New Crypto-Secured Lending System with a Two-Way Collateral Function: Open Review

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Reviewers: Reviewer A, Reviewer B, Reviewer C, Reviewer D

Abstract. The final version of the paper "New Crypto-Secured Lending System with a Two-Way Collateral Function" can be found in Ledger Vol. 6 (2021) 1-16, DOI 10.5915/LEDGER.2021.215. There were four reviewers involved in the review process, none of whom has requested to waive their anonymity at present, and are thus listed as Reviewers A, B, C, and D. After initial review by Reviewers A and B, the submission was returned to the authors with feedback for revision (1A). The authors responded (1B) and resubmitted their work. After subsequent discussions between the author, assigned Ledger editor, and Reviewer B about the nature of the required changes (not included), the paper was again revised and resubmitted. The submission was then reviewed by Reviewers C and D and feedback was provided (2A). The author revised the submission in line with the final round of feedback and the decision was made that the revisions made were sufficient to address the given concerns, thus ending the peer review process. Author responses have been bulleted for reader clarity.

1A. Review

Reviewer A

Does this paper represent a novel contribution to cryptocurrency or blockchain scholarship?

No

Is the research framed within its scholarly context and does the paper cite appropriate prior works?

Yes

Please assess the article's level of academic rigor.

Unsatisfactory (better than poor but a long way from excellent)

Please assess the article's quality of presentation.

Unsatisfactory (better than poor but a long way from excellent)

How does the quality of this paper compare to other papers in this field?

Bottom 50%

Please provide your free-form review for the author in this section.

At the highest level, the two-way deposit function does not seem to have any value add over existing systems. The proposed benefit of a stable portion is flawed. If I own some percentage of an asset long, and some percentage short, then the paper correctly suggests that my positions will cancel each other out, reducing volatility. However this is simply the equivalent of holding the underlying asset from the perspective of returns, $USD for instance. For this reason, there is no financial benefit of using a long/short combination as collateral, because I may as well hold the underlying asset. You will actually be worse off due to exchange and borrowing fees. If the two-way collateral function in this form is the only way the authors would publish this article, then I would recommend Ledger to decline this paper as the use case is not substantive. However, I think with some meaningful revisions in the use case and terminology that aren't too far off topic I believe the paper could be compelling, so my recommendation will be

The utility of reinvesting collateral into different financial assets is extremely interesting, but not in a long/short ratio for the reason described above. The idea would be having collateral locked up not strictly as ETH or BTC but rather as some token which represents holdings in a diversified basket of tokens. These tokens could be long or short, with the caveat that any "wash" positions should not exist in the portfolio due to the inherent inefficiencies in that asset allocation. For instance, my token could hold 30% long ETH and 70% short BTC and that would make some sense if you are bullish on one and bearish on the other. The drawback here is that this use case ends up looking a lot like Multi-collateral DAI, which exists. Perhaps you could modify the paper to include using something like Set protocol to create baskets of cryptoassets combined in long/short ratios that inherently have less volatility without washing out, and describe how you could efficiently price these tokens by combining oracles and calculating exchange fees.

An additional confusion I had while reading the paper is that it seems to combine centralized and decentralized solutions in a way that doesn't make sense. If the smart contract infrastructure is all on-chain, the system can't reasonably use exchanges as the place where collateral is invested without defeating the purpose of having smart contracts at all and introducing a centralized point of failure. You would need to avoid exchanges if you wanted to have a truly decentralized smart contract that supports its own cryptoeconomics including

self-liquidation.

Some miscellaneous errors:
• The papers mentions using BTC and USDT on Compound, neither of which is possible. See https://compound.finance/markets for listed tokens
• The paper describes Synthetix as a DEX but it can only trade its own synthetic assets so it is more like a derivatives platform and is categorized as such by https://defipulse.com/
• Similarly dYdX is not so much a DEX as it is more of a lending platform. I would consider using the DEX's and categorizations listed on https://defipulse.com/.
• The "Conventional crypto loan" section uses MakerDao specific nomenclature (also somewhat dated as they now use the term Vault instead of CDP) but makes it seem as though this is a generic concept.

Reviewer B

Does this paper represent a novel contribution to cryptocurrency or blockchain scholarship?

Yes

If you answered "yes" to the previous question, in one sentence, describe in your own words the novel contribution made by this paper:

This paper presents the new crypto lending system to monatize the collatoral loans.

Is the research framed within its scholarly context and does the paper cite appropriate prior works?

Yes

Please assess the article's level of academic rigor.

Good (not excellent but a long way from poor)

Please assess the article's quality of presentation.

Good (not excellent but a long way from poor)

How does the quality of this paper compare to other papers in this field?

Top 50%

Please provide your free-form review for the author in this section.

