange, clearing house, CSD (or international CSD), and custodian, are the backbone of a financial system, be it on a local or even on a global level. Usually they operate fully electronically, and are also electronically interconnected. If they are fully integrated in one legal organization, they are said to be vertically integrated (i.e., Deutsche Börse Group, CME, ICE). If they are integrated with another organization of the same kind, they are said to be horizontally integrated (i.e., Euronext).

2.5.1 Trading: Price Discovery

The objective of price discovery is to match offer and demand of a specific stock in time, and in a consolidated order book, in order to find an execution price by applying specific rules (matching algorithms) (Fig. 2.11). The most common execution algorithm is the *maximum executable volume with lowest surplus* rule. When two different prices are possible, additional criteria and priorities have to be applied to get one execution price.[11]

A precondition to build this kind of market is fungibility of the product and, therefore, a standardization of the stock, usually specified by law. To build the central order book from scratch, the round lot (buy and sell side) has to be defined, before priorities are applied.

Price discovery can take place in different forms: order driven or through market making (Fig. 2.12). Order driven means that all incoming orders are matched against the spread or stored in the central order book, applying the price-time priority. Market making has two possibilities: single or multiple market making.

Price discovery takes place to open or close a market (usually through the opening/closing call) The same procedure is typically used to restart a market fol-

[11] See Chap. 4.

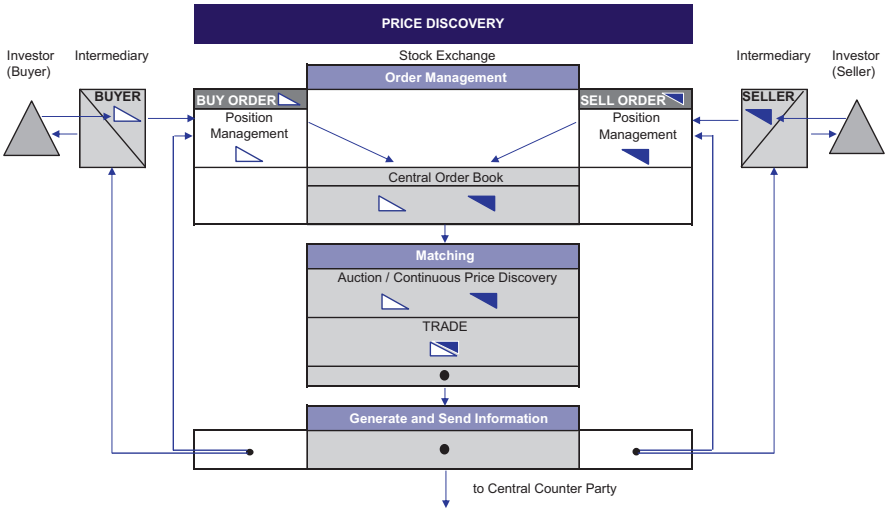

Fig. 2.11 Elements of the price discovery process

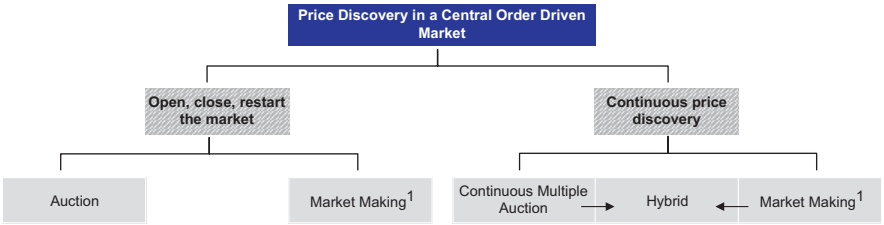

Fig. 2.12 Price discovery in a central order-driven market

lowing a trading halt. After the market is open, continuous price discovery within a defined period of time (trading time) takes place. The form may differ from multiple auctions only to market making or hybrids of the two forms, to continuous price discovery in just executing incoming orders against the spread in the central order book and if not possible store them, first according to price and within the same price according to time (Fig. 2.12).

Price discovery only takes place when the market is open. The market can be halted if one or more of the following criteria are not fulfilled:

- Orderly price discovery:
  - Both sides of the central order book have posted bids and offers.
  - The matching algorithm has to be consistent all the time.
- Equal access for all market participants to all key functions.
- Equal information for all market participants.
- Complete data integrity.

Scope, contents, and procedures of a fair and orderly price discovery are described through a market model.[12] The specification of a modular market model (MMM) includes:

- User groups and customers
- Trading form: call auction, order-driven market, market making, or a hybrid form including the matching algorithm
- Trading parameters: like transparency of the order book, different order types or the trading phases

Defining a tailor-made and customized market microstructure is an optimization procedure under the premises of creating the biggest possible liquidity pool in a specified segment. On the one hand, each module of the MMM interacts and interferes with the other modules, and on the other hand, the specification of a market model is elaborated sequentially from step I to step V.

To build the market model, in steps I and II, customer needs, user requirements, and particularities of the traded product determine the selection or choice. Then, in step III, the market model is defined either as a quote-driven or as an order-driven market. In step IV important trading parameters as shown in Fig. 2.13 have to be fixed.

The criteria of acceptability of a specified market model should—with reference to Thomas Kuhn's criteria of the acceptability of a theory[13]—be:

1. Consistency to guarantee fairness[14]
2. Agreement with market observations
3. Simplicity or the avoidance of unnecessary complexity especially concerning functionality
4. Breadth of scope to cover the chosen segments, e.g., products and customers
5. Fruitfulness, including conceptual integration and fertility for users, customers, products, and services

Furthermore, the market model has to fully reflect the rules and regulations of an exchange and is also fully mirrored in the software running the back end of the trading platform. The microstructure, defined through the MMM, has to be approved by the surveillance authorities and/or the regulators and implemented in the market, where it is eventually operated by the exchange.[15] The implemented market model must grant the overriding premises of investor protection and maximization of liquidity.

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[12] Cf. [2], Equity Markets in Action, pg. 10ff.

[13] Cf. [3].

[14] Including equal treatment regarding access, transparency, information (ad hoc information and market data), fees, and functionality.

[15] The rollout of a new market model is a major technological project with key elements like member education and training (traders, IT departments, middle and back-office); tuning the system in terms of latency, volume, and functionality; getting started in time with members, surveillance, market operations, and other dependent entities like CCPs, settlement, and custody organizations.

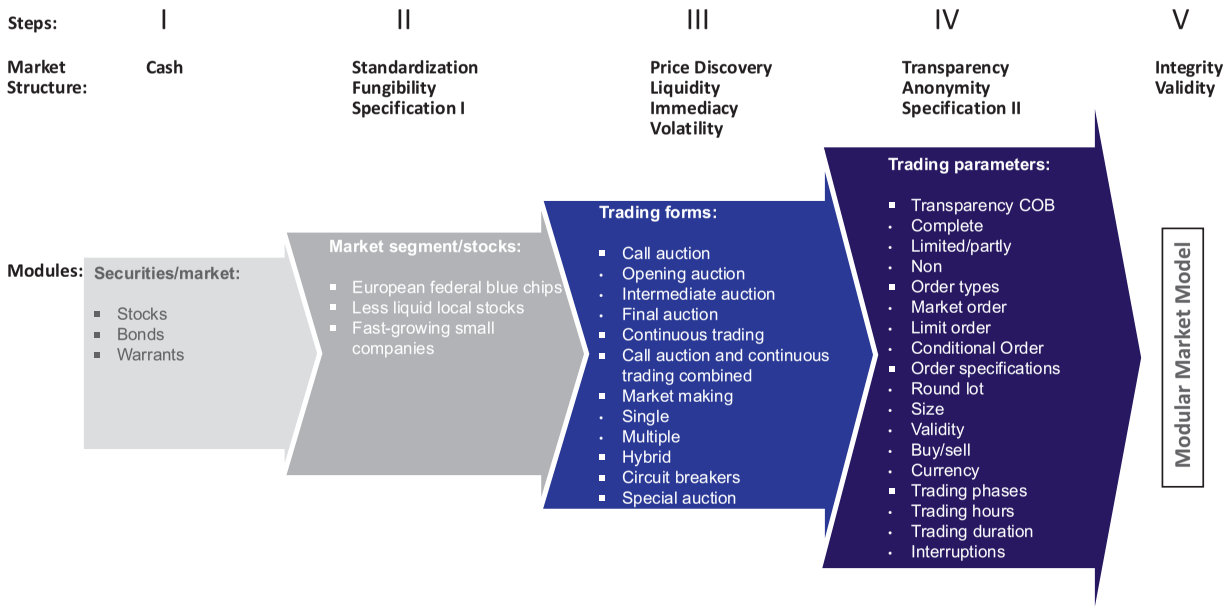

Fig. 2.13 The modular market model

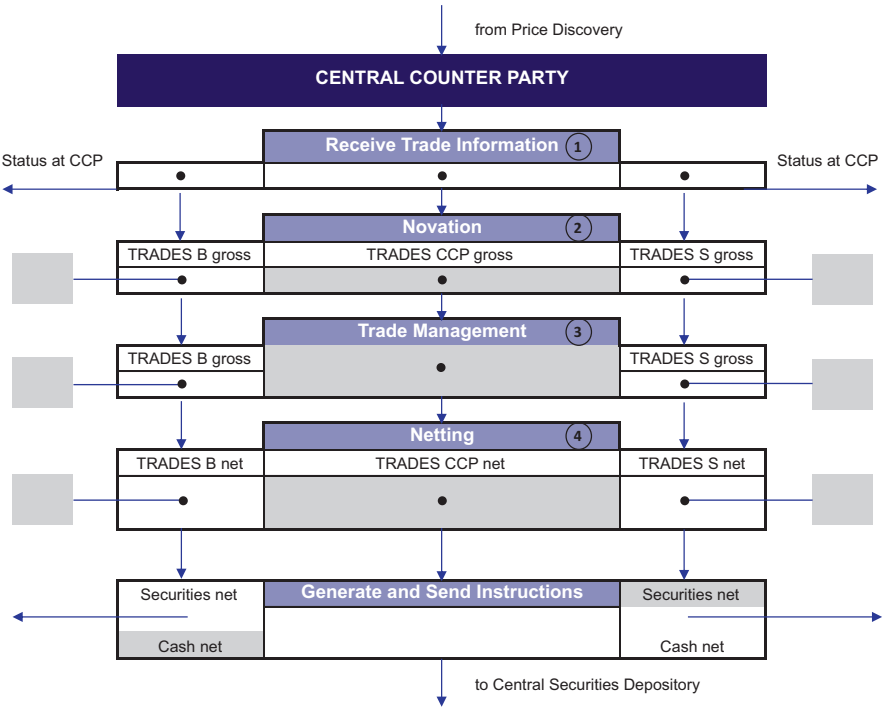

Fig. 2.14 Elements of a central counterparty

2.5.2 Clearing: Risk Management and Market Stability

Within the value chain, the CCP is the most important module to determine the risk profile of the industry. A CCP receives trade information from the exchange (1) to continue and to complete the transaction. Besides price and size, trade information contains specific master data like the symbol of the stock/security (e.g., DB1 for Deutsche Börse Group), the International Security Identification Number (ISIN), and, for local trades, some local master data (e.g., in Germany the so-called Wertpapierkennnummer (WKN)). The incoming information is used for novation (open offer) (2). Based on this process, trade management (3) and netting (4) take place consecutively (Fig. 2.14).

