Autonomint: A Stable Coin Protocol backed by decentralized Credit Default Swaps

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Abstract
Any business or enterprise transaction happens in currency, either in physical or digital mode. We are currently seeing deterioration in the transactional currencies' value leading to reduction in capital efficiency across all asset classes. Thus, there must be a store of value that is relatively volatile but inherently stable. By using the stable coin pegged with dollars (transaction currency), we can lend it stability. This stability also comes from the psychological measure of the value among people based on their understanding of purchasing power of transactional currencies. In addition, the stablecoin will allow the holders to capture the deterioration in purchasing power of transactional currency by adding volatility to the process. This volatility comes in the form of interest rate change and asset value change, which works as a hedge against the loss in value of the transactional currency and also captures the upside of the same.
In this chapter, we propose a novel stablecoin (AMINT), a stablecoin protocol offering a Loan to Value Ratio (LVR) of 100%. AMINT combines decentralized derivative instrument Credit Default Swaps (CDS) and collateral options to manage the risks and provide adequate incentives for every stakeholder. AMINT is capital efficient and backed by strong counterparties to ensure trust in the system. We have proposed unique protocol (AMINT) to ensure safety and security for clients looking for more profits for their investments. AMINT acts as a lending protocol that enables 100 % LVR to crypto users. Apart from these features, we have tried adding features to AMINT, managing the risks related to collateral using CDS. The protocol ultimately ensures high capital efficiency of the deposited assets and brings a stable coin which caters to both retail and institutional returns and risk tolerance capacity needs.

Keywords: Crypto, Credit Default Swaps, Loan to Value Ratio.

1 Introduction

Trust is the ultimate currency that drives any human interaction across the world. People trust someone or something if they have strong backing. Cash as we know it today is utilized as the medium of exchange because it has strong support from their countries' respective governments. Two layers of trust run any business or human interaction across the world. Companies or clients pay in currencies like Rupees/Dollars to another business/person in return for the services/effort/goods delivered to each other. Here, trust in currency and trust in another business to provide the services keeps the wheels of the economy chugging along.

There was a time of the Free Banking Era when anyone could print their currency and in which there was no government interference. The free-banking laws specified that a state banking authority determined the general operating rules and minimum capital requirement without any approval. However, this issued new currency also requires the backing of government bonds. These state bonds at that time were not fully riskless but, banknotes issued against the same were at the par value of bonds. So, Banks could issue a $100 banknote by depositing a state bond with a market value of $90 but par value of $100 [1].

Highly trusted backing ensures that the system will be highly capital efficient. Banks can lend a loan against an illiquid asset like property/real estate or an intangible asset like an Ivy League college education. This introduces capital efficiency as people can take a loan against their non-cash equivalents or non-liquid assets. Similarly, corporations can issue corporate bonds against their book assets, and their credit ratings ensure that the interest charged is reasonable.

We are currently seeing a deterioration in the value of our transactional currencies [2], leading to a reduced in capital efficiency across all asset classes. Thus, there must be a store of value that is relatively volatile but inherently stable. Stability is also a function of a psychological measure of value backed by our understanding of the purchasing power of transactional currencies. In addition, the stablecoin also allows the holders to capture the deterioration in purchasing power of transactional currency, adding volatility to the process. This volatility works as a hedge against the loss in value of transactional currency [3].

The proposed model AMINT is to create a stable coin that is highly capital efficient with solid backing by the counterparties to ensure trust in the system is maintained. We have devised unique mechanisms to ensure risk is limited to parties looking for outsized or more than usual returns on their investment.

AMINT is the world's first stablecoin and lending platform offering a Loan to Value ratio of 100%. We are also the first protocol utilizing a combination of decentralized derivative instruments like Credit Default swaps and Collateral options to manage the risks and provide adequate incentives for every stakeholder through collateral volatility. It has three core components: stable coins, Credit default swaps and options. It also has a lending protocol where the stablecoins are minted and sent to users who deposit some crypto assets as collateral. AMINT ensures that it can provide a 100% Loan to Value ratio so that clients can borrow stablecoins against the entire value of their collateral. To manage the downside risk of collateral deposited, we have devised a unique mechanism to keep the collateral value neutral to price variations that is enabled by taking a short position on the underlying collateral against the long side of trade handled by protocol on behalf of our Credit Default swaps holders. These CDS owners deposit the stablecoins in our CDS contract, and their funds are utilized to take a long position on the underlying collateral borrowers' deposit. These CDS owners are compensated with a combination of upfront fees and ongoing periodic fees for taking the long side of the position and providing downside protection to collateral assets for borrowers. The borrowers pay these fees to CDS holders in exchange for downside protection of their collateral and a call option on the underlying collateral asset at some Out of Money strike price. The call option allows them to capture the upside of their collateral that automatically makes the CDS owners option sellers as they are also paid some fixed fees for taking the long side of the trade at some Out of Money strike price. The protocol ultimately ensures high capital efficiency of the deposited assets and brings a stable coin which caters to both retail and institutional returns and risk tolerance capacity needs.

This chapter is divided into the following sections:

Section 1: Introduction

Section 2: Background and Related Work

Section 3: Stable Coin - Challenges

Section 4: Problem Statement

Section 5: Proposed Work – The AMINT Project

Section 6: Working of the Protocol

Section 7: Risk Management through Time-bounded Liquidity

2 Background and Related Work

Some of the most popular stablecoins in the market are USDT (Tether) and USDC (Circle), and both of them are centralized and backed by Proof of Reserves. Many crypto companies pay their employees' salaries in USDT and USDC, which is also the preferred option among employees. As the value of the USDT is fully backed by fiat currencies, the peg always remains stable and you will always be redeemed $1 for $1 stable coin.

Other stablecoins are over-collateralized stable coins like Maker Dai, which has a native blockchain cryptocurrency like ETH or other established projects tokens as their collateral, and stablecoins are minted at the Loan to Value ratio of 60% or below mainly. These have gained the most adoption due to their over-collateralized nature, which makes the protocol less susceptible to default, and stablecoin also doesn't lose peg widely. Interest rate mechanisms are put in place to manage the demand and supply of stable coins in the market which in turn helps manage the peg of stable coin to $1[4].

Stablecoins are backed by on-chain algorithms with an algorithmic rule that manage the supply and demand of stable coins and asset backing them. They can be burned and minted algorithmically to ensure a 1:1 peg [5].

Then there are partially collateralized and partially algorithmic stablecoins like FRAX [6]. Their collateral consists of established blockchain projects like ETH and ABOND asset in a ratio that varies based on the supply and demand of stablecoins, affecting the stable coin price. If the stablecoin price is above peg, then there is a higher demand for the stable coin, which can be utilized by protocol to increase the percentage of their protocol token as backing for the stablecoin minted, leading to the adoption of their receipt widely and increase in the price of the token. This increases the projects' market capitalization of the project and broader success and strength of protocol.

Some stablecoins just mints stablecoins in return for supplying native blockchain assets like ETH or established project tokens. These projects have these deposited assets in their balance sheet, which are volatile. Any change in the value of these assets is compensated by the minting of ABOND asset sold or bought as per the decrease or increase in asset value at a particular discount.

There have been depegging in all 4 scenarios mentioned above with major bank runs in algorithmic stablecoins and partially collateralized stablecoins. Example: The Terra Luna crash, which was based on Algorithmic stablecoin design with the protocol own asset being used as collateral to back their stablecoin [7]. The other big crash occurred with Finance stablecoin which was a partially collateralized and algorithmic stable coin [8]. Over-collateralized stablecoins have faced de-pegging during periods of high collateral volatility, affecting the auction of collateral assets at a discounted price. Even centralized stablecoins like USDC backed by Proof of Reserves had a de-pegging of more than 10% due to their budgets being affected in banks that got bankrupt due to bank runs. Sometimes, the funds are being utilized in government bonds or other assets [9], which decrease in value leading to a fall in reserves [10].

After we analyze various stablecoins, we have observed some core user tendencies towards minting and borrowing stablecoins.

1. Users want to stay long in their volatile asset but also not lose out on other yield opportunities in this fast-growing Defi space. Since there have been a lot of platforms and yield farms coming out now and then, taking leverage against your capital to take benefit of these other yields is highly enticing. Hence, people borrow stablecoins against their volatile assets to explore different works in the market.

2. Stable coin as a currency is widely accepted across all the new and established platforms. New platforms prefer stablecoins because they do not want their platform to be affected by some external risk factors or overall Defi volatility [11]. Established platforms prefer stablecoins to diversify their TVL (Total Value locked) to stable assets which will grant backing to their governance tokens or utility tokens. Stablecoin backing is similar to cash equivalent backing, which commands the highest trust among the user base [12].

