FiRM: The Fixed Rate Money Market Protocol

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Abstract

The Fixed Rate Market or "FiRM," is a new DeFi lending market protocol from Inverse Finance that implements a new DeFi primitive, DOLA Borrowing Rights, and a novel money market architecture, Personal Collateral Escrows. DOLA Borrowing Rights provide a rights-based approach to lending that solves for the volatility of variable interest rate lending and the constraints of conventional fixed rate interest lending. Users benefit from the certainty of fixed-rate loans while gaining optionality and speculative opportunities from borrowing rights. Personal Collateral Escrows isolate collateral deposits by individual wallet address, allowing for more efficient use of their collateral such as retention of voting rights for governance tokens deposited as collateral.

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Introduction: Twin DeFi Industry Challenges

The release of the Compound Finance whitepaper[1] in February 2019 began a revolution in decentralized finance. Three years later, the growth limits of its lending market model are clear and stem from two increasingly limiting features: variable rate lending and cross-collateral asset pools.

Variable rate lending often requires borrowers to accept high levels of interest rate volatility, uncertain interest expenses, and increased risk of liquidation. Variable rates, due to their use by leading stablecoin projects to manage their US dollar pegs, can themselves be seen as contributing to the historical instability of DeFi markets.

Separately, cross-collateral lending protocols require lenders and borrowers to mix their collateral assets into a common pool with other users. The rehypothecation of that collateral in the form of loans drives the risk of collateral theft while limiting the utility of many governance tokens. Cross-collateral lending pools also bring oracle and insolvency risks due to their inability to cap borrows according to collateral type.

[1] https://compound.finance/documents/Compound.Whitepaper.pdf

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Despite many popular lending protocols embracing both variable rates and cross-collateral asset pools, to expand DeFi lending into broader markets and begin to address the multi-trillion fixed rate lending opportunity, it is essential for the DeFi industry to chart a clear path towards more sustainable and predictable lending practices.

The Challenge of Variable Interest Rate Volatility

Conventional DeFi lending involves borrowing tokens at a variable interest rate where interest on the borrowed principal is accrued according to a time- or event-based formula. However, unlike traditional commercial or consumer lending, variable rates in DeFi are not ultimately driven by a central bank's interbank lending rate but rather by the actual supply and demand for a given token in a decentralized lending market, based on sub optimally parameterized interest rate curves. For stablecoin projects, the supply of stablecoins to lending protocols may also be expanded or contracted by the project's operators to force the price of the stablecoin to return to its US dollar (USD) peg[2] or projects may simply change the interest rate on loans independently. Historical analysis of variable interest rates in DeFi demonstrates high volatility:

Table 1: Aave Variable Lending Rates - Dec 2020 through Sept 2022

	DAI	USDC	USDT
Max Variable Rate	78.60%	38.03%	53.90%
Min Variable Rate	1.56%	0.00%	0.84%
Range	77.04%	38.03%	53.06%
Std. Deviation	**9.58%**	**6.06%**	**8.10%**
Mean Variable Rate	7.01%	5.73%	6.86%

Source: Ration/Aave

Using the historical lending data in Table 1 above, volatility, as measured by the standard deviation of the day-to-day variable interest rates available on Aave, illustrates the unpredictability of variable borrowing rates in DeFi. The impact of unpredictability on investor[3] behavior[4] is well-documented and such volatility, left unchecked, will limit the long-term market for DeFi lending.

Another issue with variable rates is the lack of an optimal interest rate calculation mechanism. Compound and Aave use arbitrarily configured utilization rate-based curves that lead to suboptimal rate pricing and

[2] https://cryptoslate.com/makers-dai-approaches-1-peg-following-aggressive-interest-rate-hikes-and-tether-fallout/
[3] https://www.aeaweb.org/articles?id=10.1257/aer.104.1.27
[4] https://direct.mit.edu/rest/article-abstract/94/2/517/57936/Policy-Uncertainty-and-Household-Savings?redirectedFrom=fulltext

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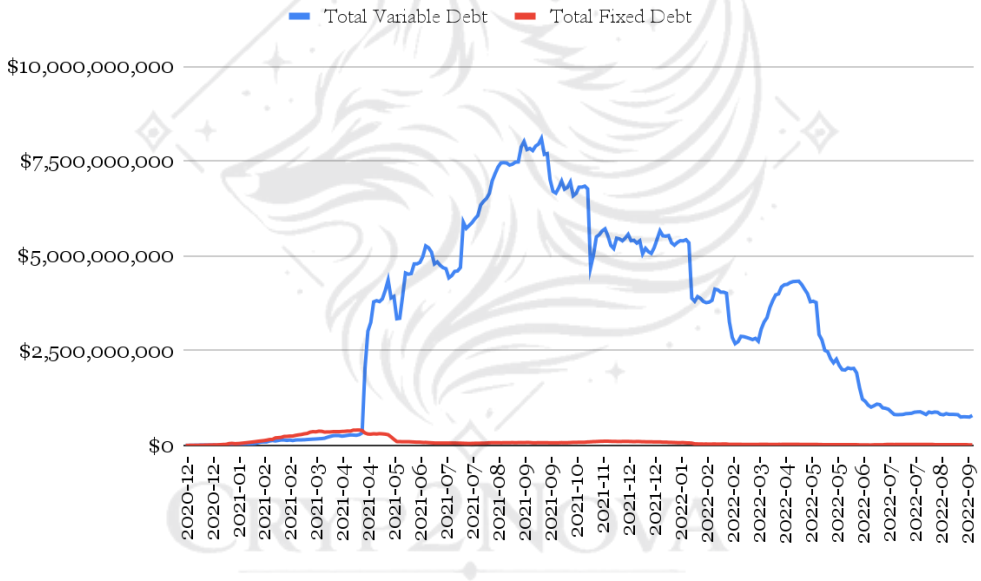
therefore suboptimal borrow liquidity utilization, whether it's under- or over-utilization. Interest rate pricing should instead be market-driven to ensure optimal pricing and borrow liquidity utilization. Prior protocols have struggled to find a solution to this problem.