An intermediation between the trading activity and the settlement process takes place via a clearing house, a so-called CCP. There are several reasons for the development of such CCPs:

1. Reduction of gross risk exposure and enhancing capital efficiency through multilateral netting, therefore reducing counterparty risks and risks of trade.
2. Improving market structure: A CCP entering through novation (open offer) as counterparty in every trade guarantees specifying and monitoring of counterparty risk. A CCP takes over the counterparty risk of the market participant

directly (CM) and indirectly (through a GCM) and enforces strict risk control and adequate collateralization of open positions.
3. Assure anonymity.
4. Efficient use of collateral.
5. Neutral valuation of positions.
6. Improve risk management, payments, and delivery of stocks by IT on a real-time basis.
7. Improve market integrity by an early warning function and by avoiding a system collapse due to the failure of a market participant, e.g., Lehman (domino effect), in a timely manner through permanent margining.
8. Organize buy-ins and guarantee delivery.

The governance of a clearing house clearly contributes to its enhanced market integrity in preventing excessive risk taking by its members, simplifying market connectedness, and optimizing the collateralization of markets and counterparty risk management. The CCP is an integral part of a global strategy of exchange organizations.

A CCP that is registered with the regulator, is compliant with CPSS-IOSCO principles for financial market infrastructure, and is fulfilling a capital requirement of risk-weighted 2 % of their trade exposure is called a qualified CCP.

A CCP can cover local markets, regions, and even different time zones, and it can cover either a single product category or several categories. Consequently, there is a variety of different CCP types, and a clear distinction between a clearing house, a CCP, and a qualified CCP. To date, about 100 CCPs are registered globally, with the most prominent being CME Clearing, ICE Clear, LCH.Clearnet, and Eurex Clearing.[16] Every CCP reduces causes and magnitude of systemic risks, due to the fact that a CCP:

- Acts as an independent risk manager
- Creates transparency
- Has on its cash account only own money or central bank money
- Mitigates market member's counterparty risk
- (Most importantly) does not trade any financial instruments from its own account

2.5.2.1 Novation

Novation:

- Defines the (new) legal and counterparty risk structure in between the intermediary, the stock exchange member, and the clearing house (Fig. 2.15)
- Changes the entire risk and liability structure of a marketplace because, on the counter side of a trade, the individual counterparty risk is replaced with the higher creditworthiness of the CCP
- Is a necessary precondition for netting

[16] C.f.: DBAG White Paper 2014, pg. 8.

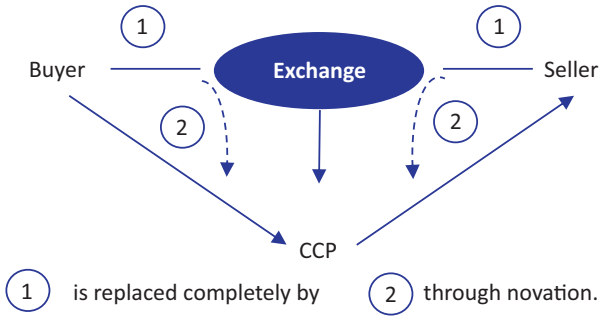

Fig. 2.15 Novation

- Is the basis for handling risk management outside the clearing house, starting with netting and continuing with the margining procedure

Legally, novation means that one obligation is replaced (1) by a new obligation (2), whereby the content of the new obligation (2) is identical with the content of the old obligation (1). The old obligation (1) is then no longer in existence and is to be treated as if it never existed.

What this means in terms of market and liability structure is shown in Fig. 2.16.

2.5.2.2 Netting

After novation, the netting of all buy and sell orders of a participant in a predefined time period and in a predefined product range (cross-products) takes place, usually once per trading day. Due to the netting, only the residual amount of securities and/or money is due. Through this netting procedure:

- Complexity and thereby costs for clearing members are significantly reduced.
- Volume of transferable securities and money is significantly reduced.
- Risk management is improved.

The effect of netting becomes obvious when comparing (for the same situation in terms of market participants and order flows) the three scenarios: no clearing, with bilateral clearing, and with multilateral clearing. The nature of the netting effect can be seen as quantitative or qualitative.

To start with the quantitative netting effects, the key performance indicators (KPI) are shown in the chart below.

Figure 2.17 shows a simplification of the market situation. Here the market consists of three participants or members (A/B/C) and six different financial order instructions, in this case one stock. In this market the netting effect is a factor of 10, comparing a situation without netting with a situation in which multilateral netting through a CCP takes place. The effectivity of netting itself increases with the clearing volume. The netting volume is a product of the number of market participants,

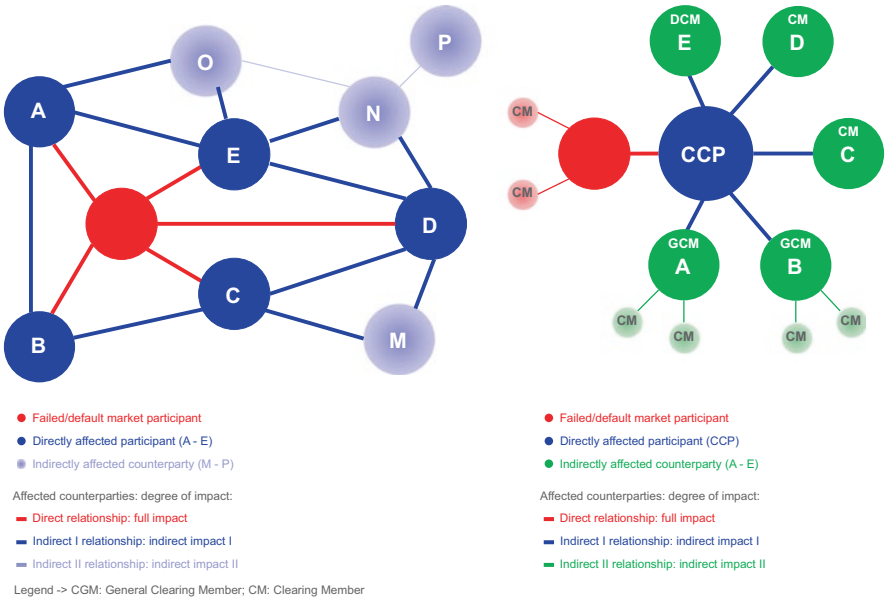

Fig. 2.16 Market and liability structure in bilateral vs. multilateral netting

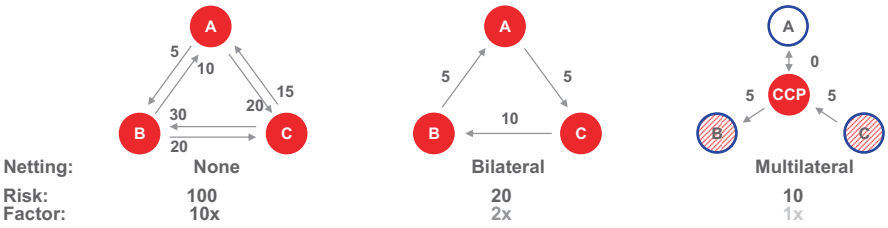

Fig. 2.17 The quantitative netting effects

the number of financial instruments traded, and the volume of market participant's open interest: The higher the number and the higher the volume, the bigger the netting effect and the cost reduction.

The qualitative dimension of netting is summarized in Table 2.1.

Hence the qualitative effect of netting to market integrity is the reduction of complexity and of financial and counterparty risk (Fig. 2.18).

Coming from no clearing to a clearing house the following is the case for exchange and clearing members:

- Mistakes in handling and administrating stocks go down.
- If this process is driven electronically, data and information handling is much faster.

Table 2.1 Qualitative dimension of netting

	Bilateral netting	Multilateral netting through novation
Market structure	• Very complex relationships: Everyone trades with everyone directly/ bilaterally	• Simple: one central counterparty
	• Many dependencies	• Every trading party has one (and only one!) bilateral relationship to the CCP
	• Bilateral relationships are not known: intransparent	• Business relationships are transparent in the CCP
Liability structure	• All market participants are directly or indirectly affected	• Only CCP directly affected[a]
	• Danger of domino effect	• CCP is hedged against default of one of its members (cf. default management)
	• No information about magnitude of market impact (who, how much, etc.) due to opaque situation	
Liquidity structure	• Distressed market participants need liquidity; many counterparties	• Distressed market needs liquidity: one access partner (e.g., EUREX: Bundesbank ≫ collateralized access to central bank money)

[a]Depending on clearing structure, in specific cases (if a GCM fails) other clearing members might be directly affected as well

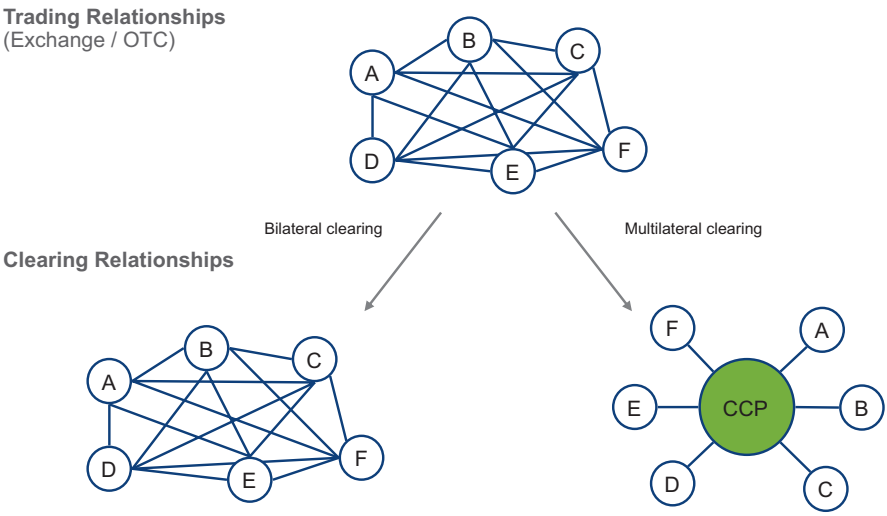

Fig. 2.18 Complexity of bilateral and multilateral clearing

Therefore:

- Costs go down due to reduced complexity and lower volume.
- Risk structure and risk management improve.

For the whole market structure, this means that:

- Transparency is enhanced.
- Surveillance/control improves.
- Liability structure with a CCP stabilizes a marketplace because defaults can be mitigated by a CCP.
- Arbitrage is reduced.
- Revenue potentials might be reduced because the CCP must be paid for services provided.

