Simple Summary

Gauntlet proposes adjusting interest rate parameters for the Ethereum, Polygon, Avalanche, Arbitrum, and Optimism Aave V3 markets. Tokens impacted include USDC, USDT, EURS, WBTC, DPI, and CRV. If these changes are approved, our models indicate that it could lead to over $135k in annualized protocol revenue growth.

Abstract

Given the significant shifts in crypto markets, Gauntlet's platform has evaluated all assets on Aave V3's active markets and has identified opportunities to adjust parameters for certain assets for the benefit of the protocol. Our methodology makes data-informed decisions around setting borrower and supplier interest rates when market conditions require the protocol to reduce risk or when strategic opportunities present themselves to increase protocol revenue without materially impacting risk. This analysis further finetunes the interest rate curves of Aave V3 across the Ethereum, Polygon, Avalanche, Arbitrum, and Optimism markets.

Methodology

Objectives

Among other factors, there are two primary reasons to adjust an interest rate curve:

1. mitigate the risk of 100% utilization in a pool
2. build reserves via protocol revenue to cover insolvencies or other expenses in the future

As a secondary objective, we want to optimize the user experience of Aave's borrowers and suppliers

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Mitigating Risk

The first case of mitigating 100% utilization is of more immediate benefit to the protocol. High utilization is poor UX for suppliers, as it can restrict their ability to withdraw an asset from the pool. For example, if a pool contains $10M in USDT, and $9M are loaned out, the maximum a supplier could withdraw is $1M since the pool cannot exceed 100% utilization. LPs of USDT on Aave V3 experienced this scenario recently. In addition to impacting suppliers, liquidations may be hindered because, at 100% utilization, only aTokens (not the underlying collateral) can be seized. If liquidators are concerned they won't be able to cash these aTokens in for the underlying collateral in time to lock in a profit, this risks leaving the protocol with insolvent debt. Increasing interest rates can motivate borrowers to repay the asset and motivate suppliers to deposit more of the asset. Both would decrease utilization to more desirable levels.

Building Reserves

The second use case of building reserves is more opportunistic in nature. Reserves serve as the rainy day fund for protocols, protecting against unforseen events. Over time they may also be used to fund operations, reducing the reliance on the native token treasury. Moreover, interest rates can be used opportunistically to capture increased reserves when specific market conditions are met. Since the annualized reserve growth is (total borrowed) * (borrow rate) * (reserve factor), opportunities to increase revenue present themselves when:

1. We can incentivize more borrowing without slashing borrow rates
2. We can increase borrow rates without losing borrowers
3. We can raise reserve factors without losing suppliers

Elasticity Model

The reaction of borrowers and suppliers to changes in interest rate is governed by borrower and supplier elasticity. If a borrower is elastic, they would reduce their borrowing position in response to an increased interest rate, but if a borrower is inelastic, they would ignore changes in interest rates. If a supplier is elastic, they would increase their supplying position in response to increased interest rates, but if a supplier is inelastic, they would ignore changes to interest rates.

Interest rates on Aave are computed as a function of utilization through the interest rate curve such that interest rates are higher when utilization is higher. As a result, there is a natural counterbalancing effect to interest rate curve changes: if borrowers or suppliers are elastic, then an increase in interest rates would be followed by borrowers reducing their positions or suppliers increasing their positions, which would bring interest rates back down.

Consider the case where either all borrowers are elastic and all suppliers are inelastic. The figure below shows the expected user behavior if we were to swap out Curve A for Curve B. At time t=1 (shown as ① in the figure), the borrow rate is steady at the market rate. At time t=2, we execute the IR curve change to Curve B which hikes the borrower rate. As a result, borrowers begin closing their positions due to the higher rate because they are elastic, until we get back down to the equilibrium rate at t=3.

An analagous scenario can be constructed if suppliers are elastic and borrowers are inelastic. If both borrowers and suppliers are elastic, it is harder to predict the effect on user positions because it is dependent on who is more elastic and who acts faster between borrowers and suppliers.