1. This paper proposes a new crypto lending system incorporating a two-way deposit function that allows a borrower to invest his/her collateral proportions by analyzing the market. With this, the price hike of collateralized loan problems solved.

2. The introduction has well-defined novelty, significance, and the contribution of the paper.

3. The author never discussed the state-of-the-art or related work that validates the research problems addressed in this paper.

4. In the whole paper, the author focuses only on Section 2, i.e., the New Crypto Lending system, but didn't discuss the results and evaluation of this crypto lending system. Without evaluation, it is tough to validate the system, and the paper looks like a whitepaper.

Best the authors follow these instructions:

Here are links to my videos about how to do research:
https://www.bitchute.com/playlist/ot123WiUhjU0/

Here is the link to the corresponding slides:
https://drive.google.com/open?id=0Byw4AEomZK2eU0RVdWdTSEJzNE0

Here is a paper about how design science works:
https://drive.google.com/open?id=0Byw4AEomZK2ecUtxQVp1aUh5STA

This link explains how action-design science works:
https://drive.google.com/open?id=0Byw4AEomZK2eVkYyZnpWbXg4ZTQ

These paper focus on how to properly evaluate design-science research:
https://drive.google.com/open?id=0Byw4AEomZK2eSXFobVFIVGticVk

Please use this tool for drafting your design:
https://drive.google.com/open?id=1koigvNWCZ1X5WJIA0bo-ppHpF6HFmEyB
Register for that with this tool: https://mydesignprocess.com

You can draft an outline with this xmind.net template that I also talk about in Part 3 of my videos:
https://drive.google.com/open?id=0Byw4AEomZK2edzBZMUNMcUhUUW8

Very important are the research questions that should follow such a structure:
https://drive.google.com/open?id=0Byw4AEomZK2eTHZNRXBwcllXZ3c

5. Please revise your manuscript and add the state-of-the-art, evaluation / results to the paper.

1B. Author Responses

Reviewer A

At the highest level, the two-way deposit function does not seem to have any value add over existing systems.

- Thanks for your opinion. With regards to the purpose of this paper, we focus on tackling an issue that has caused "a low LTV and frequent liquidation" to many users on MakerDao lending platform. As an alternative, we like to propose "the two-way deposit function" and the more detailed benefits will be explained in section 3.3. For the sake of clarity, we've changed the term from the two-way deposit function to "twoway collateral function", and also changed a lot in section 3.

The proposed benefit of a stable portion is flawed. If I own some percentage of an asset long, and some percentage short, then the paper correctly suggests that my positions will cancel each other out, reducing volatility. However this is simply the equivalent of holding the underlying asset from the perspective of returns, $USD for instance. For this reason, there is no financial benefit of using a long/short combination as collateral, because I may as well hold the underlying asset. You will actually be worse off due to exchange and borrowing fees.

- Good point. We, however, have to admit that our "stable portion" can provide a user with a higher LTV(loan-to-value) and lower risk from price volatility vis-à-vis that of MakerDao. Moreover, we made things possible in section 3 by utilizing "the two-way collateral function". For the sake of clarity, we've changed the term from the stable portion to "hedged portion".

If the two-way collateral function in this form is the only way the authors would publish this article, then I would recommend Ledger to decline this paper as the use case is not substantive. However, I think with some meaningful revisions in the use case and terminology that aren't too far off topic I believe the paper could be compelling, so my recommendation will be

- Many thanks.

The utility of reinvesting collateral into different financial assets is extremely interesting, but not in a long/short ratio for the reason described above.

- We believe that the explanation over this issue is well done in section 3.

The idea would be having collateral locked up not strictly as ETH or BTC but rather as some token which represents holdings in a diversified basket of tokens.

- Thanks, but our key idea is the two-way collateral function, which can get economic returns if the price of the collateral falls. The concept of a diversified basket concept is very good point. Thanks!

These tokens could be long or short, with the caveat that any "wash" positions should not exist in the portfolio due to the inherent inefficiencies in that asset allocation. For instance, my token could hold 30% long ETH and 70% short BTC and that would make some sense if you are bullish on one and bearish on the other.

- Very good point. We added "a basket concept" in section 2.3.

The drawback here is that this use case ends up looking a lot like Multi-collateral DAI, which exists.

- No. Multi-collateral DAI do not provide the downside collateral of our two-way collateral function

Perhaps you could modify the paper to include using something like Set protocol to create baskets of cryptoassets combined in long/short ratios that inherently have less volatility without washing out, and describe how you could efficiently price these tokens by combining oracles and calculating exchange fees.