3. Users want to take advantage of the peg off balance, especially when stable coin value is above peg. This way, they can borrow stable coins at 1 USD from the protocol and sell them at the market price at > 1 USD to generate a net profit.

While designing our protocol, we are aware of this reality and try to stay close to above core user tendencies as much as possible. We don't want our protocol to mint some stable coins by exchanging some volatile crypto just because people want to go riskless and hence makes the protocol highly capital inefficient. We will then be storing the every asset (ETH or SOL) on which we are building our Defi protocol.

The proposed work provides an opportunity for users to go riskless but in the process do not lose out on their volatile crypto and always be long on the base layer assets.

3 Stable Coin - Challenges

Existing collateralized lending protocols and algorithmic stablecoins have below issues:

1. These protocols have a low capital efficiency — DEFI lenders will require collateral over the value of the loan so that if the value of borrowed asset drops or the value of the collateral drops, the lender still has a cushion in the form of excess collateral allowing the lender to retain their initial principal helps in saving the protocol from insolvency, but it also limits the amount of capital to be borrowed.
2. Protocols need to monitor the market to set an efficient Liquidation discount constantly. Some protocols like Maker and dYdX use an auction mechanism where liquidators bid with increasing amounts of the protocol currency/borrowed asset to

liquidate under collateralized accounts. These bidders will be able to get the collateral at a discount named a LD (Liquidation Discount) and then sell the collateral back in the open market at the market price, thus pocketing the profit. However, there is slippage in decentralized exchanges like Uniswap which varies with the Liquidation size. This slippage might lower or eliminate the arbitrage while selling the collateral. Thus, these protocols need to constantly monitor the market and re-evaluate their Liquidation discount (LD) to both ensure overpaying of collateral when the market rate is lower as well as ensure not underpaying when the market rate is higher, which will lead to no one bidding for liquidation leading to insolvency risks.

3. Algorithmic stablecoins backed by another stable coin - These stablecoins backed by a stablecoin asset which doesn't fulfill the need of users to stay long in their current crypto asset and capture the yields through price appreciation in them.

The proposed work tries to solve these issues.

4 Problem Statement

The above challenges have motivated us to work on the AMINT. Some of the problems faced in real-time:

1. There is a need to create a stable coin that is highly capital efficient with solid backing by the counterparties to ensure trust in the system is maintained.
2. Current stablecoin protocols need to design better incentive and user-friendly mechanisms for their borrowers. Borrowers have to monitor their collateralization ratios to avoid the risk of getting liquidated. This limits the borrowing capacity to a lower Loan to value ratio so that the borrowers' have some leeway to manage liquidation risk that decreases the capital efficiency of the protocol. Although there are projects out there that through some subscription fees provide services of maintaining the collateral ratios it introduces another overhead on top of the borrowing fees.
3. The current stablecoin does not provide downside protection for borrower collateral. So, during bearish times, there is a higher risk of collateral liquidation leading to less utilization of these projects and less minting of stable coins which can have a ripple effect on the strength or crypto economics of these projects.
4. Current stablecoin projects still need to build a capital efficient way to manage liquidations with incentive structures not attractive enough for liquidators. The best way now is to create a readily available pool of stablecoins utilized to manage liquidations at a particular discount.

5 Proposed Work - The AMINT Project

AMINT is a stablecoin that many competitors ranging from dollars and other currencies across the world. With hyperinflation coming, there must be a store of value that is relatively volatile but inherently stable. Through the proposed model, we aim to provide the best capital efficiency to every participant involved. The project has three components, as mentioned below:

1. Stablecoins - are issued upon locking collateral like ETH. The LTV (Loan to Value) ratio will be 100%.

2. Decentralized CDS (Credit Default swaps) - The second part of the AMINT are Credit Default Swaps. Depositors can enter CDS with the protocol and get regular funding payments apart from the interest rates they earn by depositing their stablecoins on protocol. Participants can earn more than 100% APY over and above the meager interest rates they receive from depositing their assets. The CDS owners will also act as can also be avail of the service of option premiums by which their assets will be readily available in case of default by the borrower compensated with option premiums in return for the same.

3. Collateral options - The collateral options are the source of fees for CDS owners. The idea behind collateral options is to give an option to the borrower for creating lossless strategies. In traditional finance, people buy options to hedge their downside and create a limited loss strategy. Using the same method, upside is maintained as the collateral options are a form of call options that allows the borrower to earn all the upside above a particular strike price. As the borrower enters into the contract with the protocol and takes a loan against Ethereum or any other collateral, another contract will get active. Upon paying an upfront option price, the borrower can hedge the downside risk.

These three will work together to maintain the peg of stablecoin and manage collaterals and defaults. The protocol will have two types of user-base with different risk tendencies and opinions about the market.

1. The first type of users will be borrowers who want to mint stablecoins and long the volatile crypto asset that they hold. These users also want to maximize their deposited capital's efficiency. To achieve the same, the users can mint and borrow the stablecoins against their deposited capital at the maximum LTV ratio of 100%.
2. The second type of users will be something called Credit Default swap owners. Credit Default Swap (CDS) allows one to swap the credit/default risk in exchange for some periodic fixed fees. In its aim to provide a 100% LTV ratio to borrowers, the protocol faces the credit/default risk when there is a decrease in deposited capital (collateral) value. This protocol will protect itself against these credit risks with the help of CDS owners. The protocol will swap the credit risk from itself to the CDS owners. These users will deposit the stable coins in CDS contracts. The stablecoins deposited will act as a counterpart and their capital will be utilized to counter the credit risk generated on decreasing collateral value. These CDS owners' capital will be locked, and in return, they will be compensated with a combination of

upfront fees and periodic fees, which will help them achieve returns near to 100% APY.

5.1 Option Fees exchanged among the participants

The collateral option fees are shared from borrowers to CDS owners achieved through an options derivative. The protocol will also have a 'delta neutral contract' where borrowers' capital and CDS capital will take short and long position respectively. This will help achieve downside protection on borrower's capital and help the protocol to capture an upside of the borrower's capital and utilize that upside to provide excessive returns to CDS owners and borrowers. For the initial few years, the Protocol parameters will be handled by our core team to ensure stablecoin peg is maintained with appropriate incentives created. We will automate most of the parameters over the course of this stabilization period in order to achieve an equilibrium state where the protocol runs smoothly.

6 Working of the Protocol

Figure 1 shows the functional model of the proposed work.

6.1 Stakeholders in Protocol

1. Borrowers – Borrows stable coin by depositing acceptable volatile assets (Ethereum) as Collateral

2. Credit Default Swap owners – Deposits stable coin, utilized by the system to provide downside protection for the ETH deposited by borrowers

