FRINGE

Whitepaper, V1.4

March 2023

Abstract

The Decentralized Finance ecosystem has established a growing variety of financial facilities for the crypto space, including trading, lending, saving, insurance, options, futures and derivatives. There are established projects within this ecosystem that offer single-point solutions within this variety of services, as well as compound solutions that offer a combination of them. The predominant platforms in this ecosystem offer broad support of these financial services for the well-known, large capitalization cryptocurrencies. However, this support rapidly diminishes for smaller, less-known altcoins. There is a material magnitude of capital locked in these altcoins and yet their holders have limited opportunities to deploy their capital in the DeFi ecosystem.

In addition, there are a number of distinct disparate blockchains upon which these offerings are available. A challenge for investors and asset holders is that by and large these different blockchains represent separate environments where services are not currently freely interoperable across chains. Some cross-chain interoperability exists, but such facilities are still reaching a state of maturity, with significant opportunity for improvement to provide seamless interoperability. Currently, assets are less mobile across the disparate environments, which increases costs for users to operate across them and limits capital efficiency.

The market to offer a broad set of financial services across multiple blockchains for holders of smaller, less-known altcoins is relatively untapped. Fringe Finance offers owners of these altcoins a compound solution of borrowing, lending, leveraged trading, stablecoin and staking facilities. In addition, Fringe will offer insurance capabilities and a flexible choice of variable and fixed-interest solutions. Fringe Finance also aims to provide cross-chain interoperability for certain services. Our platform also offers composability: third-party projects can employ Fringe Finance's financial primitive offerings into their own composite product offerings. We believe this results in a platform with a unique value proposition and long-term viability that will act as a core platform component of future innovations in the rapidly expanding Decentralized Finance ecosystem.

Contents

0   About this whitepaper and the Fringe Finance ecosystem

This whitepaper examines the design of Fringe Finance and its joint ecosystem. As such, it covers the various components of the Fringe ecosystem:

1. **Lending**, released on June 24th, 2022 (previously Primary Lending Platform).
2. **USB Stablecoin**, currently underway.
3. **Staking**, finalized in Q4 2022.
4. **Amplify**, a single-asset leveraged trading facility to be delivered in Q3 2023.
5. **Margin Trade**, an asset-pair leveraged trading facility to be delivered in Q3 2023.

This whitepaper does not aim to constitute a comprehensive overview of the above, but rather a high-level starting point for anyone who wishes to become familiar with Fringe's vision and workings. As some components of Fringe Finance are currently underway, any description of them in present tense constitutes only a figure of speech to avoid redundancies in the text.
For a more elaborate documentation of the smart contracts and inner workings of Fringe Finance, refer to our official documentation.

1 Introduction

Fringe Finance is dedicated to unlocking the capital in speculative cryptocurrency assets by providing loans and leveraged trading facilities collateralized by these assets. Holders of these more speculative assets who have conviction to the upside price opportunity of their tokens can now put them to productive work instead of just waiting idly for their price to appreciate.

The cryptocurrency market comprises a large number of cryptocurrencies. Some are well-known with large market capitalizations, high liquidity and with broad support by many DeFi platforms for trading, lending, borrowing and other services. There are other smaller *altcoin* cryptocurrencies that have smaller market capitalizations, lower liquidity and are not well-supported by a broad variety of DeFi platforms.

These smaller altcoins are often new or apply to a niche use case and therefore can be more speculative than more popular, large cap cryptocurrencies. The capital locked in these smaller altcoin assets often could not easily be deployed into the DeFi ecosystem because of the lack of broad support by DeFi platforms.

Fringe Finance solves this problem by accepting not just the larger, more popular cyptocurrencies, but also a large variety of smaller altcoin assets as collateral for loans and leveraged trading purposes. Even though these smaller altcoins are often more volatile than the larger, more popular coins, Fringe Finance uses a variety of borrowing parameters and related mechanisms to maintain the stability and financial protection of the platform. These parameters include a platform-wide maximum borrowing capacity for each collateral asset and automated computation of each collateral asset's loan-to-value ratio (LVR). To effectively implement these mechanisms, the asset's historic volatility, available liquidity, and other non-subjective metrics are taken into account. See Section 8.3 - Collateral Asset Parameter Modelling for more details on how these parameters are modeled.

Fringe Finance's vision also includes cross-chain collateralization, fixed-interest loans, lending against NFTs, lending against LP (Liquidity Provider) tokens, a decentralized backend, a decentralized UI, and embedded DeFi insurance which provide a platform rich in features to service the growing crypto economy. The Fringe Finance platform will sustainably adapt through transitioning governance to the Fringe Finance DAO so that its community of stakeholders can best guide its future direction to best suit the community.

The Fringe Finance Platform offers the following compelling benefits for its various participants:

Participant	Value Proposition
Lender	Lenders can be institutional lenders, high net-worth individuals or any crypto-asset holders who wish to receive more attractive interest rates as compared to what they often receive in the traditional banking system. They do this by lending out their crypto asset holdings on the Fringe Lending platform.
Borrower	Borrowers who have conviction of the upside price opportunity of their assets can now put them to productive work instead of just waiting idly for their price to appreciate by taking out loans on the Fringe Lending platform. They can also mint USB stablecoins on the Fringe USB Stablecoin platform and deploy them as they see fit elsewhere in the crypto economy.

Participant	Value Proposition
DAOs and Project Treasuries	A DAO or project treasury enjoys the same benefits as borrowers and lenders. A project can deploy their treasury onto Fringe so that they can take out loans for project expenditure or invest in new initiatives without needing to sell their project tokens. This has the additional benefit of removing from market supply the tokens they use as loan collateral, resulting in a positive impact for the price of their project token. A project can also lend out their treasury on the Fringe Lending platform. Fringe has integrated support for multisig wallets so that projects can maintain their trust minimization through the use of multisig access.
USB Saver	Any participant in the crypto economy who holds the USB stablecoin can deposit their USB in the USB Stablecoin Saving facility to receive interest payments.
Staker	The Fringe Staking platform aims to offer rewards for staking of various assets to incentivize token holding and staking to benefit the Fringe ecosystem and community. Staking assets will include FRIN tokens, relevant Liquidity Provider tokens, fTokens (Fringe Finance's interest-bearing tokens received by lenders) and others. Staking rewards will be offered variously in relation to both long-term and short-term staking incentivization schemes. FRIN token holders can opt to stake their FRIN tokens to receive rewards derived from fees charged on the Fringe Finance Platform. FRIN Stakers will also be able to participate in directing the evolution of the platform via voting for DAO proposals.
Liquidator	Liquidators help keep the platform stable by liquidating positions that fall below minimum collateralization levels – and receive the liquidated collateral assets at a discount – which they can sell on the open market to realize a profit.
Traders	Fringe Finance offers traders the ability to take leveraged positions to maximize potential gains. Fringe Amplify allows a trader to gain leveraged exposure to an asset. Fringe Margin Trade allows a trader to gain leveraged exposure to an asset pair.

Table 1: Benefits for participants in the Fringe Finance Platform.

2 Fringe Finance Overview

Fringe Finance's market differentiator is to provide holders of a wide range of assets, including low liquidity coins, with a means to act as borrowers by accessing collateralized loans and to mint the Fringe Finance stablecoin (USB) to use as they see fit within the broader DeFi economy. Fringe also offers traders the ability to take leveraged trading positions via leveraged trading facilities.

Lenders can also enjoy attractive interest rates by offering to lend out their capital on the platform.

Fringe Finance also incentivizes Liquidators to help stabilize the platform, USB savers to earn attractive interest rates, and FRIN holders to stake their tokens to earn rewards from fees charged on the Fringe Finance platform.

Finally, the Fringe Finance platform provides both ongoing and temporary staking reward opportunities to encourage various actors to interact with the platform to promote awareness and adoption.

In all, Fringe Finance offers a unique opportunity for both high-liquidity and low-liquidity coin holders and for all other participants who interact with the platform. Fringe Finance offers an immediate-term, sustained model of reciprocal economic incentives for all participants to establish and support this vision.

And with Fringe Finance's future transition to governance by the community via the Fringe Finance DAO, Fringe can evolve and extend over time to add more value to the DeFi ecosystem which will lead to more value for $FRIN holders.

2.1 Fringe Finance DeFi components
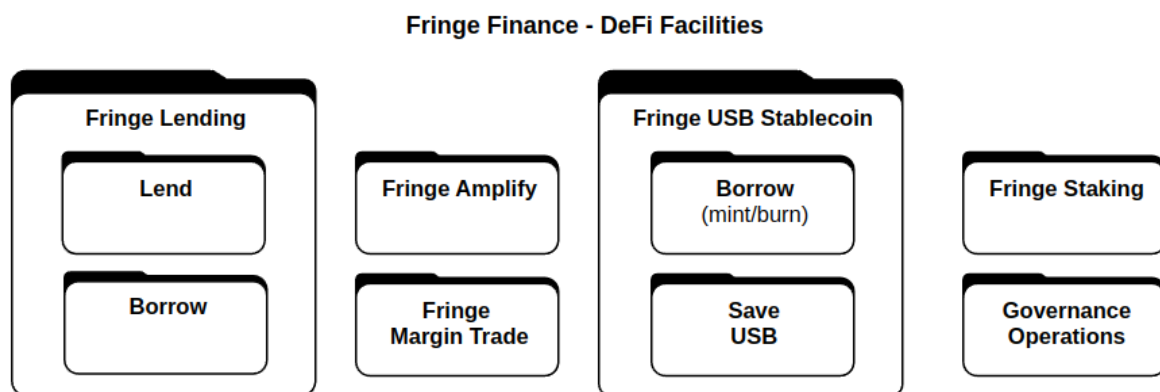
Fringe Finance is comprised of the following components:

Figure 1: Components comprising the Fringe Finance Platform.

