

HRG Assessment:

Clearing and Settlement – Making Financial Information Flow

Executing an order, “the trade,” declares the intention to buy or sell a security. “Clearing and settlement” refers to everything that happens after that initial declaration to cause the actual transfer of assets and ownership. Instructions and trade-related information must flow between broker/dealers, the securities exchange, central clearing parties, custodial banks, and security depositories, so that each takes the necessary action at the right time. How well the process works depends upon how well information flows between all of the players.

Today that flow must cut across diverse business entities, each with its own systems, data environments, protocols and processes. Making it work is an information management and application integration challenge of the first degree. The process does work: in the US alone, \$1.7 trillion in trades pass through the national clearing network daily. Still, clearing and settlement today involves too many starts and stops, slowing things down, introducing error, and causing far too many trades to fail. There are very real opportunities to streamline the process, driving down transaction costs, shortening the settlement cycle and increasing the volume of successful trades.

Industry-wide, such changes can save billions of dollars in costs annually and increase market liquidity. Internationally, eliminating barriers to efficient cross-border trading could substantially increase the cross-border flow of capital and stimulate economic growth and investment. For individual trading firms, cost and efficiency gains can impact competitive differentiation and market position.

This paper examines the clearing and settlement process as it exists, and identifies opportunities and barriers to streamlining the process. We will begin by looking at a national system, that of the US, and then turn to cross-border trading complexities and opportunities. We will conclude with thoughts on information liquidity and vendor considerations.

Industry wide, increased efficiency in the clearing and settlement process can save billions of dollars in costs annually, increase market liquidity, and help more efficient firms gain a competitive edge.

Achieving these efficiencies requires partnering with vendors that understand how to integrate diverse systems and processes, driving an information flow across business entities, technologies and vendors. Sybase has unified its offering under the concept of “Information Liquidity,” the unimpeded flow of information across geographic and technology borders. The Harvard Research Group believes that Sybase offers significant advantages to organizations addressing the clearing and settlement challenge.

Introduction to Clearing and Settlement

The basic steps are the same, whatever is being traded. However, the process gets considerably more complicated when trading spans international borders. Let's begin with the base case, national market scenario and focus on the security trade:

The trade: Information captured here, and conveyed through buy/sell orders, flows through the clearing and settlement process. Any data entry error or miscommunication here will cause the trade to bounce back later in the process. Trade reference data include the unique security identification (CUSIP) number, strike price, quantity, description, buyer and seller. Audit trail information is also included, identifying broker identification numbers on both sides.

Trade Confirmation or Matching: Both sides of the trade, buyer and seller, must agree on trade details. Once both sides have been compared and found in agreement, the transaction is "locked in" or "matched." Often this is done by the exchange that processed the transaction. Other organizations provide matching services, as part of a trade management service offered to trading organizations. Virtual Matching Utilities (VMU) such as Omgeo or SunGard provide matching services, and submit the matched trades directly to the national clearing service.

Clearing: The clearing organization, or Central Counterparty (CCP) ensures that trades are matched, communicates settlement instructions to all of the parties involved and drives the process through settlement. It will also calculate the positions of each party to the trade. This information is critical, defining everything that must be in place in order for the trade to settle. At the moment settlement occurs, the seller must have sufficient inventory of the security on hand, and enough cash reserves to meet liquidity requirements should the deal fail to go through. Similarly, the buyer needs to have enough cash on hand, in the appropriate currency – an appropriate debit ceiling – to cover the transaction.

The CCP provides this service to member firms. Members are generally the larger broker/dealers and custodial banks that have the necessary systems and processes in place to directly track and manage the clearing process. Small- to mid-sized firms typically find it more cost-effective to work through a member, or correspondent clearinghouse, rather than taking on this challenge themselves.

Novation: Frequently the CCP will take ownership of and guarantee the trade, once the trade has been matched. It will be a buyer to all sellers, and seller to all buyers.

