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Vigor 2.0

Economic Model

0rigin Labs

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Contents

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1 Introduction

Vigor was among the first generation of on-chain lending platforms. It was unique amongst its peers as it utilised a volatility risk-based approach using models that are prevalent in traditional asset derivative markets. Whilst this was the correct mathematical approach, there were several challenges that left the system impaired and ultimately unused.

We have addressed those challenges in Vigor 2.0, including simplifying and deconstructing the model, in order to meet performance expectations whilst managing resource usage in a blockchain environment. This also allows a modular approach for future development with multi-product and multi-chain integration.

Crypto assets have differing, yet high, specific risk and high correlations. Vigor 2.0 is built upon single Local asset-collateralised borrowing pools that create their own USD denominated stablecoins. Each Local stablecoin can be used (spent) or added to a global liquidity pool which generates the Meta stablecoin.

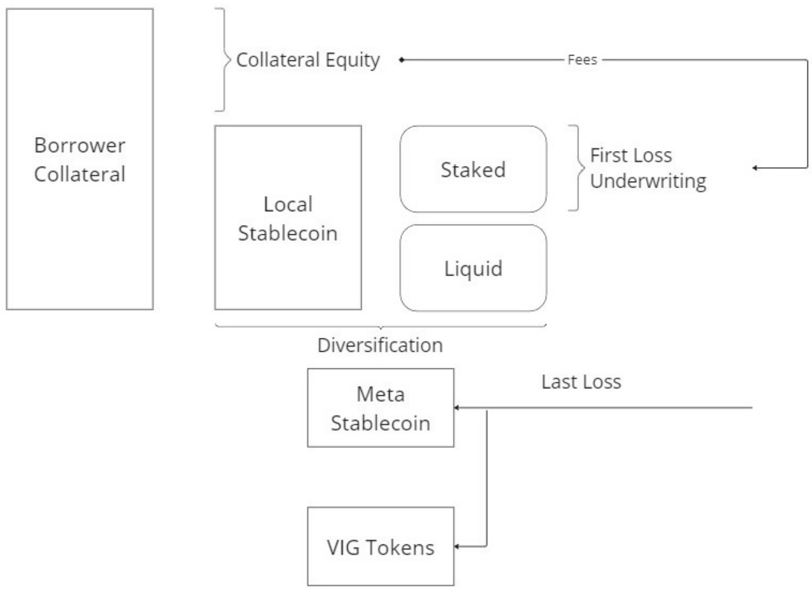
This approach allows risk to be priced per single asset, with the portfolio effects resolved by the market through the component Local stablecoins and the Meta composition.

Whilst we have produced an asset risk-pricing model for a specific set of blockchain assets, namely liquid trading tokens, future assets with different risks can be priced using asset-appropriate models yet can now still contribute to the Meta and overall Vigor 2.0 economics.

The native token VIG is not a payment token nor can it be collateralised, as was the case in the previous version of Vigor. In Vigor 2.0 it is used to *vote-stake* for Local pools which determines the weightings of the respective Local stablecoins in the Meta. VIG stakers receive recycled VIG tokens from excess-of-loss loan fees, and VIG itself is systematically burnt over time.

2 Local Risk Pricing

Figure 1: Local Stablecoin



Each Local stablecoin is collateralised for now with one asset, for example EOS. A borrower can select *any amount* of over-collateralisation as long as the equity component is in excess of the liquidation trigger point.

The model requires three market data inputs for any asset which will be provided by the QED Oracle protocol.

1. Price
2. Annualised volatility parameter
3. Average daily volume

Clearly price is more dynamic than the other inputs. All loans are floating rate with no maturity. The borrower chooses when to repay (absent of liquidation).

We take a relatively crude expected-time-to-default t_i for any loan i based on the spot price P, the loan strike K_i and the volatility σ.

$$t_i = \left[\ln\left(\frac{P}{K_i}\right)\frac{1}{\sigma}\right]^2 \tag{1}$$

The APR loan rate R_i is determined from:

$$R_i = \frac{cK_i}{Pt_i} \tag{2}$$

where c is a constant drawn from the cumulative normal distribution curve, $c = 1 - \Phi(1) = 0.15866$.

