xDollar V2: A Non-Custodial, Multi-Chain and Multi-Collateral Lending (mc^2) Platform

xDollar Research
research@xdollar.fi

Abstract. xDollar Version 2 (V2) is a non-custodial lending platform that allows users to deposit tokens into its smart contracts and mint a non-custodial stablecoin, xUSD, in return. The platform supports the use of multiple types of token, as opposed to the norm of relying on a single asset in order to carry out this function. Supported tokens include those from multiple Ethereum Virtual Machine (EVM) compatible chains, such as Polygon, Avalanche and IoTeX, as well as multiple tokens within a single chain, such as Wrapped ETH (WETH), Wrapped BTC (WBTC), and MATIC on the Polygon network. The xDollar multi-chain, multi-collateral (mc^2) approach is able to enhance the solvency of the entire xDollar V2 platform with diversified collaterals, and increase the use of both its stablecoin (xUSD) and its governance token (XDO). As a result, the use cases of the platform are broadened, as is potential community adoption. Of even greater significance, xDollar V2 includes a specific stablecoin collateral function, wherein users are able to collateralize other stablecoins, such as USDC, against xUSD at a 1:1 ratio. By combining this stablecoin collateralization with a redemption function, the platform is able to significantly reduce the price volatility of xUSD, allowing its more effective promotion as a dollar-pegged and highly liquid token.

Contents

1.   Background and Motivation

Mainstream cryptocurrency assets such as Bitcoin and Ether, in addition to tokens on EVM-compatible chains like MATIC, AVAX and IOTX have shown significantly higher price volatility than traditional asset classes like stocks and bonds. In response to this, fiat-based stablecoins such as USDC and USDT have emerged and grown in popularity as blockchain-native, liquid and stable assets able to counter this volatility. Not only do they provide this useful source of stability, they are also able to act as intermediaries in some transactions (especially those conducted on decentralized exchanges) and serve as a means of measuring token value through their transactional capacity. Furthermore, the ability to move into stablecoins can possess great appeal for cryptocurrency users due to it allowing them to avoid some of the negative consequences of short term moves into fiat (fees, tax liability, etc.). Despite the presence of these positive qualities, however, the need to surrender more volatile cryptocurrency assets when obtaining the stablecoins on the market does mean abandoning their potential for positive price action. Collateral-based stablecoins solve this by allowing cryptocurrency holders to deposit their comparatively volatile tokens as collateral and receive a stablecoin in return. When ready, the stablecoin and the debt accrued from performing this action can be paid back and the original collateral retrieved. This ability brings the refinance business model of the fiat world to that of cryptocurrency, providing significant benefits and use cases to cryptocurrency holders wishing to regularly transact in stablecoins.

The current market leader in collateral-based stablecoin platforms is MakerDAO. MakerDAO allows its users to lock up often volatile tokens in exchange for a newly minted, dollar-pegged stablecoin, DAI. Its users can thus unlock some of the economic value of their more volatile tokens while retaining their exposure to the underlying crypto asset. Beyond that, token holders can leverage the obtained liquidity to lock up additional collateral and receive further exposure to their collateralized tokens. There are, however, many drawbacks to the MakerDAO model. The fees incurred when using MakerDAO are often high and unpredictable, a factor that lowers the incentive for users to interact with their smart contracts. There is also the necessity of maintaining a high collateral ratio due to the platform's inefficient liquidation process\$, which decreases their capital efficiency in addition to increasing the platform risk.

With this backdrop, a novel platform, Liquity protocol, was launched during the spring of 2021. At launch, Liquity made several key breakthroughs in the field of collateralized stablecoins and introduced significant advantages it held over its competitors. These included 1) interest-free borrowing; 2) a low collateral ratio requirement (110%); 3) an xUSD-like pool (stability pool) mechanism that increased liquidation efficiency and 4) a redemption process to protect the lower bound of the stablecoin price.

Liquity experienced great success after it went live and its core protocol remains stable and robust. Despite this positive outcome, however, like MakerDAO, there exist some key drawbacks in the protocol's design:

• **Single Token Collateral** - Liquity limits users to depositing exclusively ETH as collateral. Although ETH is second only to Bitcoin in terms of market cap and notoriety, other tokens are quickly growing in popularity and liquidity while possessing many of the positive qualities that make ETH a good collateral. Those who wish to use the platform but possess cryptocurrencies other than ETH may experience friction both in converting their tokens into ETH and in accounting for the need to exchange assets they may wish to hold to another. This limits the use of the platform and constrains more extensive user adoption.

• **Single Chain Deployment** - Liquity has, so far, only been deployed on the Ethereum mainnet, excluding users of other EVM-compatible chains. The operational complexity and risks involved in cross-chain bridging inevitably lead to users who hold cryptocurrencies on other chains to have a reluctance to bridge their assets and experience the Liquity platform.