Description of Fringe Finance components

Package	Description
Fringe Lending	Fringe Lending is a lending facility that accepts a wide range of collateral asset types and multiple capital (borrowing) assets. It: Rewards **lenders** for depositing (whitelisted) capital assets made available to be lent to borrowers and traders. Allows **borrowers** to take out over-collateralized loans against whitelisted collateral assets. Allows **liquidators** to liquidate part of a borrower's loan that falls below minimum collateralization levels. The **System** administers the following: ● Interest payments to lenders. ● Interest charges on borrowers' loans. ● Fee collections and diversion to the Fringe treasury.
Fringe USB Stablecoin	The USB Stablecoin facility provides the following: ● Allows **borrowers** (i.e. minters) to mint USB stablecoins against a wide range of whitelisted collateral asset types. ● Allows USB savers to deposit their USB stablecoins to earn interest. ● Contains a facility to allow **liquidators** to liquidate borrower positions that fall below minimum collateralization levels. The **System** administers the following: ● Levies stability fees on borrower open loan positions. ● Pays interest to USB stablecoin savers. ● Collects fees and diverts them to the Fringe treasury.
Fringe Amplify	Fringe Amplify is a leveraged trading facility to allow traders to gain leveraged long exposure to an asset in relation to its USD price.
Fringe Margin Trade	Fringe Margin Trade is a leveraged trading facility to allow traders to gain leveraged exposure to an asset pair.
Fringe Staking	Allows FRIN token holders and other asset holders to stake assets to earn staking rewards. Fringe Staking supports multiple staking programs to incentivize users to participate in various ways within the Fringe ecosystem. The system pays rewards to staked positions. Staking rewards are paid from the Rewards Pool for each staking program.
Governance	Allows a **Project** to apply for listing on the USB Stablecoin platform. i.e. where USB Collateral Safes accept the project's ERC-20 token as collateral against which borrowers can mint USB.

Package	Description
	The **Admin** actor assesses the application then either accepts or rejects it. Accepting an application will result in the project's token being listed on the Fringe Lending Platform and/or the USB Stablecoin Platform.

Table 2: Description Fringe Finance components.

2.2 Overview of Fringe Finance's DeFi components

2.2.1 Fringe Lending

Fringe Lending offers lending and borrowing facilities.

Fringe Lending allows **lenders** to deploy their capital to earn interest and allows **borrowers** to take collateralized loans from the pool of assets deposited by lenders.

Lenders deposit whitelisted assets to the **Primary Capital Pools**. This mints a proportional amount of Fringe's interest-bearing fTokens, which are assigned to the lenders in return for their deposit.

Borrowers deposit collateral into a **Primary Collateral Safe** of their own, which is then reflected as their borrowing capacity arising from the deposited assets. The borrowing capacity is derived by multiplying the value of the deposited assets by their loan-to-value ratio, or LVR. Different collateral assets can have different LVRs.

Collateral types accepted into Primary Collateral Safes are assigned a Loan-to-Value Ratio (LVR) through our approach to parameter asset modeling. Borrowers may take out loans of the capital from the **Primary Capital Pool** based on the borrowing capacity afforded them by their deposited collateral i.e. loans are collateralized. Loan positions may be adjusted by the borrower by either borrowing more capital assets, repaying any part of the loan and depositing or withdrawing collateral, so long as the minimum collateralization level is maintained as dictated by their collateral LVR.

Interest rates apply within Fringe Lending as follows:

- Borrowers are charged interest on their loans.
- Lenders are paid interest collected from borrowers according to their proportion of the **Primary Capital Pool** and its capital utilization rate.

Liquidations work as follows in Fringe Lending:

A borrower's loan must always be sufficiently capitalized above a Liquidation Threshold. The Liquidation Threshold is dictated by the collateral asset's LVR. Loans that fall below the Liquidation Threshold are subject to liquidation by liquidators who repay part of the loan and in return receive a greater portion of the position's collateral. Fringe Lending liquidations are more fully described later in this document.

2.2.2 Fringe USB Stablecoin

The USB Stablecoin allows borrowers to deposit collateral and to mint Fringe's USB stablecoin (USB) against their deposited collateral. USB is a USD-pegged stablecoin backed by crypto assets. USB stablecoins are burned when the borrower repays any part of their loans.

The USB Stablecoin facility allows borrowers to deposit crypto collateral into a **USB Collateral Safe** of their own which is then reflected as their borrowing capacity arising from their deposited assets. Collateral assets accepted by USB Collateral Safes are a set of whitelisted assets. Borrowers may mint USB stablecoins based on the borrowing capacity afforded them by their deposited collateral i.e. USB stablecoins are collateralized. Upon repayment of $USB, the $USB is burned and the borrower's borrowing capacity is increased according to the amount repaid.

Borrowers are charged a Stability Fee as part of the mechanism to keep the USB stablecoin stable. This Stability Fee is the cost to mint and hold $USB – and therefore effectively acts as an interest rate on borrowing. Stability fees are pooled and paid out to USB stablecoin savers who deposit their USB to receive interest. This dynamic between borrowers' stability fees and USB savers' interest is part of the economic mechanism that elegantly stabilizes the price of the USB stablecoin to parity with 1 USD.

Liquidations work as follows in the USB Stablecoin Platform:

A borrower's position must always be sufficiently capitalized above a Liquidation Threshold. Positions that fall below the Liquidation Threshold may be subject to liquidation by liquidators who repay the minted USB and in return receive a greater portion of the position's collateral. USB Stablecoin liquidations are more fully described later in this document.

2.2.3 Fringe Amplify

Fringe Amplify is a leveraged trading facility to allow traders to gain leveraged long exposure to an asset in relation to its USD price.

A trader selects an asset then specifies a margin amount and a multiplier. Fringe Amplify then creates a leveraged trading position of the selected asset to the value of the margin amount times the multiplier.

While the position is open, interest is charged on the margin amount times the multiplier.

If the trading position falls into a liquidatable state, liquidators will partially liquidate the position to bring it back into a healthy state. The trader's position will still be maintained, though now partially liquidated.

2.2.4 Fringe Margin Trade

Fringe Margin Trade is a leveraged trading facility to allow traders to gain leveraged exposure to an asset pair.

A trader selects a pair of assets, one to 'go long' and the other to 'go short'. The trader also specifies their desired exposure to the asset pair. Fringe Margin Trade will specify the margin the trader needs to deposit for the trading position.

While the position is open, interest is charged on the exposure amount.

If the trading position falls into a liquidatable state, liquidators will partially liquidate the position to bring it back into a healthy state. The trader's position will still be maintained, though now partially liquidated.

2.2.5   Fringe Staking

Fringe Staking offers rewards for staking of various assets to incentivize token holding and staking to benefit the Fringe ecosystem and community. Staking assets will include FRIN tokens, relevant liquidity provider tokens, fTokens (Fringe Finance's interest-bearing tokens received by lenders) and others. Staking rewards will be offered variously in relation to both long-term and short-term staking incentivization schemes.

For FRIN token holders to receive rewards (a share of fees collected by Fringe Finance), FRIN tokens must first be staked on the Fringe Staking. Rewards are awarded to the $FRIN stakers according to their proportion of the FRIN Staking Pool. Rewards are more fully described later in this document.

2.3   Fees

A (small) platform fee is charged on interest charged to borrowers within the Fringe Finance Platform. Platform fees accumulate in the Fringe treasury. A proportion of fees collected are paid to FRIN token stakers as rewards.

Other fees may be collected from time to time for other operations undertaken by users on Fringe Finance.

Platform fees are described in further detail later in this document.

2.4   Asset Types Supported

Projects may apply to have their coin whitelisted so that it can be accepted as collateral within Fringe Lending and/or USB Stablecoin. The Fringe Finance DAO will accept or reject the application.

Different collateral asset types will be assigned different Loan to Value Ratios (LVR) and debt limit based on their 'risk profile.' When assessing a new coin, various criteria (described in Section 8.3 - Collateral Asset Parameter Modelling) will determine its LVR and debt limit.

The debt limit (Maximum Borrowing Capacity) assigned to each collateral asset is part of the mechanism to protect the platform from external price manipulation attacks and to ensure efficient liquidations in the event of adverse market conditions.

2.5   Fringe Finance Platform Actors

The actors for each component of the Fringe Finance Platform are as follows:
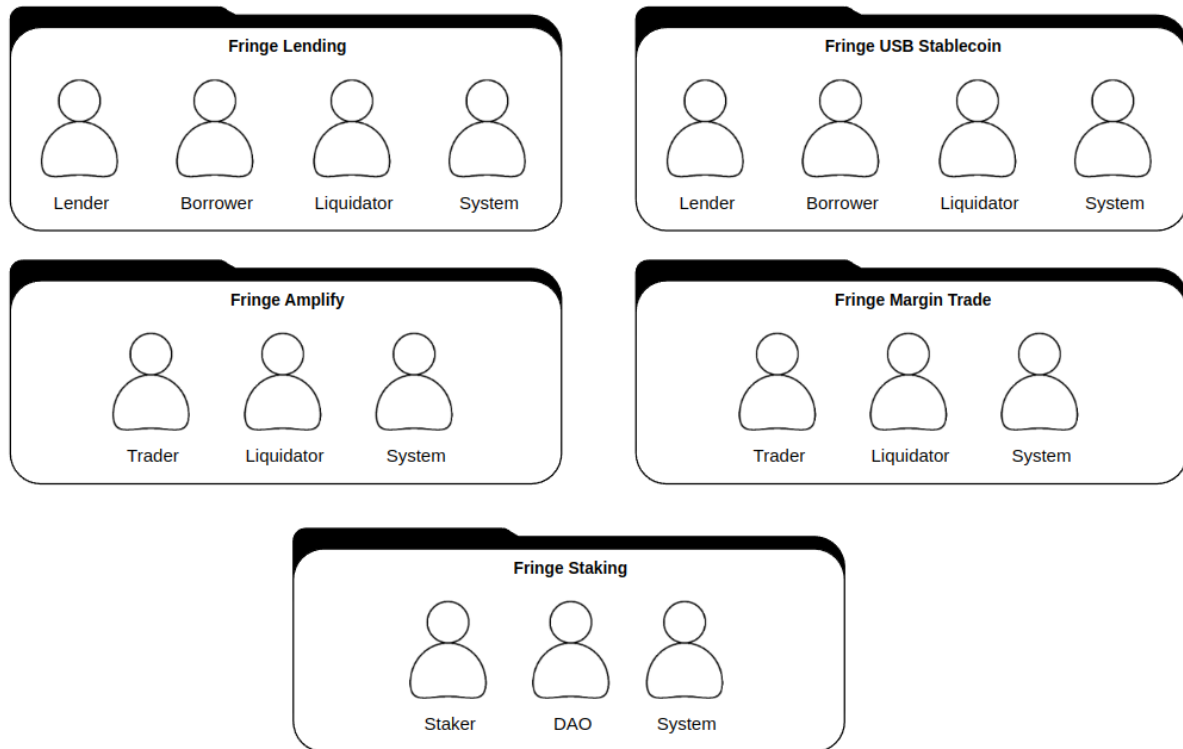
Figure 2: Fringe Finance Platform actors.

