1. The Bank's role in oversight and prudential supervision of financial market infrastructures, custodians, payment service providers and other market infrastructures and critical service providers

To provide more insight in the systems and institutions providing payment, clearing, settlement, custody and other services, either from a wholesale or a retail market perspective, section 1.1 provides an overview of the structure and interdependencies between them. Relevant processes and flows are more explained in detail in the next parts of this Report (i.e. chapters 2, 3 and 4). Section 1.2 explains the Bank's mandate and role in the oversight and prudential supervision of this sector, either in a national or international perspective.

1.1 Critical nodes in the functioning of financial markets and payment services

The systems and institutions covered in this Report can be ranked in three categories according to the type of service provided: (i) securities clearing, settlement and custody, (ii) payments and (iii) other market infrastructures and critical service providers to the financial infrastructure. Through their activities or services provided to the financial industry, these systems and institutions are the critical nodes in the functioning of financial markets and payment services as well as the real economy. If designed safely and managed properly, they are instrumental in reducing systemic risks and contagion in the event of financial crisis. At the same time, they are interlinked with other FMIs, financial intermediaries and other actors such as merchants or retail customers. These interdependencies are briefly presented and illustrated in chart 1. Box 1 shows how these systems and institutions providing payment, clearing, settlement, custody and other services have performed between 2008 and 2018 in terms of transaction volumes and values.

Securities clearing, settlement and custody

A trade in a financial instrument is concluded between a buyer and a seller by agreeing the price and the contract terms. Trading in such instrument can be on-exchange (i.e. on a centralised platform designed to optimise the price-discovery process and to concentrate market liquidity) or bilaterally on an over-the-counter (OTC) basis (i.e. where the counterparties make the bid and accept the offer to conclude contracts directly among themselves). In both cases, buyer or seller are usually banks or investment firms. They could rely on other intermediaries (e.g. brokers) to conduct trades. Trade exchanges such as Euronext Brussels are supervised by securities regulators and are not covered in the Report.

FMIs and financial institutions that provide securities clearing, settlement and custody services are considered part of the post-trade securities landscape. The clearing of a trade via a central counterparty (CCP) generally means that the CCP becomes the buyer counterparty for the seller and the seller counterparty for the buyer. Both original counterparties to the trade then have a claim on the CCP. The direct participant of a CCP – usually a bank or an investment firm – is called a clearing member. A clearing member may clear not only its own trades via the CCP, but also those of its clients. Whereas there are no CCPs established in Belgium, CCPs in other countries can be systemically important due to their clearing activities for the Belgian securities market.

After clearing, the settlement of a trade results in the transfer of cash and/or of a financial instrument between the parties in the books of a central securities depository (CSD). CSDs generally act as the register of securities issued in their domestic market. In the case of international securities, such as Eurobonds, issuers can choose the currency or country of issue. These securities are held in international CSDs (ICSDs)[1]. When a CCP has intervened to clear a trade, settlement takes place on the books of (I)CSDs[2] between the buyer and the CCP, and between the seller and the CCP. There are three (I)CSDs established in Belgium: Euroclear Bank (ICSD), Euroclear Belgium and NBB-SSS (both CSDs). The cash leg of securities settlement takes place either in payment systems operated by central banks (i.e. central bank money, for example TARGET2) or on the books of an (I)CSD with banking status providing (multicurrency) cash accounts (i.e. commercial bank money, for example Euroclear Bank).

Financial institutions that facilitate their clients' access to securities investment markets are referred to as custodians. In that capacity of intermediary, custodians can offer their clients safekeeping and settlement services. A local custodian primarily focuses on serving a single securities market. If a custodian has access to multiple markets, it is considered a global custodian. The Bank of New York-Mellon SA/NV (BNYM SA/NV), established in Belgium, is the global custodian of the BNYM group providing investment services to more than 100 securities markets.

