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"THREE POSSIBLE WAYS THAT BLOCKCHAIN TECHNOLOGY COULD DISRUPT THE COMMODITIES INDUSTRY"

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Three Possible Ways that Blockchain Technology Could Disrupt the Commodities Industry

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Introduction

Today we are seeing wide-ranging applications for blockchain technology. From digital payments, to streamlining supply-chains, to the security of votes in elections, each day new applications and real-world use-cases for blockchain technology are being introduced and proposed.

In terms of the commodities sector, blockchain technology has many practical applications that are not hypothetical but rather are possible using technology that exists today. Specifically, blockchain technology can be incorporated into (a) the current United States crop insurance industry, (b) supply chain logistics to help increase food safety and minimize the cost of food recalls, and (c) a new mechanism through which investors can gain direct exposure to commodities and commodity producing assets. In this paper we will investigate these three applications and discuss how the incorporation of blockchain could improve on the status quo.

What is Blockchain Technology?

Blockchain technology provides a way for untrusted or unaffiliated parties to transact using a common shared ledger or record of transactions. The technology can be applied to a variety of "transactions," including payments for goods, votes in an election, and updates to medical records, for example. Additionally, this particular type of technology allows two parties to transact without relying on an intermediary thereby potentially reducing the cost and time of business operations as well as providing the potential for greater operational efficiency.

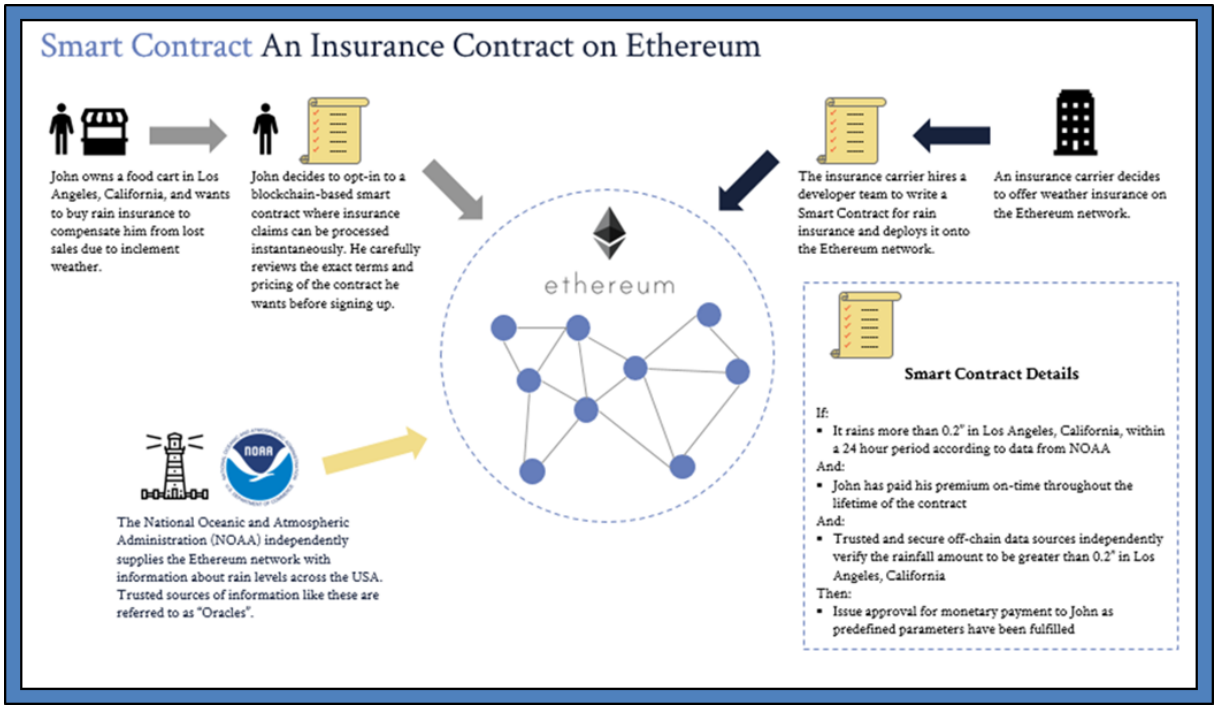
What is a Smart Contract?

