



Atomic settlement:

Counting down to zero

Initially emerging from the crypto and blockchain realm, atomic settlement has become a buzzword across financial services. Some even consider it a game changer in the FX world, claiming that it facilitates shorter settlement cycles like T+0. What is atomic settlement, and why is it so novel? And is there a problem with T+2 settlement that needs a solution?

All Greek to me

As is often the case with new developments, there is no agreed definition of ‘atomic settlement’, and it can mean different things to different people. Before discussing its meaning in the post-trade and FX context, it is worth considering how the term evolved over time.

‘Atomic’ derives from the Greek word ‘atomos’, which means uncuttable or indivisible. In the crypto space, the term ‘atomic swaps’ emerged around 2013 to refer to exchanges of crypto assets across blockchains without third-party involvement.¹ Simply put, these swaps can only have two atomic states: fully complete or fail. There is no intermediate state: they either happen or not.



“There is no agreed definition of ‘atomic settlement’.”

Atomic settlement’s key properties

Approximately two decades ago, the global community of public policy makers agreed on a definition of ‘settlement’: the completion of a transaction wherein the ownership of an underlying asset is transferred from a sender to a receiver. The act of settlement discharges obligations in respect of funds or securities transfers between two (or more) parties.²

The term ‘atomic settlement’ was developed in the context of research and experimentation around delivery-versus-payment (DvP) and payment-versus-payment (PvP) arrangements in a blockchain environment.

One key attribute of ‘atomic settlement’ is simultaneity, whereby one leg of a transaction settles if and only if the other leg settles. Without going down a technology rabbit hole, it can be said that such simultaneous transfers on an all-or-nothing basis can be achieved, for example, with hash time lock contracts (HTLCs), which create conditionality between two assets. In order to receive the respective assets, the beneficiary must enter a cryptographic passphrase (hash lock) and act within a predetermined timeframe (time lock).³

‘Atomic settlement’ also has a cross-ledger dimension like that of ‘atomic swaps’, at least if HTLCs are used. However, over time the cross-ledger aspect and interoperability became less pronounced, and nowadays certain types of atomic settlement could occur on a single ledger.⁴

¹ The idea of atomic swaps without the intervention of third parties was first presented by Tier Nolan in 2013 in the context of cryptocurrency exchanges.

The atomic swap concept was introduced in 2017 by Charlie Lee, who founded Litecoin.

² CPMI (2003) Glossary of terms used in payments and settlement systems.

³ See, for example ECB / Bank of Japan (2019) Project Stella – synchronized cross-border payments; Bank of Canada / Monetary Authority of Singapore (2019) Enabling cross-border high value transfer using distributed ledger technologies; Federal Reserve Bank of New York / New York Innovation Center (2022) Project Cedar – phase one report; BIS Innovation Hub (2023) Project Icebreaker – Breaking new paths in cross-border retail CBDC payments.

⁴ See, for example Bech, M, et al (2020) On the future of securities settlement, BIS Quarterly Review; Box C: “If security tokens and the cash tokens exist on the same ledger, then an atomic settlement smart contract can be used to coordinate clearing and settlement. [...] If the security tokens and the cash token exist on separate ledgers, then either a centralised party could be introduced to coordinate the transfer or a hash timelock contract (HTLC) could be used.”