DeFi "early adopters" may share an appetite for risk that discounts or even ignores the uncertainty of variable rate lending as interest rates tend to rise in line with earning opportunities, however for the DeFi industry to rival TradFi lending volume requires addressing a far larger "early majority" market segment who are less prone to thrill-seeking and instead seek more predictable borrowing costs and DeFi returns.

Challenges of Conventional Fixed Rate DeFi Lending

A smaller segment of the DeFi lending industry today, fixed-rate lending, has to date failed to gain meaningful market traction:

Chart A: Variable vs. Fixed Rate Debt on Aave (DAI, USDC, & USDT)
Dec 2020 - Sept 2022



This result, however, is not for a lack of good effort: multiple projects have approached the opportunity from the most basic direction - direct fixed-rate lending (e.g., Notional Finance) to yield splitting (Element, Pendle) to tranching (BarnBridge), and finally, even interest rate swaps (Voltz). Most require relatively short and fixed maturity dates, regular interest payments, limited collateral options, and interest rates that are far higher than variable rates. Similarly, "stable rate" lenders like Aave, where the lending protocol reserves the right to change a fixed rate in the event borrowing surpasses 90% utilization, may offer less restrictive loan terms but also at unattractively high interest rates. For purposes of this whitepaper, we will rely in part on the analytics[5] from the team at Aave who offer "stable" rate lending and whose data is used

[5] https://app.rationcsv.com/preset/d283f0fd-e0d0-40da-988a-4bf9b2649a2c

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here as a proxy[6] for adoption across all stable- and fixed-rate lending markets. All forms of fixed and stable rate lending are referred to here as "fixed" for simplicity.

Difference in Debt Levels	
Mean	**63 x**
Median	**62 x**

Using Aave's data we can see that the mean difference between variable and fixed rate debt levels on Aave during a 21-month period was 6,305% (63x). The very modest adoption of fixed rate DeFi lending is largely due, we believe, to high historical fixed borrowing rates:

Table 2: Aave Fixed Lending Rates - Dec 2020 through Sept 2022			
	DAI	USDC	USDT
Max Fixed Rate	83.60%	43.03%	61.90%
Min Fixed Rate	5.09%	4.00%	4.42%
Mean Fixed Rate	**14.62%**	**12.63%**	**14.49%**
Std. Deviation	8.88%	5.40%	7.67%
		Source: Ration/Aave	

Mean fixed rates over a 21-month period for DAI, USDC, and USDT average 7-8% higher than variable rates for the same period:

Table 3: Aave Difference Between Mean Variable and Fixed Lending Rates - Dec 2020 through Sept 2022			
	DAI	**USDC**	**USDT**
Mean Variable Rate	7.01%	5.73%	6.86%
Mean Fixed Rate	14.62%	12.63%	14.49%
Mean Fixed Rate Risk Premium	**7.61%**	**6.91%**	**7.63%**
% Difference	209%	221%	211%
		Source: Ration/Aave	

[6] The modest TVL of all fixed rate lending protocols and even the viability of some projects led us to rely on the more statistically reliable and robust data from Aave, even if its "fixed" rates are not truly fixed. Also, worth noting Aave's dominance across DeFi lending https://defillama.com/protocols/Lending

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While borrowers may enjoy benefits[7] of a fixed interest rate under this lending model, the outsized risk premium reflects the volatility of variable rates, and more importantly, the constraints of an outdated lending paradigm. Fixed-rate lenders not only require compensation for their opportunity cost of capital at least at the same rate as variable-rate lenders, but they additionally need to be compensated for the opportunity cost of foregoing profits from the variable rate volatility. The option value of profiting from variable rate volatility is reflected in the fixed rate premium. We contend that this optionality is inefficiently priced and crudely structured both for borrowers but also for lenders who as a result may receive lower revenues. A more coherent approach is needed if DeFi lending volumes are to ever rival TradFi.

Token Borrowing Rights: A New DeFi Primitive

A promising approach for eliminating interest rate volatility and creating a more attractive fixed-cost lending regime isolates the interest expense in a loan and restructures it as a *borrowing right*. In this new paradigm, a lender mints a special fungible token known as a Token Borrowing Right or "TBR" that provides its holder with the right, but not the obligation, to borrow a specific token for a fixed period. Similar in certain respects to a perpetual call option[8], TBR's are purchased before a loan is issued and are spent over time relative to the amount of the loan. Unspent TBR's may be held as a hedge on rising rates or traded on the open market for speculative purposes.

