Review: USDs Whitepaper

The authors of the paper present and analyze the mechanisms of USDs, a partially collateralized algorithmic stablecoin that aims to address the inefficiencies within the existing stablecoin space.

Below I analyze each section of the paper separately and mention major and minor issues.

Abstract: Please consider adding an abstract

Section 1: Introduction

Overall, this section is well written. The authors make clear why stable coins are important, why the current stablecoins are insufficient, and hence there is a gap in the market. They make the claim their stablecoin will cover this gap and provide a brief overview of the solution. Keep in mind that whitepaper introductions tend to be directed to people with limited to no knowledge of the topic so that everyone can grasp the main idea. As a result, it is necessary to provide detailed explanations and, where possible, examples supporting the claims.

Minor Issues:

- In the second paragraph, the authors make two claims, "*Fiat-backed stablecoins tend to be highly centralised, which makes them prone to censorship*" and "*crypto-backed stablecoins… require overcollateralization*", which are both valid but might not be evident to an amateur in the field. For that reason, I would suggest that the authors provide evidence to support these claims, e.g., USDT has blocked more than 40 addresses since its creation, and depending on the collateral, the collateralization ratio for DAI can be 175%.

- The first sentence of the second paragraph, in my opinion, should be moved to the end of the first paragraph since it concerns the importance of stablecoins, not their classification.

- The last sentence of this section might be better to be moved to the end of the paper. Usually, future endeavors are mentioned in the conclusion of the paper.

Section 2: USDs Stability Mechanism Outline

For the most part, this section is well written, and the reader can get a solid idea about the mechanisms of USDs. However, a few key aspects are missing and need to be clarified.

Major Issues:

- The mechanism that mints/burns USDs requires the price of the collaterals and SPA, while χ_{target} requires the price of USDs. As a result, for these processes to function

effectively, they will require a price oracle. The authors provide no information about this oracle. Considering that a compromised oracle can have a detrimental effect on the mechanisms, this omission is critical. I would suggest the authors include an additional paragraph detailing the characteristics of the oracle and what mechanism of USDs would allow it to retain a value close to $1 if the oracle was to be compromised.

- In section 2.2, the authors mention, "*For β we pick values to make the algorithm sufficiently responsive to rapid changes in situations where USDs deviates from the peg.".* Considering the importance of $\chi_{target,}$ and as a result of β, additional explanation is necessary on how they pick β (extensive simulations is not enough), how often it is changed, how they make sure that USDs will always manage to adjust to heavy price fluctuations, etc.

- Considering the recent collapse of IRON, another partially collateralized algorithmic stablecoin, and the fact that USDs has some similarities with it, I believe the authors should include a simple example of how USDs' mechanisms would avoid a similar scenario. The authors are not responsible for this issue, but I feel they must address it since it has the potential to harm the reputation of the project.

Minor Issues:

- The values of γ are not specified in the following equation

$$\chi_{Burning} = \chi_{target} + \gamma * max(0, \chi_{Target} - \text{Collateral Ratio})$$

- The following equation doesn't take into consideration the case where USDs = 1
  It's easy to understand what happens when USDs = 1, but the authors should include it.

$$\chi_{target} = \alpha * \text{Block Height} + \beta * (1 - \text{USDs price})^2 \mathbb{1}_{1 > \text{USDs price}} - \beta * (1 - \text{USDs price})^2 \mathbb{1}_{1 < \text{USDs price}}$$

Section 3: What is the optimal collateral?

This section does an excellent job of delving into how the collaterals will be chosen as well as the methods utilized to accomplish that.

Minor Issues:

- The authors pick the collaterals with the objective of maximizing the Sharpe ratio. In my opinion, the Sortino ratio would be more suitable for this cause since it takes into consideration only the negative volatility and ignores the upside volatility, which is beneficial for the model. Regardless of which ratio the authors choose, they will have to explain in greater detail why it was chosen.

- While the paragraph in which the authors describe the machine learning techniques they implemented is good, I believe it can only be improved if they include the specific algorithms.

Section 4: Stability Levers

This section is the weakest of the paper (on par with section 6). Although the first part of the section is well written and provides a good high-level overview of the methods that will be implemented to keep USDs trading around the $1 mark, the subsequent methods, in my opinion, exhibit a significant decline in scientific reasoning, which comes as a surprise after sections 2 & 3. The section contains several critical ambiguities which impede readers from understanding how the mechanisms are designed. Taking into consideration the section's importance, I believe the authors should rewrite a significant portion of it, adding more detail.

Major Issues:

- In section 4.2, the authors provide no information on how they define the time periods of short and long-term APY. If the period of the short-term APY is too small, it will create high fluctuations in the Subsidy%, and as a result, the APY will not be stable.

- In section 4.3.1, the authors do not explain why they choose a 3-day average, how do they come up with the values for p and δ, and although they mention they simulated the "*daily USDs price and inflow swap fee*", provide zero information about the simulation itself. As a result, no substantial information can be derived from this section.

- Section 4.3.2 suffers from the same issues as section 4.3.1, but in addition, the first graph of page 11 does not give any additional information (on page 10, the authors explain that the outflow swap is an exponential function with a cap, and this is also what the graph shows)

Section 5: Conclusion

There is not much to say about this section. It does a good job summarizing the paper.

Section 6: Appendix

This section is also of low quality, but in contrast to section 4, I believe the authors do not have to keep it in the paper**.** Since the authors lack market data, they make a considerable number of assumptions in order to run the simulations, and the final findings have a very low likelihood of producing a high impact scenario. Furthermore, simulations should also be made with respect to corner cases since they have the potential to derail the project, rather than just the average case scenarios. The authors cannot and do not need to predict every

outcome before the project reaches the market. After the project launches, a better dataset will be available to run these simulations. At this point, I would suggest they outline the strategy indicating the steps they intend to take after they acquire the market data. This can include time series analysis for the value of USDs, stress test to see how the mechanisms perform when USDs is unpegged, etc. If they choose to keep this section, they must state that the results may not accurately reflect reality and are only an attempt to provide a glimpse into the system after it launches.

I am not going to provide major/minor issues for this section because I believe the whole approach is wrong and should not be included in the paper.

Section 7: DAO Governance

This section does a good job explaining in detail the steps of the governance mechanism.

Section 7.1: Portfolio optimization results and visualization

This is a good section providing adequate information about the optimization of the portfolio.

Minor Issues:

- The authors mention, "*we first transform the covariance matrix and then we put it into the algorithms*" but they do not mention the specific algorithms that were used. Please include the specific algorithms.

In conclusion, considering the difficulties of creating an algorithmic stablecoin, I believe this approach has a lot of potential, but the authors would have to provide more information about the mechanisms underlying it. Additionally, the authors will have to demonstrate how the mechanisms work in cases of high volatility from a more practical point of view by providing examples. Finally, they should avoid making predictions when there is not enough data.

The paper contains some minor spelling and formatting mistakes which I have provided in a separate document.