In the rapidly evolving world of decentralized finance, Uniswap has emerged as a leading decentralized exchange (DEX) and an essential part of the DeFi ecosystem. As a result, it's crucial to assess proposals and make decisions that drive the DAO's growth and sustainability. This document aims to provide a comprehensive framework for evaluating Uniswap proposals based on a cost-benefit analysis, incorporating factors such as current cash flows, future cash flows, and governance value. By examining the impact of proposals on users, cash flows, and governance value, this guide seeks to equip voters with a clear step-by-step guide and the necessary mathematical tools to make informed, data-driven decisions that maximize the benefits for the Uniswap DAO and its users.

What are the forces driving Uniswap's usage?

Uniswap enables users to trade cryptocurrencies without centralized intermediaries, leveraging an automated market-making (AMM) mechanism to facilitate transactions.

Liquidity on Uniswap

To enable users to trade cryptocurrencies without centralized intermediaries, Uniswap relies on liquidity from external third parties known as Liquidity Providers (LPs).

LPs deposit liquidity (L) in the form of tokens into the Uniswap protocol, allowing traders to swap between various token pairs using an on-chain mechanism called an Automated Market Maker (AMM). By doing so, LPs assume a financial risk of losses compared to holding capital outside Uniswap liquidity pools, as described in various statistical research

. This risk is denoted as (R) and represents the expected percentage of liquidity deposited that an LP should anticipate losing based on market conditions. To compensate for this risk, LPs are incentivized to provide liquidity either by earning a portion of the trading fees generated by the protocol or receiving external liquidity mining incentives (I). Additionally, LPs must consider operational overhead (O), which includes costs associated with building systems, hiring staff, usage fees (e.g., Gas Fees), as well as brand or network effects that may make Uniswap more appealing for depositing liquidity. These costs are deducted from the fees generated, constituting a fixed cost incurred regardless of the liquidity amount deployed by a given LP.

An LP's objective function is to maximize risk-adjusted return (RAR) which can be calculated as:

Generally, as liquidity within Uniswap increases, RAR is expected to decrease, assuming relatively fixed fees. This allows Liquidity Providers to competitively set Uniswap's risk-adjusted return (RAR_Uniswap) at a rate that is competitive with alternative investments in the market (RAR_Market). Assuming no long-term arbitrage opportunities remain available, competition between LPs will result in an efficient allocation of liquidity between Uniswap and the rest of the market, leading to the following equivalence:

Uniswap LPs will rebalance between Uniswap and external yield sources to maximize overall RAR for a given liquidity quantity.

Programs that attract LPs to Uniswap are those that minimize risk (R) and operational expenses (O) while maximizing fees (F). In the short term, a higher RAR_Uniswap resulting from these policies encourages LPs to transfer more liquidity from other market segments, aligning RAR_Uniswap with RAR_Market and marginally increasing RAR_Market by intensifying competition in the broader capital allocation marketplace.

The general function that predicts the amount of liquidity in Uniswap at any given time can be summarized as:

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Increased risk and operational expenses negatively impact liquidity, while increased incentives in the form of fees or liquidity mining incentives positively affect liquidity. We use an up arrow to indicate a positive relationship and a down arrow to signify a negative relationship, acknowledging that deriving this exact function would necessitate statistical modeling based on empirical data.

Trading on Uniswap

The ultimate user of Uniswap is Liquidity Takers otherwise referred to as "traders" who use the liquidity provided by LPs in order to swap between various token pairs.

Traders may have different reasons for swapping tokens, but these reasons generally stem from a perceived discrepancy between the value (V) a trader assigns to a given token and the price at which the trader can buy that token, accounting for fees paid (F) and slippage due to insufficient liquidity or an inefficient AMM design (S). The overall price execution for a given trade (P) can be calculated as:

The expected excess net profit (PnL_trade) for deciding whether to execute a trade can be further summarized as:

A trader would only execute a trade when PnL_trade is positive. To determine whether to execute a trade on Uniswap or an alternative venue, a trader would choose the venue that maximizes PnL_trade through better price execution. We can express this as the alternative (AltPnL_trade) using the above formula with the price execution on an alternative exchange.