How Token Borrowing Rights Work

A loan using TBRs implements two smart contracts. The first is the market contract that facilitates the lending of a token based on the deposit of approved collateral. The second is a TBR token contract referenced by the market contract. To execute a loan on the market contract, the user is required to have a positive TBR balance in their wallet.

Upon executing the loan, a user's TBR balance begins to decrease linearly over time in proportion to the value of the loan, on terms specified in the lending contract. For example, one TBR is spent for every token borrowed for 12 months.

A TBR-based loan must always reference a TBR balance greater than or equal to zero in a user's wallet. As the TBR balance approaches zero, the user may add additional TBR's to their balance to avoid forced replenishment at an unfavorable price. To guarantee repayment, if a loan's value falls below the specified collateral factor, liquidation may occur.

DOLA Borrowing Rights

The first implementation of Token Borrowing Rights has been developed for Inverse Finance's[9] DOLA stablecoin: DOLA Borrowing Rights or "DBR's." DBR-based borrowing solves for the volatility problem

[7] Aave does not guarantee a fixed rate if token utilization rises above 95% where it may undergo "rebalancing" https://docs.aave.com/faq/borrowing

[8] May also be compared to an energy storage capacity futures contract.

[9] Note that whenever the term "Inverse" is used it refers to Inverse Finance DAO. www.inverse.finance.

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of variable interest rates while providing a more flexible and efficient alternative to most fixed-rate DeFi borrowing regimes.

Table 4: Comparison of DeFi Borrowing Methodologies				
	DBR-based Fixed Cost Borrowing	**Fixed Rate Borrowing**	**Stable Rate Borrowing**	**Variable Rate Borrowing**
Example	***Inverse Finance***	*Notional*	*Aave*	*Compound*
Real fixed borrowing costs	**Yes**	Yes	Mostly	No
No interest rate rebalancing or modifications possible	**Yes**	Yes	No	No
No maturity dates	**Yes**	No	Yes	Yes
Reduced borrowing expense uncertainty	**Yes**	Yes	Mostly	No
Reduction or elimination of protocol-wide liquidations	**Yes**	Yes	No	Yes
Reduced risk of individual liquidations	**Yes**	Yes	Mostly	No
Option to trade unused borrowing rights for profit	**Yes**	No	No	No
Option to lock-in an interest rate and borrow in the future	**Yes**	No	No	No
Borrower-friendly alternative to the management of variable rates for purposes of stablecoin peg management	**Yes**	No	No	No
			Source: Ration/Aave	

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Borrowing DOLA With DBR's

The DOLA Borrowing Right, or "DBR", provides a holder of one DBR with the right to borrow one DOLA for one year.

Users may elect to limit their upfront DBR expense when executing a loan and instead add more DBR's later. Users may add additional DBR's to their wallet at any time to extend the length of the loan or support additional loans. There are no maturity dates. Additional DBR's may be procured from the open market at any time.

The borrowing process retains most of the conventional DeFi borrowing user experience including depositing collateral and borrowing stablecoins; the process of acquiring and spending DBR's to execute a loan, however, is novel.

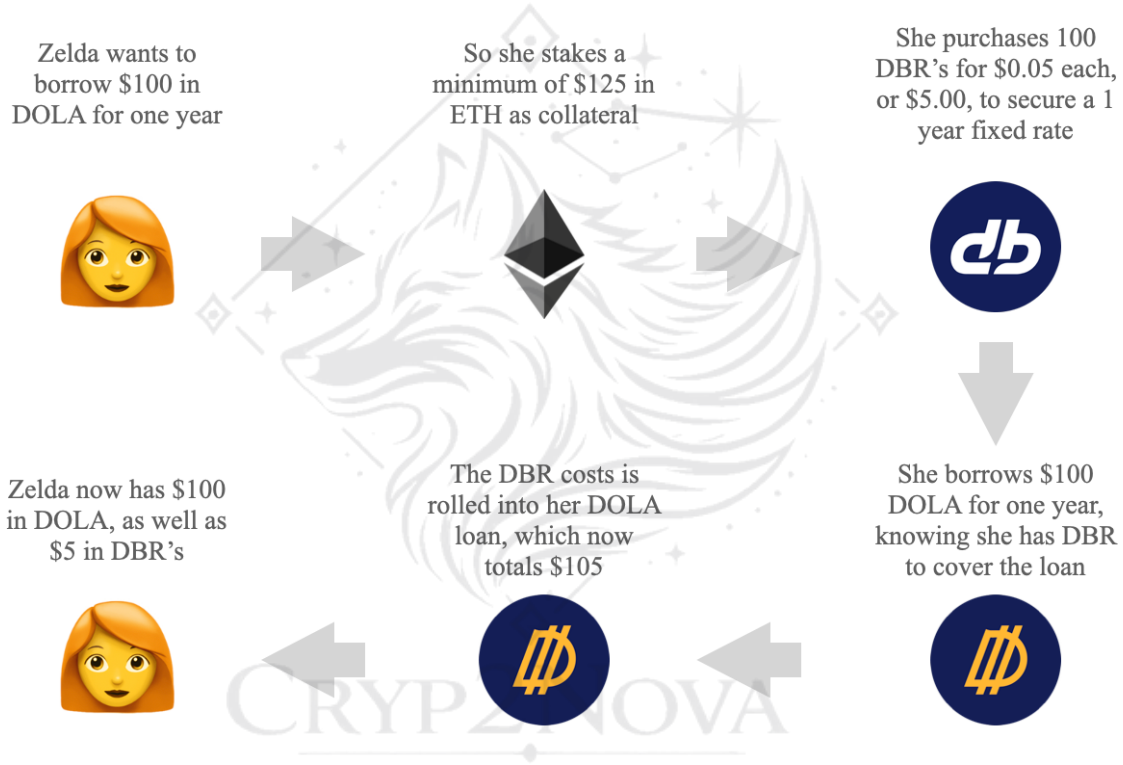
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A user's DBR balance is spent on a pro-rata basis at a rate equivalent to 1 DBR spent per 1 DOLA borrowed per year:

$$DBR_{max} = \frac{(\text{DOLA To Be Borrowed})(\text{Loan Length in Days})}{365}$$

or .00273973 DBR's per day per DOLA borrowed. An example of the process for a simple DOLA loan using DBR's:

Chart B: Simple DOLA Loan Using DOLA Borrowing Rights



Note that in the above example the cost of the DBR's may not necessarily be automatically rolled into the cost of loan if instead the DBR's are purchased on the open market. The cost is only rolled into the loan if Zelda opts to use a special helper feature within the inverse.finance app to buy DBR using DOLA debt.

Loan Repayment & Recharging

As there are no maturity dates or regular (e.g., monthly) payments for loans in the FiRM system, borrowers have multiple options for extending or repaying loans.

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1. ***Repay loan early.*** Users may repay a loan at any time with no early repayment penalty. Unused DBR's may be held by the user for future loans or sold on the open market. By repaying a loan before DBR balance reaches zero, a user avoids high forced replenishment charges.
2. ***Extend loan manually.*** As a user's DBR wallet balance decreases over time users may manually add DBR's to their wallet before their DBR balance approaches zero by purchasing DBRs on the open market. There is no maximum length of a loan if a user's DBR balance is above zero, and a user may add DBR's to a loan position in perpetuity.
3. ***Extend loan via Recharge.*** While most borrowers will maintain a positive DBR balance or repay loans early, to encourage healthy borrowing Inverse implements a forced replenishment feature called Recharge to minimize unwanted liquidations. If a user's DBR balance turns negative while borrowing DOLA, additional DBR's are added by Inverse at regular intervals to a user's wallet to maintain a positive DBR balance. The cost of additional DBR's during Recharge is paid by adding DOLA debt to the user's loan balance. DBR's purchased via Recharge is priced at a substantial premium to market DBR pricing to incentivize responsible loan management and to avoid having to rely on oracle infrastructure. The Recharge feature can be repeated if the borrower fails to replenish their DBR balance or repay their loan, until the borrower's DOLA loan balance reaches the maximum collateral factor for the loan, triggering a liquidation process.

Liquidations

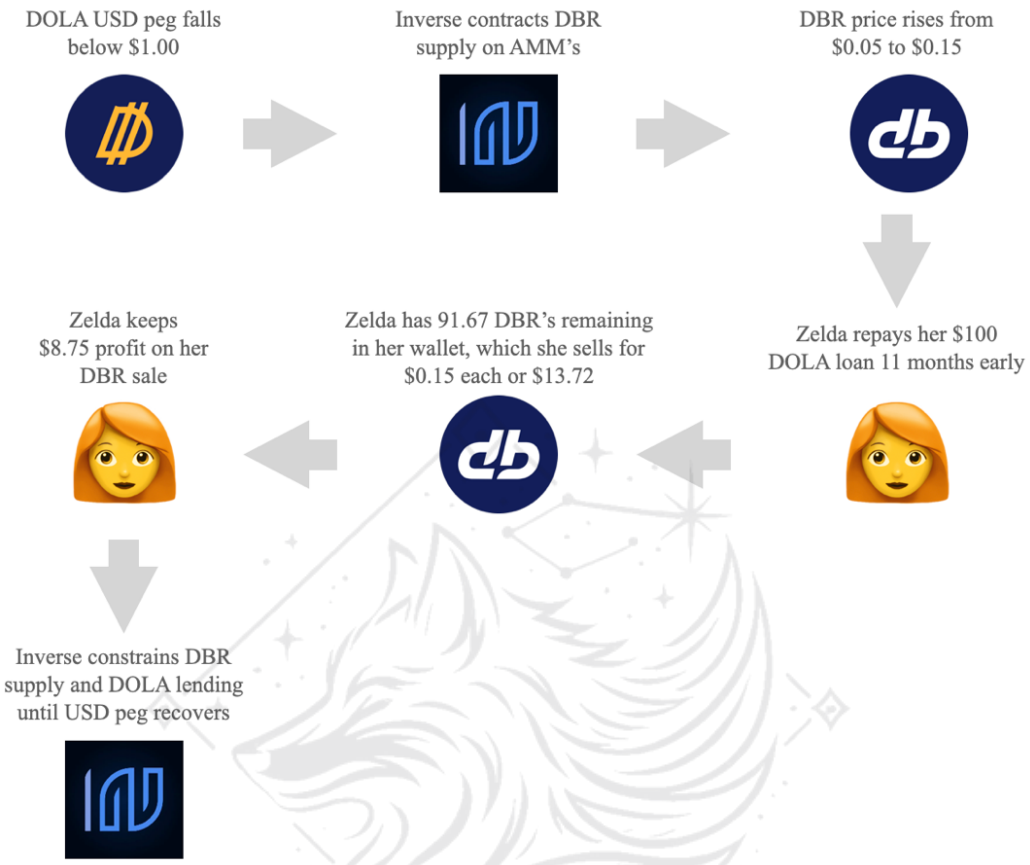
The liquidation process follows common DeFi liquidation practices where a fee (e.g., 10%) is collected by third-party liquidators who successfully repay loans that have become eligible for liquidation due to a breach of a borrower's collateral factor. An additional liquidation fee may also be charged by the Inverse Finance DAO treasury.