2.5.2.3 Risk Management

In this scenario the main risks of a CCP are:

I Short term:

- Counterparty credit risk: The default of a member, thus the credit risk, is the main risk for a CCP (market/liquidity risks are contingent on this credit risk of members). However, this risk is largely mitigated with the conservative margin that assumes a probability of default for members of 100 %, as well as the robust **lines of defense**. So this risk accounts for roughly one-third of a CCP's total risk. (Covered probability of default for members is a conservative 100 %.)
- Operational risk: This is mainly driven by service deficiency. Legal risk, damage to physical assets, and unavailability of services and systems. Due to the central role of a CCP these risks account for roughly two-thirds of a CCP's total risk.

II Mid- to long term:

- Business risk: for example, regulatory and macroeconomic developments
- Project risk: for example, the implementation of new functionalities or hardware

The risk profile of a fully fledged CCP is made low by margin, etc. and handled through stringent processes and product collateralization, especially also for the positions of members in default. Regarding the risk profile of a CCP, it is important to bear in mind that:

- CCP positions are always balanced
- CCPs are not trading on their own account:
  - No market exposure
  - No speculation
- Members default:
  - Special procedure and strong decision power of a CCP
  - Potential losses covered by margining and buffer

- Robust lines of defense[17]

The risk management of a CCP starts with member admission and continues with member monitoring. The applicant has to fulfill the following requirements[18]:

Apart from being licensed by the local authority to provide credit to clearing customers and to receive collateral in the form of cash and securities, an applicant must be under surveillance of a responsible local authority according to standards equivalent to the applicable regulatory standards in the EU, and the applicant is required to sign relevant clearing conditions. The clearing function contribution (which is linked to the risk exposure or at least to the minimum contribution amount) can be submitted in the form of collateral in securities and/or cash. Based on the asset classes that they are trading, members must fulfill minimum requirements to get the corresponding clearing license: the applicant needs to have (or to open) an account at the corresponding central bank (cash account) and CSD (securities and cash account), and also needs to provide evidence of a securities account and a pledged securities account with the central custodian. Additionally, various technical and operational requirements have to be fulfilled permanently.

A CCP evaluates, controls, monitors, and handles not only in stocks but, in the best case across all asset classes, different risks centrally, real time, and online. The most important risk is the counterparty risk:

The counterparty risk of all the general clearing members (GCM), and the regular clearing members (CM), is monitored by the permanent calculation of the margin requirements (Fig. 2.19). Ideally, this calculation (valuation) is done in real time, as for example at Eurex Clearing. Members have to cover their risk with collateral against a haircut. If the risk of a member is not covered, an intraday margin call will take place. Schematically this is explained in the following exhibit:

As a concrete example of the Eurex clearing house, on a monthly basis, one can start to deduct from the overall clearing volume of €16,343 billion the netted volume of €16,304 billion (Fig. 2.20). In case of the Eurex-CCP, a buffer of approximately 20 % is calculated. This enhances the resiliency of the system. It is like a security premium for the market, which amounts in this case to €12 bn. Adding the net margining requirement and the buffer results in the sum of the collateral needed to cover the total margin requirement. Eurex calculates this margin cross-product and in real time. Therefore, their data is also an excellent basis for the risk management of the clearing members, e.g., the banks.[19]

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[17] With this structure, CCPs' lines of defense withstand an equity market drop of 30 % ([4], p. 23).

[18] For example: [5], Clearing Conditions for Eurex Clearing AG, Chapter I, Part 1, Top 2.1: https://www.eurexclearing.com/blob/clearing-en/51612-136778/238376/34/data/clearing_conditions_en_ab_18_11_2013.pdf.pdf.

[19] For example: [5], Clearing Conditions for Eurex Clearing AG, Chapter I, Part 1, Top 3: https://www.eurexclearing.com/blob/clearing-en/51612-136778/238376/34/data/clearing_conditions_en_ab_18_11_2013.pdf.pdf.

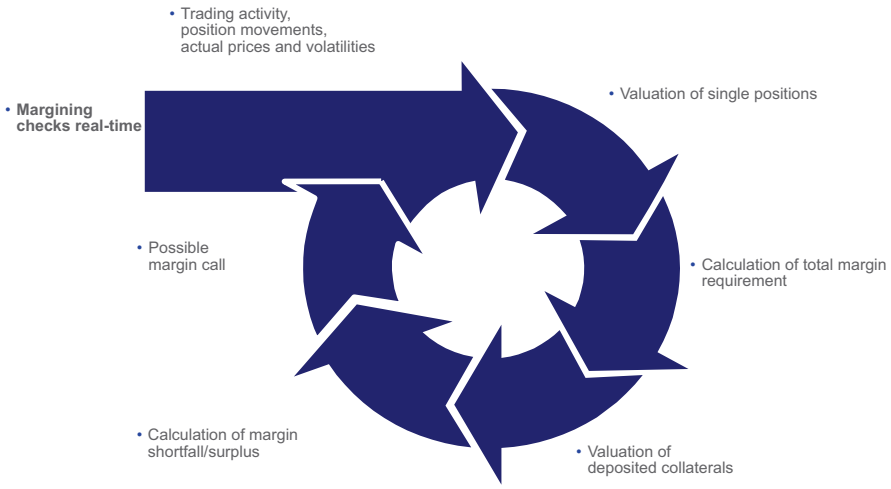


Fig. 2.19 Permanent margining of counterparty risk

Regarding the systemic risk of a capital market, the CCP has to be considered in a broader environment. In the chart above, the following phases of the risk management process and respective effects of a CCP can be distinguished:

1. Phase I: Elimination of €16,304 billion by multilateral netting; the systemic risk is reduced by this amount.
2. Phase II: To secure the counterparty risk of the clearing house, the whole amount has to be managed as follows:

   (a) Parameterized haircuts for each individual collateral
   (b) Cross-asset class collateralization
   (c) Real-time *portfolio management*
   (d) Timely margin calls when necessary

With this ongoing margin management, the counterparty risk of a CCP is permanently covered with a buffer of approximately 20 %.

The overview provided in Fig. 2.20 outlines that the CCP, in acting like a hub, is *the* central part that gives an indication of what the market risk and the systemic risk could be. If the respective product is of global importance, risk management can be monitored even on a global level (Fig. 2.21).

2.5.2.4 Lines of Defense

If a clearing member cannot fulfill the margin requirement (net position plus buffer), a margin call is made. To cover the position, cash and securities with a corresponding haircut can be brought in. A haircut can be delivered in:

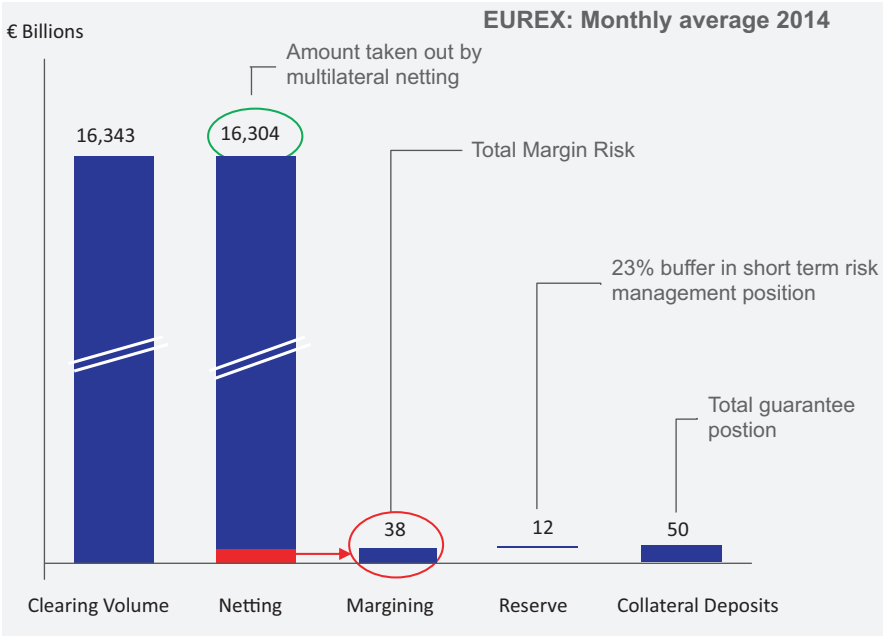


Fig. 2.20 Risk management and mitigation: the systemic risk

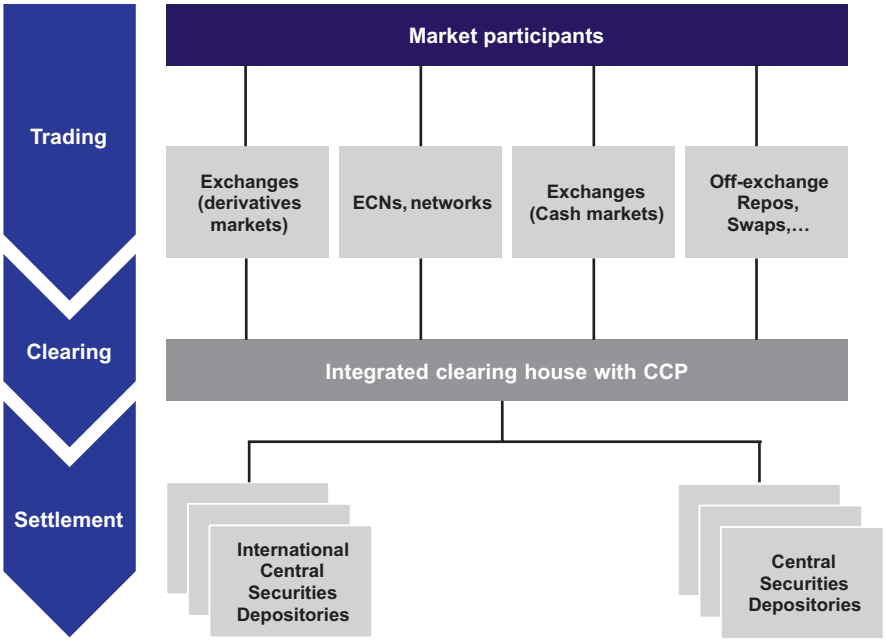


Fig. 2.21 CCP and enlarged value chain

- Cash (no haircut)
- Fixed income (haircut based on rating of debtor)
- Equities (haircut starting at 30 % of the mark-to-market value for the best rated listed companies)

Systemically the lines of defense look as follows:

The important elements of this *waterfall* structure, like the Eurex Clearing's Lines of Defense that correspond to EMIR, are funded by the members. In monitoring and maintaining these lines of defense, a clearing house—if rightfully handled—cannot go out of business. On the contrary, taking out market distressed members in a timely fashion (e.g., Lehman Brothers), a CCP enhances system stability, thereby being part of the solution, not part of a problem. In general, this means that CCPs reduce the risks of domino effects in a crisis situation; they do so by replacing complex bilateral relationships with high interconnectedness (*spider web*) with a 1:1 relationship to a CCP. With their primary focus on risk mitigation and control, the CCPs act like shock absorbers for the financial markets (Fig. 2.22).