In many cases, we expect blockchain technology to be applied via smart contracts. A smart contract is custom computer code stored on a blockchain and executed by a blockchain network. The blockchain network independently facilitates the verification and enforcement of the contract as well as enabling individuals to track the contract in real-time. In some cases, smart contracts have what is known as a "triggering event." A triggering event is typically a binary outcome whose occurrence can be verified by an independent third-party. In most cases, the contract has a payout associated with the triggering event.

For example, John, a food-cart vendor in Los Angeles, California, could enter into a smart contract with an insurance carrier to insure against inclement weather. In this case, the smart contract would specify the location and specific amount of rain that would have to fall in order to trigger the insurance payout from the carrier to John. John would pay the carrier a monthly premium for this contract and the carrier would place the insurance payout into an escrow account. John and the carrier would specify an independent third-party to act as the trusted-information source. In this case they could select the National Oceanic and Atmospheric Administration (NOAA) as the source for daily rainfall information by specific location. Each day the smart contract automatically checks the NOAA weather database for rain in Los Angeles, California. If one day it rains more than the agreed upon amount, in this example 0.2 inches, and if John had been paying his premium on-time throughout the life of the contract, then the insurance claim would immediately and automatically be paid out to John.

John benefits from entering into the smart contract because unlike a traditional insurance contract the payout is immediate and automatic. He does not need to "trust" the insurance carrier to follow through with his claim or wait out the insurance claim process, which could potentially cause disruptions to his operations. The insurance carrier could also potentially experience significant costs savings for a smart contract policy compared to a traditional policy as much of the administrative work is automated. Additionally, smart contracts could provide insurance carriers with another type of insurance product to sell to their clients. This hypothetical scenario is illustrated in Figure 1 below.

Figure 1
Simplified Smart Contract Example



Source: New Beacon Partners.
Note: Icons courtesy of FlatIcon.

Smart Contracts and the United States Crop Insurance Industry

We can extend the example of John and the insurance carrier to the United States crop insurance industry. Currently, there are two types of crop insurance available to farmers in the United States: Crop-Hail and Multiple Peril Crop Insurance (MPCI). Crop-Hail policies are not part of the Federal Crop Insurance Program and are provided directly to farmers by private insurers. Many farmers choose to purchase Crop-Hail insurance as hail has the unique ability to destroy a significant portion of a farmer's crops while leaving the rest undamaged. In areas of the United States where hail is frequent, farmers often purchase a Crop-Hail policy to protect their high-yield crops. Unlike MPCI policies, a Crop-Hail policy can be purchased at any time during the growing season, according to National Crop Insurance Services.

MPCI policies differ from Crop-Hail policies in that they must be purchased prior to planting and cover loss of crop yields from a number of natural causes including drought, freezing temperatures, disease and excessive moisture. Under the Federal Crop Insurance Program there are currently 15 private companies that are authorized by the United States Department of Agriculture Risk Management Agency (USDA RMA) to write MPCI policies. The USDA RMA oversees and regulates the program as well as sets the rates that can be charged and determines the crops eligible to be insured in different parts of the country. The federal government subsidizes the farmer-paid premiums to reduce the cost for farmers and provides reimbursement to the private insurance companies to offset a portion of the operating and administrative costs. These subsidies ensure that crop insurance remains affordable to the majority of farmers and ranchers, again according to National Crop Insurance Services.

In the insurance industry, one type of insurance, parametric, should be well suited for use with smart contracts. Parametric insurance (also known as index-based insurance) compensates a policyholder when agreed-upon parameters are met. It is essentially an if-then contract for insurance. Payment is tied to predefined parameters, thereby decoupling the insurance policy from an underlying asset. Therefore, parametric insurance differs from traditional insurance because it does not indemnify the actual loss incurred to an asset from a risk-event. In a parametric insurance contract, the insurer makes an agreed-upon monetary payment based on when predefined parameters are met, which makes the payout process predictable and quick (Foggan and Cwiertny, 2018).