Payments

The payments landscape covers both wholesale (i.e. transactions between institutional investors) and retail payments segments (i.e. transactions between retail customers), and includes payment systems, payment service providers (PSPs) such as payment institutions (PIs) and electronic money institutions (ELMIs), processors of payment transactions and card payment schemes.

Payment systems cover both large-value payment systems (LVPS) and retail payment systems (RPS). While LVPSs generally exchange payments of a very large amount, mainly between banks and other participants in the financial markets, RPSs typically handle a large volume of payments of relatively low value such as credit transfers and direct debits. In Belgium, most payments are processed by TARGET2, the LVPS connecting Belgian with other European banks, and by the Centre for Exchange and Clearing (CEC), which is the domestic retail payment system processing intra-Belgian domestic payments.

Card payments typically involve a "four-party scheme", i.e. cardholder, card issuer, merchant and acquirer. The card of the person on the purchase side of a transaction (cardholder) with a merchant is issued by an institution (card issuer) which was traditionally always a bank, but can, nowadays, also be a PI or ELMI. The acquirer is in charge of acquiring the transaction on behalf of the merchant (i.e. performing for the merchant all the steps necessary for the buyer's money to be paid into the merchant's account). The role of PIs and ELMIs in the retail payments area is multiple. For instance, in the case of card payment transactions, PIs and ELMIs can issue the payment cards to the user and/or acquire the funds for the payment on behalf of the merchant. The acquiring business has gradually become a market whereby, alongside banks, PIs are playing a growing role. The relevant rules and features according to which card payments – either debit or credit – can take place are defined by card payment schemes. The Belgian domestic (debit) card payment scheme is Bancontact. Mastercard Europe (MCE) is the European subsidiary of the international (credit) card payment scheme established in Belgium. One processor provides the underlying network and services for the majority of card payments, namely Worldline SA/NV. After the processing of card payments, transactions are sent to the CEC for clearing and settlement. PIs have also

1 In this case, a duopoly exists as there are two ICSDs in the EU which act as "issuer CSD" for Eurobonds; i.e. Euroclear Bank established in Belgium and Clearstream Banking Luxembourg.

2 The term (I)CSD is used to cover both CSDs and ICSDs.

a major role in providing money transfer/remittance services (fund transfers) allowing retail customers to transfer cash from Belgium to a third party in different locations around the world and vice versa.

CLS Bank, a US-based settlement system for foreign exchange (FX) transactions is linked to the LVPS systems operated by central banks of 18 currencies (including TARGET2 for EUR), making it possible to settle both legs of the FX transaction at the same time. CLS Bank eliminates FX settlement risk when – due to time zone differences – one party wires the currency it sold but does not receive the currency it bought from its counterparty.

Other market infrastructures and critical service providers

TARGET2-Securities (T2S) is the common settlement platform for European CSDs. Although SWIFT is neither a payment system nor a settlement system, a large number of systemically important systems depend on it for their daily financial messaging. It is therefore considered as a critical service provider.

BOX 1

Growing importance of payment and settlement systems, FMIs and other service providers in the payment area

The years between 2008-2018 were marked by the break-out of the financial and sovereign crisis, by the implementation of monetary policy measures to soften the impact of those crises, as well as by new regulation aiming to avoid their re-occurrence in the future (e.g. EMIR clearing obligation). In parallel, this period also saw the advanced digitalisation of payments processing.

The underlying parameters that could explain the evolution in FMIs' and service providers' business activities can be diverse (e.g. market volatility in wholesale markets, digitalisation of retail payments). The chart below shows for a selection of systems and institutions the business growth rates between 2008 and 2018 (with 2008 as the reference year). Some of them have expanded their activity considerably. In terms of transaction volumes, this is notably the case for Euroclear Bank (+154 %) and SWIFT (+104 %)[1]. In value terms, highest growth rates are recorded for Euroclear Belgium (+188 %)[2] and Euroclear Bank (+86 %). Others have also grown but less significantly (e.g. retail payment system CEC) or were subject to more volatility (e.g. NBB-SSS due to impact sovereign crisis).