A trade would occur on Uniswap if there is a greater expected net profit (ePnL_trade) from executing on Uniswap versus an alternative venue which can be calculated as:

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A trade will occur on Uniswap over an alternative venue when ePnL_trade is greater than or equal to 0.

A trader's overall goal is to maximize their total net profit (PnL_overall) across multiple trades after accounting for fixed operational overheads (O), such as hiring staff and building systems to enable trading on the Uniswap DAO, as well as any brand or network effects influencing trading decisions.

A trader would integrate with and begin using the Uniswap protocol only if PnL_overall > 0.

Programs that would entice traders to join and increase usage of the Uniswap protocol would include minimizing price execution (P) for given trades as well as reducing overall integration and support costs to the Uniswap DAO in the first place.

The general function that predicts the trading volume on Uniswap at any given time can be summarized as:

A decrease in price execution and operational expenses relative to competing exchanges results in higher trading volume on the protocol.

Who should Uniswap ultimately serve?

Uniswap is often described as a "public good". The Uniswap protocol exists as a set ofopen-source smart contracts which can be used by anyone permissionless-ly and publicly on the various blockchains on which it is deployed. In this way, the deployment of Uniswap is truly a public good where any interested user can use Uniswap in whatever way suits their best interests.

This framing accurately describes Uniswap the protocol, however, fails to describe the incentives facing UNI token holders who ultimately control many aspects of the protocol through governance. Through governance, financially interested UNI token holders can increase or decrease their "voice" in the protocol by increasing or decreasing their economic alignment in the protocol by buying up a larger share of outstanding UNI tokens thus funding the core development of the protocol and any ongoing operational spending required.

The LPs and traders who use the Uniswap protocol are stakeholders in the sense that they use and rely on the Uniswap protocol. Despite this, these users have not achieved strong financial alignment through token purchases or useful actions which have led to token disbursement. Ultimately, when considering various proposals through governance that may impact the Uniswap protocol it is the objectives of token-holders that should be primarily considered. Users of the protocol are of course able to increase their financial stake and governance power by buying up tokens and becoming UNI holders themselves allowing them to have a stronger voice in the ecosystem if desired.

None of this is to imply that users' concerns are irrelevant or should not be considered. The best way to maximize long-term objectives for UNI holders will be to align incentives between UNI holders and the users of Uniswap. The long-term objectives of token-holders will be maximized through a rich, robust, and diverse ecosystem of users who rely on the platform meaning any decision made by token-holders should primarily consider how it will impact users. The key takeaway here is simply that the goals of governance are primarily to create this long-term valuable and robust ecosystem increasing the value of the UNI token long term, not to enrich specific users at some particular point in time.

There are two primary lenses through which we can ascribe value to UNI token holders:

Financial Returns

The UNI token can be viewed as a dividend-accruing financial asset, supported by protocol revenue if the Fee Switch is activated, as discussed in recent proposals on the forums

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One way to value the UNI token is through the Discounted Future Cash Flows Model (DFCF), a commonly used valuation

method for estimating an asset's intrinsic value. The DFCF model estimates the present value of all future cash flows an asset is expected to generate, discounted at a rate reflecting the risk associated with holding the asset.

The DFCF model can estimate the intrinsic value of UNI governance tokens by calculating the present value of all future cash flows generated by the Uniswap protocol through trading fees and other revenue sources. The formula for the DFCF model is:

where:

- PV is the present value of all future cash flows
- FCF_t is the free cash flow (protocol revenue) generated in period t
- r is the discount rate, which reflects the costs and risk associated with holding the asset
- t is the total number of periods over which cash flows are being discounted

Because this model takes into account future cash flows, the present value of the UNI token depends not only on the free cash flows Uniswap can generate today, but more importantly, on the discounted future flows Uniswap can generate over its lifetime.

Programs that enhance current and/or expected future cash flows for Uniswap token holders will cause the present value of holding a token to rise, materially benefiting holders. Programs which reduce the uncertainty of future cash flows (represented as a reduction in r) would also be effective at increasing the present value of tokens.

