VMEX Finance

Protocol Litepaper
V0.2

August 2022

Introduction

The ability for an individual to take a loan out against collateral is a cornerstone of financial market efficiency. As essential as it is, acquiring a loan is often an incredibly tedious process requiring facilitation by centralized banks. However, with the emergence of decentralized finance, we have seen the success of trustless and permissionless over-collateralized lending protocols. These protocols, such as Aave and Compound, created an open lending environment accessible to anyone with an internet connection. While these protocols have been a massive success, a few flaws still remain:

1. Borrowing is generally limited to the lowest risk crypto assets, leaving a large base of popular crypto assets underserved.
2. By only letting lenders issue loans against the most conservative collateral types, with low risk loan-to-value ratios, yield opportunities are severely limited for lenders.
3. Most lending protocols do not have native insurance for depositors, and for the protocols that do provide it, it is unclear how much true coverage exists.

With the above in mind, VMEX has set out to build a next generation over-collateralized lending protocol that expands the usability and experience for all users of the protocol (both borrowers and lenders). To achieve our ambitions, VMEX introduces the following core features:

1. Isolated lending markets segmented by asset risk, also known as Tranches, allowing lenders to underwrite loans of varying risk profiles and borrowers to use both low risk and higher risk assets as collateral.
    - Borrowers can use higher risk assets as collateral, the most important being liquidity provider and vault positions.
    - Lenders can create strategies tailored to their risk profile by spreading their assets across tranches.
    - The isolated tranche structure allows for individuals and protocols to create and manage their own lending markets.
2. Opt-in native protocol insurance, allowing depositors to confidently cover their positions.

This is a large efficiency gain over current lending protocols that bundle various risks together and offer a blended return to lenders. VMEX's native protocol insurance creates a new yield opportunity for DeFi participants while giving depositors in VMEX liquidity markets confidence their positions will be covered from protocol level risks. To accomplish this, VMEX's core contracts are modified from Aave V2, allowing the protocol to build off the battle-tested and extensively audited foundation that Aave has built.

At its inception, VMEX will focus on providing tranched lending markets for a series of low risk and higher risk assets. This will include the traditional DeFi staples in addition to Liquidity Provider (LP) and vault positions such as Uniswap, Sushiswap, Curve, Convex, and Yearn.

Vmex will continue to expand into further asset classes as the protocol develops. This litepaper introduces VMEX Finance, a decentralized lending protocol offering flexible risk tranches for both borrowers and lenders.

Tranched Lending and Borrowing

At the core of VMEX's design are lending tranches. The tranche structure allows for collateral assets to be bundled together based on their risk and assigned to isolated lending markets. Note, all assets, assuming they are governance approved lendable assets, are lendable in all tranches, but can only be used as collateral in their assigned tranche and all higher risk tranches. As a result, VMEX is able to support both low risk and high risk crypto assets without the fear of higher risk collateral assets impacting the health and security of lower risk markets.

Since lending markets are segmented by the risk of the assets they contain, lenders will be able to deposit assets across tranches of varying risk. This is a large efficiency gain over current lending protocols that bundle various risks together and offer a blended return to lenders.

Lending

When lenders come to VMEX, they can deposit any governance approved lendable assets into lending pools, segmented by the risk tranche. The tranche that a lender can deposit into will not be restricted by asset type , only collateral assets will be restricted to tranches. This allows lenders to deposit their lendable asset into any of the tranches available on VMEX. Lenders then have the ability to capture higher or lower yields on their assets, depending on their risk profile. If a lender chooses to take out a loan against their deposited assets, they must enable the asset as collateral, choose the amount marked as collateral, and then select which of the asset assigned tranches to borrow out of. After this, the specified amount of the asset will be moved into the tranche as collateral.

Each tranches' liquidity pool for a given asset will have its own APY, dictated by the tranches' and assets' unique borrowing rate and utilization. Additionally, lenders can select to have one click insurance coverage on their positions, from VMEX's insurance module. The interest rate paid for a lender's insurance will be deducted from their lending APY, and will be dependent on the tranche they are lending in as well as the utilization of that tranche's insurance pool.