Settlement: The Central Securities Depository (CSD) implements the settlement instructions: securities are delivered, and funds paid. The depository controls the actual securities, and so can register and transfer ownership. For the most part, security ownership has been dematerialized. Stocks are represented by book entry, so that physical stock certificates do not need to change hands. However, some trades, such as mortgage-backed securities, still require physical movement of paperwork. The deal is not complete and "irrevocable" until this is done.¹

Clearing and Settlement in the U.S.

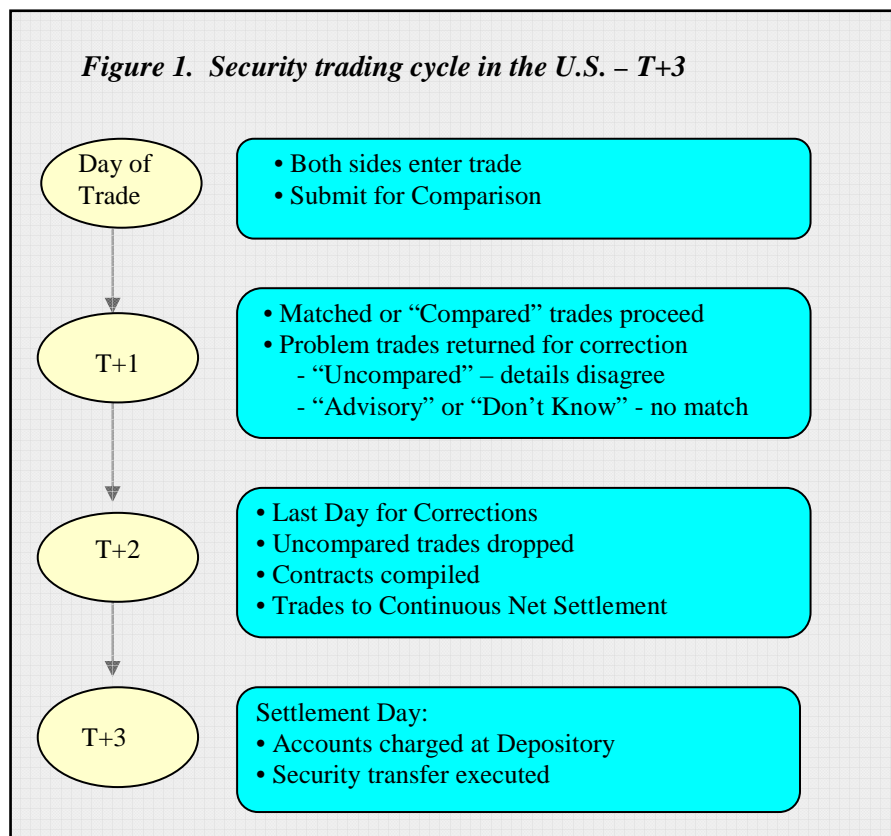
The U.S. system benefits from a highly centralized clearing and settlement structure, and so serves as a model for understanding the workings of a national system in general.

The Depository Trust and Clearing Corporation (DTCC) is at the heart of the system, settling nearly all security trades in the U.S. On the clearing side, the DTCC comprises five clearing organizations, which are responsible for clearing different sorts of instruments. The National Securities Clearing Corporation (NSCC), for example, clears

nearly all traded stocks, while the Government Securities Clearing Corporation clears all government securities. The DTCC also includes the national depository, the Depository Trust Company, which handles settlement for most U.S. trades.²

Additional clearing and settlement activity occurs outside this system, through such organizations as the Options Clearing Corporation, which clears all exchange-traded options. For non-exchange traded instruments and derivatives traded over the counter, the buyer and seller must arrange clearing and settlement between themselves or their agents. More often than not, the DTC still plays the role as depository for most securities that are behind the traded options.

U.S. security trading operates around a three-day cycle (see Figure 1), while stock options and most government securities settle within one day of the trade. Pressure has been building to shorten the security trading cycle, and the Securities and Exchange Commission seems poised to direct the shift to a one-day (T+1) cycle.