While this simple model is helpful in making recs, it is important to caveat that different tokens can have a mixture of elastic and inelastic users, and that no user is perfectly elastic or inelastic. It is also important to note that utilization is extremely noisy, fluctuating due to token prices, competing yield offerings, and the whims of individual users, which makes elasticity measurement noisy.

In the recs below, we assume that either borrowers or suppliers are elastic when predicting impact. As we make IR curve recs to Aave, we are gathering more data about user elasticity that will help us improve our recs over time. For example, the chart below shows the reaction of users to our previous USDT recs. The 4 charts show utilization, interest rates (blue for borrower, orange for suppliers), total borrows, and total supply over time. The black line shows when the IR curve change was executed. In this particular case, we recommended decreasing the Uoptimal from 90% to 80% and raising slope 2 from 0.6 to 0.75.

The immediate effect of this change was a spike in borrower and supplier interest rates. Roughly a day later, we see an influx of supply and outflux of borrows which restored interest rates to their previous equilibrium. In this particular case, suppliers had a bigger reaction than borrowers.

Impact Measurement

When making IR curve recs, we measure impact in 3 ways:

1. Predicted immediate impact on utilization and revenue
2. Counterfactual utilization
3. Rate at 100% utilization

Predicted immediate impact on utilization and revenue

Based on our assumptions about borrower and supplier elasticity, we can quantify the expected change in total amounts borrowed and supplied:

- If only borrowers are elastic, then we can compute the change in amount borrowed by assuming that the borrow rate will be restored to equilibrium
- If only suppliers are elastic, then we can compute the change in amount supplied by assuming that the supply rate will be restored to equilibrium
- If borrowers and suppliers are inelastic, then we can assume that borrows and supply stay constant

Based on the new equilibrium borrows and supply, we can compute the projected utilization

and projected protocol revenue

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Counterfactual utilization

Based on our assumptions about borrower and supplier elasticity, we can look at historical interest rate data to predict what utilization would have been if we were on a different IR curve. If borrowers are elastic, we can take the borrow rate at a given point in time and determine what utilization it corresponds to on a new interest rate curve. If suppliers are elastic, we could do the same with supplier interest rates.

In order to quantify the risk posed by a historical or counterfactual timeseries of utilization, we measure the percentage of time that utilization was above 90%, 95%, and 99%

.

When computing counterfactual utilization, there are a few caveats that are important to keep in mind:

- During utilization spikes, users could be quite inelastic to interest rates which may cause impact to be overestimated

- For moments when utilization hit 100%, we cannot measure counterfactual utilization because we do not know the maximum interest rates that users would have tolerated

Rate at 100% utilization

The maximum borrower and supplier interest rates are used when utilization is 100%. If this rate is not high enough, there would not be enough incentive for borrowers to close their positions and suppliers to enter, leaving the protocol at risk. But if this rate is too high, we may see borrowers getting quickly liquidated from the exorbiant interest fees, which would be bad for user experience but also potentially lead to liquidation cascades.

We use the liquidation time

metric to better quantify this danger of max interest rates getting too high. We define it as the time it would take for a user to get liquidated if they supply USDC and borrow a given token at USDC's current Loan-To-Value at the max token borrow rate and the min USDC supply rate. We assume that interest compounds once per block for this calculation. Due to differing Loan-To-Value parameters on different Aave markets and different block times on different chains, the liquidation time for a given IR curve can differ between different Aave markets.

Recommendations

Stablecoins

USDC

Utilization of USDC has been safely below the optimal since the beginning of the year, even through severe market events like the USDC depeg that have caused utilization spikes for other stablecoins. Given the safety of USDC as an asset and high liquidity of USDC across chains, there is an opportunity to bring in more borrowers by lowering USDC interest rates without incurring significant protocol risk. We therefore recommend lowering slope 1 from 0.04 to 0.035.

Historical Usage

The YTD utilization, total borrows, and total supply for all USDC markets are shown below. The dashed line in the utilization chart show the optimal. The dashed lines in the borrowed and supplied charts show borrow and supply caps, when they are set and close to the range of data.