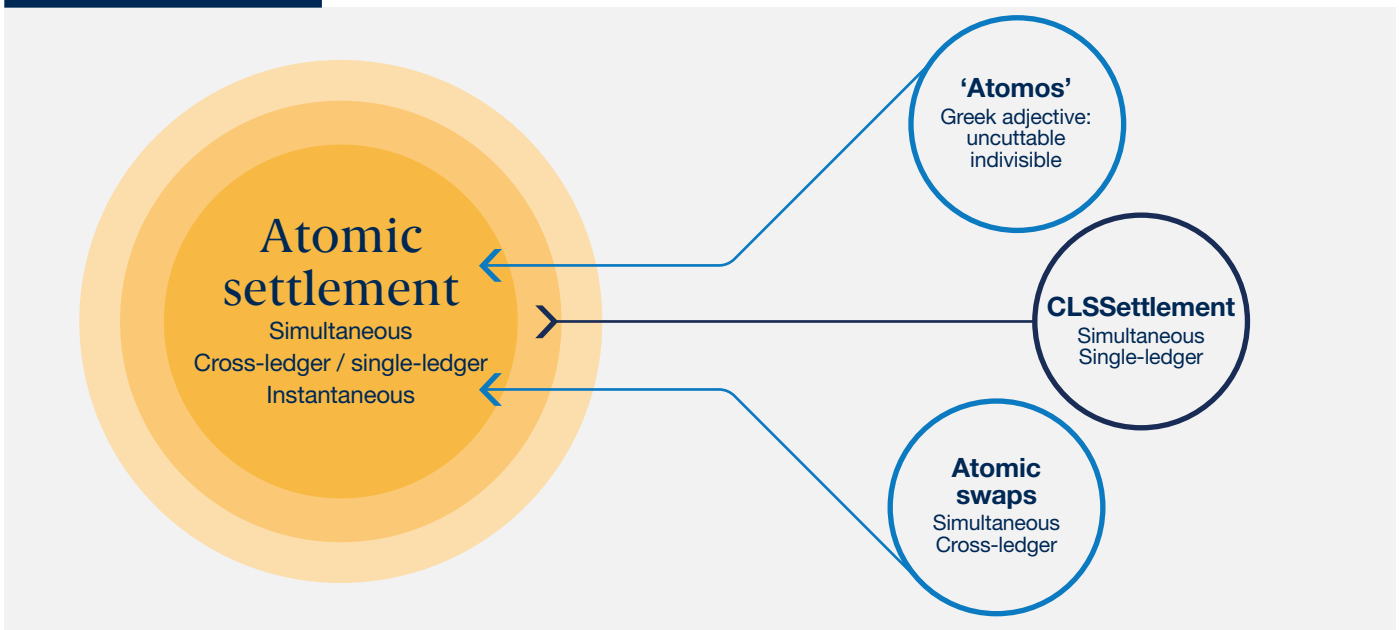
How new is new?

“Simultaneous single ledger settlement already exists today, which begs the question what is so novel about the concept of atomic settlement.”

But if ‘atomic settlement’ can include simultaneous single ledger settlement – which already exists today – then this begs the question what is so novel about atomic settlement (Figure 1).

For example, CLS offers multicurrency settlement for FX transactions. It mitigates FX settlement risk by synchronizing the settlement of payment instructions for the two currency legs of a trade with finality and irrevocability. CLS’s PvP functionality ensures that a party’s payment instruction in one currency is not settled unless the corresponding payment instruction in the counter currency is also settled. In other words: you get paid only if you pay. In this respect, CLS’s settlement design might be considered a type of atomic settlement.

Figure 1: Atomic or not?



Need for speed

“Instant payments are payments in which the transfer of funds occurs in real-time or near real-time on a 24/7 basis.”

There are more variations around the term ‘atomic settlement’. Besides the shift from cross- to single-ledger approaches, instantaneous settlement is sometimes considered a feature of ‘atomic settlement’.⁵

Instantaneous settlement is clearly on the rise in the retail payment space, where users expect to make payments with the same speed they can access content on the internet. Instant payments (also called faster payments) are payments in which the transfer of funds occurs in real-time or near real-time on a 24/7 basis.⁶ In other words, instantaneous settlement may happen in the blink of an eye.⁷

But as instantaneous settlement becomes mainstream in the retail space, it may not (yet) be necessary or desirable in the FX post-trade space, for reasons outlined below. In fact, simultaneity (i.e., that the payments underlying the two currency legs of a trade are settled on an all-or-nothing basis) and instantaneousness (i.e., that the trade and the corresponding settlement coincide) are two distinct concepts. Therefore, some advocate against commingling these attributes under the term ‘atomic settlement’.⁸

⁵ See for example R3 (2022) Atomic settlement: ‘If you have Amazon prime, you already understand the process.’

⁶ CPMI (2016) Fast payments – Enhancing the speed and availability of retail payments.

⁷ For example, the instant credit transfer scheme of the Single European Payments area, called SCT Inst, foresees a maximum duration of ten seconds; europeanpaymentscouncil.eu/what-we-do/sepa-instant-credit-transfer.

⁸ Lee, M., Mueller, B. (2022) ‘What is Atomic Settlement’, Liberty Street Economics, Fed NY.