6.2 Tokens in Protocol

1. Stablecoin
2. Option
3. Protocol Token (generated when CDS owner loses money)

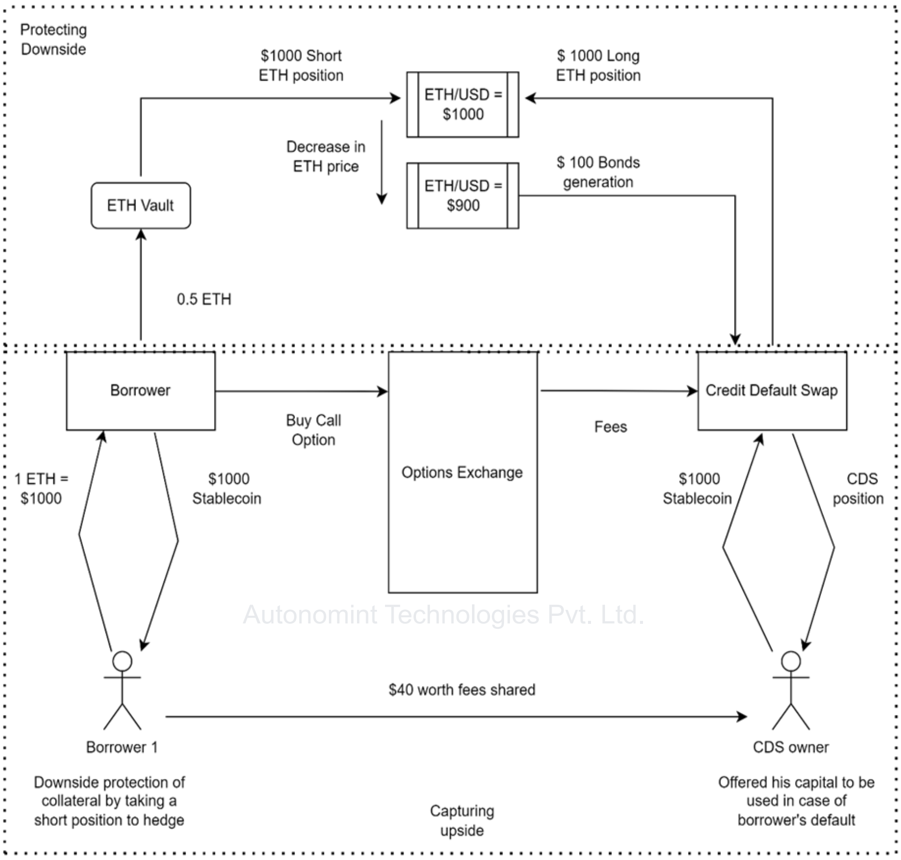

Fig.1. Functional Mechanism of Project AMINT

The borrower borrows a stable coin against collateral deposited. Let's assume the collateral deposited is Ethereum into the Ethereum Vault. On the other hand, the CDS owner deposits a stablecoin utilized in case of borrower's defaults. Protocol now in order to give downside protection of collateral to borrowers will engage in a short position using ETH in the 'ETH vault' on the underlying asset i.e., ETH price. Conversely, Protocol will take CDS stable coin deposits and put them in a long position on the ETH/USD price. Now, if the ETH value decreases, the short work will profit by an equivalent increase in value captured by deduction of the same amount from the long position. Also, if the ETH value increases, the long work will profit by an equivalent increase in value after deducting the same amount from the short position. However, the rise in ETH price in ETH vault creates a net neutral strategy for short position holders thus offering them downside protection. Thus, we achieve

our objective of creating a delta-neutral plan by providing downside protection to borrowers and protocol during the decrease in collateral (ETH) price. Now, the borrowers don't have to worry about confiscating of their collateral due to breach in LTV (Loan to Value) ratios. They can now generate yield during bearish times as their collateral value is not decreasing.
However, by creating this delta- neutral strategy, we have also made a limitation in capturing the upside of collateral i.e., increase in the price of the ETH, which is very dear to borrowers and one of the big reasons for them not letting go of their collateral. So, we solve this issue with the help of a collateral option's mechanism illustrated in the later sections.

The deposits of stablecoin are locked for some duration. Also, the CDS owners will be getting option fees from borrowers in return for offering their stablecoin deposits to offer downside protection from borrowers. Minting of ABOND asset is done when the collateral value is 90% of the borrowed amount and when the collateral value has touched 80% of the borrowed amount. In the initial stages of the protocol, we will be offering downside protection based on the volatility of Ethereum. We plan to 20% downside protection for collateral.

There is an alternate mechanism of providing protection of CDS deposits by generating a bond or hedge token which will be given to CDS once they unlock their deposit after fulfillment of contract unlock conditions. This bond or hedge token will have a maturity of 6-12 months. These bonds/ hedge token's value will depend on the total amount pending for maturity at different time durations. This bond/ hedge token can be with other participants.

6.3 Components of the Protocol

Borrowing of stablecoins

A borrower deposits ETH as collateral, and the protocol mints the equivalent value of stable coin in 100% Loan to Value ratio.

1. Track the price of ETH at the time of borrowing to store the USD worth of collateral deposited by the borrower. Every borrower will have its dollar worth collateral amount stored in the smart contract parameters when borrowing.
2. Protocol immediately deposits ETH into the ETH vault and takes a short position on the Delta neutral contract.
3. Protocol mints stable coin equivalent to USD worth of ETH collateral deposited

4. Total Debt for a particular Vault = Amount borrowed + Borrowing Fees

At t =0, APR = 12% (where APR is the Annual Percentage rate of borrowing written in decimals)

Assumptions
ETH Price = $1000

Collateral Deposited = 1 ETH = $1000

Stablecoin Borrowed, B = $1000

Total Debt at time t = $B*(1+APR/n)^{nt}$

Where n is the number of compounding periods per unit of time

Where t is the time in decimal years

While calculating the Total Debt of Protocol, we don't need to loop across all the individual vaults to calculate the Total Debt by looking at the particular time for every vault since borrowing. Instead, whenever a new borrower comes the amount, we will keep adding and deducting the total borrowed amount. After addition or deduction, we will multiply the amount with the current rate and time since the last borrower came or the last event that happened in the borrowing contract.

Therefore, Total Debt to be returned by borrowers = Total Vaults Debt * $(1+APR/n)^{nt}$

So, there is no need to loop across all the vaults every time, which can make our contract very complex and time-consuming.

We also will be utilisating Cumulative Rate to track the total debt for individual borrowers:

- Calculate Cumulative Rate: This begins by determining the Annual Percentage Yield (APY), which represents the annual interest rate considering compounding.
- Convert to Per-Second APY: To break down the APY into smaller time increments, such as seconds, we calculate the equivalent APY for a single second. This helps in understanding the interest earned or charged in a very short period.

- Derive Rate per Second: Convert the per-second APY into a rate per second, which is essentially the interest rate added or deducted each second (1 + per-second APY).
- Determine Current Cumulative Rate: This rate is used to assess the cumulative effect of compounding interest over time. It considers the rate per second, the duration between the last recorded event and the current one (in seconds), and the last recorded cumulative rate.
- Normalize Borrowed Amount: Normalize the borrowed amount by dividing it by the current cumulative rate. This normalization adjusts for the dynamic cumulative rate, making it easier to calculate interest amounts.
- Calculate Amount to Return: The amount to be returned is calculated by multiplying the normalized amount by the current cumulative rate. This represents the total amount to repay, accounting for the cumulative interest accrued over the specified duration

So, essentially the logic will look like as below

a. Get the APY.
b. Calculate the APY for one second.
c. Turn the Per second APY into Rate/sec (1 + per second APY)
d. currentCumulativeRate = ratePerSecond * duration between last and current event(in secs) * lastCumulativeRate.
e. Calculate normalizedAmount = borrowAmount / currentCumulativeRate.
f. amountToReturn = normalizedAmount * currentCumulativeRate.

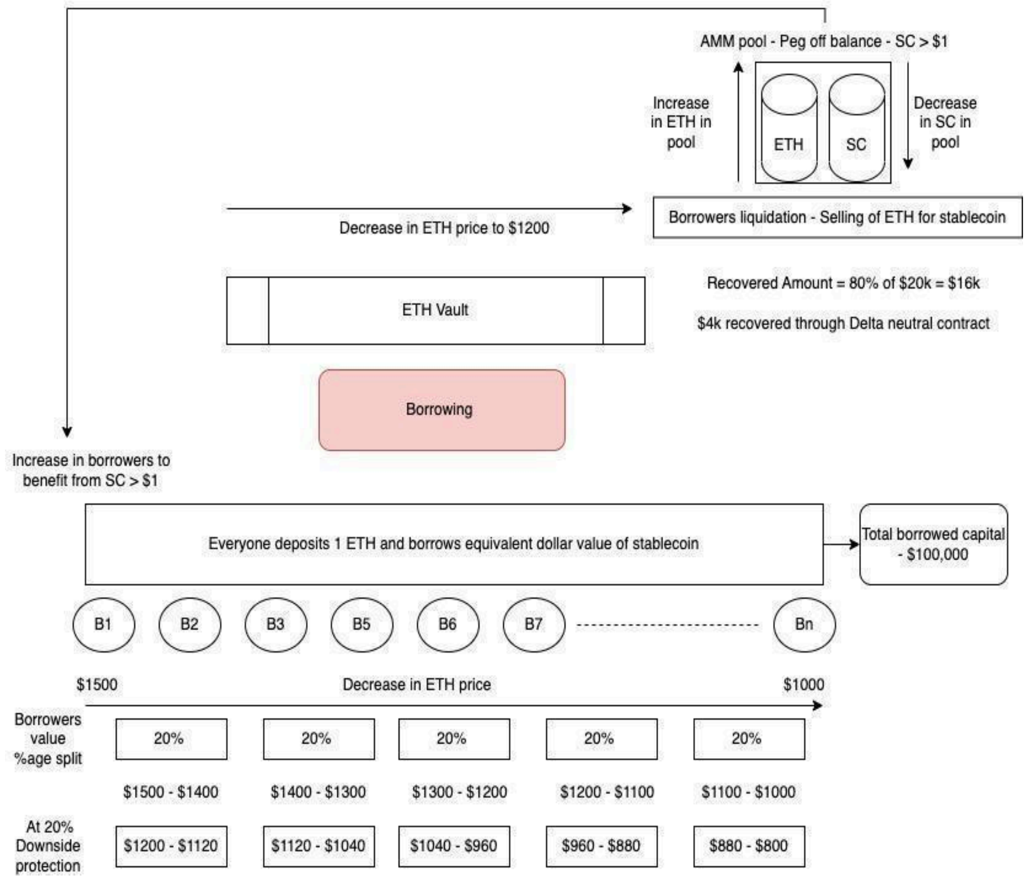

Fig.2. Borrowing Module

Credit Default Swap Entry by Holders

1. Each CDS holder will deposit the AMINT stable coins after buying from a market in the CDS contract in multiples of $500
2. The contract will save each CDS holder position.
3. The pooling of the total amount and taking a long position on a Delta neutral contract will be done.
4. An option seller utilizes the pooled amount in an options contract on behalf of CDS holders. This way, the CDS holders will get the option fees from borrowers.

