

# Behind the scenes of financial markets: A look at the Swiss financial market infrastructure

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Developments in the global financial markets have been remarkably dynamic in recent years. Market participants have steadily expanded the range of tradable financial instruments, and the trading volume in some segments has occasionally reached epic proportions. Indeed, the number of financial market participants has also grown steadily.

These developments have not gone unnoticed in the media world, where coverage has increased significantly. While just a couple of years ago, coverage of events in the financial markets was limited to a select few newspapers and journals; nowadays, every local paper provides the latest market data and investment tips; to say nothing of the non-stop reports and analyses we see on various specialised TV channels and internet portals. Most of the attention focuses on the ever-fluctuating share prices and foreign exchange rates, as well as on the interest rates on money market and capital market investments and the prices of a whole range of other financial instruments, such as options, futures and other derivatives. At the same time, it is easy to overlook the fact that efficient financial markets depend on financial market infrastructures where market participants trade, clear and settle the individual financial instruments. These infrastructures primarily include stock exchanges and other trading platforms, central counterparties, as well as payment and securities settlement systems.

To the layperson wishing to come to grips with what these financial market infrastructures do and how they work, and attempting to get a glimpse of what goes on behind the scenes of financial markets, it probably quickly becomes apparent that there is far more to this world than meets the eye. This is due, on the one hand, to the often excessive and less-than-consistent use of technical terms and acronyms, and, on the other, to the absence of clear and concise definitions explaining how the individual elements of the financial market infrastructure interrelate. The aim of this article is, therefore, to provide some insight into the world of financial market infrastructures, albeit with two restrictions. We will first focus on the fundamentals of the financial system and on those financial market infrastructures that financial intermediaries (such as banks or securities dealers) use to trade, clear and settle financial instruments with one another. For

clarity's sake, however, the relationship between the financial intermediaries and their customers will not be discussed. We will then turn our attention to financial market infrastructures that are either domiciled in Switzerland or are significant for the Swiss financial system. By limiting the scope of our article in this way, we hope to avoid overwhelming the reader with too much information.

The article's first chapter looks at the normal life cycle of a financial market transaction, from the trading right through to the clearing and settlement of a financial instrument. Chapter 2 discusses the role played by financial market infrastructures at each stage of the cycle on a general level, while chapter 3 deals with it in more specific terms. To conclude, chapter 4 addresses the significance of financial market infrastructures for the stability of the financial system.

## 1 The life cycle of financial market transactions

In order to understand just how essential financial market infrastructures are for the smooth functioning of markets, as well as what tasks they perform and how they are interconnected, it is best to start by taking a closer look at the individual steps of a financial market transaction. Although the life cycles of the various financial instruments differ slightly from each other, they all have three basic stages in common: trade, clearing and settlement. However, before a financial instrument can be traded, it has to be issued. Thus, for the sake of completeness, the issuance of financial instruments will also be discussed here.

**Issue:** Financial instruments are issued in the primary market. For instance, to raise funds in the form of equity or borrowed capital, companies generally issue securities, such as shares or bonds, with the aid of a specialised issuing bank. Similarly, other financial instruments, particularly derivatives, are usually issued by financial intermediaries or by the stock exchange itself.

**Trade:** Financial instruments are traded (i.e. buyers and sellers are brought together) in the secondary market – either on a stock exchange or over the counter (OTC). To conclude a transaction, the contracting parties have to agree on all the economically relevant terms of the transaction, such as the quantity, price and settlement date.

**Clearing:** This step covers all aspects of a transaction that take place between the conclusion of the trade and its settlement. The time interval between trade and settlement (settlement interval) differs depending on the underlying financial instrument. For derivatives, for instance, the interval corresponds to their maturity which is often several months or even years. Even spot transactions usually have an interval of several days between their trade and settlement dates. Take, for instance, foreign exchange transactions, and indeed most repo transactions: these are not settled until two working days after the conclusion of the trade; the settlement interval for shares, meanwhile, is generally three working days. A number of factors determine which of the following clearing steps are pursued, the main ones being the underlying financial instrument, the period of time that elapses between the trade and settlement dates of a transaction and whether the trade took place on a stock exchange or OTC.

