



GENERATING **BANKING & FINANCIAL SERVICES** IMPACT

Impact of distributed ledger technology on syndicated loans



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Introduction

In the last year, distributed ledgers (also referred to as blockchain) have been touted as a panacea that will disrupt banking and capital markets. One of the most likely areas for disruption is the syndicated loans market. With a decentralized market, a distributed ledger system could serve as an asset register and ledger for both the primary and secondary markets. However, the syndicated loan market suffers from three key problems:

1. The process by which these loans are syndicated to investors and the price at which they are sold (whether at par, premium, or discount) is highly opaque
2. Settlement takes time and locks up significant amounts of capital
3. Costs associated with booking and serving these loans are very high

This paper evaluates the impact of distributed ledger technology on the above three challenges. While distributed ledger technology will have a beneficial impact in addressing these challenges, the impact will be evolutionary rather than disruptive. This document makes the assumption that the specific model of this technology applicable to capital markets are the notion of private ledgers and not public ones like bitcoin or ethereum. In the following sections, we describe the **current market infrastructure** of syndicated loans^[1], what they would look like if distributed ledger technology were **applied end to end across participants**, and then discuss the **potential impact** of this technology on syndicated lending.

1. As per the annual Shared National Credits (SNC) Review published by the Federal Reserve, the total outstanding syndicated loans in 2015 was \$1.9 trillion. As per the SNC Review 2015, there were 10,675 credit facilities made to 6,571 borrowers. There are two broad categories of lenders in this market banks and non-banks. As per the SNC review, banks contributed to 77% of total commitments and non-bank institutions (CLOs, hedge funds, retail mutual funds etc.) formed the remaining 23%.

Section 1:

Distributed ledger technology—5 foundational elements

This section describes the foundational elements of distributed ledger technology. These elements will be explained using a simplified illustration from the syndicated loan market.

Illustration

- Bank A makes a loan of \$50 million to a borrower at a price of LIBOR + 5
- Bank A then seeks to sell \$20 million of this loan through its trading desk, Trade Desk A
- Investor Bank I seeks to purchase this \$20 million slice of the loan through its trading desk, Trade Desk I
- As per the current process, the two banks negotiate the trade over phone, email, or fax. In this example, Bank A and Bank I agree to trade at “par,” meaning Bank I will pay Bank A the full \$20 million for the 40% share of the loan. Bank A, as administrative agent, will continue to receive principal and interest payments from the borrower and disburse to Bank I its pro-rata share
- Over time, Bank A sells parts of the loan to three additional investors: Bank I-1, Bank I-2, and Bank I-3. Bank A, in addition to being the lead arranger,

also plays the role of the administrative agent, interfacing with the borrower on behalf of the syndicate group and routing the flow of cash between the borrower and the investor group

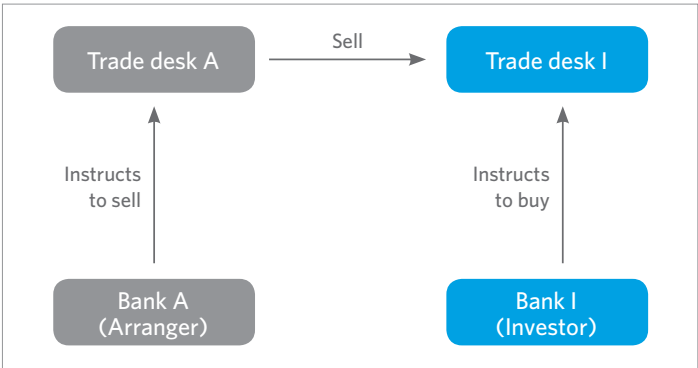


Figure 1

In the current state, each participant maintains its own set of records. Even though all investors are being paid under the same contractual terms, every party is maintaining its own book of records^[2]. The left side of the below diagram shows the current state. The right side of the diagram shows a distributed ledger enabled process where there is only a distributed ledger database serving as the single source of truth. Agent and investors all connect their downstream systems to this distributed ledger database (see figure 2).

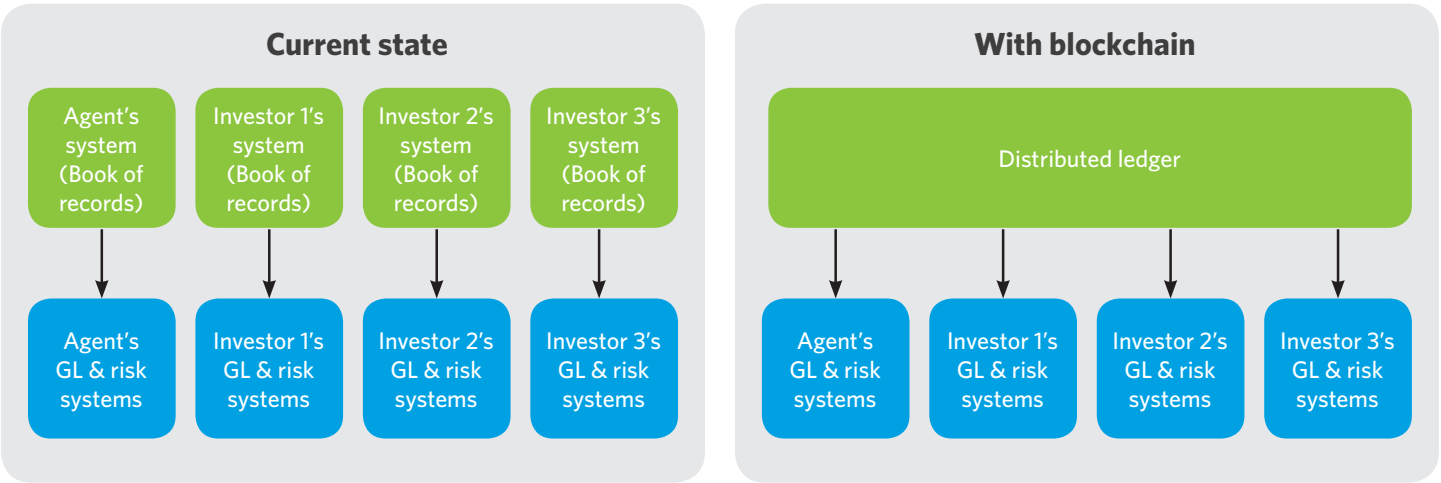


Figure 2

2. There are initiatives underway to create automated feeds from the agent bank’s system to the investors’ systems. However, the penetration of these ‘straight through processing’ technologies between the agents’ and the investors’ systems is very limited.

Central recordkeeping has existed for a long time. But distributed ledger technology provides the benefits of central recordkeeping without the need for a central recordkeeper. The five foundational elements of the technology solve the five key data concerns facing participants in a syndicated loan.

	Concern	Distributed ledger foundational element
1	Data will be lost	Distributed storage
2	Unauthorised users can access and modify data	Digital signatures
3	Lack of historical audit trails	Transaction chain
4	Data is not accurate	Validation
5	Data will be retrospectively changed	Blockchain

Figure 3

Each of the foundational elements of this technology has existed for a while. The distributed ledger technology can be viewed as a synthesis of these technologies.

Element 1: Distributed storage, data concerns, and loss of data

Figure 4 below compare how data will be stored in a traditional central database compared to a distributed storage model. In the central

database model, each bank participating in the syndicated loan is reporting data to the central database which is being maintained by a central recordkeeper in a central server^[3]. In a distributed storage model each bank is still contributing data to the database but now the architecture is a peer-to-peer network or a distributed ledger. Everyone has the exact same copy of the database stored in its computer and all computers (known as nodes) are linked to each other so that the database is at any time synchronized across the network. A change to the database made in one node will be reflected in all other nodes.

Distributed storage: Why does it matter?

Distributed Storage implies that at any point of time everyone has a copy of the exact same database and if any of the nodes fail (for example Bank A’s server crashes), there is no loss of information. Of course the same result can be obtained if the central record-keeper is maintaining appropriate backup procedures. However, imagine a situation where the information in the database is not only used for analysis but to trigger real world action. Let us say that we build a program that triggers an automatic wire between the selling and the buying bank every time a change in ownership is recorded in the database. In such a scenario, participating banks in

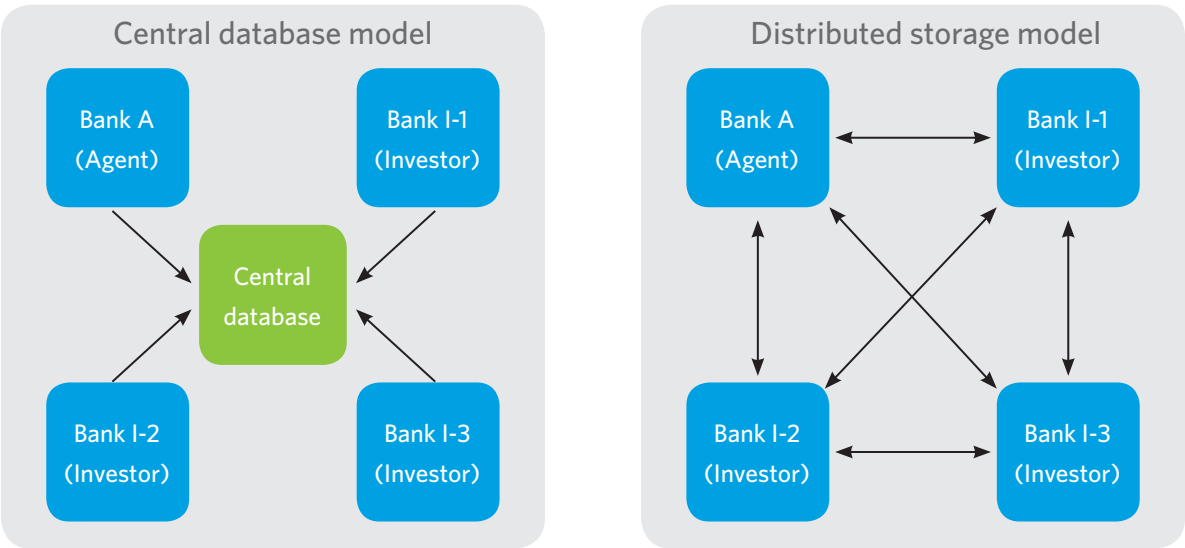


Figure 4

3. The closest construct to a Central Database in the loan market is the LoanServ product that was originated by DTCC and is now owned by Markit. GENPACT | White Paper | 5

