

rhAmple - A *rebase-hedged* Ample Protocol

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This document presents a rebase-hedged Ample protocol enabling the creation of an *%-ownership of Ample supply* interest-bearing ERC20 token.

Introduction

Ampleforth, a new synthetic commodity money created in 2018, introduced the *rebase* operation, enabling non-dilutive and atomic supply adjustments. These supply adjustments are executed once per day based on the difference of Ample's market rate and an inflation adjusted target rate.

In July 2021, Ample borrowing and lending went live on the Aave lending market. For borrowers, Ample enables a safe debt-denomination just like a stablecoin, while lenders can reduce their exposure to the daily rebases in exchange for an interest.

Hedging of negative Rebases

The possibility to lend Ample enables the hedging of negative rebases, i.e. negative supply adjustments, because the debt denomination of the borrower does not rebase.

Furthermore, whether an upcoming supply adjustment will be positive or negative is computable before the rebase gets executed. This is due to Ample's market and target rate being readable at any point in time from Ampleforth's oracles.

This makes it possible to hedge negative rebases by lending Ample before the rebase gets executed and enables the development of *%-ownership of Ample supply* interest realizing strategies.

The rhAmple protocol

The rhAmple protocol is capable of hedging negative rebases automatically. The protocol achieves this by plugging-in an Ample hedger implementation and an Ample rebase strategy implementation.

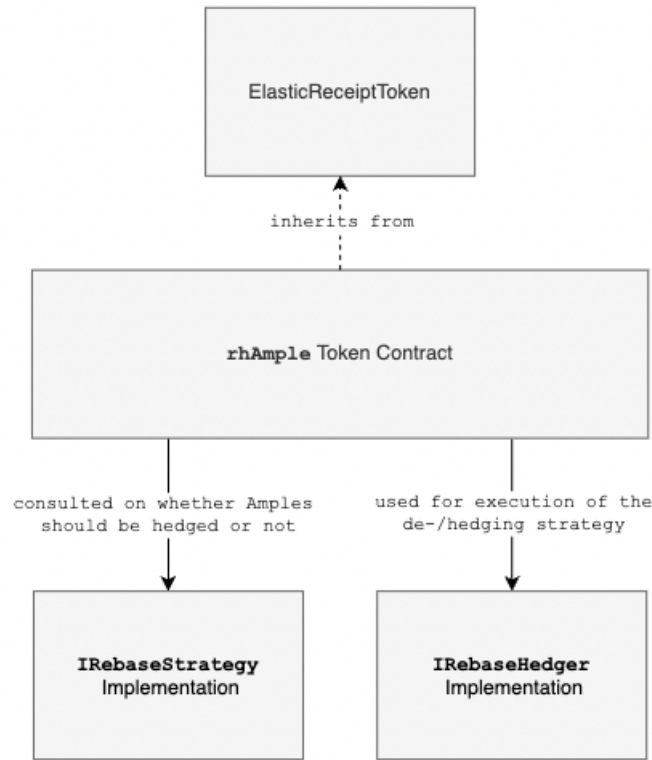
The rebase strategy implementation is consulted to decide whether the next rebase should be hedged while the hedger implementation is used to execute a hedging strategy.

Furthermore, the rhAmple ERC20 token, representing an Ample deposit in the protocol, uses the `ElasticReceiptToken` as foundation, enabling a fixed conversion rate of rhAmple to Ample under management in the protocol of 1:1. Building upon this invariant enables the creation of tranching rhAmple by using the Buttonwood contracts and possibilities for easy integration of the rhAmple token as no rhAmple price oracle is needed to evaluate a user's balance valuation.

Architecture

The rhAmple protocol is composed of four different smart contracts:

1. The `RhAmple ERC20` token contract
2. The `IRebaseStrategy` implementation
3. The `IRebaseHedger` implementation
4. The `ElasticReceiptToken` dependency



Initial Strategy and Hedger Implementations

The initial `IRebaseStrategy` implementation is a stateless contract that queries Ampleforth's oracles for Ample's market and target rate and sends a hedging signal if the market rate is lower than the target rate, i.e. if a negative rebase is expected. Note that this strategy does not take Ampleforth's rebase threshold or the supply delta of the rebase into account.

The `IRebaseHedger` implementation used upon launch uses the Aave lending market for hedging. Upon request, the implementation deposits the protocol's Ample tokens on behalf of the protocol into Aave. After a successful deposit, the protocol will hold aAmple tokens.

The de-hedging of Amples, i.e. the withdrawal of Amples from Aave, could fail if the borrowing activity is too high. In such a case, the hedger implementation will market sell the aAmple tokens for Amples using the Mooniswap exchange.

To not produce too much slippage during such a trade, the rhAmple protocol introduces a variable defining the maximum amount of Amples allowed to hedge.

Restructuring

The restructuring of Ample deposits is executed on every token-state mutating function, e.g. a token transfer. If the strategy's signal for the upcoming rebase changes compared to the protocol's current hedging state, Ample deposits get automatically (de-)hedged depending on the strategy's signal.

The rhAmple contract publishes its hedging state through a public variable to enable keeper services to trigger a restructure manually as soon as the hedging state differs from the strategy's current signal. Strategy implementations can be simulated off-chain and consulted in regular time intervals to trigger a restructuring of the protocol if the hedging state should change.

Roadmap

After a successful Beta on the Kovan testnet and the initial launch on Ethereum mainnet, the ownership of the rhAmple contracts should be reconsidered. It is the author's intention to keep the rhAmple protocol a non-fee taking, public good for the Ampleforth community. In order for the protocol to provide a maximum of neutrality and trustless-ness, the author will propose an incubation of the protocol into the *ForthDAO*.

Conclusion

The rhAmple protocol is a new primitive for the Ampleforth and broader *elastic finance* ecosystem. It enables long-term holders to earn an interest on their idle Amples, in terms of Ample supply ownership, by holding an interest-bearing token.

Furthermore, due to rhAmple's rebasing nature the rhAmple token can be used by Buttonwood's Bond and Tranche contracts the same way Amples are. This could lead to further de-

velopments such as splitting rhAmple's interest from the Ample principal, enabling instruments giving exposure to Ample's borrow activity on lending markets.

References

1. The rhAmple Protocol Contracts
2. The ElasticReceiptToken Contracts