- Trade capture, matching and confirmation: In the case of OTC transactions, the relevant trade details are first captured internally by both trading partners; the details are then compared to ensure they match and, finally, the terms of the trade are confirmed. Financial instruments that are traded on an electronic exchange are handled differently, however. In this instance, the trading partners are generally not required to follow these steps themselves; instead the trade details are captured, saved, transferred to the contracting parties and confirmed directly by the exchange when the trade is concluded.
- Netting: Individual transactions can be combined and offset either bilaterally or multilaterally. Netting makes particular sense in cases where mutual obligations have the same settlement date.
- Transfer of obligations to a central counterparty: During the entire settlement interval, the trading partners are at risk that their counterparty will fail to meet its contractual obligations. In order to eliminate counterparty risk, a central counterparty can step between the trading partners either when the trade is executed or afterwards.<sup>1</sup> By being the buyer to every seller and seller to every buyer, the central counterparty assumes the obligations of both trading partners. However, in order for the central counterparty to be able to meet its own obligations should one of its participants fail to fulfil its obligations, the central counterparty needs to

<sup>1</sup> Owing to the fact that derivatives generally have long maturities and that the trading partners are thus subject to counterparty risk for a longer period of time, central counterparties are most useful in the derivatives market. This notwithstanding, central counterparties are becoming increasingly active in other markets, such as for share trading.

have sufficient financial resources. For this reason, central counterparties generally require their participants to provide adequate collateral, often in the form of margins and contributions to a default fund.

- Risk and position management: In markets where no central counterparties are present, trading parties can also limit their counterparty risk bilaterally, for instance by netting and collateralising open positions.

**Settlement:** When a transaction is settled, the obligations entered into by the contracting parties upon conclusion of the transaction are fulfilled. While certain transactions require the delivery of a specific financial instrument on the settlement date, others require only cash settlement. When a share or bond is traded, the contracting parties agree, for example, that the seller physically delivers the share or bond to the buyer and that the buyer transfers the agreed sum of money to the seller. Cash settlement is particularly common for derivatives.

## 2 The role of financial market infrastructures: Overview

So what role do financial market infrastructures actually play in the trading, clearing and settlement of financial instruments? It should be noted at this stage that financial markets could in fact function without financial market infrastructures: trades could, for instance, be effected directly between trading parties with a handshake or a telephone call; the clearing and settlement could also be done directly. In the case of share trades, this would involve the seller physically handing the agreed securities over to the buyer and the buyer paying the seller the agreed sum of money either in cash or by means of a transfer to the seller's account with the buyer.

It is not difficult to imagine, however, that a financial system based purely on bilateral relations, such as the above example, would be highly inefficient. Central financial market infrastructures that are used by many parties allow the various steps in the process to be standardised, automated and accelerated. This in turn helps bring down the costs connected with the trading, clearing and settlement of financial instruments.

Thus, the creation of central marketplaces, such as stock exchanges or alternative trading platforms,

offer a number of advantages over purely bilateral trading arrangements. Owing to the increased ease of bringing potential buyers and sellers together, these marketplaces primarily promote price transparency and market liquidity.

When it comes to clearing financial market transactions, infrastructures particularly facilitate a greater automation in the processing of relevant information, with the result that manual intervention can be minimised and operational risk reduced. Of particular importance are central counterparties, which enable the elimination of the counterparty risk faced by their participants. This is especially advantageous in anonymous markets and for forward transactions where the trade and settlement dates are often far apart. By offering the participants the option of netting mutual obligations, central counterparties also help to reduce the number of transactions that need to be processed, thereby saving liquidity.

The advantages of financial market infrastructures are perhaps most apparent in the settlement of financial instruments, i.e. payment and securities settlement systems. Without a central custodian and a settlement system, the immobilisation and dematerialisation of securities, which now form an integral part of a modern and efficient financial system, would not be possible.<sup>2</sup> Furthermore, the settlement of monetary debt via a payment system which connects at least the most important financial intermediaries boasts a number of advantages over bilateral correspondent banking arrangements. The most notable advantage being that payment system participants can centralise their liquidity, which not only means that their overall liquidity requirements can be reduced, but also that the available liquidity can be used more efficiently. In the case of interbank payments, the central processing for a particular currency is best carried out by the appropriate central bank. On the one hand, banks can benefit from the soundness of the central bank, while on the other, the central bank, in its special role as the issuer of legal tender, can quickly provide additional liquidity at any time should the need arise.