Reserve Status

Market

Borrowing Status

Collateral Enablement

Arbitrum

Stable and Variable Borrowing

Collateral Enabled

Avalanche

Stable and Variable Borrowing

Collateral Enabled

Ethereum

Variable Borrow Only

Collateral Enabled

Optimism

Stable and Variable Borrowing

Collateral Enabled

Polygon

Stable and Variable Borrowing

Collateral Enabled

IR Curve Recommendation

Parameter

Current Arbitrum

Current Avalanche

Current Ethereum

Current Optimism

Current Polygon

Recommended

Variable Base

0

0

0

0

0

0

Optimal

0.9

0.9

0.9

0.9

0.9

0.9

Variable Slope 1

0.04

0.04

0.04

0.04

0.04

0.035

Variable Slope 2

0.6

0.6

0.6

0.6

0.6

0.6

Reserve Factor

0.1

0.1

0.1

0.1

0.1

0.1

Projected Impact

Assuming borrowers are elastic, we expect additional USDC to be borrowed in response to increased interest rates until the borrower interest rate is restored to its current rate. This would have the following impact on utilization and annualized protocol revenue:

- Ethereum:
- Utilization: 84.96% to 90.05%
- Revenue: $423k to $449k
- Utilization: 84.96% to 90.05%
- Revenue: $423k to $449k
- Arbitrum:
- Utilization: 67.42% to 77.05%
- Revenue: $107k to $122k
- Utilization: 67.42% to 77.05%
- Revenue: $107k to $122k
- Polygon:
- Utilization: 82.55% to 90.03%
- Revenue: $102k to $111k
- Utilization: 82.55% to 90.03%
- Revenue: $102k to $111k
- Avalanche:
- Utilization: 57.41% to 65.61%
- Revenue: $69.5k to $79.5k
- Utilization: 57.41% to 65.61%
- Revenue: $69.5k to $79.5k
- Optimism:
- Utilization: 68.79% to 78.62%
- Revenue: $51.7k to $59.0k
- Utilization: 68.79% to 78.62%
- Revenue: $51.7k to $59.0k

These changes would lead to a $67k (8.4%) increase in annual revenue for USDC in these markets. The figure below

compares the YTD historical utilization of USDC against the counterfactual utilization assuming that borrowers are elastic.

USDT

The Ethereum market currently uses a riskier interest rate curve for USDT than the other markets. We recommend moving it to the interest rate curve used by the other markets by lowering the optimal from 0.9 to 0.8 and raising slope 2 from 0.72 to 0.75.

Historical Usage

The YTD utilization, total borrows, and total supply for the USDT ethereum market is shown below. The dashed line in the utilization chart show the optimal.

Reserve Status

Market

Borrowing Status

Collateral Enablement

Ethereum

Variable Borrow Only

Collateral Disabled

IR Curve Recommendation

Parameter

Current Ethereum

Recommended

Variable Base

0

0

Optimal

0.9

0.8

Variable Slope 1

0.04

0.04

Variable Slope 2

0.72

0.75

Reserve Factor

0.1

0.1

Projected Impact

Assuming suppliers are elastic, we expect additional USDT to be supplied in response to increased interest rates until the supplier interest rate is restored to its current rate of 2.11%. This would decrease utilization by 4.13% with no significant impact to protocol revenue

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The figure below compares the YTD historical utilization of USDT against the counterfactual utilization assuming that suppliers are elastic.

The table below shows the percentage of time that utilization was above 90%, 95%, and 99% for the historical (left of the arrow) and counterfactual (right of the arrow) utilization timeseries.

Aave V3 Ethereum

Time above 90% utilization

6.07% → 2.68%

Time above 95% utilization

2.68% → 1.49%

Time above 99% utilization

0.77% → 0.60%

EURS

Borrowers of EURS on Polygon have been actively hitting the borrow cap, while suppliers have not been reaching the supply cap. There is reason to believe therefore that borrowers would be inelastic to an increase in interest rates while suppliers may be elastic, so we recommend raising slope 1 from 0.04 to 0.06.

Historical Usage

The YTD utilization, total borrows, and total supply for all EURS markets are shown below. The dashed line in the utilization chart show the optimal. The dashed lines in the borrowed and supplied charts show borrow and supply caps, when they are set and close to the range of data.