2.5.2.5 Default Management

In case of the default of one or several clearing members, a clearing house must protect its customers and minimize impact on a client's positions. A corresponding default management process facilitates the liquidation of the defaulter's portfolio (Fig. 2.23).

1. Client transfer and preliminary measures: A default management committee assists the clearing house in the default management process while the defaulting client's positions and collateral are transferred for hedging and auctioning.
2. Hedging: The hedging process reduces risks for the clearing house and stabilizes the portfolio for the following auctioning process.
3. Independent sale: The default management process includes the possibility for an independent sale of a certain liquidation group to another clearing member.
4. Auctioning: Establishing a fair price for the respective portfolio; this is the integral responsibility of the clearing house in the auctioning phase. Clearing members who are active in the liquidation group are required to participate in the auctions. Other customers may participate so long as they are compliant with the clearing member's bidding obligation.
5. Asset class resolution: Losses from possible remaining positions are charged to non-bidders in cases where they do not agree to enter into a residual settlement (that is, taking on these positions from the clearing house at auction prices or at the last mark-to-market price). If no member participated in the auction, the corresponding transactions may by terminated by the clearing house.

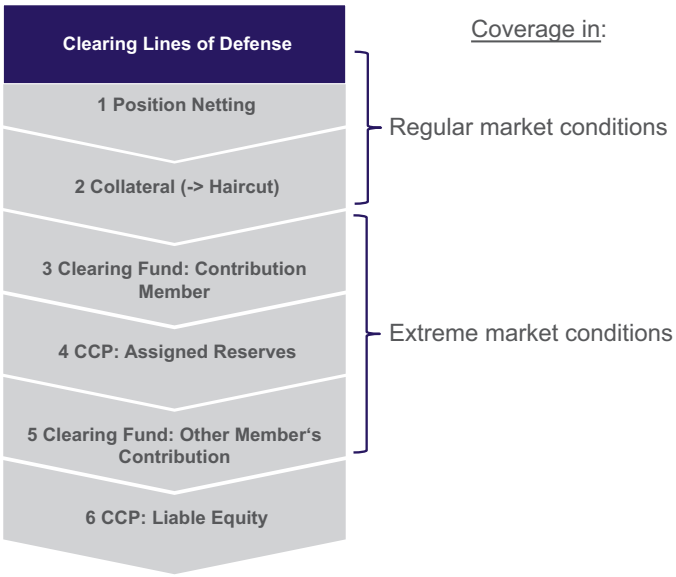


Fig. 2.22 Lines of defense

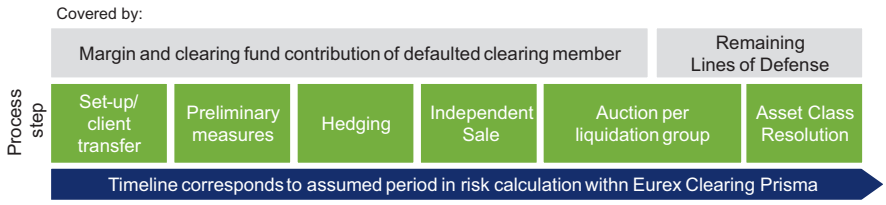


Fig. 2.23 Overview of the default management process framework of Eurex Clearing

2.5.2.6 Key Criteria for CCP Rating

Because they centralize counterparty credit risk, CCPs are perceived (especially by regulators) as relevant for systemic risk. The following main criteria are indicators for the stability of a CCP:

1. *Lines of Defense*: CCPs must provide a comprehensive risk management that contains sufficient collateral to cover losses (*defaulter pay* model), a mutual clearing fund, which covers extreme tail risk in case of member failure, and limited liability that provides certainty for members about their credit exposure.
2. *Access to Liquidity*: Sufficient liquidity is crucial for a CCP to cover obligations at any time. The liquidity source needs to maintain its reliability even under stressed market conditions (access to central bank liquidity is considered to be the most reliable source).

3. *Governance*: Structure of the CCP's management and risk committee must comply with regulatory requirements.
4. *Regulatory compliance*: The risk management framework has to reflect recent regulatory standards.

2.5.3 *Settlement: Delivery Versus Payment*

Settlement is the delivery of the traded securities against the payment in cash for the traded securities through a CSD within a specified time (usually $T+2$ working days) and stands for the completion of the trade transaction. In short: DvP. The overriding principle is delivery of securities (by a CSD) versus payment of cash (by central bank payment systems or a cash platform, i.e., in the EU: Target2) within a predefined time period (Fig. 2.24).

If the settlement takes place in a domestic market for domestic stocks, a CSD executes this transaction. If the transaction is cross border, an ICSD executes. Starting the settlement-process, the CCP determines the CSD or ICSD.

The settlement information and instruction to the CSD/ICSD come from the CCP and the stock exchange. All the information and instructions are checked by the settlement supervision. In the validation phase, the correctness and completeness of the settlement instructions are checked, and instructions may be changed or

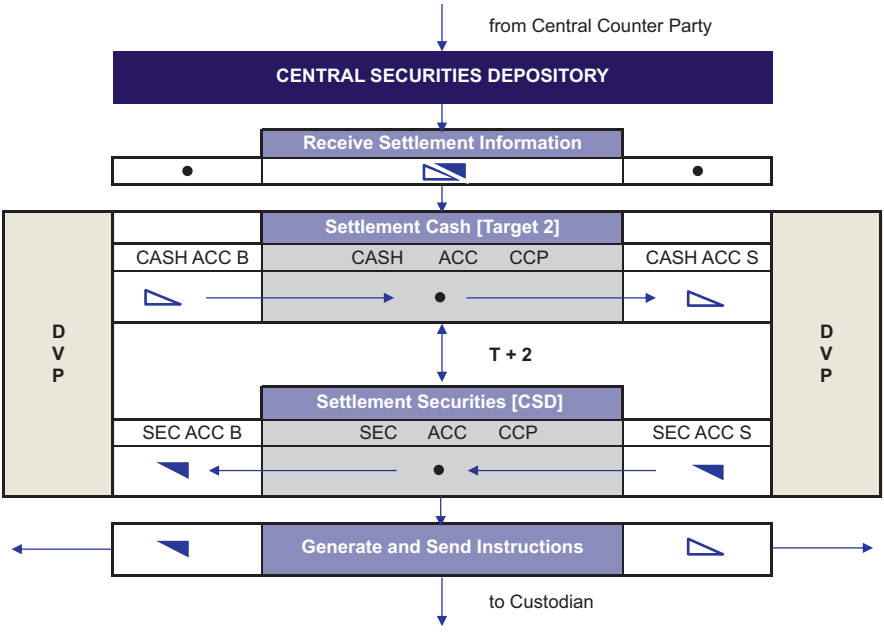


Fig. 2.24 Elements of a central securities depository

deleted. Blocking and release of instructions to matching immediately or on customers request are also part of the validation. Matching in settlement means bring together corresponding instructions from the two counterparties of a trade for the purpose of settling (thereby applying settlement-matching-rules). Based on the action, the status of the settlement instructions has to be set to *matched*, *unmatched,* or *advisory*.

For settlement (DvP), the balances of the securities (delivery) and the cash account (payment) have to be checked and, in case of insufficient need, to be corrected. Then the sequence of bookings can be optimized and eventually the debit and credit on cash and securities accounts takes place. Based on that, *settled* can be given as an information via the CCP and/or exchange to the customer.

There are two types of CSDs as shown in Table 2.2:

- CSD: Covers national securities (stocks, warrants, corporate and government bonds) in local currency and settles nationally.
- International central securities depository (ICSD): Covers international securities in numerous currencies and settles cross border.

If a CSD provides or delivers securities as security collateral to cover financing and credit facilities, this business is called a **pledge**. In order to enhance efficiency and to reduce complexity to make cross-border transactions in Europe faster and cheaper, *Link Up Markets* led by *Clearstream* was set up. On the one hand, (local) CSDs stay unchanged in function and mission; on the other hand, with Link Up, they can integrate cross-border functionality. This is a quantum leap in Europe's settlement area (Fig. 2.25).

The Link Up Markets model will replace the current inefficient setup with the following advantages:

- Single point of access for CSDs to participating markets
- Easy implementation of enhanced CSD links in central bank money leveraging TARGET2-Cash
- Reuse of efficient local infrastructure
- Absorbing differences in market standards
- Best-in-class CSD services for all asset classes (excluding derivatives) and multiple currencies
- Continuous harmonization of market practices
- Flexible extension of market coverage in Europe and beyond

Table 2.2 CDS vs. ICSD

	CSD	ICSD
Currency	Domestic	FX and domestic (multicurrency)
Securities	Domestic–domestic (intramarket/national)	Cross border: foreign domestic (intermarkets/international)
Custody	National	National and international

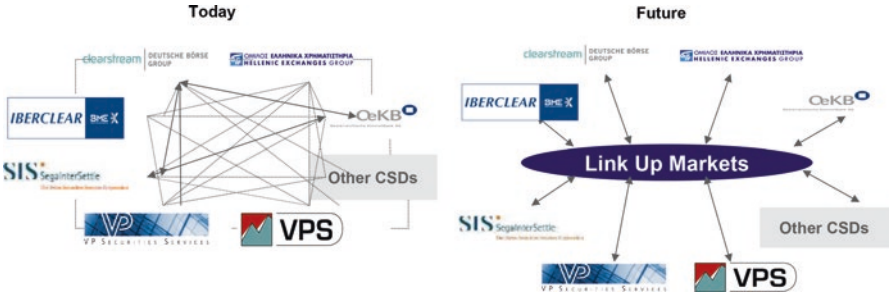


Fig. 2.25 Current and future European CSD landscape

	Europe	United States	
Equities	**Central Securities Depositories (CSDs)** ▪ Clearstream Banking AG Frankfurt ▪ Euroclear Belgium (CIK) ▪ Euroclear France (Sicovam) ▪ Euroclear Netherlands (Necigef) ▪ Euroclear UK (CrestCo) ▪ 17 CSDs in the Eurozone alone	**DTCC** ▪ User-owned CSD ▪ For equities and non Fedwire eligible bonds ▪ Without banking services	Equities
Fixed Income	**International Central Securities Depositories (ICSDs)** ▪ Services provided by Clearstream Banking S.A. Luxembourg and Euroclear Bank ▪ Securities depositories and Settlement agents for international debt and other instruments ▪ Banking license, with value-added services	**Bank of New York / JPMorgan Chase** ▪ Settlement agents for primary dealers in Fedwire eligible securities ▪ Banking license, with value-added services ▪ Utilize Federal Reserve securities wire assuring finality of settlement and payments	Fixed Income

Fig. 2.26 European versus US post-trade landscape

With respect to the post trade landscape, there is a significant difference in the European versus the US marketplace (Fig. 2.26):

2.5.4 Custody: Administration and Safekeeping

Custody means administrating and safekeeping securities for others. This enables settlement in exchanging securities between seller and buyer. A custody account, the equivalent to the money account, is established for each customer. Customers of a custodian are usually banks, not private persons or individuals. The account information includes details of the types, nominal values, and quantities or volumes of the securities held, as well as the name and address of the account holder (Fig. 2.27).