Actor Descriptions

Package	Actor	Description
Fringe Lending	Lender	Any user who supplies whitelisted assets as capital to the **Primary Capital Pools** to be made available for borrowers to borrow. Receives interest payments for supplied capital, via higher redemption value of their fTokens. Described below.
	Borrower	Any user who supplies collateral to a **Primary Collateral Safe** to take out a loan from the capital within the Primary Capital Pools.
	Liquidator	Any user who identifies and then liquidates part of a loan that is below the minimum collateralization level. The USB Stablecoin Platform also has a similar liquidator role.

	System	The Fringe Finance Platform, which takes fees for various user interactions with the platform, charges borrowers interest for open loans and pays interest to lenders.
USB Stablecoin Platform	USB Borrower (Minter)	Any user who supplies collateral to a USB Collateral Safe and borrows (mints) USB stablecoins against their deposited collateral.
	USB Saver	Any $USB holder who deposits their $USB to the USB Savings pool to receive interest.
	Liquidator	Any user who identifies and then liquidates part of a loan below the minimum collateralization level. The Fringe Lending facility also has a similar liquidator role.
	System	The Fringe Finance Platform, which takes fees for users' interactions with the platform, charges borrowers Stability Fees (interest) for open loan positions, and pays $USB Savers' interest.
Fringe Amplify and Fringe Margin Trade	Trader	A user who takes a leveraged trading position.
	Liquidator	Any user who identifies and then liquidates part of a trading position below the minimum collateralization level. Liquidators are the same actor for Fringe Amplify, Fringe Margin Trade and Fringe Lending.
	System	The Fringe Finance Platform, which takes fees for various user interactions with the platform, charges traders interest for open trading positions and pays interest to lenders.
Fringe Staking	Staker	Stakers may stake various assets and receive rewards as part of the incentivization for token holding and staking to benefit the Fringe ecosystem and community. Staking assets will include FRIN tokens, relevant liquidity provider tokens, fTokens (Fringe Finance's interest-bearing tokens received by lenders) and others. Staking rewards will be offered variously in relation to both long-term and short-term staking incentivization schemes. FRIN token holders who stake $FRIN in the Fringe Finance Staking Platform will receive rewards of a portion of fees collected by the Fringe Finance Platform and allow them to participate in governance voting.
	System	The Fringe Finance Platform, which issues rewards to stakers according to their proportion of the stake in the various Fringe Finance staking pools.
Governance	Project	Project that makes an application to Fringe Finance to have their token listed as a collateral type accepted by the Fringe Lending Platform and USB Stablecoin Platform.

	DAO/Admin	Accepts or rejects projects' requests for listing - and assigns parameters for accepted projects (LVR, Maximum Borrowing Capacity, conservative factors).

Table 3: Description of the Fringe Finance Platform actors.

3 Fringe Lending

Fringe Lending is a non-custodial, DeFi lending facility. Within Fringe Lending:

- **Lenders** can deposit whitelisted assets to the Primary Capital Pool to earn interest from borrowers who borrow these assets.

- **Borrowers** deposit whitelisted altcoin assets to the Primary Collateral Safes, which can be used as collateral against which they can borrow assets from the Primary Capital Pools.

- **Liquidators** liquidate borrower positions that are below the minimum collateralization level.

Users can interact with the Platform in a number of ways, as diagrammed below:
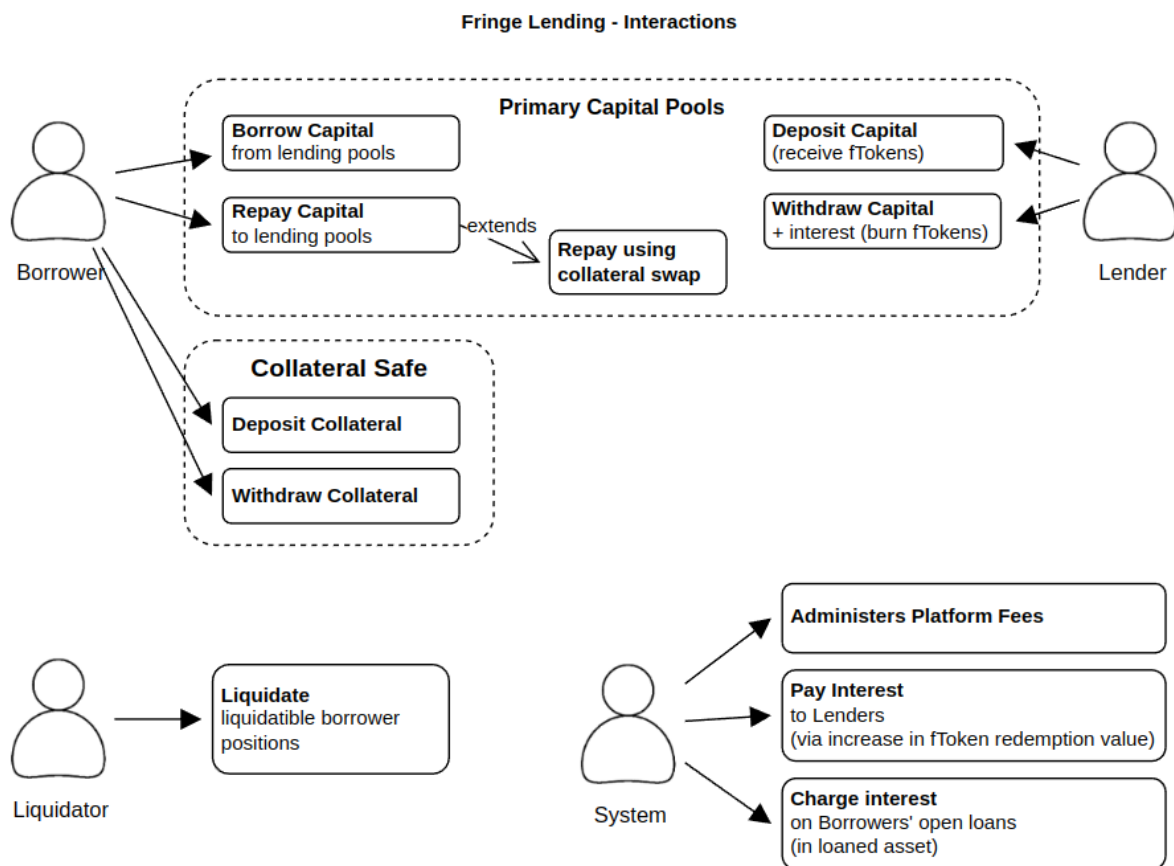
Figure 4: Fringe Lending Platform interactions.

3.1 Lenders – Depositing capital assets

Lenders deposit whitelisted capital assets to the Primary Capital Pools and receive fTokens in return to reflect their deposit. The Primary Capital Pools are composed of separate markets of each whitelisted capital asset.

Unlike an exchange or peer-to-peer platform, where a lender's assets are matched and lent to a borrower, the Fringe Finance protocol aggregates the supply of lenders' assets for each capital

asset; when a lender supplies an asset, it becomes a fungible resource within the pool for that asset. This approach offers significantly more liquidity than direct lending. Unless every asset in a market is borrowed, lenders can withdraw their assets at any time, without waiting for a specific loan to mature.

3.2   Lenders – Receiving interest

Assets supplied to a market are represented by an ERC-20 token balance ("fTokens") which reflects the deposited underlying asset. Holding fTokens entitles the owner to an increasing quantity of the underlying collateral asset. As the money market accrues interest, which is a function of borrowing demand, fTokens become convertible into an increasing amount of the underlying asset. In this way, earning interest is as simple as holding an ERC-20 fToken.

Indeed, a holder of fTokens does not need to redeem them on the Fringe Finance platform to regain their deposited capital assets — they can instead sell the fTokens on the open market for whatever asset they wish, as long as an external market exists.

3.3   Lenders – Withdrawing capital assets

Lenders redeem their fTokens to withdraw the underlying capital asset from the relevant Primary Capital Pool. Their fTokens reflect the interest they have earned by an increase in the redemption rate of fTokens since they received them.

3.4   Borrowers – Depositing collateral

Borrowers can deposit whitelisted collateral assets to the Fringe Lending Platform into a user-specific and asset-specific Collateral Safe.

In return for their altcoins, users receive a non-transferable token, PIT, which standardizes their collateral assets. Each PIT is pegged to 1 USD. As such, PIT represents the borrower's borrowing capacity in USD.

The amount of PIT tokens awarded to the borrower for the assets they deposit is based on the LVR for the asset deposited. The borrower's borrowing capacity, or PIT value, can be calculated using the following formula:

$$\textbf{Borrowing capacity } = \textbf{AssetPrice}_c * \textbf{CountOfTokens}_c * \textbf{LVR}_c$$

Where:

- AssetPrice_c = USD price of the collateral asset
- CountOfTokens_c = Number of collateral asset tokens deposited
- LVR_c = The collateral asset's LVR

The amount of a user's PIT (i.e. borrowing capacity) will fluctuate with the market price of their collateral assets they have deposited. For a full breakdown of how a collateral asset's LVR is determined, go to Section 8.3 - Collateral Asset Parameter Modelling.

3.5   Borrowers – Undertaking loans of capital assets

Borrowers can take out loans from the Primary Capital Pools based on their borrowing capacity. i.e. amount of PIT tokens they have available.

If the borrower has remaining borrowing capacity , a loan amount can be extended by borrowing additional capital assets or excess collateral can be withdrawn by the borrower.

3.6   Borrowers – Interest charges on open loan positions

Interest is charged on each of the borrower's open loan positions. This is calculated per block and is accrued to each loan position.

The platform presents both the loan principal amount and the accrued interest amount for each loan.

Accrual of interest increases the amount the borrower needs to repay to settle the loan. Accrual of interest also reduces the amount of the borrower's available PIT tokens. i.e. reduces their remaining borrowing capacity.

3.7   Borrowers – Repaying loans

Any repayment of capital assets to settle a loan position is first applied to the accrued interest amount and then applied to the loan principal amount.

Repaying any part of a loan increases the borrower's borrowing capacity. i.e. increases the amount of available PIT tokens.

Fringe supports Atomic Repayments, which allows a borrower to repay a loan in part or in whole using collateral assets that are securing the loan. This allows borrowers to settle loans without needing to have the capital assets on-hand to repay the loan.

Atomic Repayments employ a third-party DEX aggregator to swap collateral assets for the capital (lending) asset to then repay the loan using the swapped capital assets. Atomic Repayments are available so long as there is a liquid trading market to enable the swap between the collateral asset and the capital asset.

3.8   Interest rate dynamics on Fringe Lending

Borrowers are charged interest on their open positions. Lenders receive interest on the capital they contribute to the Primary Capital Pool.