• **Price Stability** - Despite Liquity's 110% collateral ratio and the 1:1 redemption mechanism the protocol includes that sets theoretical price boundaries ($1-redemption fee to $1.1+ borrowing fee), in reality, due to supply and demand dynamics, the price may remain at either the upper or lower boundary for extended periods. Ideally, a stablecoin should peg strictly to the fiat value it represents at as close to a 1:1 ratio as is possible. Despite its relatively narrow range when compared to other platforms, with price fluctuations taken into account Liquity's stablecoin is still exposed to the risk of price instability of its stablecoin.

• **The LQTY Native Token** - The concept of the LQTY staking pool is innovative in that it allows stakers of the platform's native token, LQTY, to receive 100% of the platform's revenue. However, beyond claiming revenue as part of the fee sharing mechanism, the use case for LQTY is minimal. It possesses no governance function, an omission that distinguishes it from many successful decentralized finance (DeFi) "blue chips" like MakerDAO, AAVE, Curve, and Sushiswap. In addition, 100% distribution of platform's revenue may not be the most efficient way for capital allocation especially in the long run.

2. Innovations and Key Benefits of xDollar V2

The xDollar V2 platform is built on the foundations set by Liquity but introduces its own breakthroughs and innovations in order to solve its predecessor's drawbacks and limitations. The key benefits and improved design mechanisms of xDollar V2 include:

• Multiple chain, multiple collateral deployments (mc^2)
• A hard price ceiling and floor
• Adopter rewards and governance participation through the XDO token

2.1. Multiple Collateral, Multiple Chain Deployments

xDollar Version 2 (V2) offers the ability to use multiple types of token as collateral on the platform. By depositing their collateral, users are able to mint the platform's stablecoin, xUSD. The xUSD token can then be used as a dollar-pegged and liquid unit of account or staked in the platform's xUSD pools (stability pools). Staking xUSD earns the user platform rewards distributed in the platform's native token, XDO, in addition to also facilitating the acquisition of the liquidation profits traded on the secondary market. xDollar V2 and other platforms that support the token provide liquidity pools that facilitate the trading and price discovery of the xUSD token. This occurs through transactions conducted on and across decentralized exchanges motivated by the ability to obtain profits from actions that contribute to the maintenance of the dollar peg.

No matter where users mint xUSD and irrespective of the types of collateral used to do so, the tokens are completely fungible. The permissible collateral types that allow for the minting of xUSD are determined by community voting and governed by the DAO.

xDollar V2 is a multi-chain deployment, being available on several EVM-compatible chains. This provides huge convenience to the users of different chains and allows them to participate in DeFi operations within a barrier-free ecosystem. xDollar's vision is to distribute vital functionality across all cryptocurrency networks, with a long-term mission of democratizing DeFI by making it accessible to its billions of potential users.

2.2. Hard Price Ceiling and Floor

The price of the xDollar V2 stablecoin, xUSD, is designed to remain stable. Smart contracts with carefully considered mechanics protect the price floor and ceiling. The price floor is guaranteed to be $1 (minus the redemption fee), with issued xUSD tokens fully redeemable against collateral held within the platform's smart contracts. xUSD can be traded back into the platform in exchange for an amount of collateral equal in face value (1 xUSD for $1 worth of collateral) to the returned xUSD (minus a redemption fee). If the xUSD is traded below this price in the secondary market, arbitrageurs will buy xUSD at the lower price and then redeem collateral with a higher dollar value than the tokens spent purchasing the xUSD, resulting in a profit. Arbitrageurs thus act to restore the peg by increasing demand for a limited market supply of xUSD.

On the ceiling side, the platform employs the stablecoin collateral mechanism, where users are able to deposit stablecoins like USDC into the platform and swap them for an equivalent dollar value of xUSD, incurring a fixed 1% fee in the process. In other words, a user who deposits $1.01 USDC will get $1 xUSD. This mechanic would contribute to the peg maintenance of xUSD to USDC as, if the price of xUSD were higher than the peg value, arbitrageurs will deposit their USDC and get xUSD in return. By then selling this minted xUSD on the secondary market they are able to secure a profit. By these means, arbitrageurs assure peg restoration within a strictly defined floor and ceiling.

2.3. Adoption Reward: XDO and DAO Governance

Users who deposit xUSD in the xUSD stability pool and contribute to the health of the platform receive as a reward for this service the XDO governance token. The XDO token can then itself be staked within the platform's XDO pool to earn a proportion of the protocol revenue generated from issuance and redemption fees. The remaining revenues will be distributed to platform treasury which will be used for platform long-term development such as XDO buybacks. XDO is issued according to a release schedule that halves the number of tokens distributed each year, favoring early adopters.