Administration delivers services in the following areas of a security:

- Clarifying and conforming ownership and all rights associated with it (dividend, voting, liquidation)
- Capital elements (e.g., dividends, capital increase for a stock)
- Tax

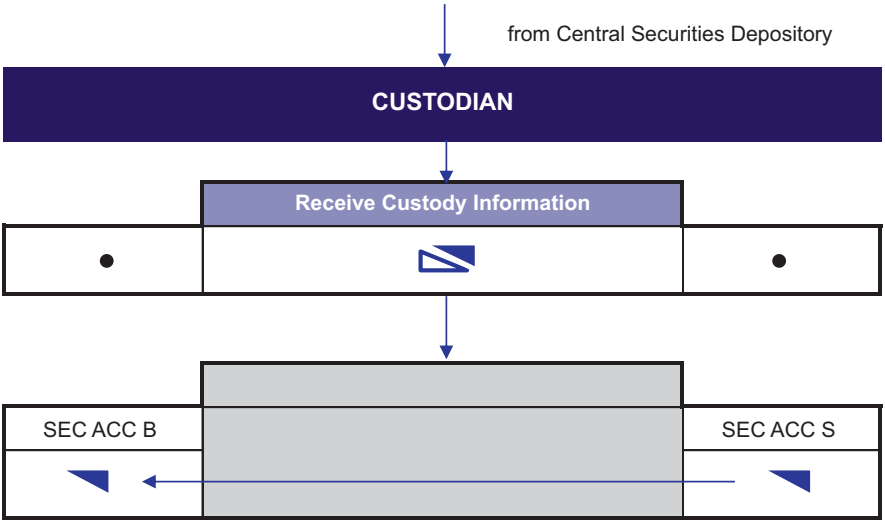


Fig. 2.27 Elements of a custodian

- Shareholder meetings (e.g., information concerning the voting rights, invitation, substitution)

These activities are summarized in Fig. 2.28.

The custody market in Europe is considerable, namely €10.2 trillion. Its structure is fragmented into the following segments (in trillion Euro)[20]:

- Market-secured funding: 5.1 (50 %)
- Central bank-secured funding: 4.5 (44 %)
- Trading with CCPs: 0.3 (3 %)
- OTC derivatives margining: 0.2 (1.5 %)
- Settlement: 0.2 (1.5 %)

A study carried out by Clearstream and Accenture revealed that global institutions manage their collateral or cash on an individual trading desk basis without any coordination, leaving a single institution with a number of discrete liquidity pools. This leads to expensive collateral use. The situation externally is similar: banks tend to have positions across a wide number of markets, and they maintain a discrete collateral pool in each.

Accenture found that the greatest benefits from overcoming these inefficiencies were reaped from enabling institutions to maximize liquidity, reduce financing costs, and lengthen the funding term. The study reported that, if these issues were resolved, the potential value from optimizing collateral so as to replace unsecured funding with a secured equivalent could be €3.8 billion. Additionally, the cost of maintaining excessive levels of collateralization with multiple settlement agents, involving greater legal costs and development of multiple interfaces with a variety of external providers and internal pools, could be around €400 million.

[20] See [6].

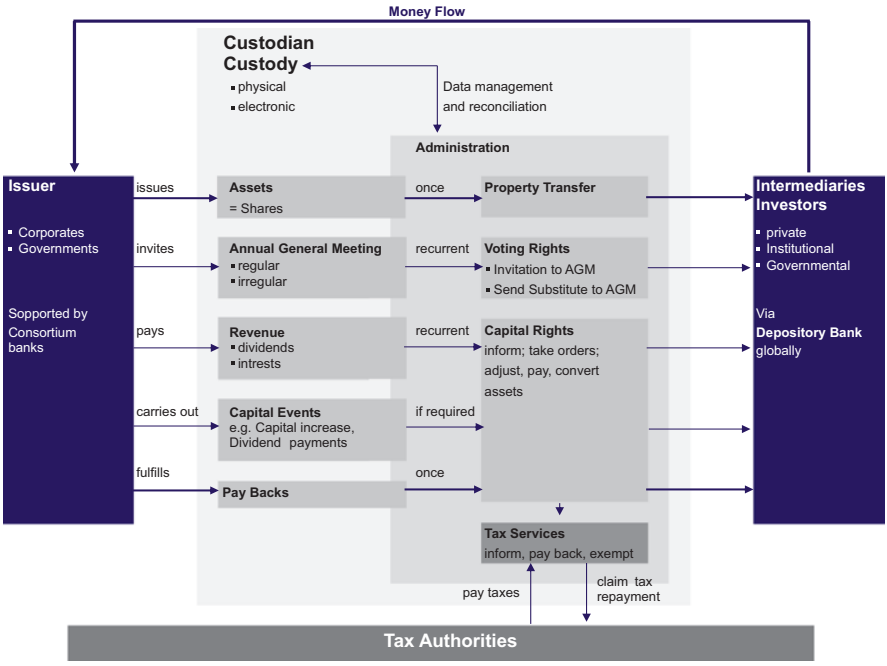


Fig. 2.28 Custodian—elements and flows

During the credit crisis, tri-party agent services in particular experienced a boom, as they allowed banks to better manage and cover their exposures through a neutral infrastructure provider. CSDs are particularly well placed to help the market overcome possible collateral shortfalls by optimizing collateral pools. Clearstream, for example, has long-standing experience in providing collateral management and securities lending services via its global liquidity hub. It can leverage this knowledge to help partners overcome collateral fragmentation and the related cost.[21]

2.6 The Objective of the Value Chain: Straight-Through Processing

If a trade is matched immediately and then directly cleared and settled, the process from starting the order at an intermediary to the receipt of the settlement confirmation at the same intermediary is called STP (cf. Fig. 2.29). The instant booking of cash for securities means processing within seconds or faster with one objective:

[21] See [6].

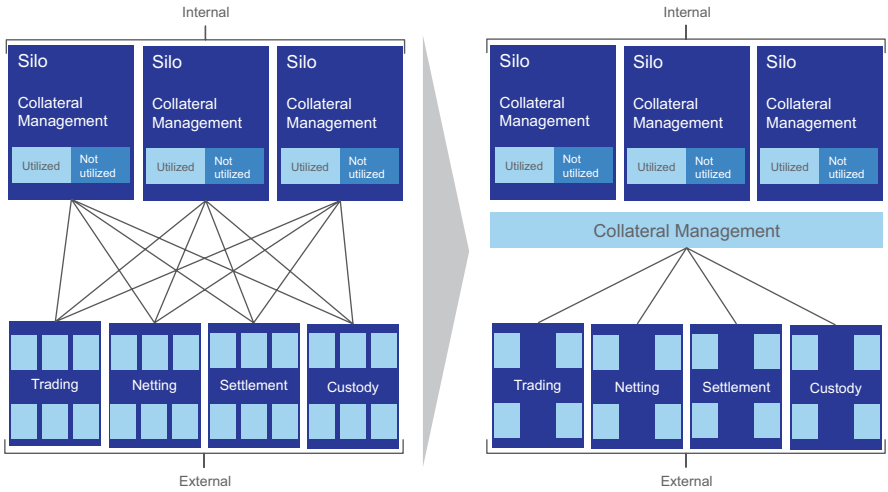


Fig. 2.29 Custodian: reducing internal and external fragmentation (Accenture 2014)

minimize execution costs and all kinds of risk.[22] An integrated value chain (such as Deutsche Börse Group has) generally offers instant clearing and following settlement: the usual round-trip time for orders ranges within microsecond trading at peak times.[23]

STP involves the circulation of money and securities: The role of the clearing house in this process is twofold: on the one hand, the CCP handles the exchange; on the other hand, the CCP assures the settlement (DvP) via its own balance sheets and in real time.

The security and the money flow within the value chain are outlined schematically in Fig. 2.30. The STP process in the securities' value chain ensures the execution of all processing steps via electronic media. Manual interference is not required. Data once captured cannot get lost, are protected from errors in manual processing, and only need to be entered once. That even applies when processing across the boundaries of separate asymmetrical units or even companies and institutions. A prerequisite for STP processing is a high degree of standardization along all steps, as well as reliable and stable points of execution of these steps (Fig. 2.31).

[22] For example volatility risk, counterparty risk, market risk, country and currency risk, liquidity risk, hedging risk.

[23] Round-trip time refers to the time order processing takes from an intermediary via order book and matching to the CCP and back to the intermediary.