Fringe Lending automatically adjusts the interest rate charged to borrowers so that a balance occurs to economically incentivize borrowers' and lenders' participation in the platform.

- When there is **high borrower demand**, the interest rate they are charged will be algorithmically **increased**. This will attract **more lenders** to the platform – who will receive a share of the greater interest charges collected from borrowers.
- When there is **low borrower demand**, the interest rate they are charged will be algorithmically **decreased**. This will attract **more borrowers** to the platform.

The term Utilization Rate is used to describe demand from borrowers in respect of the proportion of a capital pool that borrowed. A low Utilization Rate will tend to decrease interest rates and a high Utilization Rate will tend to increase interest rates. Each lending market offered by the Fringe Lending Platform will have its own interest rate dynamic according to its Utilization Rate.

As a result of this dynamic of automatically balancing interest rates within Fringe's variable interest rate offering, there are no deterministic fixed interest rates. The market determines interest rates. This allows Fringe Lending to remain competitive in the crypto economy – since deterministic fixed interest rates would cause the platform to swing into and out of being competitive in relation to other crypto platforms.

Note, however, it is likely that lenders may enjoy higher interest rates for their assets using Fringe Lending as compared to other platforms. This is because Fringe Lending can be a predominant lender for many speculative collateral assets that do not have other well-established lending markets.

Fringe's variable interest rate model is designed for capital efficiency, whereby excess lender capital tends to decrease borrower interest rates to attract more borrowers. Conversely, high borrower utilization will tend to increase interest rates to attract more lenders. There is no direct correlation of utilization rate and interest rate. Interest rates will trend higher or lower depending on the prevailing utilization rate vs the target utilization rate.

The model calculates interest rates based on the following variables:

IR = interest rate

Cu = current utilization rate (total borrowed/total loaned across the platform)

Tu = target utilization rate

G = gain factor (see below)

Jg = jump gain (only applies if Cu > Tu)

Ir = annualized borrower IR to be used for calculating accruals

LastIR = value of Ir calculated last time this calculation was run

Dt = years since the last time this calculation was run

Dir = change in borrower IR per year

E = (Cu — Tu) = how far away from the target utilization rate we are (error expressed in percentage points)

Then, when running the model:

if **Cu > Tu: Dir = E x G x Jg; else Dir = E x G**

The interest rate is subsequently calculated as follows:

Ir = LastIR + (Dt x Dir)

The interest rate change is confined to a change of -5% and 5% per week. Below the utilization rate of 85%, the interest rate changes are negative; with linear and proportional increments up to a utilization rate of 85%. Beyond a utilization rate of 85%, the interest change per week increases linearly at a higher rate until it hits a change of 5% when the utilization rate is 100%.

4 Fringe USB Stablecoin
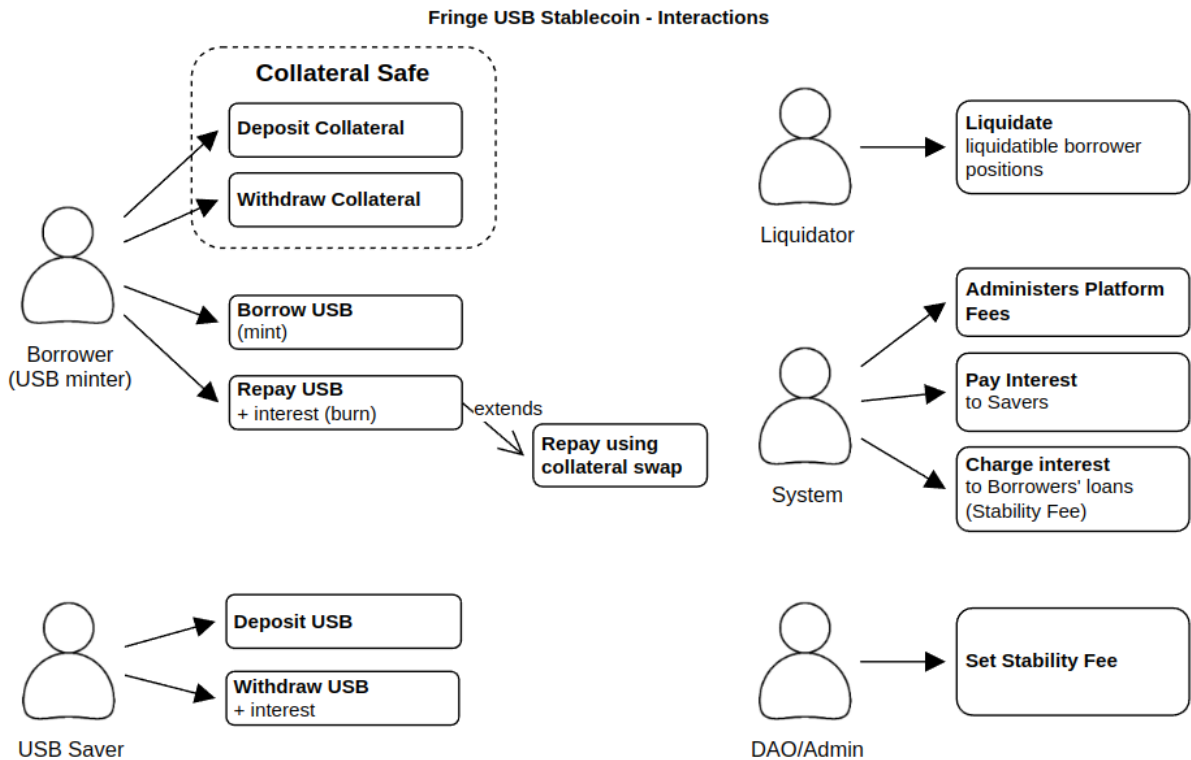
Figure 5: USB Stablecoin Platform interactions.

Though we use the terminology of "borrowers" in the descriptions below, this is really the participant who mints the USB stablecoin. i.e. the 'minter.'

4.1 Borrowers – Depositing collateral

Borrowers can deposit whitelisted assets to the USB Stablecoin Platform into a user-specific and asset-specific Collateral Safe.

In return for their assets, users receive a non-transferable token, PIT, which standardizes their collateral assets. Each PIT is pegged to 1 USD. As such, PIT represents the borrower's borrowing capacity in USD.

The amount of PIT tokens awarded to the borrower for the assets they deposit is based on the LVR for the asset deposited. $PIT value can be calculated using the following formula:

$$PIT = AssetPrice_c * CountOfTokens_c * LVR_c$$

Where:

- $AssetPrice_c$ = USD price of the collateral asset
- $CountOfTokens_c$ = Number of collateral asset tokens deposited
- LVR_c = The collateral asset's LVR

20

The amount of a user's PIT (i.e. borrowing capacity) will fluctuate with the market price of the assets they deposited on the platform as collateral.

4.2   Borrowers – Minting $USB

Borrowers can mint USB stablecoins ($USB) based on their borrowing capacity (i.e. PIT tokens). It can be thought of as a $USB loan that eventually will need to be paid back. The remainder of this description will use the analogy of a $USB loan.

If the borrower has remaining borrowing capacity (i.e. remaining PIT tokens), the loan amount can be extended by borrowing additional USB stablecoins.

4.3   Borrowers – Interest charges on open positions

The USB Stablecoin platform's prevailing Stability Fee can be thought of as the 'interest rate' charged to open $USB loan positions.

Interest is charged on each of the borrower's open loan positions. This is calculated per block and is accrued to each loan position. The platform presents both the loan principal amount and the accrued interest amount for each loan.

Accrual of interest effectively increases the amount the borrower needs to repay to settle the loan. Accrual of interest also reduces the amount of the borrower's available PIT tokens. i.e. reduces their remaining borrowing capacity.

4.4   Borrowers – Repaying USB positions

Any repayment of USB stablecoins to settle a loan position is first applied to the accrued interest amount and then applied to the loan principal amount.

Repaying any part of a loan increases the Collateral Safe's borrowing capacity. i.e. increases the amount of available PIT tokens.

Fringe supports Atomic Repayments, which allows a borrower to repay a loan in part or in whole using collateral assets that are securing the loan. This allows borrowers to settle loans without needing to have the capital assets on-hand to repay the loan.

Atomic Repayments employ a third-party DEX aggregator to swap collateral assets for the capital (lending) asset to then repay the loan using the swapped capital assets. Atomic Repayments are available so long as there is a liquid trading market to enable the swap between the collateral asset and the capital asset.

4.5   USB Savers – Depositing USB tokens

USB token holders may deposit their $USB on the USB Stablecoin Platform Saving facility to earn interest.

4.6   USB Savers – Receiving interest

USB Savers receive interest in the form of USB stablecoins. Interest accrues against their position and is displayed by the platform.

Interest is sourced from stability fees charged against $USB borrowers. i.e. interest charge to borrowers against their open $USB loan positions.

Interest paid to $USB savers is calculated based on the proportion of the $USB savings pool their deposit represents. Interest accrues to the USB saver's deposit holdings – in the form of USB tokens.

4.7   USB Savers – Withdrawing USB tokens

USB Savers can withdraw their $USB at any point including any accrued interest, back into their connected wallet.

4.8   Interest rate dynamics on the USB Stablecoin Platform

Borrowers are charged interest on their open positions. i.e. Stability Fee charges. USB Savers receive interest on the USB tokens they deposit in the USB Savings Pool.

The USB Stablecoin Platform allows the Platform Admin to periodically adjust the Stability Fee (i.e. interest rate) charged to borrowers so that a balance occurs to economically incentivize borrowers' and lenders' participation in the platform.

- When there is **high borrower demand**, the interest rate they are charged will be periodically manually **increased**. This will attract **more USB savers** to the platform – who will receive a share of the greater interest charges collected from borrowers.
- When there is **low borrower demand**, the interest rate they are charged will be periodically manually **decreased**. This will attract **more borrowers** to the platform.

As a result of this dynamic that automatically balances user participation, there are no deterministic fixed interest rates. The market determines the interest rates via the Admin adjustments to the Stability Fee.

This allows the Fringe USB Stablecoin Platform to remain competitive in the crypto economy – since deterministic fixed interest rates would cause the Platform to swing into and out of being competitive in relation to other crypto platforms. Note, however, it is likely that USB Savers will enjoy higher interest rates for their USB stablecoin assets using the Fringe Finance Platform as compared to using other stablecoins and staking them on other platforms. This is because the Fringe Finance platform will be a predominant lender for many speculative assets that do not have well-established lending markets.

5 Liquidations

A borrower's loan must always be sufficiently capitalized above a Liquidation Threshold. i.e. Collateral Value * LVR. Loans that fall below the Liquidation Threshold may be subject to liquidation by Liquidators who repay the loan and in return receive a greater portion of the position's collateral.

