Following AIP-26 it was noticed that the interest accrued for the AMPL market above 75% utilization is higher than expected. After investigation the reason for the discrepancy was identified to be the following:

In AAVEs MathUtils there is an over-approximation in the application of the interest rate for computing compounded interest.

In calculateCompoundedInterest method

Periodic rate (per second) is computed as:

uint256 ratePerSecond = rate / SECONDS_PER_YEAR;

in comparison to the exact computation.

derived from:

.

The deviation in the applied interest rate causes a small over-approximation for APYs <10%, but grows exponentially as can be seen below.

Expected APY

Effective APY

Expected daily rate

Effective daily rate

4.00%

4.08%

0.01%

0.01%

5.00%

5.13%

0.01%

0.01%

10.00%

10.52%

0.03%

0.03%

50.00%

64.87%

0.11%

0.14%

100.00%

171.83%

0.19%

0.27%

200.00%

638.91%

0.31%

0.55%

1000.00%

2202543.09%

0.68%

2.78%

10000.00%

2.69E+43%

1.30%

31.52%

This difference is especially noticeable in the AMPL market, where the configured interest rate can go up to 10,002% at max utilization.

The AAVE Genesis team has been made aware and they will publish more guidance on the discrepancy.

ARC Rationale

As mentioned in AIP-26, a nonlinear interest curve is more suited for AMPL's market and potentially other assets on AAVE's platform. It turns out that this over-approximation produces just such a curve.

The over-approximation mentioned above results in an exponentially growing curve which allows for defining a more suitable interest curve for AMPL. We propose the following parameters for AAVE's default interest rate strategy, which produce the curve below:

- Optimal utilization = 80%
- Base rate = 1%
- Slope1 = 2%
- Slope2 = 750%

APY table above 80% Utilization:

Utilization

APY

80.00%

3.05%

81.00%

49.93%

82.00%

118.15%

83.00%

217.40%

84.00%

361.82%

85.00%

571.94%

86.00%

877.67%

87.00%

1322.50%

88.00%

1969.72%

89.00%

2911.43%

90.00%

4281.60%

91.00%

6275.19%

92.00%

9175.85%

93.00%

13396.29%

94.00%

19536.98%

95.00%

28471.63%

96.00%

41471.48%

97.00%

60386.14%

98.00%

87906.81%

99.00%

127949.14%

100.00%

186210.38%

The part of the curve under 80% Utilization:

Rationale:

1. Accounting for the over-approximation of the existing Slope2=10,000% interest curve requires reducing the slope2 parameter.
2. Taking advantage of the exponential curve allows for:

a. Setting a higher optimal utilization rate.

b. Setting a higher maximum APY.

without creating a too steep of an interest rate increase right above the optimal utilization rate.