SIS x-clear
Member of the SIS Group

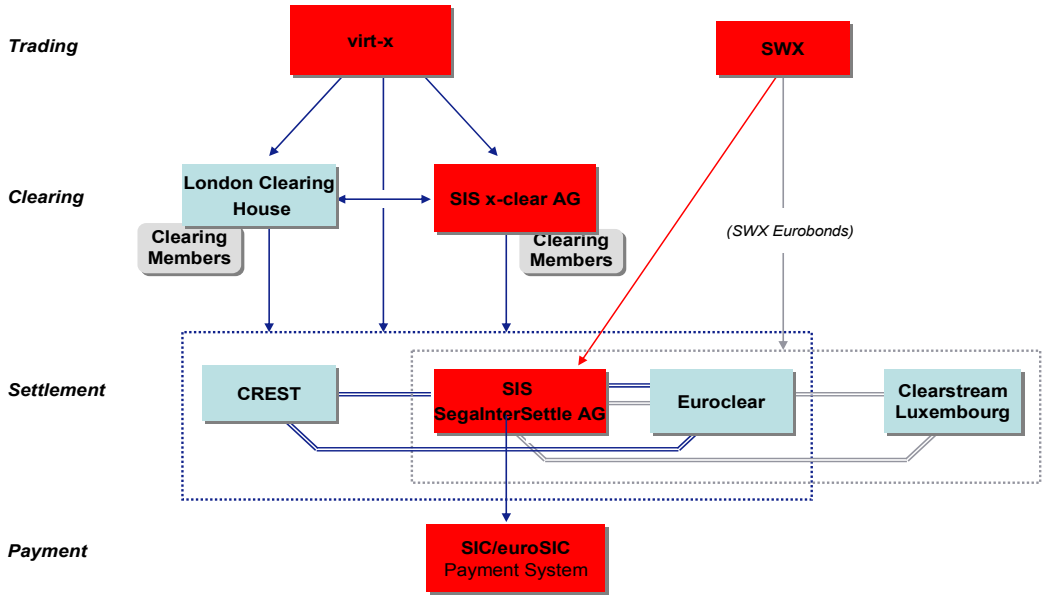
Enhancement to SIS SegaInterSettle's Settlement Algorithm

Naresh Kumar Khivraj

Introduction

SIS SegaInterSettle, SWX Swiss exchange, virt-x (pan-European stock exchange) and Swiss Interbank Clearing (SIC) work in unison to operate the Swiss Value Chain. Developed by the Swiss financial centre, collaboration between non-profit organizations has made the Swiss markets a model for efficient post-trade processing systems. SIS SegaInterSettle plays a significant part in the Swiss Value Chain with real-time links with the stock exchanges, clearing houses and payment systems. With a real-time link to the Swiss National Bank's SIC payment system, the entire process – from trading till settlement - is processed on a straight through processing (STP) basis enabling real-time simultaneous final irrevocable DVP (SFIDVP) settlement.

Enhanced Swiss Value Chain



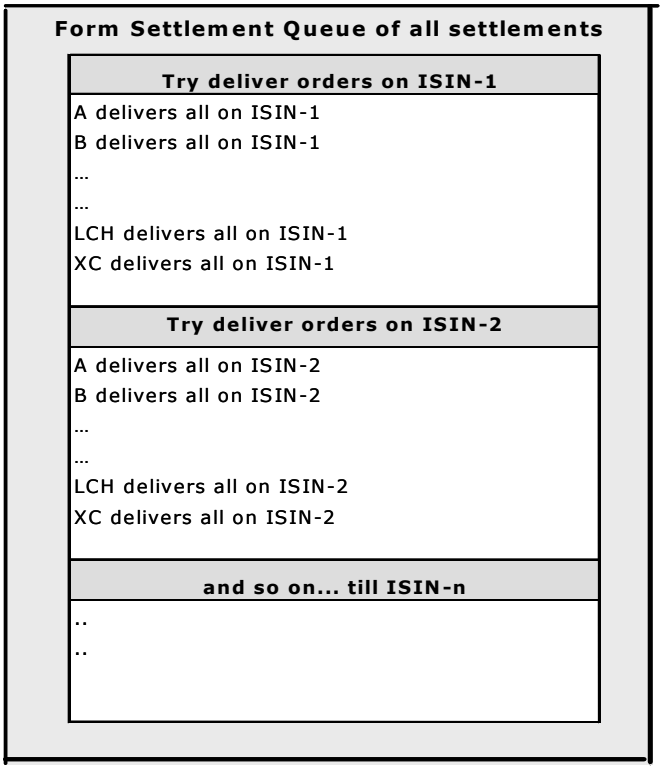
SIS SegaInterSettle's SECOM system operates a real-time settlement engine. At the start of a day (after beginning-of-day processing), orders whose settlement date has reached are tried for settlement in a pre-defined sequence. The earlier algorithm worked very well under bi-lateral settlement which existed prior to introduction of the central counterparties (CCP); Clearing services were launched in May 2003 for virt-x. SIS x-clear and LCH.Clearnet are the two CCPs for virt-x.

