

Exploring coexistence in the securities industry: Why the ISO 20022 central dictionary is the key to interoperability and realising data opportunities

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ABSTRACT

This paper looks at how the securities industry can better manage coexistence between different message formats along with realising the many opportunities presented by available data. This is with a view to arriving at greater efficiency, profitability and interoperability within securities and across financial services. It begins with an overview of the quantities and types of data produced by the industry, discussing the costs and risks this poses if it is not sufficiently well managed. It then moves into a discussion of the need for a common language for all parts of financial services, including securities, to agree on in order to communicate more effectively. The paper focuses on using the global ISO 20022

standard for this purpose. It covers the question of migrating to it as a message format, for which there is little appetite within the securities industry in the short to medium term. ISO 20022's central repository and data dictionary provide a solution, creating the common language that can help to ensure interoperability between entities. It includes discussion of the many benefits of using ISO 20022 in this way, such as reduced costs, risks and timeframes. It highlights how ISO 20022 as a data model can be applied to developing standardised application programming interfaces and building connections with emerging technologies and industries such as distributed ledger technology and crypto assets. The paper also looks at the risks and limitations posed by a prolonged period of coexistence. The use of a common data dictionary can enable firms to interoperate without having to align data exchanges at the syntax level; however, there are still associated costs, risks and inefficiencies. The conclusion is that securities market participants should collaborate to adopt a common data dictionary that can be integrated into their systems, their software and their processes.

Keywords: coexistence, data, ISO 20022, interoperability, securities, securities services, standards

MANAGING CHALLENGES AROUND DATA

In the securities market and across financial services, there is a need to agree on a common language for the efficient exchange

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of data. The ISO 20022 standard provides a solution, with components including its messaging format and its data dictionary.

Within securities, there is little appetite for industry-wide migration to the ISO 20022 messaging format. This is due in part to the ongoing viability of current formats, bringing less urgency, especially within domestic markets; the costs and complexities of the adoption process, particularly in relation to local frameworks; and conflicting interests among market participants.

If, however, the securities market is to manage coexistence more effectively and, along with the entire financial industry, be able to capitalise on the data revolution, it remains crucial to explore how the ISO 20022 data dictionary can be applied.

Financial markets produce and consume prodigious quantities of data. In the front office, traders and asset managers (and their algorithms) ingest vast amounts of data to decide what and when to buy and sell. Post-trade, the middle and back offices translate those trading and investment decisions into transactions to settle by exchanging data with counterparties and their agents and with financial market infrastructures (FMIs). Further data is created and exchanged when the outcome is reported by custodian banks to buyers and sellers as changes in their holdings. In addition, in many jurisdictions, data related to these transactions is compiled and reported to market authorities.

These exchanges of data between principals, agents, customers, vendors, FMIs, authorities and, increasingly, the third parties that use data to create additional open finance products and services are costly. The costs arise mainly in back and middle offices, where additional staff are needed to overcome the problems created by the low levels of automation in data exchange. The problems include fresh errors introduced when employees rekey data received from counterparts.

Data errors and omissions increase financial risk. They can cause transactions to fail, or value to be forfeited when deadlines are missed, or assets cannot be located, or even compliance risks when standing settlement instructions (SSI) data is manipulated, for instance. Regulatory fines can be incurred. Indeed, many markets insist on punishing counterparties that fail to deliver by levying financial penalties and ‘buying in’ the missing securities at the expense of the failing party. For example, in February 2022 the Central Securities Depositories Regulation (CSDR) of the European Union (EU) introduced a settlement discipline regime that levies financial penalties for failure to deliver.

Risks and costs of this kind are inflated by a lack of automation that persists in most securities operations. Automation certainly requires investment in digital technology instead of people. But the effectiveness of any investment is blunted if the sender and the receiver of data do not share a common understanding of how to interpret it. Without a common understanding, banks must incur the additional cost of investing in tools that translate data from one format to another.

Translation tools mitigate the need to reformat or even rekey data manually to fit the systems and processes of the recipient, which used to introduce new errors or omissions of crucial components, but translation still represents a duplication of work and cannot be fully automated. Worse, because counterparties do not share data in a common format, they cannot work together easily to rectify any problems before they cause a process or a transaction to fail, which leads to additional cost.

