QIAN

A crypto assets backed stablecoin protocol

QIAN Stablecoin Governance Committee

Content

I. Preface

1. Background

With the popularity of blockchain technology and cryptocurrencies, a whole new form of currency has emerged.

However, the immense price volatility of cryptocurrencies makes it impossible to use them as a medium of trading, or as a tool of deferred payments, or as a unit of account. Based on the need for stability, the stablecoin Tether (USDT), has rapidly emerged, with the circulating supply already approaching $10 billion.

In the cryptocurrency industry, there are currently three main types of stablecoins: fiat-backed, cryptocurrency-backed and algorithmic stablecoins.

Fiat-backed stablecoins, currently represented by USDT, BUSD, HUSD, USDC, PAX, TUSD, etc., has the largest market share among all the stablecoins.

The most common representative of cryptocurrency-backed stablecoins is the DAI launched by MakerDAO. Market share of this type of stablecoin is second to the fiat-backed USDT. Due to the high level of decentralization, cryptocurrency-backed stablecoins are developing rapidly and are more widely embraced by the open source community.

The algorithmic stablecoin, which is represented by project Ampleforth, which stability adjustment mechanism is based on the automatic adjustment of the total supply of tokens. Algorithmic stablecoins has been widely doubted due to its rudimentary mechanism and its inability to maintain currency price stability, and thus far has little market share.

2. Problems

The stablecoin DAI is designed following BitUSD in BitShares, using cryptocurrencies as collateral to secure the intrinsic value of the stablecoin. Both BitUSD and DAI are experimental products that have a lot of room for improvement.

Take the issuance mechanism of the United States dollar for example, a system of "issue collateral" is in place whereby Federal Reserve banks are required to provide the Fed with qualified collaterals, together with additional collaterals, which are equal to or greater than 100% of the amount of currency issued and in circulation when they receive additional dollars. Most of these collaterals is U.S. Treasury securities owned by the Federal Reserve Banks, in addition to gold securities, qualified commercial paper, mortgage notes, bank promissory notes, and qualified state and local government bonds.

All cash in use is issued by the Federal Reserve and the dollar is actually a type of Federal Reserve note which is fully secured at the time of issuance. The collateral is primarily U.S. Treasury securities, the value of which in turn is backed by the credit of the U.S. government. Hence, the issuance of the U.S. dollar is backed by U.S. government credit.

For the U.S. government, the cost to issue the dollar is only about 2% per year of interest on the U.S. Treasury securities, and the dollar is issued without the issuer (the Federal Reserve) having to prepare any more assets in advance, otherwise the cost of issuing the dollar would be much higher and the dollar's ability to stimulate economic activity in the United States would be weaker.

Based on the national background of the MakerDAO team, they clearly refer to the currency issuance mechanism of the US dollar at the beginning of their product design, and the DAI is the collateral note of the MakerDAO system. The issuance of DAI is dependent on CDPs, and the holders of CDPs not only need to spend real money in advance to purchase cryptocurrencies such as ETH, but also need to bear the stabilization fee of DAI. This is the equivalent of issuing U.S. Treasury securities with gold reserves which require the United States government to buy gold in advance, then using these gold reserved U.S. Treasury as the issuing guarantee of dollar. It is clearly a losing business for stablecoin issuers, and this design fundamentally constrains the volume of DAI issuance.

Therefore, without a breakthrough in the underlying design, the supply of stablecoins like DAI will not be able to grow a huge amount. Under the squeeze of fiat-backed stablecoins, the impact of cryptocurrency-reserved stablecoins will gradually decline, eventually confined to a small market as an alternative asset. Following the pattern of technology’s development, stablecoins like DAI may be replaced by cryptocurrency-backed stablecoins with more reasonable mechanisms.

3. Issuance mechanism of the Hong Kong dollar

The United States dollar is a classic example of currency issuance through government credit, and only a government with a strong and consistent credit history that is able to repay the principal and interest on national debt on time can guarantee the sustainability of this currency issuance mechanism. Another dominant international currency issuance mechanism is the issuance of national/regional currencies secured by the mainstream foreign exchange. For example, a currency maintains a fixed exchange rate with the United States dollar and thus indirectly maintains its own currency stability, which is known as a fixed exchange rate regime. In the fixed exchange rate regime, a monetary authority pegs its currency's exchange rate to another currency, a basket of other currencies, or to another measure of value (such as gold), and may allow the rate to fluctuate within a narrow range. To maintain the exchange rate within that range, a country's monetary authority usually needs to intervene in the foreign exchange market to maintain value stability in its currency. One representative of the fixed exchange rate regime is the Hong Kong dollar and its currency board system.

One of the features of the Hong Kong dollar issuance system is that it provides for the HKD issuance of at least 100% of United States dollar foreign exchange, specifically, the issuing bank delivers the United States dollar to the Foreign Exchange Fund managed by the Hong Kong Government in exchange for a certificate of indebtedness equivalent at a fixed exchange rate, and then bank issues the banknotes of the Hong Kong dollar equivalent to the amount on the certificate. If the issuing bank wishes to reduce the volume of Hong Kong dollars issued, it submits the according certificate of indebtedness and Hong Kong dollars at a fixed rate to the Exchange Fund, in exchange for the equivalent United States dollars.