Prior to introduction of the CCPs, the counterparties to orders were usually banks or securities brokers. The Delivering party usually had enough stock in their custody accounts which ensured that orders settled during SECOM's first attempt to settle them. The receiving party also maintained sufficient cash balances so that at least some of their receive orders settled during the first attempt to do so. With introduction of CCPs, every cleared order had a CCP as counterparty.

This paper discusses the challenges faced by the CCPs in oiling the settlement with sufficient cash liquidity which arose due to the introduction of CCPs for virt-x and also the innovative and effective solution which was implemented in May 2005 to address the same.

Existing Settlement Algorithm

The exhibit below explains the functioning of SECOM's earlier settlement algorithm.



For a particular ISIN, deliver orders were tried for settlement member-wise. Thus, for the first ISIN picked up for settlement, all deliver orders of one particular member would be tried for settlement before trying deliver orders for another member. After deliver orders of all members have been tried for settlement, the settlement algorithm would move to eligible orders for the next ISIN. Deliver orders of CCP were tried towards the end for every ISIN, to account for the fact they do not have any stock at the start of settlement. This was under the assumption that the CCPs could first receive stock from all deliverers and then deliver the same onwards to their receiving counterparties. This assumption did not work out as planned. Settlement of an order usually involved sending out a payment message to the central bank's payment system

to debit the buyer and credit the seller. The time taken to send out such payment messages (known in the marketplace as F10 messages) and to and get a response back was usually more than a few seconds. Thus, the time taken by the settlement engine to run through trying all orders on an ISIN was less than the time taken for the first delivery to settle. This meant that when the CCPs' deliver orders on an ISIN were tried for settlement, none of the other orders on that settlement has settled, resulting in even the CCPs' deliver orders going overdue[1].

CCPs were not geared to operate efficiently under existing settlement algorithm

Settlement in SECOM operated efficiently until CCPs were introduced. Over 90% of trading on virt-x is on Swiss securities. The fact that LCH mandates settlement of Swiss securities only in SIS SegaInterSettle (hereinafter SIS) and that most of SIS x-clear's members chose to settle all their virt-x trades also in SIS ensured that almost all virt-x trades settled in SIS. One of the important benefits of introduction of a CCP in any market is the possibility to introduce multi-lateral netting, with the resultant efficiency gains due to reduction in number of settlements. The service offering by virt-x and the CCPs provided a facility of optional netting to its members. In spite of the obvious benefits of netting, members have been slow to move to netting and a majority of virt-x members continue to settle on a gross basis. Introduction of a CCP into a trade obviously increases the number of gross settlements. With most members opting to settle on a gross basis, the number of orders settling increased significantly after introduction of the CCPs.

Unlike regular members of SIS who usually have sufficient security balances at the start of the daily settlement process, the CCPs go into the settlement day without any significant security balances. CCPs do not take their own positions and hence, only deliver onwards to receivers, what positions they receive from deliverers.

To retain streamlined settlement processing and to achieve a high rate of successful settlement before the start of trading on the stock exchanges, the CCPs had to maintain a larger balance in their cash accounts. This obviously was not a very favorable situation considering the opportunity costs of maintaining cash balances.

Settlement Buckets

Apart from the higher cash requirement for CCPs, the bottlenecks in settlement processing also led to higher usage of the system's processing power by the settlement engine. Various approaches were analyzed to increase the efficiency of the settlement engine with regard to liquidity requirements as well as in the settlement engine's usage of processing power. The settlement engine of SECOM is a very complex one, supporting SIS's settlement services for Swiss and pan-European clients for various domestic and cross border markets. Hence, a major overhaul of the settlement engine (for example, incorporating an overnight settlement batch cycle, before moving to real-time gross settlement) was ruled out.