Another major advantage of central financial market infrastructures is the relative ease with which they can be connected with one another. Provided the interfaces between the exchanges, central counterparties and payment and securities settlement systems are efficient, the whole processing chain from trade to settlement can be automated – referred to as straight through processing (cf. box 2). If payment and securi-

ties settlement systems are suitably connected, mutual obligations can also be settled simultaneously. This particularly eliminates the risk of the seller delivering the securities without receiving the equivalent funds from the buyer, or vice versa.

### 3 The role of financial market infrastructures: Specifics

Below, we explain which financial market infrastructures are used to trade, clear and settle the main financial instruments. This overview describes how the various financial market infrastructures are interlinked, and how this allows individual processes to be standardised, automated and accelerated.

#### Exchanges and other trading platforms

Most exchanges and trading platforms focus on trading specific financial instruments. For instance, some exchanges specialise in share or bond trading, while others trade mainly in derivatives, such as options or futures. Traditionally, a certain type of financial instrument could be traded on one exchange only; however, competition between trading venues has recently intensified. Today, at least for some instruments, trading parties can choose between several trading venues. Box 1 provides a brief outline of the most important financial instruments.

Swiss-issued shares (including participation certificates and dividend-right certificates) are mainly traded on **SIX Swiss Exchange**.<sup>3</sup> In addition, SIX Swiss Exchange can also be used to trade various bonds, as well as exchange traded funds (ETFs) and exchange traded structured funds (ETSFs).

Increasingly, Swiss-issued shares are also traded on alternative platforms abroad, for instance **Chi-X** or **Turquoise**.<sup>4</sup> The **BX Berne eXchange** has established itself as a niche exchange for trading shares of small regional companies.

A wide variety of derivatives can be traded on the **Eurex** and **Scoach** platforms.<sup>5</sup> While Eurex is predominantly used for trading the exchange's own-issue derivatives on shares, share indices, interest rates, loans and volatility, Scoach specialises in structured products issued by banks and other financial intermediaries.

Repo transactions in Swiss francs can be conducted on the **Eurex Repo** trading platform.<sup>6</sup> One of the platform's main customers is the Swiss National Bank

2 Immobilisation refers to securities that are not held directly by the investors, instead they are held in a central system, i.e. in a central securities depository, while dematerialisation refers to the issuance of uncertificated securities, whereby the certification of financial instruments is done away with completely.

3 In May 2009, trading in Swiss blue chips was repatriated from London-based SWX Europe to SIX Swiss Exchange. Shares of Swiss small caps and mid-caps (small and medium-sized companies) were already being traded on SIX Swiss Exchange. SIX Swiss Exchange is a subsidiary of SIX Group (Swiss Infrastructure and Exchange), which is owned by the Swiss banks. For more information, cf. [www.six-group.com](http://www.six-group.com).

4 Chi-X is a subsidiary of Instinet, which is, in turn, owned by Nomura Holdings. Turquoise is a joint venture between a number of globally active banks, including Credit Suisse and UBS.

5 Both Eurex and Scoach belong to SIX Group and Deutsche Börse AG (with each owning 50%).

6 Eurex Repo is a subsidiary of Eurex.

## Box 1: Categories of financial instruments

Using the simple categorisation below, we attempt to provide an overview of the main instruments traded on financial markets; given the plethora of financial instruments, this list makes no claim to completeness. Since the categorisation is based on financial instruments' economic role, any instruments performing one or more roles can be assigned to more than one category. For instance, the foreign exchange swap, in which a foreign exchange spot transaction and a forward forex transaction are combined, is not only a foreign exchange transaction but also a traditional money market instrument, as well as a derivative.

### Capital market instruments

The capital market is predominantly for trading financial instruments used in medium and long-term borrowing and lending of funds. A distinction should be made between participations and claims.

Participations constitute rights in a company and, as a rule, represent an entitlement to a share of the profits, and of the proceeds in the event of liquidation. In addition to conventional shares, this category includes participation certificates, shares in cooperatives, dividend-right certificates, as well as units in investment funds, ETFs and ETSFs.

Claims constitute asset-based entitlements of a creditor vis-à-vis a debtor; such entitlement is to a debt defined as a monetary amount. Claims include bonds, which can themselves be divided into various categories, e.g. according to maturity, currency of issue, domicile of issuer (domestic or foreign bonds), or type of issuer (public or private sector). In addition, one can distinguish between straight bonds, on the one hand, and convertibles and warrant issues, on the other.