The Hong Kong dollar insurance was overcollateralized based on foreign exchange. According to reported data in January 2020, Hong Kong's foreign exchange reserves reached 445.8 billion US dollars. Correspondingly, the issued Hong Kong Dollar M1 reached 206,626.864 million on January 1, 2020 (206,626,864 million) US dollars. The ratio of foreign exchange reserves to the base currency is more than twice as high, and the Hong Kong dollar thus has a very high safety cushion.

If the demand for US dollars in the market rises and the Hong Kong dollar depreciates, e.g. the market price becomes 1:7.9, the issuing bank will use 1 US dollar to buy 7.9 Hong

Kong dollars in the market and redeem 1 US dollar from the Exchange Fund with 7.8 Hong Kong dollars, getting 0.1 Hong Kong dollar difference, completing the arbitrage process. In this transaction, the Hong Kong dollar is recalled, the amount of Hong Kong dollar in circulation on the market decreases, demand increases and the exchange rate rises accordingly.

If the demand for HKD in the market goes up, say to 1:7.7, the issuing bank will use the HKD 7.7 to buy $1 and then use the $1 to buy HKD 7.8 from the Exchange Fund (the right to issue the HKD 7.8 to be exact), from which it gets a spread of HKD 0.1. This transaction process has seen a decrease in the volume of the dollar, an increase in the volume of the Hong Kong dollar, a decrease in demand, and a fall in the exchange rate.

The above process depicts the pegged exchange rate mechanism of the Hong Kong dollar, which ensures the widest acceptance precisely because the Hong Kong dollar uses the US dollar as the collateral currency. This has been fundamental in keeping Hong Kong's economy open to the world and thus becoming the financial center of Asia.

II. Introduction to QIAN stablecoin protocol

1. The basis for the creation of QIAN

The core of Hong Kong dollar issuance is that banks can pledge foreign exchange assets to the Hong Kong government at zero cost after holding them, in exchange for the power of HKD issuance; there is no need to pay additional costs for the Hong Kong government to redeem the Hong Kong dollar from the banks, the two parties only need to stipulate a pre-agreed conversion ratio.

With this minimal friction mechanism in place, a seamless conversion between the Hong Kong Dollar and the US Dollar can be ensured, thereby stimulating the issuance of the Hong Kong Dollar and the continued economic prosperity of the entire Hong Kong region.

A truly successful cryptocurrency-backed stablecoin should be designed using a pegged exchange rate system with reference to the Hong Kong dollar issuance mechanism. Since cryptocurrencies have monetary properties but are subject to high price volatility, appropriate adjustments and risk control designs need to be made based on a pegged exchange rate system, design new stablecoins with the concept of token swaps.

QIAN Stablecoin governance committee developed the QIAN stablecoin protocol, a decentralized stablecoin framework which support issuance of various non-custodial stablecoins. QIAN version 1.0 refers to the design concept of DAI, after analyzing its design deficiencies, The Force Protocol team redesigned the stablecoin QIAN.

2. Important concepts of the QIAN system

In the I Ching (the Book of Changes), QIAN represents the universe, the most sublime positive energy and spirit. With this important meaning in mind, we named QIAN as the platform of first crypto-asset reserve stablecoin with a currency swap system.

KUN is the governance token of the QIAN stablecoin protocol, used to vote on QIAN ecological governance and to maintain QIAN price stability. The KUN symbolizes the earth,

which bears all things, and people work and cultivate based on the land, so KUN also symbolizes the governance of mankind.

QUSD is the first stablecoin issued by QIAN system, which takes the exchange rate of US dollar as its pricing standard and maintains its price stability through a series of stability adjustment mechanism. In the future, QIAN will issue various stablecoins corresponding to the exchange rates of legal currencies of different countries and administrative regions, such as QEUR, QHKD and so on, according to the needs of global users.

3. QIAN's design philosophy

The right to issue QIAN stablecoins belongs to every cryptocurrency holder.

With reference to the pegged exchange rate system of Hong Kong dollar, the QIAN stablecoins will be considered as the proof of currency swap between the smart contract and the cryptocurrency holder. A US dollar-holding Hong Kong bank is like a holder of cryptocurrencies such as ETH, while the Hong Kong dollar-issuing government is like the smart contract system that controls QIAN’s stablecoins issuance and recall.

To get QIAN’s stablecoins, without paying any interest, users only need to lock the excess cryptocurrencies into QIAN's smart contract. This step is different from the CDP mechanism of stablecoins such as MakerDAO but is a currency swap. QIAN stablecoins are considered as a proof of currency swap between the smart contract and the cryptocurrency holder, and we name the smart contract under this mechanism CSA (i.e. Currency Swap Agreement). Unlike CDPs, there is no interest to be paid, so QIAN's CSA is likely to be held for a long time.