[1] An order which has been tried for settlement but did not get settled is termed as overdue, till it gets settled

Analysis of the settlement pattern of orders involving CCPs had shown that the smallest 75% orders had a cumulative settlement amount of only about 25% of the total settlement amount (Pareto principle). If the available cash in the CCP accounts could be used first to settle the smaller orders, both the major issues with the settlement algorithm could possibly be addressed. The available cash would be used for settling the majority of orders without creating bottlenecks due to insufficient liquidity – similar to the concept of 'Express Check-out counters' at supermarkets.

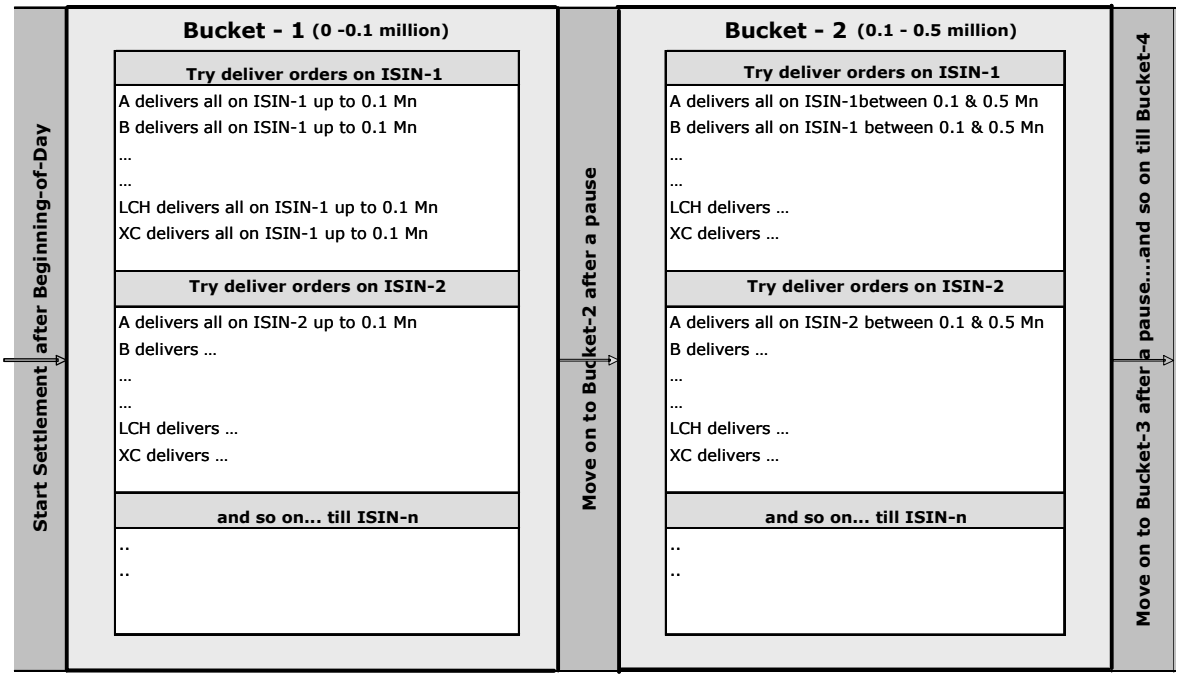
This led to the idea of trying CCP orders for settlement in the order of increasing settlement amounts. Rather than trying all orders on a particular Member-ISIN combination in a random sequence, orders were to be grouped by settlement amount into four settlement buckets. Settlement algorithm was changed such that orders in the first settlement bucket –the smaller orders – would be tried for settlement first, before moving on to the other three settlement buckets sequentially. The objective of this design was to prioritize the settlement of smaller orders (smaller settlement amounts) such that the CCPs' limited cash balances were utilized initially towards settling the large number of orders with smaller settlement amounts.

Functioning of the enhanced algorithm with settlement buckets

Before the start of real-time settlement processing, orders are grouped into four settlement buckets as follows:

Settlement Bucket	Start Range	End Range
1	0	0.1 million CHF
2	0.1 million CHF	0.5 million CHF
3	0.5 million CHF	10.0 million CHF
4	10.0 million CHF	& above

The exhibit below explains the functioning of enhanced settlement algorithm after the introduction of settlement buckets.