5. The decision to unlock CDS holder stablecoins is based on tracking a combination of fixed term and protocol parameters.

The ratio of CDS holders/ Ratio of borrowers >= 0.2

The above ratio should be greater than 2 to unlock the CDS positions.

Bonds or tokens minted when the CDS owner tries to unlock their position that can be unlocked after a certain time threshold and certain protocol parameters conditions like the ratio of the total number of borrowers to the total number of CDS owners.

Delta-Neutral Contract (Downside Protection for Borrowers)

A Delta neutral contract involves taking two opposite positions on the price of ETH/USD.

1. One is the short position taken by the borrowers 'on ETH/USD, and the other is the long position taken by the CDS holder on ETH/USD
2. Assuming a 10% decrease in the price of ETH, the CDS holder's short position will cause a corresponding 10% increase in USD value to be added for each ETH held in the ETH vault. This additional amount will be subtracted from the CDS long position.
3. These are synthetic positions, and no cash settlement is happening on every change in price after every periodic interval.
4. Cash settlement only happens if a CDS holder wants to withdraw his amount after a lock-in of 1-month duration is over. At that moment, we will calculate the final balance of the total pooled amount. If the amount is positive than the amount pooled, then a fraction of the amount will be deducted and given to the CDS holder.

Calculation of balances of a long position and short position

1. Short position (Borrowers)

a. Calculate the quantity of ETH deposited in the ETH vault

b. Track the price of ETH in periodic intervals (1 min)

c. If the Price of the ETH in the current periodic interval is higher/lower than the previous periodic interval, then the total balance of the short position will be deducted by the below formula:

X = (Total number of ETH in ETH Vault * ETH Price change (Between Periodic intervals)

Short Position Balance = Total Short Position Balance – (Total number of ETH in ETH Vault * ETH Price change (Between Periodic intervals)).

2. Long Position (CDS Holder)

a. Calculate the total amount of stablecoin deposited in pool

b. As the price of collateral (ETH) changes, there is a change in the CDS pool long position balance

Total Long Position Balance = Long position balance in previous interval + X (Real)

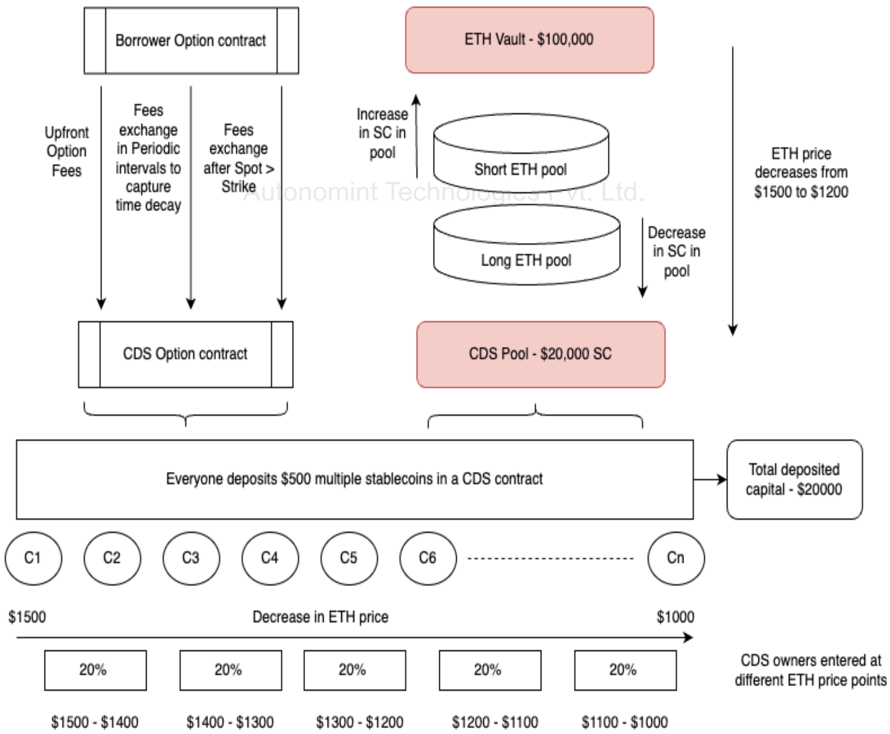

Fig.3. CDS module

Option's contract

Earlier versions based on the ERC20 standard failed to adequately distinguish between principal and interest payments while also accommodating for differing rolling maturities. In the past, holders encountered theta decay as all positions neared maturity simultaneously, leading to a prisoner's dilemma [13]. The duration is measured in seconds utilizing Unix-timestamps, as permitted by Solidity.

1. The design of the option contract aims to offer borrowers a means of benefiting from a potential increase in the price of ETH. This is accomplished through the purchase of a call option at a specified strike price.
2. Furthermore, the option contract facilitates the transfer of option fees from option buyers (i.e., borrowers) to option sellers (i.e., CDS holders), thereby allowing CDS holders to earn a high yield APY on their deposited funds while maintaining a Delta-neutral position for borrowers.
3. There are 5 variations of strike prices that borrowers can take – 5%, 10%, 15%, 20%, and 25%. It implies that borrowers can buy a call option on ETH price on the above percentage ranges for strike prices only
4. The option price will decrease from a 5% strike price option to a 25% strike price option as per the risks

There are three different approaches to designing an option fees exchange mechanism:

First Approach

1. There will be only five markets for option prices -
   a. Borrowers who have purchased a call option at a strike price of 5% will be grouped together.
   b. Borrowers who have purchased a call option at a strike price of 10% will be grouped together.
   c. Borrowers who have purchased a call option at a strike price of 15% will be grouped together.
   d. Borrowers who have purchased a call option at a strike price of 20% will be grouped together.
   e. Borrowers who have purchased a call option at a strike price of 25% will be grouped together.
2. At the start, the option market will only offer a 5% strike price option. Thus, all borrowers will participate in the options contract by purchasing a call option at the 5% strike price.

3. Option Price calculation

For a borrower buying a 5% strike price option when the ETH price is at $1000 so the strike price is $1050

He pays some Initial Option Fees = 20$

Option Price = Current Option Price * (1+ % change in ETH price from the contract start * 10) - (Time decay affect on Price)

Option Price also changes if some borrower comes in between to sell its option at the current price. So, that seller will be given the increase in option price by deducting the same amount over the left borrowers who are still holding the option implying they are bullish on the option price and thus acting as a counterparty to the borrower looking to exit from his option contract.

Another mechanism for Option price calculation will be utilisation of Black scholes

Options Formula

d1: $(\ln(S / K) + ((r + (\sigma^2) / 2) * T)) / (\sigma * \sqrt{T})$
d2: $d1 - \sigma * \sqrt{T}$

Where:

- S is the spot price of the asset.
- K is the strike price of the option.
- r is the risk-free rate (annualized).
- σ is the volatility (annualized).
- T is the time to expiry (annualized in years).

These coefficients are crucial in the Black-Scholes model for calculating option prices and Greeks.

Calculating Option Prices:

The function optionPrices will calculate both call and put option prices based on the following formulas:

- Call Price: Call = $S * N(d1) - K * e^{(-r * T)} * N(d2)$
- Put Price: Put = $K * e^{(-r * T)} * N(-d2) - S * N(-d1)$

Where:

- N(...) is the cumulative standard normal distribution function.
- S is the spot price of the asset.
- K is the strike price of the option.
- r is the risk-free rate (annualized).