3.1 Fixed-exchange-rate mechanism

In order to maintain the value of QIAN and flatten the exchange rate fluctuation, we will build an exchange rate market for arbitrageurs to trade around QIAN, control its exchange rate stability through market behavior. QIAN will establish a set of perfect trading arbitrage mechanisms, and apply it in Uniswap, Curve and other decentralized trading platforms and some centralized exchanges, as well as linking it with external

protocols to regulate the price of QIAN stablecoins through the market to maintain stability against fiat currency.

Under certain conditions, such as when the overall reserve assets of the QIAN system are below a certain level, the market price of QIAN stablecoins might fall below its face value and not recover for a sustained period. In this case, non-CSA holders can redeem the cryptocurrencies corresponding by the market price at par value from the system using QIAN stablecoins such as QUSD. There is a second arbitrage path in addition to secondary market arbitrage. Arbitrage operations around "QIAN stablecoins/fiat currencies" will allow for effective regulation of CSA opening/closing.

3.2 Negative interest rate incentive

When QIAN stablecoins increase in value against the fiat currencies, it means that the supply of QIAN stablecoins in the whole system is insufficient, and the unit QIAN stablecoins can be exchanged for more assets, at this time, it is necessary to promote CSA generation, so that the supply of QIAN system can return to normal range, and then promote the return of the market price. To achieve this, we further facilitate the regulation of the QIAN stablecoins exchange rate by introducing a negative interest rate.

A negative interest rate is a mechanism to adjust the supply of QIAN stablecoins. In order to maintain the development and stability of the QIAN ecology, locking cryptocurrency to mint QIAN stablecoins will not generate interest by default. The system will pay interest to the newly created CSA when it is necessary to incentivize the minters to increase the circulation of QIAN stablecoins, and the interest will be paid in KUN, the governance and stabilization token of QIAN protocol, calculated on the value of KUN tokens.

3.3 No cost to hold CSA

As a liquidity provider, holding the CSA of QIAN does not need to pay any interest, on the contrary, it is possible to get the interest from the smart contract as additional income, which will stimulate users to hold QIAN's CSA for a long time, so that QIAN stablecoins has the possibility to be used for cross-border payments, consumer payments, asset transactions, lending and other economic activities. With 0 holding cost, QIAN stablecoins can really participate in and promote the development process of decentralized finance,

and develop together with the fiat-guaranteed stablecoins, which also does not require holding cost, to serve users with different needs.

3.4 Promote the use of cryptocurrencies such as ETH

QIAN 2.0 system will support a variety of cryptocurrencies swap for QIAN, users holding ETH and other cryptocurrencies, locked their assets to the QIAN smart contract, can use QIAN for various transactions, investment activities. No collateral interest is required, reducing the financial burden on cryptocurrency holders.

Combined with the DeFi money market protocols such as Compound, AAVE and ForTube, as well as the increasingly mature decentralized trading products (Uniswap, Curve, Balancer, etc.), users will get excess investment returns through QIAN, but also strengthen the asset properties of cryptocurrencies like ETH, promoting more people to hold cryptocurrencies.

3.5 Further revenue generation with new technologies such as Flash Loans

Flash loans are currently known to be a secure technology where any smart contract with assets can choose to provide a flash loan service, and by charging a certain amount of interest on the loan, it can use its own assets to add more revenue. Aggregator tools for flash loans are already appearing in the DeFi ecosystem on Ethereum, allowing for a more robust flash loan service by aggregating traffic from smart contracts that support flash loans.

QIAN's smart contract will support flash loan functionality, as the cryptocurrencies locked in QIAN's smart contract can get additional income for the contract, QIAN stablecoin governance committee will regularly buy KUN tokens in the market with the flash loan income, KUN as the income value storage carrier of the QIAN smart contract, will be locked into the smart contract of QIAN system income deposit.

3.6 Self-cycling ecology, steadily expanding the market

Any stablecoin operation team needs to clearly answer these questions: who are the users of the stablecoin, what are the scenarios for stablecoin usage, and how can we expand the market share of the stablecoin?

QIAN 2.0, as a member of a cryptocurrency-backed stablecoin projects, has a clear answer.

First, the users of existing cryptocurrency-backed stablecoins are available only to a small segment of the population willing to participate in mortgage lending at cost. QIAN's CSA has no interest cost and can cover all cryptocurrency users.

Secondly, since there is no long-term cost of holding, QIAN will really have the potential of value scale, circulation means, storage means, payment means, with the possibility of extending to all scenarios of currency usage.

Third, QIAN 2.0 is owned by all KUN token holders. , after the launch of QIAN 2.0, it will actively cooperate with the participants of DeFi, and gradually expand the market share.

3.7 Risk control

In the design of QIAN, the following risk management rules are followed.

First, QIAN 2.0 upholds to the principle of excess reserves, when the user using ETH and other cryptocurrencies generates QIAN stablecoins, a certain percentage of the start-up coverage rate, the ratio between the value of cryptocurrencies locked and the value of Stablecoin minted should be at least 120%.