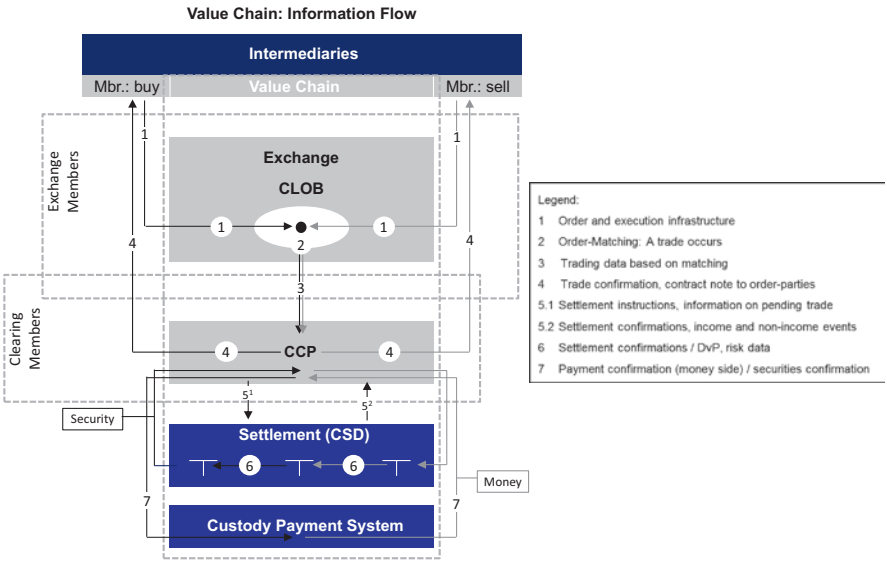


Fig. 2.30 Flow of information within the value chain

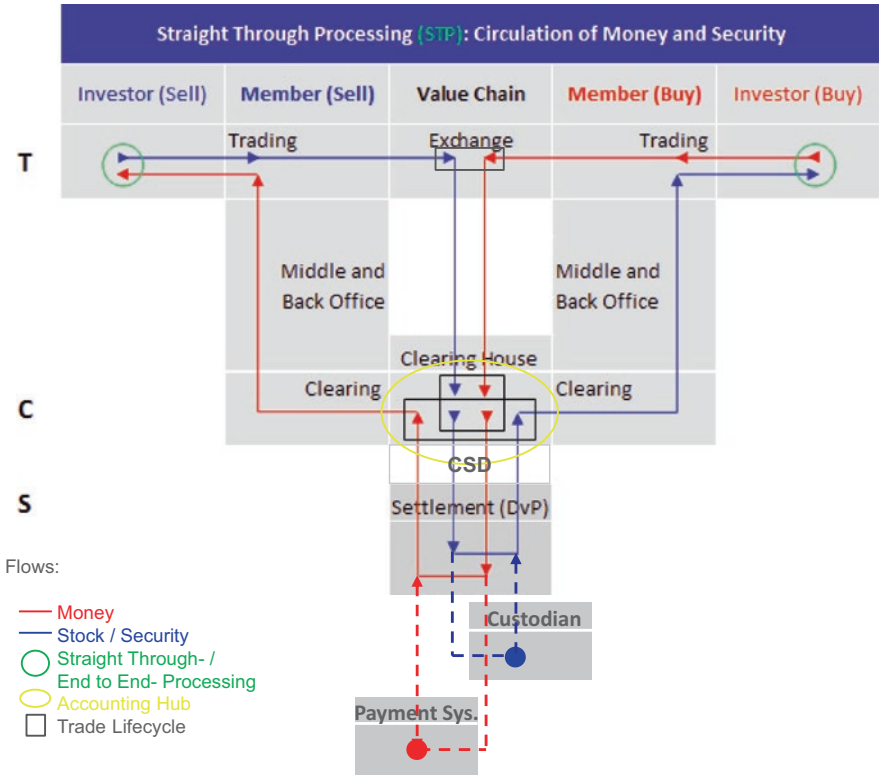


Fig. 2.31 Straight t-hrough processing of money and securities (schematic)

2.7 The Role of Technology Within the Value Chain

2.7.1 Key Characteristics

Today's equity markets are fully automated, and transactions are seamlessly processed along the value chain by customized, purpose-built IT systems. Each step in the value chain typically involves different systems: for example, market data dissemination, trading, clearing/risk, settlement, and custody. Organizations which cover more than one of these steps may deploy tightly integrated systems across their part of the service spectrum.

However, even when systems are operated within a single entity, the functional components are still fairly distinct and self-contained. Efficient transaction processing requires well-defined electronic interfaces in order to avoid manual intervention and to allow for an uninterrupted process flow (STP). When the value chain spans multiple organizations—e.g., a stock exchange, a clearing house, a CSD, and a custodian—the handover of transactions between their respective IT systems needs to follow clearly structured confirmation protocols and must pass through distinct demarcation points, control processes, and time stamping.

While these systems tend to be reasonably well interlinked nowadays, they still display widely varying characteristics. Some of these key characteristics apply to the specific business functionality, whereas others impact the underlying technology (Fig. 2.32).

Depending on the step in the value chain, a different set of key characteristics is relevant. For example, the functional richness of a risk management system far exceeds that of a trading engine. Or, while settlement data should most certainly be kept in a persistent environment, market data, however, can become fairly irrelevant as soon as it is superseded by new transactions and the market has moved on.

2.7.2 The Trading Platform: The Formula One of Exchange Systems

The IT systems used at each step along the value chain are typically based upon proven infrastructure components which are well established in the financial industry. While the functional richness and the complexity of the business requirements may vary, most components can be deployed on standard computing systems and use industry standard architectures.

This is not the case for those systems that cater to today's extremely fast response times in electronic trading. High-performance trading systems nowadays deploy technology that goes far beyond conventional designs to reduce transaction latencies to an absolute minimum. Leading-edge technologies, such as remote direct memory access, field-programmable gate arrays, and microwave transmission, can bring down order transmission and processing times down to microseconds (a millionth of a second). In Chap. 6, we outline specific design principles for these high-performance trading systems.

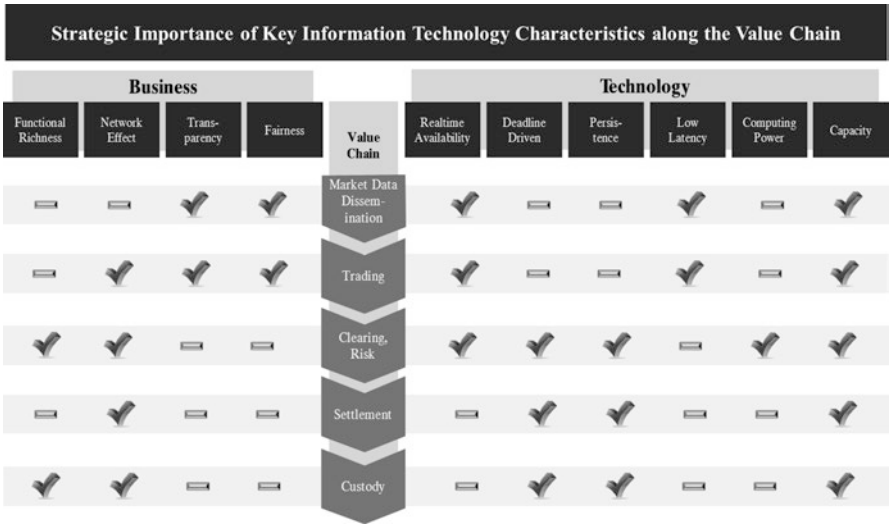


Fig. 2.32 Strategic importance of key IT characteristics along the value chain

2.7.3 Price Discovery: Software vs. Software

The price discovery process is defined by means of algorithms in the form of software. It is the objective of matching as part of the central system to determine the execution price,[24] sequentially for a specific situation as well as for continuous trading. The application of an abstract concept (like the principle of highest executable volume) via software and hardware secures the determination of one execution price per listed share at any time within the central order book. Software facilitates the sequential execution of a distinct, unmodifiable description of a process—matching—in numerous finite steps (Fig. 2.33).

The matching algorithm has the following properties:

I Syntax (form):

- Expressed in a specific language, formal and consistent
- Finite number of steps until a definite result is reached
- All steps are executable and sequential[25]
- Completeness, i.e., all possible "what if" cases are conclusively covered[26]

[24] Each specific situation in the CLOB has exactly one execution price.

[25] For price discovery only in technologically determined exceptional cases parallel.

[26] In philosophy an axiomatic system has to be consistent, whereas price discovery as a system has to be consistent AND complete (cover all possible cases).

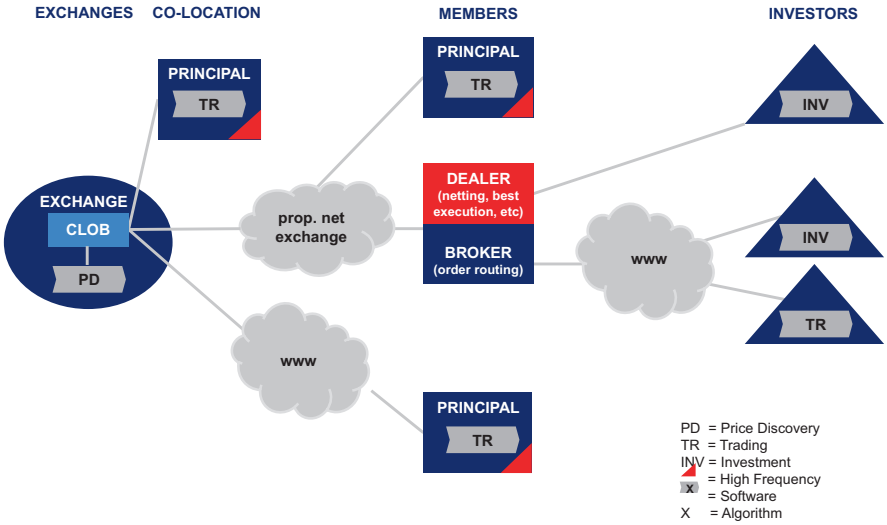


Fig. 2.33 Price discovery and order execution: software (PD) vs. software (TR/INV)

II Semantics (contents):

- Axioms or rather assumptions as unprovable elementary principles, describing an ontology.[27] Regarding price discovery, the most important principles are the principle of highest turnover with lowest surplus, and the principle of price-time priority.[28] For market participants the principle of equal treatment is of utmost importance.
- Consistency: axioms must not contradict themselves, while the same is true for the process.
- Completeness, i.e., all the axioms together contain all information to cover the entire price discovery process. Any further additions would lead to inconsistency.

2.8 Risk Management Along the Value Chain

One of the key functions of an exchange organization (along with trading, clearing, settlement, and custody) is the provision of efficient risk and securities management services to participants in the international capital markets around the globe. Therefore, it is especially important that the exchange organization should also have appropriate procedures in place to protect itself from risk.

An exchange organization could categorize risk into three types: operational, financial, and business risks. Operational risks include system availability risks,

[27] Cf. [7].

[28] Cf. Chap. 4.

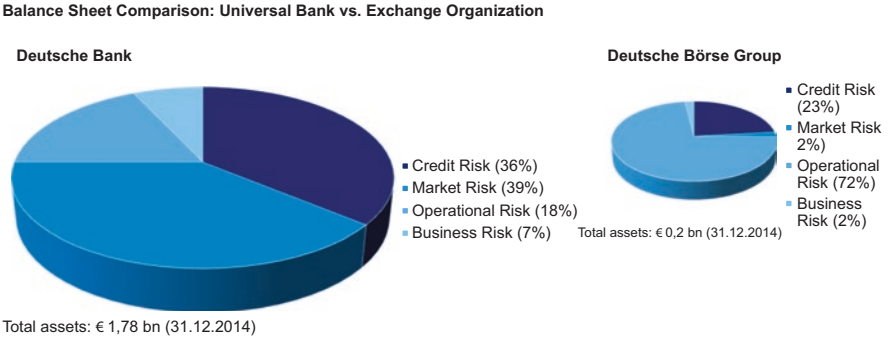


Fig. 2.34 Risk profile universal bank vs. exchange organization

legal and regulatory risks, and processing errors. Financial risks include primarily credit but also market and liquidity risk. Business risk reflects potential impacts on the organization's operating result attributable to economic, competitive, regulatory, or other market developments.

While the trading, clearing, settlement, and custody division of an exchange organization deal with the enormous volumes that are being transacted in the international capital markets, they avoid holding market positions that are at risk. Furthermore, credit risk is managed through strict customer acceptance and credit approval processes. Thus, while the exposures to customers can amount to billions of Euros, Dollars, Renminbi, or one of the other currencies in which the respective organization processes transactions, such exposures are generally to highly rated counterparties, and they are fully secured by high-quality collateral. In addition, the clearing house's exposure is protected by member contributions to the clearing fund while, in the settlement business, exposure is very short-term (primarily intraday). Only by protecting itself can an exchange organization protect its customers.

