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# Blockchain Technology for the Mutual Fund Industry

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## ABSTRACT

Blockchain and other business disruption technologies have created a buzz in the last few years and have become an inevitable discussions topic in the financial circles. It will have game-changing impact on businesses, particularly on the banking and financial services. Consortium or Enterprise Blockchain is the latest technological evolution allowing us to build hybrid blockchains (public and private) using features such as permission restriction and multiple controlling authorities. These hybrid features allow easy yet controlled information sharing between various stakeholders. After getting acceptance in areas such as remittance & supply chain financing, blockchain is now making inroads into sub-sectors such as asset and wealth management.

This article demystifies blockchain concepts and demonstrates an implementation for the mutual fund (MF) industry. MF industry is plagued by slow processing. For example, it takes days together to onboarding a new investor, transactions take a date to appear on statements while NAV computations takes hours to compute and show up for registrars to process transactions. We explore how smart contracts can help cut the transaction processing but will blockchain provide high speed and latency necessary? Can investor statements be accessed dynamically? Will distributed information sharing and decentralization system save costs and time for the stakeholders, particularly in client onboarding, NAV dissemination? How can blockchain help in KYC and other compliance related activities? Can mf scheme portfolios and factsheets get constructed automatically and available with real time updates? How can regulators and auditors have easy access to information as and when they want? Finally, we will examine some of the challenges or hurdles that come in way towards the implementation.

## JEL Classification

O31, G14, G20

## KEYWORDS

blockchain, mutual fund, asset management, smart contract, consortium blockchain, kyc

## INTRODUCTION

Blockchain and other disruptive technologies are all set to bring about profound changes to businesses. The order of the day is that businesses “have to disrupt or get disrupted”. Financial service providers have to embracing new technology and evolve themselves or else face extinction. The Ripple blockchain system, for example, threatened the dominance of SWIFT with its concept of “correspondent banking” in the overseas money transfer space. Meanwhile, JP Morgan and few others have started building blockchain-based Interbank Information Network (IIN) to make global payments faster and more efficient challenging SWIFT's dominance. This forced SWIFT to become an “incumbent-turned-innovator” and come up with PoC to move to blockchain. In a

similar manner, asset, wealth and fund management companies have to begin embracing technology, transform themselves and thereby reap the advantages that come along with.

Blockchain is a data structure which stores encrypted information (such as a data related to financial transactions, an image file of the investor or a monetary value) grouped together and put into a block. Each block is "chained" to the next block using a hash. All these blocks are accessible on the network in the form of a shared distributed ledger. This shared ledger will be in a decentralized, secure, transparent and immutable environment. Blockchains can be classified into two types: Based on access to the blockchain itself (permission-less or permissioned) and based on access to blockchain data (public or private) (Farah, 2018). These features could help Mutual Fund (MF) industry by reducing operation time and cost and service investors better.

The various stakeholders in the Mutual Fund (MF) industry are – the Regulator (the Securities and Exchange Board of India (SEBI) in India), the Asset Management Company (AMC) (which manages day to day operations of the asset management), Stock Exchange (in case of traded funds), Sponsor (promoter of the MF), Trustee (protector of unit holders' funds and assets), Custodian (who takes custody of assets of the fund), RTA (maintains investor transactions or records), Auditors (audits scheme accounts), Fund Accountants (who compute NAV), Distributors (who sell and service MF products to investors), Collecting Bankers (who collect and disburse investor funds), Stock brokers (who executes transactions in securities), KYC Registration Agencies (responsible for maintain KYC records), Payment Aggregators (payment gateway processors) and of course the Investor.

### **PROBLEM DEFINITION**

Blockchain has proved itself to be of immense use in core banking and financial markets. But can it be of use for the mutual fund industry? One of the biggest challenges in the MF industry is that it is run in a centralized environment. This will mean high cost of maintaining digital infrastructure and maintaining uptimes. Further, each stakeholder is working in their own segment in the form of a loosely tied up systems and because of this, there is considerable time lost in processing transactions. For example, there is a considerable time lag from the closure of stock market for the computation of NAV. Similarly, the RTA can only process transactions at night and can send confirmations to investors the next day morning. The overall investing process is slow and time consuming.

We begin by doing a literature study to find the recent happenings in the blockchain space and how it is trying to address the needs of the finance sector. The broader goals of this study are to find how the legacy systems can be replaced with enterprise blockchain technology in the MF space. We propose a workflow on how various stakeholders can use features like smart contracts, distributed network, decentralization, notary and other services. We finally explore the possible challenges we would encounter in the implementation process and what more needs to be done for a full-scale implementation.