Figure 2: Loan Rate APR

Spot Price / Loan Strike

		1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2
Ann. Volatility	25%	99.2%	24.9%	11.1%	6.3%	4.0%	2.8%	2.1%	1.6%	1.3%	1.0%
	50%	397.0%	99.4%	44.3%	25.0%	16.1%	11.2%	8.3%	6.4%	5.1%	4.1%
	75%		223.7%	99.7%	56.3%	36.2%	25.3%	18.6%	14.4%	11.4%	9.3%
	100%		397.7%	177.3%	100.1%	64.3%	44.9%	33.1%	25.5%	20.3%	16.5%
	125%			277.0%	156.4%	100.5%	70.1%	51.8%	39.9%	31.7%	25.8%
	150%			398.9%	225.2%	144.8%	101.0%	74.6%	57.4%	45.6%	37.2%
	175%				306.6%	197.0%	137.5%	101.5%	78.1%	62.1%	50.6%
	200%					257.4%	179.6%	132.6%	102.1%	81.1%	66.0%
	225%						227.3%	167.8%	129.2%	102.6%	83.6%
	250%							207.2%	159.5%	126.7%	103.2%

For practical reasons, and the existence of a liquidation trigger, low collateral coverage in high-volatile assets is not possible. However, highly leveraged positions are better viewed as a daily cost.

Figure 3: Loan rate Daily

Spot Price / Loan Strike

		1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2
Ann. Volatility	25%	0.27%	0.07%	0.03%	0.02%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%
	50%	1.09%	0.27%	0.12%	0.07%	0.04%	0.03%	0.02%	0.02%	0.01%	0.01%
	75%		0.61%	0.27%	0.15%	0.10%	0.07%	0.05%	0.04%	0.03%	0.03%
	100%		1.09%	0.49%	0.27%	0.18%	0.12%	0.09%	0.07%	0.06%	0.05%
	125%			0.76%	0.43%	0.28%	0.19%	0.14%	0.11%	0.09%	0.07%
	150%			1.09%	0.62%	0.40%	0.28%	0.20%	0.16%	0.12%	0.10%
	175%				0.84%	0.54%	0.38%	0.28%	0.21%	0.17%	0.14%
	200%					0.71%	0.49%	0.36%	0.28%	0.22%	0.18%
	225%						0.62%	0.46%	0.35%	0.28%	0.23%
	250%							0.57%	0.44%	0.35%	0.28%

2.1 Loan Fees

Loan fees are calculated and applied every 24 hours, in advance. Fees are drawn from borrower collateral and there is no reliance on a borrower payment. It is possible that a loan fee can trigger a liquidation.

2.2 Aggregation Limit

The amount of borrower collateral per local asset in total cannot exceed 20% of average daily volume. This is tested daily.

> When a borrower is trying to set up a loan that would breach this threshold, the loan is reduced to the appropriate amount.
>
> When the average daily volume *decreases* and this produces the breach, loans are liquidated on a Last In First Out (LIFO) basis. That is, more recent loans are liquidated in order of recency until the limit is reached. There is no fee for this liquidation and the excess collateral is returned unencumbered to the borrower.

2.3 Liquidation Trigger

For any loan i we apply a premium to the loan strike as a function of daily volatility to solve for the liquidation trigger L_i.

$$L_i = K_i \cdot \exp\left(\frac{\sigma}{\sqrt{365}}\right) \tag{3}$$

Table 1: EOS Loan Example

Price	\$1.20
Loan strike	\$1.00
Volatility	65%
Time	142 days
APR	27.2%
Daily Rate	0.07%
Liquidation Trigger	\$1.0346

2.4 Liquidations

Liquidations can occur in 2 ways, depending on the asset.

1. Auction model where a specific liquidity pool purchases collateral at the Loan Strike K_i as soon as the trigger is reached.

2. Automated execution on UtilityX where the assets are sold *at market*.

The liquidation trigger is designed to provide a spread for traders looking to execute the liquidations.

2.5 Repayments

Loans are repayable using the respective Local stablecoin to settle the obligation. A user may choose to let the system liquidate on their behalf and redeem residual equity.

2.6 Underwriting

Local Stablecoins can be used to underwrite impairments on collateral from liquidations. Holders stake these as first-loss assets and have the following features:

- Receive the first share of loan fees.
- Receive any excess from liquidation execution.
- Absorb losses on liquidation execution whereby their stablecoins are proportionately burnt.