Thus an analysis of, e.g., Deutsche Börse Group's risk profile shows a significant difference from other financial institutions. While credit and market risk may account for 75 % of the economic capital requirements of a large universal bank,[29] at Deutsche Börse Group, credit risks account for only around 23 % and market risk for just 2 % (Fig. 2.34).[30]

2.9 Contractual Relationships Within the Value Chain

Describing the value chain of an equity market one must consider the trading layer, the clearing layer, and the settlement layer. These layers are integrated by the STP of transactions on a technical level. In this section of the chapter, we focus on the legal relationships that are required (or that at least are usually established) for each layer in order to execute and process securities transactions along the value chain (Fig. 2.35).

[29] Deutsche Bank quarterly report (30.09.2014).

[30] Deutsche Börse Group (31.12.2014).

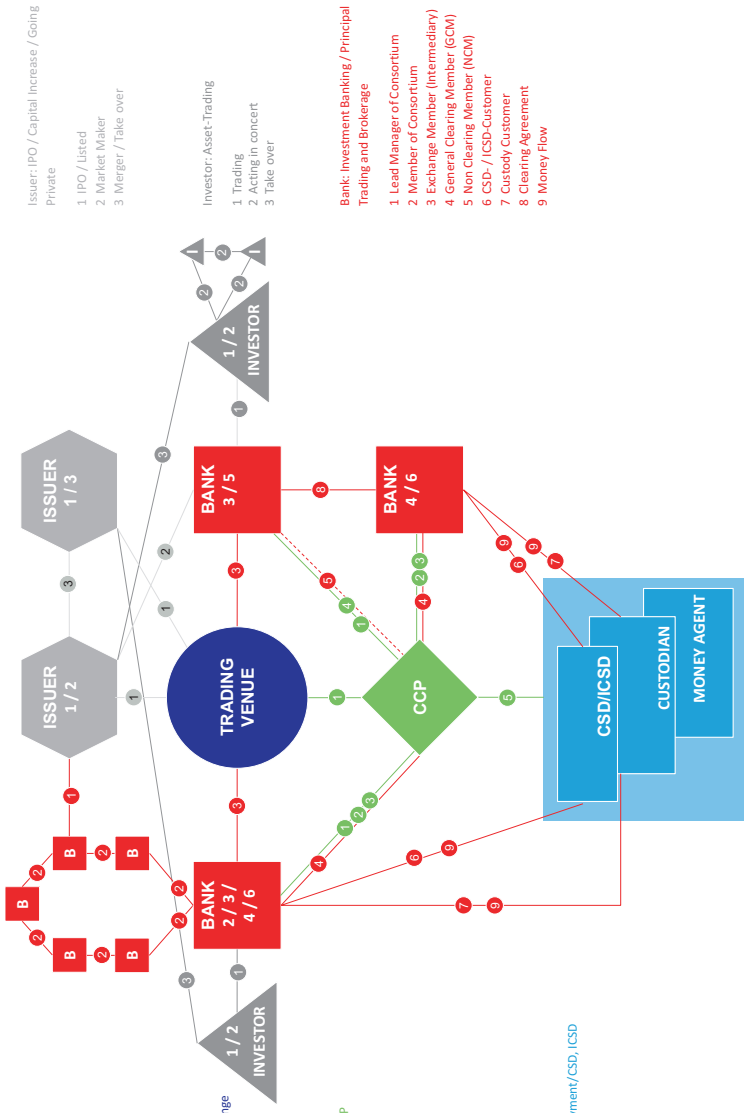


Fig. 2.35 Legal relationships within the value chain

- On the *trading layer*, i.e., on the level of the securities exchange as an organized marketplace, transactions are concluded based on an approved set of rules, and are supervised by the bodies of the exchange and the competent regulators. A precondition for the conclusion of transactions on the exchange is, on the one hand, the availability of tradable securities and, on the other hand, the admission of trading participants who have access to the trading system of the exchange, and who enter orders (or quotes) into the trading system for the purchase or sale of such securities. Therefore, on the trading layer, legal relationships are established by the exchange with issuers of securities admitted to trading on the exchange and with trading participants. As a rule, securities exchanges have no direct legal relationships to investors who are not at the same time issuers or trading participants.
- As previously discussed in this chapter, on most of the securities exchanges, a CCP is contractually interposed between the trading participants (*clearing layer*). The exchange, in cooperation with the CCP, may determine that transactions in specific securities are not eligible for clearing and that these transactions have to be settled bilaterally between the counterparties without the CCP being involved. Unless such bilateral settlement is foreseen, transactions in securities executed on the exchange are being cleared through the CCP who provides post-trade anonymity, netting, and counterparty risk management services. To clear transactions through the CCP, exchanges require that their trading participants have CCP arrangements in place to ensure the orderly settlement of transactions. They may choose to participate in the clearing of transactions as clearing members of the CCP or as non-clearing members, by facilitating third-party clearing members. On the clearing layer, the CCP establishes legal relationships to the entities that are involved in the clearing process, i.e., to both clearing members and non-clearing members.
- On the *settlement layer*, in order to settle the transactions executed on the exchange, CSDs organize the exchange of cash and securities on a delivery-versus-payment basis, and for that purpose they maintain technical interfaces with exchanges and their trading participants. For transactions that are cleared through a CCP, interfaces are in place with the CCP and its clearing members as well. For the settlement of transactions, legal relationships are established between the CSD and its customers. Such customers of the CSD are trading participants, intermediary banks, clearing members, and the CCP, depending on:
  - Whether transactions are settled bilaterally or are cleared through a CCP
  - Whether the settlement solution is implemented by the trading participants of the exchange

As clearing services by the CCP comprise the collateralization of transactions, the CCP is served by the CSD in particular, as the CCP needs legal and operational access to collateral locations.

In addition to the legal relationships addressed in the following sections, further legal arrangements are required to ensure that transactions are processed on an orderly basis for each layer, and along the entire value chain of the equity market.

In particular, on each layer agreements are concluded for the provision and/or operation of the required IT infrastructure. Such agreements are not necessary if the IT infrastructure is provided and operated by the securities exchange, the CCP or the CSD. Usually, contractual arrangements are also in place between the layers that provide for the use of clearing and settlement services and operational details of the processing of transactions across the different layers.

Whereas the trading, clearing, and settlement layers are integrated by STP on a technical level, from a legal perspective they can be integrated or linked together in various ways. Given that the exchange, the CCP, and the CSD may be independent, or that they may be operations within the same organization, two basic models exist. In the *vertical model*, the securities exchange, the CCP, and the CSD are all entities that are totally or substantially owned by the same company or group. This model is usually highly efficient and cost effective, but it gives only limited choice to the trading participants of the exchange with respect to the clearing and settlement of transactions. In contrast, the *horizontal model* separates the business into three layers: trading, clearing, and settlement. In this model, exchanges may integrate more than one CCP or CSD for the clearing and settlement of transactions. Though this model provides more choice for trading participants, from a legal and operational perspective it is more complex than the vertical model. Therefore, in the horizontal model, besides cost efficiency, it has to be taken into account that the implementation of different clearing or settlement solutions must not have an adverse effect on the orderly trading on the exchange, and on the orderly clearing and settlement of securities transactions.

2.10 Market Regulation: Investor and System Protection

Economic growth relies heavily on a safe and functioning financial system. The Financial Crisis revealed considerable shortcomings of financial market regulation and supervision; these were on the legislative side (namely regulatory and supervisory gaps) and on business side (ineffective risk management and a lack of transparency). This resulted in systemic weaknesses of the global financial system.

Based on these findings, the G20 Pittsburgh Summit in 2008 introduced a reformation of the regulatory environment of financial markets with the objective of establishing a "new normal" for the global system. While overriding principles for regulation and supervision remain the same, namely:

- Investor protection: including transparency, fairness, and equal treatment of all market participants
- System protection: focusing especially on operational and financial risk management

The focus of this new order was set to be safety, integrity, efficiency, and burden-sharing to prevent a recurrence of those events that initially triggered the crisis.

The Pittsburgh Summit also saw the introduction of the G20 regulatory reform agenda that defined the new scope of international rule-making and oversight.

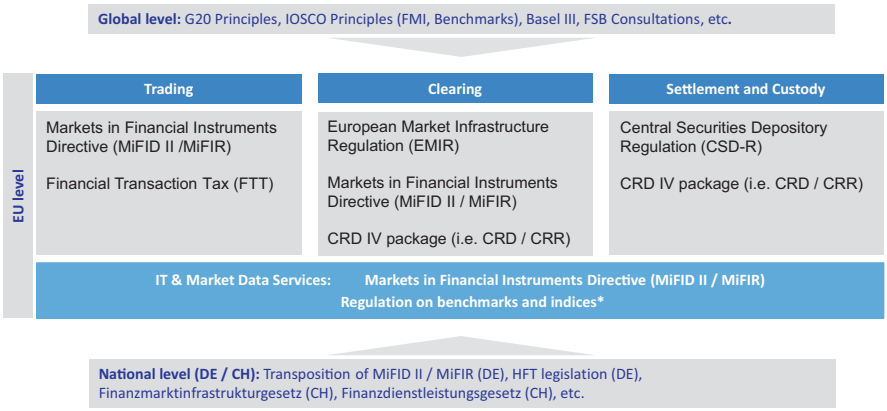


Fig. 2.36 European regulatory initiatives with impact on the value chain

Recently revised, the agenda currently comprises topics like how to end too big to fail, how to manage the shadow banking system, and how to increase the security of the derivatives market.

Due to the extensive interconnectedness of the financial system, the inevitable precondition to reach these goals is international cooperation in determining how best to develop a level playing field regarding supervision and regulation. Clearly, consistent implementation procedures are needed.

Especially for Europe, a joint federation of several states that had differing implementation practices pre-crisis, accomplishing all of this is an immense challenge. The same challenge exists for financial market infrastructure providers who are active in this environment. Most of the relevant initiatives covering European financial market regulation are developed on European level. Figure 2.36 outlines the number and diversity of regulatory initiatives that have had an impact on integrated exchange organizations like Deutsche Börse Group. All of them were developed following the principle of maximum harmonization (i.e., leaving little or no opportunity for member states to decide on specifications).

Although a very precise G20 process aims at a level playing field for regulation and supervision, a concrete tendency regarding regulatory arbitrage and fragmentation (especially between the EU and the USA) is becoming increasingly visible.

Different to the USA (where a majority of financial market regulation is covered by the Wall Street Reform and Consumer Protection Act, commonly known as Dodd-Frank Act), the European Union has developed numerous regulations covering different pillars of the financial system.

While Dodd Frank covers trading and clearing, EMIR, the European Market Infrastructure Regulation, regulated clearing only. Due to the prevailing variety of national regulatory systems, its realization takes much longer in the EU than it does in the USA, thereby allowing US financial firms to offer services faster in Europe than their European competitors. Another example is the prevailing intention of some European states to enact a financial transaction tax, which the USA completely rules out.