One way in which those costs become visible is excess holdings of cash or securities, and expensive borrowing facilities, to cover payments or deliveries of assets that do not materialise on time. Accounts of the same transactions or holdings must also

be reconciled iteratively between financial institutions and their customers to arrive at a common understanding. While these steps circumvent immediate problems, they impose a continuous tax on transactional activity.

To establish the status of a transaction, back and middle office employees are forced to contact their equivalents at the previous link in the data chain by telephone or e-mail or (increasingly) chat. Although reports are delivered periodically, they are only as up-to-date as the information received from the previous link in the settlement chain. This can delay the progress of a transaction to settlement until fresh or missing information is received.

Delays in the receipt of information make it impossible for counterparties to be certain of their position. In many cases, reports are not delivered until the end of the trading day, or even later, condemning some transactions to unavoidable failure. This is especially true of cross-border transactions — such as those between North America and mainland China — where time zone differences, mismatched settlement timetables and cut-off deadlines truncate the time available to obtain the missing data.

This can damage the competitive position of even established financial institutions. Because their operational staff are unable to check the status of transactions and portfolios in real time, incumbents struggle to compete with new entrants that use fast data processing to poach their best clients and most profitable revenue streams. This is precisely what has happened to major banks in the global payments industry and could occur again in the securities markets, especially if the tokenisation of assets develops rapidly.

Slow and inadequate information also makes compliance obligations to share customer data with third parties providing open finance services more difficult to meet — and this is not the only compliance risk

incurred. Non-standardised data increases the risk of inadvertent breaches of know-your-client (KYC), anti-money laundering (AML), countering the financing of terrorism (CFT) and sanctions screening laws and regulations. The difficulties of onboarding a client, identifying and reporting a suspicious transaction or meeting a regulatory deadline are all multiplied if the relevant information is harder to obtain because it must be extracted from non-standardised data sets.

Lastly, the lack of a common understanding of data inhibits the ability of established financial institutions to mount an effective strategic response to the rise of new issuance, trading, settlement and safekeeping techniques. Cryptocurrencies and securities and asset-backed securities issued, traded and settled in tokenised form on blockchain-based networks are attracting the interest of trading houses, asset managers and institutional investors.

Since tokenised securities are unlikely to displace existing securities immediately, electronic bridges must be built between tokenised securities networks and the conventional securities markets infrastructure of exchanges, central counterparty clearing houses (CCPs) and central securities depositories (CSDs). It will be much easier for data traffic to flow across those bridges if the data exchanges are based on a common language.

PHASED APPROACHES TO ISO 20022 ADOPTION

The simplest path to a common language is for all parts of the financial services industry to agree on the meanings of terms (semantics) and a common set of grammatical rules (syntax) that govern how the terms relate to each other to convey meaning. A useable combination of syntax and semantics exists already in the shape of the ISO 20022 standard, a global data model for

financial institutions active in the payments, foreign exchange (FX), trade finance and securities markets.

In the cross-border payments industry, the benefits are great enough for market participants to have committed themselves to the adoption of ISO 20022 between November 2022 and November 2025. In a survey conducted in 2018, SWIFT found that more than 97 per cent of major global payments banks supported replacing the existing message type/text (MT) messages with data structured to the ISO 20022 data model. Eighty per cent of high-value payments make use of ISO 20022 already.

For payments banks, the adoption of ISO 20022 by the major real-time gross settlement systems (RTGS) operated by the central banks is a major incentive to follow suit. But there are other valuable benefits of migrating to ISO 20022. One of them is improved customer due diligence. Regulatory liability for financial crime has made KYC, AML, CFT and sanctions screening checks on payers and payees important.

The replacement of existing MT messages by ISO 20022 messages will facilitate completion of these checks, because the new message types can not only incorporate more information about clients and counterparties, but also transmit the information in standardised formats that facilitate automation of the checks.

In the securities industry, however, these incentives are less compelling. While 25 of the 83 CSDs that custodian banks use to settle transactions through the SWIFT network have adopted ISO 20022, more than four out of five are in Europe,¹ where the TARGET2-Securities (T2S) settlement engine has made adoption of ISO 20022 a condition of usage.

In addition, implementations of ISO 20022 by CSDs have to be adapted to local realities. This applies especially to the need of CSDs to service domestic clients that

are content with proprietary methods of communication and rarely or never trade across national borders with counterparties that insist on using international standards. This does not preclude using ISO 20022 to define the meanings of terms in proprietary messages, but it does lead to variations in the structure of messages.

