

A cross-border payments, exchange and contracting platform for the 21st century

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Abstract

Cross-border payments can be slow, expensive and risky. They are intermediated by counterparties in different jurisdictions which rely on costly trusted relationships to offset the lack of a common settlement asset as well as common rules and governance. In this chapter, I present a vision for a multilateral platform that could improve cross-border payments, as well as related foreign exchange transactions, risk sharing and, more generally, financial contracting, based on earlier work by Adrian et al (2022). The approach is to leverage technological innovations for public policy objectives. A common ledger, smart contracts and encryption offer significant gains to market efficiency, completeness and access, as well as to transparency, transaction and compliance costs, and safety.

Cross-border payments can be slow, expensive and risky. In today's world of payments, counterparties in different jurisdictions rely on costly trusted relationships to offset the lack of a common settlement asset as well as common rules and governance. Imagine if a multilateral platform existed that could improve cross-border payments, at the same time transforming foreign exchange transactions, risk sharing and, more generally, financial contracting.

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This chapter provides an overview of the current landscape and presents a path forward on how a newly designed multilateral platform could enhance cross-border payments and eventually stimulate the provision of key international public goods and infrastructures.

Today's world of payments

Currently, at the domestic level, there exist infrastructure and governance structures that allow the private sector to better provide payment and financial services. At the international level, however, there is a lack of coordination that results in insufficient provision of these public goods and inefficient arrangements for cross-border transactions.

Compounding these issues is the disruption in cross-border payments caused by emerging new technologies that allow transactions to circumvent borders and

¹ These are the views of the author and not necessarily those of the International Monetary Fund (IMF), its Management or its Executive Board. This chapter is based on earlier work by Adrian et al (2022).

regulations, as well as the fears of fragmentation that have arisen with ongoing geopolitical conflicts.

Indeed, the need for better cross-border payments has long been recognised by the international community. In the *October 2020 roadmap for enhancing cross-border payments*, G20 Finance Ministers and Central Bank Governors endorsed a set of 19 building blocks that aim to achieve faster, cheaper, more transparent and more inclusive cross-border payment services. These should be safe and secure, and would facilitate economic growth, international trade, global development and financial inclusion.

With these objectives in mind, the design of a multilateral exchange and contracting platform should improve cross-border transactions in two ways.

First, it should centralise payments and settlement and integrate functionalities needed for cross-border transactions, namely, to streamline compliance, reduce the cost of foreign exchange conversion, and better manage financial risks. Second, it should leverage new technologies to better organise payments and associated financial markets. These new technologies can alleviate the underlying obstacles to trade. They include common ledgers with unique states, programmability that allows for automated financial contracts (“smart contracts”) and encryption that ensures privacy. Participants can then interact via a multilateral exchange and contracting system where they can truthfully share information with smart contracts while retaining privacy relative to other parties.

The current landscape is continuously updated by private and public sector innovation. Fast (retail) payment systems are emerging from private bank clearing associations and from central banks (World Bank (2021), Duarte et al (2022)). Fintechs serving households and small businesses start from digital payment functions but build credit and insurance products on top, with synergies in data and financial products. At the wholesale level, large intermediaries like JPMorgan have been developing blockchain-based solutions for instantaneous digital transfers of Treasury and collateral (US money market funds).

The responsibility for tracking transfers and changes in ownership in this landscape rests on multiple brokers and intermediaries that modify their clients’ accounts to reflect those transactions. With infrastructures and legacy systems created to facilitate intermediation, the information from these transactions is recorded in several ledgers for each intermediary and each of the clients that enter a transaction. However, these ledgers do not guarantee a unique common underlying state, and limited communication makes reconciliation time-consuming and costly.

For cross-border payments, many of these infrastructures are insufficient or do not exist. Establishing trust and coping with market failures is more difficult and expensive when transactions must be carried out across borders. At the international level, the lack of common governance across borders makes these public goods scarce or non-existent and leads to high risks, high costs and high concentration.

First, there is no common and widely available settlement asset internationally. Banks must rely on foreign banks to access foreign central bank money via nostro/vostro accounts (ie the same account from the point of view of two different banks), or they must set up branches and be regulated in the countries where they want to have access to central bank reserves.

Second, cross-border transactions usually require that an agent in the payment chain make the conversion across currencies. In many cases, this implies risks and high costs, which are among the main drivers of cross-border transaction costs.

Third, compliance with rules for cross-border transactions is expensive. At the international level, there is a lack of common governance for vetting procedures and monitoring. Not only is it expensive to gather these data on customers; it can also be risky to trust financial institutions from other jurisdictions as the soundness of their procedures can be uncertain.

Specialisation in overcoming these three frictions in cross-border payments gives rise to networks of bilateral correspondent banking relationships, international banking and closed loop solutions that have high fixed costs and economies of scale. The result is concentrated market structures and large intermediaries that play a central role in cross-border payments.

