

Summary

In this post, Gauntlet hopes to help formalize the community discussion around strengthening the GHO peg and to organize into its core components with actionable items.

We will outline -

- Current state of GHO minter behavior and relationship with GHO market price
- Potential methods to stimulate GHO demand

, as well as other suggestions for the liquidity plans discussed in the community

- Our view on how key GHO updates should be scheduled to bring the highest impact

Motivations

Since GHO was launched with v3 Ethereum as its facilitator in July 2023, it has grown to ~25m in market cap, with ~12m locked in DEX pools across Uniswap and Balancer. Strong supply side [initiatives](#) help incentivize GHO LP positions to support a maturing stablecoin. Proposed [plans](#) to diversify liquidity pools will further provide variation in trading pairs.

One of the main challenges that may prevent greater GHO adoption is its discount to the \$1 peg. GHO has traded < \$1 since inception, exhibiting general negative drift, with some price spikes, possibly due to liquidations involving GHO debt and/or GHO repayment. As a result, GHO ADV is ~\$1m and price movement is heavier-tailed compared to other stablecoins. GHO rolling standard deviation (GHO_std in graph below) also exhibits some degree of volatility.

The DAO has also taken [various steps](#) to swap treasury holdings into GHO to fund future strategic initiatives. However, bringing GHO back to peg will require sufficiently stimulating organic demand for GHO, in addition to the supply side initiatives already live. So far, a number of suggestions have been raised to help bring GHO back to peg. However, each of these have their own questions around their efficacy in doing so, as have been brought up via discussion.

- [Increasing default GHO borrow rates from 1.5% to 2.5%](#), along with discussion for [scheduled borrow rate increases](#)
- [Enabling wGHO as collateral](#)
- [Creating the GHO Stability Module](#)

Current State of GHO: How GHO minter behavior impacts GHO market price

Analysis of the relationship between GHO price and GHO positions further emphasizes the need for increased organic GHO demand

. Currently, decreasing GHO price encourages existing profitable GHO mints to repay and realize profit.

- We define the profit of a GHO position to be the difference between the current market value of that GHO borrow, versus the market value when it was minted.

GHO positions timeseries, mint price considerations

- (Blue) Weighted averaged GHO mint prices trend downwards, with recent magnitude of downwards movement limited by decreased recent mint volume compared to GHO launch.
- (Red) Total GHO minted has passed 50m.
- (Pink) GHO Price briefly recovered by borrow rate increase to 2.5% on 2023-09-20, but price decay continued to happen

GHO positions timeseries, with position pnl considerations

- (Green) Large upswings in realized profitability (GHO position close-out) occurred at declined GHO price levels
- (Yellow) Positive weighted unrealized profitability is mostly due to legacy positions opened at GHO launch when GHO price > 0.98
- There is slight negative correlation (-0.13) between GHO daily returns and GHO supply changes.

GHO mint prices for current positions

- A large number of early minters repaid their debt and took profits on GHO price decline (late 2023-08).

- Roughly half of all GHO minted (~25m) was minted by 2023-08-11, at which GHO price was 0.981.
- There were 15m GHO minted with avg price above 0.981 on 2023-08-11.
- As of 2023-10-21, roughly 6m GHO remains minted with avg price above 0.981, suggesting a large number of positions have been repaid.

Conclusions on current state of GHO

Given current status of GHO demand vectors, GHO minters could be broken down into two types of users: GHO shorters who seek to make profit when future GHO price < mint price, and GHO LPers who mint GHO to LP on DEX. Both can contribute to GHO sell pressure.

- GHO shorters market sell their minted GHO.
- LP can acquire double-sided liquidity positions through minting GHO and selling half of the GHO for USDC, contributing to GHO sell pressure.

This suggests the following may be playing out.

1. 50 bps borrow rate increase per the schedule encourages a tranche of users to repay their GHO, some passive LPers and some shorters
2. GHO repayment briefly triggers GHO price recovery
3. New GHO shorters enter at this higher price point and mint GHO to market sell, new GHO LP mints GHO due to increased volume and chance for higher fees
4. Influx of users from (3) may restart price decay.
5. GHO price remains outside of (0.995, 1.005) per borrow schedule, leading to proposal for rate increase.

As a result, without organic demand and buy pressure to counter (4), the above sequence may cycle and repeat, potentially leading to decreased GHO supply (excess costs from mint) without repeg.

Ultimately, minter behavior may change once borrow rates exceed benchmark rates (such as Maker DSR) or when borrow rates exceed expected fee revenue from liquidity provision.

Potential methods to stimulate GHO demand

Finding synergy between the features of Aave as a lending platform and GHO may help spur usage. The high level to achieve this could be to use GHO borrow rates to finance GHO demand vectors. We explore a couple additional ideas below and explore their tradeoffs. The ideas we suggest may allow for users to recycle between various use cases in their lifetime of holding GHO, across evolving market volatility.

Stake GHO to lower WETH/USDC/USDT/etc borrow rates

At a high level, users can stake GHO to reduce their borrow fees. The premise behind this approach would be to draw demand for GHO by providing rebates on borrows, especially during bull markets. For instance -

- a user looking to recursively collateralize WETH with WSTETH can stake GHO to reduce their borrow fees for WETH loops, increasing profitability for the strategy.
- a user looking to implement an SDAI ↔ USDC loop can stake GHO to reduce borrow fees for USDC loops.

This type of rebate may allow for more user-centric benefit rather than a blanket yield denominated in GHO (such as reducing borrow costs for leveraged LST-WETH strategies). A couple considerations need to be kept in mind.