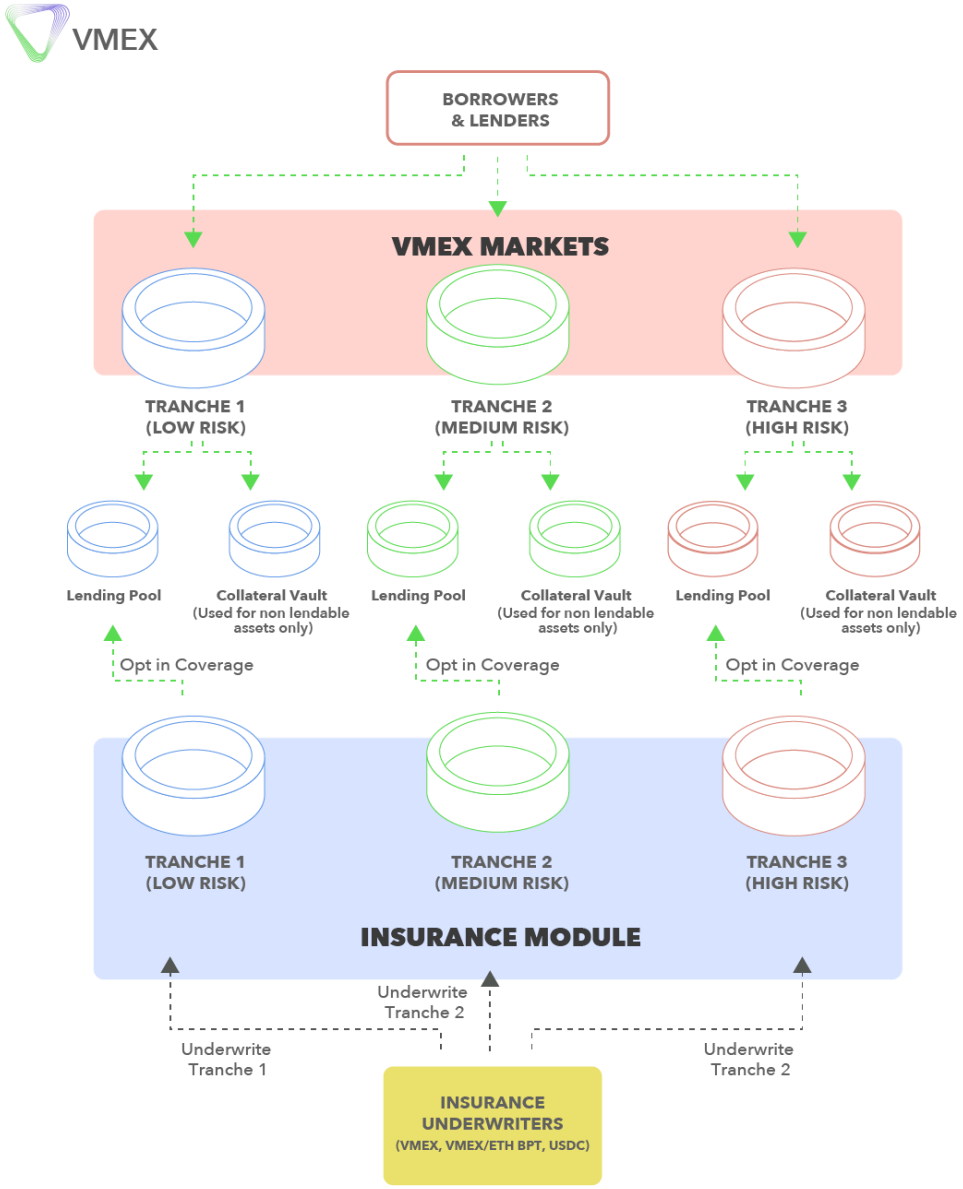
When lenders deposit into a VMEX liquidity pool, they will receive either uninsured vTokens or insured ivTokens, which are both interest-bearing ERC20 tokens. Holders of vTokens will receive continuous earnings from the interest that borrowers pay on their loans. Holders of ivTokens will receive continuous earnings from the interest that borrowers pay on their loan, minus the insurance APY paid to cover their position. Lenders can withdraw their vTokens and ivTokens at any time, as long as there is enough liquidity to withdraw. Users can deposit a

variety of assets into VMEX liquidity pools and earn borrowing fees and protocol emissions, as detailed in the Token Functionality section below.

Borrowing

The type of collateral a user deposits, its corresponding risk parameters, and the selected LTV will determine which lending tranche the users will be borrowing out of and their borrowing interest rate. Each asset will be given a risk score (see the tranche classification section below) and a corresponding tranche that the asset is associated with when being used as collateral. Certain asset types, such as LP and Vault positions, can only be used as collateral assets. Users will be able to use a given asset as collateral in the tranche that the asset is assigned to and all higher risk tranches. The purpose of allowing assets to be used as collateral in all higher risk tranches is to allow borrowers to use lower risk assets, such as stable assets, to support their higher risk loans. However, VMEX governance will have the ability to isolate collateral assets to individual tranches.

