Shade Bonds

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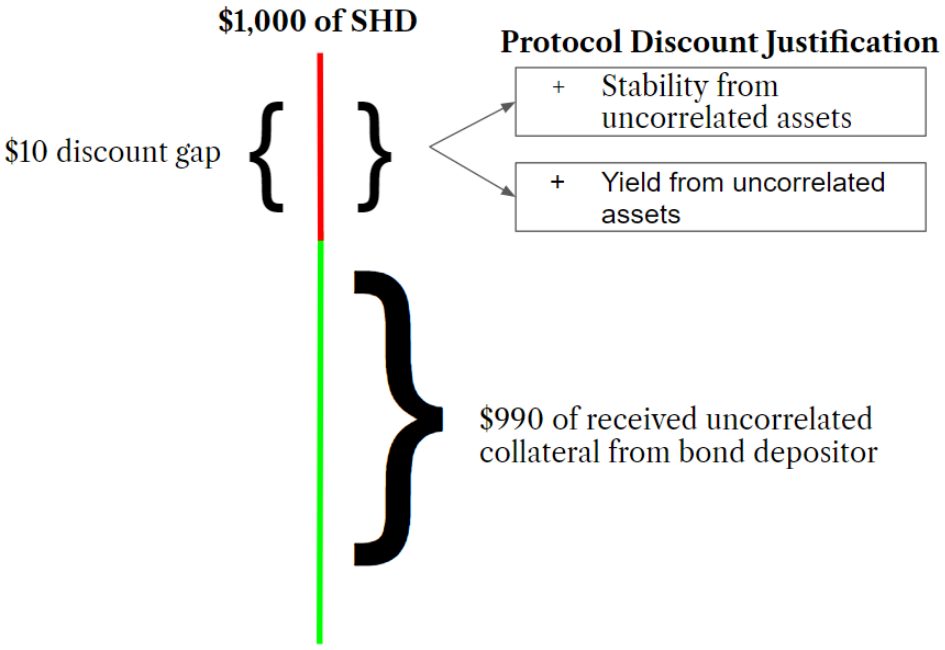
Abstract. One of the most powerful bootstrap mechanisms available for DeFi protocols are Protocol Issued Bonds (PIB) which empower decentralised treasuries to ask for specific types of collateral at a specific price rate. In return for depositing collateral into the bond, the depositor receives freshly minted governance tokens from the protocol at a slightly discounted rate from the market price. Users receive their tokens after x number of days (blocks) that can then be freely used on the market. Arbitrage between the discounted rate and the market rate encourages users to interact with the bonds, and in return the treasury is able to bootstrap itself with uncorrelated assets in a sustainable manner.

Shade Bonds function similarly to other traditional DeFi bonds, with the distinct difference that users can purchase bonds in a privacy-preserving way as a result of the encryption attributes powered by secret contracts on Secret Network. Additionally, Shade bond issuance is managed via Shade Protocol governance and branches - empowering SHD tokenholders over time to determine the rate of issuance as well as the types of collateral gathered on the Shade Protocol treasury.

Shade Bonds

Shade Bonds are collaterally backed issuance of SHD minted via the treasury. The only non-collaterally backed component of Shade Bonds is the gap between the discount rate and the market price of SHD. While this could be perceived as an inflationary mechanic, the increase in the strength of the Silk peg from the uncorrelated assets as well as the yield bearing capabilities of the incoming collateral received by the Shade treasury increases the fundamental value of SHD at a rate that approximates (if not exceeds) the discount to market rate - making this sort of mechanic justifiable as long as liquidity shocks are accounted for.



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With Shade Bonds, users deposit the desired amount of tokens into the bond contract and receive their SHD tokens (at a rate targeting a discount to market price) upon claiming after x number of days/blocks. Arbitrage between the discounted rate and the market rate encourages users to interact with the bonds, and in return the treasury is able to bootstrap itself with uncorrelated assets in a sustainable manner.

Profit example:

- User deposit $990 worth of sSCRT/SHD LP tokens into the bond contract
    - $1,000 worth of SHD at $10 (100 SHD) is locked inside the bond contract
    - Timer begins
- User waits 5 days
- User unlocks their 100 SHD from the bond contract
- SHD is still trading at $10, user sells their 100 SHD
    - User earns a $10 profit ($1,000 sell value - $990 value of initial collateral deposited)

Loss example:

- User deposit $990 worth of sSCRT/SHD LP tokens into the bond contract
    - $1,000 worth of SHD at $10 (100 SHD) is locked inside the bond contract
    - Timer begins
- User waits 5 days
- User unlocks their 100 SHD from the bond contract
- SHD is now trading at $8, user sells their 100 SHD
    - User takes on a loss of $190 ($800 sell value - $990 value of initial collateral deposited)

One of the more attractive bond types is a Silk bond. Users that purchase a Silk bond have a high degree of assurance that they will receive a certain amount of yield based on the stability of Silk. The most difficult part of a SHD bond is ensuring that the Silk issued is economically accounted for through either purchase or BCM constraints.