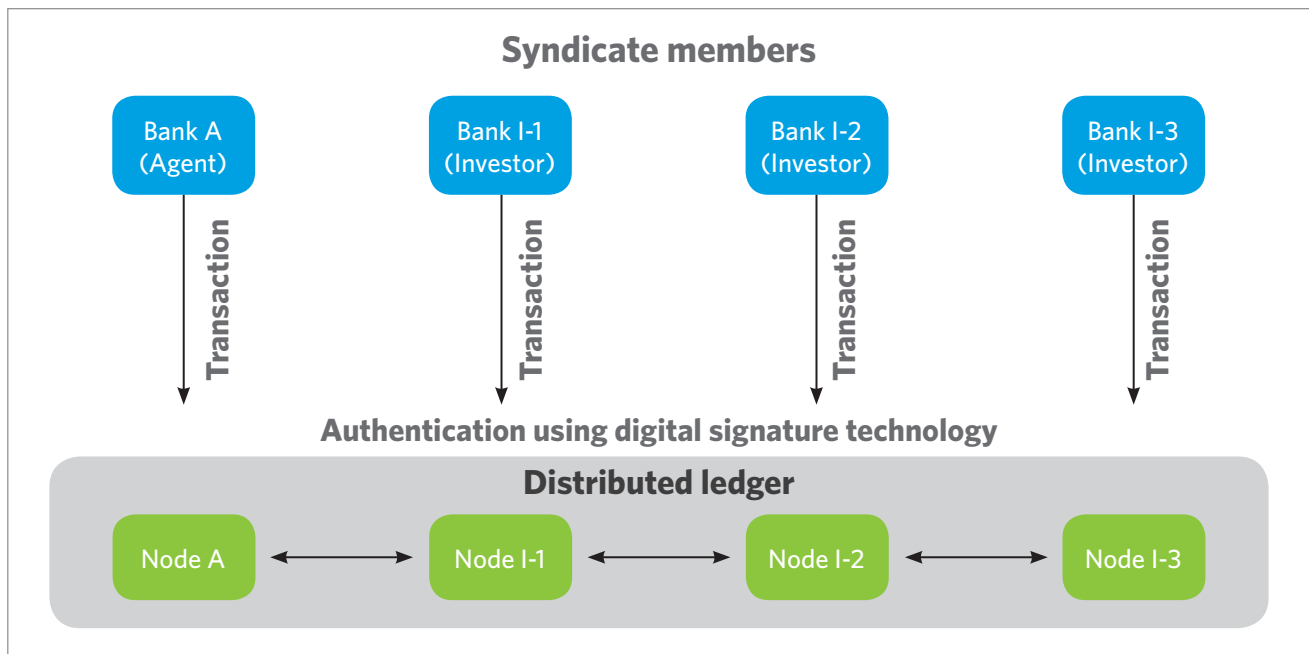


Figure 5

the syndicated loan may not be willing to trust the backup procedures of the central record keeper.

Distributed Storage enhances the security of the data by increasing the level of redundancy but does not address the issue of data accuracy. For data accuracy, other building blocks of the technology become important and those are explained below.

Element 2: Digital signature, authentication, and non repudiation

A key element of ensuring data accuracy is ensuring that any record added to a database can be traced to the user who added the record with a high degree of certainty. Blockchain uses the concept of digital signatures, a concept that, like distributed storage, is not unique to blockchain (see figure 5).

Digital Signature: Why does it matter?

The technology behind digital signatures ensures the following:

- The digital signature is derived from two attributes: the user who processed the transaction, and the content of the transaction. Since the digital signature is unique to a transaction, the authentication is happening at the transactional level. It eliminates the risk of repudiation. Users cannot claim later that the distributed ledger does not reflect the truth
- If a physical document is signed with a handwritten signature, there is a risk that the contents of the physical document can be tampered with. Digital signatures eliminate the risk of tampering since tampering causes the value of the digital signature to change and it

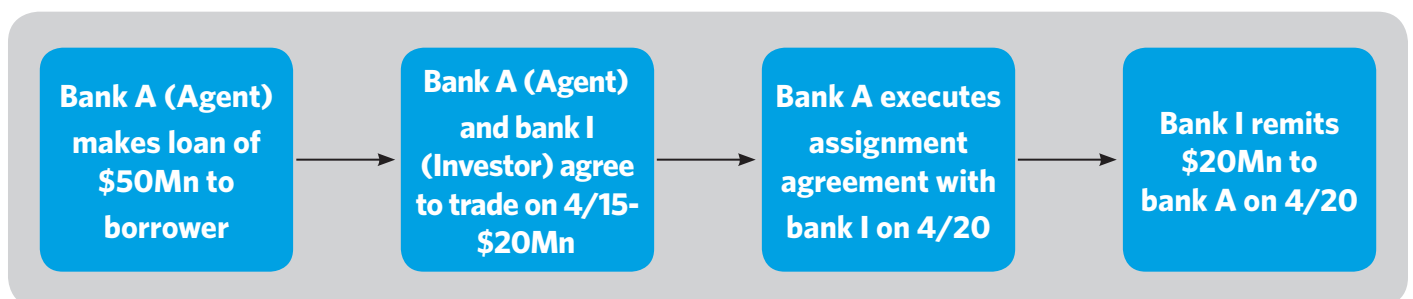


Figure 6

will no longer point to the user who posted the unadulterated transaction

Element 3: The transaction chain and traceability

The distributed ledger stores the history of activity, not just the ending balances. During the life of the illustrative syndicated loan, thousands of transactions will take place. These transactions could involve exchanges with the borrower and exchanges between investors as new investors join and old investors pay out. The distributed ledger will track the entire history of activity (see figure 6).

Transaction Chain: Why does it matter?

The transaction chain ensures that it is possible to track the current state to its roots. Consider a scenario where an arranger bank sets up a syndicated loan on a distributed ledger and all participating banks subscribe. Now say that, two years after the deal closes, a participating bank

does not agree with the share of interest payment it is receiving. The distributed ledger has a history of all transactions, hence all participants can audit the historical trail.

Element 4: Validation and accuracy

Validation is the process by which the content of the transaction is validated, while digital signature authenticates who performed the transaction, validation is the process of verifying the content of the transaction.

When transactions flow into the distributed ledger, they must first be confirmed. One way to validate or confirm transactions is through a voting mechanism. For example if both Bank A and Bank I vote that the trade occurred, then it can be agreed that the transaction is valid. Banks may choose to outsource this function to neutral validators. For example, a validator may confirm