- T is the time to expiry (annualized in years).
- d1 and d2 are the coefficients calculated earlier.

These formulas calculate the theoretical prices for European call and put options based on the Black-Scholes model.

Calculating Greeks (Delta and Vega):

- Delta: The delta measures how much the option price changes with respect to changes in the underlying asset price. It is calculated using the cumulative standard normal distribution function N(d1) for a call option and N(d1) - 1 for a put option.

- Vega: The vega measures how much the option price changes with respect to changes in implied volatility. It is calculated using the square root of time to expiry, √T, multiplied by the standard normal distribution function N(d1) for both call and put options.

These Greeks provide insights into the sensitivity of option prices to changes in the underlying asset price and implied volatility.

Second Approach

1. Once an option buyer enters into an options contract, they will receive an NFT representing their position at the 5% strike price. They may then choose to list the NFT in a marketplace for sale at a specific price.

2. Potential buyers of the NFT may purchase it at the listed price and subsequently deposit it into our protocol, enabling them to receive any benefits resulting from the ETH price being above the strike price on the specified expiry date.

Third Approach

The option prices with no maturity dates and five strike price options

1. Borrowers who have purchased a call option at a 5% strike price will be grouped together.
2. Borrowers who have purchased a call option at a 10% strike price will be grouped together.

3. Borrowers who have purchased a call option at a 15% strike price will be grouped together.
4. Borrowers who have purchased a call option at a 20% strike price will be grouped together.
5. Borrowers who have purchased a call option at a 25% strike price will be grouped together.

Total Option fees = 40% Upfront Payment + Continuous stream of option payments for time decay in option price with no maturity dates

For Instance, ETH spot price = $1000

The borrower deposits 1 ETH as collateral to borrow a $1000 stablecoin.

Borrower takes a call option at a 5% strike price with no expiry of the maturity date. So, the strike price is $1050.

Total fees = Upfront Option Fees + Continuous stream of option payments to capture theta decay + Option Fees to maintain position (If Spot > Strike)

Total Fees = $10 + $20 (Continuous fees deduction from $20 in 1% percentage points corresponding to theta decay) + (%age Deduction of overall upside as long as the position is kept open)

We will also be utilising Cumulative rate here to accrue the fees from borrowers to dCDS holders. Every option fees will be treated as a percentage gain and a global cumulative rate function will help accrue these fees across dCDS holders based on their time duration and amount of deposits.

7 Risk Management through Time-bounded Liquidity

Our protocol is designed to provide borrowers with downside protection on their collateral while also enabling them to capture the potential upside. This is currently achieved through a combination of CDS capital [14] and collateral options used as incentives.

It is crucial for our protocol to have the necessary flexibility to manage risk and incentivize participants appropriately. This will be achieved through the use of concept called Time-bounded liquidity which will help tackle the issue of high liquidity risk in the system along with providing risk diversification. We will be minting Yield Bearing assets with bond like characteristics, which will only be minted and burned based on the actions of participants. We call these assets as ABOND in our protocol. We recognize the importance of time value of money in providing yields to parties, whose assets are utilized by a counterparty to manage project operations, drawing upon traditional finance principles. In our protocol, we also utilize the assets of CDS owners to manage downside risk of collateral. As compensation, they receive upfront fees and a continuous flow of fees for time decay in options. The ABOND asset will serve as a risk management tool for both the protocol and CDS owners.

7.1 **Approach 1**

The protocol is designed to manage risk by providing appropriate incentives for participants in the form of ABOND asset. These tokens will be minted and burned only based on participant's actions, and they will be utilized as a risk management tool for both the protocol and CDS owners. The protocol has a downside protection built in through its Delta-neutral function, but it also needs flexibility to manage risk by reducing its reliance on collateral assets' volatility.

It provides incentives through ABOND asset to diversify the risk from collateral assets to ABOND asset. The ABOND asset' mint function will get activated when the borrower's collateral has fallen down to 10%, and the number of ABOND asset minted will be twice the fall in collateral value. These tokens will be provided to the borrower on returning the stablecoins borrowed. The provided tokens are double the value of loss in collateral, so they act as an incentive for the borrower to earn an upfront yield. This higher yield compensates for the higher yields that the borrower could have earned by locking or staking their stable coins on some protocol.

By diversifying the risks from collateral volatility to ABOND asset, the protocol has higher flexibility in managing risks. The protocol will mint tokens that will be distributed after some term or time duration to the CDS owners. This will act as yield on locking of the CDS capital for higher durations with the protocol.

It can be observed in current decentralized lending platforms such as Compound Finance that stablecoins provide significantly higher supply APYs (20-40 times) compared to volatile assets like ETH. This yield is even more substantial for tokens with active yield farming programs. [15]

By depositing Ethereum to borrow stablecoins, individuals can potentially earn higher yields by efficiently utilizing their stablecoins. Despite the deduction of borrowing fees, the yields offered on stablecoins are higher due to their non-volatile nature.

Our protocol includes a Delta-neutral function to provide downside protection. However, we also recognize the need for flexibility in managing risk by reducing our reliance on collateral asset volatility. To achieve this, we plan to incentivize participants with ABOND asset, which will diversify the risk from collateral assets to the tokens themselves. When a borrower's collateral falls to 10%, our ABOND asset mint function will activate, creating tokens equal to twice the collateral's fall in value (e.g., 20% of collateral value if it has fallen to 10%). Upon returning the borrowed stable coins, the borrower will receive these tokens as an upfront yield. The double value of the tokens relative to the loss in collateral serves as an incentive for the borrower to earn a return. The upfront tokens compensate for the higher yields the borrower would have earned by locking or staking their stable coins on other protocols.

The CDS owners take on a significant amount of risk in exchange for large option fees. However, their participation is solely based on their view of the collateral assets' volatility. If the collateral asset's volatility is low, then they will benefit from higher returns through option fees. Conversely, if the volatility is high, their returns are more likely to be negatively impacted. By diversifying the risk from collateral volatility to ABOND asset, we gain greater flexibility in managing risks within the protocol. The protocol will mint tokens that will be distributed to CDS owners after specific time duration, providing a yield for locking CDS capital for longer periods with the protocol.

One potential issue with the protocol's 100% LTV is that users may attempt to game the system by borrowing stable coins to buy ETH, and then using that ETH as collateral to take out another loan. However, since fees are deducted from the original stable coin loan, the actual loan value is closer to 95%. This means that repeatedly opening borrowing positions in this way would not significantly impact the system, as the borrowed value is eventually returned. The only systemic risk would be if the collateral for all of these borrowing positions were to fall in value, which could impact the CDS pool.

ABOND asset flow

Objectives:

The ABOND issuance serves a threefold purpose:

1. Creating a yield-bearing asset with bond-like characteristics, featuring flexible maturities determined by borrowers.
2. Establishing a risk management mechanism through a time-bound liquidity concept to safeguard the protocol against extraordinary events, such as a sudden mass redemption of stablecoins (akin to a bank run).
3. Leveraging ABOND to restore the peg should other mechanisms fail to promptly reestablish stability.

Process:

ABOND Creation:

- ABOND tokens are minted against Ethereum, akin to how traditional bonds are issued against cash.
- Given the volatility of Ethereum, ABONDs are minted at a 20% discount to the prevailing ETH price to account for the associated price risk. This discount may vary dynamically based on ETH price volatility.

Yield Accrual and Redemption:

- Borrowers deposit ETH as collateral, which is then split in half, with one part placed in an external protocol to generate yields.
- When a borrower repays the borrowed AMINT, the ETH price is checked. A 20% discount is applied to half of the collateral ETH to determine the amount of AMINT required to back the ABOND.

  Example:
  - During Deposit: ETH = $1000
  - 1 ETH is initially deposited by the borrower as collateral, with 0.5 ETH sent to an external protocol.
  - During repayment, ETH = $850
  - Half of the collateral (0.5 ETH) is valued at $425, with a 20% discount reducing it to $340.
  - $340 (or 340 AMINT) is used to back the ABOND asset, while any remaining returned AMINT is burned.
- This results in 0.5 ETH valued at $425 being locked in an external protocol, which secures 340 AMINT stablecoins. These 340 AMINT tokens are then used to mint ABOND tokens in a 4:1 ratio, yielding 80 ABOND tokens. The current price or redemption value of ABOND is set at $4.