DOLA USD Peg Stabilization

An important aspect of DBR monetary policy is the stabilization of DOLA's $1.00 peg. When DOLA's peg rises *above* $1.00, additional DBRs are minted and sold into the market, lowering fixed borrowing costs, and creating additional demand for DOLA loans and, ultimately, providing the additional supply of DOLA required to return DOLA to its peg. When DOLA's peg falls *below* $1.00, the rate at which new DBR enters the market is reduced which creates upward pressure on DBR prices and incentivizes borrowers to repay DOLA loans early to trade unused DBR's for a profit. As DOLA loans are repaid, DOLA is burned.

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Chart C: DOLA USD Peg Stabilization Using DBR's



The DOLA peg is further stabilized through conventional DOLA supply expansion and contraction on partner variable rate lending markets and other DOLA Feds.

Use Cases for DBR-based Loans

The introduction of DBR's provides for a broader set of use cases for DOLA loans than is typically possible or practical with variable rate loans. A sample of these new use cases includes

- ***Yield Farming.*** DBRs enable yield farmers to borrow at predictable rates over long time periods, eliminating the uncertainty of interest rate spikes common in variable rate lending. Yield farmers who "loop" their strategies are assured that their DOLA borrowing rate will not spike and eventually trigger a cascade of liquidations. Additionally, in the case where yield farming activities rise, a farmer utilizing DBR could capture profits (from higher DBR prices) at the very moment that underlying farming activities are becoming less profitable.
- ***Real World Assets.*** DBR's are ideal for borrowers financing "real world" assets ("RWA's") like home down payments, a car, or college tuition. Financing costs can be fixed for many years and like yield farming, DBR's solve for the uncertainty of variable rate borrowing or the hidden costs of other "fixed rate" lending. DBR's also enable sellers of RWA's like a home to "transfer" their

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(below market rate) DBR's along with the asset itself to a buyer, like real-world assumable mortgages.

- ***Rate Locking.*** Potential borrowers wishing to "lock in" a borrowing rate in advance of executing a loan can do so by purchasing DBR's and holding them until the loan is executed. Borrowers and investors concerned about future rate increases may wish to accumulate DBR's as a hedge against future rate rises.
- ***Insurance/Cover.*** DBR's enable users to borrow at a fixed rate to purchase cover from projects like Nexus Mutual, making the cost of using leverage to purchase cover more predictable.
- ***Collars.*** DBR's enable users to limit downside losses on assets by borrowing at a fixed rate against the asset to purchase put options from projects like Hegic, making the cost of using leverage to collar a position more predictable.
- ***Rate Arbitrage.*** DBR's enable traders to implement new interest rate strategies that rely on fixed rate leverage to execute against arbitrage opportunities with rates on other lending protocols or even with TradFi instruments like U.S. Treasury bonds, since both borrowing costs and bond yields are fixed.
- ***DAO Treasury and Payroll Operations.*** DBR's enable DAO's to borrow against dormant Treasury assets without the uncertainty of variable rates, enabling the Treasury to fund operational expenses like payroll or liquidity mining. DAO expenses can be paid utilizing DBR's to avoid negative price action on governance tokens, which themselves can be safely and predictably staked as collateral for DOLA loans.

Additional use cases for DBR's include:

- ***P2P DBR Lending.*** Loan DBR's from your wallet. Borrow DBR's from another holder at market- or below-market rates if you agree to repay with the DBR's you borrowed plus additional DBR's as "interest." Short DBR, if you prefer.
- ***DBR Savings Lockers.*** Accumulate DBR's on a DCA basis or buy-and-hold in anticipation of a need for low rates for a future loan. Lock DBR's for extended time periods for very long-term planning purposes, with incentives to encourage long-term locking.
- ***DBR Futures.*** Agree to buy or sell DBR's later using leverage. Synthetic versions of DBR's on perpetual futures exchanges provide additional opportunities for hedging or speculating.
- ***DBR Take Profit.*** Utilize products such as Uniswap v3 ranges to a) speculate on higher interest rates or b) take profits at a predetermined interest rate target.