Since the crop insurance is based on verifiable data (i.e., weather data), the United States crop insurance market is a suitable candidate for smart contracts. Since Crop-Hail policies are already provided directly to farmers by private insurers instead of through a government program like MPCI policies, Crop-Hail policies represent a better candidate for potential smart contract implementation. Similar to our example of John and the insurance carrier, farmers would be able to enter into smart contracts with private insurers. In this case, the smart contract would work as follows:

1. The farmer and the private insurer would agree to terms of the Crop-Hail policy as they do today; however, the terms of the contract would then be coded onto a blockchain.

2. In the event that hail does occur and is greater than the size defined in the parameters of the contract, the smart contract would automatically verify the hail event with an independent third-party, in this case most likely the NOAA.

3. Once the hail event was confirmed, the farmer would automatically and immediately receive a payout from the private insurer.

There could be several major impacts from the integration of smart contracts into the crop insurance market, both for the farmer and the private insurers. First, farmers would receive immediate and automatic payouts, meaning that once the event was verified, they would be compensated. Second, since the insurance contract is decoupled from the underlying asset, there would be no need for an insurer to send an adjuster to the farmer's field to examine the damage or even for the farmer to have to report the damage himself or herself to the insurance company (Martin, 2018). Instead, trusted and secure off-chain data sources and indices could be monitored to capture information on the contract parameters and provide approval for automatic payout when the contract parameter is met or exceeded (Foggan and Cwiertny, 2018). Third, enabling farmers to purchase Crop-Hail insurance policies via smart contracts could increase the potential for competition among insurers. Increasing competition among insurers may then lead to decreases in premiums for farmers. Fourth, by implementing Crop-Hail policies via smart contracts a significant cost savings could be experienced by the private insurer, assuming many of the administrative costs of maintaining and monitoring the contract were alleviated, a portion of this cost would presumably be transferred to the farmers in the form of lower premiums. Finally, there would be less room for fraud. Since the information needed for the contracts would be provided by an independent third-party, there could also be less of a chance for the information source to be manipulated.

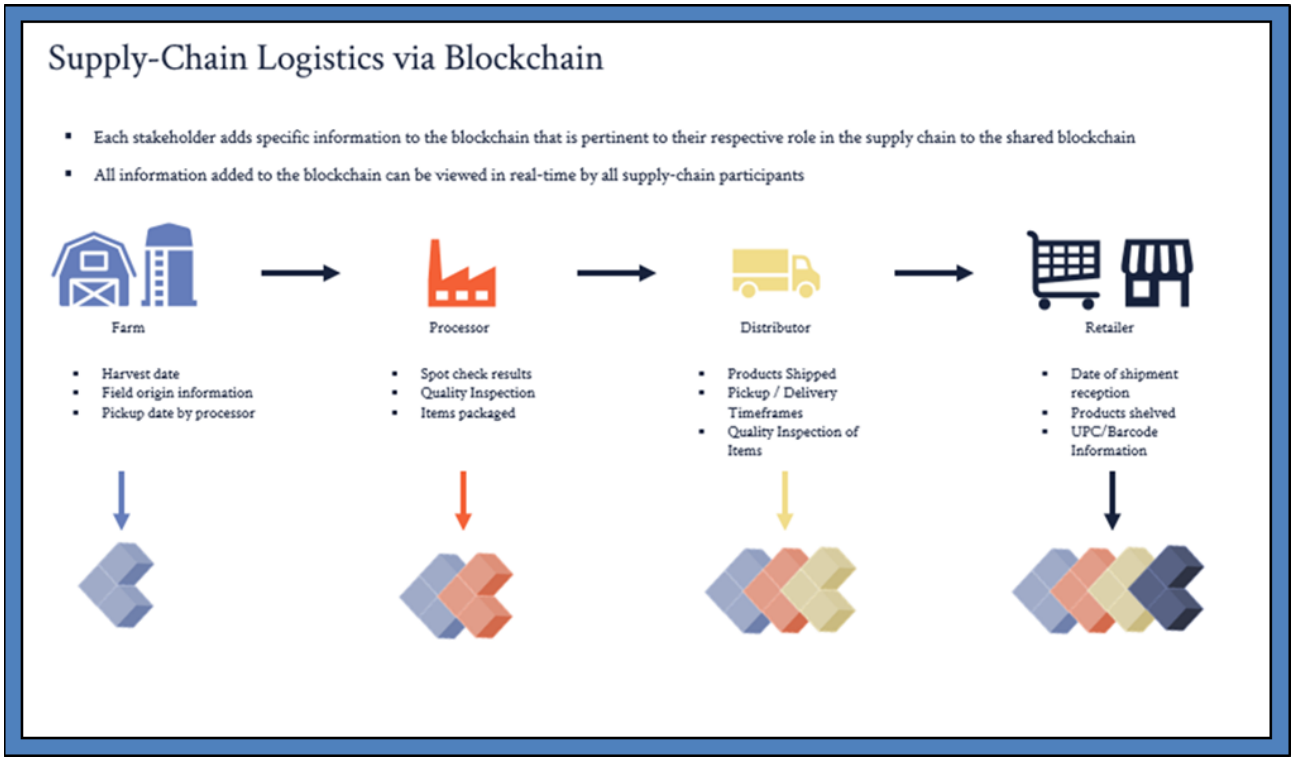
Minimizing Costs and Impacts from Food Recalls