At the same time, CSDs have to service international institutions such as global custodian banks, which favour standardisation of the methods by which they interact with all CSDs because it reduces costs and risks. As a result, CSDs have to invest in systems that can support both their international users and their domestic market participants and the needs and budgets of the two groups are not the same.

Likewise, although the KYC, AML, CFT and sanctions screening checks on clients and counterparts are as onerous in the securities industry as the payments industry, securities firms have already adopted the ISO 15022 standard, which replaced ISO 7775 between 1999 and 2002. ISO 15022 not only provides adequate support for most customer due diligence purposes but enables securities firms to achieve 99 per cent rates of automation in settlements and reconciliations.

From the outset, ISO 15022 also included a dictionary of reusable terms, so it shares a data dictionary approach with ISO 20022. Because a data dictionary facilitates the use and reuse of standard definitions across multiple message types, ISO 15022 enables users to capture much of the value of ISO 20022 already. The data components for settlements and corporate actions messages, for example, are common across both ISO 20022 and ISO 15022.

This is why ISO 20022 is being adopted in the securities industry mainly where it can replace complex and expensive manual processes, or entirely new processes, rather than processes that ISO 15022 already handles efficiently. ISO 20022 messages were

created, for example, to help global custodian banks meet their obligation under the EU Shareholder Rights Directive (SRD II) to disclose to issuers the identity of shareholders concealed by nominee accounts they operate on behalf of investors. Other data exchanges poorly served by ISO 15022, such as account opening messages and withholding tax reclaims, are also encouraging the adoption of ISO 20022.

WEIGHING UP ADOPTION AND COEXISTENCE

Major platform upgrades present the opportunity to adopt ISO 20022 on a general rather than a specific basis. Even then, companies continue to use ISO 15022 because it remains the preferred format of their clients in at least some areas, such as settlement, reconciliation and regulatory reporting. Once it is adopted, however, ISO 20022 data dictionary fulfils a useful function as a translation tool for receiving and sending data flows in multiple formats, not just ISO 20022 and ISO 15022.

Another incentive for adoption is the ability to express ISO 20022 messages in the eXtensible Mark-up (XML) syntax. XML is a widely used syntax for coding financial information exchanged and published on the Internet — regulators, for example, increasingly require regulated firms to submit information in the XML-based language — so it is widely understood by technicians working at securities firms. This simplifies adoption of ISO 20022.

But the development most likely to vindicate the value of ISO 20022 in standardising data flows of all kinds is the standardisation of application programme interfaces (APIs). APIs drive new products and services, especially in open finance, and the standardisation of the terms used in APIs will make it easier for data to flow without interruption. The anticipated proliferation

of APIs could provide a major incentive for securities firms to adopt ISO 20022.

Indeed, adopting ISO 20022 for APIs could allow securities firms to bypass adopting the standard for messages altogether. That could reduce the costs of adjusting and testing internal operating, messaging and data systems, as well as the costs of migrating buy-side clients on to a new data model.

This reflects the fact that any financial institution that adopts ISO 20022 must manage competing demands. On the one hand there is the lack of a business case to invest in ISO 20022. Buy-side clients are content to continue using FIX and ISO 15022 or even no standard at all. On the other hand, FMIs and regulators — in Europe at least — mandate the use of ISO 20022 to settle securities transactions, report transactions to trade repositories,² calculate, collect and report financial penalties imposed on counterparts that cause transactions to fail³ and respond to requests for information about shareholders.⁴

Faced with these obstacles, most securities firms understandably prefer to postpone making irreversible choices. Of the 6,000 securities participants that use SWIFT today, less than 200 send ISO 20022 messages over SWIFT. In some markets and segments, ISO 20022 is not used at all. Only half the highest volume users in the securities services industry that responded to a 2018 survey by SWIFT favoured setting a date to migrate to ISO 20022.

A more recent survey, conducted by the International Securities Services Association (ISSA) in the summer of 2020, found little had changed. Nearly nine out of ten banks thought adoption of ISO 20022 could be postponed for at least five years in the absence of a regulatory obligation or pressure from buy-side clients to make the change. Even FMIs favoured a phased transition to ISO 20022 no shorter than three to five years.