### Money market instruments

The money market is mainly for trading financial instruments used in short-term borrowing and lending of funds. The most important instruments in the Swiss franc money market are repos, uncollateralised interbank money market loans and investments and foreign exchange swaps, which the banks use both for short-term liquidity management and for risk hedging or speculative position-taking. The remaining instruments are used for either short-term liquidity management (customer time deposits, fiduciary investments, money market debt register claims) or for hedging or speculative position-taking (swaps, forward rate agreements, interest rate futures).<sup>7</sup>

### Foreign exchange transactions

In foreign exchange transactions, two currencies are exchanged at an agreed exchange rate. A distinction is made between spot and forward transactions.

### Derivatives

Derivatives are forward contracts whose value is dictated by movements in one or several underlyings (share prices, interest rates, exchange rates, etc.). Derivatives allow risks to be transferred from one counterparty to another. The main types of derivative are options, forwards, futures and swaps.

### Structured products

This is a form of investment in which different financial instruments are bundled to create a new product (e.g. a basic investment such as shares or bonds combined with a derivative).

<sup>7</sup> cf. Veyrassat, Antoine (2004), The Swiss franc money market: instruments and market participants, SNB Quarterly Bulletin 3/2004, pp. 42–55.



(SNB), which uses it to carry out repo transactions with its counterparties for monetary policy implementation purposes.

Probably the most global and liquid of all financial markets is the foreign exchange market. This is reflected in the fact that the buying and selling of foreign exchange is not bound to any fixed exchange. In addition to the traditional (but dwindling) practice of trading foreign exchange by phone, and trading via information systems such as Reuters and Bloomberg – through which brokers can continually quote bid and ask prices – forex deals can now also be transacted on a number of specialised trading platforms (e.g. FXall, Hotspot FX, FlexTrade, Lava, FX Market Space and eSpeed).

Finally, there are some financial instruments that are not traded on either an exchange or a trading platform. These are mainly customised derivatives, which are predominantly traded OTC.<sup>8</sup> Traditional money market transactions in which banks borrow liquidity on an uncollateralised basis for terms between one day and several months, are also carried out OTC. Other financial instruments, such as shares (which are generally exchange traded), are also traded OTC, especially in the case of large transactions (block trades). In addition, financial intermediaries with high trading volumes can directly net out offsetting orders from customers or from their own-account trading (inhouse settlement).

#### Clearing systems and central counterparties

For exchange traded financial instruments, the exchange usually performs various clearing services, such as trade capture, matching and confirmation. Thus, in such cases there is no need to set up a special infrastructure for these services. By contrast, with OTC financial instruments there is a clear trend towards replacing traditional bilateral clearing mechanisms with central platforms. For example, **DTCC Deriv/SERV** offers its participants a number of services which allow centralised processing of OTC derivatives across their entire life cycle.<sup>9</sup>

**SIX x-clear**<sup>10</sup> is the only Swiss-domiciled central counterparty. Its service offering covers shares and ETFs traded on SIX Swiss Exchange and the London Stock Exchange (LSE); it is also planning to offer its services to other European exchanges. The financial instruments traded on SIX Swiss Exchange can also be cleared through the UK-domiciled **London Clearing House (LCH)**.<sup>11</sup> **Eurex Clearing** acts as central counterparty for derivatives traded on Eurex.<sup>12</sup>

8 According to Deutsche Börse Group, over 80% of derivatives contracts are traded over the counter. Deutsche Börse Group (2008), *The Global Derivatives Market – An introduction*.

9 DTCC Deriv/SERV is a subsidiary of the US-domiciled Depository Trust and Clearing Corporation (DTCC).

10 SIX x-clear Ltd is a subsidiary of SIX Group. For more information on SIX x-clear, cf. R. Oleschak (2009), *SIX x-clear, the central counterparty*. Available at [www.snb.ch](http://www.snb.ch).

11 LCH is operated by LCH Ltd, a subsidiary of LCH Group.

12 Eurex Clearing is a subsidiary of Eurex.

#### Payment and securities settlement systems

Many financial instruments, including most of the shares, bonds and ETFs issued under Swiss law as well as the derivatives traded in Scoach's Swiss market segment are held in custody by the SIX SIS central securities depository.<sup>13</sup> Transfer of these instruments takes place via **SECOM** (Settlement Communication System), the securities settlement system operated by SIX SIS.