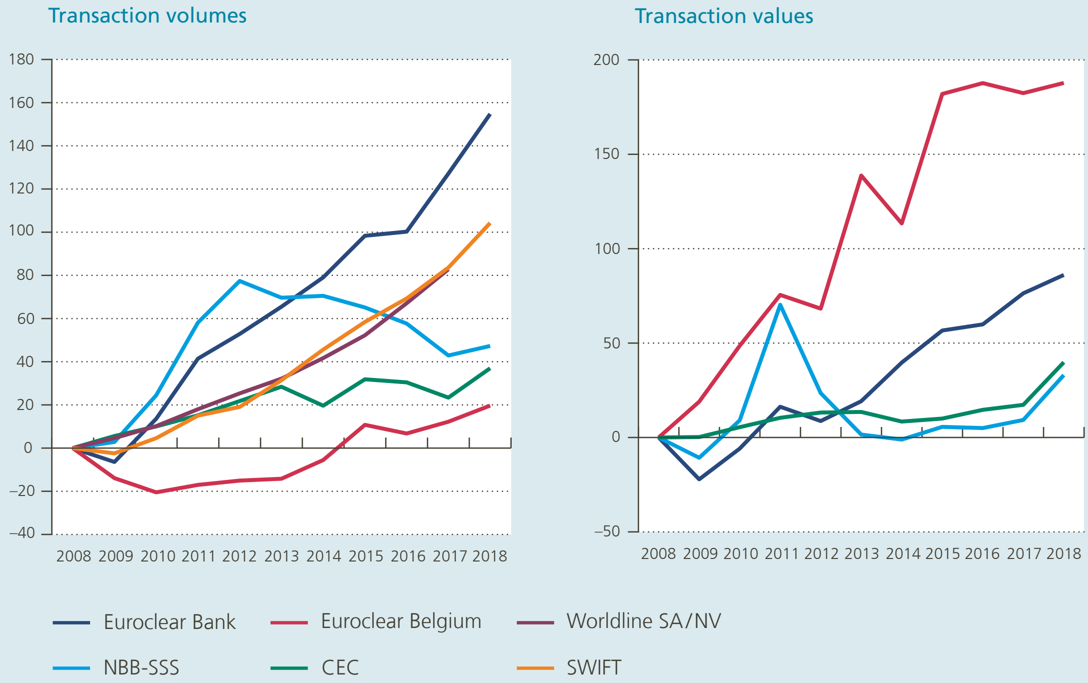
In general, the systemic importance of these systems and institutions continues to grow. An unexpected disruption of those systems and institutions could have a significant impact widespread across different types of stakeholders (including the public in general). Should payments between market participants fail, one of the counterparties could for example be faced with acute liquidity risks. Operational incidents can be *fast burning* disturbing businesses and society at large provoking economical damage to individuals (retail perspective) or to financial markets and monetary policy (wholesale perspective). *Slow burning* scenarios (cyber, data integrity) could impact confidence in the financial system. Operational resilience of FMIs and

1 Worldline SA/NV data for 2018 not available.
2 Euroclear Belgium settles mainly equities that are expressed in terms of market value.

other service providers in the payment area is therefore a top priority for regulators, both with respect to day-to-day operational risk management (e.g. capacity management, system change plans) and contingency situations (e.g. business continuity plans, disaster recovery plans), including in case of cyberattacks.

