Vanna Finance

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Abstract

A derivative leverage and hedge DeFi protocol offer leveraged trading and hedging capabilities, empowering users to optimize strategies and manage risks effectively within the decentralized finance ecosystem. Vanna's provision of the Greeks dashboard enables effective strategy optimization and risk management for positions. It opens up new possibilities for amplifying returns and protecting investments in a dynamic and decentralized manner.

1 Introduction

DeFi, or decentralized finance, is currently at a stage where significant innovation is still required to compete with traditional financing methods. In comparison to traditional finance, the majority of volume comes from the derivatives market, which is not yet a significant contributor to the DeFi ecosystem. Additionally, the DeFi market is characterized by high volatility, making it challenging to effectively leverage investments in such an unpredictable environment. To address this issue, there is a need for a product that offers a leverage solution and a hedging dashboard to manage the position based on Greeks, enabling users to generate profits in both bullish and bearish markets. This kind of tool would provide stability and increased opportunities for profit-making within the DeFi space.

Vanna is an exciting new feature in Decentralized Derivatives Finance. It makes leveraged trading and hedging easier and more accessible. With Vanna, users can take advantage of opportunities and manage risks in the DeFi derivatives market with simplicity and efficiency. It's a game-changer that empowers traders and investors to navigate DeFi more effectively and make the most of their investments.

The derivative leverage and hedge DeFi protocol is a cutting-edge system that facilitates Trader's participation in leveraged trading and hedging strategies within the decentralized finance ecosystem. Vanna protocol empowers participants to magnify their asset exposure and potentially enhance returns through leveraged positions. Moreover, It offers robust tools and mechanisms for risk mitigation by providing comprehensive hedging capabilities. By seamlessly integrating leverage and hedging functionalities within the DeFi landscape, this protocol presents traders and investors with novel opportunities to optimize their strategies, effectively manage risk, and potentially augment the overall performance of their portfolios.

In addition to its leverage and hedging capabilities, Vanna has introduced the derivative Greeks Dashboard, a sophisticated tool designed to assist traders in effectively hedging and securing their positions within the decentralized finance ecosystem. This type of dashboard draws inspiration from similar tools utilized in traditional finance derivatives markets, where it plays a critical role in ensuring the security of positions.

2 Motivation

2.1 Problem

Many DeFi derivatives markets had low liquidity compared to traditional financial markets. This limited the size of trades and could lead to significant slippage when executing larger orders.

To execute a significant trading strategy and effectively hedge positions in the derivatives market, traders require substantial capital. When traders lack the necessary funds to open positions in line with their strategies or to adequately hedge their existing positions, they can encounter several issues, including position liquidation, reduced hedging capabilities, and missed opportunities

2.2 Objectives

- Creates a product that enhances derivatives protocol liquidity and boosts trading volumes.
- Offering traders the ability to leverage their funds while providing advanced functionality like a dashboard to calculate their position's option Greeks and manage perpetual positions, empowering them to optimize their trading strategies

2.3 Solutions

- Vanna is Yield Oasis: Earn Passive APY with One-Sided Liquidity or Unlock DeFi-native Leverage and Derivative Hedging
- On one side, lenders can lend their funds to borrowers who are also traders at a high interest rate, while also receiving rewards from traders based on the profits they generate through their strategies. This dual benefit structure allows them to potentially achieve significant returns on their investments.
- Traders deposit collateral to get leverage on the assets they've contributed. They then utilize this leveraged amount to execute derivative strategies in whitelisted protocols like Lyra, perp, and Mux, aiming to earn passive income.
- To manage their strategy, traders use a dashboard where they access their user-specific strategy information. They can then make position adjustments based on their option Greek parameters. This is a very helpful dashboard for traders to manage their position

3 Protocol Architecture

The current implementation of the Protocol is as follows:

3.1 Protocol Overview

Vanna is an undercollateralized lending and borrowing protocol that offers high leverage and derivative hedging functionalities. Vanna comprises four key participants:

- **Lender**: These individuals provide capital for lending purposes.
- **Trader**: Borrowers/traders have access to the protocol for borrowing funds, even with undercollateralized capabilities.
- **Trader Account**: Responsible for overseeing the protocol, managing borrowed funds, handling liquidation processes, and distributing interest.
- **Strategy Hedging Dashboard Tool**: This interface fetches traders' positions and provides derivative Greeks data to help them effectively manage their positions. It indicates the equity buy/sell based on the Greek's change

Vanna's robust features and ecosystem enable efficient and secure lending and borrowing operations while facilitating derivative trading and risk management strategies.

3.2 Lending Pool

Vanna Finance's DeFi lending platform stands out by offering lenders a reliable, integer-based Annual Percentage Interest (API) rate exceeding 10%. Achieved through diligent utilization rate management and trader profit-sharing, it provides a unique opportunity for substantial passive income when compared to platforms like Compound or Aave.

- **Supply**: Lenders supply assets into the lending pool and, in return, receive vTokens, which are issued based on the current exchange rate.
- **Withdraw**: Lenders redeem their vTokens to recover the principal amount, along with the accrued interest, as well as a share of the trader's profits.

3.3 Trader's Account

Vanna offers individualized smart account features customized for each trader, encompassing all their activities within this intelligent account. The management and oversight of the smart account are handled by the account manager contract.

- **Account manager**: Traders route all their activities through the smart account manager, which executes their calls. The account manager is tasked with various critical responsibilities, encompassing the creation and initialization of accounts for users (traders). It supervises the status and availability of these accounts and facilitates actions like withdrawals and transfers among users, accounts, and the lending pool. Additionally, the account manager handles profit accounting and plays a key role in the liquidation process.
- **Open Account**: Traders can create accounts linked to their specific addresses.
- **Close Account**: Traders can opt to close their smart accounts once they have cleared all outstanding debts, and the account manager assures the verification of all required checksums for the account closure.

3.4 Trader's Borrowing Fetchers

Vanna also offers a borrowing pool for traders, enabling them to access Undercolateralized loans while tailoring the collateral-to-base ratio to their risk-reward preferences. These loans can be up to 10% of the collateral, and borrowers can leverage up to 1000x to bolster their derivative strategies.

- **Deposit**: The trader initiates a deposit by calling the ”deposit” function, utilizing their initial margin as collateral.
- **Borrow**: Traders can borrow assets against their undercollateralized positions with leverage of up to 10x.
- **Repay**: When repaying all borrowed assets, the total amount to be paid includes both the initial borrowed amount and the accrued interest.
- **Withdraw**: Traders can withdraw the deposited amount in addition to the profits they've earned, all while ensuring the account manager verifies the necessary checksum.

3.5 Strategy Toolkits

The Vanna Finance Strategy Toolkit is a groundbreaking solution for tackling issues in derivative finance. It empowers traders to use various strategies to boost profits. This toolkit is carefully designed to meet all the requirements and makes managing these strategies much easier

- **Option Market**: Vanna leverages the Lyra Option Market for both opening and closing option positions. Additionally, it provides access to essential metrics like the Greeks, empowering traders to make well-informed position decisions based on these indicators.
- **Future Market**: Vanna effectively utilizes the MUX Future Market to initiate both long and short positions while maintaining their initial margin. The Future Protocol serves as a strategic tool for hedging against potential risks associated with option positions.
- **Spot Market**: To achieve a perfectly hedged position, traders using options and futures may need to buy or sell assets in the spot market. Vanna introduces a spot market to facilitate this precise hedging of positions.
- **Hedging Dashboard**: Vanna's Hedging Dashboard is an exceptionally unique and remarkable feature within the Vanna protocol. It automatically retrieves a trader's delta-neutral strategy and computes the effects of Greeks, including their inherent characteristics. This feature greatly simplifies position management for traders, sparing them from manual calculations and offering a more convenient and efficient approach.