Users' optimal outcome is that the price of SHD remains the same or increases while they wait to claim their bond. In the future, bond issuance could use other uncorrelated assets from the treasury to rebalance and modify the existing portfolio composition of the ShadeDAO.

Bond Types

Issuance policy of Shade Bonds is split into three different categories:

- Bounded Bonds
- Unbounded Bonds
- Treasury Bonds

Bounded bonds use SHD that was preminted for ShadeDAO treasury usage at the inception of the protocol. Unbounded Bonds use minted SHD or SILK that was not preminted at the inception of the protocol. Treasury bonds use assets (such as SCRT or ATOM) that have been acquired from either revenue, bounded bonds, or unbounded bonds.

Philosophically, Shade Protocol issuance faces a difficult choice - unbounded bonds empower the protocol to dilute existing tokenholders in the future once there is no more bounded bonds that can be minted. This is ultimately a form of collateralized inflation that equally dilutes all holders in favor of growing the treasury. Protocol governance will have to decide the scope of unbounded bonds, or if they will ever be used at all.

Illiquid Markets

During the early stages of SHD when markets are illiquid, Shade Bonds play a powerful role because bonds allow large users to acquire a significant position in SHD without having to pay a significant amount of slippage on an illiquid DEX. In essence, the ShadeDAO establishes a spot price with a capped trade size. This spot price trade issued by the ShadeDAO is willing to accept as many different trades at the established rate until the bond opportunity has filled up. There may be only one entity that interacts with any given bond, or thousands.

During the early stages of Shade Protocol (pre-ShadeSwap) there is a significant amount of illiquidity as it pertains to acquiring SHD. This is because emissions to deepen liquidity do not begin until ShadeSwap is launched. The more illiquid the market, the more of a disparity there is in reflecting all market participants being able to express their degree of demand within the context of limited supply. As such, during the early stages of Shade bond issuance it may be unsafe for the protocol to distribute SHD at a discount via a bounded bond because a large entity might rapidly purchase up a bond at a market price that is essentially trading at a significant discount compared to actual demand for SHD. This demand cannot be properly expressed in the illiquid market. Because the bond is issued at a spot price, a single entity can take a massive position without impacting the market price. Bond issuance has a similar effect to the market as an OTC. Because of this inaccurate pricing problem, Shade bonds should be issued at a premium to market price until enough price discovery has been explored with bond issuance. The ShadeDAO in this scenario is analogous to an order-book model, and should layer its bond issuance to discover the actual market rate of SHD (in the absence of a liquid DEX such as ShadeSwap). Because there is no slippage with Shade bonds, large entities will prefer acquiring SHD even if its issued at a premium to market because they will be able to obtain more SHD with their purchase order size through the bond then they could through an illiquid DEX.

Issuance Policy

Shade Bonds are advantageous for issuance when the treasury value of SHD is less than the market value of SHD. Treasury value of SHD is the hypothetical floor value of SHD since SHD token holders have a claim to revenue streams and collateral that exists on the ShadeDAO.[1]

$$Treasury\ Value\ =\ \Sigma\ of\ all\ the\ value\ of\ the\ uncorrelated\ assets\ on\ treasury\ /\ \#\ of\ SHD\ in\ treasury$$

Whenever the market price of SHD is greater than the treasury value of SHD, there is an opportunity to sell SHD to the open market at a rate that is advantageous for the ShadeDAO (and by extension the protocol).

$$(Treasury\ Value\ <\ Market\ Value)\ ->\ Issue\ Bonds$$

$$(Treasury\ Value\ >\ Market\ Value)\ ->\ Buyback\ SHD$$

$$(Treasury\ Value\ =\ Market\ Value)\ ->\ No\ operations$$

[1] Note that the term “ShadeDAO” is interchangeable with the term “Shade Treasury”

Due to the nature of the relationship between the treasury value of SHD and the market value of SHD, there will be a range of opportunities that emerge that must be managed by the branch of Shade governance responsible for issuing bonds. Within this set of equations, with the approval of governance, bonds are structured to be "unbounded" in there issuance as there is significant downside if the protocol decides to limit itself into perpetuity with respect to its ability to acquire uncorrelated assets from the open market within favourable conditions as outlined above. Therein, the most important consideration is the *rate of issuance* of SHD resulting from bonds. The greater the rate of issuance, the greater the potential liquidity shocks that could result from bond arbitrage and speculators. Thus, issuance of bonds is always a careful interplay between opportunity derived from the gap between market price and treasury price versus the risks of rapid issuance of SHD onto the market (even within the confines of what is considered favourable conditions).