Secondly, in order to increase the security of locked assets within the CSA, to avoid liquidation in extreme market conditions, meanwhile keep the utilization rate of cryptocurrencies, QIAN 2.0 will introduce volatility factor according to the speed of market price change of cryptocurrencies, and regulate the ratio of locked asset value in CSA.

When prices go up or down unilaterally, volatility rises, and the system adjusts the CSA's start-up coverage rate upward. During periods of smoother markets, volatility decreases, and the system reduces the percentage of CSA start-up coverage rates. This design will effectively mitigate the impact of market volatility on lock-in assets of CSA, encourage users to perform CSA lock-in in a smooth market and increase the security of locked-in assets.

Thirdly, when the market price plummets, the customer's CSA adequacy rate decreases, the CSA has two kinds of status changes in the process of declining: alarm status and frozen status.

For example, a user holds CSA of ETH (the CSA_{ETH}), when its reserve asset adequacy ratio drops to 150% (alarm line of CSA_{ETH}), QIAN system will remind the user to fill the locked asset. At this point, if the market continues to plummet and the user is too late to make up the supplement, the adequacy of the CSA continues to decline, and when it falls below 120%, the smart contract will freeze the user's CSA until the user replenishes the locked asset above the safe level before unfreezing. Users will not be able to initiate redemptions of locked assets through their own addresses until they have replenished them.

Since QIAN 2.0 supports a variety of crypto-asset locking, users may hold CSA of different assets in hand, and the inherent risk is different among various assets, so there will be different risk control lines, and the specific control criteria (specific ratio of alarm line, frozen line) will be determined by the community after full discussion.

Fourthly, a frozen CSA may be liquidated, allowing non-CSA holders to redeem assets in frozen contracts with QIAN stablecoins based on the values of all stablecoins generated by frozen CSAs, which will be detailed in the subsequent section on smooth arbitrage mechanisms.

In addition, QIAN version 2.0 will maintain the global debt auction mechanism designed in version 1.0. Under extreme conditions, the adequacy rate of certain or all reserve assets in the QIAN system may be less than 100%, resulting in insufficient support for the intrinsic value of the QIAN stablecoins. If there is a general lack of willingness on the CSA holders to replenish the lock-in at this point, and the market price of the underlying reserve asset does not recover for some time, this will create a reserve gap (debt) in the QIAN system. In this case, the system will initiate a global debt auction after the overall reserve adequacy has been consistently below a certain level and after a certain observation period.

In the global debt auction, the system will unfreeze the governance tokens KUN provided by QIAN stablecoin protocol governance committee and auction them out to the public, with the proceeds of the auction being used to cover the system-wide reserve asset adequacy ratio. The QIAN stablecoin protocol governance committee, along with all KUN holders, will be the final guardian for the QIAN system.

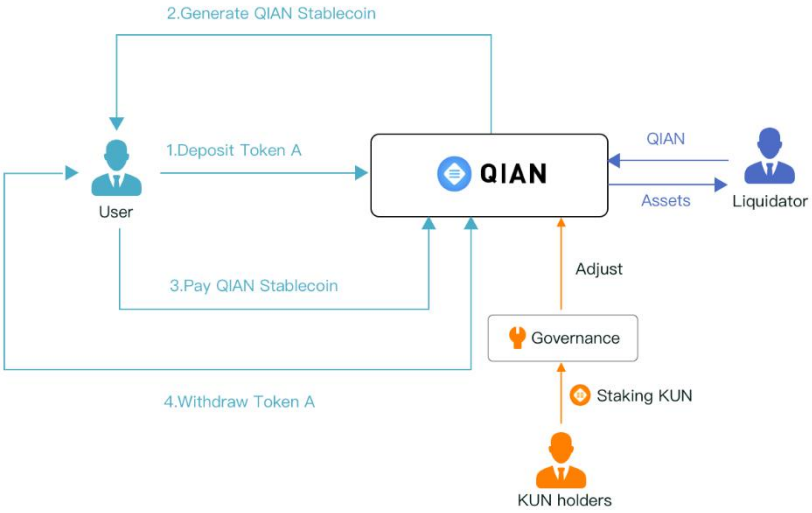

Figure 1 Value flows in QIAN

3.8 Summary of QIAN 2.0's advantages

In summary, the design advantages of QIAN are as follows.

Table 1 Design advantages of QIAN

	QIAN 2.0	DAI
Issuing mechanism	Currency swaps	Collateralized lending
Coin holding costs	No costs, potential positive benefits	Medium to high costs
Coin holding risk	Medium or low risk	Medium or high risk
Resistance to extremes	Strong, to be tested	Weak, exposed
Is there a return on the collateral asset?	Positive return	Negative return
Support for new technologies	Strong	To be seen
Ecological support	Improving	Good
Is there a final guardian?	Yes	Yes
Target market	DeFi, cross-border payments in the real economy, consumer payments, asset transactions, lending activities, and other types of economic activities	Mainly limited to DeFi
The underlying fiat currency	USD and other fiat currencies	USD

III. Locked asset management

1. Core Configuration Parameters of cryptocurrencies

QIAN stablecoins are generated by users locking cryptocurrencies in smart contracts, initially the underlying assets will be in ETH, ERC-20 versions of BTC, and other mainstream ERC-20 tokens. After a certain period of stable operation of the system, we will consider incorporating offline assets mapping tokens with consensus to be used as collateral for the issuance. Given the high volatility and correlation of token-based assets, excess reserves of all types of assets will be required.