Orders with settlement amounts up to 100'000 CHF are tried first, as part of the first settlement bucket. Within the first settlement bucket, the existing sequencing of orders has been retained – CCPs continue to be the last deliverers within a particular ISIN.

To ensure efficient performance of the settlement engine as well as optimum usage of CCPs' cash balances, orders forming part of a subsequent settlement bucket are not tried for settlement until a majority of orders of the previous settlement buckets have settled successfully. This is achieved using the following two parameters:

- Pending number of payment messages: This is the number of payment messages, which have been sent to the Swiss National Bank's payment system, but which are still unsettled.
- Cumulative amount of pending payment messages: This is the sum of amounts for the above.

The above two are parameterized for each settlement bucket to control the transition of the settlement algorithm from one settlement bucket to another. Only if both the above parameters are satisfied for a settlement bucket, the settlement algorithm moves from to the subsequent settlement bucket. However, after a maximum elapsed time in a particular settlement bucket, the subsequent settlement bucket would be tried irrespective of the above two parameters being satisfied or not. Thus at any time, the system's processing power and CCPs' cash liquidity focus on a smaller and manageable subset of large number of CCP orders which settle everyday.

Analysis of the pattern of orders as well as actual system performance of the new settlement algorithm helped in setting the optimum level of parameters for each settlement bucket.

Settlement Performance of the Enhanced Settlement Algorithm

The enhanced settlement algorithm came into effect from 17th May 2005. The performance of the same was monitored during the period 17th to 20th May 2005 and was compared with performance for the previous week. To test the efficacy of the enhanced settlement algorithm, progressively lower level of cash liquidity was maintained for the CCPs. The following charts depict the performance of the enhanced settlement algorithm for various parameters.

Chart 1: Settlement Performance vs. Cash Liquidity

This chart compares the performance of the new settlement algorithm in terms of the number of orders which got settled at specific times, against the progressively lower levels of cash liquidity maintained for the CCPs. The settlement performance recorded at 07:00 and 08:30 continued to be at high levels in spite of progressively lower levels of cash liquidity maintained. Trading on stock exchanges begin at 09:00. To enable swift processing of exchange trades by the system, it is expected that a big majority of orders would settle by the time trading begins.