The Challenges of Cross-Collateral Asset Pools

In April 2022 and June 2022 Inverse Finance was subject to oracle price manipulation incidents that took advantage of the cross-collateral pool design of Inverse's money market currently known as Frontier. Both attacks manipulated the oracle price for certain collateral assets which allowed the attacker to withdraw other borrowable assets that are currently considered bad debt by Inverse Finance DAO[10].

[10] https://www.inverse.finance/transparency/shortfalls

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The cross-collateral pool design is required for Compound-fork money markets which accept deposits from lenders who in turn receive most of the interest paid by borrowers. However, all deposits are combined or "pooled" to facilitate liquidity as well as the freedom for depositors to then borrow from among a selection of borrowable assets regardless of their underlying collateral deposit.

As evidenced by multiple exploits[11], the cross-collateral pool design creates a single point of failure for the protocol should an attacker gain access to this combined pool of assets. In response, some lending protocols have sought to circumvent this weakness of cross-collateral pools by creating *isolated* lending pools which rather than pooling all collateral into a common pool, isolate deposits according to collateral name. For example, in isolated pools, all WETH deposits remain within a single WETH pool and are never mixed or co-mingled with WBTC or other tokens. While this reduces the single point of failure inherent in the cross-collateral pool mentioned above, the user in the isolated pool example still mixes his or her WETH collateral with the WETH collateral from other users and magnifies the risk in the event of unauthorized access. Therefore, while in some ways isolated pools are an improvement over the original Compound design, this approach only partially mitigates the security risks.

The limitations of both the cross-collateral and isolated pool designs extend further as the lender of the collateral must surrender rights to governance, revenue sharing, rebasing, or other rights available only to token holders. The borrowers of that deposited collateral instead become the beneficiaries of all governance and other utility in the token. In summary, we believe DeFi lenders today require depositors to absorb excess collateral deposit risk with high constraints on token utility.

Personal Collateral Escrow: A New DeFi Lending Market Architecture

Mostly unexplored to date is the concept of a collateral deposit that remains isolated not only by the collateral name (e.g., ETH) but also according to the individual depositor. Pooling of assets, whether cross-collateral or isolated, is eliminated.

The main benefits of this approach are two-fold. First, by disaggregating similar collateral deposits by user (wallet), each depositor unlocks new collateral utilities that were not possible in a pooled mode such as access to governance voting. Second, the single point of failure inherent in the pool approaches described above is instead distributed across many users creating a less attractive target for attackers.

Third, this new approach to DeFi lending market design, Personal Collateral Escrow or "PCE," implements an additional critical step: unlike most conventional lending markets, PCE's prohibit the borrowing of deposited collateral. In the case of Inverse Finance's implementation of PCE's, borrowing is limited to its debt-backed stablecoin, DOLA.

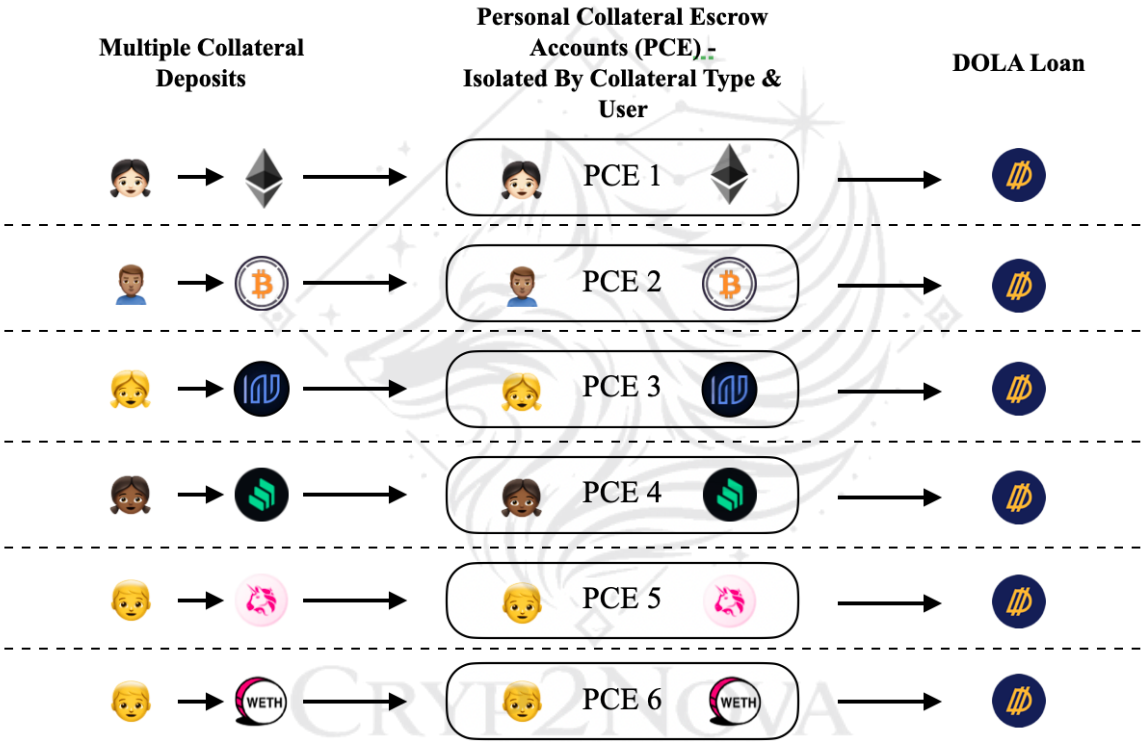
[11] https://decrypt.co/93874/biggest-defi-hacks-heists