Every year 48 million Americans are made ill by food-borne pathogens (Kowitt, 2016), and the average impact to an affected food company is typically $10 million in direct costs (Tyco Integrated Security, 2012) such as notification (to regulatory bodies, supply chain and consumers), product retrieval, storage, destruction of the unsalable product as well as additional labor costs associated with these actions, and all of this is before factoring in brand damage and lost sales. Additionally, the current method with which food companies handle food recalls seems to us inefficient given the technology available. For example, companies release the product name, product code numbers, UPC codes as well as expiration dates and product descriptions to suppliers and customers to try to contain contaminated items. Even if the food company can pinpoint that one particular field or factory as responsible for the contamination, current technology takes more than 6 days to trace back a particular piece of fruit to its farm of origin. If a food company were to utilize blockchain technology to capture supply chain and transportation information this trace-back process is decreased from more than 6 days to less than 2.5 seconds (Walmart, 2017). Furthermore, food companies can also pinpoint where particular items went very quickly. For example, if they knew food items from "Factory X" were contaminated they could instantaneously determine what stores these affected items were shipped to, when they were received and contact the stores to have those items immediately pulled from shelves, and potentially contact customers who purchased that product. This would prevent mass panic over a potential food recall as

well as the destruction of unaffected products, associated labor costs as well as mitigate brand impacts from the recall. The advantage of decreasing the trace-back process time cannot be understated for food companies that are trying to trace and mitigate the risks of food recalls to the public. Major corporations are beginning to implement this technology into their supply chains for this exact reason. Walmart has been working with IBM on a food-safety blockchain solution and is now requiring all of its leafy green suppliers to upload their data onto the blockchain by September 2019 (Walmart, 2018).

Blockchain technology would enable food companies to quickly and accurately contain food contamination events. Figure 2 below illustrates how blockchain technology could be utilized to capture data from each stakeholder, thereby allowing the data to be quickly accessed during a recall or trace-back scenario. By being able to trace back food from store to origin in less than 2.5 seconds compared to 6 days, they will be better able to minimize the number of individuals affected as well as in some cases prevent the contaminated items from ever being shelved. Additionally, by being able to determine which stores received contaminated items via their supply chain history, unaffected food items could be sold without generating additional food waste and lost revenue to the food company. Furthermore, consumers would be given a greater sense of confidence that the recall was effective as the technology can empirically show that the infected food items have all been accounted for.

Figure 2
Supply Chain Logistics via Blockchain



Source: New Beacon Partners.
Note: Icons courtesy of Microsoft PowerPoint.