The coming years will see even more work on an international level to foster a consistent political strengthening of regulated markets and market infrastructure

that make a substantial contribution to stable, transparent, and crisis-proof financial markets. Financial market infrastructure providers are not only facing challenges from regulation. Due to the overall transformation of the financial service industry, exchange organizations in particular can derive considerable opportunities from new customer needs and new business opportunities.

2.11 New Customer Needs

2.11.1 Scope and Mechanisms of the Financial Market Reform

The financial market reform is centered on preventing excessive risk taking on global capital markets by ensuring the transparency of derivatives marketplaces, by curbing leverage, and by imposing rigorous risk management. Consequently, financial reform targets market participants both sell side and buy side, as well as the venues and infrastructure through which they interact. Both elements are interrelated and shape customers' needs in the post-crisis environment. Although the dislocation originated in the mature Western markets, the reform agenda that is based on the G20 objectives applies globally, through either international accords like Basel III/BCBS IOSCO or concurrent regional frameworks like EMIR/Dodd-Frank.

The impact of regulation on customer needs is essentially threefold:

- First, regulators mandate the use of multilateral trading systems (MTS) or CCPs, and they selectively prohibit specific activities like prop trading.
- Second, within the range of licit market structures and roles, capital and liquidity rules influence the profitability of capital market business lines, and they provide incentives for the usage of standardized instruments and central clearing. As a result of these two factors, market participants align their business models and their balance sheet structures with the revised set of available transactional options and incentives. This in turn affects their customers' product choices and the distribution channels.
- Finally, market participants need to step up their capabilities in managing data, risk, collateral, and liquidity in the new regulatory environment. Buy-side customers are compelled to set up a front-to-back access infrastructure to cater to the multipolar market structure.

2.11.2 Mandated Change of Market Structure and Participants' Roles

The prescriptive elements of financial regulation define the range of permitted activities as well as eligible trading and post-trade platforms. The Volcker rule that practically eliminates prop trading by US banks has partly shifted these activities away

from US banks and into hedge funds that access markets and financing through prime brokers rather than directly as sell-side actors. **High-frequency trading** in Europe will likely be restricted, but not eliminated, by upcoming EU regulation.

Moreover, regulators define and mandate the use of transparent, MTS for specific standardized instruments, thereby displacing models with dealer-centric liquidity provision. Listed exchanges, dealer-controlled entities, as well as network- and technology-focused players have competed for operating these nascent marketplaces. Central clearing has been imposed for a large range of derivatives contracts. These rules will be complemented by obligatory margining for non-centrally cleared derivatives.

Finally, a comprehensive registration obligation for OTC derivatives has been put in place, but this does not usher in a new way of transacting. Market participants need to build up connectivity to electronic platforms and to accommodate new reporting, trading, and clearing processes. The latter affects certain nonfinancial entities that are using derivatives vis-à-vis to direct market participants.

In summary, post-crisis regulation redefines market models and transaction processes, affecting direct and indirect market participants. Some former activities of the dealer community are displaced or shifted to less regulated entities.

2.11.3 Strategic Balance Sheet Management

Banks need to manage their balance sheets more strictly in light of Basel III's increased capital and liquidity standards. The revised capital requirements drive the profitability of capital market business lines and, consequently, the allocation of risk capital across asset classes, product types, and trading/post-trade channels. Channels are relevant as CCP positions enjoy lower capital requirements (lower counterparty weight and CVA exemption) than equivalent exposures to other counterparties where both routes are permitted. Product choice matters as—among those positions held at CCPs—easy-to-liquidate standardized derivatives are assigned lower margin requirements than typical OTC contracts.

The benefits of standardization and clearing enter the equation of product profitability. Regulation accentuates the trade-off between profit margins and capital costs. Since dealers are compelled to charge higher costs to their clients, they are incentivized to opt for plain vanilla products and to accept more basis risk in return for lower fees. Finally, the prospective Basel III leverage ratio will add a channel-agnostic dimension to capital costs, and the impact will depend on its parameterization. However, the design of this rule will first put low-margin trading businesses at risk.

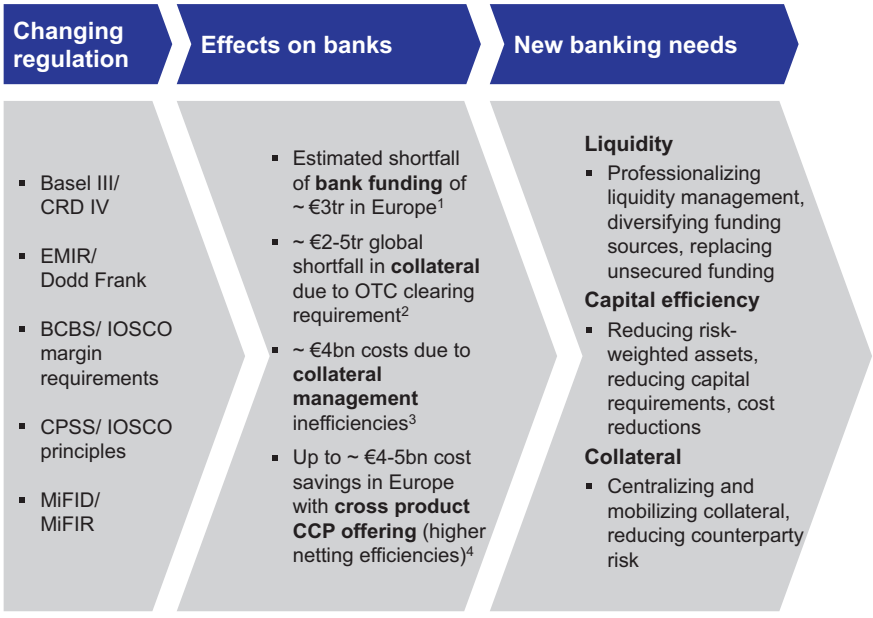
In light of the revised cost structure of the banking/broker-dealer sector, the provision of liquidity will be reorganized. For instance, bond dealers may cease to provide liquidity as the increasing capital cost of inventory erodes the profitability of market making in a low-yield, low-volatility environment. Investors will therefore have to seek liquidity in alternative multilateral market setups, or in the shadow banking sector that involves less regulated players like hedge funds. This brings new, technology-focused operators to the fore in fixed income, and it modifies trading logic and infrastructure.

Apart from capital requirements, Basel III comprises specific regulations on short- and mid-term liquidity, which calls for a proper structuring of the balance sheet, and a robust toolset for operational liquidity management.

In summary: The capital regulation of Basel III, which was targeted by regulators for the sake of systemic security, has crystallized the migration towards central trading of standardized instruments and clearing. In this process, Basel III reinforces the reallocation of liquidity pools away from dealers, and it further increases the scale and scope of central counterparty clearing.

2.11.4 New Requirements: Market Access, Liquidity, and Post-trade

The partial retreat of the dealer community compels the buy side to build up an infrastructure to access directly standardized products traded on multiple venues. They need capabilities to ensure best execution across fragmented liquidity pools, and to manage the risks inherent in the use of imperfect hedging tools that are provided by the wholesale markets of standardized derivatives. As these requirements add to clearing obligations, major buy-side players will have to match the dealer community's trading and post-trade technology (Fig. 2.37).



1) Quantitative impact study of Basel Committee on Banking Supervision (December 2010)
2) Celent study "Cracking the Trillion Dollar Collateral Optimization Question" (August 2012)
3) Accenture and Clearstream study "Collateral Management" (2011)
4) "The future of central clearing" study by Eurex Clearing and Oliver Wyman (April 2014)

Fig. 2.37 Changing regulation drives new customer needs

For the dealer community, the increasing centralization of counterparty and market risks within CCPs dramatically enhances the effectiveness of risk management. It facilitates timely and comprehensive transparency across the market, and it increases the speed and robustness of risk mitigation as well as recovery and resolution processes. At the same time, high-grade collateral is becoming an increasingly scarce resource as initial margin requirements—for CCP or bilateral positions—drive up costs by adding to the funding-related collateral requirements of central banks and other liquidity sources.

Market participants will best deal with this challenge if they are enabled to draw on a virtually integrated pool of their eligible assets, and can allocate these flexibly to risk exposures or liquidity providers. CSDs and global custodians provide collateral management services for that purpose. Both are complementary in principle, while their division of labor differs in the USA, Europe, and other financial centers due to the specific market infrastructure arrangements.

In Europe, CSDs play a pivotal role in the collateral management and securities financing that they offer as complementary services to their core notary, safekeeping, and settlement functions. Central bank money access, and close collaboration with the CCPs, has enabled the design of integrated, high-security collateral management solutions that span trading and financing markets.

In contrast, collateral management infrastructure in the USA is centered on custodian banks, specifically J.P. Morgan and Bank of New York Mellon, which are both in the securities financing and derivatives clearing markets. Although the system has proved workable, assigning central infrastructure functions for cash and securities settlement to commercial banks exposes US markets to heightened systemic risks.

The post-trade infrastructure in financial centers other than Europe and the USA is currently undergoing upgrades in terms of rulebooks, processes, and tools. The process involves the replication of specific collateral management capabilities developed by infrastructure providers, often in cooperation projects.

2.11.5 Outlook: Transformation of Global Capital Markets

While the financial market reform applies globally, the magnitude of the transformation varies across regions. The US and European approaches have, up to financial crisis, built up oversized banking sectors and excessive leverage. Consequently, the transformation of their capital markets in terms of downsizing and structural adjustments is far more pronounced than is the case in Asia. The speed of regulatory action is equally varied. The USA has implemented its “Wall Street Reform” in the Dodd-Frank Act more swiftly than the EU equivalents MiFID II/EMIR, as the decision-making process in the EU is invariably more complex. National regulators in Asia follow suit, but their frameworks are less pervasive in OTC derivatives rules in light of the limited size of these markets in their region.

This transformation has spawned a plethora of new reporting, trading, and clearing offerings to facilitate compliance and optimal operational management within the new landscape. For exchange organizations (reasonable) regulation represents:

- An asset due to positive effects on market integrity
- Opportunities for new products and services

Market infrastructure providers and other players from the financial market ecosystem have competed to serve emerging customer needs. The competition is global, but mutual access rules are still being fleshed out.

US operators have had a head start as they were in a position to upscale their businesses ahead of EU competitors. However, integrated European exchange groups are uniquely positioned to deliver innovative post-trade technologies by integrating cash, collateral, and risk management functions. Such evolution towards holistic post-trade solutions started before the crisis. This development was increasingly driven by the cooperative efforts of different market infrastructure providers and their respective regulators and central banks. The same is true for Asian markets as well. But, whereas in the USA and in Europe the regulatory structures are set on implementation, in Asia some key market players, primarily China, can still make strategic use of the second mover advantage.

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