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Depositing & Borrowing with PCE's

The user experience for depositing collateral (e.g., ETH) and borrowing DOLA in the PCE paradigm is virtually identical to that of cross-collateral markets. The existence of the underlying smart contracts supporting PCE features is hidden from the user.

Chart D: Personal Collateral Escrow Deposits & Borrowing



Unlocked Governance Token Utility

A significant drawback of cross-collateral and isolated collateral pools is the lender's loss of governance and other rights when collateral is deposited. A token that is loaned via cross-collateral pool transfers all rights to voting, revenue sharing, and other utility to the borrower of the token.

PCE's conversely prohibit the rehypothecation of all deposited collateral and utilize a wrapping process that allows users to retain all governance and related utility in their collateral. This "liberates" governance token holders who previously were unable to move their governance tokens to lending protocols for fear of losing governance voting power and other rights.

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Security

While no lending protocol is completely immune to hacks, PCE's were designed to enable multiple new layers of security.

First, by isolating deposits in such a granular fashion compared to cross-collateral pools, PCE's no longer offer intruders a single pool of assets to target but rather many, smaller targets.

Second, with a PCE a depositor's collateral cannot be loaned. Since the only borrowable asset in Inverse Finance's implementation of PCE's is DOLA and since borrowable DOLA is capped per collateral asset, the potential impact of a price oracle manipulation incident is reduced to an undue liquidation.

Inverse Finance implements two additional security measures for FiRM. First, a newly designed Pessimistic Price Oracle (PPO) uses the lower of either the current collateral price on Chainlink or the 48-hour low price as observed by the PPO, divided by the collateral factor. For example, if the current Chainlink price is $1,500 and the 48-hour low was $1,000 and the collateral factor is 80%, the PPO returns $1,250.

This approach further discourages potential oracle price manipulation attacks by preventing users from borrowing against more than the lowest recorded value of their collateral over the prior two days. It is likely that this approach will also encourage healthier borrowing and fewer liquidations.

Second, a daily borrow limit sets a ceiling on the total amount of DOLA available for loans on any given day in each market. A daily borrow limit helps Inverse reduce its risk exposure on a per-market basis and in the future will allow for the support of more high-risk collateral assets. This limit is adjusted regularly by the Inverse risk team as the system matures.

Customized Lending

While not initially implemented by Inverse, unlike conventional pools, PCE's allow the operator of the money market to enable custom lending policies for individual deposits. For example, in the future, Zelda's DAO may qualify for a higher-than-average collateral factor and a lower-than-average liquidation fee for a loan against ETH, while Scott's DAO may only receive standard terms on its loan.

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PCE Summary

Benefits of PCE's over more conventional collateral pools:

Table 5: Comparing DeFi Collateral Deposit Methodologies			
	Personal Collateral Escrow	**Cross-Collateral Asset Pool**	**Isolated Collateral Asset Pool**
Example	***Inverse Finance***	*Compound*	*Abracadabra*
Collateral isolated by token name	**Yes**	No	Yes
Collateral isolated by user/wallet	**Yes**	No	No
Collateral Not Loaned/Guaranteed Ability to Withdraw Deposited Collateral	**Yes**	No	Varies
Retain full governance and other ancillary rights of deposited collateral	**Yes**	No	No
Option to customize loan parameters by user	**Yes**	No	No
High resistance to flash loan attacks	**Yes**	No	No