To create a value that is an offchain signal utilized to signal the significance of the opportunity to acquire assets at a favourable rate in relation to the treasury value of SHD, a price normalised cubic function is used to generated the *issuance opportunity score (IOS).* Due to the nature of being a cubic function, the greater the discount, the greater the exacerbation of the available opportunity for the bond issuance.

$$\beta = Treasury\,Value - Market\,Value$$
$$Opportunity\,Floor\,(\delta) = Normalisation\,Value$$
$$Issuance\,Opportunity\,Score\,(IOS) = (\beta/\delta)^3$$
$$Monthly\,Available\,Issuance = IOS * ((Issuance\,Rate * Total\,SHD)/12)$$

A negative IOS would imply a SHD buyback opportunity from the treasury at a discounted rate in relation to the treasury value of SHD. The more buyback that occurs, the less SHD that will exist in active circulation, thus pushing market price back to a price point that is greater than or equal to the treasury value of SHD. Whenever the opportunity floor is greater than β, the rate of potential issuance is drastically throttled. This is to prevent aggressive issuance tied to opportunities that are not significant. Ultimately, governance will have control over this opportunity floor.

The smaller the opportunity floor, the smaller the required β is needed before the cubic function begins to influence the issuance opportunity. Due to the nature of the cubic function impact on β, the greater the β, the more aggressive issuance is. Finally, the issuance rate is a percentage value that loosely determines what percentage of supply can be released in the form of bonds over the course of a year. Between the modification of the issuance rate and the opportunity floor governance from both tokenholders, the respective bond issuance branch should be able to finalise a bond issuance policy that is stable and sustainable while also remaining opportunistic to pricing disparities.

The following charts are examples of when the opportunity floor is set to $20 (bond issuance isn't drastically modified until β grows beyond $20) and where the monthly available issuance amounts to IOS * 10,000. Additionally, scenarios where β < 0 signals SHD buyback opportunities that should be performed by the ShadeDAO.


Issuance Score
4
3
2
1
0
5
10
15
20
25
30
0.015625
0.125
0.421875
1
1.953125
3.375
Treasury Price - Market Price


Monthly Issuable SHD
40,000
30,000
20,000
10,000
0
5
10
15
20
25
30
156
1,250
4,219
10,000
19,531
33,750
Treasury Price - Market Price

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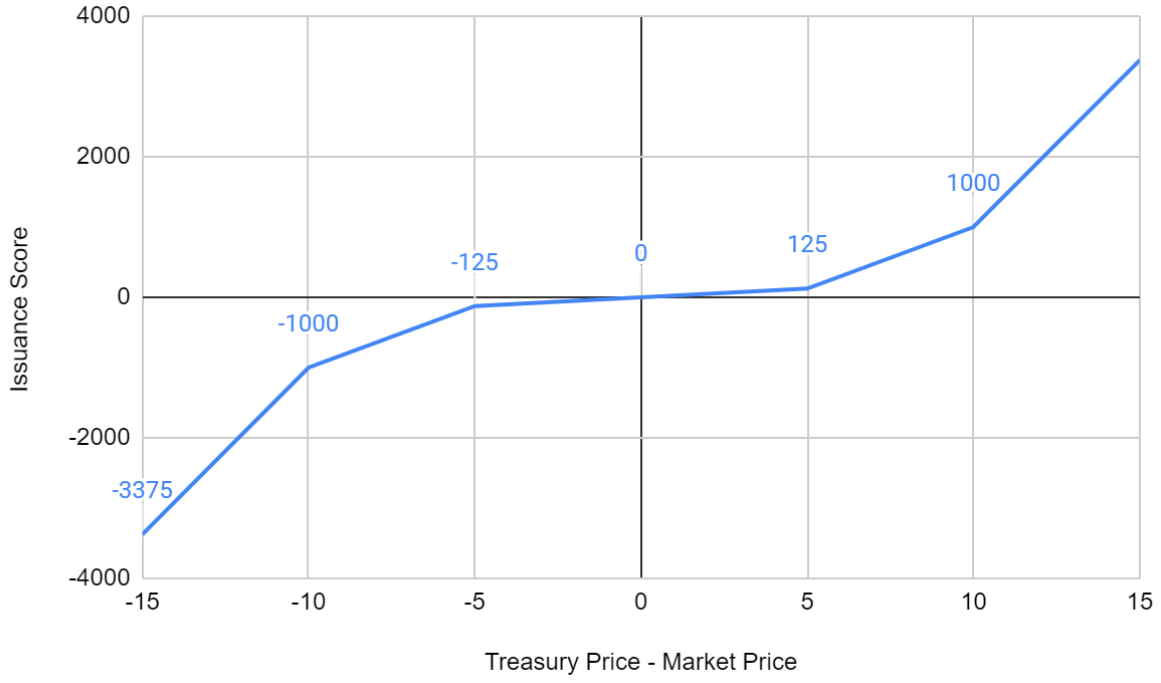