A New Potential Way for Investors to Gain Direct Exposure to Commodities

When an investor decides he or she wants to allocate a portion of his or her portfolio to commodities they typically are faced with the following 5 ways to gain exposure: 1) Directly purchasing the commodity, 2) Use commodity futures contracts to gain exposure, 3) Subscribe to a commodity-focused private placement fund, 4) Buy shares of exchange-traded funds that specialize in commodities or 5) Buy shares of stock in companies that produce commodities.

The most direct way to gain exposure is the first option, to purchase the commodity outright; however, in order to do so an investor would generally need to accept physical ownership of the commodity and store it. Some commodities like precious metals have developed markets for buying a bar or a coin, and these are fairly easy to store; however, what if an investor wants to invest in crude oil or natural gas? In today's markets direct ownership of crude oil, natural gas, or other hard-to-store and hard-to-divide assets is extremely difficult and in some cases not possible for a typical retail investor; however, with blockchain, we argue this becomes possible.

In July, blockchain platform Maecenas partnered with London gallery Dadiani Fine Art to offer fractional stakes in Andy Warhol's *14 Small Electric Chairs (1980)*. 31.5% of the Warhol work was offered for sale via cryptocurrencies and the minority shares were distributed to winning bidders paying in cryptocurrencies. The sale and subsequent trading of these minority shares are tracked via blockchain and effectively create a transparent and real-time marketplace for the artwork (Randall-Stevens, 2018).

This model of "tokenization" can be applied to many types of asset classes outside of art and has already been employed in real estate. In 2018, the St. Regis hotel in Aspen sold 18.9% of the resort for $18 million via digital tokens (Carroll, 2018). This sale enabled investors to gain direct exposure to a real estate asset, that without tokenization, they would never have been able to hold in their portfolio.

Like the St. Regis hotel in Aspen, this model of "tokenization" could be specifically applied to hard-to-store and hard-to-divide assets and potentially introduce both a new type of product to the commodities market as well as a new type of product provider. Currently, the majority of Exchange Traded Funds (ETFs) and Exchange Traded Notes (ETNs) that provide exposure to hard-to-divide or hard-to-store commodities such as crude oil and natural gas by holding futures contracts and not the actual physical asset. This could change with the utilization of blockchain technology by ETF and ETN managers as these managers could warehouse hard-to-divide or hard-to-store commodities using traditional storage methods and digitally "divide" them into tradeable tokens. Like the Warhol painting, blockchain technology could allow an asset typically only owned by one buyer to be owned by many. This additional liquidity could potentially provide an incentive for managers to begin to offer this type of a product.

Using blockchain technology would not avoid other costs such as transportation, storage, insurance or enforcement-of-contract legal fees; however, it would enable investors to obtain direct exposure to commodities without having to invest through a traditional ETF or ETN. Blockchain technology could enable fund companies to expand their offerings to investors, thereby allowing investors to obtain direct exposure to a particular asset in fractional amounts and without having to take delivery of the particular asset.

Additionally, the "tokenization" model could be applied to locations where commodities are mined, drilled or produced. For example, an owner of a gold mine, oil field or farm could digitally "divide" their mine, field or farm and sell a percentage of their commodity producing asset via digital tokens, just as the St. Regis hotel did in Aspen. By selling a percentage of their mine, field or farm via digital tokens, the owner could experience a monetization event while providing investors direct access to a commodity producing asset that would typically only be available to them indirectly through an ETF or ETN. In this particular case, the owner of the mine, field or farm would continue to operate the asset while the owners of the digital token would share in the profit / loss of the commodity producing asset.

By applying the tokenization model, a new type of commodities-linked product could be created and begin to give investors a greater degree of flexibility as well as opportunity to invest directly in commodities and commodity producing assets.

Conclusion

In the above discussion, we noted our belief that blockchain technology can bring positive change to the commodities industry; however, what is most important is that it is possible to implement this technology today. The applications discussed above are not unsubstantiated or purely speculative applications, but rather are applications that either are already being implemented or have a clear path towards implementation. Blockchain technology should not be thought of as a strange or obscure technology but instead as the next technological innovation capable of creating better and more secure ways to transact goods and services. Just as the internet revolutionized the way that market participants interacted, we argue that blockchain too will similarly impact the status quo.

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