Evolution of transactions processed by selected FMIs and service providers

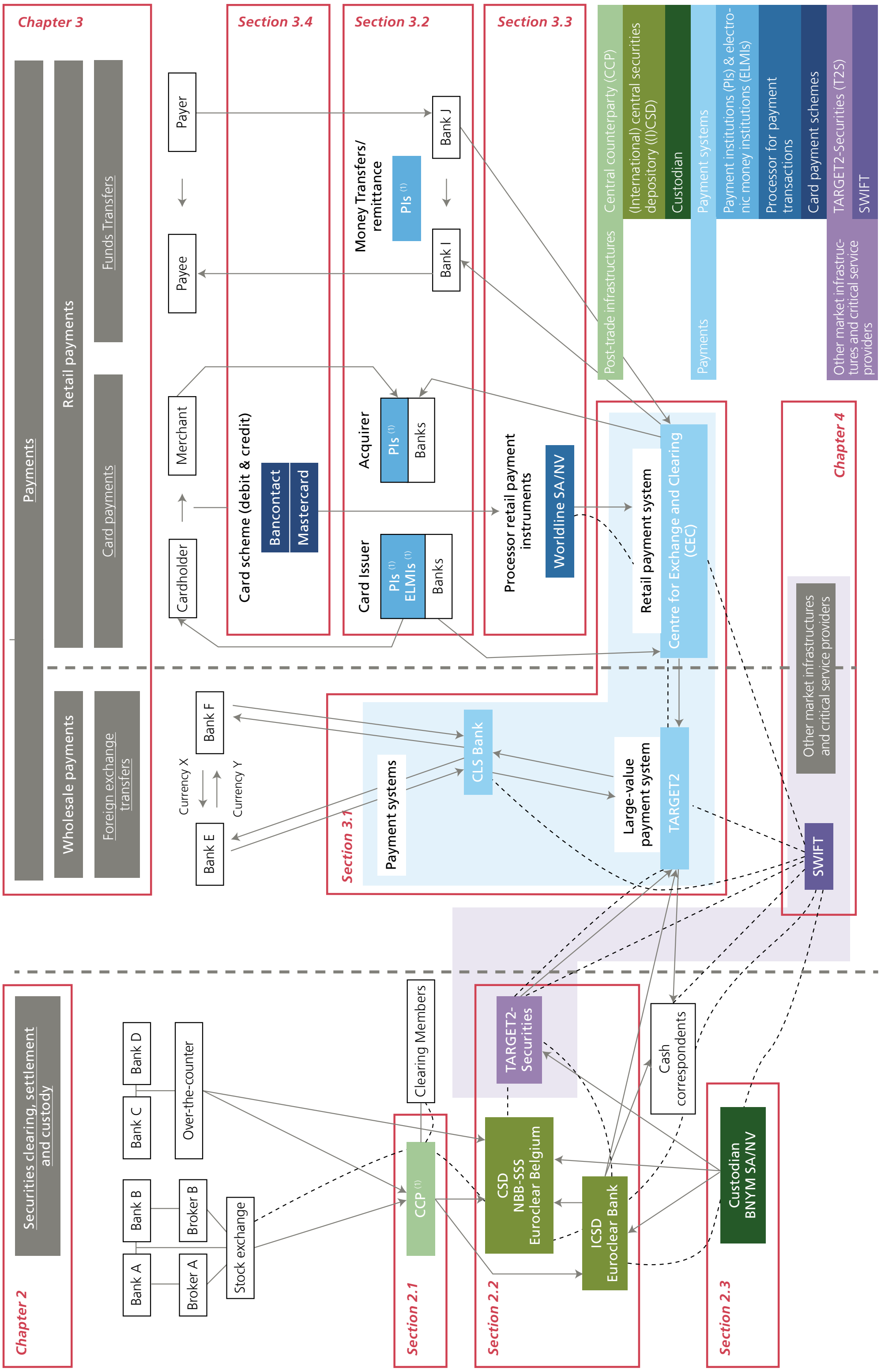
(in %, reference year 2008 as index 0)



Source : NBB calculations.

Chart 1

Interlinkages through & between financial market infrastructures, custodians, payment service providers and other market infrastructures and critical service providers



1 Individual institutions are listed in Table 2

1.2 FMIs, custodians, payment service providers and other market infrastructures and critical service providers subject to oversight and prudential supervision by the Bank

The Bank has responsibilities in both oversight and prudential supervision of financial market infrastructures (FMIs), custodians, payment service providers (PSPs), such as payment institutions (PIs) and electronic money institutions (ELMIs), and other market infrastructures and critical service providers.