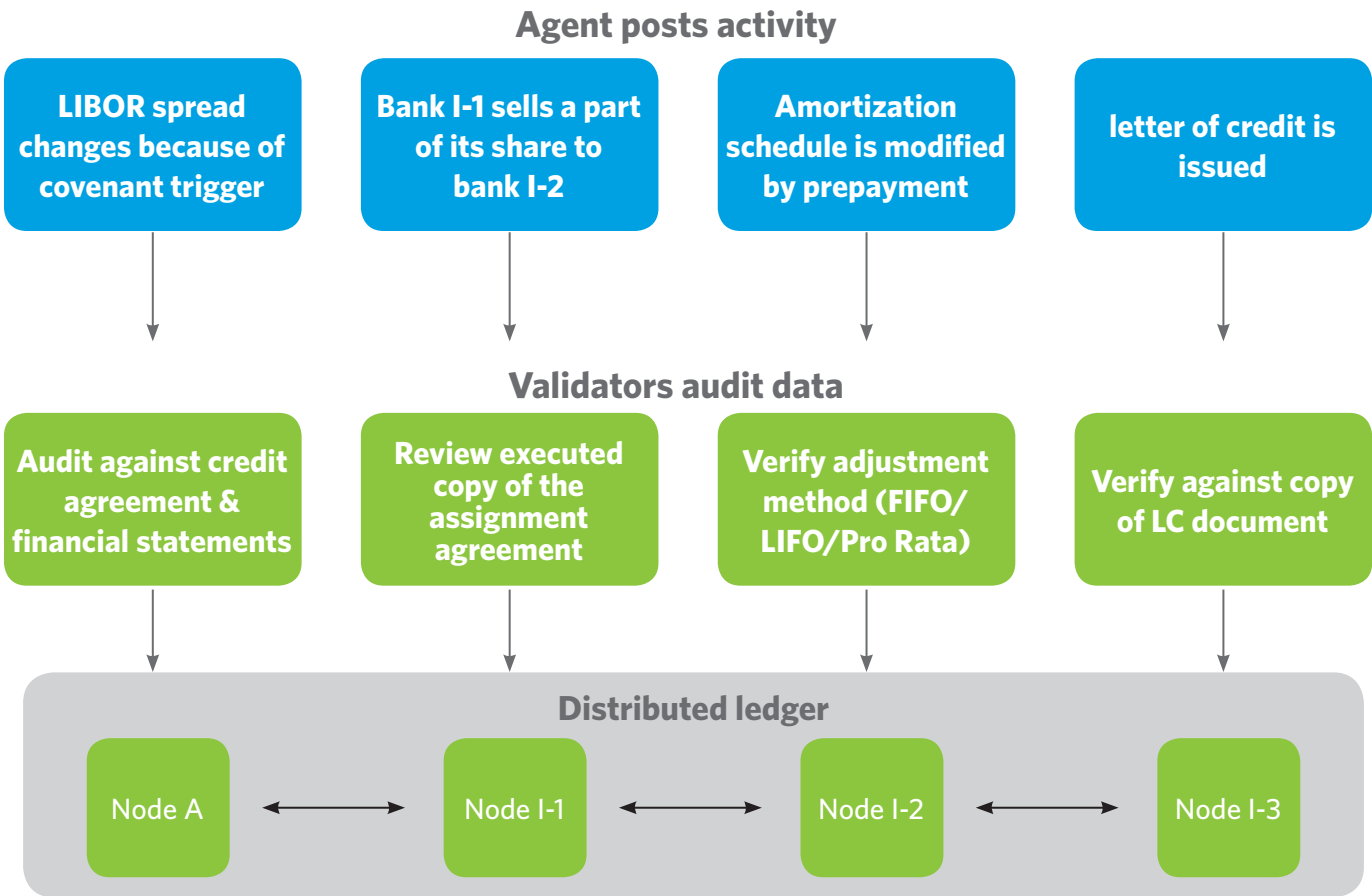


Figure 7

4. Also known as Transfer Certificates outside the US

a trade transaction within the distributed ledger by comparing against the executed copy of the assignment/agreement^[4]. In this hypothetical example, a group of validators are appointed by investors on a syndicated deal and these validators verify transactions posted by agent Bank A into the distributed ledger (see figure 7).

Validation: Why does it matter?

The validation mechanism allows the members to agree on a single source of truth, defined as anything that exists in the distributed ledger. This opens up the possibility to trigger real world actions of financial value based on the data in the distributed ledger. There are some caveats, however:

- While the record in the distributed ledger is considered to be the truth, it still may not have legal validity. For example, in the event that Bank A and Bank I were in a dispute over ownership in a court of law, it is not yet known what weight would be given to transactions in the distributed ledger
- There is no guarantee that every syndicate member will report real-world transactions into the distributed ledger. This brings us to the question of why syndicate members would cooperate—and why they would invest the effort in validating transactions. The underlying premise is that the benefit of using this technology outweighs the effort, but, again, this has not been tested

Element 5: The Blockchain and Immutability

After transactions have been validated and entered into the distributed ledger by authorized users,

there is still a risk that users can retrospectively modify the data. The description in figure 8 below shows one of the ways by which immutability can be achieved. This was used for the blockchain model that was behind the Bitcoin network and that is how the term ‘blockchain’ came into being. However this is only one ‘how’ behind the ‘what’ of immutability and developers building distributed ledger platforms may choose a different method than what is described.

In the blockchain iteration of distributed ledger technology, transactions are grouped into clusters called blocks. Transactions are assigned to blocks through the validation process (Element 4). A transaction that is unassigned to a block has not been validated yet. To understand this concept, assume that nine transactions are processed in the life of a loan. Assume that the first three transactions all happened at roughly the same time and are grouped in Block A. Block A is now assigned a unique code by the system and this unique code is called a hash. The code assigned to the block is the result of a mathematical transformation process. Once the transactions are grouped into three blocks—Block A, Block B, and Block C, with each block assigned a hash—they flow into the distributed ledger in a sequential order. So a set of transactions belonging to a block can be considered transactions that occurred at roughly the same time (see figure 8).

The hash, as mentioned, is a unique identifier assigned to a block of transactions by the system. There are three key attributes:

1. The hash assigned to the block is derived through a mathematical transformation process

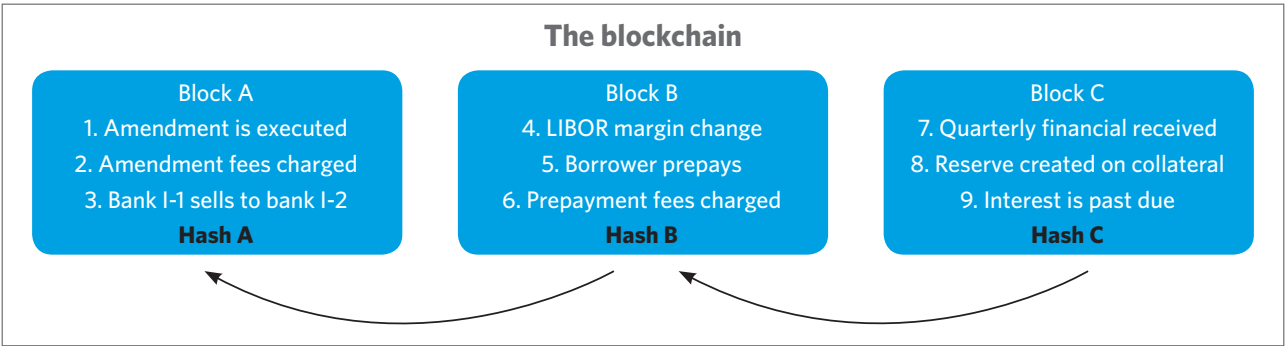


Figure 8

that takes as an input the underlying details of the transactions in the block. After transactions 1, 2, and 3 are grouped into Block A, if details of the underlying transaction are changed the hash assigned to Block A will change as well.

2. Each block contains a reference to the hash of the previous block. So if a change was made to Transaction 1, the value of Hash A will change. But now Block B, which was referencing the old value of Hash A, is no longer valid either—hence Block B will now show an error. This will cascade down to Block C because Block C was referencing Block B.

Because of the above, any attempt to modify data in the distributed ledger is immediately discovered by all participants. Transactions that were assigned to blocks, and hence considered validated, are now back to being unconfirmed.

The Blockchain: Why does it matter?

The concept of delivering “immutability” through technology has the following benefits:

- It creates trust: All participating banks can be sure

that the data cannot be tampered with, and that, in the event of any tampering, the breach will be discovered immediately

- It solves the problem of “double spending.” After selling \$20 million, Bank A has only \$30 million of the original \$50 million left. Suppose Bank A now tries to defraud the counterparties by selling \$50 million to another bank. Since the blocks are sequentially ordered by time and within the blocks, transactions are also sequentially ordered by time, and the system is intelligent enough to know that Bank A does not have \$50 million to sell^[5]

Summary

Distributed ledger technology provides participants in the syndicated loan market a platform for a single source of truth. The data in the distributed ledger is immutable, subject to high levels of authentication, and reflects the truth based on an agreed-upon validation mechanism. The diagram below illustrates how the five foundational technology elements can result in the creation of a secure database without the need for a central recordkeeper (see figure 9).

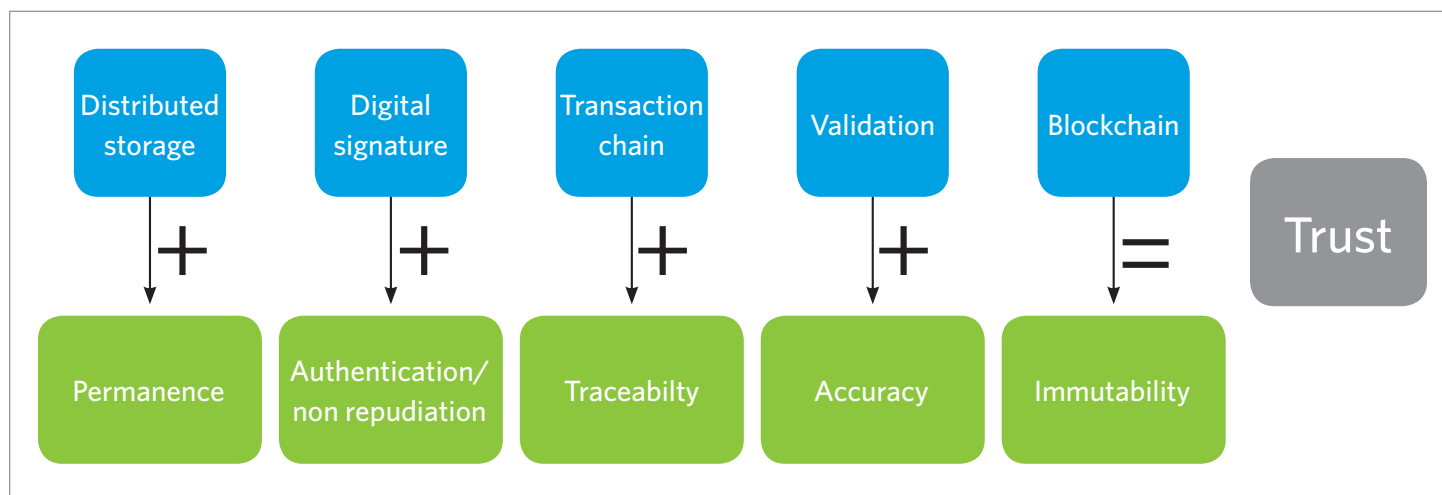


Figure 9

5. It is worth noting here that we envision the Blockchains in syndicated lending to be private ledgers with access restricted to a finite set of participants who have been KYCed. Hence the elaborate security procedures required in an open ecosystem like Bitcoin may not be needed in syndicated lending.

Section 2:

Overview of smart contracts

Smart contracts can be viewed as a computer code version of a contractual term, or as a kind of if-then statement. Consider the following example of a contract term:

If a prepayment is made on a term loan within the first two years of funding, then charge a prepayment penalty equivalent to 1% of the prepaid amount.