Similar to lenders, when users borrow against their collateral they are issued non-transferable interest-bearing debt tokens. These tokens are minted when a user initiates a borrow and burned when the borrow is repaid.



Tranches Classification

Properly classifying collateral types into tranches is essential to the success and security of the protocol. As such, VMEX's risk management committee and governance participants will assess the risk of each collateral type and assign them risk ratings. Risk ratings, in addition to a users selected loan-to-value, will determine which tranche a collateral type is associated with.

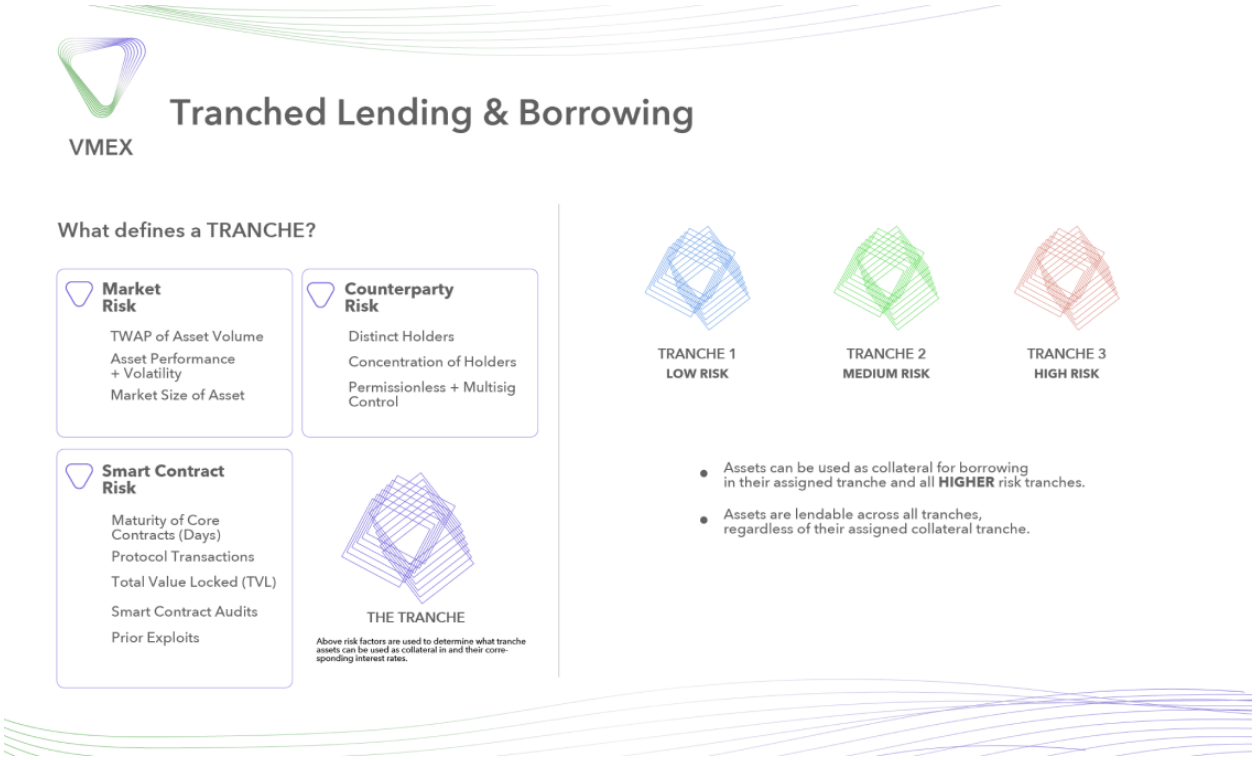
When determining the risk rating for a given collateral type, an assets Market Risk, Smart Contract Risk, and Counterparty Risk will be considered. These risk categories are inline with

the industry standards set by Aave and Compound. The three main risk categories contain the following evaluation criteria:

1. Market Risk
    a. Asset liquidity risk: Average daily volume
    b. Asset volatility risk: Asset normalized volatility
    c. Market size of asset

2. Smart Contract Risk
    a. Maturity of core contracts (days)
    b. Protocol transactions

3. Counterparty Risk
    a. Distinct holders
    b. Permissionless + multisig control



Active Risk Management

The risk of any given asset, whether it is a smaller market capitalization asset or a blue chip asset, is ever changing. As such, an assets risk score should not be calculated and set, but rather be actively monitored and recalculated.