Reserve Status

Market

Borrowing Status

Collateral Enablement

Arbitrum

Stable and Variable Borrowing

Isolated

Polygon

Stable and Variable Borrowing

Isolated

IR Curve Recommendation

Parameter

Current Arbitrum

Current Polygon

Recommended

Variable Base

0

0

0

Optimal

0.8

0.8

0.8

Variable Slope 1

0.04

0.04

0.06

Variable Slope 2

0.75

0.75

0.75

Reserve Factor

0.1

0.1

0.1

Projected Impact

Assuming suppliers are elastic, we expect additional EURS to be supplied in response to increased interest rates until the supplier interest rate is restored to its current rate. This would have the following impact on utilization and annualized protocol revenue:

- Polygon
- Utilization: 37.39% to 30.52%
- Revenue: $1.9k to $2.3k
- Utilization: 37.39% to 30.52%
- Revenue: $1.9k to $2.3k
- Arbitrum
- Utilization: 74.65% to 60.95%
- Revenue: $140 to $180
- Utilization: 74.65% to 60.95%
- Revenue: $140 to $180

These changes would lead to a $440 (17.7%) increase in annual revenue for EURS in these markets. The figure below compares the YTD historical utilization of EURS against the counterfactual utilization assuming that suppliers are elastic.

The table below shows the percentage of time that utilization was above 90%, 95%, and 99% for the historical (left of the arrow) and counterfactual (right of the arrow) utilization timeseries.

Aave V3 Polygon

Aave V3 Arbitrum

Time above 90% utilization

0.00% → 0.00%

6.73% → 3.33%

Time above 95% utilization

0.00% → 0.00%

1.61% → 0.07%

Time above 99% utilization

0.00% → 0.00%

0.04% → 0.00%

Large Cap

WBTC

Given the high market cap and stability of BTC as an asset, we recommend lowering WBTC interest rates on the Ethereum and Polygon markets in order to encourage more borrowing. We recommend lowering the variable slope 1 to 0.04. Assuming borrowers are elastic, this should increase capital efficiency and bring in more revenue for the protocol.

Historical Usage

The YTD utilization, total borrows, and total supply for all WBTC markets are shown below. The dashed line in the utilization chart show the optimal. The dashed lines in the borrowed and supplied charts show borrow and supply caps, when they are set and close to the range of data.

Reserve Status

Market

Borrowing Status

Collateral Enablement

Arbitrum

Variable Borrow Only

Collateral Enabled

Avalanche

Variable Borrow Only

Collateral Enabled

Ethereum

Variable Borrow Only

Collateral Enabled

Optimism

Variable Borrow Only

Collateral Enabled

Polygon

Variable Borrow Only

Collateral Enabled

IR Curve Recommendation

Parameter

Current Arbitrum

Current Avalanche

Current Ethereum

Current Optimism

Current Polygon

Recommended

Variable Base

0

0

0

0

0

0

Optimal

0.45

0.45

0.45

0.45

0.45

0.45

Variable Slope 1

0.07

0.07

0.07

0.07

0.07

0.04

Variable Slope 2

3

3

3

3

3

3

Reserve Factor

0.2

0.2

0.2

0.2

0.2

0.2

Projected Impact

Assuming borrowers are elastic, we expect additional WBTC to be borrowed in response to increased interest rates until the borrower interest rate is restored to its current rate. This would have the following impact on utilization and annualized protocol revenue:

- Ethereum:
- Utilization: 11.36% to 19.88%
- Revenue: $36.4k to $63.7k
- Utilization: 11.36% to 19.88%
- Revenue: $36.4k to $63.7k
- Arbitrum:
- Utilization: 17.03% to 29.81%
- Revenue: $39.9k to $69.8k
- Utilization: 17.03% to 29.81%
- Revenue: $39.9k to $69.8k
- Optimism:
- Utilization: 5.61% to 9.81%
- Revenue: $1.5k to $2.7k
- Utilization: 5.61% to 9.81%
- Revenue: $1.5k to $2.7k
- Polygon:
- Utilization: 2.93% to 5.12%
- Revenue: $890 to $1.5k
- Utilization: 2.93% to 5.12%
- Revenue: $890 to $1.5k
- Avalanche:
- Utilization: 1.07% to 1.87%
- Revenue: $100 to $180
- Utilization: 1.07% to 1.87%
- Revenue: $100 to $180

These changes would lead to a $59k (74.9%) increase in annual revenue for WBTC in these markets

. The figure below compares the YTD historical utilization of WBTC against the counterfactual utilization assuming that borrowers are elastic.