- Calculate the prepayment penalty
- Post a bill for the penalty to the borrower's online banking account
- Initiate a wire transfer for the prepayment penalty from the borrower's bank account to the lender's bank account
- Distribute the pro-rata share of the prepayment penalty to investors

Figure 10 reflects the concept of a smart contract which is not a new concept. For example, a parking garage key may be preprogrammed to deactivate if a user is delinquent on paying the monthly charge. Or an automotive lender may preprogram a car's ignition not to switch on if the owner fails to make a monthly payment. What is new is that advancements in technology now

allow smart contracts to expand deployment on an unprecedented scale.

Smart contracts: Why do they matter?

Distributed ledger technology allows for the creation of a trusted source of transactional data. The transactional data is a reflection of real-world events that have already occurred. However, distributed ledger technology can not only store transactional data, but also through computer code reflect if-then statements and trigger outcomes in the real world. For example, when the distributed ledger records a trade between Bank A and Bank I, it could cause a funds transfer between bank accounts. Smart contracts, thus, expand the functionality of distributed ledger technology.

The coded if-then statement would benefit from the same traits that are applicable to the data contained in the distributed ledger: permanence, immutability, validation and high levels of authentication. Syndicate lenders and the borrowers could agree on the terms of the smart contract within the distributed ledger and be reassured that the code, once validated, will not be

The 'If' statement



The 'Then' statement

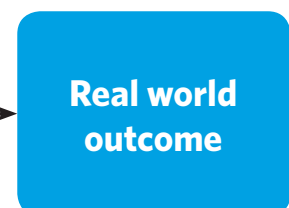


Figure 10

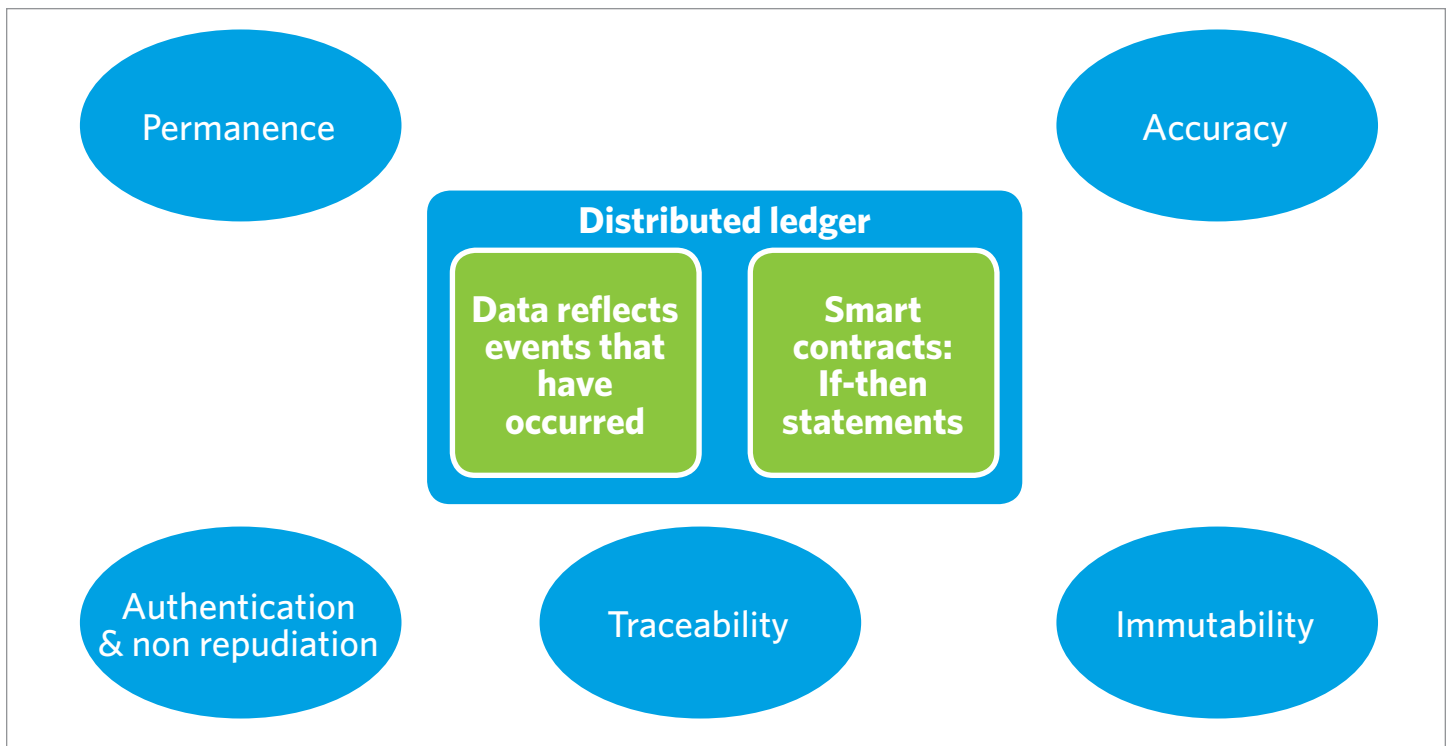


Figure 11

tampered with. This code could then trigger outcomes in the real world based on certain triggers.

Summary

Smart contracts technology allows contractual terms to trigger real - world actions without manual intervention. By creating a central, trusted source of truth, the distributed ledger provides syndicate members a reliable source of data on the basis of which they can take action. Smart contracts expand the potential for disruption by automating the execution of some of those actions (see figure 11).

Distributed ledger technology thus solves the problem of central recordkeeping without the need of a central agency. The key question is whether solving this problem will deliver the following outcomes:

- Greater transparency in how loans are priced and sold to investors
- Faster settlement times
- Lower servicing costs

The topic is further discussed in next section.

Section 3A:

Impact of distributed ledger on bookrunning

The following is a synopsis of how the process of bookrunning typically works today.

Current state

- A private equity sponsor ABC Capital seeks to acquire Company XYZ. The sponsor seeks to fund 30% of the acquisition price via a senior debt facility and invites mandates from financial institutions who compete to play the lead arranger role. The total size of the proposed debt facility is \$500M. Prospective lead arrangers submit bids
- Bank A wins the mandate. As the lead arranger and administrative agent, Bank A seeks to hold 10% of this facility and syndicate the remaining 90%. The arranger also assumes underwriting risk^[6]. If Bank A is not able to raise the financing, it must either hold more than the 10% it intended, or sell pieces of the loan at a discount to investors

Figure 12 below depicts the various stakeholders

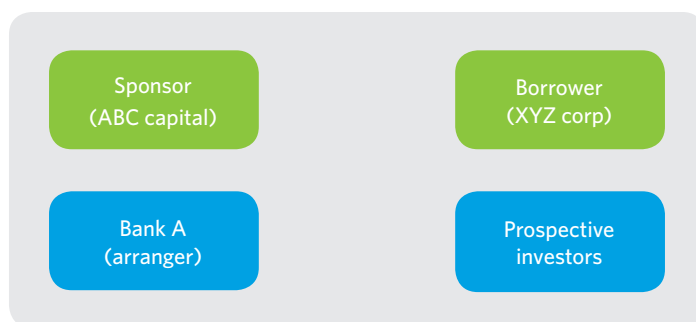


Figure 12

- Bank A issues a Commitment Letter that outlines key contractual terms. The final version of the contract is documented in an executed Credit Agreement. However, the Commitment Letter outlines all key terms and has some structural flexibility built in to

enable clearing of the syndication

- There are two streams of activity depicted in figure 13 below that occur in parallel between the time the Commitment Letter is issued and closing date
 - Stream 1 led by Bank A's Risk Team, which performs all the due diligence on the borrower
 - Stream 2 led by Bank A's Trade Desk, which must place the debt with syndicate members

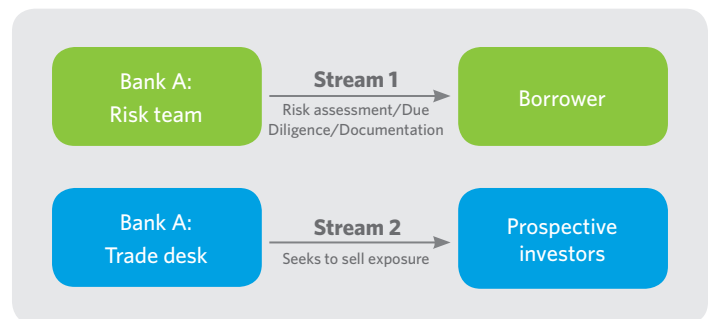


Figure 13

Here are some key characteristics of Stream 2:

- All negotiation occurs in private one-on-one conversations between Bank A's trading desk and prospective investors
- Investors submit their bids (what interest rate they expect on the deal) and how much they are willing to buy via fax/email/telephone conversations
- The trading desk accumulates bids in a spreadsheet to determine how much has been allocated; if there is not sufficient demand, Bank A may have to sell portions of the loan at a discount so that investors get the yield they expect
- The sharing of information with investors occurs via digital channels such as Intralinks, Syndtrak, and DebtDomain

6. In an underwritten deal, the lead arranger assumes the underwriting risk. In a 'best-effort' syndication, if the deal does not generate enough demand, the deal will simply fall through.