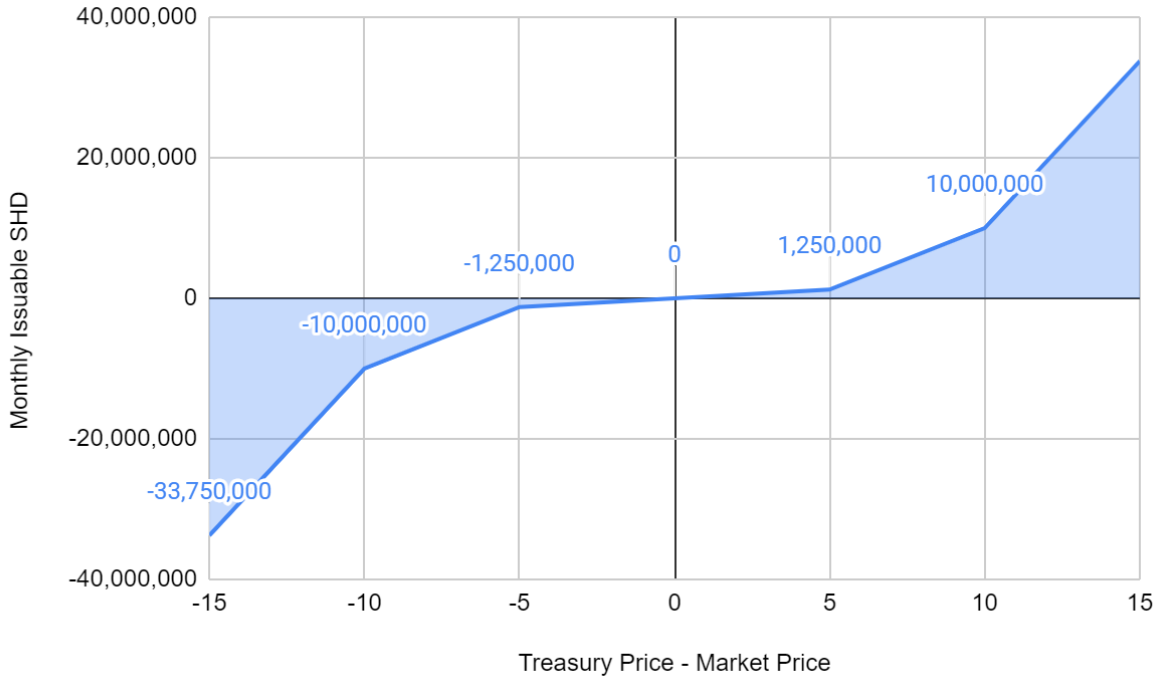

Targeted Collateral

The role of uncorrelated assets pulled into the ShadeDAO via bonds fall into four categories of optimization: yield generating, stablecoins, scarce store of value, and liquidity tokens. *Yield Generating* is any sort of collateral that is capable of generating yield *without experiencing the risks of impermanence loss*. Examples of *yield generating* assets are Layer-1 governance tokens such as $ATOM, $LUNA, and $SCRT which are all capable of being staked. The next category

is *stablecoins*. The level of attractiveness for the ShadeDAO to acquire a stablecoin is based on five variables: liquidity, bridge risk, smart contract risk, degree of decentralisation, and volatility. Examples of stablecoins that fall into this category are IST & CMST. Next is *Scarce Stores of Value* - these are "hard-assets" such as bitcoin, ethereum, and monero that have deep liquidity, halvening cycles, and/or historical relevance within the cryptocurrency domain. Finally, the last category are *liquidity tokens* which are mathematical claims on a portion of tokens tied to liquidity pools on decentralised exchanges such as ShadeSwap. The more *liquidity tokens* owned by the ShadeDAO, the more locked-liquidity is available for the Shade Protocol community.

Initially, the ShadeDAO will be heavily focused on acquiring yield generating and LP tokens during the beginning of the protocol's lifecycle. Overtime, there should be a steady shift towards holding more and more stablecoins and scarce stores of value as adoption for Silk solidifies.

Conclusion

Bonds are an incredibly powerful primitive that will help bootstrap, scale, and grow the ShadeDAO throughout the duration of its lifespan. Importantly, governance and branches managing the issuance of Shade bonds must carefully balance the rate of issuance so as to not introduce damaging liquidity shocks into the larger market. Simultaneously, bonds must be well positioned to capitalise on large discrepancies between the market price and the treasury price of SHD. If balanced properly, bonds can be the fundamental source for gathering the necessary collateral to add both additional liquidity and stability for Silk and other key Shade Protocol primitives.