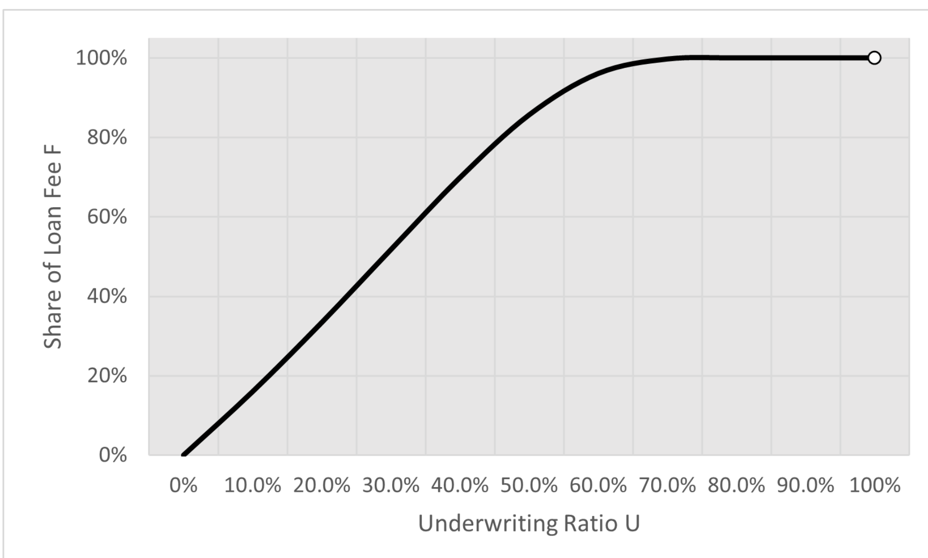
So here we can see the staked Local stablecoin for underwriting is at risk, protecting the asset value of their liquid equivalent.

The proportion of loan fees paid to underwriter stablecoins F_u is a function of the proportion of supply staked in the pool U and again draws on the cumulative normal distribution Φ.

$$F_u = \frac{1}{c}\left[\Phi\left(\frac{1}{1-U}\right) - \Phi(1)\right] \tag{4}$$

where c is as in Equation 2 and $U \in [0, 1)$.

Figure 4: Underwriting Share of Loan Fees F_U



Noting that:

- If there are zero underwriters, the fees drop down to the Meta and VIG pools.
- 100% of excess liquidation proceeds in excess of loan strike go to underwriters (notwithstanding the point above).
- 100% of underwriting capital is burnt before losses impair the rest of the system.

3 Meta Stablecoin

The Meta is a form of LP Token composed of the basket of the underlying local stablecoins.

3.1 Liquidity Pool

The Meta pool is a specialist multi-asset / multi-weight pool that sits on UtilityX.

Meta are minted by adding any number or combination of Local stablecoins to the pool, and vice-versa, Meta are burned by withdrawal of Local stablecoins.

The weightings for each Local stablecoin in the Meta pool are derived from the VIG Stake for each local pool (as a proportion of total VIG staked). This means that the pool is continually rebalancing as a function of supply-demand and VIG staking.

Net transaction fees generated from the Meta liquidity pool accrue to Meta holders generally by the creation of new Meta (yield as opposed to capital appreciation).

3.2 Transaction Fee Rate

The fee rate for the Meta f_m is dynamic based on the volatility and composition of the basket at that time. For every local asset j we know the volatility input σ_j and weighting from VIG w_j, hence:

$$f_m = \sqrt{\frac{\sum \sigma_j^2 w_j^2}{T}} \tag{5}$$

where $T = 175\,200$, derived from the assumption of a set of transactions every 3 minutes. From a practical perspective, noting the non-rigorous assumptions, f_m is capped at 0.25%.

3.3 New Assets

As a new Local asset is created, and since there must be a VIG stake in place for such creation, the Meta weightings will change to include the new Local stablecoin. This will require a short auction period to allow the new Local stablecoins to initiate their balances in the Meta.

3.4 Staking

Meta stablecoins can be staked into a second-loss pool which underwrites losses on all the Local pools if their underwriting capital is exhausted. These Meta are burned in proportion to losses to protect liquid Meta collateral value.

Fees for staked Meta F_m are determined from the proportion of Meta staked S_m and VIG Staked S_v using an adaptation of the Kelly Criterion (F_u from Equation (4)).

$$F_m = \frac{S_v}{1 + S_m} \cdot (1 - F_u) \tag{6}$$

Figure 5: Meta Share of Residual Fees

		VIG Staking										
		1%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Meta Staking	1%	1%	10%	20%	30%	40%	50%	59%	69%	79%	89%	99%
	10%	1%	9%	18%	27%	36%	45%	55%	64%	73%	82%	91%
	20%	1%	8%	17%	25%	33%	42%	50%	58%	67%	75%	83%
	30%	1%	8%	15%	23%	31%	38%	46%	54%	62%	69%	77%
	40%	1%	7%	14%	21%	29%	36%	43%	50%	57%	64%	71%
	50%	1%	7%	13%	20%	27%	33%	40%	47%	53%	60%	67%
	60%	1%	6%	13%	19%	25%	31%	38%	44%	50%	56%	63%
	70%	1%	6%	12%	18%	24%	29%	35%	41%	47%	53%	59%
	80%	1%	6%	11%	17%	22%	28%	33%	39%	44%	50%	56%
	90%	1%	5%	11%	16%	21%	26%	32%	37%	42%	47%	53%
	100%	1%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%

The share of fees due to Meta are paid in Meta stablecoins themselves (the local fees are converted).