T+1 will pose a major challenge. Getting everything done in one day will require a rapid, automatic flow of trade content and instructions, with minimal intervention, leaving little time to correct mistakes. Working against this is the batch process orientation of most trading systems. Trade-related information and instructions are gathered and moved in batches, scheduled around trading hours. The critical systems challenge, then, will be to enable an evolution toward a continuous, real-time process without requiring wholesale replacement of existing solutions.

Industry efforts have turned in this direction. The Securities Industry Association (SIA) has shifted its focus from T+1 to achievement of efficiencies that will ultimately make T+1 possible, under the banner of “Straight Through Processing,” or STP. STP connotes the ultimate objective: the continuous and automatic processing of trades, all the way through final settlement. The DTCC endorsed the SIA move and announced plans to enhance its own

services, at the heart of the system. Reflecting an evolutionary approach, the DTCC's plans promise to significantly impact process efficiency, while minimizing requirements placed on legacy applications. These are discussed in more detail below.³

Making the process more efficient

STP, then, is not so much a need as a direction. The need is to achieve process improvements that offer real returns on investment. Increased efficiency is not just about speed. It is about reducing errors, lowering costs, making the process more reliable and less risky, and by so doing making it easier to trade within and across borders.

We can start by looking for anything that pulls the trade off the automatic track. Following the flow of the trade through the system, we can identify a number of opportunities to increase efficiency:

1. *Getting the trade details right.* Trades will not match if both sides do not agree on the details. Most initial matching failures occur due to misstatements in the trade information. Simple data entry mistakes like an incorrect CUSIP (stock identification) number are often at fault. Better data checks and balances, ideally linking trade entry to the central product database, would help here. To the greatest extent possible, nothing should have to be reentered; information should flow from one system to the next.
2. *Match all trades early in the cycle.* Clearing / trade management services and Virtual Matching Utilities (VMUs) provide matching services before the trade enters the clearing process. This will catch errors and head off issues later in the cycle.
3. *Shift toward real-time trade capture and processing.* As noted above, today's systems are batch-oriented, and constructed around the T+3 timetable. Electronic Communications Networks like SuperMontage (Nasdaq), Linx (NYSE), and Instinet/Island are pushing the industry toward real-time trade entry, and the NSCC is working with the major exchanges to receive trades on a real-time basis. Batch processes can be executed with greater frequency, until some point in the future when true real-time models can be implemented.
4. *Reduce or eliminate exempting of trades from automatic processes.* More than 20% of the 700,000 daily settlements managed by DTCC are exempted. Why? According to DTCC, this occurs largely to enable trade participants to control the timing of trade settlement, so that they can ensure that their positions will be able to accommodate the trade. Improving access to settlement status and schedule would help eliminate this need. This leads to our next point.
5. *Provide better access to trade transaction status and control.* Buying, selling and trading organizations need to know the real-time status of the trade, and ideally, have the ability to influence the timing of the settlement transaction. This would eliminate the need for most of the exemptions noted above.

The DTCC has announced plans for an inventory management system with this sort of communication in mind. A customer (clearing member or depository client) profile will define standard instructions regarding transaction authorization. This way, most transactions will flow through the system with the presumption of acceptance. Only items that fall outside the profile will be exempted. The system will also provide direct access to transaction status and other information. This falls short of giving the client full process control, but it is a start.

6. *Reduce fails and reclaims.* Improving the communication of trade status and settlement timing should also have a significant impact on reducing trade failures ("fails") and post-settlement reclaims (trade recalls). According to the DTCC, most fails occur due to a lack of inventory on the part of the seller.⁵ Real-time

information on trade and position status through the settlement cycle could flag impending issues and head off settlement problems.

The SIA has estimated that the industry would save \$2.7 billion per year by settling two days faster.⁶ However, if the efficiencies noted above were achieved, benefits could be even greater. For example:

- Better attention to data quality at the front end, combined with greater use of matching utilities, have the potential for reducing matching errors to something close to zero. We know the DTCC settles 700,000 deliveries daily; a one per cent reduction in mismatched trades would eliminate 70,000 trade returns and reentry every day, or 14 million transactions per year.
- Reducing the number of trades exempted from DTCC's Continuous Net Settlement (CNS) system could have similar effect. If the current total of exempted trades, 140,000 trades per day, were cut in half – which seems entirely plausible – an additional 70,000 trades per day would go through without added handling that exempted trades receive.
- What if reclaims, which currently represent \$7 billion or more per day in trade value, could be cut in half? This would save the transaction costs and potential damage assessments for 5,000 transactions per day. Trade completion rates would increase, and settlement risks – and the capital required to cover them – would decline.