Oversight and prudential supervision of FMIs differ in a number of areas, ranging from the object of the function, the authority being responsible, the topics covered, as well as the regulatory framework and tools used. However, both oversight and prudential supervision activities, and the framework they are relying on, evolve over time.

Central banks have always had a close interest in the safety and efficiency of payment, clearing and settlement systems. One of the principal functions of central banks is to be the guardian of public confidence in money, and this confidence depends crucially on the ability of economic agents to transmit money and financial instruments smoothly and securely through payment, clearing and settlement systems. These systems must therefore be strong and reliable, available even when the markets around them are in crisis and never themselves be the source of such crisis. FMI oversight pursues these objectives by monitoring systems, assessing them and, where necessary, inducing change. It is generally recognised as a core responsibility of central banks.

The Bank's oversight of payment, clearing and settlement infrastructures is based on Article 8 of its organic law [1] and focuses on systems established in, or relevant for Belgium. Although SWIFT is neither a payment, clearing or settlement infrastructure, many of such systems use SWIFT which makes the latter a critical service provider of systemic importance. SWIFT is therefore subject to a (cooperative) central bank oversight arrangement.

The Bank is also prudential supervisory authority for individual financial institutions, as well as custodians and PSPs like PIs and ELMIs. As of November 2013, a substantial part of the Bank's prudential responsibilities for credit institutions were transferred to the ECB under the Single Supervisory Mechanism (SSM) Regulation [2]. Significant institutions, such as Bank of New York Mellon SA/NV (BNYM SA/NV), are directly supervised by the SSM. Less significant institutions remain under the prudential supervision of the Bank as national competent authority.

Some FMIs are subject to both oversight and prudential bank supervision, typically if the FMI operator has a bank status (as is the case for Euroclear Bank). The oversight activity and prudential supervision are, in such situations, complementary in nature: while the oversight activity focuses on the sound functioning of the settlement system (by assessing compliance with oversight standards such as the 2012 CPMI-IOSCO Principles for FMIs (PFMIs)), the prudential supervision focusses on the financial soundness of the operator (by assessing compliance with banking regulations). As a result, oversight and prudential supervision typically cover different topics. One of the main priorities of oversight relates to the prohibition and containment of any transmission between participants of financial or operational risks through an FMI or service provider. Typical areas oversight is focussing on cover the functioning of the system and how its organisation and functioning minimises or avoids risks not only for itself but – just as importantly – for its participants. Examples thereof include settlement finality rules reducing risks linked to the insolvency of participants (which prevent automatic unwinding of other participants' previous transactions with a bankrupt participant), delivery versus payment (DVP) or payment versus payment (PVP) mechanisms eliminating principal risks in transactions between participants, fair and open access for participants, and stringent requirements on business continuity plans ensuring continuity of services for participants. Oversight also takes into account risks related to system interdependencies (either via connected systems or participants) that could provoke contagion risks in financial markets. Prudential supervision intends

1 Article 8, Law of 22 February 1998 establishing the Organic Statute of the National Bank of Belgium, Belgian Official Gazette 28 March 1998, 9.377.

2 Regulation (EU) No. 1024/2013 of the Council of 15 October 2013 conferring specific tasks on the European Central Bank concerning policies relating to the prudential supervision of credit institutions, OJ. 29 October 2013, L. 287, 63-89 (http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX: 32013R1024&from=en).

to ensure that institutions are financially robust at micro-prudential level, thus helping to maintain the trust of the institution's counterparties and, in this way, promoting financial stability. Some types of risks are within focus of both FMI overseers and bank supervisors. However, their perspective is different as an FMI's business model is based on transferring liquidity (which has an element of time criticality) between – or on behalf of – its participants, whereas a bank's business model is rather based on maturity transformation (short term deposits, long term assets). Therefore, the regulatory approach for credit, liquidity and operational risk for FMIs and banks is different. Table 1 compares the different approaches between the oversight of FMIs and the prudential supervision of banks, further illustrated by Chart 2.