In summary, the majority view in the securities industry does not favour adoption of ISO 20022 soon. The corollary is a prolonged (and possibly indefinite) period of coexistence of different data models and versions of data models. Coexistence is further complicated in the case of the securities industry by the fact that participants already use different models in the front office (FIX) and the derivatives markets (Financial products Markup Language [FpML]), and there are several proprietary models published by FMI's such as the Depository Trust and Clearing Corporation (DTCC) and Euroclear CREST.

It is unrealistic to expect this profusion of message standards to be replaced by an agreement on one. Indeed, a recent survey found securities firms are comfortable managing multiple data formats. So far, securities market participants, unlike their payments market equivalents, have declined to commit themselves to a phased transition to ISO 20022 messaging. Instead, a pragmatic approach is required to mitigate the adverse effects of a prolonged period of coexistence in the securities industry.

ADOPTING ISO 20022 AS A COMMON DATA MODEL

Pragmatism suggests the adoption of a single, syntax neutral data model. ISO 20022 makes this a much simpler and cheaper option than previous standards because it enables companies to separate the decision to adopt ISO 20022 from the capabilities of the technology on which ISO 20022 will be run. The key to this flexibility is the data dictionary.

The critical point is that ISO 20022 is not just a messaging format, it is an open global standard for financial information. It enables the financial industry to define and store the basic business elements in the central repository and data dictionary. This results in consistent, rich and structured

data, creating a common language that can be understood by anyone and used for every kind of financial business transaction. In this way, ISO 20022 can be used as a repository of content that can be machine-processed and enriched to effectively support the way institutions interact.

The common language of the ISO 20022 standard is recorded and made publicly available in the continuously expanding central repository, which consists of a business process catalogue and a data dictionary. The catalogue contains more than 2,200 structured data exchanges that can be used to support a variety of business processes, such as making a payment or settling a securities transaction. The ISO 20022 repository has been designed to support market practices, by creating a common baseline of base messages and components, and allowing the creation of variations of those, to meet specific market requirements. This approach fosters reuse where possible or required.

The same is not true of the data dictionary, which currently holds a few thousand well-defined terms that can be used in any data exchange. Data in any syntax could be mapped on to the terms defined in the ISO 20022 dictionary, allowing data structured in one format to be translated into data that can be understood — and, as importantly, processed automatically — by the user of any other format. In essence, the ISO 20022 data dictionary can act as a common data model for any data exchange.

Messages configured to the FIX standard devised by FIX Protocol Ltd, for example, have components that can be mapped to the equivalent components defined in the ISO 20022 data dictionary. Where a FIX message incorporates components that cannot be found in the ISO 20022 data dictionary, they can simply be added to the dictionary as new definitions of terms.

This ability to enable different standards to interoperate has a number of advantages. Chief among them are speed and

economy. Even a phased migration of the entire securities industry to ISO 20022 would be expensive, time-consuming and unlikely to end in universal adoption anyway. Local proprietary standards, notably of the kind used by CSDs to support their domestic clients, will persist. FIX will continue to dominate pre-trade messaging, and FpML will remain the industry standard for derivatives products.

Adopting ISO 20022 at the level of the data dictionary, on the other hand, would minimise the investment of money and time by securities market participants in reconfiguring systems and processes and transitioning clients from one data model to another. This explains the widespread agreement within the securities industry on the value of adopting a single data dictionary. That agreement is not cost-free or commitment-free and will be easier to achieve if the project is led not solely by heads of operations but also by product managers, who can make the business case, obtain budgets and secure senior management support.

The business case can be built on two foundations. The first is that a common data dictionary would solve existing problems at low cost without incurring the risk of attempting to migrate the entire securities industry to a single syntax. Using components from a common data dictionary eliminates the risk of being locked into a particular syntax, enabling users to accommodate change, including the adoption of entirely new data models. The second is that it would future-proof existing systems and support smooth transition towards new services and technology developments, including cryptocurrencies and tokenised assets issued on to distributed ledger technology (DLT). A common data dictionary provides standardised components capable of bridging differences in the ways traditional assets and digital assets issued on to DLT are traded, settled, held and serviced.