A loan's Health Factor is a measure of its relation to the Liquidation Threshold. A Health Factor greater than one (1) indicates the loan is suitably capitalized above the Liquidation Threshold. A Health Factor less than one (1) indicates the loan is not suitably capitalized and is below the Liquidation Threshold.

A liquidation event incurs a Liquidator Fee. The Liquidator Fee varies depending on the loan's Health Factor. The lower the loan's Health Factor, the greater the reward that will be awarded to the liquidator.

Fringe employs partial liquidations. This provides a number of benefits, as follows:

- Minimizes the impact to borrowers during liquidation events.
  - The way this minimizes impact to borrowers is by borrowers being charged *only the liquidator reward fees associated with the partial liquidation* to bring the loan back above the minimum collateralisation level.
  - Additionally, the borrower retains the remaining open loan position they entered into and thus is still positioned according to their original intent (i.e. exposed to the upside potential of their collateral asset.)
- Partial liquidations also provide a benefit to the Fringe platform.
  - Partial liquidations invite more liquidators to participate given lower secondary market liquidity requirements to dispose of collateral won in a liquidation. This makes Fringe's liquidation process more efficient and aims to reduce the likelihood of positions becoming insolvent. This improves the Fringe platform's stability.

The mechanisms for partial liquidations are as follows:

1. Allow liquidators to choose the amount they wish to liquidate up to a MaxLA - Max Liquidation Amount
   a. MaxLA is the amount the position needs to be liquidated that will result in the loan position attaining the Target Health Factor
   b. MaxLA is calculated as described below in the heading **MaxLA - MAX_LIQUIDATION_AMOUNT Calculation**.

2. Establishes a mechanism *similar* to an auction which increasingly incentivizes liquidators as the loan position's Health Factor falls. The LRF - Liquidator Reward Factor is a function of the Health Factor, where a lower HF results in a higher LRF (not necessarily proportionally).
   a. Once a partial liquidation occurs, the auction continues. LRF is still calculated as a function of the prevailing Health Factor.
   b. To note, PLP's existing full-position liquidation model provides a liquidator reward of 7%. This is currently a parameter on a per-collateral-asset basis.
   c. To note: With this new liquidation model, **there is no explicit auction process** (like, say, DAI's liquidation model.) Liquidators simply participate based on the prevailing LRF which is a function of the prevailing Health Factor.

       i.   Given there is no explicit auction process, there is no additional actor who needs to initiate an auction. i.e. there is no "two-step process" for liquidations. This is mentioned here just to distinguish Fringe's model from the DAI model which requires an actor to initiate a liquidation auction.

Notes
- Any liquidator can liquidate up to the MaxLA.
- The borrower will still have an open loan position after the partial liquidation.
- If the liquidator liquidates an amount equal to MaxLA, the position will be returned to HF> 1. i.e. healthy, unliquidatable. (And if the liquidator liquidates an amount less than MaxLA, HF may be less than 1 and there remains an opportunity for another liquidator to perform a liquidation for another amount up to the newly-calculated MaxLA.)
- Fringe's previous full liquidation model will be retired.
  - Once this new partial liquidations model is implemented, it will not be possible for liquidators to expressly perform full liquidations via that retired facility.
  - However, it may be the case that a 'full liquidation' can occur via this new partial liquidation model.
    - The way this can occur is when MaxLA >= Outstanding loan value. I.e, if the new partial liquidation model results in a 'full liquidation' scenario, then this is permitted (via the new 'partial' liquidation model.)
    - I.e. Liq amount can be any value between and including MinLA & MaxLA, and if MaxLA > Outstanding Loan Value, then MaxLA = Loan value.

- **LRF - LIQUIDATOR_REWARD_FACTOR Calculation**

A liquidator will be rewarded with collateral value greater than the loan amount they repay. The collateral the liquidator receives is:

    Loan Amount Repaid * **LIQUIDATOR_REWARD_FACTOR**

LRF is a function of the current Health Factor. A lower HF results in a higher LRF.

Note: Fringe will initially implement a simple curve to calculate LRFs per the formula below, but this will likely change in the future (*).

    $LRF = (1 + (1 - HF)*k)$

Where:
- k is the LIQUIDATOR_REWARD_CALCULATION_FACTOR, a system-wide parameter. k is a positive **real** value. We will initially set this parameter value = 1.

- We will set a maximum for LRF of 115%.
  LRF_MAX = maximum value for LRF. A positive **real** value. We will initially set this parameter value = 115%.

LRF > 100%, by virtue of no liquidator will perform a liquidation if LRF is <= 100%.

(*) In the future, Fringe may implement a different curve and other rules that attempt to address issues such as further minimizing risk of price manipulation attacks and front-running. For the time being, Fringe has implemented this formula above but has constructed the partial liq mechanism to allow a new model to be applied as and when needed.

- **MaxLA - MAX_LIQUIDATION_AMOUNT Calculation**

  MaxLA = (LVR * CVc - THF * LVc) / (LRF * LVR - THF)

Where:
  - MaxLA = dollar amount needed to reduce the loan to bring the loan to the Target Health Factor.
  - LVc = current loan value.
  - CVc = current collateral value.
  - LVR = loan to value ratio for the loan's collateral type.
  - LRF = liquidator reward factor factor. e.g. 107%, but this is calculated based on the current Health Factor.
  - THF = Target Health Factor. e.g. 110% The aim of THF is to bring the loan position to a healthy state. E.g. to Health Factor =1.1.

Rules:
  - If MaxLA > Outstanding Current Loan Value (LVc), then set MaxLA = LVc.
    - The reason for this rule is to allow a loan position to be effectively fully liquidated with this 'partial liquidation' facility when required to maintain the platform's stability. i.e. when MaxLA > LVc.
  - If Collateral paid to the liquidator > CVc, then set Collateral paid to the liquidator = CVc. (This allows Fringe DAO to liquidate any insolvent positions at a loss if the need ever arises.)

- **MinLA - MIN_LIQUIDATION_AMOUNT Calculation**

Fringe will specify a system-wide dollar amount called MPA - MIN_PARTIAL_LIQUIDATION_AMOUNT. The following formula is to be used to derive **MinLA - MIN_LIQUIDATION_AMOUNT**

  MinLA = min(MaxLA, MPA)

To note: **MPA** is a stored parameter whereas **MinLA is calculated.**

6 Platform fees

Platform fees are charged for events within the Fringe Finance Platform. Events that may incur a fee include user interactions (such as taking out a loan) and some events do not involve a user interaction (such as interest being charged against a loan.)

Currently, fees are charged only as follows:
- A percentage of interest paid by borrowers. This applies to Fringe Lending, USB stablecoin platform, Fringe Amplify and Fringe Margin Trade. These fees are accumulated into the Fringe treasury.
- A variable percentage of a liquidation, as described in the heading Liquidations. These fees are paid to the liquidator as a reward for undertaking the liquidation function.

Even though fees are only charged as itemized above, Fringe may charge other fees in the future as needed to ensure the best balance of incentive-compatible participation in the Fringe ecosystem. The following table lists the possible fee **events,** who may be charged to and the basis of the fee.

6.1 Fringe Lending Platform events

Event	Fee or No Fee	Charged To	Notes
Deposit/withdraw to/from the Primary Capital Pool	No fee	Lender	No fee charged.
Deposit/withdraw collateral	No Fee	Borrower	No fee charged.
Borrow from the Primary Capital Pool	No fee	Borrower	No fee charged.
Repay loan to the Primary Capital Pool	**Fee**	Borrower	% of interest accrued amount.

Table 4: Fee events - Fringe Lending Platform.

6.2 Fringe Amplify and Fringe Margin Trade events

Event	Fee or No Fee	Charged To	Notes
Deposit/withdraw collateral	No Fee	Trader	No fee charged.
Borrow from the Primary Capital Pool	No fee	Trader	No fee charged.
Close trading position	**Fee**	Trader	% of interest accrued amount.

Table 4: Fee events - Fringe Amplify and Margin Trade facilities.

6.3   USB Stablecoin Platform events

Event	Fee or No Fee	Charged To	Notes
Deposit/withdraw collateral to/from the USB Stablecoin platform	No Fee	Borrower	No fee charged.
Take out $USB loan from the USB Stablecoin platform	No fee	Borrower	No fee charged.
Repay $USB stablecoin loan to the USB Stablecoin platform	**Fee**	Borrower	% of interest accrued amount.
Deposit/withdraw $USB to/from USB Savings Pool	No fee	USB Saver	No fee charged.

Table 5: Fee events – USB Stablecoin Platform.

6.4   Liquidation events

Event	Fee or No Fee	Charged To	Notes
Liquidate a position that falls below the minimum collateralization level. (Liquidations can occur on the Fringe Lending Platform, Fringe Amplify, Fringe Margin Trade and the USB Stablecoin Platform.)	**Fee**	Borrower	Paid to the liquidator via the discounted collateral the liquidator receives from the borrower's/trader's collateral related to the liquidated position. The percentage fee charged is variable as described in the heading Liquidations.

Table 6: Fee events - Liquidations.

6.5 Staking events

Event	Fee or No Fee	Charged To	Notes
Stake/unstake tokens	No Fee	Staker	No fee charged.
Pay staking rewards to staker	No Fee	Staker	No fee charged.

Table 7: Fee events – Staking.

6.6 Governance events

Event	Fee or No Fee	Charged To	Notes
Project application	No Fee	Project	--
Project acceptance	Fee	Project	Set by or negotiated with the Fringe Finance DAO (or Platform Admin prior to transition to DAO.)

Table 8: Fee events – Governance actions.

6.7 Denomination of platform fee charges

Fees charged to users of the platform are not paid in FRIN tokens. This would result in a poor user experience, where users would have to first purchase FRIN tokens to use the platform. The Fringe Finance platform avoids this friction.

The denomination of fees **charged to** users of the platform are as follows:
- ○ Portion of interest when repaying a borrow position: paid in the capital asset of the borrow position and accumulated into the Fringe Treasury.
- ○ Portion of interest when repaying a trading position: effectively paid by the trader in the collateral asset used to secure the trading position, but swapped for the capital (short) asset and accumulated into the Fringe Treasury.
- ○ Liquidation fees: paid in the liquidated collateral asset used to secure the borrow or trading position and paid to the liquidator.

7 Fringe Staking

The Fringe Finance Staking Platform aims to offer rewards for staking of various assets to incentivize token holding and staking to benefit the Fringe ecosystem and community. Staking assets will include FRIN tokens, relevant liquidity provider tokens, fTokens (Fringe Finance's interest-bearing tokens received by lenders) and others. Staking rewards will be offered variously in relation to both long-term and short-term staking incentivization schemes.