### **LITERATURE STUDY**

The traditional Blockchain and Ethereum methods are facing challenges for adoption in finance domains. For example, the consensus mechanism (particularly "proof of authority") and huge delays in getting data added (commit) to the block will mean that there is no guarantee that a user gets a confirmation of acceptance (or rejection) for his transaction immediately. This is because the transaction could be accepted to the blockchain at a later point of time. And in the meanwhile, if the user re-issues the transaction, it could so happen that both the earlier and the re-issued transaction can get accepted by the blockchain at a little point of time. Simply to say, delays in transaction time are simply not acceptable in the finance domain.

Further, using blockchain as replacement to relational data management system (RDBMS) (upon which almost all financial transaction data is stored) is not a good idea (Sara & Aviv, 2018). Changing the blockchain to fit the user cases or to meet business requirements is again not a good idea. Of course, companies like BigchainDB and Inter-Planetary DB (IPDB) are attempting to take database and add blockchain features to it. Further, banking is all about security and confidentiality. Is it wise to let all the blocks on the network to have a copy of a customer financial transaction, no matter how well they are encrypted? The answers to most of these issues are addressed by the Enterprise Blockchain.

The Enterprise or Consortium Blockchain (such as Hyperledger, R3CEV and Corda, JPMorgan Chase Quorum, Microsoft Azure with Bletchley and CoCo etc) overcame several shortcomings of traditional blockchain by taking the concept to the next level, such as with speed (performance and throughput), permission (who will have read access. write access, maintain consensus?) and privacy (identity management, data privacy etc) (Chiuy & Koeplz, 2018). Being semi-decentralized and permissioned, it allows different entities to be on the blockchain, each able to manage one or few nodes or execute the consensus protocol depending on the permissions. R3CEV and around 70+ members are working on to build a system that will record, manage, synchronise, support financial transactions and agreements with Corda. The end result of this effort is expected to be power frictionless transactions between banks, supplant current non-interoperable legacy systems.

Several companies, such as Northern Trust (for private equity), BlackRock and EY (for wealth and asset management (EY, 2017)) are testing or using blockchain technology in financial areas beyond remittances and supply-chain. However, countries like India are yet to see industry-grade blockchain implementations outside the corporate-level and there is ample interest for this. An attitude shift by Governments, Regulators and Agencies will encourage large-scale application of the technology (Vijaya Kittu & Aruna, July 27 & 28, 2018).

Calastone, a technology solutions provider, has successfully conducted a test run with one full day transactions sourced from 1200 fund and distribution manager clients from 34 countries and proved that blockchain can help cut cost and improve efficiency for the asset management industry (Calastone, n.d.). BNP Paribas Securities Services and Axa Investment Managers are attempting at using it to make fund distribution easier.

Blockchain can be used in digital asset management, such as in the asset issuance, claim of ownership, and transfer. Some applications in this regard include smart property, tie to a fiat currency, coupons, collectables, local community money etc. Features of blockchain such as - Impossibility of counterfeit, Immutability, Disintermediation and ease of transfer, Transparency and ease of auditing, no overhead related to transaction processing and Network effect brought by the unified infrastructure for multiple types of tokens help us for use digital assets in the financial industry (BitFury Group, 2016).

### **SYSTEM DESCRIPTION**

Mutual Funds operations in Indian are regulated by SEBI and will be as per the circulars and amendments made to Master Circular in force (SEBI, 2018). A hybrid blockchain will be used in this proposed system such that the permissioned private segment provides information (such as investor transaction information) only to and by authorized parties while the public segment provides information (such as day-end NAV data, factsheets etc) to all users without any restrictions. Smart contracts will be used for the information (and fund) flow between the stakeholders as and when necessary. The user interface and interaction with the blockchain network will be through a Dapp (Decentralized Application).

When an investor gives a transaction request (purchase, redemption, systematic transactions) or service requests (change in bank details, transfer of holding etc), a smart contract gets generated between the investor and the RTA. The smart contract is a short piece of code, called “chaincode” that resides on the blockchain. It contains a set of executable functions (such as to invoke, update or query the data store in the ledger) and state variables. Input parameters (investor folio #, scheme name, transaction type etc) are given to the functions which are then executed and results in change in the state variable (unit allocation if successful, messaging in case of failure etc.). The smart contract will be coded in a high-level language (such as Solidity or Python) and are compiled to get byte codes. The compiled smart contract is then put on the blockchain, given a unique address, and is invoked by the authorized parties (such as investor, RTA etc).