Since xDollar V2 enables the multi-chain, multi-collateral feature, there are a greater number of decisions for XDO token holders to make, decisions exercised through the act of voting. Like other governance tokens, XDO token holders receive voting rights proportionally when determining the future development and direction of the xDollar platform. Examples of governance topics that will come before XDO holders include the addition of new collateral types, new chain selection, platform upgrades; essentially any topic that manages the health and growth of the xDollar V2 platform.

3. xDollar V2 Functionality

xDollar V1 was built on top of the Liquity protocol, adopting its fundamental functions and in doing this acknowledging the protocol's stability and success. Going beyond Liquity's contribution to the ecosystem, xDollar V2 possesses numerous innovations focused on the addition of advanced functionality. These innovations include the implementation of multiple collateral types and chain agnosism in a DAO-governed lending platform.

3.1. Fundamental Functions

3.1.1. Borrowing Function:

Any user may obtain liquidity at any time and in an entirely permissionless manner after depositing cryptocurrency collaterals approved by the xDollar V2 platform into a specified account (trove). The collateral assets are then locked by the smart contract, securing them from then onwards. The trove is required to always maintain a Minimum Collateral Ratio (MCR) of 110%. The MCR is calculated as the total dollar value of the collateral divided by the total value of debt, i.e., the dollar value of the minted xUSD. When a user deposits collateral and mints xUSD the protocol will charge a one-time borrowing fee, which is calculated at base rate + 0.5%, where the base rate is a function of the frequency and amount of redemptions occuring on the platform. The borrowing fee has strictly defined boundaries, falling within 0.5% to 5%.

A borrower needs to also have a "reserve" for paying the gas fee in the case of the liquidation of their trove. xDollar V2 requires different liquidation gas reserves based on the chain, collateral, and market used. Roughly speaking, the liquidation gas reserve would be higher on Ethereum, where gas fees are consistently higher when compared to those of other chains. The protocol differs from Liquity in this regard, as Liquity requires a fixed amount of liquidation reserve.

xDollar V2 will assess its implemented chains and their internal systems in order to determine an optimal liquidation gas reserve.

Example:

A borrower opens a new trove by depositing 5,000 MATIC and draws 4,000 xUSD. At the point of doing so, the borrower needs to pay a 0.5% borrowing fee on the 4,000 xUSD, an amount equal to 20 xUSD. On top of this, the protocol will also require a liquidation reserve of 50 xUSD. Therefore, in total, the borrower generates 4,000+20+50=4,070 in xUSD debt, with $4,000 xUSD arriving in their wallet for their immediate use. The total cost ratio for both fee and liquidation reserve is 70/4,000=1.75%. Please note that this is a one-time charge and the liquidation gas reserve will be returned to the borrower when they close the trove without liquidation.

3.1.2. Close Trove and Redemption

Users can choose to regain access to their original deposit by closing their troves. Alternatively, users could choose to redeem their collateral tokens for xUSD through the redemption process at a 1:1 ratio to their xUSD value. When carrying out these processes, the system uses the received xUSD to first repay the user's trove with lowest collateral ratios (those at greatest risk of liquidation), transferring the respective amount of collateral from the affected position to the redeemer. Redemptions are also subject to a Redemption Fee, which is a function of the relationship between the base rate and the redeemed quantity of xUSD. The minimum Redemption Fee is 0.5%. The fee is subtracted from the redeemed xUSD, marginally reducing the amount of collateral that the redeemer receives.

3.1.3. Liquidation and the xUSD (Stability) Pool

If the collateral value of an account drops below the level of its debt, i.e. the quantity of xUSD minted, a liquidation process is triggered against the in the xUSD (stability) pool and the collateral pools in which the account holds assets. This occurs without the public auction process that is often a component of other platforms.

The xUSD (stability) pool is the first line of defense in maintaining system solvency. This is because sUSD (stability) pool deposits absorb and cancel the debt of defaulted troves. In return, xUSD (stability) pool participants are rewarded for this by their receipt of collateral taken from liquidated positions at a significant discount. xUSD (stability) pool depositors are free to withdraw all or part of their remaining xUSD deposit for other uses of the token such as providing liquidity in DEX and trading, with the system always paying out the entire collateral gain made by the depositor.

3.1.4. Recovery Mode

To keep the system robust and efficiently protect the solvency of the platform, the xDollar V2 protocol has a recovery mode that will be triggered should the collateral ratio of the platform ever fall below a certain threshold. Currently, the minimum collateral ratio is 150%, though this can be adjusted dynamically based on market conditions and as a result of parameters chosen through the governance of XDO stakeholders. When the recovery mode is triggered, all trove

swith collateral ratio below the threshold are liquidated, while those with a higher collateral ratio will remain secure.