VMEX will actively monitor the risk of all listed assets and the tranches they are associated with in real time, via a risk management dashboard. The risk management dashboard will be publicly visible on the VMEX website, allowing users of the protocol to view the risk make up of the available tranches. If a certain governance set risk criteria is met for any given asset, assets can be moved between tranches.

Loan Interest Rates

A given borrower's interest rate, for a specific asset, will vary based on the tranche they are borrowing out of (higher risk tranches will have more “aggressive” interest rates) and the utilization of the lending asset in the tranche, since each tranche’s pool of borrowable assets is isolated. To protect against liquidity risk, optimal utilization will be lower for a given asset in the assets collateral tranche, assuming the asset can be used as collateral. In tranches where the asset is not used as collateral, optimal utilization can be increased due to the decreased liquidity risk in that tranche. Borrowers will be able to select either variable rate loans or stable rate loans.

The interest rate R_t follows the model developed by Aave:

$$if\ U\ <\ U_{optimal}: R_t\ =\ R_0\ +\ \frac{U_t}{U_{optimal}} R_{slope1}$$

$$if\ U\ \geq\ U_{optimal}: R_t\ =\ R_0\ + R_{slope\ 1} + \frac{U_t - U_{optimal}}{1 - U_{optimal}} R_{slope2}$$

Permissioned Tranches

Permissionless lending pools opened up a new wave of decentralized lending. Allowing anyone to permissionlessly deploy an isolated lending market with support for any assets, and manage their own money market parameters unlocked more open borrowing and lending opportunities. However, despite the positive opportunities ushered in by permissionless lending markets, it became evident that their fully permissionless nature allowed for excessive mismanagement of pool risk and asset risk by pool operators. This leads, in some cases, to loss of user funds.

Through the use of permissioned tranches, VMEX aims to create open borrowing and lending markets for DeFi participants and protocols while providing the necessary tools and structure needed to manage lending market risk. To start, VMEX will allow whitelisted protocols or individuals to create and manage their own tranche, composed of lending and collateral assets of their choice, which enables tranche managers to capture a share of tranche revenue.

To ensure market safety, all assets in a permissioned tranche must be governance approved assets. If they are not, they must be submitted for governance approval via a request form. The rationale for requiring assets to be governance approved is simply because some assets are not safe to be used as collateral assets, such as rebasing tokens. Additionally, using VMEX’s

standardized asset risk formula, the protocol will assign a risk rating to each tranche and the individual assets that the lending market contains. The risk rating of a given tranche and its corresponding assets will be actively monitored in real time and publicly displayed, allowing users of VMEX to be properly informed on the market's risks.

Governance approval will be necessary for a tranche to be covered by the Insurance Module. Once the tranche is approved, a new insurance tranche will open in the Insurance Module for users to deposit in. The Insurance Module structure will allow for tranche managers to provide their own incentives to encourage users to stake in their insurance tranche. If a permissioned tranche is not yet approved for coverage by VMEX's Insurance Module, tranche managers will be allowed to provide their own insurance for the lending market via a single access Insurance Module tranche.

Liquidity Providers & VMEX Strategies as Collateral

As Liquidity Provider positions continue to be a staple of yield in DeFi, and with the trend of DAO's owning their own native token liquidity, there is growing demand to leverage LP positions as collateral on decentralized lending protocols. However, most current lending protocols only accept a very small base of LP positions as collateral. Protocols that have a larger selection often only allow users to borrow the same tokens that make up the LP pair they posted as collateral.

Liquidity Provider (LP) positions are ideal collateral assets for borrowers, due to their yield generating nature. VMEX will enable both LP positions and LP positions deployed in custom yield generating strategies to be used as collateral. VMEX strategies will deposit supported LP positions into yield boosting protocols, such as Convex Finance, to earn higher returns for depositors. Rewards earned from the depositors position will be automatically deposited into other yield generating VMEX markets, which will grow the depositors collateral base and continue to earn them rewards.

For example, a user can deposit a tricrypto2 Curve pool token as collateral into VMEX. A VMEX strategy will deploy the tricrypto2 pool token into Convex, allowing the user to start earning both CRV and CVX rewards. The CRV and CVX rewards will automatically flow into VMEX collateral positions, increasing their overall base of collateral. In this example, the CRV and CVX markets will also have associated strategies, allowing users to continue to earn yield on their automatically harvested yield.