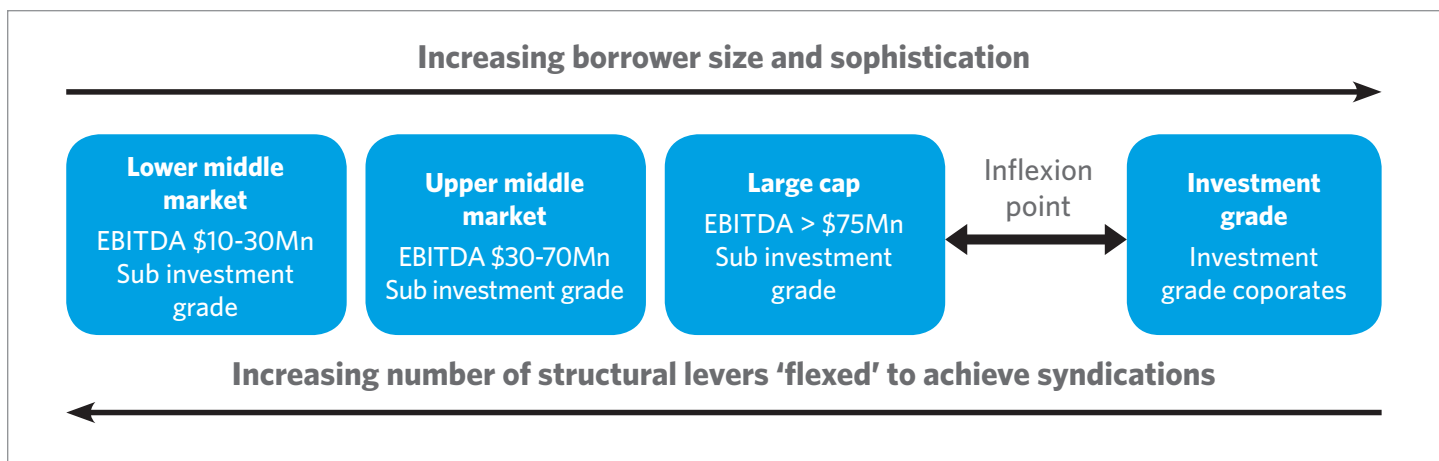


Figure 14

Using distributed ledgers

What if the terms of the deal were put on a distributed ledger database, and the entire bookrunning process occurred in a manner similar to an auction system? Likely the fundamental dynamics of the process would remain the same. There are multiple elements being negotiated with investors, the challenge is not a price discovery problem but a structure discovery problem. Since multiple elements are involved, the tradeoffs that counterparties make cannot be easily subject to an auction system. The elements of the structure that are being negotiated include:

- The spread that will be charged to the borrower
- The amount being subscribed - an investor may offer to buy \$20M if the interest charged to the borrower is Libor + 400, but offer \$30M if the interest charged is Libor +500
- Covenants that put restrictions on the borrowers - some investors may seek stricter covenants in return for participating in the deal
- Covenant ratios
- The financing structure of the acquisition between first lien loans, second lien loans, high yield bonds and equity contribution by the Sponsor
- Amount and type of fees
- Call protections including penalty paid by borrower for prepayment
- Shorter maturities

There is a lot of back and forth discussion that occurs between the arranger, sponsor, borrower, and investors as the latter seek to understand the deal structure, credit quality, and industry dynamics. Syndicated deals cover a wide spectrum as shown in figure 14 from right to left in this continuum^[7]. The number of structural variables being “flexed” to achieve a successful syndication increases and the emphasis on “price” alone to clear the syndication diminishes, from right to left.

Further, in periods of financial crisis, the structural provisions subject to “flex” widen as the bargaining power shifts from the sponsor/borrowers to the lenders. An online process of bidding may be more effective for investment grade loans that tend to be more standardized. All of the underlying business dynamics described above will continue to be applicable with distributed ledgers.

While the negotiation process can continue to be offline, there are operational efficiencies to be gained in the middle and back office by recording the results of the bookrunning process on the distributed ledger, instead of on an Excel spreadsheet, as is commonly the case today. Capturing the final outcome of the bookrunning process in a secure distributed ledger sets the stage for more efficient handling of subsequent processes discussed in the following two sections. Figure 15 below is a conceptual diagram of the distributed ledger storing the final deal structure that was discovered as an outcome of the bookrunning process.

7. The investment grade syndicated loan market is significantly different from the sub-investment grade market in terms of loan structures and participating lenders and as such represents an inflection point in the market.

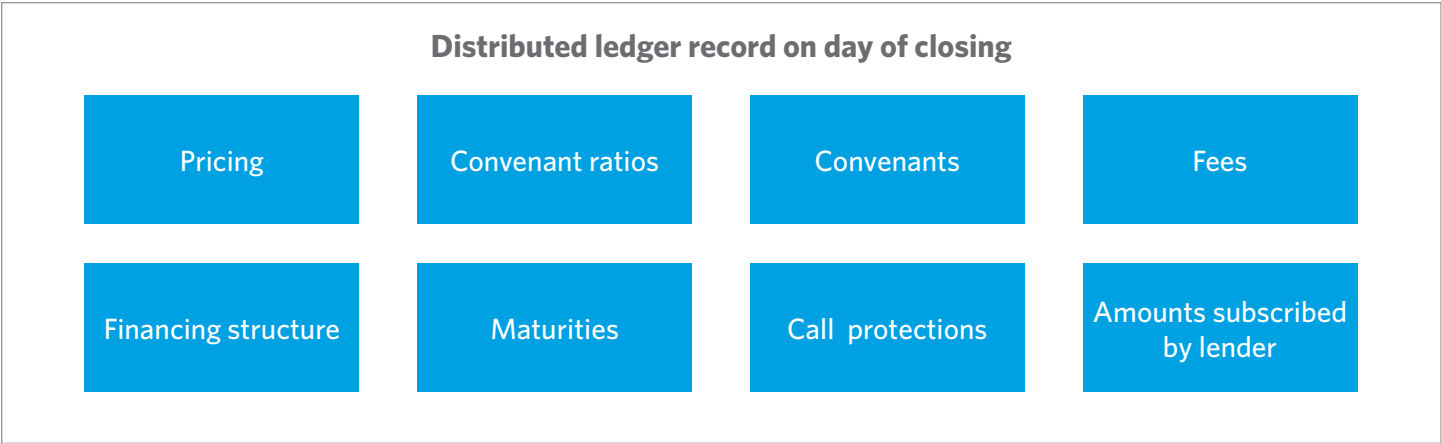


Figure 15

It would require significant behavioral change for trading desks to move away from Excel spreadsheets, as traders are not likely to see any tangible P&L benefit. However, once the bookrunning process is complete, the middle office can enter the final terms in the distributed ledger

(existing systems in the marketplace could be the user interface) and from that point forward, the distributed ledger could serve as the single source of truth. As terms are amended during the life of the deal, the modifications would flow into the distributed ledger as additional transactions.

Impact of distributed ledger on trading

The following is a synopsis of how the trading process typically works today, continuing from the illustration in the previous section.

Current state

- Bank A (the Lead Arranger and Administrative Agent) received bids from 100 investors. The commitments by the investors add up to \$450 million with Bank A holding \$50 million
- Now these commitments will be sold over a period of weeks through the process of “primary trading.” Typically primary trades are completed within 30–45 days of the deal closing. During this period, the arranging bank will have a higher hold than its target hold

The following diagram reflects two key dates:

- Trade Date- the date when ‘credit’ risk is transferred from Bank A to the investor. A telephone exchange between the two trading desks is sufficient to finalize the trade date and the terms of the trade. Different investors will trade on different dates

- Settlement Date- the date when there is formal transfer of ownership and the transfer of cash takes place. Any interest received from the borrower will be split proportionately with the investor after the settlement date (see figure 16)
- Over time, during the life of the deal, the syndicate group (the lead arranger and investors) may buy and sell among themselves or with new investors who may come into the syndicate. The ‘secondary trading’ process is critical in granting liquidity to the market-enabling investors to convert their loan exposures to cash if they want to

There are two concepts of liquidity:

1. Trading Liquidity: This can be as quick as scheduling a phone call with a counterparty
2. Settlement Liquidity- the time taken between trade date and the actual settlement date. The median cycle time is 12-14 days for loans traded at par (distressed loans sold at a deep discount take longer) and this median conceals longer delays in the extremes

The key problem in the loan market is settlement

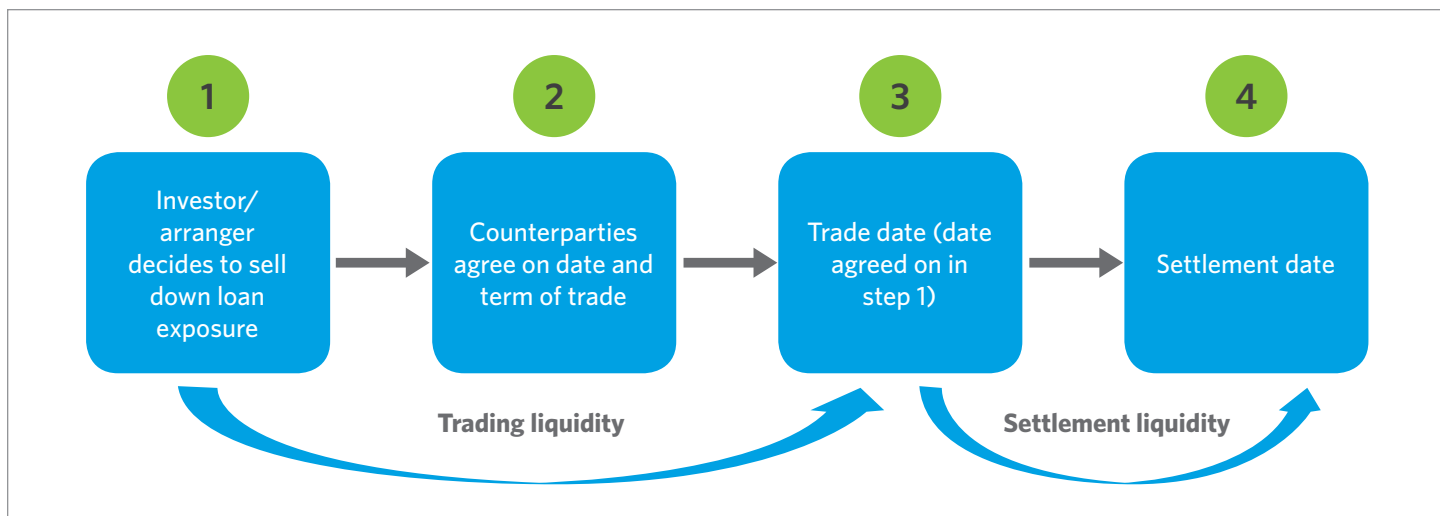


Figure 16

liquidity — the long cycle time between trade date and settlement date. Reducing cycle time to settlement would alleviate the following:

- It releases capital for the lender, including the lead arranger who has to set aside regulatory capital for the time period the exposure has not been syndicated
- Trading desks can engage in new trades if position limits are reduced through quicker settlements
- Retail mutual funds facing an asset-liability tenure mismatch have to set aside additional cash and open lines of credit in case of a widespread redemption

An examination of the reasons behind the **long cycle times** in settlement reveals several key factors (see figure 17).