When the transaction is processed, the RTA would probably issue mutual fund units of the scheme (purchase request) or redeem units (redemption request). This transaction information is added to the blockchain node, validated in near-real time and can be accessible from the blockchain network permanently, thanks to the distributed ledger concept. In case the transaction required a transfer of asset (such as redemption proceeds), a digital exchange of asset can happen. For example, a fund transfer in the form of electronic money (cryptocurrency) can automatically happen to the investor wallet, in which case there will be no intermediary such as a bank (BitFury Group, 2016). In countries like India where dealing with cryptocurrency and other virtual currencies is not allowed (RBI, 2018) for investing in securities market, the RTA would issue a transaction request to the bank to do a fund transfer of fiat money. Even this can happen by means of a smart contract between RTA and the bank. This results in faster transfer of redemption proceeds to the investor bank account - almost instantly instead of three days. Distributors will be paid commission in similar lines. Reducing settlement time will increase liquidity and decrease transactional risk, something which is more important in Exchange Traded Funds (ETFs). Further, there will not be any need for extensive regulation because the network is self-regulating. Similarly, there is no need of any central trust ensuring authority because the smart contract itself executes the terms of the contract. Legacy systems such as the GSM network-based Short Message Service (SMS) system and One Time Password (OTP) security token authentication method etc. can continue to be used in the off-blockchain environment (Danushka, Sheila, Konstantinos, Raja, & Keith, 2016).

Information on the blockchain is always available permanently. So, permissioned parties (such as investors) can get his Statement of Account (SOA) or the Common Account Statement (CAS) be generated at any point of time directly from the blockchain without depending on the RTA. Addressing investor complaints too can be done over blockchain. This will reduce the operational burden and allows offering de-centralized services by the RTA. This is particularly useful in the Indian context where we have multiple RTAs (CAMS, Karvy MFS and Franklin Templeton) are operating. A lot of time can be saved in the entire process which can probably be used to enhance customer experience.

The transaction details on the blockchain are time stamped and group of such transactions are bundled into blocks. Each block will have a cryptographic hash for identification. Each of the block is connected to a previous block thus forming a chain structure. The whole data will be on the blockchain network but the identity won't be exposed and the contents (transaction data) cannot be leaked. Thus, only those who have permission will be able to see its contents.

Timestamping and Notary services guarantee uniqueness and restrict double spending. Notaries take up the task when the asset issuer is not required to process the transaction or to write data to the blockchain (B. Gipp, 2017). Hence, this task can be given to one of the parties (nodes) in the system. Online blockchain based notary services that offer proof of ownership, proof of integrity and proof of existence on mobile device are catching up.

The Know Your Customer (KYC) is an important compliance requirement in the financial industry that gained significance since the 9/11. Banking and financial service regulators across the globe (such as the Reserve Bank of India (RBI) and SEBI in India) mandate that financial institutions maintain KYC data strictly and in compliance with their standards. The Indian Mutual Fund industry takes Central KYC (CKYC) managed by the CERSAI (Central Registry of Securitization Asset Reconstruction and Security Interest of India) which functions as the Central KYC Registry (CKYCR). Typical KYC data (and other investor declarations being taken such as FATCA etc.) being captured include profile data, preferences, net worth, tax status, political exposure etc. The current centralized KYC architecture increases new investor onboarding cost and time and hence is inefficient. With blockchain, customer can do a "self-service" by uploading his KYC data (fresh submission or update) into a block which will be validated by an authority (could be a dedicated CKYC or any such authority such as a bank or the RTA). A digital identity (similar to the KYC Identification number currently used) is generated to trust sign all financial transactions. This can be used by trusted parties (such as other financial institutions) to verify KYC status in real time and process the investor transaction. This means that when an investor generates a new folio or invests in a new mutual fund scheme, his KYC compliance can happen almost instantly. The processes of CKYC or an Automated clearinghouse (ACH) and automated customer account transfer (ACAT) systems can be simplified or even eliminated (by automation) because the blockchain itself does audit trail and fact-checking. Time taken for KYC completion can be cut down from 2-3 working days to almost real-time.

Blockchain provides speed, transparency and traceability and so Regulator or Auditors can pull out compliance data, do enquiry or inspection with the data from blockchain (except of course for physical inspection) at any time without waiting for the RTA or AMCs to provide information and hence there will not be reduced non-compliance penalties. SBI, together with 27 banks are currently working on a shared blockchain KYC concept. Cognizant and few Indian insurers have customer and policy information sharing which includes KYC and due diligence. Similarly, IBM with HSBC and others has designed a proof-of-concept for Shared Corporate Know Your Customer platform.