For each cryptocurrency, the core parameters of the system configuration include.

- Market Price Volatility Vol_i: Due to the high-frequency trading nature of cryptocurrencies, the QIAN 2.0 system will draw on current common international indicator RV (Realized Volatility) in the market, which reflects option price fluctuations. Define the volatility of cryptocurrency i as Vol_i. at the beginning of the system going online, Vol_i will be updated based on the quoted intervals of the oracle. The concept of stablecoin and options is different, the risk of the underlying assets can be effectively managed through recent realized volatility, thus Vol_i does not address projections of future volatility.
- Initial guarantee ratio $Q_{i,0}$: subject to market price fluctuations for each cryptocurrency, $Q_{i,0}$ is in dynamic flux and will be updated based on the quotation cycle of the oracle at the beginning of the QIAN system going online.
- Current asset guarantee ratio $Q_{i,t}$: $Q_{(i,t)} = \frac{Locked(i,\ t)}{QUSD_i}$;
- Minimum asset guarantee ratio $Q_{i,min}$: a percentage of the guarantee ratio of the CSA for asset i, below which will trigger the freezing of guarantee assets.
- Alarm guarantee ratio $Q_{i,alarm}$: $Q_{i,alarm} = \frac{Q_{i,0} + Q_{i,min}}{2}$, an alert will be triggered if the CSA's asset ratio falls below a certain percentage, alerting the user that the CSA needs to be replenished with more reserve assets in order to maintain a healthy guarantee ratio, however, the user will still be able to fully redeem the CSA if it's not replenished.

- Maximum mint amount: it means the maximum amount of QUSD that can be minted in the system for that type of cryptocurrency.

Where Locked(i) is the overall value of the currently locked cryptocurrency i, quoted from the oracle and updated periodically.

For a cryptocurrency i, set the maximum minting amount of QIAN to be H, then there are

$$0 < H \leqslant \frac{Locked(i) \times Price(i)}{Q_{i,0}}$$

Where Price(i) is the current market price of the cryptocurrency (from the oracle).

2. Overall core configuration parameters of the system

For the system, the core parameters include.

- Overall asset guarantee ratio Q_{total}: $Q_{total} = \sum_{i=1}^{n} Q_i \times \frac{QUSD_i}{QUSD_{total}}$
- Overall minimum guarantee ratio Q_{min}: Initially, $Q_{min} \geq 90\%$ is required, and subsequent adjustments will be made through the community governance process.
- Debt auction observation time $T_{auction}$: When Q_{min} appears, the time before the global debt auction begins.

3. Cryptocurrency portfolio management

In order to avoid QIAN stablecoins (such as QUSD)'s price volatility, diversify risk and enhance stability, the QIAN system will select reserves from mainstream cryptocurrencies and tokenized assets based on indicators including, but not limited to: asset type, market capitalization, liquidity, volatility, issuer, and region of issuance.

Since QIAN is a decentralized system, every user is free to participate in the minting of QIAN stablecoins. The system's crypto-asset portfolio management has a highly flexible strategy, and the system does not deliberately maintain the ratio accounted for the various crypto-assets in the system. However, as mentioned earlier, the system will set the maximum minting amount for different cryptocurrencies i. This parameter is related to the

required initial guarantee rate of CSA for cryptocurrency i, with a higher maximum minting amount for low-volatility cryptocurrencies.

IV. Stability management

1. Price fluctuation buffer mechanism

1.1 Design philosophy

The current crypto pledged stablecoin lacks a mechanism to adjust the closing and collateralization operations based on volatility indicators, which makes the stablecoin system unable to effectively cushion the impact of market fluctuations on pledged assets in the face of extreme market conditions, and prone to pledged asset losses in the face of a similar market crash to the one on March 12, 2020, thus affecting the balance of the entire stablecoin system.

Therefore, in designing the QIAN system, we considered the impact of price, volatility, and time on the underlying reserve assets in a comprehensive manner. Also, unlike traditional financial products, such as options, where volatility factors directly affect pricing and trading model, the QIAN Stablecoin system introduces a volatility parameter that is designed to make the equilibrium of the stablecoin less perturbed by the price of underlying asset, thus it maximizes the ability to maintain the overall balance of the system.

1.2 Volatility index

QIAN 2.0 will introduce the Volatility Index V_i as an important measure of the volatility of the underlying reserve assets.

The price of any asset goes up and down, and when the price accelerates up or down, as the return accelerates up or down, the insufficient risk of underlying reserve asset gradually accumulates as V_i increases. At this time, the safety of the underlying reserve assets can be effectively cushioned from price fluctuations by increasing the initial guarantee ratio Qi and suspending liquidation operations.