Where both the traditional markets and the new DLT can draw on a common data dictionary, they are better able to interoperate. Using a common data dictionary only is much less demanding than a transition to ISO 20022 at the syntax level as well. This also helps to mitigate the further risk that the new asset classes grow so quickly that the traditional securities industry fails to act promptly enough to seize the opportunity to support digital assets.

Work is already underway to support the industry to move in this direction. For example, the ISSA is currently conducting research and compiling recommendations, which include a focus on the importance of collaboration between securities and emerging crypto asset industries. A key suggestion is to reuse existing standards, and specifically the ISO 20022 data dictionary, to drive interoperability between DLT networks or tokenisation platforms and existing services. This could extend to harmonisation across business concepts and processes, tokens, digital wallets and smart contracts, along with helping to create a common mechanism for cross-referencing legal and smart contracts.

The ISO 20022 data dictionary can also be used as the basis for the APIs that, in every industry, are driving not only new services based on data sharing, but a growing range of services that aim to put users in control of their own data. In financial services, APIs are visible in open platform innovations driven by open finance regulations and a variety of DLT. Shared definitions from a dictionary greatly facilitate data exchanges through APIs.

In the longer term, techniques such as artificial intelligence (AI), machine learning (ML) and natural language processing (NLP) are likely to reduce the importance of the use of any syntax, whether it is FIX, FpML, ISO 15022 or ISO 20022, as they will enable information to be extracted from unstructured data, in both centralised

and decentralised forms. Because it contains agreed definitions, however, the data dictionary will remain useful even after technological developments make the syntax redundant.

COEXISTENCE WITH A COMMON DATA MODEL

Minimising disruption to existing systems and processes is valuable to users. A common data model allows them to continue to use different formats to communicate with each other, clients and FMIs. Facilitating the coexistence of different messaging standards also enables users to continue to use the message syntax of their choice, without reducing the scope to adopt ISO 20022 messages where it makes commercial sense.

Migrations to ISO 20022 will continue on that basis. But every financial institution and FMI in the securities industry will face different commercial incentives and adopt ISO 20022 for their own reasons and to their own timetable. At FMIs, for example, ISO 20022 adoption might coincide with a systems upgrade. Global custodians, on the other hand, are likely to migrate when the cost of managing multiple standards exceeds the cost of the investment.

This incentive-led approach is a logical consequence of a prolonged period of coexistence, in which the use of a common data dictionary enables securities firms to interoperate without obliging the industry to align data exchanges at the syntax level.

Any awkward limitations, business or other, can be overcome by extensions. For example, a standard that uses fewer characters to express the same data component as another standard can be extended to carry the additional characters. This enables continued interoperability without corrupting the standard, because the extensions are adopted only by those users to which they are useful and allows for controlled flexibility.

Nevertheless, for all its advantages, co-existence of multiple message syntaxes does impose costs and risks on the securities industry. ISO 20022 can carry more data than ISO 15022, which cannot be matched by making ISO 20022 ‘backwards compatible’ with ISO 15022. Despite sharing a data dictionary, it is impossible for some components in ISO 20022 to be mapped into the confines of an ISO 15022 message. So, even where ‘backwards compatibility’ is possible, there remains a risk of truncation of data and mistranslation between the formats.

There is also the problem of message versions. Multiple versions of ISO 20022 messages have proliferated as FMIs have adopted the standard. These risks of errors and fragmentation are increased when interoperability is extended to other messaging standards such as FIX and FpML, where use of multiple versions of the same messages are widespread or to proprietary standards of the type published by FMIs. A similar fragmentation is evident in the growing use of proprietary APIs. So far, most APIs are designed not to meet the requirements of interoperability but to facilitate bi-lateral traffic between pairs of suppliers and customers.

In fact, coexistence increases the risk of divergence between standards at every level: institutional, national, international and across syntaxes. Financial institutions and FMIs adjust messages to their own peculiar needs, either to maintain a competitive advantage or for local regulatory reasons. Prolonged coexistence risks ossifying such local adaptations over the long term, simply by making them possible without inhibiting workable exchanges of information between market participants in the short term.

The risk of multiplying message versions can, however, be managed and mitigated. In 2015 SWIFT invited FMIs to support an ISO 20022 Harmonisation Charter, which commits signatories to adhere to market practices, impose version controls

and share information about implementations of ISO 20022. Agreements on version control of this kind are essential to a durable coexistence strategy since uncontrolled permutations undermine the ability to map data between standards. They mitigate the risks and costs of fragmentation compounding over time.