We are just scratching the surface. How much capital could be redeployed if liquidity risk was significantly lowered? What is the opportunity cost of a failed trade? And what is the value of settling half a day, or two days sooner? Clearly, the benefits can be enormous.

Cross-Border Clearing and Settlement

The opportunities for increased efficiency are even more pronounced for cross-border trading. Trading costs are much higher for cross-border transactions, reflecting their complexity. In one study, the Giovannini group found that fees charged by the International Central Security Depositories (ICSDs), which focus on cross-border transactions, were on average eleven times those of the national CSDs.⁷ The London Stock Exchange, in its own analysis, found that European traders pay nearly six times more per EU transaction than U.S. traders pay for the equivalent DTCC service. According to that study, this differential is equivalent to adding ten basis points to the EU cost of capital.⁸

Overall, higher costs and complexity of cross-border trading serve to impede the cross-border flow of capital, diminish liquidity and increase costs, dampening economic growth and investment. Why does this happen?

Each country essentially operates its own version of the DTCC, its own national CSD. There is no cross-border utility that provides the functions of the DTCC on a global or pan-European basis. For the most part, trades need to be settled at the CSD that manages that particular security. German securities need to be settled at the German CSD, Clearstream Banking Frankfurt. An Italian security would need to be cleared with an Italian clearing bank, and settle at the Italian CSD, Monte Titoli. Any trading organization wishing to trade in a given market needs to belong to that CSD, or work with another firm that does.

You can begin to see the issue. In Europe alone, there are nineteen national CSDs and two ICSDs, each with its own rules, systems and protocols, setting up a many-to-many communications nightmare. Not surprisingly, it has been estimated that 15% to 16% of all cross-border trades fail due to errors and miscommunication.⁹

A EU-commissioned poll of European banks, trading firms and clearing organizations, conducted by the Giovannini Group, underscored the need to address cross-border trade processing issues. Fifteen barriers to cross-

border trading were identified, and two were mentioned most often: the diversity of IT platforms and interfaces, and multiple systems requirements, associated with trading in multiple countries.

Several organizations have taken on elements of the problem, all offering a sort of communications overlay, their own versions of hub-and-spoke architectures, to work around the differences of diverse national systems. SWIFT, an industry-owned cooperative, addresses the communication issue, providing secure messaging services and interface software to financial institutions in 197 countries. It offers a standard messaging interface to all clients (FIX and ISO 15022), and reliably flows information to member organizations over its own global IP network.