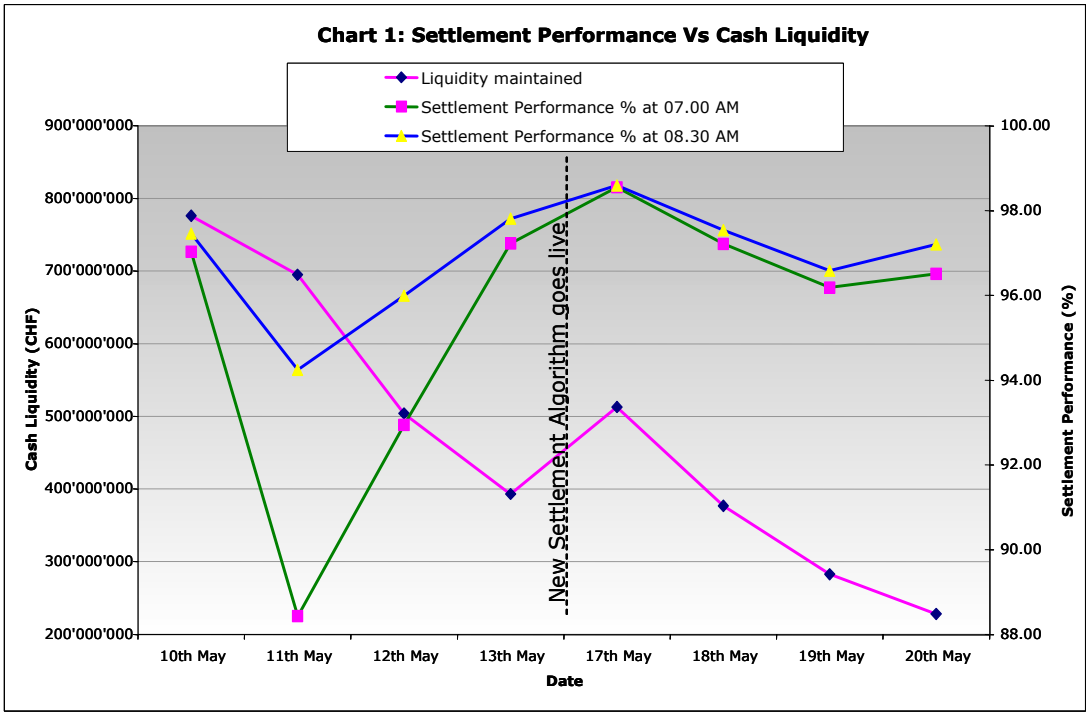


Chart 2: Total Settlement Amount vs. Cash Liquidity

This chart compares the cumulative settlement amount of all CCP orders against the cash liquidity maintained for the CCPs.

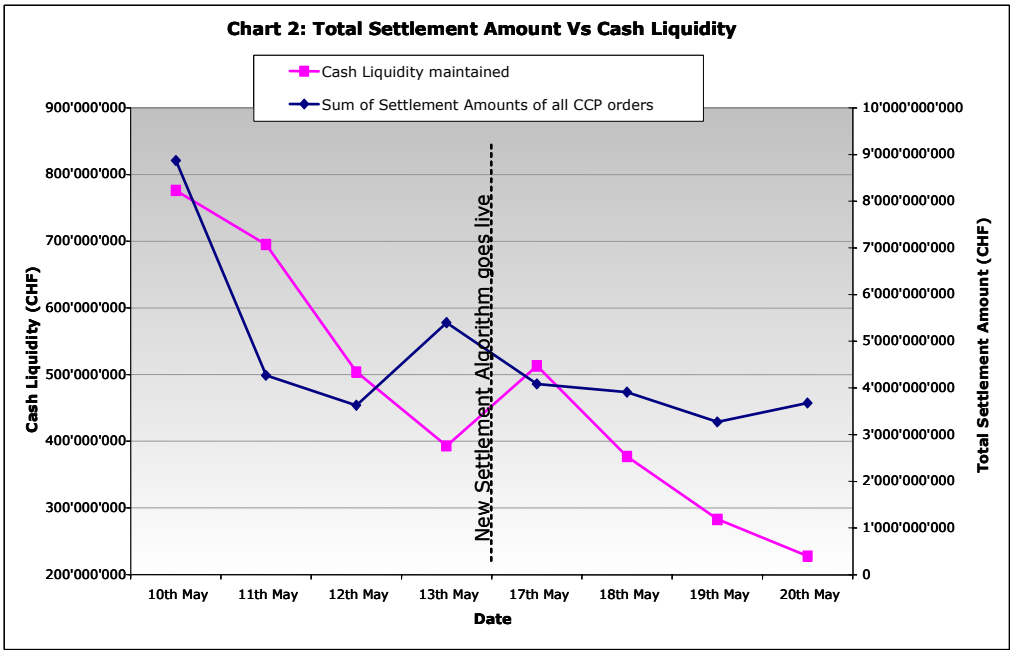


Chart 3: Number of CCP Orders vs. Cash Liquidity

This chart compares the number of CCP orders for settlement against the amount of cash liquidity maintained for the CCPs. In spite of the increasing number of orders being serviced by progressively lower levels of cash liquidity, the settlement algorithm had performed very well.