A number of public- and private-sector innovations and initiatives have attempted to improve cross-border payments. Standardised messaging made correspondent banking faster and safer (first with SWIFT and, more recently, with ISO 20022). Netting and settlement has been improved for some currencies. Regional payment platforms have been developed, and experimentation in interlinking domestic payments systems is also ongoing. Payment providers have also been developing new services. Solutions that leverage stablecoins for fast and inexpensive cross-border payments have also grown recently.

Currently, there are related ongoing projects and experimentation that also aim to develop solutions for cross-border payments using distributed ledger technologies (DLT). Some of these projects are in the public sector and led by a consortium of central banks, in some cases in collaboration with the BIS Innovation Hub, while others have been launched by the private sector.

We can build on all these initiatives – and go further.

Tomorrow's world of payments

In a recent working paper (Adrian et al (2022)), we outline a vision for a new platform to facilitate cross-border payments, currency exchange and financial contracting – dubbed the “X-C platform” or just “X-C”. X-C has a centralised, multi-currency foreign exchange trading environment and also allows for the introduction of contracts and policies to manage foreign exchange risks.

Our focus with X-C naturally goes beyond just payments, as we include other functions that are needed for competitive and efficient cross-border payments outcomes. The idea is to create markets that are currently missing, establish infrastructures to fill in gaps in financial access and reduce inefficiencies in cross-border payments. To do so, we are explicit about economic frictions, and we lay out the technological requirements for the solutions we propose. This gives a blueprint for the design of the platform, its infrastructures and its functions.

A first key aspect of the design is that organising cross-border transactions on a multilateral platform like X-C could improve efficiency by reducing transaction chains, settlement risk and the costs of foreign exchange transactions. This hinges on an architecture that would provide key public goods such as (i) a common infrastructure with rules and governance that would shorten transaction chains and give legal certainty to participating agents; (ii) common settlement assets issued by central banks to reduce settlement risk; and (iii) a trading environment to trade these different settlement assets on the platform.

A second key aspect of the design is combining the separate features of new technologies that X-C would require to address market failures and inadequate contracts. These features are one common ledger, programmability and cryptography. The X-C platform uses the common ledger to build markets and keep track of ownership of participants' transactions. The ledger is built to be able to interact with computer code. Smart contracts can read, execute and modify entries in the ledger and automatise financial contracts. Cryptography allows smart contracts to be executed without revealing information to relevant parties.

Each of these three features is used to address different fundamental obstacles to trade that limit contracts. Limited commitment due to the potential renegeing of contracts can be addressed with cryptographic commitments such as atomic swaps (ie the exchange of money and assets from separate blockchains) and automatic transfers. Untrusted messages, where agents are suspicious about whether the other party complies with rules, can be tackled with domestic certification combined with cryptography to preserve data sovereignty and privacy. Unobserved states that generate financial risks can be addressed by aggregating information from privacy-preserving messages. Unobserved actions like front-running (Auer et al (2022)) can be tackled with contracts executed by programmed rules. The design is anchored on contract theory and market design – how agents should interact to best overcome market failures, what they should trade and how markets should be organised for best results.

In the current cross-border payments landscape, large institutions act as dealers and need to cover the cost of holding currency inventories. There are further markups to cover foreign exchange and counterparty risk. The market power from concentration also results in even higher markups. X-C's design aims to increase competition, lower spreads and reduce risks by providing infrastructure, contracts and markets for just-in-time liquidity transfers for previous contract commitments; a centralised multi-currency market; and instruments and markets for better hedging of risks.

Settlement risk is eliminated by immediate guaranteed settlement at a certain point in time or guaranteed contracted settlement at future designated dates and states. This is why we call this a "dynamic ledger", in which messaging, settlement and committing contracts become linked. Digital monies issued by central banks ("certificates of escrow") on X-C can then be used for programmable final settlement in participant countries' currencies. Thus, cross-border transactions using X-C are final and irrevocable.

To deal with data, retain privacy and comply with domestic and international regulations, X-C leverages cryptography to enable regulators and compliance officers to conduct checks, monitor and audit in a privacy-preserving fashion. Financial integrity checks and capital flow management encompass two sets of rules and regulations that can make cross-border payments slower, riskier and more expensive. X-C can help reduce costs and risks by automating compliance with these rules while preserving privacy.

Strong privacy can be retained while preventing untraceable transactions by leveraging "credential providers" and control agencies together with cryptographic proofs (eg zero-knowledge proofs) and checks. This makes it possible to decouple controls and user authorisation from transaction submission and execution.

The functionalities of X-C allow it to manage information generated at the local level efficiently and in a way that preserves privacy. They also allow it to identify and

vet the individuals or firms that X-C's participants may want to serve. For example, a transaction order can read a list of sanctioned individuals and attach a cryptographic proof that the individuals participating in a transaction were vetted and are compliant with, for example, anti-money laundering/combating the financing of terrorism (AML/CFT) rules.