Insurance Module

The Insurance Module is the mechanism that secures user positions in the event of a Shortfall Event (deficit). To accomplish this, VMEX incentivizes users to deposit VMEX, VMEX/ETH BPT, and USDC into the Insurance Module. If a Shortfall Event occurs, a portion, in equal parts,

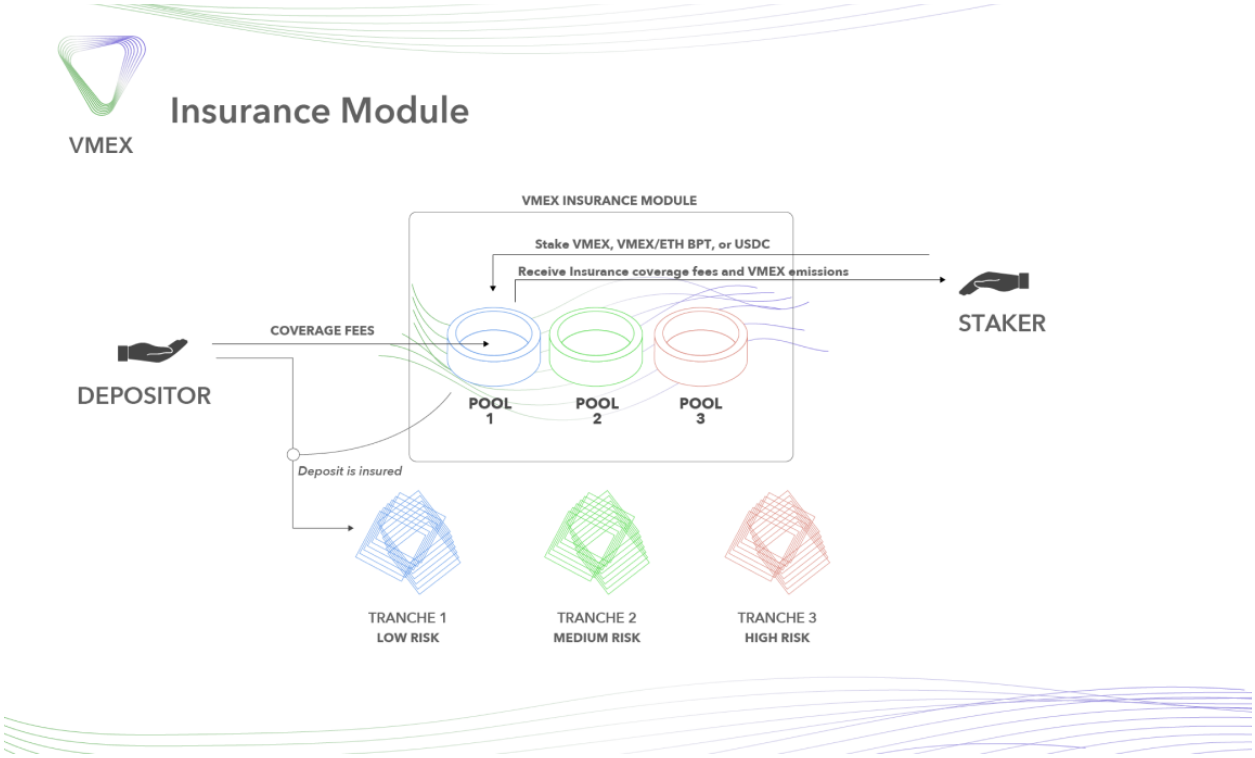
of the VMEX, VMEX/ETH BPT, and USDC will be auctioned off for the assets needed to eliminate the deficit. In return for depositing into the Insurance Module, users will receive protocol emissions, insurance coverage fees, and fees and rewards from the Balancer Pool position.

Taking inspiration from Aave's Safety Module, VMEX's Insurance Module is the mechanism that secures user positions as well as the protocol in the event of a shortfall event. When designing the Insurance Module, we noted the following issues with Aave's Safety Module:

1. Excluding protocol tokens, the users who are securing the protocol receive minimal rewards for underwriting insurance on lenders positions.
2. Having a single insurance pool that bundles together a spectrum of risks and pays out a single blended fee is very inefficient.
3. By having the safety module coverage integrated with all lending markets, it is unclear to what extent lenders would be covered in the event of a major shortfall event.
4. Using the native protocol token as the core asset in the Safety Module, and while having the majority of liabilities denominated in different crypto assets, will likely result in high correlation between the price of Aave and shortfall events. This results in further uncertainty of true coverage.