3.2.   Advanced Functions

xDollar V2 makes significant innovations through the implementation of technically advanced functions incorporating no small amount of economic complexity:

3.2.1.   The Multi-Chain, Multi-Collateral Mechanism

Users with different types of tokens are able to deposit their eligible tokens to xDollar V2 and mint xUSD. xDollar V2 also operates on multiple chains. All xUSD minted are fungible and traded at parity, and xUSD on different chains can be moved across those chains using bridging applications. In summary, this functionality provides the following benefits:

• The platform produces one type of stablecoin, xUSD, which is easy to manage, straightforward to use, and robust.

• xUSD can be used in the same manner irrespective of the chain it is on, such as in xUSD pools (stability pools).

• The XDO governance token is also transferable across chains while retaining its fungibility, allowing XDO stakers to receive profits accrued across the entire platform. This differs from other platforms.

• On some platforms, the use of multiple collaterals results in the minting of multiple stablecoins. For example, a competing platform onto which ETH and MATIC were deposited might result in the minting of specific ETH-backed and MATIC-backed xUSD equivalents. xUSD avoids this significant drawback with the single, indistinguishable stablecoin that xDollar V2 is able to generate.

• Further to the above, there is no conversion of multiple stablecoins, such as xUSD-MATIC or xUSD-ETH, into each other. The stablecoins minted with the xDollar V2 platform can be directly exchanged by users for other fiat-based stablecoins, thus lowering the operational complexity.

• There is no need to build liquidity pools for multiple collateral derived stablecoins (eg. xUSD-MATIC or xUSD-ETH). This has a significant benefit, as splitting stablecoin liquidity into multiple liquidity pools to cater to these subtle differences would lower total liquidity and contribute to price volatility and system inefficiency.

• As the generation of multiple stablecoins such as xUSD-MATIC or xUSD-ETH is avoided, so too are internal arbitrage opportunities that would add to operational complexity. Due to supply and demand dynamics, these different stablecoins would have different price dynamics despite being issued by the same platform and thus present a means of carrying out arbitrage.

xUSD minted within xDollar V2 possesses a positive compatibility with all xUSD pools (stability pools) regardless of the collateral type, and is fully redeemable against all collateral pools.
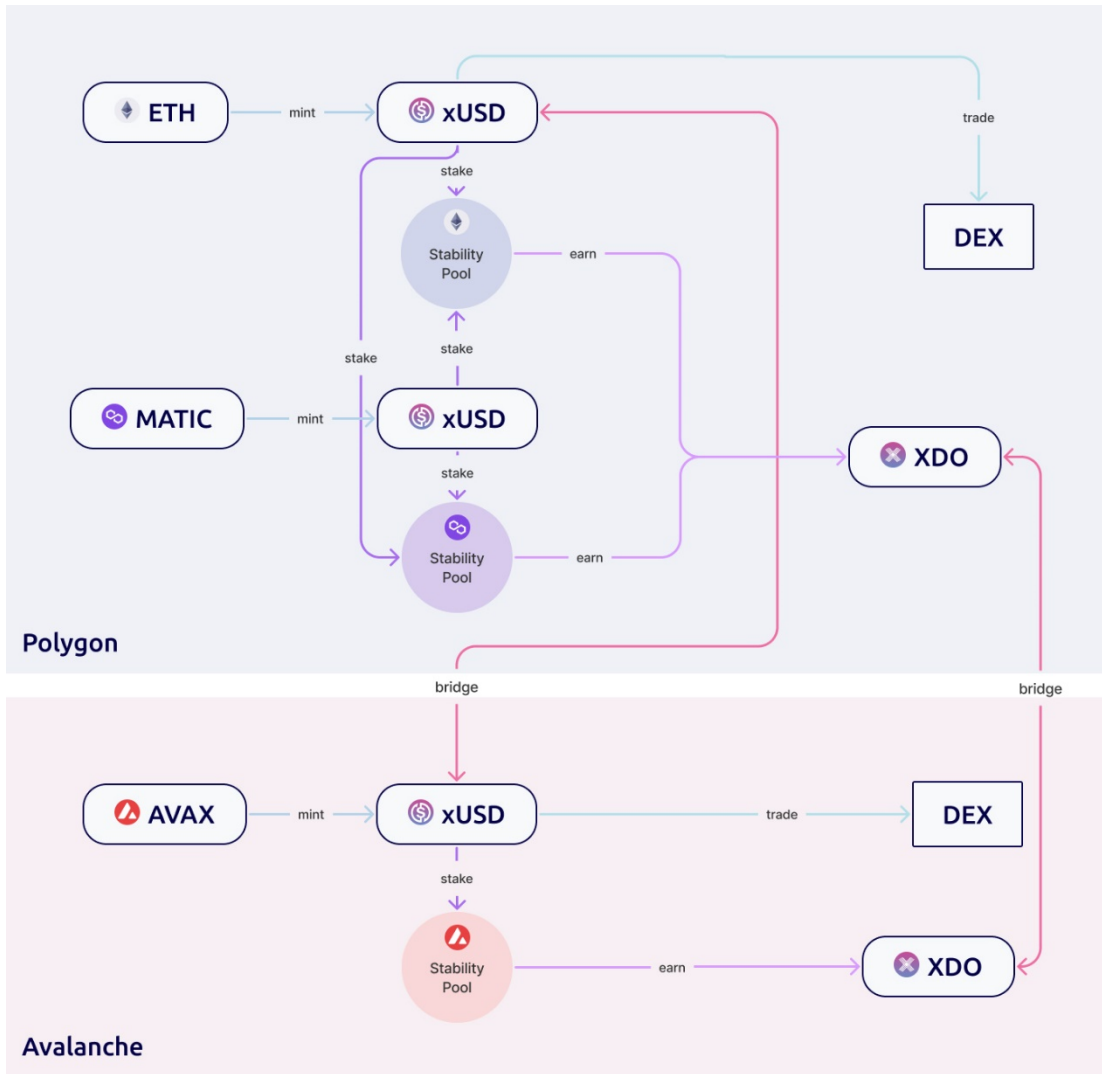
Figure 1: xDollar V1 and V2 illustration flow