The Vanna Strategy Toolkit represents a perfect amalgamation, addressing all the requirements traders seek. Vanna strongly believes that this distinctive feature is a game-changer for the DeFi derivative industry, poised to drive mass adoption and substantial trading volumes.

3.6 Vanna Smart Account

The Vanna Smart Account offers users the ability to engage in leveraged activities with approved DeFi protocols. By storing user funds and borrowed margin funds within a secure smart contract, the Smart Account facilitates authorised user operations without granting direct access to the funds held within the account.

This innovative solution enables users to leverage their overall funds within the Smart Account, empowering them to participate in interactions with derivative-focused DeFi protocols such as Lyra, Perp, MUX, and more. The debt incurred through leveraging is backed by the total funds available within the Smart Account, ensuring its security.

3.7 Liquidity-providing tokenization

Vanna introduces two distinct types of tokens to tokenize both sides of the position Supply tokens and Debt tokens.

For depositors who lend their assets to the lending pool, Supply tokens serve as a representation of their deposit and act as a means to claim both liquidity and interest accrued on the deposit. These Supply tokens adhere to the ERC20 standard and possess composability and transferability. Upon each deposit, new Supply tokens are minted, and they are subsequently burned when liquidity is withdrawn.

Users lending assets receive Supply tokens equivalent to their principal balance along with any accrued interest. As time progresses and interest accumulates, the exchange rate between the Supply tokens and the underlying asset increases. This mechanism draws inspiration from Compound's cTokens.

3.8 Interest Rate

- **Borrow Rate**:
  The Vanna protocol embraces flexible interest rates that can be readily adapted. These interest rate models are open to enhancements and modifications in forthcoming protocol iterations. Accrued interest is determined by the utilization of protocol reserves, reflecting the demand for these reserves. The effective interest rate represents the cost borrowers bear for their loans. Vanna utilizes a non-linear interest rate model, drawing inspiration from the sentiment protocol. You can calculate the borrowing rate for a specific market using the following formula:

  Ib(t) = · 3.5 · ((0.1 · U(t)) + (0.1 · U32(t)) + (0.3 · U64(t)) / secsPerYear. where,

  Ib(t) - Borrow Interest Rate for time t (0 Ib 1.75) U(t) -

  Utilization of funds at time t (0 U 1)

- **Lending Rate**:
  The lending rate, which signifies the return for lenders, is determined by combining the borrowing rate and the reserve factor (Rf). The reserve factor represents the difference between the borrowing rate and the lending rate. It will be used to increase protocol solvency and form the fees of the protocol that form the governance-controlled treasury. Initially, the reserve factor will be set at 5 % but this is subject to change as per governance in the future. Additionally, lenders receive a portion of the traders' profits in the lending rate, granting them extra rewards on their positions. At present, this formula is not included, but Vanna intends to incorporate it in the future. The lending rate can be calculated as follows:

  Il(t) = Rf · Ib(t) · U(t)

where, Il(t) - The lending rate at time t

Rf - Reserve factor

Ib(t) - Borrowing rate at time t U(t) -

Utilisation of funds at time t

4 Risk Engine

The well-being of a position is contingent on the borrower's capacity to repay the loan. The risk engine's goal is to uphold the general health of the protocol while minimizing the credit risk faced by depositors through the management of potentially vulnerable debt. Alongside default risk, the protocol also addresses volatility risk stemming from abrupt price fluctuations in borrowed or collateral assets that can jeopardize a position's stability. We define the risk factor R(t) for a debt position at time t in the following manner:

$R(t) = A(t0) + I(t)\ \ A(t)/\ Ld \cdot M(t)$

where,

t0 - block timestamp when the debt position was created A(t)

- Value of assets in the borrowed account at time t I(t) -

Cumulative interest accrued at time t

Ld - liquidation discount, 0 ¡ d ¡ 1 M(t) - Value of collateral pledged by the borrower at time t

In simpler terms, the risk factor signifies the portion of the collateral that needs to be sold at a reduced price to offset all the losses suffered by the borrower and finalize the position.