As the rate of change in the price of the underlying reserve asset of the stablecoin is stabilizing, at which index V_i falls and insufficient risk is released, the QUSD price from

which the deviation occurred can be returned by reducing Qi and resuming liquidation operations.

1.3 Volatility calculations

1.3.1 RealVol Daily Formula

In traditional derivatives markets, the yield, or Realized Volatility (RealVol), especially on a daily basis, has been widely accepted as the underlying calculation parameters for a volatility index (e.g. RVOL and RVOV, etc.). Due to the unique nature of cryptocurrency trading, the traditional RealVol Daily formula for the market needs to be redesigned as the underlying parameter for the volatility calculation of stablecoin reserve asset i.

The RealVol Daily Formula starts with the traditional formula for standard deviation and modifies it in a few key ways.

Annualization Factor

RealVol sets the annualization factor to a constant. Due to the 7×24 nature of trading in the cryptocurrency market, the actual number of trading days should be corrected to the number of days in the natural year. Since there is variation in the number of days in a month, it is better to have an approximate constant than to have several exact but different values. The constant value of 365 represents the number of trading days in a typical year. Because of the changes in the calendar in any particular year and/or the holiday schedules in any particular country, the actual number of trading days may be slightly higher or lower than 365.

More readable representation

The result of RealVol is typically a value less than 1.00. RealVol multiplies the result by 100 in order to bring the values to a more intuitive “fiat currency valuation” construct.

For example, the annualized realized volatility of a cryptocurrency’s return may be 0.20. Often, traders would quote this number as 20%. RealVol would disseminate the index value as 20.00.

RealVol Daily Formula

$$R_t = \ln \frac{P_t}{P_{t-1}}$$

Where:

R_t = continuously compounded daily returns from t-1 to t

ln = natural logarithm

P_t = underlying Reference Price (“closing price”, determined by oracle price source) at day t

P_{t-1} = underlying Reference Price (“closing price”, determined by oracle price source) at day immediately preceding day t

$$Vol = 100 \times \sqrt{\frac{365}{n} \sum_{t=1}^{n} R_t^2}$$

Where:

Vol = realized volatility

365 = a constant representing the approximate number of trading days in a year

t = a counter representing each trading day

n = number of trading days in the measurement time frame

R_t = continuously compounded daily returns as calculated by formula

1.3.2 Design of RealVol Real-Time Formula

Due to the continuous trading nature of cryptocurrencies, after deriving the daily RealVol, we need to further calculate the real-time RealVol, which provides an indication of the 1-month daily realized volatility index throughout the trading day.

All of the design elements described for the RealVol Daily Formula are the same for the RealVol Real-Time Formula. To convert from a daily to a real-time value, one needs to start with the RealVol Daily Formula, then incorporate the current underlying price and a weighting scheme. Doing so provides continuous updates throughout the trading day and delivers to traders a useful, real-time indication of the up-to-the-moment 30-day daily realized volatility. Essentially, VOL measures a constant 30-day realized volatility even while we are within the new, most recent, day (“Today”).

For instance, if we are 80% through the current day (n+1), we will use the most up-to-the-moment URP to calculate the partial (80%) day’s return (n+1) from yesterday’s

URP (n). Then we consider the very first day in the calculation period and weight that whole day's return by 20% (100% - 80% = 20%). In this manner, we still have the weight of 30-day realized volatility at any moment in time even though there are actually 31 returns — 20% weight on day 1, 80% weight on day 31, and full weights for days 2 through 30 (for a total weight of 30 days of returns).

Note: While the partial return of the current day is self-weighting, and therefore requires no additional coefficient, the self-weighted portion of the current day is nonetheless required to be calculated so as to apply the proper remaining weight to the full day 1 return. In order to calculate the weight of the current day, the current time each day is measured to the closest minute. Since there are 1,440 minutes in a day, the current time and the number of minutes in a day are used in the RealVol Real-Time Formula to calculate the daily weight to be applied to day 1.

When the time of day equals the close of today (n+1), the weight of the return of day n+1 is now 100%, while the weight of the return of day 1 is 0%. Thus, with its weight of zero, the return of the original day 1 drops out of the calculation. The original day 2 now becomes the new day 1 and all other days get renumbered as well. The RealVol Real-Time Formula at this very instant in time (the close at 12:00 PM CST in our example) simplifies to the RealVol Daily Formula. The instant after the market closes, we begin anew, with the returns renumbered, such that there are again only 30 returns, with the new trading day having a weighted return as day 31.

1.3.3 RealVol Real-Time Formula

$$Vol_R = 100 \times \sqrt{\frac{365}{n}\left[\frac{1{,}440 - m}{1{,}440} R_1^2 + \sum_{t=2}^{n} R_t^2 + R_{n+1}^2\right]}$$

Where:

1,440 = number of minutes in a day

n+1 = current today

m = number of minutes up to the current moment in time of the current day (n+1) beginning from the time of the most recent market close (day n)

R_1 = return for first day (day 1) of the period (from close day zero to close day 1)

R_{n+1} = partial return (the return using the current underlying price and the Underlying Reference Price of the prior day).