1. Borrower consent

Some syndicated credits have provisions that require a borrower’s consent before a new investor can join. This can prolong the cycle time to liquidate the debt holding, especially in the secondary market. Most syndicated loans carry the flexibility to amend terms or waive covenant requirements if majority of lenders agree. Hence borrowers may not be keen to provide consent to a lender whom they perceive will not be amenable to such changes.

2. Agent consent

There are two broad types of debt facilities, revolving facilities where the borrower is given a credit line against which they can draw in the future, and term facilities where funding is done upfront. The agent (as well as the borrower) thus has an interest to ensure that any prospective investor be able to fund their obligations on the revolver

in the future^[8]. This became very important after the collapse of Lehman Brothers with Agent Banks putting increasing emphasis on counterparty risk.

3. Ownership verification

In the loan market there is no central agency like DTCC (in the US) to keep track of ownership. It is the agent that maintains the book of record and verifies for the buyer that the seller actually owns at least as much of the loan as is being sold. This process can be time consuming, especially if the seller’s position in the loan keeps changing between the trade date and settlement date due to activity on the loan like principal repayments by the borrower.

4. KYC & sub fund allocation

A buying institution often allocates total exposure to multiple legal entities/sub-funds. This process of sub-fund allocation will typically happen later in the cycle - if it is not completed by trade date, the settlement will be delayed. Further, KYC has to be done on any sub-fund with whom the arranger has not traded before. As new sub-funds keep getting created, KYC processes add to delays.

5. Buyer incentives

The buyer simply may not be ready to settle on trade date, thus prolonging the gap between trade date and settlement date. Historically, as per industry rules, the seller pays the buyer ‘delayed compensation’ for any delays in settlements beyond T+7 days (Trade + 7 Business Days). The purpose of delayed compensation is to bring the two parties to where they would have been had they settled on T+7. The seller earns interest from the borrower for the period after T+7 but then pays the buyer delayed compensation to offset the latter for the

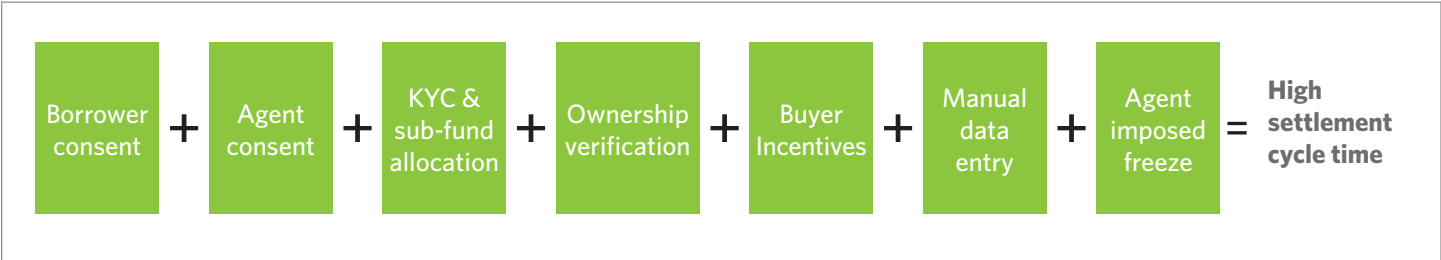


Figure 17

8. This is also relevant for Delayed Draw Term Facilities where the funding is done in multiple installments.

loss of interest income. However, this creates perverse incentives since the buyer has no incentive to settle early and can even encourage behavior where the buyer is earning yield by leveraging the seller's balance sheet. In 2016, the Loan Syndications and Trading Association (LSTA) is planning to implement a new standard whereby the buyer will only receive delayed compensation if the buyer was able to demonstrate that he was ready to settle the trade on T+7.

6. Agent freeze

The agent imposes certain dates where all trading is frozen. The administrative agent is responsible for two sets of activities: enforcing contact terms with the borrower, and ensuring that the pro-rata shares of all investors are accurate in the servicing system. Consider a scenario where the terms of the deal have been amended and the back-office of the agent bank is making structural changes in its system to reflect the amended terms. If during the same time interval, investors keep trading between themselves, it causes enormous administrative burden on the agent. This causes the agent bank to impose black out dates for trading, typically around quarter ends.

By nature, large syndicated deals are lumpy and many of these deals tend to close around quarter ends. This causes significant stress on the back offices of agent banks. For instance, 80% of primary trades relate to deals closing on 20-25 days in the calendar year (centered on quarter ends). Since most back offices of agent banks are not staffed for

peak volume, trade settlements are put on a queue causing additional delays in settlement.

7. Manual data entry

Figure 18 depicts the various systems that accompany the trading workflow. Data is re-keyed multiple times across the various systems. These systems were developed by different vendors in an industry that evolved over time. It is expected that these legacy systems will continue to be the conduits through which data will be entered into the distributed ledger. Hence the problem of integration between these systems will have to be solved, whether distributed ledger technology exists or not. In addition, the burden of manual data entry falls mostly on the agent bank regardless of whether the agent is directly buying/selling or facilitating a trade between investors.

Using distributed ledgers

In the diagram below, all activities on the loan are feeding into the distributed ledger database. The industry may develop new user interfaces for entering data into the distributed ledger or existing IT systems (example ClearPar, TSI, Syndtrack, Intralinks, Loan IQ, ACBS, AFS etc.) feed into the distributed ledger database-the latter being the more likely scenario since banks are not going to exit out of their legacy infrastructure easily (see figure 19).

In this scenario, if the entire syndicate group and prospective investors agree that the distributed

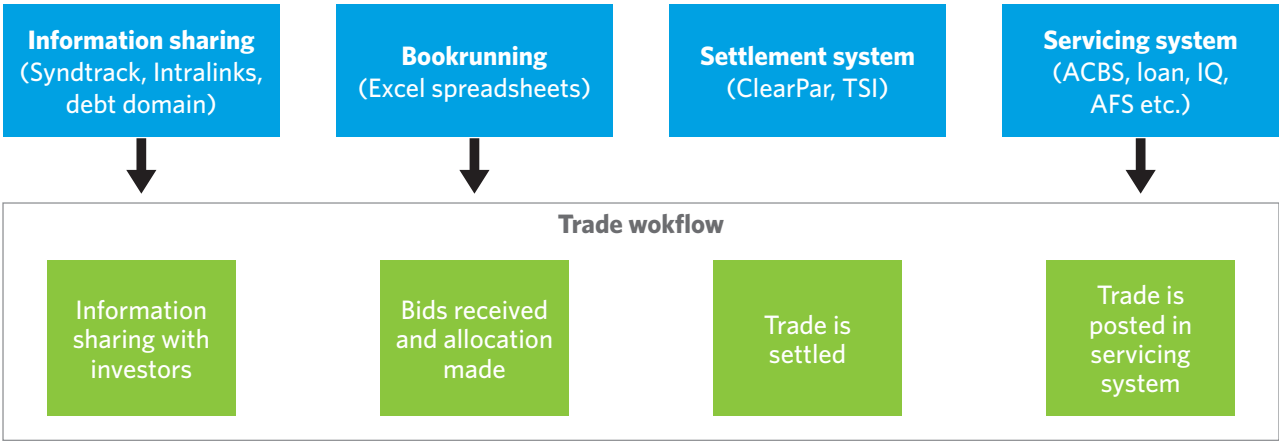


Figure 18

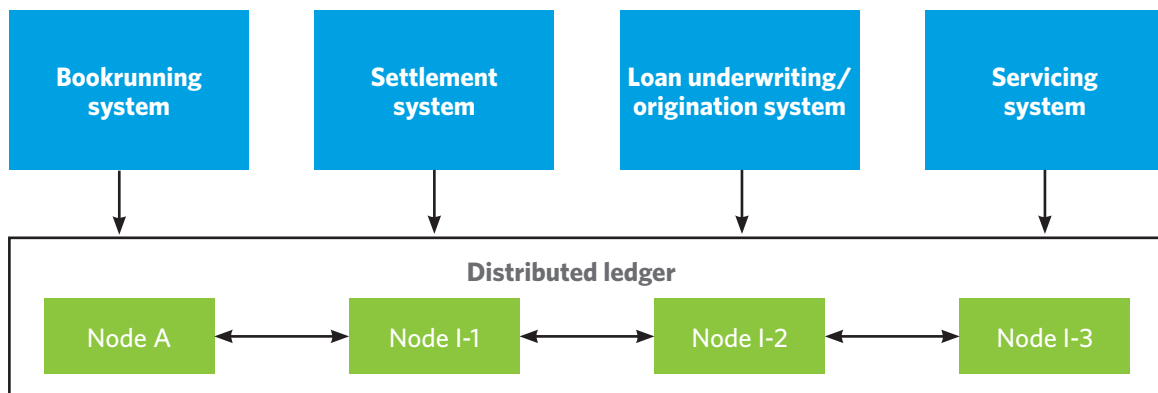


Figure 19

ledger reflects the truth with 100% certainty, then the following subset of the factors enumerated above will be alleviated (but not eliminated):

- **Ownership verification:** There is no need for the syndicate group to rely on the agent to verify ownership. However, this is not a significant cause of delays in the primary market because the seller is the agent and the buyer is buying directly from source
- **Agent freezes:** The primary loan market will continue to be cyclical because of the underlying market dynamics and the back/middle office of agent banks will be stretched around quarter ends. However, as the agent's intermediation role in facilitating trades is diminished, the impact of cyclicity on the agent bank's capacity to process trades will diminish

In summary, distributed ledgers will have a salutary impact on some root causes behind long settlement

cycle time. However, it is not a panacea, as evident from the preceding analysis. There are currently several industry initiatives underway to address the root causes behind long settlement times and the Loan Syndications and Trading Association (LSTA) is leading many of these initiatives.