3.2.2. Stablecoin Collateral

One issue with the Liquity stablecoin model has been its inability to create a tight enough spread around the value of \$1. In fact, a stablecoin using the Liquity model will tend to consistently trade at a slight premium to \$1. To counter this and strengthen the xUSD peg while expanding collateral options for end-users, xDollar V2 provides the option to collateralize stablecoins like USDC for xUSD. For a small, 1% fee, users are able to mint or sell xUSD to other stablecoins.

To be more specific, when a user deposits USDC into the xDollar V2 platform, they will essentially be opening a special trove that accepts only USDC as collateral at a minimum collateral ratio of 101%. The liquidation and redemption functions are disabled in these troves and as long as the troves are open they remain active until users claim their USDC by simply closing them. The USDC troves are also not subject to liquidation in Recovery Mode. These factors create a tighter and more stable spread, minimizing volatility and retaining the xUSD

peg closer to $1, a crucial ability during a period of market volatility when many collateral prices could fluctuate rapidly. These factors also make it easier to onboard users who already possess stablecoins in their portfolio but who do not want exposure to more volatile assets.
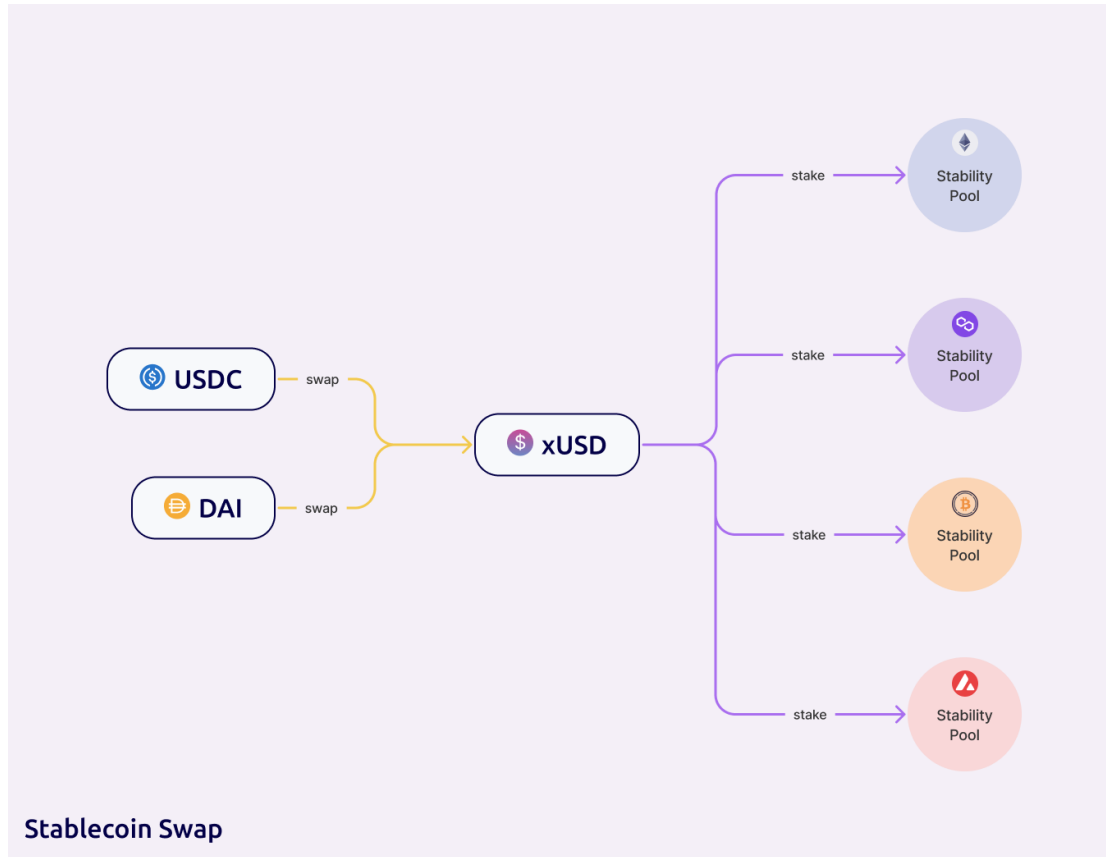