To solve these issues, VMEX introduces an improvement to the Safety Module design, called the Insurance Module, that requires depositors to opt into coverage, in exchange for a fee paid out to users staking in the Insurance Module. Staking in the Insurance Module will be segregated into separate insurance pools that correspond to the tranches users deposit into. Each asset in each insurance pool will have a unique interest rate associated with it, determined by the risk of the assets that fall into the corresponding lending tranche, the specific asset being lent, and the utilization of the insurance pool for that tranche. The interest rate earned by depositors in an Insurance Module tranche will be a blended rate of all loans being underwritten in a tranche.

By having a tranche segregated Insurance Module that requires depositors to opt in for a fee and stakers to deposit to specific risk tranches, the Insurance Moule will have improved capital efficiency. Opt-in insurance coverage will also allow the protocol to determine exactly how much coverage it is able to underwrite, giving depositors confidence that their positions will be covered in the event of a major shortfall event. Additionally, governance can control the degree of leverage (covers that exceed dollar value of assets staked) the Insurance Module allows to optimize risk/reward. Leverage would function by multiplying a users stake amount by the allowed leverage amount, allowing them to stake more assets than they have across the tranches. For example, with 100 VMEX and a 2x leverage limit, users would effectively be staking 200 VMEX across the tranches of their choice.



Shortfall Events

The main goal of VMEX's Insurance Module is to protect the protocol and depositors from shortfall events that may result from liquidations, smart contract risk, or oracle failure. In the event a shortfall event occurs, VMEX, VMEX/ETH BPT, and USDC will be auctioned off proportionally, from the tranche the default is associated with, to cover the deficit. The auction process functions by sending the assets to the Auction Module, which will auction off the assets in a Dutch Auction style process. The amount of assets sold at any given time will be determined by the total size of the deficit, to prevent large price impacts. Additionally, VMEX's Backstop Module will accumulate a portion of fees earned by stakers in the Insurance Module with the goal of further supporting the Insurance Module during shortfall events. If a shortfall event occurs, the backstop module will use its funds to purchase VMEX tokens being liquidated at the current market price to prevent large impacts to the VMEX price.

VMEX Market Depositors

Depositors in VMEX markets will have access to one-click insurance coverage through VMEX Insurance Module. When a user deposits assets in a given lending tranche, they will be quoted two separate APRs: an insured APR and an uninsured APR. Insured positions will receive ivTokens and continuous earnings from the interest borrowers pay on their loan, less the insurance APY paid to cover their position. If a depositor's APR goes negative (borrow APR

earned is less than insurance APR paid), they can remove their positions cover by paying down what they owe for the coverage up to that point, it can also be removed directly from their position.

Stakers

Since the Insurance Module will be segregated into separate tranches, stakers will be able to choose the amount of risk they want to underwrite and in turn the amount of yield they earn. To participate, users can stake VMEX, VMEX/ETH BPT, and USDC into the tranche they wish to underwrite and receive the staked version of their deposit, which will earn VMEX emissions and the tranche specific fees from lenders that opt into coverage. In the event of a Shortfall Event, all assets staked in the tranche that corresponds with the shortfall event will be frozen until the insurance payout is resolved. Further, all stakers will undergo a 10 day cooldown period when unstaking from the Insurance Module (the duration of the cooldown period can be adjusted by governance).

Insurance Interest Rates

To ensure that the insurance module is diversifying its insurance obligations, the interest rate lenders pay for coverage on a given asset will be determined by the amount of insurance underwritten for a given asset and the utilization of all assets staked in the assets corresponding insurance tranche. As such, the price of insurance for a given asset will get more expensive the more of an asset is insured or the more of the available insurance for a tranche is utilized. Optimal insurance utilization will be important to balance with the leverage limit allowed for lenders, to ensure the Insurance Module remains solvent. Stakers in the insurance module will receive a blended interest rate from all assets in the tranche(s) they are staking in. Depositors seeking coverage will be able to select either variable rate loans or stable rate loans.