Finally it is worth noting that liquidity is not a key challenge for the entire syndicated loan market. In the syndicated loan market, liquidity is primarily a concern for institutional investors who are a major force in the middle two segments shown in figure 20 below^[9]. For these investors (CLOs, pension funds, hedge funds, insurance companies), such loans are an investment with focus on valuations and liquidity rather than a lending relationship with the borrower. In the lower-middle-market space, investors are typically buy and hold lenders, while the yields in the investment-grade market are too low for such institutional investors.

9. The segregation between types of lenders is not always watertight. For example some institutional investors are going 'down market' while some players in the lower middle market are making forays upmarket.

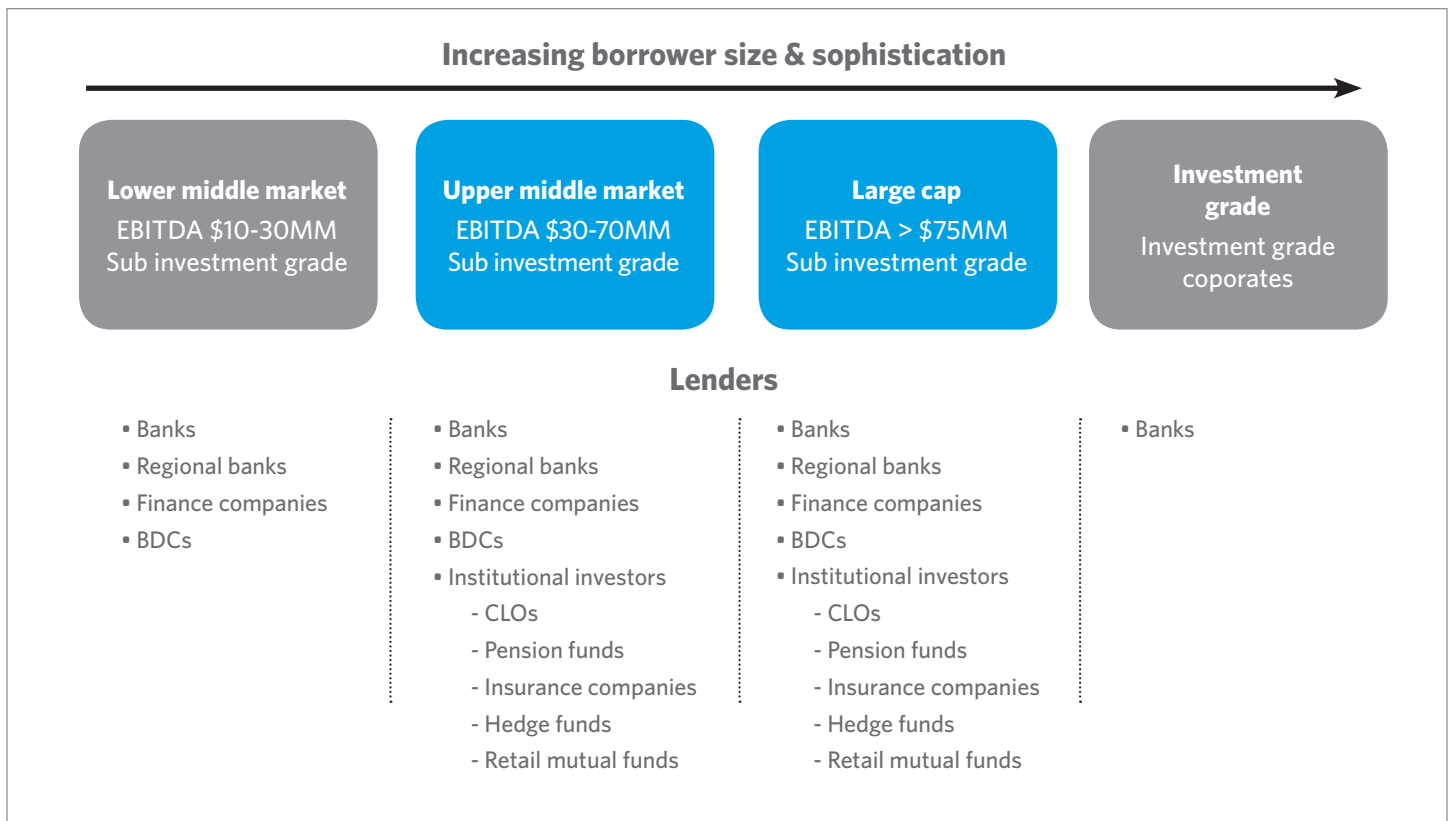


Figure 20

Impact of distributed ledger on servicing

The following is a synopsis of how the servicing process typically works today.

Current state

- Bank A (Administrative Agent) receives an interest payment from the Borrower. Bank A then distributes the cash to all investors on the loan in their pro-rata share
- Bank A also sends faxes/emails to investors notifying them of how much cash they have received and the explanatory calculations on how their share of interest was derived
- Bank A tracks the global loan balance and each investor's share on its own servicing system. Each of the investors track their portion of the loan balance in their own individual servicing systems. In this example, Bank A posts the interest payment on its system and the investors post their share of the interest payment in their own servicing systems based on the fax/email notifications received from the agent (see figure 21)

- The inefficiencies in the above ecosystem are obvious. The lenders (including the agent bank) are being paid under the same contract terms. The administrative agent is maintaining the book of record for the entire syndicate group. Yet each investor is maintaining its own book of record reflecting its pro-rata share of the same loan^[10]
- Straight-through-processing initiatives are underway to enable direct transfer of data from the agent's system to the lender's system. However, the penetration of these technologies is limited

Using distributed ledgers

In a distributed ledger system, data from the administrative agent's system would feed to the distributed ledger. The syndicate members could appoint one neutral institution to perform the validation function. The investors could then link the distributed ledger to their general ledgers and other internal systems (see figure 22).

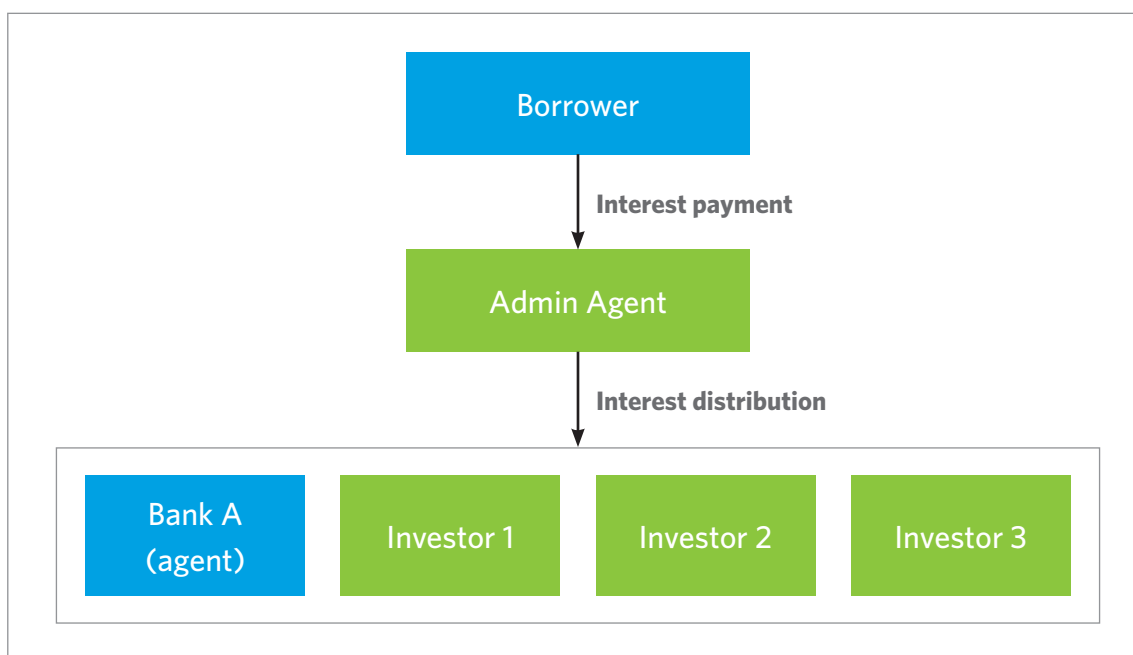


Figure 21

10. Markit offers a service whereby it does global servicing of the same deal for multiple buy-side lenders and then passes on the activity to the in-house system of each buy-side lender.