Key Considerations:

- Users are assured that their ABONDs will always be redeemable for $4 in value, regardless of any fluctuations in the backing ETH's value.
- Example: If the price of the 0.5 ETH collateral falls to $300, a user can redeem 80 ABOND tokens for a total value commitment of $320.
- Users receive 0.5 ETH (valued at $300) and 20 AMINT (valued at $20) in return for 80 ABOND tokens, after which these tokens are burned.

- If the price of ABOND rises to $5, users can redeem their ABOND tokens for ETH and accrued yields by depositing the equivalent in tokens. For example, if the ABOND price is $5, users need to deposit 64 ABOND tokens to receive the collateral and yields accrued since the deposit.
- In the scenario where there is an excess supply of ABOND tokens in the market due to users not redeeming them, a balance is naturally maintained through various mechanisms.
- New users returning loans will receive fewer ABOND tokens when ETH prices remain constant and unchanged during the loan period. For instance, if a user initially deposits 1 ETH as collateral and the price remains $1,000, they receive 64 ABOND tokens upon repayment. The balance (e.g., 16 tokens) must be purchased to reach the total of 80 ABOND tokens required for redemption.

Challenges and Solutions:

1. For users selling ABOND tokens, a solution is needed to calculate the yield when the users who didn't previously participate return their tokens.

Possible Solution:

- Users who don't have an active position in the protocol and are redeeming ABOND tokens can be provided with one month's worth of yield as the minimum locking period for ETH collateral is one month. Yield will be based on the interest accrued during the previous month.

2. When a user who doesn't hold a position with us presents ABOND tokens, we evaluate the collateral locked for a minimum of one month. During this assessment, any collateral deposited within the last month is not taken into account. In this case, the user is entitled only to the unlocked ETH equivalent to the number of ABOND tokens deposited.

   The calculation process can be summarized as follows:

   Suppose the user submits 10 ABOND tokens, and their current price is $5. We first examine the total AMINT tokens in our Dirac pool, which exclusively includes tokens minted to back ABOND tokens, excluding any other AMINT tokens deposited from protocol gains or liquidation gains. Simultaneously, we check the total ETH deposited in our external protocol.

From these evaluations, we calculate two key values:

- The total ETH in the external protocol divided by the total number of ABOND tokens in our pool, determining the amount of ETH to be provided to the user in exchange for their 10 ABOND tokens.
- The total AMINT tokens divided by the total ETH in the external protocol, establishing the amount of AMINT to be burned in return for the 10 ABOND tokens.

This calculation process takes into consideration the balances of ETH and AMINT tokens within the protocol and facilitates a fair exchange of ABOND tokens based on the current market conditions.

7.2 Managing Liquidation in Protocol

Method 1

We have a set of borrowers Br = {b1, b2, b3, b4…………..bn)

Where bi denotes the i-th borrowing position

It is a single collateral lending protocol with stable coin borrowed in an LTV ratio of 100%

Assuming the collateral utilized is the ETH, we have all these borrowers coming at different points of time at different ETH prices and borrowing stablecoin loans at 100% LTV.

Thus, the ETH prices associated with this group of borrowers can be represented as:

Er = (E1, E2, E3,E4…………….En)

Where Ei represents the ETH price for the i-th borrowing position

The collateral amount will be a fraction or multiple of ETH value, with Ci denoting the collateral deposited by the i-th borrower.

The debt taken in stablecoin is equivalent to the price of the ETH at an LTV of 100% LTV

As the borrower also needs to engage in an option contract along with the borrowing, the borrower needs to pay some option fees to provide downside protection to collateral and capture ETH upside if the price rises above a particular strike price. We will deduct these fees at the time the borrowing occurs from the Loan value taken by the borrower.

These option fees are a combination of upfront and fees for taking a perpetual position in the call option. After deducting the perpetual call option fees corresponding to the time decay of a particular borrowing position, some of them will be returned. If a borrowing position is closed early, the borrower will receive the fees back.

The prices will be calculated on the below factors:

1. The fees will have a $10 minimum cap
2. The fees will be dependent on the strike price of the perpetual call option. Payments will be higher for a higher strike price option.
3. The upfront fees will be determined based on the percentage of downside protection provided to the collateral amount. Initially, the protocol will offer 20% downside protection.

Upfront fees = 10% * 20%* Ci*Ei

Perpetual Option Fees will be calculated based on the strike price.

1. We will group together borrowers who purchased a call option at a 5% strike price.

40%* (Strike Price of ETH - Ei)

2. We will group together borrowers who purchased a call option at a 10% strike price.

30%* (Strike Price of ETH - Ei)

3. We will group together borrowers who purchased a call option at a 15% strike price.

20%* (Strike Price of ETH - Ei)

4. We will group together borrowers who purchased a call option at a 20% strike price.

10%* (Strike Price of ETH - Ei)

Autonomint

5. We will group together borrowers who purchased a call option at a 25% strike price.

$$5\% * (\text{Strike Price of ETH} - Ei)$$

The perpetual option fees will have a time decay deduction of fees every day from the perpetual option fees.

$$\text{Time decay} = 0.1\$ + 10\% * (\text{ETH price change every day})$$

7.3 **Liquidation management**

We manage liquidation by minting ABOND asset. However, we can still wait for liquidation to happen and then take action. We will proactively action to protect the protocol against any liquidation or strive to earn some yield until the liquidation happens (in two ways):

1. Earning yield from collateral deposited - We will split the collateral value into two parts half of the collateral will be deposited in some other protocol to earn yield, and half of the collateral will be kept here to offer downside protection in our See-Saw function.

2. Minting of ABOND asset at various stages will be done when the collateral value is 90% of the borrowed amount and when the collateral value has touched 80% of the borrowed amount. When the collateral value touches 80% of the borrowed amount, we give them ABOND asset in return for stablecoins. We will apply some Liquidation discount before giving ABOND asset. This mechanism will ensure that we do not have to take our collateral back from an external protocol which might charge us some fees and lose out on yield on the collateral deposited.

If Di is the debt in stablecoin taken by the borrower bi, then at 100% LTV

$$Di = Ci * Ei$$

Rt denotes the value of collateral ETH at time t

So, the health of the borrowing position,

$$Hi = (Ci * Rt) / Di = (Ci * Rt) / (Ci * Ei) = Rt / Ei$$

The health of the borrowing position will mainly vary from 0 to 2 approx. Considering that with the rise in the value of Hi, the borrower has increased incentive to close his position and take the increase in value. We will mint ABOND asset at different stages.

1. When Hi approaches 0.9, the ABOND asset will be minted based on the below formula:

If the market price of ABOND asset = Pm

$$\text{ABOND asset} = [(Ei - Rt) * 2] / Pm$$

2. When Hi approaches 0.8, we will mint the ABOND asset again. We will use a Hypothetical Liquidation discount (U) to determine the value of the ABOND asset minted for Liquidators.

$$\text{ABOND asset} = [0.1 * (Ei - Rt)] / Pm$$

Here, Hi of 0.9 & 0.8 are dependent on the ETH volatility and CDS volumes/Borrower volumes

Example

Assuming the current market price of ETH, Rt = $1000

The borrower, bi, puts 1 ETH as collateral. In return, the protocol mints $1000 AMINT SC

So, here Ci is the collateral as a multiple of ETH = 1

Also, Ci*Ei = 1*1000 = $1000

The borrower also chooses the 5% strike price i.e., $1050

So, the option price for borrower = Upfront Option fees + Perpetual option fees

= 0.1*0.2*Ci*Ei + 0.3*(Strike Price - Ei)

= 0.1*0.2*1000 + 0.4*(1050-1000)

= 20 + 20 = $40

So, out of 1000 AMINT SC minted, we will take 40 SC as Option Fees leaving the borrower with 960 SC

We have different scenarios as follows:

1. ETH fell to $950

The health of borrowing position, Hi = 0.95

If borrower decides to come and return $1000 SC, then he will get his ETH and $50 SC.

Essentially, the borrower will only receive $950 SC and get their ETH back.

2. ETH fell to $900

So, here Hi = 0.90

Let’s, ABOND asset, Pm = $2

The protocol will mint ABOND asset = [(Ei - Rt) * 2] / Pm

= [(1000 - 900) * 2]/ 2

= 100 ABOND asset

In this case, if the borrower decides to return $1000 SC, they will receive their ETH back after 3 months, but they will immediately receive 100 ABOND asset. Essentially, the borrower will only need to return $900 SC to receive the 100 ABOND asset.

3. ETH fell to $850

Here Hi = 0.85

In this case, if the borrower decides to return $1000 SC, they will receive their ETH back after a 3 month time period, but they will receive the previously minted 100 ABOND asset. Essentially, the borrower will only need to return $850 SC to receive the 100 ABOND asset.