The interest rate R_t is an adaptation of the model developed by Aave:

$$if\ U_{asset\ ins.} < U_{asset\ optimal\ ins} : R_t = R_0 + \frac{U_{t\ asset\ ins.}}{U_{asset\ optimal\ ins}} R_{slope1}$$

$$if\ U_{asset\ ins.} \geq U_{asset\ optimal\ ins.} : R_t = R_0 + R_{slope\ 1} + \frac{U_{t\ asset\ ins.} - U_{asset\ optimal\ ins..}}{1-U_{asset\ optimal\ ins.}} R_{slope2}$$

$$If\ U_{tranche\ ins.} \geq U_{tranche\ optimal\ ins.} : R_t = R_t + \left(\frac{U_{t\ tranche\ ins.} - U_{tranche\ optimal\ ins.}}{1-U_{tranche\ \ optimal\ ins.}}\right) R_{tranche\ slope}$$

Liquidations

On VMEX, a liquidation occurs when a borrower's health factor drops below 1 due to the value of their collateral no longer covering the required loan-to-debt value. The two ways a liquidation

might occur are 1) the value of collateral decreases relative to the borrowed asset or 2) the borrowed asset increases in value relative to the borrower's collateral.

VMEX, using the same process as Aave and Compound, incentivizes liquidations by auctioning off a borrower's collateral to liquidators at a discount to the current market value. When a liquidation occurs, up to 50% of a borrower's debt can be repaid in exchange for the liquidated collateral plus a liquidation bonus, set by governance for the specific asset being liquidated. Unlike other lending protocols, VMEX takes a 10% fee on all liquidations that occur – the fee received is split between staked token holders and VMEX DAO.

Token Functionality

VMEX is the governance and utility token of VMEX, used to both secure and vote on the future direction of the protocol. Users of VMEX protocol can earn VMEX in three ways:

1. Borrowing assets on VMEX
2. Lending assets on VMEX
3. Staking VMEX, VMEX/ETH BPT, or USDC in the Insurance Module

Borrowers, lenders, and stakers receive VMEX emissions as a way to incentives and bootstrap both the use and security of the protocol.

Distribution

VMEX distribution will initially follow a fixed per epoch (1 day) emissions schedule, with the exact distribution for a given period being a governance voted and approved schedule. Having the emissions schedule flexible via governance allows VMEX emissions to be tailored to the current needs of the protocol – avoiding unneeded token inflation. VMEX will have a max supply of 20,000,000 tokens. In each epoch, incentives will be evenly split between borrowers, lenders, and those who stake in the Insurance Module, as staked VMEX. The amount of tokens received by both borrowers and lenders will be proportional to the time weighted amount of debt or credit they held of an asset within a given epoch. Additionally, the portion of emissions allocated to a specific borrow or lend asset will be determined by gauge weights every 7 epochs, voted on by holders of staked VMEX. Ultimately, all token emissions schedules and portions can be adjusted by governance to meet the demands of the protocol, including, minting up to an additional 2.5% of token supply every year after 97.5% of emissions are used.

Reward Mechanics

Borrowers and lenders on VMEX will receive staked VMEX, streamed out over an epoch, proportional to the time weighted amount of debt or credit they held of an asset within a given epoch. Since emissions are received as staked VMEX, users will have to undergo a 10 day cooldown period to unstake their rewards.

Emissions distributed to users staking VMEX in the Insurance Module will follow a different distribution process, where users earn more emissions the longer they stake in the Module. Users staking VMEX in the Insurance Module will start by earning 40% of their maximum possible earnings in a given epoch and after 1 year of staking will earn 100% of their possible earnings in an epoch, scaling linearly. If a user stakes more VMEX in the Insurance Module, the additional staked amount will undergo the same reward ramp up period.