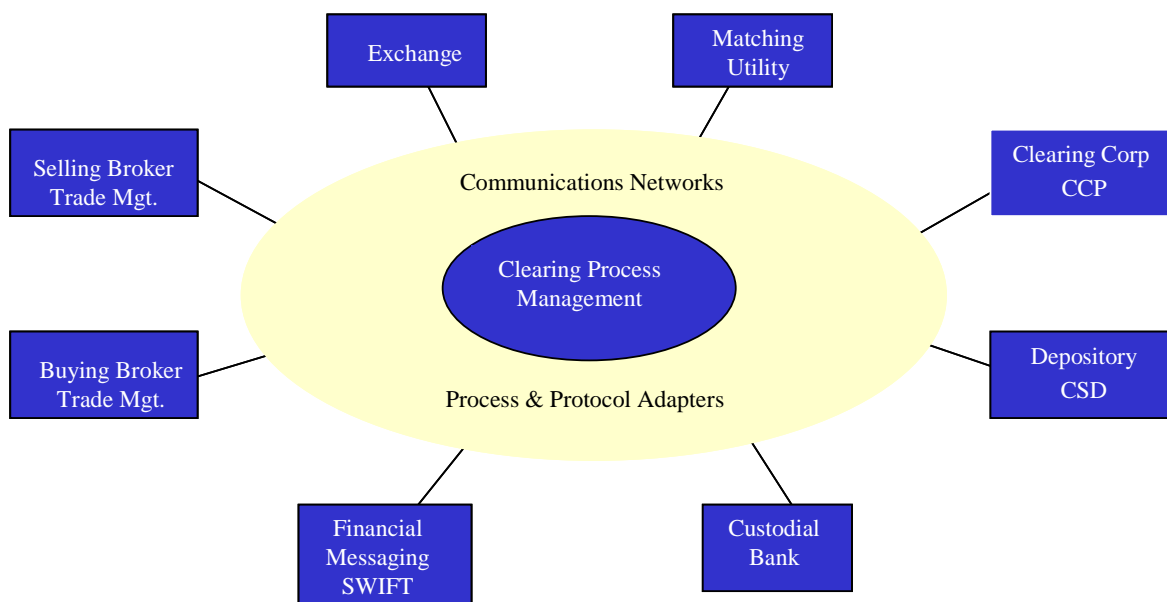
Building up from messaging, Omgeo uses the SWIFT communications services, and adds trade management services, including cross-border trade matching. At the highest level, Euroclear and ClearStream, the two European ICSDs, offer full service, cross-border clearing and settlement.¹⁰ But as noted earlier, their transaction prices are many times those for national clearing services, reflecting the complexity and inefficiencies they must address.

Implications for Information Management

The clearing and settlement process brings trade participants together – Brokers, Exchange, Custodial Bank, Virtual Matching Utility, Central Counterparty or Clearinghouse, and Securities Depository – in a confederated system of sorts. They function as a network of loosely coupled, interdependent systems that interact to enable the flow of transactions.

The heart of the process is the conveyance of trade-related information: orders and reference data, instructions, confirmations, alarms, calls to action, and so on, all under some form of process control. In a “hub and spokes” model (Figure 2), the process control application oversees clearing and settlement on behalf of its trading clients. Around the edges, communication “spokes” reach the various trade participants, providing a secure communications conduit for the access and delivery of instructions and data.

Figure 2. Clearing and Settlement – Hub and Spokes logical model



Making the process work begins with basic communication: creating a reliable, secure connection between points A and B, using common data and messaging protocols so that both sides understand what is being sent and received. This is essentially financial messaging, such as that offered by SWIFT. Going beyond basic connectivity, the real opportunity is to interconnect processes, across diverse institutions, to enable real-time monitoring and dynamic management of the clearing and settlement process.

Implementing an effective hub and spokes model isolates client applications from changes in industry standards and protocols, enables the necessary “any-to-any” communications capability, and provides the basis for centrally monitoring and managing the clearing and settlement process. Such a solution must:

- Support industry standard and proprietary protocols: proven, reliable implementations of standard messaging protocols (such as FIX and ISO 15022), as well as support for proprietary network interfaces and client- or application-specific protocols. Application integration will require evolution toward next generation standards (e.g. XML, SOAP and UDDI).
- Manage trade data quality. Errors need to be caught and corrected as close to the source as possible, early in the process. Wherever possible, product information should only be entered once, and flow from the central database into the trade.
- Dynamic database synchronization, updating and replication: The clearing process is incredibly dynamic. Situations change, requiring continuous, transaction-intensive updating of various client databases.
- *Application integration* is ultimately where the most difficult work and greatest returns will occur. Integration of legacy, batch-style applications with an increasingly real-time structure will pose a particular challenge. Better process monitoring, and eventually, actual control over the settlement process, will require process to process communication across business entities. Middleware, web services, and associated development tools, together with the expertise and architectural perspective to use them, will provide the critical building blocks.

Conclusions

There are very real opportunities to streamline the clearing and settlement process, to drive down transaction costs, shorten the settlement cycle and increase the volume of successful trades. Industry wide, such changes can save billions of dollars in costs annually, and significantly increase market liquidity. Cross-border trading in particular stands to gain dramatically. For individual trading firms, cost and efficiency gains can significantly impact competitive differentiation and market position.