Note: For clarification, the italic “R” denotes partial return; all other returns are full-day returns.

1.3.4 Relationship between the initial guarantee ratio $Q_{i,0}$ and $Vol_{i,R}$

If Q_i is always kept at a fixed value (e.g. 150%) without any adjusting factor, then in the event of market volatility, the newly minting user will be exposed to a great degree of risk, here with a real-time volatility factor, we can relate the change in real-time volatility to the initial guarantee ratio as follows.

$$Q_{i,n} = 120\% + e^{(Vol_{R,i,n} - Vol_{R,i,n-1})}$$

Where:

n = current time

i = specific asset classes, such as ETH

$Vol_{R,i,n}$ = real-time volatility of asset i at the current sampling point

$Vol_{R,i,n-1}$ = real-time volatility of asset i at the previous sampling point

The purpose of this automated reconciliation mechanism is to find an optimal balance between user asset utilization and liquidation risk. The above equation reflects the variation of the volatility itself, and its adjustment to $Q_{i,0}$. We will continue to test this formula through the operation of the QIAN system, and as data accumulates, the reconciliation formula will also be iteratively upgraded. If deficiencies are identified in the above formula, QIAN stablecoin governance committee reserves the possibility of revising it through the community governance process.

2. Cryptocurrency smooth arbitrage liquidation mechanism

The QIAN system will decide whether to open the arbitrage mechanism based on the value of Vol_R. The system encourages liquidation at lower market volatility to mitigate the impact of short-term market panic on the stability of the QIAN system.

At any time t(i), for the guarantee rate $Q_{i,t}$, the QIAN system will have the following CSA status.

- CSA(normal), where $Q_{i,t} > Q_{i,alarm}$
- CSA(alarm), where $Q_{i,min} < Q_{i,t} \leqslant Q_{i,alarm}$;
- CSA(frozen), where $Q_{i,t} \leqslant Q_{i,min}$;

For arbitragers who do not hold CSA, their redemptions may result in a reduction in the locked-in assets of CSA holders. In order to balance fairness and efficiency, for a participant of smooth arbitrage liquidation, the source of its redeemable assets at moment t(i) will be restricted to CSA(frozen).

In the arbitrage process, arbitrager will arbitrage from the overall frozen assets of reserve asset i, specifically, assuming that at moment t, the QIAN system has 100 CSAs in frozen state and these CSA generated a total of 100,000 QUSD. Any n arbitragers may use total 100,000 QUSD as the liquidation funds, according to the amount of their contributions, receive part or all of the frozen assets from the liquidation contract. During the liquidation process, all CSA(frozen) holders will receive a share of the frozen assets loss as a percentage in proportion to their total assets of the frozen assets.

All reserve assets that are in CSA(frozen) can be redeemed by arbitragers, in order to protect themselves from losses. CSA(frozen) holders must be the first to replenish the reserve assets in their CSAs to get them out of the frozen state. Either the arbitragers' redemption operation or the CSA(frozen) holders' replenishment can effectively enhance QUSD's asset reserve guarantee ratio, which helps QUSD to regain intrinsic value as quickly as possible in the event of reserve assets shortage.

This liquidation mechanism is designed to encourage all CSA(frozen) holders to replenish reserve assets, but also smooth the speed and volume of liquidation of frozen assets, mitigate and reduce the losses suffered by individual users as much as possible, therefore, we named this mechanism smooth arbitrage liquidation.

Smooth arbitrage liquidation mechanism becomes complex when the QIAN system supports multiple cryptocurrencies. Theoretically, an arbitrager could redeem any of the system's reserve assets that qualified for liquidation, and there would be no liquidation sequence of precedence among the reserve assets. The system dynamically presents the

redeemable amount of each crypto-asset in real time when arbitragers redeem crypto-assets. Redemption of cryptocurrencies by arbitrager within the range of the redeemable amount will not significantly change the distribution of cryptocurrencies across the system.

The redeemable amount of each cryptocurrency is always in dynamic change, when the reserve asset i has reached the maximum redemption ratio R_i, which objectively raises the overall reserve guarantee ratio of the system, at this time the arbitrage operation of reserve asset i is affected by the maximum redemption volume and suspended. However, as QIAN is a multi-asset system, arbitrage activities on other reserve assets will continue.

3. Debt auction

In extreme cases, the system's global asset guarantee ratio Q_{total} may be less than 100%, if market emotion remains depressed, the arbitrage liquidation will likely be suppressed, and the arbitragers will not be sufficiently willing to arbitrage. At this moment, the system's reserve assets are under-valued and will generate an overall debt. In order to maintain the intrinsic value of QIAN, the system will unlock governance token KUN and initiate debt auction. This will make up for the deficiency in the overall reserve assets, which will bring the overall guarantee ratio back above the safety line and restore the intrinsic value of QUSD under extreme market condition.