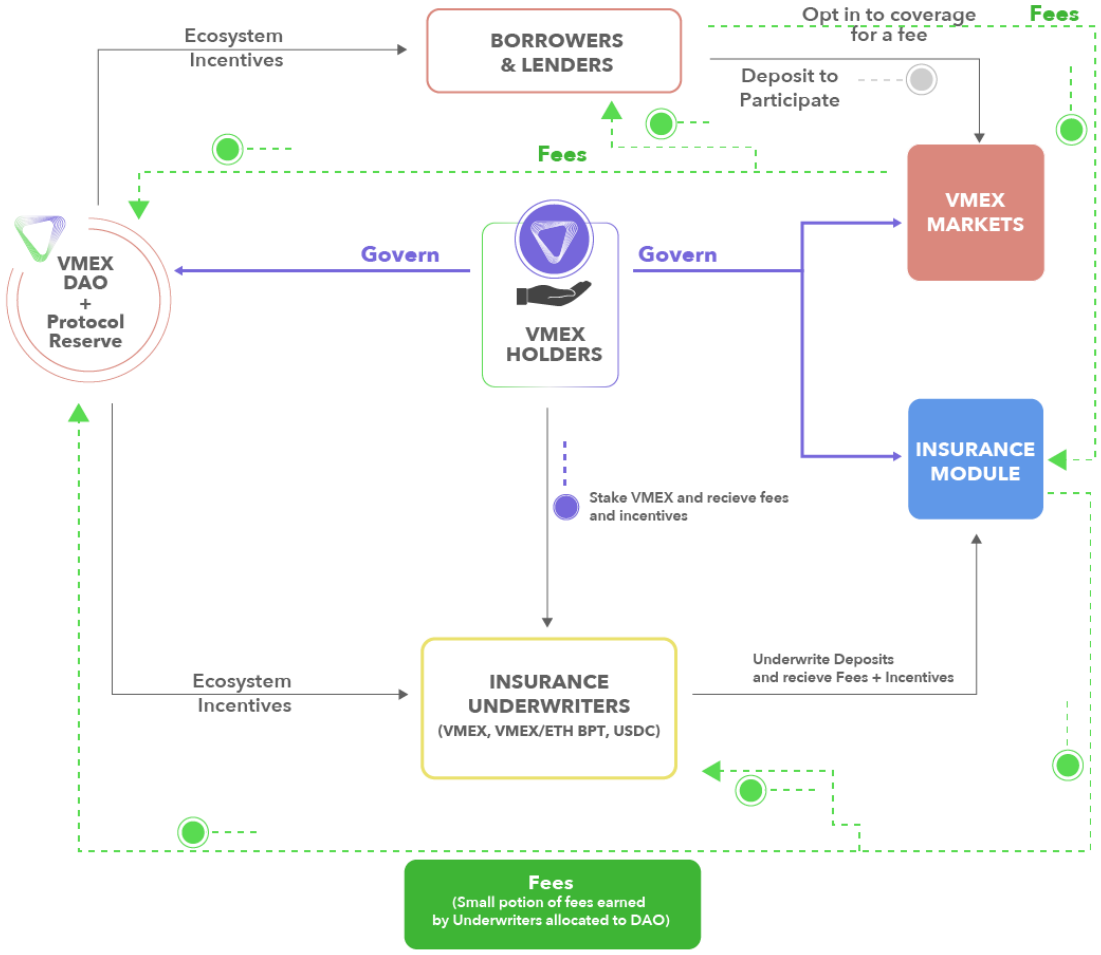
This is achieved by issuing Multiplier Points to users staking VMEX in the Insurance Module. Multiplier Points are earned at a rate of a 60% APR, and the amount a user can earn is capped at the amount of VMEX tokens they have staked. All users will start with 40% of the maximum amount of multiplier points they can have based on their staked amount.

Therefore, a users rewards will be calculated as:

$$Rewards = Staked\,VEMX\,\frac{Multiplier\ Points}{Staked\,VMEX}$$

For example, with a 100 protocol tokens staked a user will earn 100 Multiplier Points in 1 year, after which they will no longer receive Multiplier Points until they increase their stake amount. When users unstake VMEX tokens from the Insurance Module, their Multiplier Points are burned proportional to the amount they unstaked. The use of Multiplier Points achieves the same intended outcome of “ve” locking mechanisms – aligning incentives with long term holders – without the inconvenience of locking up assets, which many are hesitant to do given the volatile nature of Crypto assets.

VMEX



Fees

VMEX Markets

Lenders will receive the majority of fees paid out by borrowers, with the remainder going to VMEX Treasury to support the ongoing development of the protocol. The percent of fees allocated to the Treasury will vary based on the asset, ranging from 5-20%.

VMEX Strategies

VMEX will take a performance fee on yield earned by depositors in strategies.

Insurance Module Staking

Users who stake in the Insurance Module will receive 90% of the fees earned by the Insurance Module coverage. The remainder of the fees will be split between VMEX Treasury and the Backstop Module in the Insurance Module, which will support the purchase of liquidated VMEX tokens in shortfall events.

Governance

VMEX aims to progress to a fully decentralized protocol, governed by its token holders. Holders of staked VMEX will be able to propose and vote on changes to VMEX's risk parameters, assets supported in VMEX markets, protocol improvements, protocol incentives, and changes to the overall governance structure.

A users governance weight will be calculated as their staked VMEX multiplied by their Multiplier Points. The goal of weighting governance power by Multiplier Points is to provide more governance control to those with longer term commitment to the protocol, and to reduce the possibility for malicious votes.