As a consequence of such divergences in scope, oversight and prudential supervision are relying on different frameworks. For oversight, the PFMIs cover payment systems, securities settlement systems, CSDs, CCPs and trade repositories. For the implementation of these principles, further clarity is provided by relevant guidelines such as the CPMI-IOSCO guidance on cyber resilience for FMIs or the guidance on resilience and recovery of CCPs. In addition, the CPMI has also published an analytical framework for distributed ledger technology in payment, clearing and settlement.

The tools to conduct oversight and prudential supervision may differ too. Oversight is generally based on principles and guidelines designed in international fora (Eurosystem, CPMI, CPMI-IOSCO). The traditional approach for enforcing them was to urge FMIs and other (critical) service providers to adhering to them via central bank moral suasion (so-called "soft law" approach). Prudential supervision on the other hand, has laid down its requirements in a formal legal framework enacted through EU Directives, Regulations and local laws ("hard law" approach). However, central bank oversight has become more formal, owing to the expanding role

Table 1

Oversight of FMIs and prudential supervision of banks: a different approach

	Oversight of FMIs	Prudential supervision of banks
Authority	Central bank	Supervisory agency or central bank
Scope & objective	Safety and efficiency of payment, clearing and settlement systems (systemic stability)	Financial soundness of banks
Frameworks	CPMI-IOSCO Principles for FMIs (PFMIs) and additional guidance, Eurosystem Oversight Framework	Banking regulations (CRD IV, CRR, Belgian banking law)
Tools and instruments	Moral suasion ("soft law" approach) but in some cases regulation (i.e. PFMIs transposed into hard law by SIPSR, EMIR and CSDR)	Directives/Regulation ("hard law" approach)
Selected examples of attention points	■ System functioning (settlement finality/efficiency, DVP/PVP, settlement asset, access criteria / default management) ■ Transmission of risks (between participants or FMIs and critical service providers) ■ Credit risk: full collateralisation of intraday credit risk ■ Liquidity risk: intraday dimension and end-of-day balances – cover failure of two largest liquidity exposures ■ Operational risk: resilience, 2h recovery time objective (2hRTO)	■ Balance sheet management ■ Supervisory Review and Evaluation Process (SREP) ■ Credit risk: end-of-day risk – capital charges on Risk Weighted Assets (RWA) ■ Liquidity risk: end-of-day risk – liquidity coverage ratio (LCR), net stable funding ratio (NSFR) ■ Operational risk: capital charges

of the private sector in providing payment and settlement systems, as well as the growing criticality of these systems' proper functioning. In a growing number of cases, oversight is evolving into a hard law approach as illustrated, for example, by the fact that the ECB has laid down its expectations in the ECB Regulation on oversight requirements for systemically important payment systems (SIPSR), or by the 2017 Belgian law on systemically relevant processors for payment transactions. Also, the EU transposed the oversight framework for CCPs and CSDs (i.e. PFMIs) through Regulations (EMIR, CSDR). The Bank has been assigned as the competent supervisory authority for Belgian (I)CSDs, and is, as overseer, also considered as relevant authority under CSDR[1].

Worldline SA/NV is also subject to both prudential supervision (as PI) and oversight (as processor of payment transactions). In order to pool expertise and reinforce the synergies between the oversight function and that of prudential supervision on FMIs, custodians, PSPs and other (critical) service providers, these two functions have been integrated into the same department within the Bank to ensure that its prudential supervision and oversight approach are aligned.

