

1 Smart contracts: the ultimate automation of trust?

Smart contracts could become a transformational wave in banking

A theoretical concept developed in 1994, the materialisation of contracts capable of enforcing themselves, is now facilitated by blockchain technologies. The ability of smart contracts to alter the way in which many traditional processes are performed is potentially immense. However, standardisation and wider adoption of the blockchain is needed to turn this potential into reality.

What are smart contracts?

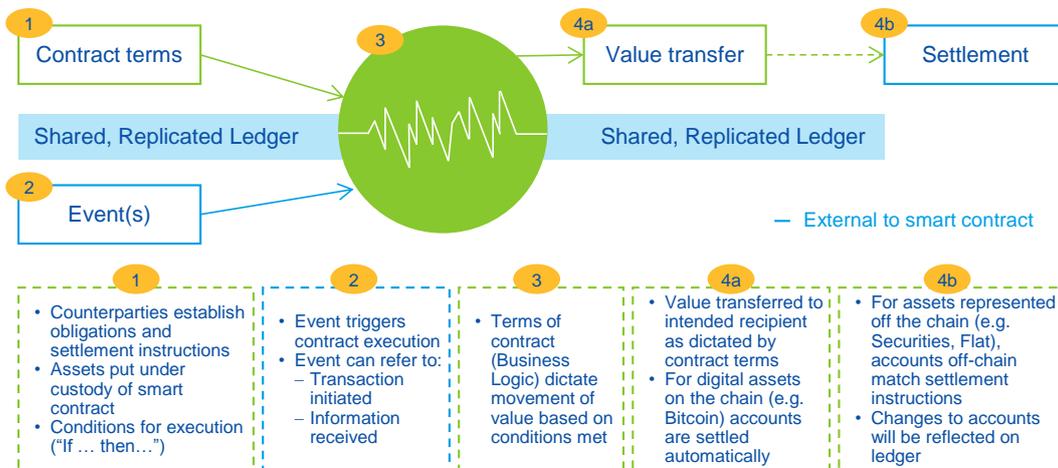
The term, *smart contract*, refers to any contract capable of automatically enforcing itself, without a third party between individual participants. Smart contracts are written as computer programs rather than in legal language on a printed document. The program can define strict rules and consequences in the same way that a traditional legal document would, but unlike a traditional contract it can also take information as an input, process it through the rules set out in the contract, and take any actions required of it as a result.

The concept was defined in 1994 by cryptographer Nick Szabo, but in practice remained unrealised because the technological infrastructure needed to support it did not yet exist. Nowadays, the advent of crypto protocols and the blockchain is changing that, and as a result the idea is seeing a revival.

In brief, smart contracts are modular, repeatable and autonomous scripts, usually running on a blockchain, which represent unilateral promises to provide a determinate computation. These scripts are stored in the blockchain at a particular address, which is determined when the contracts are deployed to the blockchain. When an event prescribed in the contract happens, a transaction is sent to that address and the distributed virtual machine executes the script's operation codes (or *clauses*), using the data sent with the transaction.

Smart contracts can be coded to reflect any kind of data-driven business logic: from actions as simple as voting for a post in a forum, to the more complex such as loan collateralisation and futures contracts, and to the highly complex such as repayment prioritisation on a structured note. A flow chart for applying business logic with smart contracts would be the following:

Figure 1.1
Applying business logic with smart contracts



Source: BBVA Research

Smart contracts: use cases in financial services

While there have been hundreds of proposed use cases for smart contracts, some of the most (directly or indirectly) relevant to financial institutions would include:

- **Loans** could be stored as smart contracts in the blockchain, together with the collateral ownership information. If the borrower misses a payment, the smart contract could automatically revoke the digital keys that grant his access to the collateral.
- **Inheritances** could be automated by setting the allocation of assets after death. It might be as simple as moving an adjustable slider that determines who gets how much. Once the smart contract can verify the triggering condition — in this case, death — the contract goes into effect and assets are divided up.
- **Escrow.** Smart contracts can easily be set up as escrow accounts that monitor an exchange between two parties. The buyer of some goods or services would transfer the payment to the contract account. The contract would monitor external services (i.e. GPS tracking) and, when ownership has been transferred from the seller to the buyer, the contract would automatically release the funds to the seller..
- **Cryptocurrency wallet controls.** Wallets controlled by contracts could include many different types of complex controls, from daily withdrawal limits to granting and revoking access for specific entities. A generalisation of this will lead to the notion of **programmable money**, a type of money which can be set up to be spent only on certain kinds of assets, in a geographical area, between two dates, etc.
- **Capital Markets.** Securities based on payments and rights that are executed according to predefined rules can be written as smart contracts. There are already experiments for the issuance of *smart bonds* and the management of private stock markets. Contracts that monitor the performance of digital or non-digital assets can also be used as futures, forwards, swaps and options.

Smart contract issues

Implementation of smart contracts is far from easy, due to relevant issues related to their definition:

- **“Real world” enforcement.** Smart contracts are simply software and as such they can “enforce” or, better, administer the state of the data to which they have access on the blockchain. Yet, beyond that, they have little reach. For the foreseeable future, they will not be enforceable in any court and few parties will be able to rely on smart contracts alone to structure all of the terms of a commercial transaction.
- **Flexibility.** Smart contracts seem to assume that parties can determine all aspects of the negotiations at the onset of their transaction. But in the real world, contracts often end up being imprecise, because what happens after parties reach an agreement is often unpredictable. Smart contracts should have mechanisms to allow parties to amend their agreements when mutually desired.
- **Adoption.** The most significant benefits of smart contract adoption come when numerous commercial entities begin to automate their interactions, by using smart contracts and a blockchain that is purpose-built for multi-party interaction. Given that only a limited number of individuals currently have the technical proficiency to develop and deploy smart contract systems, this is a real challenge.
- **Liability.** Smart contracts could pose an important challenge for regulators because they allow the creation of decentralised automated versions of P2P services like Uber or Airbnb, connecting people and handling payments without the need for a company in the middle. Regulators would be left with nothing to target, because there is no legal entity behind it.

Bottom line

The main purpose of smart contracts is to enable people to do business with strangers, usually over the internet, without the need for a trusted intermediary. The idea is that software can automate much of the process, allowing the enforcement of contractual promises without human involvement. The blockchain assures that everybody is seeing the same thing without one side having to trust the other side to be honest, because anything that is in the blockchain is unforgeable. This may sound like we won't need lawyers anymore. But smart contracts are an evolution of the legal system, not its replacement. The role of lawyers might shift from adjudicating individual contracts to producing smart contract templates on a competitive market. Contract selling points would be their quality, how customizable they are, and their ease of use. In the long term, we could see the surge of organized smart contract marketplaces that, in turn, would be fully managed through smart contracts, thus closing the circle.

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