Countdown from T+2

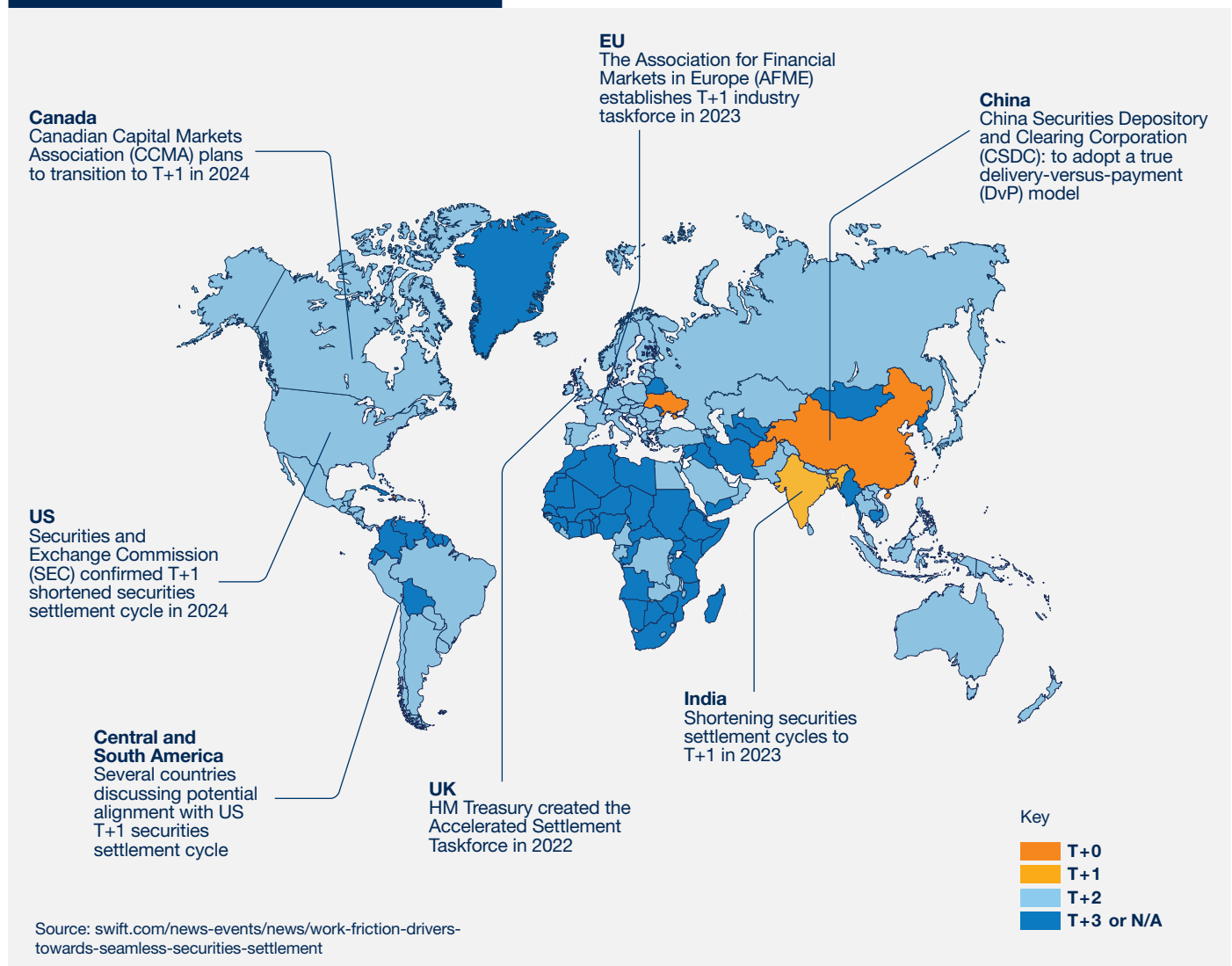
“As the world becomes increasingly digitized and fast-paced, a T+1 settlement cycle is on the horizon in the securities market.”

Before looking at FX, let’s detour to the world of securities, where there is an ongoing debate on whether or not to move to instantaneous settlement.

In securities trading, settlement normally takes place two days after the trade, a widely accepted practice abbreviated as “T+2”. When assets had to be physically exchanged by courier on horseback, T+14 was the typical settlement period. Between the 1970s and 1990s, the settlement cycle shrank to 7, 5 and then 3 days. T+2 became the rule for securities in 2014 for the EU and 2017 for the US, when back-office processes involved more time-consuming manual intervention.