4. ETH fell to $800

Here, Hi = 0.8

In this case, the borrower's collateral assets will become protocol assets, meaning Protocol will become the owner of the ETH. The Liquidator will receive the earlier 100 ABOND asset plus an additional 10% of ABOND asset, and in exchange, will give 200 SC to Protocol for the ABOND asset.

So, the liquidator will get = [0.1 * (Ei - Rt)] / Pm

= 100 + 0.1* (1000 - 800)/2

= 100 + 10 = 110 ABOND asset

Liquidator will get = 1.1 * [(Ei - Rt) / Pm] it will be a direct call from the user (depositor of that particular index cannot be a Liquidator/user).

7.4 Calculation of CDS depositor returned amount on withdrawal

We should know the total amount to be returned to the CDS depositor after a particular time period. The exchange of funds between the ETH pool and the CDS pool will be calculated after every CDS action or borrower action. As soon as a CDS deposits funds into our platform, we will identify them.

1. Current ETH market price, Er
2. Amount of CDS funds deposited/Total CDS deposited funds till now (Cd/C)
3. Total number of ETH holdings in our ETH pool

We will then calculate the current value of CDS funds in our protocol

Total CDS Deposited Funds = C

CDS deposited funds = Cd

CDS current funds = Cr1

So,

$$Cr = Cd + (Cd/C)*(Er - Ei)*(\text{Total Eth Holdings})$$

We will calculate the division of exchanged funds among the total CDS depositors using the above formula. As soon as there is a new depositor or borrower or any sort of new event, the value of different figures in the formula will change. After the new event, the division percentage of exchanged funds will be changed accordingly.

Thus,

$$Cr2 = Cd + (Cd/C)*(E_r - E_{i+1}) * (\text{Total ETH Holdings})$$

So, after every event, the reward percentage split changes, which require us to calculate the rewards split between two deposit intervals among all the CDS depositors until that moment. This exercise will be too computationally intensive for the smart contract considering there might be 100s of thousands of CDS depositors.

Also, calculating the reward split before every new CDS deposit would delay the transaction completion time and considerably affect the user experience.

In order to manage the above situation, we will maintain a record of reward split for only one standardized deposit amount. For a start, we have considered that deposit amount to be $1000. So, before every new CDS deposit transaction, we will calculate the proportionate reward for $1000 worth of deposits and update the total amount after every transaction. By recalculating the division percentage of exchanged funds, we will be able to determine the final amount to be returned to the CDS when they try to close their position. The total amount for a particular CDS will be a fraction or multiple of the current total amount of the standard $1000 deposit figure. This allows us to identify the value accrued to a CDS position during the time of withdrawal, which is one of the critical values to calculate in the operation of our See-Saw contract.

Table 4. CDS Depositors Calculation

Day	Total ETH	Initial ETH capital	ETH price	Initial CDS amount	CDS Pool	CDS depositors	Total	Net value of CDS Pool
1	51	50000	1000	10000		1000	11000	11000
2	52		1010		510	1000	12000	12510
3	53		1020		1030	1000	13000	14030
4	54		1030		1560	1000	14000	15560
5	55		1040		2100	1000	15000	17100
6	56		1030		1550	1000	16000	17550
7	57		1020		990	1000	17000	17990
8	58		1010		420	1000	18000	18420
9	59		1000		-160	1000	19000	18840
10	60		950		-3110	1000	20000	16890

Table 5. CDS Depositors Values obtained - Day wise

	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
CDS 1	1046.4	1043.3							
CDS 2		1043.3							
CDS 3			1040.8						
CDS 4				1038.6					
CDS 5					963.3				
CDS 6						965.0			
CDS 7							966.5		
CDS 8								967.8	
CDS 9									844.7

7.5 Utilization of ABOND asset as Reserve Currency

As we intend to offer 20% downside protection on collateral deposited by borrowers, we will potentially deal with a situation where users won't be returning the loan amount until & unless their collateral is near 80% of the value deposited while opening a borrowing position. This is a probable situation because users will try to take the maximum benefit of downside protection offered.

Most of the time, the collateral volatility varies between 20% so CDS capital will be protected most of the time. If and when the borrower comes to return the stablecoins back, then the returned amount will be the current collateral value. Thus, the borrower doesn't need to return the whole borrowed amount and instead give the less amount equivalent to the present value of collateral ensures that stablecoins confiscated from CDS capital remain with the protocol and never really leave the system.

A minting protocol will simultaneously generate tokens, which will be returned to the borrower. The process involves maintaining a pool of stablecoins and ABOND asset. Half of the returned stablecoin amount will be burned, while the other half will be deposited into the pool. This pool will serve as collateral for the ABOND asset minted from it.

7.6 An alternate, less risky protocol design of Project AMINT

To create a strong mechanism, we can analyze the daily volatility of collateral price and construct a normal distribution graph. By doing so, we can identify the limits within which the volatility typically fluctuates, distinguishing outlier events that fall outside these limits.

Assuming that ETH volatility usually varies around 20% so we can offer ETH downside protection beyond the 20% fall in ETH price. Our robust mechanism ensures that we will only seize CDS capital when the collateral value drops below 20% of its initial deposit value. As a result, our Credit Default Swaps module effectively transfers credit risk beyond an 80% decline in collateral value from CDS depositors to borrowers and the Protocol.

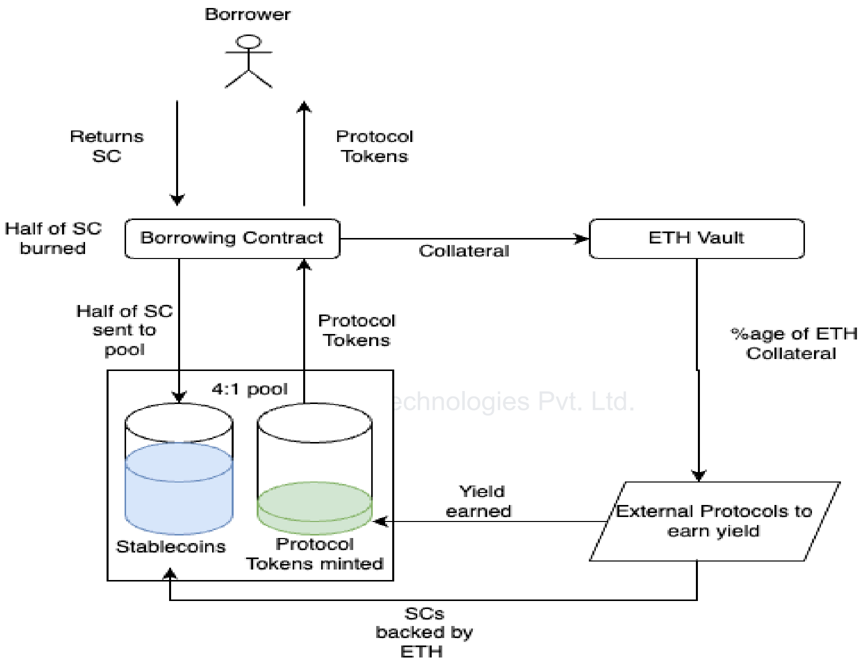

Fig.4. ABOND asset as Reserve Currency

Here, we will offer the Loan to Value (LTV) ratio of 80% with the protection offered for 80% of the collateral amount in return for option fees the borrowers are paying. Liquidation will not occur unless the collateral value falls below 80%.

If we take a below scenario

Collateral = ETH price = $1000

1. The borrower deposits 1 ETH as collateral and borrows 80% of SC, i.e 800 SC.

2. The borrower pays option fees to get downside protection and get a call option.
3. Borrower takes 800 SCs and invests in some token.

The token decreases in price by 50 %, so the borrower has lost 400 SCs due to speculation.

The borrower must purchase an additional $400 worth of stablecoins from the market to repay the $800 stablecoin loan.

If the Collateral value also falls to 60 %, then there is no need to return the whole $800 SC instead, the borrower has to return $600 SC only. This is primarily due to the 80% downside protection provided by the mechanism. Since CDS swap depositors receive premiums in the form of option and swap fees, their capital will be utilized to provide downside protection for any decline in value beyond 80% of the collateral amount. In the specific scenario mentioned, the protocol will utilize CDS capital to cover $200 worth of value.