Blockchain technologies can help prevent money laundering (called Anti-Money Laundering or AML) and Combating Finance of Terrorism (CFT) by providing a chain trail of fund flow, prevent undetected large flow of money - via crossing borders or moving between underground and the fiat economy. FinCEN (in US), Bitstamp, Bitfinex, Coinbase, Kraken, Cryptonit and several others have AML policy.

All the procedures between the Regulator (SEBI) and Sponsor / Trust / AMC can be implemented on the blockchain. Consider a hypothetical scenario – that of applying to starting mutual fund business. The filled-in application form can be put into the block data and a smart contract is generated between the Sponsor and the Regulator. There will be several clarifications that the Regulator will ask and the Sponsor / Trust / AMC will reply back and all this communication is added to the blockchain and a digital record that is secure, auditable and immutable will be maintained. The Mutual Fund Certificate will be generated online automatically as soon as all the officers within the Regulator give their permissions.

Other scenarios include approvals by Regulator, filing offer documents (OD) including draft, final and updates of Scheme Information Document (SID) and Statement of Additional Information (SAI), Key Information Memorandum (KIM), asking / giving clarifications, undertakings (such as by trustee at the launch of new scheme) etc. can be done with the help of smart contracts.

Blockchain can help in streamlining the operations and communication flow within the AMC and between AMC and other parties (such as distributors, custodians, banks, stock broker, depository etc). Screening for securities, asset allocation, research and analysis, building portfolios, back testing of investment logics, performance review etc. In an attempt to bring in transparency in appropriation of expenses, and reducing mis-selling and churning, SEBI has put a cap on the total expense ratio (TER) – the expenses that an AMC can charge. This means that various types of expenses (management fees, distribution charges, securities transaction fees incurred by the fund, shareholder transaction fees and fund services charges) are to be cut or reduced and this is possible only by operational optimization of the AMC. Blockchain can automate processes using smart contracts and cutting time and reduce operational cost by putting data on the distributed ledger.



The AMC can give an instruction to its stock broker to trade in certain securities. The funding for this will come from the bank account and the securities will be stored with the Depository and given to the custody of the Custodian. The trade confirmations will be used by a smart contract which will update the portfolio of the scheme in near real time. This means that the latest portfolio data of various schemes will be available at the tap of a button in real time. A dynamically build factsheet could be created and maintained as well. This means that investors and other stakeholders need not have to wait for the month-end portfolio disclosures and factsheets to be given by the AMC but will be available immediately and instantly from the blockchain network.

The computation of the scheme NAV by the AMC which is usually done late evening can be automated using smart contracts and can be determined few hours after stock market closing and be made available on the public ledger. The Registrar can run smart contract to process various investor transactions as soon as the NAV is determined. Investors can get alerts almost immediately after the transaction is processed instead of having to wait for the next day morning to get the confirmation of the transaction. This means that the overall transaction processing will be streamlined and can happen on the same day itself and not spread to the next day.

### SCOPE FOR IMPROVEMENT

Being an evolving technology, there will obviously a lot of scope for improvement. Firstly, the biggest challenge for blockchain implementation in asset management industry is the lack of awareness and technology familiarity. Perhaps, more industry-specific use cases and some wide scale implementation success stories would make decision makers comfortable to start using the technology. Secondly, transaction management requires database-level latency and speed. Blockchain technologies are gradually evolving in this area but are yet to catching up with industry expectations. Thirdly, smart contracts security aspects are not that robust or rather not well tested and this is critical for the industry. Fourthly, there are several sub-processes operations involving stakeholders related to the asset management business where optimizations can be made. Fifthly, financial markets work under the lenses and directions of Regulators. Regulators should encourage slow testing and migration towards new technologies. In fact, a number of Regulatory activities (legal, enforcement, filing, reporting etc.) can be moved to a decentralized environment there by cutting process time and reducing cost. Finally, the cost of transformation from the legacy systems to the new system would be very high and hence slow and gradual shift can take place, with each milestone giving more comfort and confidence to its stakeholders.

### SUMMARY

Based on the literature study and on the proposed system description, we believe that blockchain technology can help all stakeholders in the mutual fund industry with its transparency, decentralization, tamper-resistance, accountability and privacy. There will be immense saving of time and cost with all stakeholders. Smart contracts automate transaction processing and ensure that updated information is available on the blockchain at all times. NAV computation will be quicker and statement generation will be dynamic and on the fly. Redemption payments will get processed in real time. Relators and auditors will be part of the system and can take out data as and when they want from the blockchain. Overall, we feel that blockchain will have an immense positive impact and will indeed be a gamechanger in the mutual fund industry.

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