Another consideration is how to organise spot and derivative foreign exchange markets so as to improve market liquidity and better manage risks. Foreign exchange spreads play a large role in cross-border payment fees and are usually a result of wholesale market underdevelopment. A better trading infrastructure, better risk management and a more predictable policy environment can contribute to lower foreign exchange trading risks and better functioning for foreign exchange markets.

Currently, foreign exchange trade is mostly carried out through a set of major banks who carry different currency inventories and act as oligopolistic intermediaries. This requires large balance sheets, resulting in imperfect competition and price distortions. When markets are decentralised or shallower, market power and distortions tend to be greater. The centralisation of information and exchange of foreign exchange trading can help improve markets by increasing transparency and creating incentives to increase competition. It allows for visibility on prices and the quantities that are being actively traded. It also makes it possible to eliminate settlement risk from transactions.

X-C distinguishes itself from other proposals by organising foreign exchange trade in a multi-currency environment that uses market design theory. Intermediaries act as broker-dealers and compete to attract trade from clients. In addition, multi-currency auctions are introduced as a robust solution that generates competitive outcomes and can be implemented entirely through smart contracts where no third-party auctioneer is needed.

X-C also distinguishes itself by enabling participants to hedge foreign exchange risks via forward or contingent contracts by allowing on-platform foreign exchange derivative contracts and markets for those. Agents can also enter contracts that mutualise idiosyncratic risks but are contingent on aggregate shocks. Smart contracts take as inputs the messages of all the agents with private shocks and implement a cross-agent allocation.

X-C's dynamic ledger can help control and manage financial stability risks from these derivative contracts without requiring full escrow or collateral. The dynamic ledger goes beyond preventing double spending of funds and avoids the double commitment of the rights to future funds that have been contracted with others. As smart contracts are part of the ledger, these can be made to be consistent with each other.

X-C can be used to implement policies using smart contracts. It also allows for the possibility of representing additional assets on the platform's ledger, which can be useful for policymaking as well. This makes it possible to implement domestic or multilateral safety nets, create foreign exchange intervention rules and implement them on the platform, and coordinate policies among different central banks.

With escrow accounts on the platform, each central bank can trade in spot auctions and other markets. This shortens payment chains; reduces balance sheet interconnections and makes transactions faster, cheaper and safer than bilateral private claims. Not only can each central bank allow their regulated intermediaries to convert central bank reserves to certificates of escrow and vice versa, but they can also expand their balance sheet directly through trade on the platform.

Smart contracts can also be used to deploy cross-country liquidity. Participating central banks could establish borrowing and lending arrangements in which they can get certificates of escrow from another central bank participating in the platform and use them to provide liquidity to its domestic private platform participants. Cross-border liquidity provision arrangements could include liquidity bridges (used on a relatively routine basis), currency swaps (used under exceptional circumstances) or regional financial arrangements.

Cryptography is needed to preserve data confidentiality and market integrity at the macro level as well. This would allow central banks to keep their foreign exchange positions, policy and reserve goals to themselves but still use that information to tailor swap line contracts and to achieve a degree of policy coordination.

Foreign exchange intervention rules can also be implemented on X-C. Intentions embodied in messages and actual bids from central banks can be aggregated in a confidentiality-preserving fashion. Each participating central bank can communicate its preference for volatility bands for foreign exchange rates that reflect its policy choices given its risk aversion and reserve commitments. For example, a central bank can input contingent bids in auctions. These input parameters are not known to anyone, but a smart contract can find the best bands that satisfy all central banks and their reserve commitments and automatically intervene when these volatility limits are reached. This would be an improvement on how swap lines are currently used.

This use of X-C's multilateral confidentiality-preserving bidding schemes could provide additional coordination tools and build trust among central banks, thus expanding access to international financial safety nets.

Conclusion

In conclusion, a new multilateral exchange and contracting platform that centralises payments and settlement and that integrates functionalities needed for cross-border transactions, as outlined above, would help streamline compliance, reduce the cost of foreign exchange conversion and better manage financial risks. New technologies can be leveraged to better organise payments and associated financial markets and allow for the design of a multilateral exchange system where participants can truthfully share information with smart contracts while retaining privacy relative to other parties.

While new technology and appropriate economic design can go far in improving cross-border transactions, there are hurdles that require multinational coordination at the legal and political levels. These include governance agreements and aligned AML/CFT, legal and regulatory frameworks. More reflection will also be needed to ensure platforms' operational stability given their systemic nature. Finally, further work is needed to ensure regional platforms are interoperable, which will help counter geopolitical fragmentation.

Other important questions arise in terms of the role of the public sector (both country authorities and international organisations) in operating and developing platforms. Given mandates related to public policy goals, the public sector faces better incentives for developing public goods – but these public goods will only be widely adopted when their use aligns with the incentives of private sector providers and users. The role of the private sector in ensuring adoption and sustainable business models should also be further explored.

While these are all difficult issues, the prospect of a solution where technological innovations are leveraged by the public sector for public policy objectives is one that should spur the ingenuity needed to address these challenges.

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