- The magnitude of borrow rate discount for each asset should be a function of asset volatility to USD, with sufficient spread to GHO borrow rates

(i.e. stablecoins can have higher discount, WETH has less discount) We provide an example below.

- Each asset would need a “discount cap” that bounds the amount of borrow with discounted borrow rate in order to preserve supplier APR

On borrow rate discount

Borrow rate discount should facilitate Aave generating more revenue under this framework as compared to the current regime excluding GHO with high likelihood.

- For each asset

i.e. $\text{rate_buffer} = 0.005$

- USDC/USDT/DAI $\text{borrow_rate_discounts}$ can be

Since current GHO borrow rates are 3%, this comes out to $\sim 2.5\%$.

- For other assets, we can consider finding discount rate per asset X such that for some probabilistic bound k (say $\sim 90\%$)
- Using GBM (Geometric Brownian Motion) for asset returns as a rough proxy and that WETH volatility $\sim 40\%$, we find that WETH can support a borrow rate discount of $\sim 1.5\%$ at probability threshold 90%.

Borrow rates for \$100k WETH borrows, as function of staked GHO percentage of total borrows and current utilization, with 1.5% borrow fee discount

On discount caps

- Borrow rate discounts should not impact supplier APR, to avoid supply contraction. Let D be the discount cap as a percentage of current supply. The following should hold, for each asset X. Then we have

Some observations -

- The right hand side will be at least the reserve factor of X.
- Discount cap as a percentage of current supply may be tricky, especially when for asset X, amount of GHO staked exceeds discount cap.
- One way to counteract this would be to enact a penalty, users staking GHO for asset X in this situation would pay interest penalty (i.e. withdraw less GHO than they staked), and have decreased discount benefits.
- This would be similar in principle to the current IR framework (slope1/slope2) for Aave.
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- As an example, WETH would allow for discount caps of $\sim 30\%$ current WETH supply.

Stake GHO to earn GHO Savings Rate, fueled by liquidation protocol fee (LPF)

Aave v3 introduced the Liquidation Protocol Fee, which takes a portion of each liquidation bonus and [sends to treasury](#). Creating a GHO Savings Rate where interest is paid from this liquidation protocol fee may drive GHO demand and encourage people to hold GHO during volatile periods. Those who stake GHO in the GSR vault would be eligible to collect the GSR. We give some rough historical statistics.

- Aave liquidations bonus across all deployments totals \$23m over past 1.5 years
- assuming LPF of 10%, that amounts to roughly \$1.5m in LPF, or 1.5% APY for 100m GHO staked in the GSR vault.

We can simulate GHO savings rate accumulation. Let $\text{Liq}: X$

$\times P$

$\rightarrow M$

be the liquidation function that takes a loanbook matrix X

and a daily price trajectory P

that outputs a total daily liquidation M

per asset. Let LB

denote the vector of liquidation bonuses.

Then yearly expected liquidation bonuses can be modeled as

where P

is a $k \times s$ matrix for k assets and s oracle updates. Taking expectation of E_t

and noting that liquidations are convex relative to loanbook changes and price change,

We make a number of simplifying assumptions to model the right hand side:

- loanbook changes are 0 from day to day
- correlations hold and nothing “abnormal” occurs (i.e. no stablecoin depegging)
- Proxy P

via bootstrapping price returns from the past two years for WETH and assuming asset returns are equal to the asset beta-multiplier to WETH (stablecoin 0 beta to WETH)

- LPF is 10% for all assets

Simulated Growth of Accumulated GSR Rewards, assuming 100% of LPF goes into GSR, using Aave v3 Ethereum as loanbook

Simulated GSR vault growth over 100 runs reveals a median yearly GSR vault accumulation of ~280k, assuming 100% of LPF.

GSR could then be distributed proportionately across stakers in the GSR vault. There are a couple considerations with how the GSR is paid out, since a LPF based GSR could cause excess depeg $> \$1$ when significant market downturn occurs (in addition to GHO buys for liquidations).

- Vault distributes GSR daily based on average liquidation amount over past month to smoothen out liquidation spikes.
- LPF from liquidation on day i would be distributed evenly over day $i+1$ to day $i+30$
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- GSR is only paid to GHO staked in vault. The more GHO staked in vault, the lower the APY from GSR.

This also drives a couple of options on how users receive their GSR.

- GSR vault simply accumulates raw collateral from LPF and distributes rolling average amount to users.
- Users then have the option to withdraw in GHO or native token. If they withdraw in GHO, at the time of withdrawal, their proportional share is converted into GHO.

On how GHO mechanism updates should be scheduled

1. Bring GHO back to peg via community discussed methods
2. Activate GSM to mitigate impact of temporary dislocations to peg
3. GSM activation should have several conditions, discussed in the Appendix
4. GSM activation should have several conditions, discussed in the Appendix
5. Continued monitoring to evaluate GHO balance across liquidity and demand as GHO scales
6. Peg is trading within (0.995, 1.005)
7. GSM supply caps are reasonable and do not present GHO price manipulation risk
8. Aave v3 bucket capacity is properly managed
9. Peg is trading within (0.995, 1.005)
10. GSM supply caps are reasonable and do not present GHO price manipulation risk
11. Aave v3 bucket capacity is properly managed

Next Steps

We welcome community feedback on the above analysis. Some questions to consider:

- Does the community agree that stimulating GHO demand should be a priority?

- Before Maker introduced DSR in late 2019, DAI price followed similar trajectory, with liquidation volume spiking the equilibrium DAI price of $< \$1$.
- GHO demand pressure will incentivize market buying which will help bring GHO closer to peg.