Figure 2: Stablecoin Swap developed on xDollar V2

Other than through the possible implementations of other platforms, stablecoin collateral does not open a redemption function and thus provides a good guardrail:

• With the xDollar design, account closures to claim back USDC can only be instigated by the user who opened the trove.

• Such a setup is able to effectively protect the USDC collateral and prevent different users from depleting it when the market is especially volatile. When users want their USDC back, their assets are always there ready for them to claim them.

• In addition, the xDollar V2 platform closely maintains its "balance sheets" by only issuing 1 xUSD when greater than $1 is deposited as collateral. The smart contract guarantees there is no creation of xUSD without the correct collateral backing and that there is no smart contract risk introduced by the stablecoin collateral.

Although the stablecoin collateral function provides significant benefits to the platform, it does introduce some potential risks. These can essentially be reduced to the following two:

1. The risk that USDC, as a centralized fiat collateral-based stablecoin, may become subject to regulation that affects its transactional ability and thus contributes to its price volatility.

2. As users with xUSD minted from an asset like USDC take of little risk (as the protocol guarantees the exchange) but can enjoy benefits across the entire platform, such as staking in the rewarded xUSD pool (stability pool), it may cause a large portion of the TVL to come from stablecoin collateral rather than a more diverse array of cryptocurrency assets. This would dilute the benefits for those users who mint xUSD using non-stablecoins while leading them to bear a comparatively higher risk than others.

Although these risks are minor, to mitigate them the xDollar V2 protocol will set up a debt ceiling for this kind of minting so that the xUSD generated constitutes no more than 60% of the total value locked in the platform. This figure can be dynamically adjusted and will be based on the changing nature of the locked value (though the xDollar V2 DAO may, on occasion, step in to vote on a determination of the optimal debt ceiling).

3.2.3.   The XDO Staking Pool and Multi-Collateral Rewards

With the mc^2 feature enabled, xDollar has a single XDO staking pool on one chain that earns xUSD (borrowing fees from the minting of xUSD using multiple collaterals), as well as multiple cryptocurrency tokens (redemption fees from multiple collateral accounts). This differs from the xDollar V1, which only emits xUSD from minting carried out using a single collateral type and crypto token redemption fees drawn from single collateral troves.
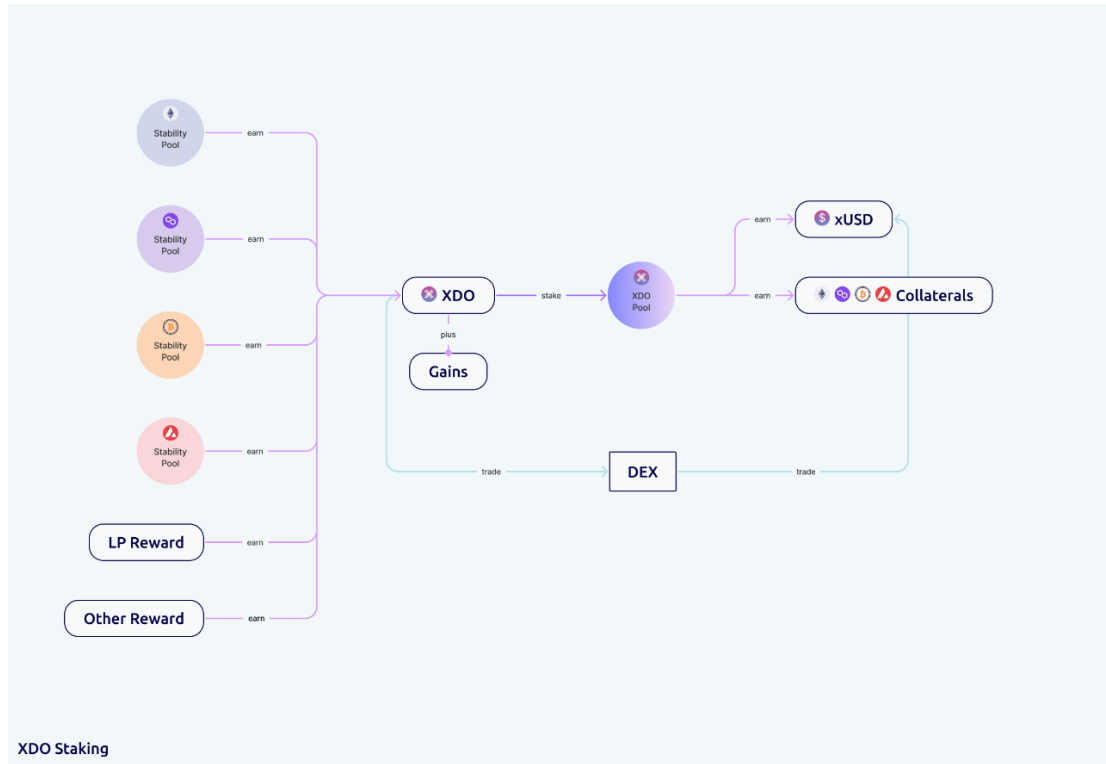