The most important payment system in Switzerland is **Swiss Interbank Clearing (SIC)**.<sup>14</sup> Financial intermediaries connected to SIC use it to settle the bulk of their large-value Swiss franc payments, especially the funds leg of repo and capital market transactions, uncollateralised money market transactions and cash settlement of derivatives trades. SIC has a fully automated interface to SECOM, which allows share or repo transactions to be settled on a delivery-versus-payment basis (cf. box 2).

The Swiss banks also operate the **euroSIC** system for settling payments in euros.<sup>15</sup> The Swiss banks use euroSIC to settle domestic euro payment transactions, as well as for the cross-border settlement of payments throughout the euro area, via links to the TARGET2 and Euro1 euro payment systems.

The majority of foreign exchange transactions are settled using the **Continuous Linked Settlement (CLS)** foreign exchange settlement system.<sup>16</sup> In CLS, both legs of a foreign exchange transaction are settled simultaneously using the payment-versus-payment principle. This eliminates the risk of one counterparty fulfilling its obligations without receiving the corresponding countervalue (principal risk). At present, CLS can be used for settling transactions in a total of 17 currencies, including the Swiss franc.

## 4 Financial stability aspects

In this article, we have discussed the importance of financial market infrastructures for the financial system, focusing mainly on the tasks and functions performed by financial market infrastructures in the trading, clearing and settlement of financial instruments. We have also highlighted to what extent centralised financial market infrastructures contribute to the standardisation, automation and acceleration of all these processes, and thus how indispensable they are for an efficient financial system.

As well as bringing efficiency gains, financial

13 SIX SIS Ltd is a subsidiary of SIX Group. For more information on SIX SIS, cf. P. Haene (2009), *SECOM, the securities settlement system*. Available at [www.snb.ch](http://www.snb.ch).

14 SIC is operated on behalf of the SNB by SIX Interbank Clearing Ltd, a subsidiary of SIX Group and PostFinance. Settlement takes place through accounts at the SNB. For more information on SIC, cf. J. Mägerle und R. Oleschak (2009), *The Swiss Interbank Clearing (SIC) payment system*. Available at [www.snb.ch](http://www.snb.ch).

15 euroSIC is operated by SIX Interbank Clearing Ltd on behalf of the Swiss Euro Clearing Bank (SECB), which is domiciled in Frankfurt am Main. Settlement takes place through accounts at the SECB.

16 CLS is operated by the New York-domiciled CLS Bank International, whose shareholders comprise around 70 of the world's major banks.

## Box 2: The Swiss Value Chain – an example of the interaction between individual financial market infrastructures

Using a shares transaction executed, cleared and settled via the Swiss Value Chain, we can illustrate the tasks and functions of individual financial market infrastructures, as well as the way in which they interact. In our example, we assume that Bank B (buyer) wants to buy 1,000 registered shares in Novartis, and that Securities Dealer S (seller) wants to sell 1,000 of the same share. Both parties indicate their willingness to buy/sell by entering buy/sell orders on the SIX Swiss Exchange electronic trading platform, where Novartis shares are quoted and traded. SIX Swiss Exchange collates all the buy/sell orders from its participants and attempts to match them according to a precisely defined set of rules. We shall assume that the matching takes place on Monday, 11 May 2009, at a price of CHF 42.60 per share. Once the buy/sell orders have been matched, the central counterparty SIX x-clear automatically intervenes between the two trading parties, becoming the seller to Bank B and the buyer to Securities Dealer S. This results in two contracts being created:

1. Securities Dealer S undertakes to deliver 1,000 registered Novartis shares to SIX x-clear on the settlement date – Thursday, 14 May 2009; in return, SIX x-clear undertakes to transfer the amount of CHF 42,600 to Securities Dealer S on the same date.
2. SIX x-clear undertakes to deliver 1,000 registered Novartis shares to Bank B on the settlement date – Thursday, 14 May 2009; in return, Bank B undertakes to transfer the amount of CHF 42,600 to SIX x-clear on the same date.