- Thanks. Please refer to the section 2.3 that we recently added, where you'll see how to use a basket and leveraged tokens for investment

An additional confusion I had while reading the paper is that it seems to combine centralized and decentralized solutions in a way that doesn't make sense. If the smart contract infrastructure is all on-chain, the system can't reasonably use exchanges as the place where collateral is invested without defeating the purpose of having smart contracts at all and introducing a centralized point of failure. You would need to avoid exchanges if you wanted to have a truly decentralized smart contract that supports its own cryptoeconomics including self-liquidation.

- Thanks. If crypto market matures over time, we'll see a better crypto ecosystem in which crypto lending is seamlessly implemented in a fully decentralized way. Please see the usage of leverage tokens in section 2.3.

Some miscellaneous errors:
• The papers mentions using BTC and USDT on Compound, neither of which is possible. See https://compound.finance/markets for listed tokens

- Thanks. We did it

• The paper describes Synthetix as a DEX but it can only trade its own synthetic assets so it is more like a derivatives platform and is categorized as such by https://defipulse.com/

- We simply mentioned Synthetix just because we like to utilize hedge position on it like iBTC (inverse BTC) or iETH (inverse ETH). No other reason.

• Similarly dYdX is not so much a DEX as it is more of a lending platform. I would consider using the DEX's and categorizations listed on https://defipulse.com/.

- Right, but dYdX provides a margin plaform with 2x~5x long position and -1x~4x short position

• The "Conventional crypto loan" section uses MakerDao specific nomenclature (also

somewhat dated as they now use the term Vault instead of CDP) but makes it seem as though this is a generic concept.

- Thanks. Added some on "Vault".

Reviewer B

1. This paper proposes a new crypto lending system incorporating a two-way deposit function that allows a borrower to invest his/her collateral proportions by analyzing the market. With this, the price hike of collateralized loan problems solved.

- Good point, thanks.

2. The introduction has well-defined novelty, significance, and the contribution of the paper.

- Thanks.

3. The author never discussed the state-of-the-art or related work that validates the research problems addressed in this paper.

- Sorry, we've tried to focus on introducing "the two-way collateral function".

4. In the whole paper, the author focuses only on Section 2, i.e., the New Crypto Lending system, but didn't discuss the results and evaluation of this crypto lending system. Without evaluation, it is tough to validate the system, and the paper looks like a whitepaper.
Best the authors follow these instructions:
Here are links to my videos about how to do research:
https://www.bitchute.com/playlist/ot123WiUhjU0/

Here is the link to the corresponding slides:
https://drive.google.com/open?id=0Byw4AEomZK2eU0RVdWdTSEJzNE0

Here is a paper about how design science works:
https://drive.google.com/open?id=0Byw4AEomZK2ecUtxQVp1aUh5STA

This link explains how action-design science works:
https://drive.google.com/open?id=0Byw4AEomZK2eVkYyZnpWbXg4ZTQ

These paper focus on how to properly evaluate design-science research:
https://drive.google.com/open?id=0Byw4AEomZK2eSXFobVFIVGticVk

Please use this tool for drafting your design:
https://drive.google.com/open?id=1koigvNWCZ1X5WJIA0bo-ppHpF6HFmEyB
Register for that with this tool: https://mydesignprocess.com

You can draft an outline with this xmind.net template that I also talk about in Part 3 of my videos:

https://drive.google.com/open?id=0Byw4AEomZK2edzBZMUNMcUhUUW8

Very important are the research questions that should follow such a structure:
https://drive.google.com/open?id=0Byw4AEomZK2eTHZNRXBwcllXZ3c

- Very thanks. We've revised section 2.3 and 3.

5. Please revise your manuscript and add the state-of-the-art, evaluation / results to the paper.

- Thanks

2A Review (Second Round)

Reviewer C

This paper is clearly written, well presented, and describes a new kind of DeFi loan that is more flexible for handling high collateral price volatility. There is a small possibility that this idea has already been described the traditional financial literature (minus smart contracts), which would be helpful to establish somewhere in the introduction.

I have been asked to provide a supplementary review and what I have written below is fairly brief. There are two issues that should be addressed before this article is published:

1) The citation formatting includes many "no author" statements and other similar issues. Please correct. The author may have to manually fix these. [Editor's note: we will work with you to bring bibliographic entries into line with our style guide]
2) I'm glad that the author disclosed a conflict of interest regarding ALFA, but in that case, I don't see why ALFA needs to be explicitly mentioned by name in the paper. I would recommend that the author just changes "ALFA" in the text to "a hypothetical stablecoin with X, Y, and Z properties" and calls it S-COIN or whatever, so long as it is clear that the new kind of loan is not tied specifically to any particular stablecoin.

Overall I think this paper presents a great contribution to the literature and look forward to seeing it published.

Reviewer D

My main concern with this paper is that I don't understand the benefit of the proposed two-way collateralized loans versus just selling BTC and then buying it back later, in many cases.