FRIN token holders can opt to stake their FRIN tokens to receive rewards.

FRIN Stakers will also be able to participate in directing the evolution of the platform via voting for DAO proposals.

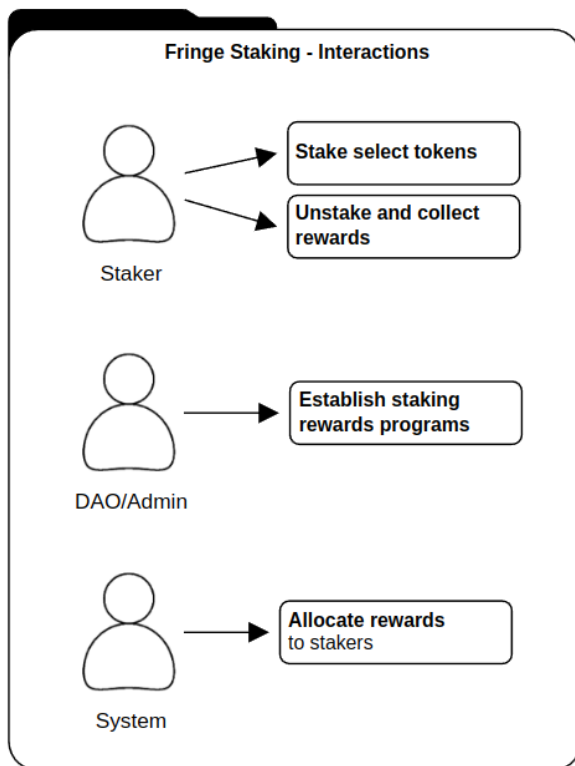The Staking platform interactions are depicted in the following diagram:

Figure 6: Fringe Staking interactions.

Rewards are paid from the Rewards Pool for each staking asset. The Rewards Pools are funded in various ways, including from the Fringe Treasury and by partners wishing to incentivize awareness of their project

Rewards are paid as follows:

Actor	Staking Asset	Rewards Asset	Description	Source of rewards
FRIN holders	$FRIN	$FRIN	Receives a share of fees collected by the platform. Permanent rewards scheme. Will allow voting on governance proposals once the Fringe DAO is live.	Treasury Platform fees pool
		Other tokens from partner projects	Project token rewards periodically offered to $FRIN stakers (in addition to $FRIN rewards). There will be support for multiple project token rewards pools. (** *future - once multi-asset rewards capabilities are live.*)	Funded by partner projects.
Lenders	fTokens	$FRIN	To bootstrap and incentivize adoption, lenders stake their fTokens to receive $FRIN rewards in addition to the interest they receive on their fTokens. Periodic rewards scheme.	Treasury
Liquidity providers	FRIN markets LP tokens (e.g. UniV2 ERC20 LP tokens).	$FRIN	Periodically incentivizing liquidity providers to external trading markets. Liquidity providers stake their LP tokens and receive $FRIN rewards. e.g. UniV2 ERC20 LP tokens. For example, incentivize $FRIN markets. Alternatively, incentivizing trading markets for any token we list as collateral. This latter example is to sustain the debt limit lending parameter for a collateral token as may be required.	Treasury
	Fixed interest LP tokens	$FRIN	Fringe may wish to provide incentives for LP providers to supply liquidity to markets that relate to Fringe's upcoming fixed interest solution.	Treasury
USB holders	$USB	$USB	USB savers will receive rewards in $USB for staking ("**saving")** their USB stablecoins. Note: the term 'saver' (rather than "staker") is intentionally used given the user can use the USB Saver facility to earn interest on their USB. This is akin to "staking" but occurs via the **USB Saving facility**. Permanent rewards scheme.	Interest paid by borrowers on their loans on the USB Platform.
		$FRIN	To bootstrap and incentivize adoption, $USB stakers will receive an extra reward of $FRIN tokens in addition to the interest they receive for saving their USB stablecoins.	Treasury

Table 9: List of envisaged Rewards

In the future, when each new component of functionality is added to the Fringe Finance Platform, a decision will be made by Governance as to whether staking incentives may be provided to promote its adoption. Any such rewards program will be designed and implemented along with the new functionality.

8 Governance

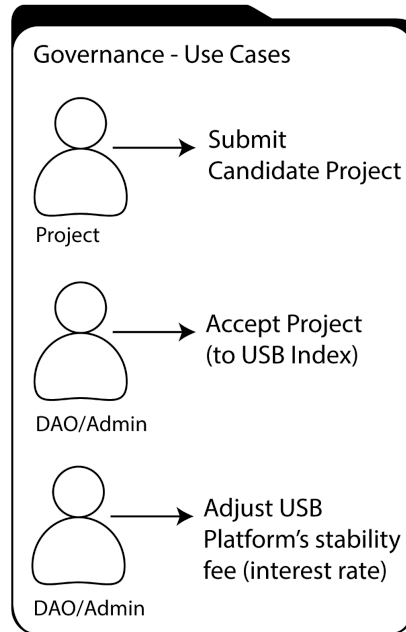The main Governance use cases are depicted in the following diagram:

Figure 8: Main governance use cases.

8.1 Submitting a candidate project

The Fringe Finance platform will eventually provide a user interface to allow new token submissions to be made.

8.2 Accepting a Project into the Platform

The Fringe Finance Admin will assess new token applications and, if accepted, will assign a LVR and maximum borrowing capacity to the token according to Fringe's parameter asset modeling approach and configure it for inclusion to the Fringe Finance platform. Accepted Project tokens can then be deposited by borrowers as collateral for loans and/or deposited by lenders as capital to be loaned to borrowers.

8.3 Collateral Asset Parameter Modeling

When assessing a new coin, the following criteria will determine its initial parameters:

- Loan-to-Value Ratio (LVR)
- Liquidator Reward Percentage (LRP)
- Debt Limits/Maximum Borrowing Capacity (MBC)

The aim of deriving suitable values for these collateral asset parameters is to balance the competing purposes of maximizing both the platform's stability and its long-term user adoption. Deriving suitable parameters employs a systematic and logical approach with a rationale that reflects the characteristics of each collateral asset.

8.3.1 Loan to Value Ratio (LVR)

Each collateral asset has an LVR that defines the ratio of loan value that a user can take out against a given value of its collateral. Loans are overcollateralized; thus, the LVR is always less than 100%. For example, a collateral asset with an LVR of 60% would allow users to take out a loan of up to 60% of their collateral value.

The method to determine LVR is to analyze the price history of the collateral asset and gauge its maximum price falls over the interval of time within which liquidations are reasonably likely to take place. A period of four hours is used to assess an asset's volatility.

The four hours threshold was established due to the competition between liquidators to be the first to liquidate a loan resulting in a strong incentive to perform liquidations quickly. Simultaneously, liquidators may not always be able to immediately perform a liquidation when a loan falls below its minimum collateralization. This could be either due to their capital already being deployed elsewhere or other more attractive liquidation opportunities being available.

The below diagram illustrates our approach by displaying discrete four-hour periods. The actual methodology applied in Fringe Finance uses continuous four-hour periods. This simplification makes the diagrammatic depiction more intuitive.
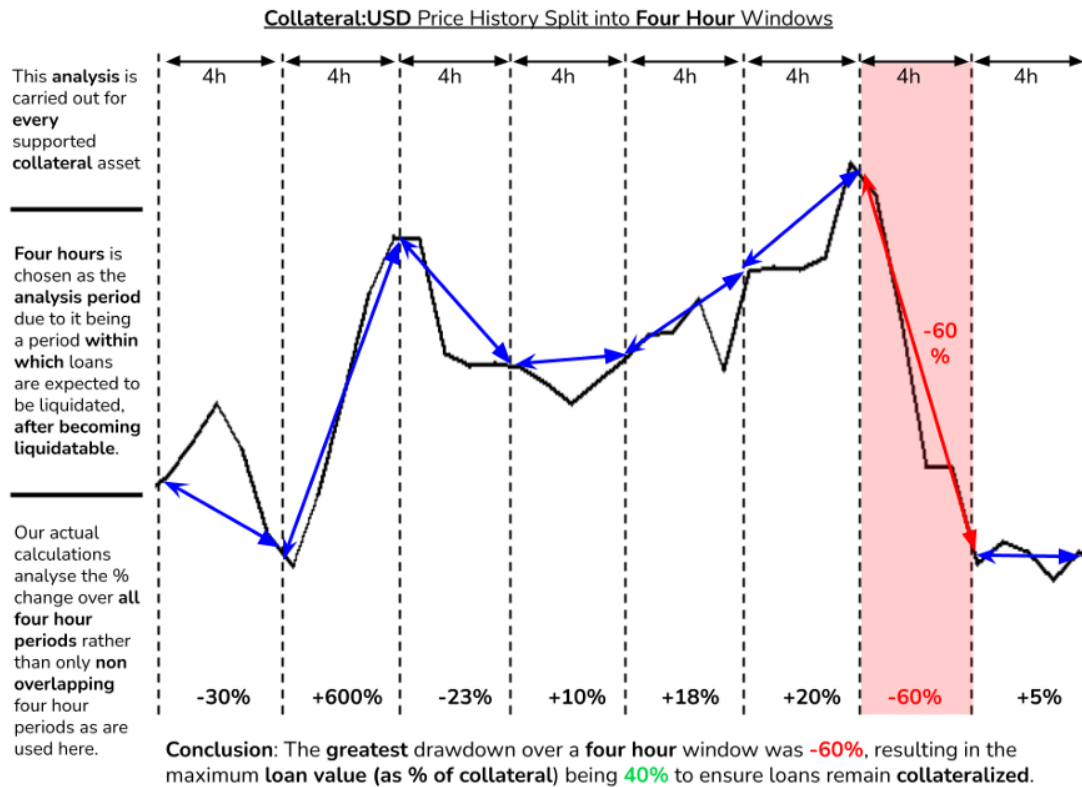
Figure 9: Analysis of an asset's maximum volatility within a four-hour period.

In the example above, the blue lines point to the open and close price points for each time window. The highlighted segment shows where the price fell the most, by 60%. This is then used as the basis for the LVR.

When analyzing historical price data, an asset's initial weeks of trading might be excluded from the dataset due to the highly volatile nature of such low liquidity periods. Such early-stage volatility is generally not reflective of long-term later patterns.