(It's important to note that the DFCF model relies heavily on the accuracy of the assumptions made about future cash flows, which can be challenging to estimate with precision. Therefore, the DFCF model should be considered less as a tool for determining the actual fair value of the UNI token here and more as a method for identifying the Key Performance Indicators (KPIs) that the Uniswap should target to improve in order to maximize the present and long-term value of the UNI token.)

Governance Power

The value of UNI tokens extends beyond financial value. UNI tokens empower community members to vote on decisions that impact the protocol and the DeFi ecosystem as a whole.

The primary considerations on how to influence the importance of governance power for UNI tokens are brand (B), market share (M), and the overall size (S) of the Uniswap protocol. The more well-known, the higher percentage of the market, and the larger the overall size Uniswap has, the more people care about the decisions Uniswap can make, irrespective of direct cash flow financial decisions. We can summarize this as the external value of governance (G), representing the present value of the amount token-holders are willing to pay to make these decisions, putting aside cash flow concerns.

A prime example of this power is the governance vote

for deciding which bridge to use when deploying Uniswap v3 to Binance Smart Chain. The community was significantly divided on which bridging protocol to use, and votes were utilized to make this determination. Uniswap's sheer size significantly influences the future of which bridge will be primarily used for Binance Smart Chain deployments and philosophically determines the type of bridging mechanism that makes sense in the broader DeFi ecosystem. Those interested in influencing the externalities of this decision must buy UNI tokens regardless of direct financial incentives.

Another example is Uniswap was given 1M OP tokens in Oct 2022 to use on liquidity mining incentives for Uniswap's Optimism deployment. Uniswap's strong brand and importance for the Optimism ecosystem ultimately gave UNI holders the ability to dictate where and how those OP tokens would be spent. While the results of this spending decision don't impact UNI holders directly through direct cash flows the economic decision for how to spend those OP tokens has real economic value that can be ascribed to UNI token holders as Governance Value.

Coming up with a purely quantitative framework for Governance value is difficult because things like brand and the importance of market share and size are highly subjective and depend on market conditions and what opportunities those features enable. Answering questions like "How much should Uniswap pay to increase their market share by 5% without any improvements to revenue?" is fairly qualitative and will likely require heuristics and input from the Uniswap community to quantify.

Assessing Uniswap Proposals: A Cost-Benefit Approach

To evaluate whether a decision benefits or harms the Uniswap community, one can conduct a cost-benefit analysis using the following equation:

If the net benefit is positive, the decision or action should be taken; otherwise, it should not be pursued. The challenge lies in accurately defining and calculating the benefit and cost, which will be the primary focus of follow on work. The goal here is to provide a common evaluation framework for the Uniswap community, enabling the Uniswap DAO to quickly evaluate good ideas and prevent bad ones from wasting time and resources.

The Costs of Token Spending

To fund various programs and development costs, Uniswap may need to spend its tokens. But how should token holders consider the cost of this spending?

Spending new UNI tokens has a cost to token holders from an inflationary perspective. If the distributed UNI tokens supply increases by 10% without impacting the present value or governance value of UNI tokens, each token's individual value will decrease by 10% due to dilution.

Assuming that the UNI token market efficiently represents the average price preferences across all potential buyers and sellers, UNI spending has an explicit cost equal to the notional price of the UNI token at the time of spending, whether it depletes the treasury or inflates the token for existing holders.

Thus, the best way to calculate the cost (C) of a given token spend (N) is to equate it to the current notional market price of the tokens (P):

Some counterarguments to this simple model include:

1. Wider distribution of UNI tokens may lead to increased decentralization and improved decision-making ability

: While this may hold true to some extent, an efficient market will likely result in UNI tokens being bought and sold by interested parties, eventually returning to a similar token distribution as before the spend occurred.

1. Distributing UNI tokens to users unlikely to sell does not put downward pressure on the price, and therefore may be less than 1-1 dilutive with the market price

: Although this might be true in the short term with an illiquid and inefficient market, in the long run, average token holders who disagree with the prevailing market price will buy or sell tokens in accordance with their preferences, ultimately bringing the market price back in line with all available sentiments.