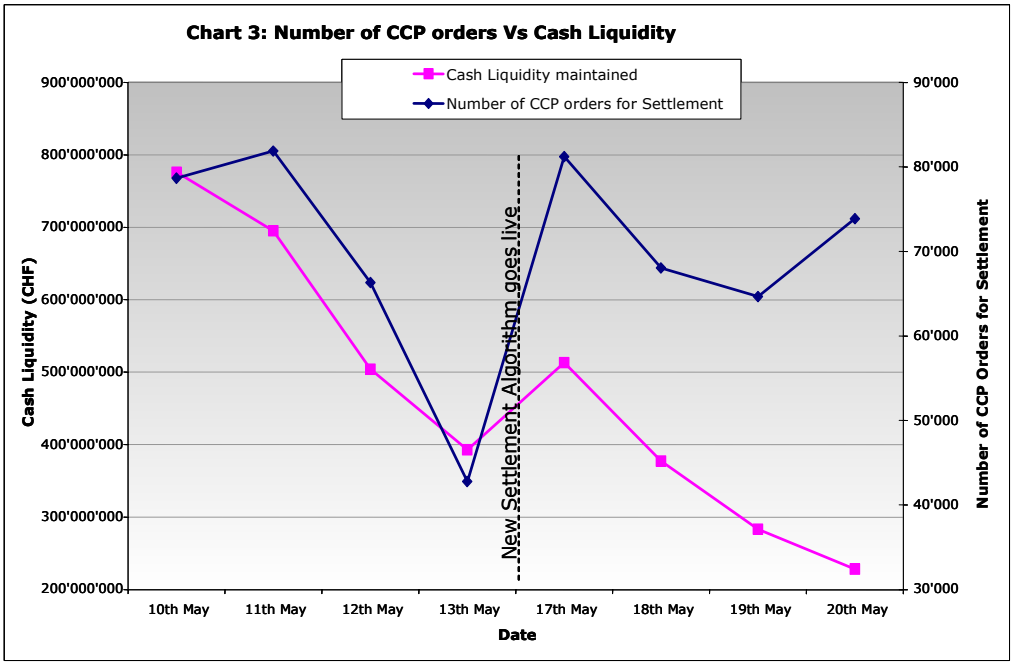
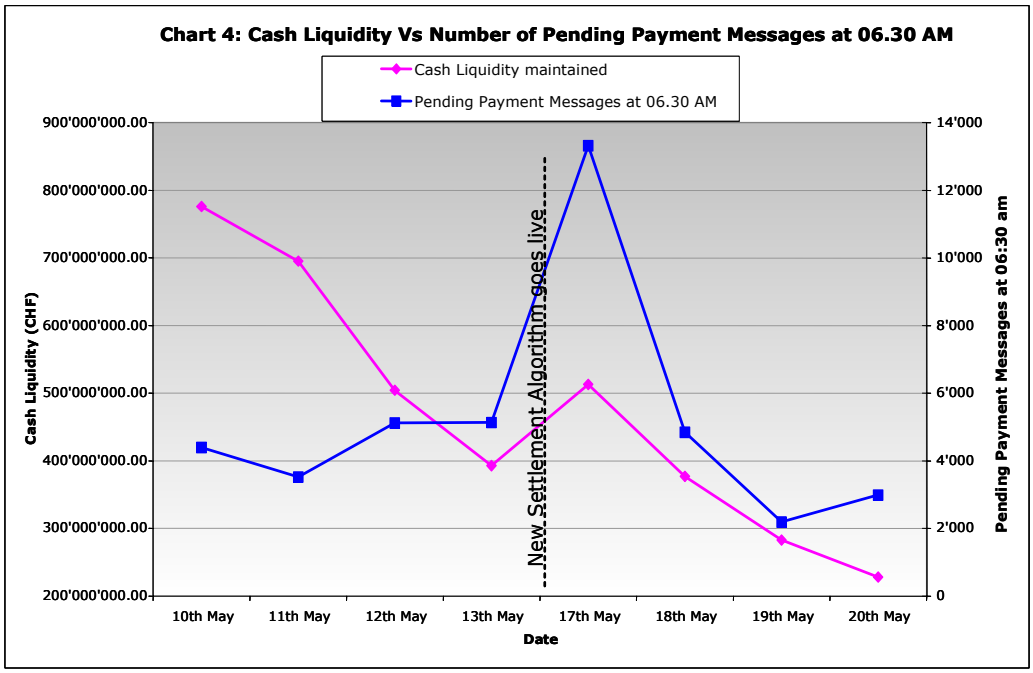


Chart 4: Cash Liquidity vs. Pending Payment Messages at 06:30

This chart depicts the pending payment messages at 06:30 am against the amount of cash liquidity maintained for the CCPs. In spite of maintaining lower levels of cash liquidity, the number of pending payment messages has been trending down after the introduction of the enhanced settlement algorithm.



Conclusion

Introduction of CCPs in Switzerland benefited participants but introduced challenges for the CCPs in managing their liquidity requirements. An innovative solution has been developed involving more efficient sequencing of orders by introduction of settlement buckets. Trying orders for settlement in the increasing order of their settlement amount has shown very good results. The efficiency of the enhanced settlement algorithm was put to test by gradually reducing the amount of liquidity by more than 50%. Measured on various parameters, the enhanced settlement algorithm has maintained, and even improved its earlier performance in spite of the reduction in the amount of cash liquidity maintained.