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CASE 1:
****

1 BTC = $20,000.
Liquidation ratio = 70%.
Rup = 50%
Rdown = 50%
Liquidation value (via Eq. 1) = $20,000
Loan amount: $10,000 (50% LTV)

So the borrower deposits 1 BTC in return for a $10,000 loan. Lender keeps 0.5 BTC (initially worth 0.5 * $20,000 = $10,000) and invests the other 0.5 BTC in a derivative that trades inversely to the price of bitcoin (0.5 BTC short position initially worth 0.5 * $20,000 = $10,000).

SCENARIO 1A: Assume the price of BTC has increased by $10,000 to $30,000 when the borrower repays the loan.

The value of the lender's collatoral is:

0.5 BTC: $10,000 + $5,000 = $15,000
0.5 BTC short position: $10,000 - $5,000 = $5,000
==
Total collatoral value: $20,000

Upon receiving the $10,000 loan repayment, the lender closes their short position in return for $5,000 / $30,000 = 0.167 BTC and returns this and the 0.5 BTC position to the borrower. The borrower thus receives 0.667 BTC.

SCENARIO 1B Assume the price of BTC has decreased to $15,000 when the borrower repays the loan.

The value of the lender's collatoral is:

0.5 BTC: $10,000 - $5,000 = $5,000
0.5 BTC short position: $10,000 + $5,000 = $15,000
==
Total collatoral value: $20,000

Upon receiving the $10,000 loan repayment, the lender closes their short position in return for $12,500 / $15,000 = 0.833 BTC and returns this and the 0.5 BTC position to the borrower. The borrower thus receives 1.333 BTC.

MY CONCERN: Imagine instead of taking out the loan, the borrow just sold his 1 BTC for $20,000, put $10,000 of that in storage and used the other $10,000 as though it were the loan amount. In lieu of repaying the loan, he instead uses the $10,000 in storage plus the $10,000 "loan repayment" to purchase BTC. In scenario 1A he would receive $20,000 / $30,000 = 0.667 BTC and in Scenario 1B he would receive $20,000 / $15,000 = 1.33 BTC. The outcome is the same as the outcome with the loan. So what is the benefit of the loan?

****
CASE 2:
****

1 BTC = $20,000.
Liquidation ratio = 70%.
Rup = 70%
Rdown = 30%
Liqudiation value (via Eq. 1) = $14,400
Loan amount: $10,000 (50% LTV)

So the borrower deposits 1 BTC in return for a $10,000 loan. Lender keeps 0.7 BTC (initially worth 0.7 * $20,000 = $14,000) and invests the other 0.3 BTC in a derivative that trades inversely to the price of bitcoin (0.3 BTC short position initially worth 0.3 * $20,000 = $6,000).

SCENARIO 2A: Assume the price of BTC has increased by $10,000 to $30,000 when the borrower repays the loan.

The value of the lender's collateral is now:

0.7 BTC: $14,000 + $7,000 = $21,000
0.3 BTC short position: $6,000 - $3,000 = $3,000
===
Total collateral value: $24,000

Upon receiving the $10,000 loan repayment, the lender closes their short position in return for $3,000 / $30,000 = 0.1 BTC and returns this and the 0.7 BTC position to the borrower. The borrower thus receives 0.8 BTC.

SCENERIO 2B Assume the price of BTC has decreased to $15,000 when the borrower repays the loan.

The value of the lender's collateral is:

0.7 BTC: $14,000 - $3,500 = $10,500
0.3 BTC short position: $6,000 + $1,500 = $7,500
===
Total collateral value: $18,000

Upon receiving the $10,000 loan repayment, the lender closes their short position in return for $7,500 / $15,000 = 0.5 BTC and return this and the 0.7 BTC position to the borrower. The borrower thus receives 1.2 BTC.

MY CONCERN: Imagine instead of taking out the loan, the borrow just sold 0.6 BTC for $12,000. He puts $2,000 of that in storage along with his remaining 0.4 BTC, and uses $10,000 in place of the loan. In Scenario 2A, in lieu of repaying the loan he buys $12,000 / $30,000 = 0.4 BTC, which added to the 0.4 BTC he put away returns him 0.8 BTC (the same amount as repaying the loan). In Secenario 2B, in lieu of repaying the loan he buys $12,000 / $15,000 = 0.8 BTC, which added to the 0.4 BTC he put away returns him 1.2 BTC (again the same as repaying the loan)

So what is the advantage of the loan if the same outcomes can be achieved by selling the appropriate amount of BTC and then buying it back later?

(I think as Rup gets closer to 1, there's some benefit to the loan, but I think it will still work out to equivalent to a smaller one-way loan combined with a partial sale of BTC.)