Vendor partnerships are critical to any IT endeavor, and they are with clearing and settlement. Industry knowledge and experience, the capacity to support a truly non-stop operating environment, leadership technology, products and tools, all are considerations. Above all, a partner in the clearing and settlement arena must be able to address integration requirements across diverse technologies and environments.

Companies like IBM, Sybase and Oracle offer complete lines of information management solutions. However, Sybase has uniquely chosen to bring together critical solution elements under unifying concept of “Information Liquidity,” the unimpeded flow of information across geographic and technology borders. Harvard Research Group believes that Sybase presents significant advantages to organizations addressing the clearing and settlement challenge:

- Application integration and data transformation: Sybase offers the software, tools and expertise to help organizations build “hub and spokes” architectures that can span diverse hardware, operating systems,

applications, databases and communication protocols. e-Biz Integrator provides this framework, and offers a wide array of software adapters to diverse software platforms and database technologies.

- Transaction monitoring: Sybase applications and tools facilitate transaction monitoring, such as BizTracker, which enables the monitoring and control of messages moving through queues.
- Middleware applications, adapters and tools: Sybase offers an extensive set of middleware, tools and adapters to help organizations move information across diverse databases, systems and protocols. Its Tradeforce messaging platform, the engine behind SWIFT's messaging network, offers a complete solution for financial messaging.
- Distributed, federated database architecture: Sybase offers the ability to unify multiple, distributed databases under a common management structure and architecture. Sybase ASE pioneered the concept of federated databases, combining central policy management and control with the performance of distributed processing through multiple related databases.
- Effectively manage diverse arrays of data: Sybase ASE has the ability to index and search diverse data types, even across different languages and character sets. Sybase ASE is the only database that can search and query XML documents or index structures stored in the database, in flat files, or at a web address.
- Data replication for global operations: Sybase Replication Server enables near real-time, global data replication. It can synchronize and replicate copies across heterogeneous platforms, across any number of locations, supports dynamic transaction routing, and offers a strong management system.
- Expertise and support: Sybase understands financial services applications and its non-stop operating environment, with a strong global presence that serves the industry's leading financial institutions. Sybase partners with its customers through such organizations as its SAGE advisory group for financial services executives, through numerous user groups, and in its one-on-one interactions.¹¹

The Harvard Research Group believes that Sybase presents a strong offering to any organization seeking to create and implement an effective clearing and settlement solution, and belongs on the short list for consideration.

Notes and Sources:

¹ Rosberg, Mariya, "Achieving Cross-Border Trade Processing Goals," Parts I and II. Securities Industry Association Research Reports, Vol. II, No. 3 & 4, March & April 2001.

² The Depository Trust and Clearing Corporation (DTCC) website (www.dtcc.com).

³ DTCC Press Release, "DTCC Announces Plans to Forge Ahead on STP Initiatives," July 22, 2002.

⁴ Reddy, Michael, Securities Operations, Second Edition. Englewood Cliffs: Prentice Hall, 1995.

⁵ DTCC white paper, "Straight-Through Processing: A New Model for Settlement," January 2002.

⁶ McKenzie, Heather, "Global Securities Services," Institutional Investor, May 2002.

⁷ Giovannini Group white paper, "Cross-Border Clearing and Settlement Arrangements in the European Union." Brussels, November 2001. This includes an excellent review of the European system and the transactional flow.

⁸ London Stock Exchange white paper, "Clearing and Settlement in Europe: Response to the First report of the Giovannini Group," February 7, 2002.

⁹ "Messaging Standards Continue to be Key to T+1," Global Investment Technology, March 19, 2001.

¹⁰ See each organization's respective website for this and further information.

¹¹ Sources from Sybase include:

Sybase White Paper, "Sybase Information Liquidity;"

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Sybase Press Release, "Sun and Sybase Reference Architecture Shatters Industry Records," April 3, 2002.

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