As the world becomes increasingly digitized and fast-paced, a T+1 settlement cycle is on the horizon in the securities market. In January 2023, India completed its transition to T+1, and the US and Canada will do the same for most securities trades starting in May 2024.⁹ The EU and the UK have not yet decided their approach,¹⁰ and most Asia Pacific financial markets currently remain with the T+2 settlement cycle (Figure 2).

Figure 2: Settlement cycles around the world



⁹ See “SEC Finalizes Rules to Reduce Risks in Clearance and Settlement”; sec.gov/news/press-release/2023-29

¹⁰ See AFME (2022) T+1 settlement in Europe: Potential benefits and challenges; in the UK, the HM Treasury created the ‘Accelerated Settlement Taskforce’ in December 2022; initial findings will be published in December 2023, with a full report and recommendations made by December 2024.

The end of the cycle

Ultimately, the evolution of securities settlement cycles has been driven by the practical constraints of what is technically feasible and operationally desirable.

The evolution of the settlement cycle in FX mirrors that of securities, but was driven more by convention than any strict rule. If two market players wish to exchange currencies same-day or even atomic (in the sense of instantaneous) instead of T+2, they are free to do so. Different business, different rules.

Most importantly, the settlement cycle must not be confused with actual settlement, which only happens at the end of the cycle. In a T+2 settlement cycle, the currency trade is agreed on day T and then matched and queued until two days later, when settlement occurs.

CLS provides a five-hour window for funding and settlement on the value date of a trade (i.e., the date of actual settlement, e.g., two days after a T+2 trade). It was designed to allow settlement across the different time zones of participating currencies. Atomic – in the sense of simultaneous but not instantaneous – settlement through CLS is normally completed within two hours.

Compressed for success

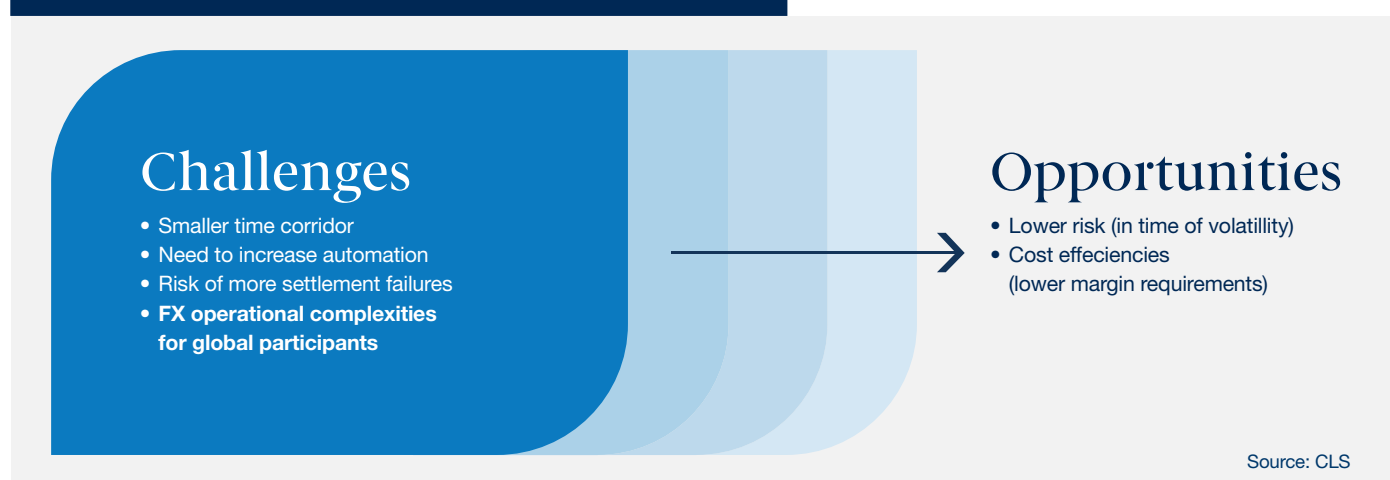
In these times of accelerated change, reliance on T+2 and even T+1 might seem archaic. The question is whether moving to T+0, either same-day or eventually simultaneous, is the next logical step, and what benefits and challenges that would bring to the post-trade and FX world (Figure 3).