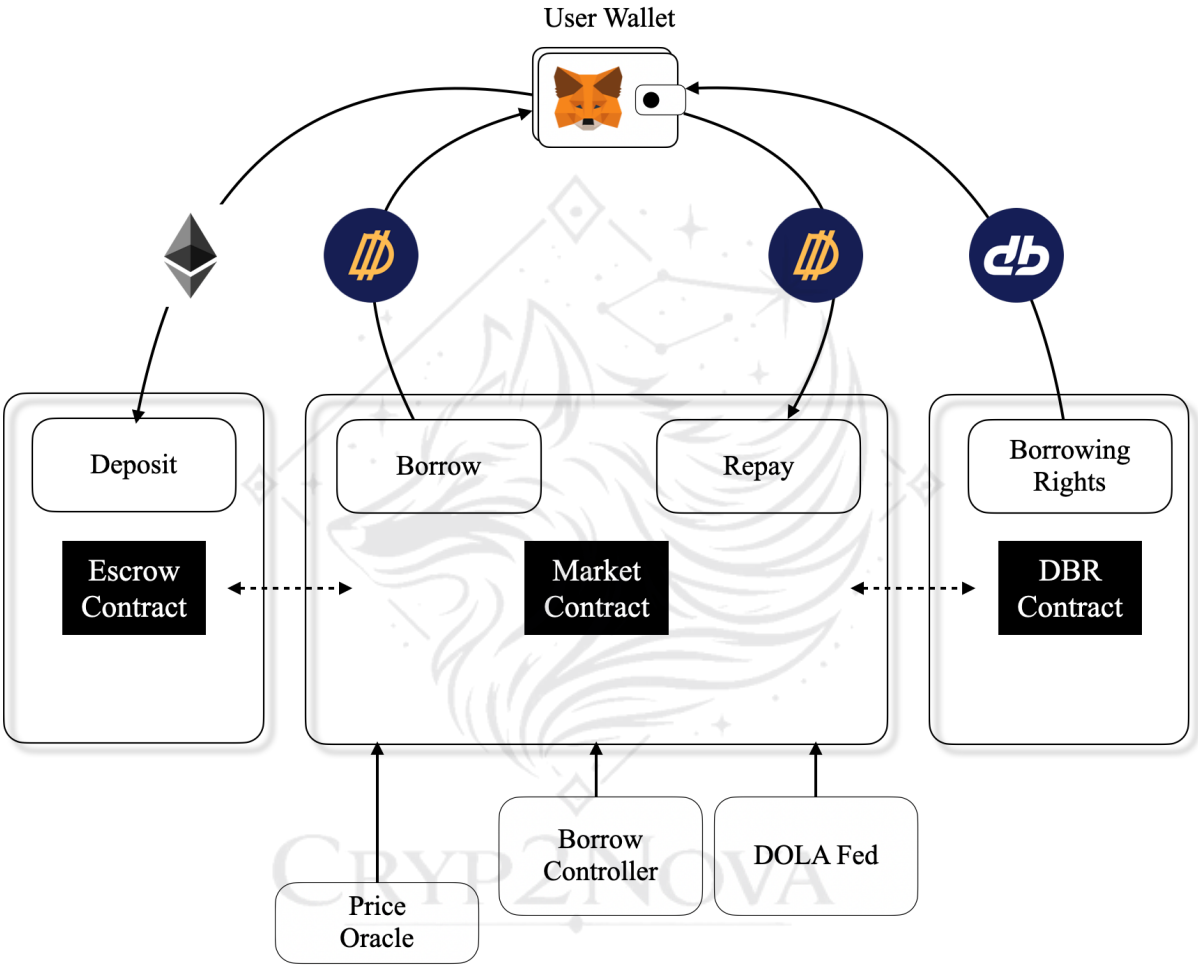
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FiRM System Architecture

The FiRM system that implements both DBR's and PCE's utilizes a series of smart contracts on the Ethereum blockchain at launch (though other L1 and L2 chains are currently being contemplated). All contracts are available for review on the Inverse GitHub page[12].

Chart E: System Architecture & User Wallet Transactions



The system is implemented with three foundational smart contracts:

1. **Escrow Contract.** Each wallet has a unique escrow contract, one for every borrower of every deployed market. Their primary purpose is holding a borrower's collateral.
2. **Market Contract.** The market contract is the central contract of the FiRM protocol and contains most logic pertaining to borrowing and liquidations. A DOLA Fed mints DOLA to a market, which is then available to borrow for users holding DBR, using the Borrow function.

[12] https://github.com/InverseFinance

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3. **DBR Contract.** The DBR contract is a non-standard ERC-20 contract. As a user borrows DOLA via any of the supported Market contracts, DBRs are slowly burned from the user's wallet to pay for the cost of borrowing. No gas costs are incurred by the user when DBR's are burned.

Use Cases for DBR-based Loans Using PCE's

In addition to use cases enabled by DBR's, PCE's themselves also enable unique use cases not easily implemented under conventional Compound-based lending protocols. A sample of these new use cases includes

- ***Governance tokens as collateral.*** An excellent use case for PCE's is the ability to use highly sought-after governance tokens as collateral on a money market. With PCE's, holders of strategic governance tokens like UNI, COMP, and others can borrow against them via FiRM while preserving the right to vote on important governance matters, receive revenue sharing, etc.
- ***Permissionless undercollateralized or "sub-prime" lending.*** While not a primary or even secondary use case for PCE's, the ability to customize lending policies for low-volume tokens with low market capitalization can be made safer using stricter collateral factors, higher liquidation fees, low borrowing caps, and even higher DBR costs. Similarly, undercollateralized lending can be enabled through similar customization if desired.

Conclusion

The reformulation of loan interest expense as a borrowing right solves multiple foundational challenges for the DeFi industry, while again highlighting the ability of decentralized smart contracts to accomplish more elegant and more composable lending than is possible with traditional "off-chain" financial systems. By implementing DOLA Borrowing Rights and Personal Collateral Escrows, the DeFi industry brings a more secure and less volatile set of lending tools to allow broader segments of the financial services industry to realize the full potential of decentralized finance.

For Inverse Finance, this opens a range of new lending opportunities including serving DAO credit needs, institutional desire for risk limited DeFi exposure, and desire by speculators to capture better returns. With borrowing rights and personal collateral escrows as new foundational infrastructure, the new product and new feature development pipeline for Inverse Finance is expanding in new and exciting ways.

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