Small Cap

DPI

The utilization of DPI has remained steady at the optimal, suggesting inelasticity of borrowers and suppliers to the interest rates set below the optimal. We therefore recommend increasing interest rates in order to charge these inelastic borrowers more to increase protocol revenue.

Historical Usage

The YTD utilization, total borrows, and total supply for DPI are shown below. The dashed line in the utilization chart show the optimal. The dashed lines in the borrowed and supplied charts show borrow and supply caps, when they are set and close to the range of data.

Reserve Status

Market

Borrowing Status

Collateral Enablement

Polygon

Variable Borrow Only

Collateral Enabled

IR Curve Recommendation

Parameter

Current Polygon

Recommended

Variable Base

0

0

Optimal

0.45

0.45

Variable Slope 1

0.07

0.1

Variable Slope 2

3

3

Reserve Factor

0.35

0.35

Projected Impact

Assuming borrowers and suppliers are inelastic, utilization would not change in response to this rec, and these changes would lead to a $430 (49.4%) increase in annual revenue for DPI in this market.

CRV

The supply cap of CRV on Polygon has been maxed out since the beginning of the year, suggesting that suppliers are inelastic to interest rates. We recommend raising the reserve factor in order to earn the protocol more revenue.

Historical Usage

The YTD utilization, total borrows, and total supply for all CRV markets are shown below. The dashed line in the utilization

chart show the optimal. The dashed lines in the borrowed and supplied charts show borrow and supply caps, when they are set and close to the range of data.

Reserve Status

Market

Borrowing Status

Collateral Enablement

Ethereum

Variable Borrow Only

Isolated

Polygon

Variable Borrow Only

Collateral Enabled

IR Curve Recommendation

Parameter

Current Ethereum

Current Polygon

Recommended

Variable Base

0.03

0.03

0.03

Optimal

0.7

0.7

0.7

Variable Slope 1

0.14

0.14

0.14

Variable Slope 2

3

3

3

Reserve Factor

0.2

0.2

0.35

Projected Impact

Assuming suppliers are inelastic, utilization would not change in response to this rec, and revenue to increase as follows:

- Ethereum: $10.0k to $17.6k
- Polygon: $11.8k to $20.6k

These changes would lead to a $16.4k (75.2%) increase in annual revenue for CRV in this market

Specifications

Parameter

USDT

WBTC

USDC

EURS

DPI

CRV

Variable Base

0

0

0

0

0

0.03

Uoptimal

0.9→0.8

0.45

0.9

0.8

0.45

0.7

Variable Slope 1

0.04

0.07→0.04

0.04→0.035

0.04→0.06

0.07→0.1

0.14

Variable Slope 2

0.72→0.75

3.0

0.6

0.75

3.0

3.0

Stable Base

0.02

0.02

0.01

0.01

0.02

0.03

Stable Slope 1

0.04

[0, 0.07]

0.005

0.005

0

0.08

Stable Slope 2

0.72

[0,3.0]

0.6

0.75

0

3.0

Reserve Factor

0.1

0.2

0.1

0.1

0.35

0.2→0.35

Affected Markets

Ethereum

Arbitrum, Avalanche, Ethereum, Optimism, Polygon

Arbitrum, Avalanche, Ethereum, Optimism, Polygon

Arbitrum, Polygon

Polygon

Ethereum, Polygon

Note: All of these recommendations should be the same or more favorable for growth than the V2 counterparts. The one exception is that the U_optimal for WBTC is 0.65, but given the low historical utilization of WBTC, this should not have an impact.

Next Steps

- Target a Snapshot vote for next week.
- We welcome community feedback.

By approving this proposal, you agree that any services provided by Gauntlet shall be governed by the terms of service available at gauntlet.network/tos.