Figure 3: XDO staking on xDollar V2

4. Multi-Collateral Simulations and Modeling Highlights

The xDollar V2 research team conducted extensive and comprehensive research, analysis, and testing based on a strict macroeconomic model to prepare for the xDollar V2 release, in addition to thorough user behavior simulation to ensure the stability, solvency, and robustness of the entire smart-contract enabled protocol.

4.1. xUSD Stability

We focused here on the stability of xUSD in certain high-stress scenarios, modeling significant volatility in the prices of non-stablecoins, including a crash occurring within a short space of time. In this hypothetical situation, a large number of liquidations occur and contribute to a volatility in the xUSD price due to it being determined by overall system health.

From observing figure 4 we can see:
- The xUSD price remains largely stable even when the crypto market crashes.
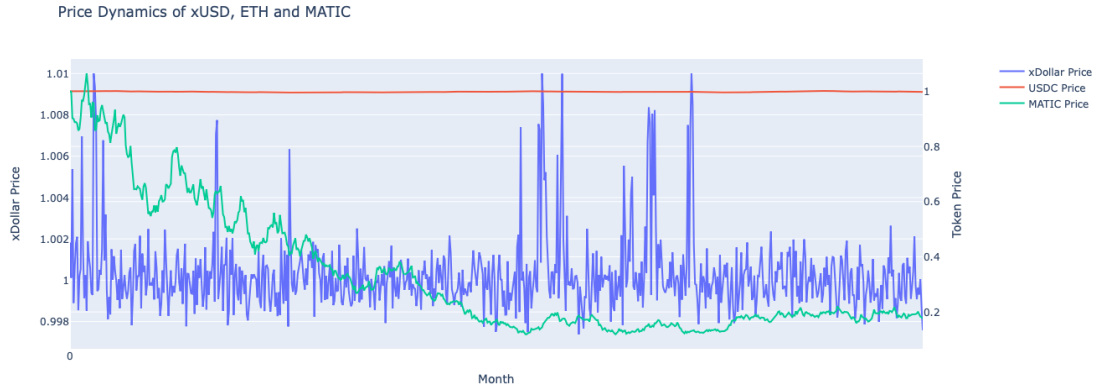- xUSD price is well within a tight range and pegged around $1.

Figure 4: Price Dynamics of xUSD and Collateral Tokens

4.2. Platform Solvency

A multi-collateral design can increase the ability of the entire platform retaining solvency and enhance the platform's robustness. We tested this by creating a hypothetical scenario in which two types of collateral, ETH and MATIC, experience differential price movements. This meant simulating greater price volatility in MATIC through implementing a crash scenario during the period mapped in figure 5 that rendered its pool insolvent for a short period. If xDollar V2 were to only support one collateral type, the entire platform would be at risk in these circumstances. However, the platform is over-collateralized and has exposure to volatility distributed across multiple collaterals and is thus able maintain solvency and overall system health, as is shown in figures 6 and 7.