1. In the long run tokens may be worth 1-1 with market price in the short run Uniswap could emit tokens when overpriced to accrue value by timing the market

: While this strategy may work for some DeFi protocols, it is not sustainable in the long term and does not align with Uniswap's goals of building a long-term, useful, and incentive-aligned protocol. Uniswap should focus on providing real value to users and token holders, leaving trading to the traders.

Considering these factors, a 1-1 ratio of notional spend value represents a reasonable and conservative choice for assessing token spending costs. Even in a world where token spend is worth less than 1-1 with notional value this conservative choice would only result in increasing returns to token holders further.

Current Cash Flows

To evaluate the net benefit of a given proposal for the Uniswap protocol, consider how the proposal will directly enhance the current protocol revenue. Since protocol revenue is generated as a percentage of every dollar traded on Uniswap based on a set protocol fee (F_protocol), we can calculate Free Cash Flow (FCF) as a function of trading volume:

Referring to our equations for Liquidity Takers, we can extend this to an immediate-term cash flow for liquidity takers (adding taker/provider subscripts to differentiate between variables for takers and providers):

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Here, execution prices and integration costs are inversely related to protocol revenue for Uniswap at any given time.

We can further extend this to include liquidity provided with the understanding that taker slippage is related to the amount of liquidity provided:

where slippage for a given trade is inversely related to liquidity, meaning more liquidity results in lower price execution.

Incorporating our earlier variables that impact liquidity, we obtain the general relationship of how parameters that Liquidity Providers care about relate to price execution for liquidity takers:

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The same variables that increase liquidity from our generalized LP function result in decreased prices for traders as the depth of liquidity increases, and thus price execution drops.

We can then replace P_taker in our original FCF_t equation giving us the final result of:

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This equation demonstrates the actions Uniswap can take to improve the objectives of liquidity providers and takers and how that relates to overall cash flows through the Uniswap Protocol.

Programs that reduce risk and operational expenses, and increase incentives for LPs, or programs that reduce fees or operational expenses for traders, will ultimately benefit token holders by increasing FCF payable to token holders.

If the FCF_t generated by a program while it's running is greater than the costs of that program at the same time (Cost_t) then the program is on its face a net positive to token holders. This would look like a program where paying $1 in tokens from Uniswap's treasury directly results in > $1 in revenue to token holders.

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Future Cash Flows

While incentives risks (R_provider), incentives (I_provider), and fees (F_taker) are stationary, meaning parameter changes or market conditions that influence them at time t will not impact them at time t+1, operational expenses (O_provider|taker) for both providers and takers are not.

These operational expenses include the one-time start-up costs of integrating systems to use Uniswap, brand loyalty, the mental cost of familiarizing oneself with Uniswap, and the knowledge that Uniswap exists in the first place and other potentially hard-to-individually quantify abstract costs. Operational expenses also include things like coordination switching costs such as migrating liquidity and volume to a new exchange, accounting for the network effect that Uniswap holds by virtue of being big already.

Lowering these operational expenses, or enticing potential users to overcome the hurdle of paying one-time costs increases future FCF_t in a compounding manner.

Here are some examples of how this may look in practice:

- A prospective trader googling "best DEX to trade on" finds the first result as "Uniswap" due to Uniswap having maintained market dominance through low fees and incentives programs. This trader chooses to use Uniswap instead of researching where they can find marginally better price execution.
- An LP has years of experience using the Uniswap protocol and has built up complex systems that allow it to manage liquidity there. The LP chooses to continue providing liquidity to the Uniswap protocol even though alternatives with slightly higher yields exist to avoid re-building that system.

Uniswap token holders may find it in their best interest to identify ways to lower future operational costs for both traders and LPs, enabling future revenue even in a world where immediate cash flow from that spend is less than the immediate cost.

In this context, we define the change in net benefit as the result of a program to include the expected change of all future expected cash flows to Uniswap against the lifetime cost of a proposed program.