The balance of fees go to the VIG token and for clarity if there were no Meta staked, all the fees would pass through to the VIG layer.

4 VIG Token

The VIG token is used to stake for Local pools. Staking effects are:

- The weighting of the Local stablecoin in the Meta.
- The share of second-loss fees allocated to staked Meta.

4.1 Residual Fees

The balance of fees, post the distribution to the staked Meta, is converted to VIG and is dealt with in two ways.

(1) Burn

(2) Distribute

The proportion of VIG burnt from the residual fees is simply $1 - S_v$, with the balance distributed to staked VIG pro rata to stake size.

4.2 Slash : Reward

Where a Local stablecoin has impaired the Meta value (not Local underwriters), a slash is applied to the VIG Stake for that pool.

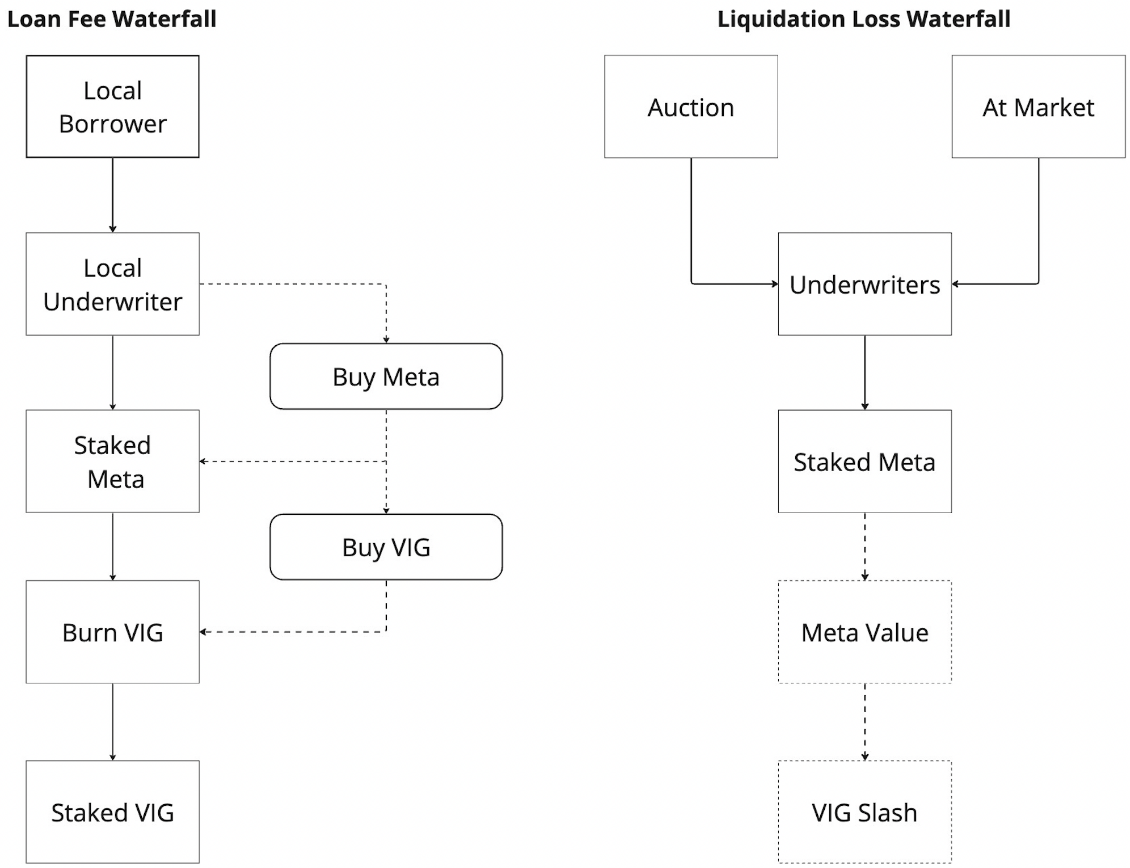
The Slash rate λ_j for local asset j is determined from the overall VIG Stake S_v, the impairment contribution to the Meta I_j and the weighting in the Meta w_j.

$$\lambda_j = S_v \left[\frac{I_j}{w_j} \right] \tag{7}$$

Here we can see increasing collective staking increases slash rate which is applied to the respective VIG stakes.

Slashed VIG are paid to all the other VIG stakes who are not currently impairing the Meta.

5 Schematic


Loan Fee Waterfall
Local Borrower
Local Underwriter
Buy Meta
Staked Meta
Buy VIG
Burn VIG
Staked VIG
Liquidation Loss Waterfall
Auction
At Market
Underwriters
Staked Meta
Meta Value
VIG Slash