Chart 2

Oversight of FMIs and prudential supervision of banks: illustration of a different approach

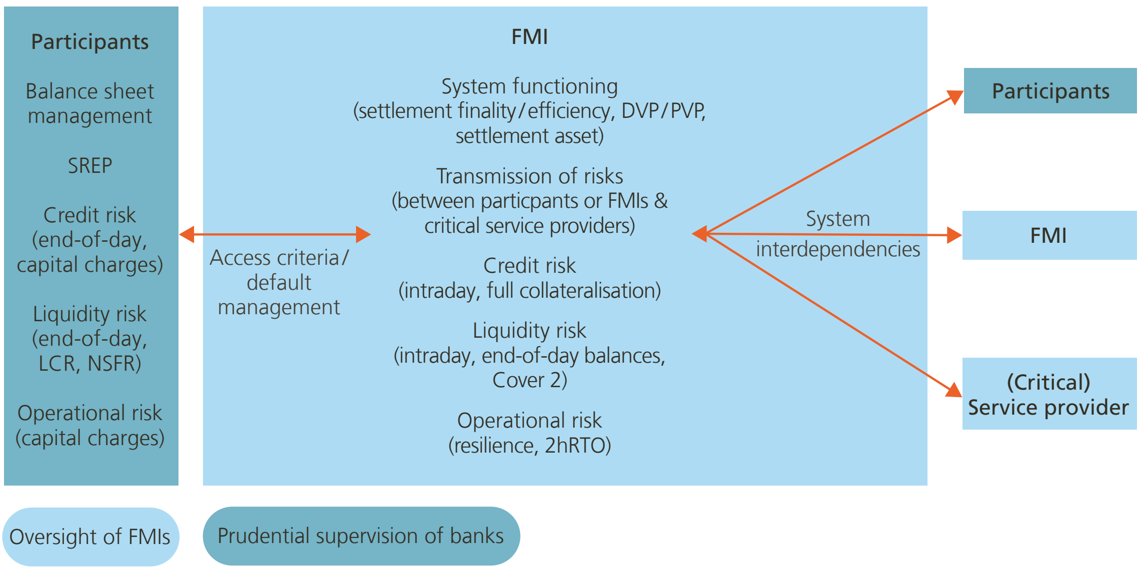


Table 2 below provides an overview of the systems and institutions supervised and/or overseen by the Bank. In addition to the type of services provided, they have been further grouped according to: (i) the type of regulatory role of the Bank (i.e. prudential supervisor, overseer or both) and (ii) the system/institution's international dimension (the Bank as solo authority, international cooperative arrangement with the Bank as lead or in another role). For the systems and institutions established in Belgium which are systemically relevant in other jurisdictions' financial markets or for the financial industry as a whole, the Bank has established cooperative arrangements with other authorities[2]. This may involve multilateral cooperative arrangements, in which the Bank acts as lead overseer (Euroclear, SWIFT). The Bank also takes part in a number of international cooperative

1 The FSMA is assigned, together with the Bank, as national competent authority for CCPs under EMIR.

2 In line with CPMI-IOSCO Responsibility E (cooperation between authorities). The Bank intends – through this report – to inform other authorities with whom the Bank does not have a formal cooperation but that may be interested in understanding the applicable framework, the regulatory approach and the main supervisory priorities.

arrangements (CCPs, BNYM SA/NV, TARGET2, TARGET2-Securities and CLS) in which another national authority acts as lead overseer/supervisor. Domestically, the Bank cooperates with the FSMA which has responsibilities in the supervision of financial markets with regard to conduct of business rules. Annex 2 illustrates the organisation structure of FMIs with an international dimension established in Belgium.

In 2018, the Bank set up TIBER-BE, a framework for testing the cyber resistance of financial institutions and FMIs through controlled ethical hackings. More details are provided in Box 2.