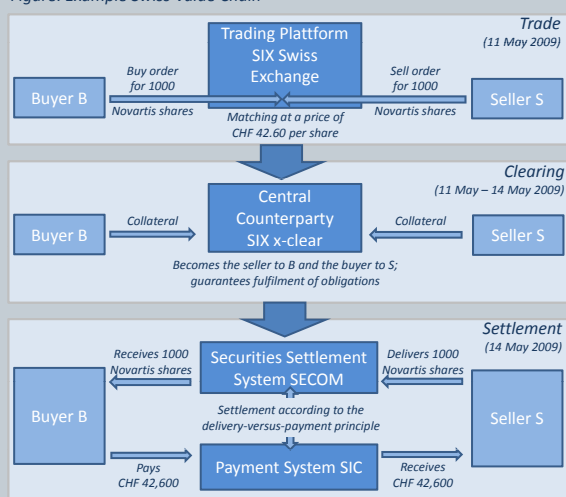
As central counterparty, SIX x-clear guarantees that it will fulfil its obligations, even if one of its participants fails and defaults on its obligations to SIX x-clear. As part of its risk management, SIX x-clear requires its participants to post collateral in the form of margins and contributions to a default fund (a kind of insurance pool), on which it can draw if necessary to cover any losses. The margins and default fund contributions required from the

participants depend on the size and volatility of their risk positions, and on their creditworthiness.

On the settlement date (14 May 2009), the obligations described above are settled via the interface between the SIC payment system and the SECOM securities settlement system, as follows:

1. SECOM checks whether Securities Dealer S has sufficient registered Novartis shares in its securities account with SIX SIS; if yes, SECOM earmarks 1,000 shares. SECOM then sends an instruction to SIC to settle the funds leg of the transaction. Provided that SIX x-clear has the necessary credit balance on its SNB account, CHF 42,600 are transferred via SIC to Securities Dealer S. SIC then confirms to SECOM that the funds leg has been successfully settled, whereupon the 1,000 registered Novartis shares earmarked in SECOM are transferred directly from Securities Dealer S's securities account to SIX x-clear's securities account.
2. SECOM checks whether SIX x-clear has sufficient registered Novartis shares in its securities account with SIX SIS; if yes, SECOM earmarks 1,000 shares. Simultaneously, SECOM sends an instruction to SIC to settle the funds leg of the transaction. Provided that Bank B has the necessary credit balance on its SNB account, CHF 42,600 are transferred via SIC to SIX x-clear. SIC then confirms to SECOM that the funds leg has been successfully settled, whereupon the 1,000 registered Novartis shares earmarked in SECOM are transferred directly from SIX x-clear's securities account to Bank B's securities account.

Figure: Example Swiss Value Chain



market infrastructures can also contribute to reducing the risks inherent in the clearing and settlement of financial instruments. However, this requires that payment and securities settlement systems have appropriate rules and procedures, and that they provide the participating financial intermediaries with the tools to identify, limit and monitor their risks. At the same time, it should be noted that any form of centralisation – and that is, ultimately, the aim when setting up financial market infrastructures – itself carries certain risks. In particular, there is a danger that individual infrastructures will become so important that any impairment of their operational capability or performance could have a severe impact on some financial intermediaries, on individual financial markets, or even on the financial system as a whole. Thus, given the volumes and amounts traded in some market segments, it is not hard to imagine how the failure of a major payment or securities settlement system might rapidly have serious consequences: banks would experience liquidity problems and there would be widespread uncertainty over who owned what and who was exposed to which risks. In short, the financial system would falter, resul-

ting in chaos.

So whoever is concerned about – or is paid to be concerned about – financial system stability must necessarily also address the functioning of financial market infrastructures. This explains why, in the past few years, many central banks have paid increasing attention to issues regarding financial market infrastructures, and particularly their risks. Whereas in the past central banks confined themselves to monitoring relevant developments, nowadays most of them have a legally enshrined mandate to oversee payment and securities settlement systems. Since the revised National Bank Act entered into force in 2004, this also applies to the SNB, which focuses its efforts in this regard on those payment and securities settlement systems that are important for the stability of the Swiss financial system.<sup>17</sup> The main objective of the SNB's oversight is to ensure that these infrastructures have appropriate rules and procedures, as well as high operational resilience. The systemic risks inherent in payment and securities settlement systems can thus be reduced and financial system stability can be strengthened.

17 cf. A. Sturm (2009), Oversight of payment and securities settlement systems by the Swiss National Bank. Available at [www.snb.ch](http://www.snb.ch).

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