Risk is a function of time.¹¹ The upcoming move from T+2 to T+1 for securities in the US and Canada is expected to further enhance market resilience, especially in periods of volatility. It will reduce the amount of time counterparties are exposed and save costs, e.g., by reducing margin requirements. However, the shorter timeframe will also increase pressure on back offices to automate and streamline processes. A shift to T+0 would amplify these benefits and challenges.¹²

The transition from T+2 to T+1 in the US and Canada for securities will also impact the global FX market and the current T+2 market convention for currency trades.¹³ It's all connected. Because of time zone differences, European and Asian market players will have much less time to mobilize the required currency for a T+1 securities trade in the US¹⁴, and may eventually be forced to make a T+0 FX trade settled same day in Europe and Asia, respectively¹⁵ (Figure 4).

“The upcoming move from T+2 to T+1 for securities in the US and Canada is expected to further enhance market resilience, especially in periods of volatility.”

Figure 3: Shorter settlement cycles: challenges and opportunities



Source: CLS

¹¹ See The Economist, “Why it matters when trades settle”; [economist.com/finance-and-economics/2021/10/23/why-it-matters-when-trades-settle](https://www.economist.com/finance-and-economics/2021/10/23/why-it-matters-when-trades-settle)

¹² Bentsen, K. (2022) “T+0? More risk, fewer benefits”, SIFMA blog.

¹³ GFMA (2023) GFXD – FX considerations for T+1 U.S. Securities Settlement.

¹⁴ When the securities market closes in the United States at 4pm, it is already 10pm CET in Europe and 5am JST next day in Japan.

¹⁵ With the expectation that securities positions will be finalized at 9pm in the US, related FX settlement in Europe and Asia would by default be pushed to T+0.

Figure 4: Potential impact of T+1 on the FX ecosystem and on CLS

Example of time challenge

Asset manager (Paris-based) buys US securities on a T+1 basis and executes a USD/EUR trade to pay for US securities (securities trade / settlement and FX trade / settlement are connected)

CET



EST

1 15:00 CET / 09:00 EST - US securities trade executed
(Amount of FX trade USD/EUR is known)

2 23:00 CET / 17:00 EST - Custodian deadline
Asset manager accesses CLS Settlement (via settlement member/custodian)
Custodian deadline is 23:00 CET (still value date T) for the FX trade

3 00:00 CET / 18:00 EST - CLS Settlement deadline
Settlement member / custodian submits payment instructions to CLS Settlement by the predefined deadline on T+1 in order for the FX settlement to also occur T+1

The possible impact on the FX market and on CLS

1. Shortening securities settlement cycles to T+1 may impact the timing of the FX transaction related to the securities trade and may also lead to increased prefunding in USD (which in turn comes with increased liquidity costs). Closer coordination of the security settlement and the FX settlement is required.
2. Time constraints may not always allow the use of CLS Settlement, which could lead to increased FX settlement risk (if no PvP was used) and higher liquidity needs (as multilateral netting in CLS cannot be leveraged).
3. It may also increase same-day FX activity. However, it remains to be seen what types of currency exchange facilities will be used for such same-day activities.
4. CLS has engaged with its members and industry bodies to better understand the potential impact and has formed an Advisory Group specific to this subject.

Source: CLS

It's not all about the tech

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Atomic settlement is an evolving term in the crypto and blockchain space. In FX, atomic settlement – in the sense of simultaneous settlement – is not a novel concept. Systems like CLS Settlement, running on proven technology, successfully provide PvP functionality on a vast scale every business day.

Instantaneous settlement, which could also be categorized under atomic settlement, is likewise technically feasible today. The fact that FX is largely based on the T+2 market standard at present, whereby settlement occurs two days after the FX trade is concluded, is not a technical constraint. It's an agreement reached across a complex post-trade ecosystem with myriad interdependencies between market participants and their processes.

There is a clear trend towards higher speed in the delivery of financial services. T+0 same-day (and eventually even instantaneous) settlement may be the logical endpoint in FX. In fact, due to time zone differences, the shift from T+2 to T+1 for securities delivery may already require that the currencies needed for the corresponding cash delivery are traded and settled T+0. This would certainly require a redesign of back-office operations and bring organizational challenges.

One thing is for sure: new technologies like blockchain alone will not shorten the settlement cycle.

Trusted by thousands of counterparties within the global FX ecosystem, CLS makes FX safer, smoother and more cost effective. Trillions of dollars' worth of currency flows through our systems each day.

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