When loans are liquidated, the underlying collateral is subsequently sold by liquidators, potentially causing slippage in its price. To take into account the impact of liquidations on the price of the collateral asset, we multiply the worst expected volatility over a four-hour period by a slippage threshold. The slippage threshold is calculated based on the maximum slippage we expect from all loans secured by a collateral asset being liquidated simultaneously.

As mentioned, a conservative factor is then applied to the maximum price drawdown, including the slippage threshold, to arrive at the final LVR used by the Fringe Lending Platform. This conservative factor considers a 5% slippage, therefore reducing the LVR to 0.95 times its original calculation. In the example presented in the diagram, this results in the following calculation:

$$LVR = max\,drawdown * conservative\,factor = 60\% * 0.95 = 57\%$$

8.3.2 Debt Limits (Maximum Borrowing Capacity)

Fringe Finance sets a maximum aggregate debt limit amount for each collateral asset. It applies to the sum of outstanding debt across all borrowers. This parameter ensures that price manipulation attacks are unprofitable and also that liquidators will be willing to perform liquidations by minimizing the potential price impact they may experience when disposing of collateral assets won in a liquidation event.

To determine an asset's debt limit, we analyze its aggregate liquidity in the markets in which it is traded. This seeks to determine how much liquidity is readily available where there is relatively little price impact.

The following example in the diagram below illustrates how the debt limit protects the Fringe Finance platform. It presents a hypothetical bid order book with a large proportion of its liquidity near the last traded market price, as is typical of order books. As liquidity dries up progressively at prices further away from the recently traded price, any subsequent trades would experience significant price impact, materially affecting the average price at which an asset could be disposed of.

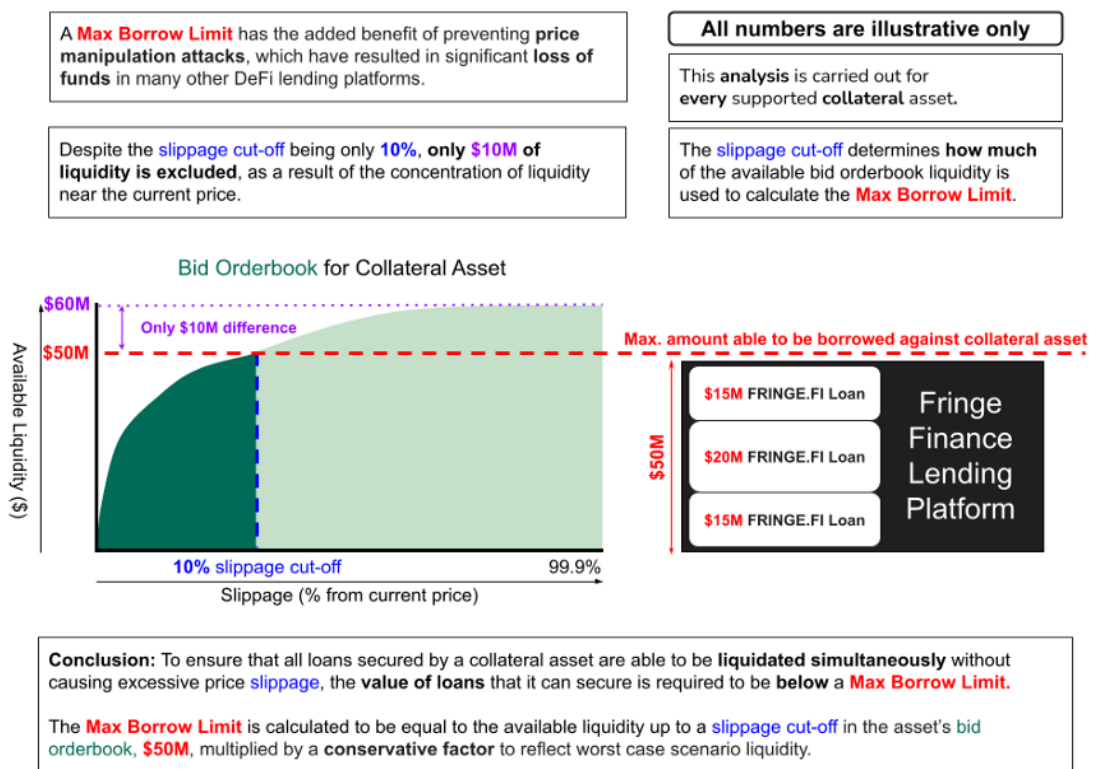*Figure 10: Fringe Finance's Maximum Borrowing Capacity parameter.*

$$Maximum\ Borrowing\ Capacity = Readily\ Available\ Liquidity\ up\ to\ the\ Chosen\ Slippage * 50\%$$

The reason to further limit the available liquidity by 50% is that it's not reasonable to assume all orders in the order book will persist in any market movement. 50% is effectively a 'conservative factor' for the sake of prudence.

The slippage, or price impact, threshold used for all collateral assets so far is 5% due to it being a point of diminishing returns. Allowing for higher price impact brings little increased liquidity and therefore is impractical.

The example in the diagram shows that up to $50M of loans on the Fringe Finance platform could be liquidated and disposed of on the available markets within a reasonably acceptable effective price impact. Of course, during usual operations of the platform, only a very small portion of all loans will need to be liquidated at any point in time, resulting in liquidators experiencing much lower price impact than the worst-case scenario.

To maximize the protection of the platform, we configured the parameters for worse-case scenarios to take into account rapid, adverse market conditions that could cause cascading liquidations to occur simultaneously.

8.3.3   Liquidator Reward Percentage (LRP)

The Liquidator Reward Percentage is the percentage of additional collateral assets awarded to the liquidator when they liquidate a loan position. It is intended to offset a liquidator's costs, which include price impact when disposing of collateral, operational overheads, and other opportunity costs which liquidators must incur.

By far, price impact is the most significant and variable of these additional costs.

Fringe's partial liquidations model rewards liquidators inverse-proportionally to the loan position's health factor. This means that as the collateral value falls further below the platform's minimum collateralization level for the loan position, the liquidator reward (as a percentage of the loan they partially liquidate) will increase. This will tend to make it increasingly attractive for liquidators to participate in our liquidation opportunities and make our liquidation operations more efficient and hence increase overall platform stability.

As the debt limit for a given collateral asset is increased, the price impact that would result from liquidating all such loans would also increase. Consequently, a higher Liquidator Reward Percentage is required to compensate liquidators for added price impact. The dynamic liquidator reward incorporated into our partial liquidation model is designed to address the nature of dynamic price impacts arising from variable liquidity of collateral assets on the available trading forums.

8.4   Adjusting a project token's parameters

Governance will monitor the changing characteristics of each collateral asset on an ongoing basis and will continue to assess the platform's performance. The parameters will be adjusted accordingly to achieve the best balance of platform stability, capital efficiency for our users, and to maximize long-term adoption through incentive-compatible mechanics.

Governance will advise the internal market of impending changes to a collateral asset's LVR to allow borrowers with open positions to adjust them as may be required to avoid liquidations.

8.5   Adjusting other governance parameters

Note the governance operations presented in this document are only a subset of the Fringe Finance platform governance operations. There are other platform parameters that can be adjusted via governance. Over time and as the platform's behavior and stability becomes increasingly predictable, Fringe will progressively ossify governance parameters. This notion of governance minimization is intended to fulfill Fringe's ongoing aim of increasing censorship resistance and trust minimisation.

9 Price Feeds

The Fringe Finance platform will employ price feeds from well-known and reliable price feed oracles.

Key criteria in selecting a source of price feeds are reliability and resistance to price manipulation attacks. Price manipulation attacks are frustrated by the need for attackers to maintain their price attack for extended periods of time and/or for them to use significant capital to perform a price manipulation attack, therefore making it unprofitable for attackers.

Chainlink has proven to be a reliable source of price data for many of the assets listed already on the Fringe platform, given Chainlink has a set of minimum threshold parameters for which they will establish a price feed. These threshold parameters include a collateral asset's minimum liquidity, minimum daily volume, the spread of exchanges on which an asset is traded and a preference for assets that have a large portion of their volume traded on centralized exchanges off-chain (which limits the ability for price manipulation attacks using on-chain flash loans).

Fringe also prices LP tokens using decentralized AMMs. This enables LP token holders to deploy their LP tokens to Fringe as collateral against which they can take out loans and mint the USB stablecoin.

Fringe is also deploying a new price feed model with further protections against market manipulation attacks and malicious oracles that will strengthen existing price feeds and allow a wider range of price feeds to be used. This will therefore allow Fringe to list even more assets as collateral and lending assets. This new price feed model will include devices that minimize impact from upward and downward price manipulations and 'escape hatches' for lenders to access their capital in the event of price manipulations. It also includes the ability to smooth out discontinuous price reports so that borrowers receive fairer prices for their collateral during liquidations. Fringe's new price model is designed to reduce reliance on third-party oracles as part of our aim to increase censorship resistance and trust-minimisation.

Given the evolving nature of the DeFi landscape, Fringe Finance will continue to assess price feed reliability and performance and will continue to innovate around our price feed mechanisms to ensure the Fringe platform is suitably protected from price manipulation attacks and failure of oracle price feeds.

10 Multi-Chain and Cross-Chain Support

10.1   Multi-chain

Fringe has released Fringe Lending, Fringe Amplify, Fringe Margin Trade and the USB Stablecoin platform on other chains, such as Polygon, Arbitrum, Optimism and zkSync. This will give users of those chains the ability to deploy their assets as capital to earn interest and as collateral to secure loans and trading positions. Fringe intends further deployments of the Fringe platform to additional chains according to market demand.

10.2   Cross-chain

Cross-chain support will include the following facilities:

- **Borrowers**: Ability for borrowers to collateralize loans using collateral on another chain.
- **Borrowers**: Ability for borrowers to also receive borrowed assets on another chain.
- **Lenders**: Ability for lenders to deposit assets using assets on another chain.
- **Lenders**: Ability of lenders to also receive interest payments on another chain.

Fringe Finance will employ proxy contracts to support these cross-chain scenarios. The aim is to enable full composability so that the Fringe Finance Platform can be used flexibly within any number of new DeFi constructs.

Detailed designs and delivery sequence of chain-specific cross-chain bridging will be published once a full review of emerging options and partnerships occur. These will be produced on a case-by-case basis given the specific technical details of each.

The Fringe Finance Platform will employ a combination of Bridging models, Notary models and Hash Time-Lock Contract (HTLC) protocols that are becoming available and are maturing to satisfy the industry's cross-chain requirements. At the time of publishing, a number of candidate technology solutions and HTLC protocols are establishing their viability relating to Fringe Finance's purposes. These include StakerDAO (Algorand, Tezos, Ethereum), Moonbeam (Polkadot◇Ethereum) and Wormhole (Solana◇Ethereum), as well as Bits Labs' cross-chain protocols. Fringe Finance already has partnerships with other blockchains and will be assessing their current and emerging cross-chain bridging facilities.