Price

Figure 5: Collateral Price Trend

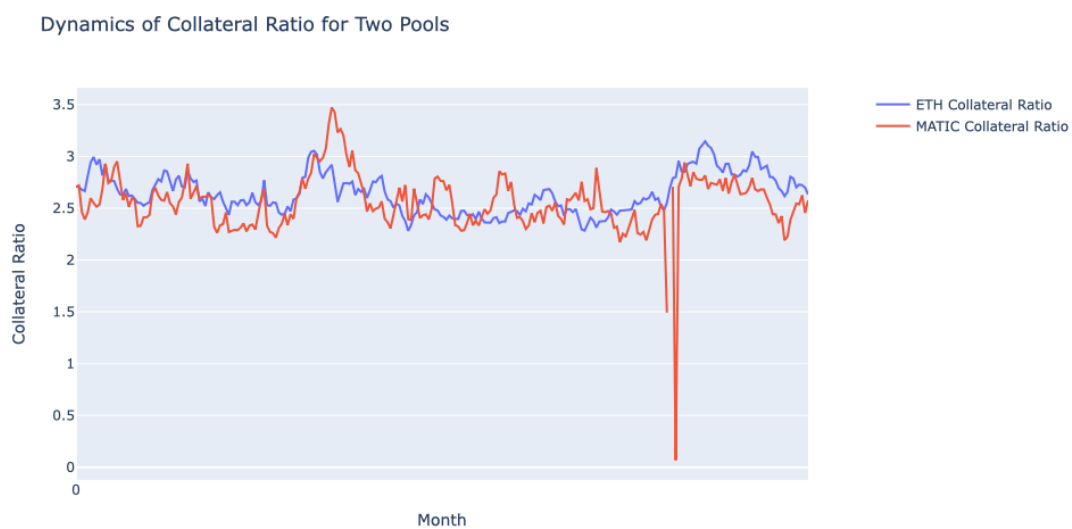Dynamics of Collateral Ratio for Two Pools

Figure 6: Collateral Price Dynamic

Figure 7: Collateral Dynamics of the Platform

4.3.   XDO Price

XDO holders can enjoy boosted yield by collecting and sharing profits generated across the entire platform. As xDollar V2 opens up to multiple collateral types and multiple chains, the potential to accrue this boosted yield increases significantly. Figure 8 shows simulation results when adding the ETH pool on top of the MATIC pool that xDollar V2 has already launched.
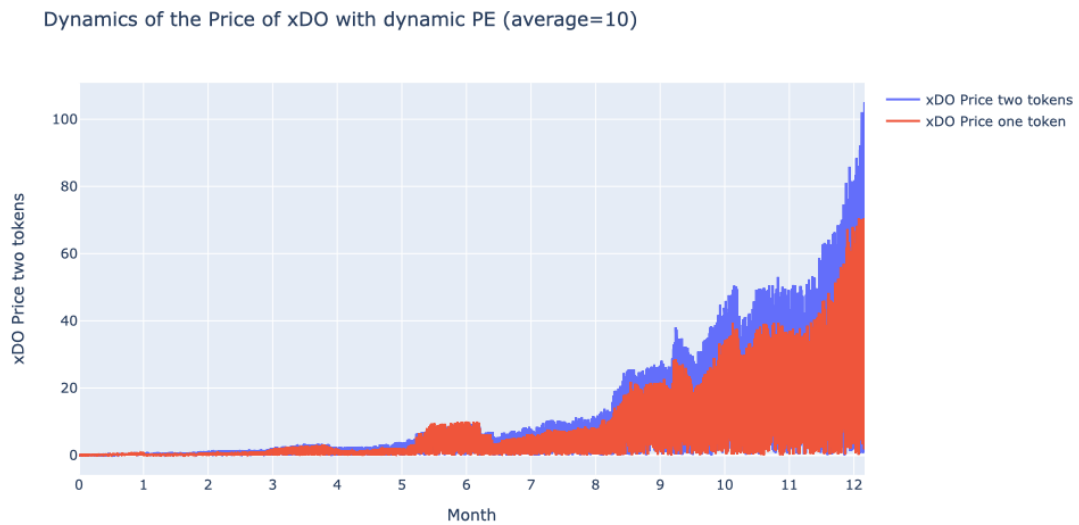

Figure 8: XDO Price Dynamics

5.   Conclusion & Future Work

Within this paper, we have introduced xDollar V2, a non-custodial, multi-chain and multi-collateral lending platform. In building the platform we are, in many ways, standing on the shoulders of giants. Yet the xDollar V2 system makes its own significant breakthroughs in accepting multiple types of collateral across multiple chains to generate a stablecoin with a hard price floor and ceiling. Furthermore, xDollar V2 charges zero percent interest rates and offers low collateral ratio requirements. In so doing, this multi-chain, multi-collateral protocol can significantly enhance platform solvency, increase stablecoin price stability, improve the adoption of stablecoins and push up returns on investment in the platform.

In future work xDollar will gradually roll out these upgrades, adding the V2 features to xDollar V1, implementing DAO governance, and multiple chain deployment. In addition, in the future xDollar Research (XDOR) will introduce xDollar V3, with its anticipated multi-collateral solutions based on modern portfolio theory and state-of-the-art portfolio optimization techniques. These are qualities that can further increase the scale of the collateral system, and further improve platform stability and protocol success.

6.   Reference

Liquity White Paper: https://docsend.com/view/bwiczmy [1]

Acknowledgment