For participants in debt auctions, the attraction is that the unlocked KUN tokens could be purchased below the market price. In the QIAN debt auction, the maximum discount rate Δr is introduced. Δr is initially set at a discount of 70%, but the exact value could be adjusted by vote after full community discussion. The total KUNs participating in the debt auction are:

$$\text{KUN total value in debt auction} = \frac{Debt\ balance}{\Delta r}$$

Starting bids in KUN's auction

$$p(start) = \frac{market\ price(KUN)}{market\ price(i)} \times \Delta r$$

The auction participant quotes and settles the bid with asset i. The final price i(final) is:

$$i(start) \leqslant i(final) \leqslant i(market)$$

Assets i from the auction will be used to cover the deficiency in system debt, and if there is a surplus, it will be locked into an auction surplus contract for future needs.

4. Global liquidation

While we holding long-term bullish view on cryptocurrencies, we must also address the fact that cryptocurrencies are still in their early development stage, with extreme market ups and downs occurring regularly, and a multi-year bear market in the past market record.

Although the QIAN stablecoin system has a series of stabilization mechanisms, it is still possible that in the event of market extremes and the long-term bear market, even debt auction could not compensate for the system-wide reserve asset guarantee ratio. If this happens and continues for a period, it means that the entire QIAN stablecoin system permanently loses its intrinsic value support. We will explore whether to conduct a global liquidation and shut down the QIAN stablecoin system in this case through a community governance process. Once the community governance passes the proposal to close the QIAN stablecoin system, a global liquidation will be initiated.

In the global liquidation state, the system will first freeze all CSAs and disable CSA generation, followed by terminating the price feed oracle and use the price of the last price feed oracle as the reference quote for the system's global liquidation. At this point, the system state changes again and users holding CSA(normal) have priority to redeem their locked assets from CSA(Normal) contract, the system will process the asset redemptions for this group of users. After the completion of asset redemption for all CSA(normal) holding users, if there are still reserve assets remaining in the system, redemption of CSA(alarm) will initiate.

In the global liquidation state, it is uncertain whether user will be able to get back all of the locked assets without suffering a loss. The probability of being able to redeem the locked assets in full is in order of CSA(normal) > CSA(alarm). The amount of varies underlying reserve assets, market price and other factors can have a combined effect on the probability of a successful redemption.

V. External systems

1. Oracle

The system needs access to external price in real time to monitor change of guarantee ratio in order to initiate CSA state change and control risk. The oracle provides the system with timely information on external prices, including stablecoin QUSD, governance token KUN and reserve tokens, and key parameters such as the guarantee ratio Q_i.

In the absence of a mature decentralized oracle solution, the system will maintain a whitelist of price feed addresses, which is governed by the community vote to add or remove. Each price feed contains price information and validity, and the system calculates the median value from all valid price feeds as the system quote. When an generally accepted oracle solution for KUN holders is available, the system will switch to the corresponding decentralized oracle to guarantee fairness, impartiality, openness and transparency of the price feed mechanism process.

2. Trading platform

When reserve asset price falls rapidly, the system may face a temporary deficiency of reserve assets, and according to the negative interest rate mechanism, interest may be paid to users. In the course of daily operation, the QIAN system may also earn interest income through flash loans or other services. Therefore, the QIAN system may have a surplus or a deficit during its operation, it is necessary to introduce an external trading platform to achieve the bidding transactions between QUSD, KUN and reserve assets.

VI. System governance

1. System participants

Key participants in the QIAN system consist of QIAN stablecoins minters, QIAN stablecoins holders and governance token KUN holders. The purpose of system governance is to balance the benefits of all participants and, based on certain trade-offs, to maintain system stability and continuous healthy development.

Primary risk of QIAN stablecoins’ minter in the system is the risk of redemptions resulting from a fall in the price of reserve assets and the contrast is frozen. The benefits which the minter enjoys include access to liquidity, value storage, risk hedging, and other features. Based on a study of similar projects in the industry, we believe that, within a reasonable range of risk, QIAN stablecoins' minting should be encouraged, which is conducive to the development of the QIAN system, so we have designed an adjustable interest rate mechanism.

The core demand of QIAN stablecoins holders is the stability of QIAN stablecoins’ face values, so we design a value stability adjustment mechanism.

2. KUN governance token

The KUN holders will be the final revenue or risk bearer for the entire QIAN system, the management of the system is determined by vote among the KUN holders.

The total number of KUN is 12 million, all KUN tokens will be distributed to QIAN system participants through yield farming, liquidity mining, governance lock-in and other specific forms. KUN tokens are 100% belong to the community, there are no team reserve, no private funding, no pre-mining.

The exact distribution scheme of KUN will be developed by the QIAN stablecoin governance committee and published on the QIAN official website and governance forum. If it is necessary to adjust the KUN distribution scheme during the development of the project, this can be done by voting.

3. Governance voting

Proposals approved by voting can modify the internal management variables of the QIAN platform, which include, but are not limited to:

- Addition of new reserve assets
- Choosing trusted oracles
- Adjusting interest
- Adjusting flash loan rate
- Risk parameters: debt ceiling for each reserve asset, initial guarantee ratio, redeemable limit, alarm line, etc.

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