Fringe Finance is undertaking a systematic analysis of viable technologic solutions to achieve cross-chain collateralization. Our technical team will then prototype a selection of technologies to gauge the trade-offs of each platform before deciding on the set of solutions to be employed to realize this cross-chain collateralization vision.

The key considerations in Fringe Finance's cross-chain collateralization implementation will include security, non-custodianship/trust minimization, user experience, insurability, breadth of token support, breadth of chains supported, cost and restrictions. Fringe Finance may implement varied solutions depending on cross-chain availability and cross-chain type as indicated by the following set of considerations:

	Hash Time Lock	Notary Overcollateralization	Notary Credibility	Bridging Chain (General Solution)	Bridging Chain (Isomorphic cross-chain dedicated solution)
Restrictions	N/A	At least one chain needs to be Turing-complete	N/A	Both chains have to be Turing-complete	Sub-chains to conform to the established framework
Security	High	High	Centralized notaries run the risk of malpractice	High	High
Cross chain Costs	Low	High	Low	Relatively Low	Low
Cross chain Depth	Only cross-chain transactions are possible	Enables assets cross-chain	Enables assets cross-chain	Enables assets cross-chain	Enables cross-chain interoperability of assets and many more forms of cross-chain interoperability

Table 10: Cross-chain model considerations.

Fringe Finance's generalized target conceptual cross-chain architecture will vary according to the considerations tabled above.

In deciding the best cross-chain options to implement, Fringe Finance will take into consideration the community's demand and the best value for FRIN token holders.

11 Fixed Interest

Fringe Finance will in the future provide lenders and borrowers with the option of fixed interest rates. This will be valuable for those who aim for predictability and to enable greater adoption of the platform, especially by institutional actors and DAOs.

Interest rates are a critical input in the construction and valuation of any financial asset. Businesses can avoid interest rate risk by engaging in fixed-rate borrowing. Fixed-rate borrowing is the most common form of borrowing in traditional markets.

In order for large traditional businesses to meaningfully adopt borrowing in DeFi, rates need to be more predictable and stable as compared to the currently prevalent variable interest rates found in DeFi. A business that borrows $100M on-chain paying 2% is very unlikely to be comfortable with the rate spiking to 20% a week later, for example, because of an unrelated liquidity mining farm paying extremely high yields. The business will either want to 1) enter into a fixed-rate, fixed-term loan, or 2) have hedging access for their variable rate exposure.

Fixed interest rates will satisfy the market for on-chain DAO-to-DAO business lending which is expected to grow significantly. As businesses mature, debt financing becomes the major source of funding and DAOs will be no different.

There are various methods by which fixed interest rates can be achieved in DeFi. There are trade-offs between each method and Fringe Finance is continuing to explore these options to determine the most suitable approach and partnerships to adopt to best achieve this strategic roadmap item.

The various methods include the following:

- **Zero-Coupon Bonds:** Whereby the borrower creates a generalized bond token (not to be confused with the FRIN token, $FRIN) that settles on a specific date which can be sold on the open market at a known discount (from which is derived the effective interest rate incurred by the borrower.)
- **Yield Stripping:** Where fTokens are split between the principal and interest components and the interest component is traded away.
- **Stable Rates**: Where the borrower is offered a fixed rate that is higher than the variable rate to account for rate volatility.
- **Contracts for Difference (CFDs) and Interest Rate Perpetual Contracts:** Whereby a collateralized leverage position is taken against interest rates.

A short comparison of some of the trade-offs between these different methods is presented below:

Construction	Capital Efficiency	Explicit shorting possible	Liquidation Risk	Synthetic rate exposure	Leveraged rate exposure	Open-term or fixed-term	Fixed-rate Lending	Fixed-rate Borrowing
Zero-coupon bonds	No	Possible depending on collateral	Medium	No	Possible depending on collateral	Fixed-term	Yes	Yes
Yield stripping	On long side	No	Low	No	Long side	Fixed-term	Yes	Possible

Stable rates	No	No	Medium	No	No	Open-term	No	Yes (until rebalance)
IR perpetual contracts	Yes	Yes	High	No	Yes	Open-term	Possible	Possible

Table 11: Trade-offs between different methods to effectively achieve fixed interest rates.

12 Decentralized UI

The Fringe Finance UI will initially be hosted by the Fringe Finance project. However, to ensure greater decentralization and reduce the likelihood of coercion by, for example, a state regulatory actor, Fringe Finance will allow anyone to deploy the client-side user interface. Fringe Finance will deploy the client-side code on a decentralized file server —such as IPFS (InterPlanetary File System)— from which users can download and execute the client code. The client code will interact with the smart contracts already operating in a decentralized manner on the blockchain.

13 Decentralized backend

The Fringe Finance backend was initially hosted by the Fringe Finance project. However, to ensure greater decentralization and reduce the likelihood of censorship by state actors or hosting providers, Fringe Finance has now released a decentralized backend that employs subgraphs on The Graph. (The Graph records specified on-chain statistical activity that can then be rendered on the Fringe dApp, thus removing the need for a separate Fringe backend.) This is part of Fringe fulfilling its aim to increase its censorship resistance.

14 Insurance

Fringe Finance intends to allow lenders to insure their deposits to the Primary Capital Pool via smart contract insurance. Also, we intend to provide a facility for borrowers on Fringe Finance to take out insurance to protect against collateral asset volatility through its partners –and thus allow a greater loan-to-value ratio to be achieved (or, conversely, allow less likelihood of a loan falling below the minimum collateralization ratio and therefore being subject to liquidation).

The process for this will entail:

- A borrowing process (purchasing insurance policy) that improves the value of the borrower's collateral.
- Therefore, our platform takes the ERC-721 token that represents the borrower's insurance position.
- Users can select the amount of coverage they wish through a sliding scale to allow them to set out their risk vs cost preferences.

Possibly this process could entail a binomial options pricing model using historical volatility.
This model of insurance that Fringe Finance intends to pursue is where the insurance facility is able to balance low-cost premiums, security and user experience with respect to purchasing coverage and making claims.

To achieve low-cost premiums, it is necessary that the insurance protocol is able to spread risk across a number of DeFi protocols. Since the insurance is hosted by the Fringe Finance platform and targets only Fringe Finance positions, it is not possible to spread risk across a number of other DeFi protocols. Hence, this will result in inefficient insurance provision and higher-cost premiums for our platform participants.

Therefore, we believe it is in order to partner with external DeFi insurance providers to meet our platform's and users' goals where appropriate.

15 Composability

The Fringe Finance Platform's various services, including lending, borrowing, insurance and fixed-interest, are and will continue to be presented in such a way so as to enable composability. This will allow the Fringe Finance Platform's services to be employed by third-party solutions that specialize in niche markets, whereby our services can be extended to the customers of those third-party solutions.

We see this as a key factor in the long-term success of the Fringe Finance platform—since we anticipate the DeFi ecosystem to continue to grow over time and as more and more third-party solutions provide services to a growing global permissionless marketplace, composability will ensure a growing and long-term use of the Fringe Finance Platform.

Accordingly, Fringe Finance will provide detailed smart contract technical documentation to allow other projects to integrate with its platform in a composable manner.

16 Other advanced features

Fringe Finance is currently testing the following advanced features in preparation for release to mainnet:

16.1.1 Atomic Loan Repayments

Atomic loan repayments allow borrowers to repay an open loan position using the collateral assets securing the loan. This offers borrowers the convenience of not needing to have assets on hand to repay the loan.

Fringe Finance will employ a decentralized exchange to swap some of the loan position's collateral assets for the lending asset to repay the loan's borrowed lending position. Remaining collateral assets are retained by the user.

17 Terms used in this document

Term	Meaning
PIT Token	Primary Index Tokens, which represent a borrower's borrowing capacity based on the collateral they have deposited multiplied by the asset's LVR. PIT Tokens are issued by both the Fringe Lending Platform and the USB Platform in response to borrowers depositing collateral assets . PIT Tokens are non-transferable and are a way to represent the borrower's borrowing capacity. Though PIT tokens are issued both on the Fringe Lending Platform and the USB Platform, their borrowing capacity is only recognized on the platform on which the collateral is deposited. i.e. PIT tokens on the Fringe Lending Platform are not recognized nor transferable to the USB Platform.
$USB	Fringe Finance's USD-pegged stablecoin.
Primary Capital Pool	Capital pool into which lenders deposit capital. There is a Primary Capital Pool for each asset type that lenders can deposit into the Fringe Lending Platform.
Primary Collateral Safe	Collateral location specifically linked to the user into which borrowers deposit collateral, against which they secure collateralized loans from the Primary Capital Pool. A user may have multiple Collateral Safes - one for each asset type, against which they may borrow capital assets.
USB Collateral Safe	Collateral location specifically linked to the user into which ($USB) Minters deposit collateral, against which they secure loans (minting) of USB stablecoins. A user may have multiple Collateral Safes - one for each asset type, against which they may borrow capital assets.
Liquidation Threshold	Threshold of a lender's loan position that triggers liquidations. This is Collateral Value * LVR
LVR	Loan-to-Value Ratio. This represents a collateral asset's borrowing capacity. This is represented as a percentage between 1% and 100%. For example, a token with an LVR of 60% would allow the user to borrow $600 of capital assets for each $1000 in collateral value before it was subject to liquidation. To note: On the USB Stablecoin Platform, select stablecoins will have an LVR of 100%. The reason for this is to enable arbitrage opportunities to bring the value of $USB back to its $1 peg in the event $USB diverges from $1.
Maximum Borrowing Capacity (aka. Debt Limit)	The maximum amount that can be borrowed by all borrowers against a collateral asset type across the Fringe Lending Platform or USB Stablecoin Platform.

Rewards Pool	A pool of funds allocated to be distributed to stakers. There will be different rewards pools to incentivize various participation and different stakers in the Fringe Finance ecosystem.
Reserve Pool	A pool of Reserve funds accumulated from a portion of interest paid by borrowers. These Reserve funds can be deployed by the Governance process for any variety of use cases to either stabilize the platform, ongoing development, platform operations or benefit FRIN token holders.
fTokens	Lenders deposit whitelisted stablecoins to the Primary Capital Pool and receive fTokens in return to reflect their deposit. The Primary Capital Pool is composed of separate markets of each whitelisted stablecoin. fTokens are the interest-earning representation of users' deposited capital assets.

Table 12: Glossary of terms used in this document.