4.1 Liquidation

If a trader's losses exceed the result of multiplying the deposit and the liquidation point, the account manager or an external actor will step in. They will liquidate all of the trader's positions and repay the borrowed amount on behalf of the trader. The protocol guarantees that there are no losses incurred by lenders. The account manager is capable of managing the repayment amount along with the total interest, ensuring that traders never fall below this threshold.

We encourage maintainers to participate in position liquidation by creating a risk-free arbitrage opportunity. They can purchase the collateral assets at a discount compared to the market rate, facilitating the closure of the position.

In pursuit of this objective, we establish a governance-controlled value de- noted as ”L.” This value serves as the liquidation risk threshold for the protocol. Positions exhibiting a risk factor R(t) greater than L (meaning a risk factor surpassing this threshold) are considered eligible for liquidation, which can be initiated by a maintainer. The maintainer acquires a fraction equal to R(t) of the collateral to assist in closing the position. The remaining portion, equivalent to 1 - R(t), is directed to the treasury as a liquidation fee.

4.2 External protocol risk

”External protocol risk” encompasses potential uncertainties and vulnerabilities associated with external protocols or systems, such as Lyra and MUX, which could influence the functionality and performance of a given protocol. These risks include susceptibilities, modifications in the external protocols, and other factors that could introduce instability or challenges.

For instance, if traders maintain multiple positions within Lyra or MUX, Vanna calculates the total deposits and total losses. If both match the criteria (R(t) ¡ L), there is no risk on Vanna’s side. However, within Lyra or MUX, there’s a possibility that many trader positions could experience liquidation based on the criteria specific to those external protocols. Vanna ensures that ample notifications are provided to address this issue, but it remains the responsibility of the traders to manage their positions in the event of external protocol liquidation.

5 Application

1. Lenders can enjoy higher returns, thanks to Vanna’s distinctive reward distribution mechanism.
2. protocol to protocol lending, A protocol like Yarn can utilize Vanna to enhance liquidity and provide higher returns for its users.
3. Vanna is the ideal platform for such traders as it provides the necessary liquidity to execute their superior delta-neutral strategy.
4. The protocol’s trading volume experiences a significant boost, leading to a skyrocketing increase in liquidity for platforms like Lyra and MUX. This is largely attributed to the widespread adoption of Vanna.
5. The dashboard is poised to become widely adopted across the entire derivatives space, serving as a comprehensive tool for managing positions, not only for Vanna but also for other derivative positions.

6 Flow

6.1 Lender

Lenders provide assets to the Vanna protocol by depositing them into the Lend- ing Pool (LP). Let's take the example of Alice, a depositor who intends to lend tokens to the protocol. Alice deposits 2 ETH into the LP and, in return, receives
1.85 vETH tokens, which are interest-bearing and serve as proof of her deposit. In the future, when Alice decides to withdraw her liquidity, she can trade 1.85 vETH for 2.20 ETH. This reflects both her original deposit and the interest she has earned over time.

6.2 Trader's / Borrower

Traders establish a smart account that is overseen by the account manager. They initiate this process by depositing their initial collateral to access leverage. To obtain leverage, traders or borrowers utilise the borrow function, contingent on the health factor. This function enables them to secure a loan even if their collateral is undercollateralized.

- **Scenario 1:** Let's consider the case of a trader named Bob. Bob pledges 1 ETH as collateral to create a debt position valued at 5 ETH. After depositing the collateral into the trader's account, Bob receives Debt To- kens, allowing for delegated operations on the account. The protocol adds 5 ETH worth of borrowed assets from the LP to Bob's account. Now, let's explore various scenarios that may unfold during the term of Bob's loan.