But version control cannot eliminate the risks and costs entirely. They will fall on FMIs, users and the vendors that provide technology to users, and will not reduce over time. The longer co-existence persists, the more difficult it becomes for older data models to keep up with changes in client and regulatory demands. Inevitably, as older data models decay, users adopt workarounds based on the old models. It will become steadily more expensive for users that choose to maintain multiple standards.

For some, migration of the payments industry to ISO 20022 before 2025 may trigger migration of parts of their securities business as well (a third of the payments traffic carried by SWIFT originates in a securities transaction). Other parts of the business will take longer, but not forever. Continuing to operate and report the two halves of the same transaction to different data models will make less and less sense as time passes, and not just for global transaction banks active in payments as well as securities. But the time when the securities industry is ready to align operations on a single data model, from the front office to the back and across all asset classes, is not now. Coexistence, and the consequent need for interoperability, will persist for a long time.

In the interim, agreement to use a common data dictionary is a realistic way of achieving interoperability between data models and so enhancing operational efficiency. To help securities market participants manage a prolonged period of coexistence, SWIFT provides a variety of specifications, tools and testing services. These facilitate

adoption of ISO 20022 in areas where it is commercially viable already and make it easy to use the common ISO 20022 data dictionary where it is not.

CONCLUSION

Exchanging data in different languages is costly and risky. It exacts a continuous toll, not just on transactional activity but on compliance budgets and even on capital by forcing financial institutions to maintain excess credit and liquidity buffers. The toll makes it harder for established institutions with entrenched client bases to compete with new entrants armed with technologies that can report earlier, manage transactions in real time and support clients investing in digital assets.

This is why securities firms may eventually tire of the inefficiency of supporting ISO 15022, ISO 20022, FIX, FpML and various proprietary data models and APIs. Industry-wide agreement to share ISO 20022 as a common language for exchanging data is an obvious way of reducing these costs and risks. Ultimately, adoption of the ISO 20022 data model as the foundation of a data exchange strategy remains the final destination.

The payments industry has chosen it already. The securities industry has no equivalent appetite. This is because market participants are already achieving high levels of automation in data exchange with ISO 15022 and other syntaxes such as FIX and FpML, and new API-dependent technologies have yet to make a separate case for adoption of ISO 20022.

Accordingly, it is unrealistic to expect the securities industry to migrate to a single data syntax soon. Instead, there will be a prolonged period of coexistence of different syntaxes. The central dictionary of ISO 20022 provides a useful means of minimising the consequent and continuing friction in data exchanges without imposing heavy

investment costs on market participants. It is also sufficiently flexible to enable incumbents to support clients investing in or trading digital assets and provides a useable foundation for designing APIs to a common standard.

In an industry in which the management of cost, risk and opportunity depends on the efficient exchange of data, the coexistence of multiple message syntaxes is undeniably inferior to the adoption by all industry participants of a single message standard. Indeed, coexistence adds costs and risks because truncated data and errors in translation have to be managed. But they can be mitigated.

If the data elements used in different syntaxes can be mapped to a common data dictionary, the industry would possess a single source of semantic definitions. It facilitates interoperability between different syntaxes because it enables translation between them. And the prospect of a significant improvement in interoperability between markets, both old and new, is too valuable not to realise.

It will not only cut the costs and risks of post-trade processing but make it easier to develop new products and services based on

data sharing. This is why financial institutions, FMIs and vendors should collaborate, starting now, to adopt a common data dictionary that can be integrated into their systems, their software and their processes.

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NOTES

- (1) The exceptions are ASX in Australia, DTCC in the US, Jasdec in Japan and SGX in Singapore.
- (2) Within the European Union (EU), these reports are mandatory under the European Market Infrastructure Regulation (EMIR), the second iteration of the Markets in Financial Instruments Directive (MiFID II), the Markets in Financial Instruments Regulation (MiFIR) and the Securities Financing Transaction Regulation (SFTR).
- (3) Under the settlement discipline regime of the Central Securities Depositories Regulation (CSDR), CSDs will calculate, report and collect (or distribute) penalties to their participants.
- (4) Under the Shareholder Rights Directive II (SRD II), issuers can request the identity of shareholders concealed by nominee accounts operated on behalf of investors by global custodian banks.