BOX 2

TIBER-BE

Successful cyberattacks can have a major impact on the confidentiality, availability and integrity of payment and securities transactions. Financial institutions and FMIs already carry out regular penetration and other cyber resilience tests by hiring specialized firms to launch short-term targeted tests on various digital parts of an institution. These tests are limited in scope and happen in the test environment. In 2018, the Bank set up a framework that goes a step further than the classic penetration tests; i.e. TIBER or Threat Intelligence Based Ethical Red teaming. This framework, agreed by the Eurosystem, focuses on advanced cyberattacks by organized crime and hostile states, with realistic and customized scenarios based on current threat information and is done in the production environment. TIBER-BE[1] will be rolled out in the course of 2019.

The Bank will work together with experts from the public and private sectors. Tests will be carried out in all discretion, with the help of specialized service providers, and coordinated by the TIBER-BE team. A team of hackers from reputable cybersecurity companies (the so-called "red team") gets the assignment, based on concrete threats, to break into a financial institution or infrastructure, where only a small group (the so-called "white team") knows about the attack. The rest of the organization (the "blue team") must track down, repel and disable the attack without knowing that they are part of a test. The supervisors and/or overseers of the institution concerned do not know in advance of the test either.

The generic test results are shared with the TIBER National Implementation Committee, which includes governmental institutions, critical FMIs and financial institutions. In addition, threat intelligence information is shared within the sector and best practices regarding cyber resilience are developed.

With TIBER-BE, the Bank acts neither in its oversight nor supervisor capabilities but as a catalyst in line with its financial stability mandate. It has established a separate TIBER-BE administrative unit within the service of Surveillance of financial market infrastructures, payment services and cyber risks.

1 https://www.nbb.be/en/payments-and-securities/tiber-be-framework.

Table 2

The Bank's oversight and prudential supervision of financial market infrastructures, custodians, payment service providers and other market infrastructures and critical service providers

(as of April 2019)

	International supervisory college / cooperative oversight arrangement		NBB solo authority
	NBB lead authority	NBB takes part, other authority is lead	
Prudential supervision		Custodian Bank of New York Mellon SA/NV	Custodian BNYM Brussels branch
			Payment Service Providers (PSPs) Payment Institutions (PIs) *Card acquiring and processing: Alpha Card, Alpha Card Merchant Services, Airplus International, Worldline, Lufthansa Airplus ServiceKarten, SIX Payment Services* *Money Remittance: Belmoney Transfert, Gold Commodities Forex, HomeSend, Money International, MoneyTrans Payment Services, Travelex, WorldRemit, Transferwise Europe, Moneygram* *Direct Debit: EPBF* *Hybrid: BMCE EuroServices, Cofidis, eDebex, IBanFirst, Oonex, PAY-NXT, Santander CF Benelux, Ebury, Digtest, Cashfree* *Account Information Services and Payment Initiation Services* *Isabel, Let's DvdVd, Accountable* Electronic Money Institutions (ELMIs) *Buy Way Personal Finance, Fimaser, HPME, Imagor, Ingenico Financial Solutions, Ingenico Payment Services, Viva Payment Services, Paynovate*
Prudential supervision and oversight	CSD Euroclear Belgium (ESES) ICSD Euroclear Bank SA/NV	CCP LCH Ltd (UK), ICE Clear Europe (UK) LCH SA (FR), Eurex Clearing AG (DE), EuroCCP (NL), Keler CCP (HU), CC&G (IT)	
	Assimilated settlement institution Euroclear SA/NV (ESA)		Processor for payment transactions Worldline SA/NV
Oversight	Critical service provider SWIFT	Market infrastructure TARGET2-Securities (T2S)[1]	CSD NBB-SSS
		Payment system TARGET2 (T2)[1] CLS Bank	Card payment schemes Bancontact[1] MasterCard Europe
			Payment system Centre for Exchange and Clearing (CEC)[1]

Post-trade infrastructures	Securities clearing	Payments	Payment systems
	Securities settlement		Payment institutions and electronic money institutions
	Custody		Processor for payment transactions
Other market infrastructures and critical service providers	T2S		Card payment schemes
	SWIFT		

Source: NBB.
1 Peer review in Eurosystem/ESCB.