If the distributed ledger contained a single source of truth and all investors relied on it, then there would be tremendous efficiencies in the ecosystem. A group of 100 investors on a syndicated deal could outsource the validation function to one institution and simply connect the distributed ledger to their in-house general ledger and risk systems. The servicing back-offices of the buy-side institutions could be drastically reduced. While distributed ledger offers the potential of significant operational efficiencies, the following caveats should be noted:

- The above envisioned ecosystem requires that standard identifiers are used across the syndicated loans marketplace to identify borrowers and facilities. The industry is evolving standard identifiers like CUSIPS and MEIs. However, hurdles remain to their adoption and distributed ledger technology does not address those hurdles
- In addition to standard demographic identifiers, for the above to work, faxes and email notifications have to be replaced by electronic messaging. Further, the electronic messaging system would have to follow a standard framework on how different transaction types (funding, rate resets, LC Draws, etc.) are

represented. The industry is evolving FpML standards for electronic messaging, however many hurdles remain in the widespread adoption of FpML. As with the adoption of standard identifiers, these hurdles are not going to go away with distributed ledger technology

- The adoption of a distributed ledger based ecosystem in syndicated loans will have to be driven by the agent banks. The operational efficiencies described above will primarily be experienced on the buy-side. The agent banks have to be convinced that they are getting sufficient gains through faster release of capital to invest in this eco-system
- For the buy-side to benefit, significant operational challenges will remain. For example it is not possible for buy-side institutions to connect their general ledgers and risk systems to multiple distributed ledgers. For this solution to be scalable, there needs to be an industry aggregator who is maintaining the distributed ledger to which all agent banks and all buy-side institutions are connected. Given the decentralized and self-regulating nature of the syndicated loan industry, this presents an additional challenge

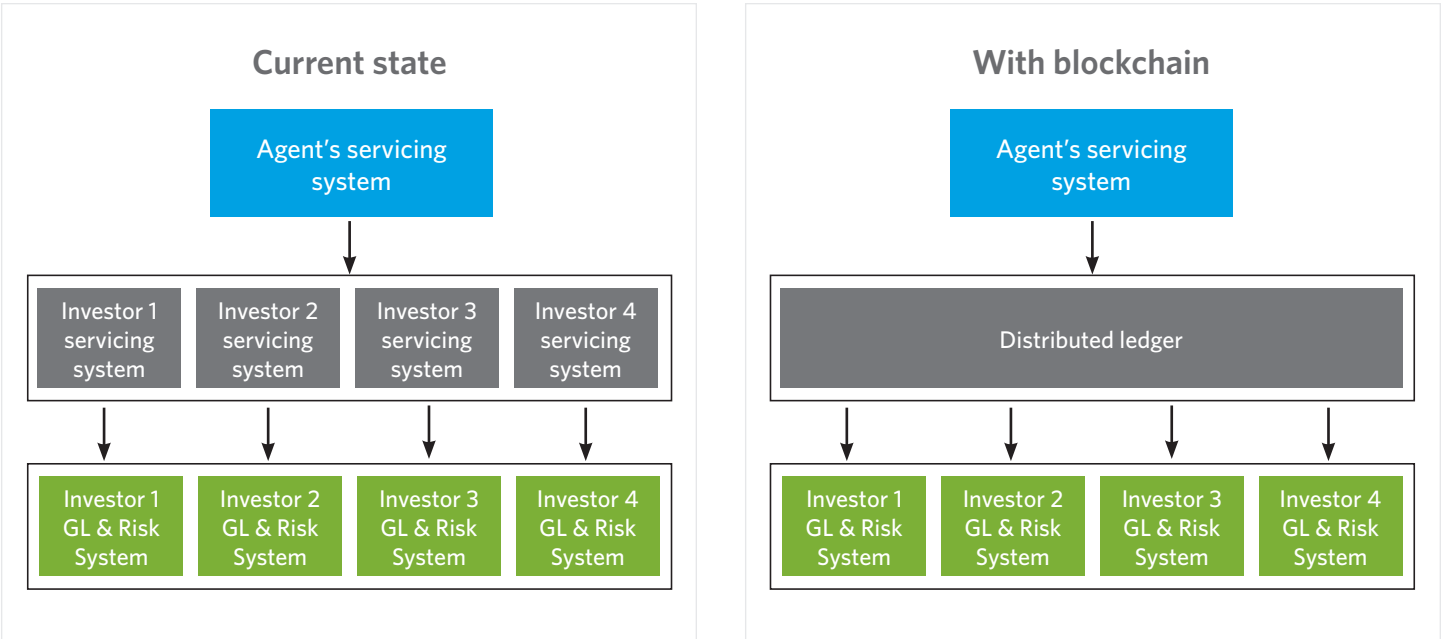


Figure 22

Conclusion

The efficiency of the syndicated loan market is constrained by three “I’s”:

- 1. Information:** Over time there has been an explosion in the amount of information available on loans, which has brought greater transparency to the market. This information includes publicly available credit ratings, loan pricing information, league tables, loan indices and greater press coverage of middle-market companies. This trend should continue to expand with ever-more information becoming available to the marketplace. However, given the complex, bespoke nature of the terms and conditions in this product (the lending contract runs into hundreds of pages), the loan market will continue to be dominated by sophisticated investors with the ability to process complex information that is often not publicly accessible
- 2. Infrastructure:** The industry needs to continue to invest in integration between various systems through electronic messaging (FpML) and use

of standard identifiers (CUSIPS, MEIs, etc.). The level of integration today is very limited

- 3. Incentives:** The loan market continues to suffer an externality problem. While the benefits of these market level initiatives (greater liquidity, larger pool of investors) are shared by the entire industry, the costs disproportionately fall on a few, especially the agent banks who must make significant investments. In the absence of concrete mandates from a regulatory agency, the LSTA continues to shepherd many of these initiatives by creating working groups and forums for agent banks, buy side banks and vendors, but progress is slow

Distributed ledger technology is a supplement to the initiatives that are currently addressing the three I’s and should not be seen as a substitute. The existing initiatives will still be needed in a distributed ledger enabled world: Distributed ledger technology will not fulfill its promise unless these initiatives are executed in parallel (see figure 23). Distributed ledger technology has the potential to:

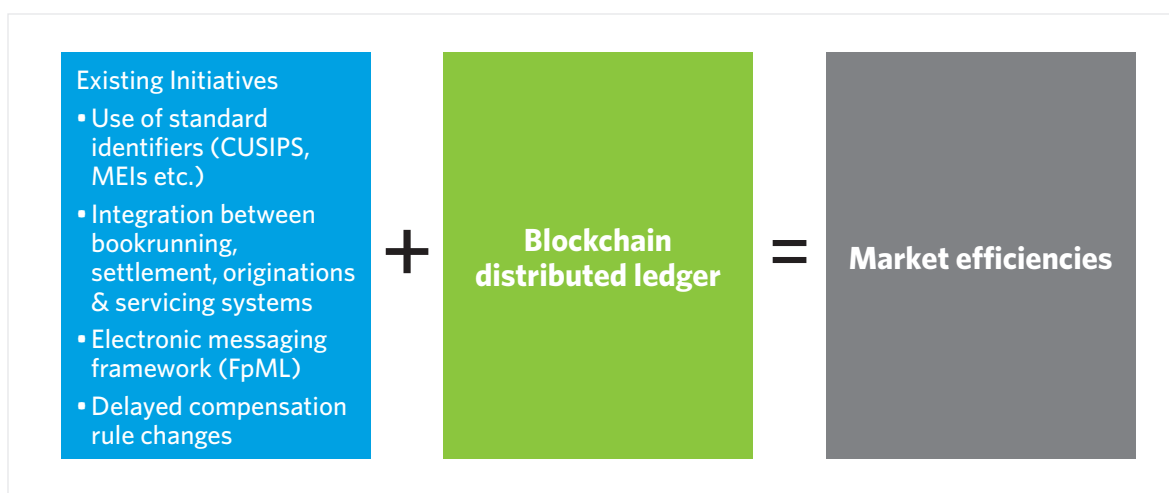


Figure 23

- Instill more transparency in the way bookrunning is done for syndicated loans resulting in a more economically 'optimal' structure discovery
- Reduce settlement times in trading, thus improving liquidity and driving more efficient capital allocation
- Reduce middle office and back office costs in servicing syndicated loans during its life cycle from booking to payoff

We expect the quantum of impact on the above problems to be in ascending order with the least impact on bookrunning and the most impact on servicing. However we believe the impact to be 'evolutionary' instead of a dramatic disruption for reasons described in this white paper. We also believe that the use of smart contracts in syndicated lending is a longer-term play and the industry must first start using distributed ledger as an informational source before proceeding to use that information as a source of automated real world transactions.

We recommend that instead of trying to anticipate what the 'best end use' of this technology will be, agent banks should execute pilots on a 'trial and error' basis. We recommend the following:

- Start pilot on simpler deals with relatively 'boilerplate' terms-an appropriate place to start would be the investment grade market and then transfer learnings to more complex leveraged deal structures
- A good beginning would be for agent banks to establish a distributed ledger database and start feeding data from their servicing system (where the book of record is maintained by the Agent today) to the distributed ledger
- Agent banks should preferably use financial product markup language (FpML) messaging for these data feeds. Without a standard electronic messaging framework, the solution will not be scalable
- Agent banks should grant investors' access to this distributed ledger-preferably on club deals where the number of investors are few and it is easy to coordinate a pilot with a few parties involved

Over a period of time, as agent banks and investors participating in the pilot get into a rhythm of relying on 'one source of truth', syndicate members would start organically discovering use cases (across bookrunning, trading and servicing processes) that make sense within the existing realities of syndicated lending instead of chasing a theoretical end-state that looks good only on paper.

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