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Governance

We can combine our financial benefits with the benefits provided by increased governance value as a result of brand and size, giving us the following equation for valuing the benefits provided across all votable, cash flow accruing UNI tokens:

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By combining the expected net present value of future cash flows to UNI holders and the premium in controlling externalities that governance allows control over all outstanding UNI tokens, we can also think of this as the expected change in value for the market cap for all UNI tokens as a result of a particular decision.

Cost-Benefit Analysis

Combining the benefit from the present value of future cash flows and governance value from making a decision against the cost of that decision provides us with the overall net benefit from that decision.

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If the expected net benefit is > 0 for a given proposal then it should be taken. If not then it shouldn't.

This framework also allows us to rank proposals in terms of priority where proposals with a higher expected increase in NetBenefit_overall should be prioritized over proposals with lower expected benefits.

An important caveat here is that it is often difficult to achieve certainty in making predictions about how a given proposal will impact the Uniswap protocol. Practically this analysis will often be theoretical or at best probabilistic. As much work as possible should be done to de-risk this through pre-work and analysis of expected impacts with only high confidence proposals being put forward. Furthermore once a proposal has been enacted its impact should be compared to its expected impact. Decisions made by Uniswap which fail to live up to expectations should be reversed or mitigated where possible.

Making and Assessing Proposals

Any proposal should be able to draw a direct line from how it impacts the users of Uniswap to how it benefits current or future cash flows or current or future governance value, and how that benefit is related to cost. If a proposal can show that its expected benefits outweigh the expected costs at any point, it has proven itself to be worthwhile.

This can be summarized as a 7-step process:

Step 1: How will this proposal impact the users of Uniswap?

e.g. "Creating a dev incentives program will attract X new third-party integrations and increase liquidity by an expected $Y, lowering price execution for traders by an expected Z%, and increasing expected volumes by an expected $W a year."

Step 2: How will this proposal impact the current cash flow to token-holders?

e.g. "This dev incentives program will increase expected volumes by an expected $X a year which at the current Y% protocol fee will increase protocol revenues by $Z a year."

Step 3: How will this proposal impact future cash flows to token-holders?

e.g. "According to our empirical analysis, integrations onboarded to Uniswap with dev incentives tend to stay there due to switching costs and network effects, increasing future cash flows by $X after the incentives program has ended"

Step 4: How will this proposal impact the governance value of UNI tokens?

e.g. "This dev incentives program will propel Uniswap to control X% of the swapping market share enabling governance to make Y decisions which are valued by the token holders at $Z in financial value"

Step 5: How much will the proposal cost?

e.g. "This dev incentives program will require an expected $X incentives paid in UNI out of the treasury per year"

Step 6: Will the benefits of this proposal outweigh the costs?

e.g. “This dev incentives program will cost $X and is expected to drive $Y in protocol revenue today and $Z in discounted protocol revenue over the next 5 years where Y+Z > X”.

Step 7: What is the confidence in my assumptions outlined in Steps 1-6?

e.g. “We predict with X% confidence based on empirical data that the benefits predicted from this proposal will fall between $Y and $Z.”

If a proposal predicts a net positive outcome with a high degree of confidence then it makes sense for further consideration.

Conclusion

In this document, we have provided a theoretical objective function for calculating the cost-benefit for any proposal to Uniswap governance as well as a 7-step framework for deciding whether a proposal is worthwhile.

If a proposal cannot justify its value after completing this cost-benefit analysis through the 7 steps showing a positive expected cost-benefit relationship, it is unlikely to be worthwhile for further consideration. Any given proposal should have at least roughly quantified estimations of cost and benefit based on available data. Only if a proposal provides compelling benefit net of costs should it be considered.

After a proposal is enacted, it should be re-evaluated as frequently as is feasible to verify the assumptions under which it was made were valid. A program that is unable to deliver on the cost-benefit relationship that it was justified under should be promptly shut down or mitigated to avoid undue cost to token holders.

The Uniswap governance process should focus on maximizing the long-term value for UNI token holders by thoroughly assessing the potential impacts of each proposal on users, cash flows, governance value, and costs. By consistently applying this structured approach to decision-making, the Uniswap community can ensure that it continues to deliver value and maintain its position as a leading decentralized exchange.