  In the first scenario, Bob makes successful predictions, causing the value of the borrowed assets in Bob's account to increase from 5 ETH to 7.5 ETH. Additionally, the position accrues 0.2 ETH in interest. Bob decides to close the debt position with the protocol and initiates this by redeeming the Debt Tokens. The protocol returns 5 ETH to the LP and distributes 30 per cent of the profits generated by the traders, which in this case amounts to 0.75 ETH.

  Thus, the protocol returns 5 ETH, deducts 0.75 ETH, and transfers the remaining assets (equivalent to 3.5 ETH in profits) to Bob's account. After accounting for the 0.2 ETH in interest due on the debt, Bob receives back
  1.55 ETH from the initially pledged collateral.

- **Scenario 2:** In the second scenario, Bob's strategy did not yield favor- able results, resulting in a loss of 0.65 ETH. Additionally, Bob needs to pay 0.2 ETH in interest. As a result, Bob's health factor is approaching a critical point. Vanna automatically sends an alert to the borrower, in this case, Bob, urging them to add more collateral to stabilize the position. This is necessary because there's an increased risk of liquidation occurring due to the precarious health factor.

- **Scenario 3:** In the final scenario, Bob's situation has worsened. The value of the 5 ETH worth of borrowed assets has dropped to 4.3 ETH. Similar to before, the position has accrued an interest of 0.2 ETH, making it eligible for liquidation. A maintainer initiates the liquidation process by purchasing a portion of the 1 ETH collateral pledged by Bob but at a discount. This helps the protocol recover the loss.

  The total value of the loaned assets, including interest (5.2 ETH), is returned to the LP. The protocol claims the remaining portion of the collateral as a liquidation fee.

6.3 Strategy

Traders have the flexibility to employ various strategies using platforms like Lyra, MUX, and Uniswap. Among these strategies are different delta-neutral approaches, such as

- Covered Call,
- Covered Put,
- Short Gamma,
- Long Gamma,
- Iron Butterfly
- Iron Condor.

These strategies often necessitate ongoing monitoring due to their impact on positions based on changes in their Greek values.

From a trader's perspective, the dashboard plays a crucial role in helping them manage their positions effectively. This feature is considered essential and a must-have function, as it ensures accurate delta neutrality and empowers traders to make informed decisions based on real-time data and Greek changes.

- **Example**: Traders engage in a short gamma strategy by opening positions with three out-of-the-money (OTM) calls, each having a delta of
  0.32. On the futures side, the trader initiates a short position with a delta of 1. As a result, the total delta for this combined position is 0.96 (long) from the calls and 1 (short) from the futures, resulting in a gap of 0.04. To balance this, traders may acquire equity from Uniswap to achieve delta neutrality.

  However, the challenge lies in the fact that option Greeks, including delta, frequently change. Traders may need to buy or sell equity or open positions to maintain profitability, and this can be complex to calculate manually. This is where the Vanna dashboard proves invaluable, as it simplifies the management of positions, making it easier for traders to maintain control and adapt to changing market conditions

7 References

- Sentiment finance whitepaper
  https://docs.sentiment.xyz/assets/files/whitepaper-6d79d366383af419382831913a0470a1.pdf
- Odin trading platform for the dashboard
  https://www.chittorgarh.com/trading-platform/odin/review/13/
- Lyra for the option
  https://docs.lyra.finance/overview/how-does-lyra-work
- DappHub. DSProxy.
  https://github.com/dapphub/ds-proxy.
- William Entriken et al. EIP-721: Non-Fungible Token Standard.
  https://eips.ethereum.org/EIPS/eip-721.
- Compound Finance. cTokens.
  https://compound.finance/docs/ctokens.
- MUX for the future market
  https://docs.mux.network/protocol/overview
- Uniswap for the spot market
  https://uniswap.org/whitepaper-v3.pdf
- Account manager smart account
  https://eips.ethereum.org/EIPS/eip-4337