8 Conclusion

The issuer issues the AMINT stablecoin to borrowers while enabling full protection of their collateral amount through a combination of Credit Default swaps and taking a Delta-neutral position on the price of Collateral at the time of borrowing. The protocol allows a Loan to Value ratio of 100% for borrowers and a high yield return for users with a Credit Default swap position. The protocol also utilizes derivatives like options to facilitate fee exchange among different users and capture the upside of the collateral amount. The main innovation of this protocol is the utilization of Credit Default swaps and options derivatives which work together to deliver high capital efficiency for borrowers and lenders. Another unique innovation is the diversification of risky positions through transferring risk from short-term holders to longer-term positions and proactive management of positions near liquidation territory. This stablecoin will serve an immediate need of retail and institutional participants with respect to risk and return tradeoff. The protocol also brings to the market new financial products like Credit Default swap and Options, which, instead of being an independent product in itself, are facilitating high capital efficiency and peg of stable coin, thus capturing an established demand and needs of the market.

Conflict of Interest

The authors declare that they have no conflict of interest.

Appendix

We are adding a financial model where we tested our model. We have built the model for ten borrowers and 10 CDS depositors coming at different times at different ETH prices. Our model has the potential to be extrapolated to thousands of borrowers and CDS depositors. We have also incorporated calculations for changes in the P/L of the CDS pool with the fluctuation of the ETH price. Additionally, we have determined the split of P/L among all CDS depositors during each new event, such as opening a new CDS position, a new borrower entering, a borrower closing their position, or any contract calls by external users. This core model of our See-Saw function is where assets move between the ETH Vault and CDS pool with changes in ETH prices.

Table 3 shows the ETH price changes over a couple of days. We observed the change in ETH price over a four-month period from 26/07/2022 to 27/11/2022 and calculated the daily and annual ETH volatility.

Table 4 applies a random number generator function for CDS deposit amounts over 100 days by tracking ETH prices over the same period. We then calculate the LTV ratios and sum them upto the values which breach the LTV ratio beyond a standard industry-wide figure of 60% LTV. We can determine the total amount required from the CDS pool and CDS depositors by using this method. Another method of LP tokens minting mechanism to calculate P/L of every CDS position is shown in table 5.

By examining the total shares/LP tokens owned by the CDS depositor, we can determine the final CDS amount for any open CDS position at any given time, as shown in Table 6. This is made possible by accounting for the change in the CDS pool's total value resulting from the fluctuation in ETH price.

Table 1. Borrowers and 10 CDS depositors at different ETH prices

Day	Total ETH	Initial ETH capital	ETH price	Initial CDS amount	P/L of CDS Pool	CDS depositors	CDS Depositor %age of ETH price
1	51		1000			1000	1
2	52		1010		510	1000	0.9900990099
3	53		1020		1030	1000	0.9803921569
4	54		1030		1560	1000	0.9708737864
5	55		1040		2100	1000	0.9615384615
6	56	50000	1030	10000	1550	1000	0.9708737864
7	57		1020		990	1000	0.9803921569
8	58		1010		420	1000	0.9900990099
9	59		1000		-160	1000	1
10	60		950		-3110	1000	1.052631579
							9.896899947

Table 2. Total/Net ETH Vault and Total/Net CDS Pool with Pool ratios

Initial CDS amount	Total CDS pool	Net value of CDS Pool	P/L of ETH Pool	ETH pool at market price	ETH Pool with P/L	Net ETH pool value	Ratio	Inverse of Ratio
	11000	11000		51000	51000	51000	0.216	4.636
	12000	12510	-510	52520	52010	52010	0.238	4.198
	13000	14030	-1030	54060	53030	53030	0.260	3.853
	14000	15560	-1560	55620	54060	54060	0.280	3.575
	15000	17100	-2100	57200	55100	55100	0.299	3.345
10000	16000	17550	-1550	57680	56130	56130	0.304	3.287
	17000	17990	-990	58140	57150	57150	0.309	3.232
	18000	18420	-420	58580	58160	58160	0.314	3.180
	19000	18840	160	59000	59160	59160	0.319	3.132
	20000	16890	3110	57000	60110	60110	0.296	3.375

Table 3. Annual Volatility

Eth Price	Date	Daily returns	Daily volatility	Annual volatility
1215.480165	11/27/22 0:00			
1216.120944	11/26/22 0:00	0.001	3.35%	32.02%
1190.840868	11/25/22 0:00	-0.021		
1199.777785	11/24/22 0:00	0.007		
1163.074472	11/23/22 0:00	-0.031		
1110.720153	11/22/22 0:00	-0.046		
1122.223882	11/21/22 0:00	0.010		
1193.216625	11/20/22 0:00	0.061		
1210.534792	11/19/22 0:00	0.014		
1214.575382	11/18/22 0:00	0.003		
1205.69334	11/17/22 0:00	-0.007		
1230.465701	11/16/22 0:00	0.020		
1259.073674	11/15/22 0:00	0.023		
1230.783049	11/14/22 0:00	-0.023		

Table 4. Calculation of CDS Amount

SI.No.	Collateral deposited	Stablecoin borrowed at 60% LTV	Collateral value after week	LTV ratio after 1 week	Breach of LTV	Difference	Total amount required from CDS pool
1	345	207	318.53	0.65	15.88	138	20818
2	236	141.6	231.56	0.61	2.67	94.4	
3	156	93.6	158.58	0.59	-1.55	62.4	
4	803	481.8	812.90	0.59	-5.94	321.2	
5	258	154.8	267.45	0.58	-5.67	103.2	
6	224	134.4	248.15	0.54	-14.49	89.6	
7	851	510.6	954.78	0.53	-62.27	340.4	
8	371	222.6	382.68	0.58	-7.01	148.4	
9	912	547.2	935.88	0.58	-14.33	364.8	
10	287	172.2	298.99	0.58	-7.19	114.8	
11	911	546.6	958.09	0.57	-28.25	364.4	
12	441	264.6	441.18	0.60	-0.11	176.4	
13	723	433.8	705.52	0.61	10.49	289.2	
14	890	534	1055.66	0.51	-99.39	356	

Bonds Tokens

In case the fees offered are less for CDS owners compared to the downside protection offered, we will be generating a new token called bond/hedge token which will be given to CDS once they unlock their deposit after 1 month. This bond/hedge token will have a maturity of 6 months. One bond/ hedge token equals to 100 stable coins at maturity after 6 months. Therefore, after six months the CDS owner can use this bond/hedge token to get the total value (100 stablecoins). Other participants can also trade this bond/hedge token before maturity.

Table 5. LP Tokens Minting Mechanism

Total CDS Deposited by users	CDS Amount Deposited at periodic intervals	Balance of CDS	Shares minted for the CDS deposit	Total shares
10000	10000	10000	10000	10000
11000	1000	11000	1000	11000
	510	11510	0	11000
12000	1000	12510	955.6907037	11955.6907
	520	13030	0	11955.6907
13000	1000	14030	917.5510901	12873.24179
	530	14560	0	12873.24179
14000	1000	15560	884.1512221	13757.39302
	540	16100	0	13757.39302
15000	1000	17100	854.4964606	14611.88948
	-550	16550	0	14611.88948
16000	1000	17550	882.893624	15494.7831
	-560	16990	0	15494.7831
17000	1000	17990	911.9942967	16406.7774
	-570	17420	0	16406.7774
18000	1000	18420	941.8356715	17348.61307
17840	-580	17840	0	17178.73205
18840	1000	18840	962.9334111	18141.66546
	-2950	15890	0	15078.10991
	1000	16890	948.9055954	16027.01551

Table 6. Total Shares Left in CDS Pool

Shares minted for the CDS deposit	Total shares	Shares burned	Total Amount during withdrawal	Final CDS Amount withdrawn
10000	10000	0		
1000	11000	0		
0	11000	0		
955.6907037	11955.6907	0	1046.363636	1046.363636
0	11955.6907	0		
917.5510901	12873.24179	0	1043.333333	1089.857568
0	12873.24179	0		
884.1512221	13757.39302	0	1040.769231	1131.028239
0	13757.39302	0		
854.4964606	14611.88948	0	1038.571429	1170.279862
0	14611.88948	0		
882.893624	15494.7831	0	963.3333333	1132.639282
0	15494.7831	0		
911.9942967	16406.7774	0	965	1096.498085
0	16406.7774	0		
941.8356715	17348.61307	0	966.4705882	1061.756345
0	17178.73205	-169.8810152		160
962.9334111	18141.66546	0	967.7777778	1038.493408
0	15078.10991	-3063.555554		2950
948.9055954	16027.01551	0	844.7368421	867.3074719

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