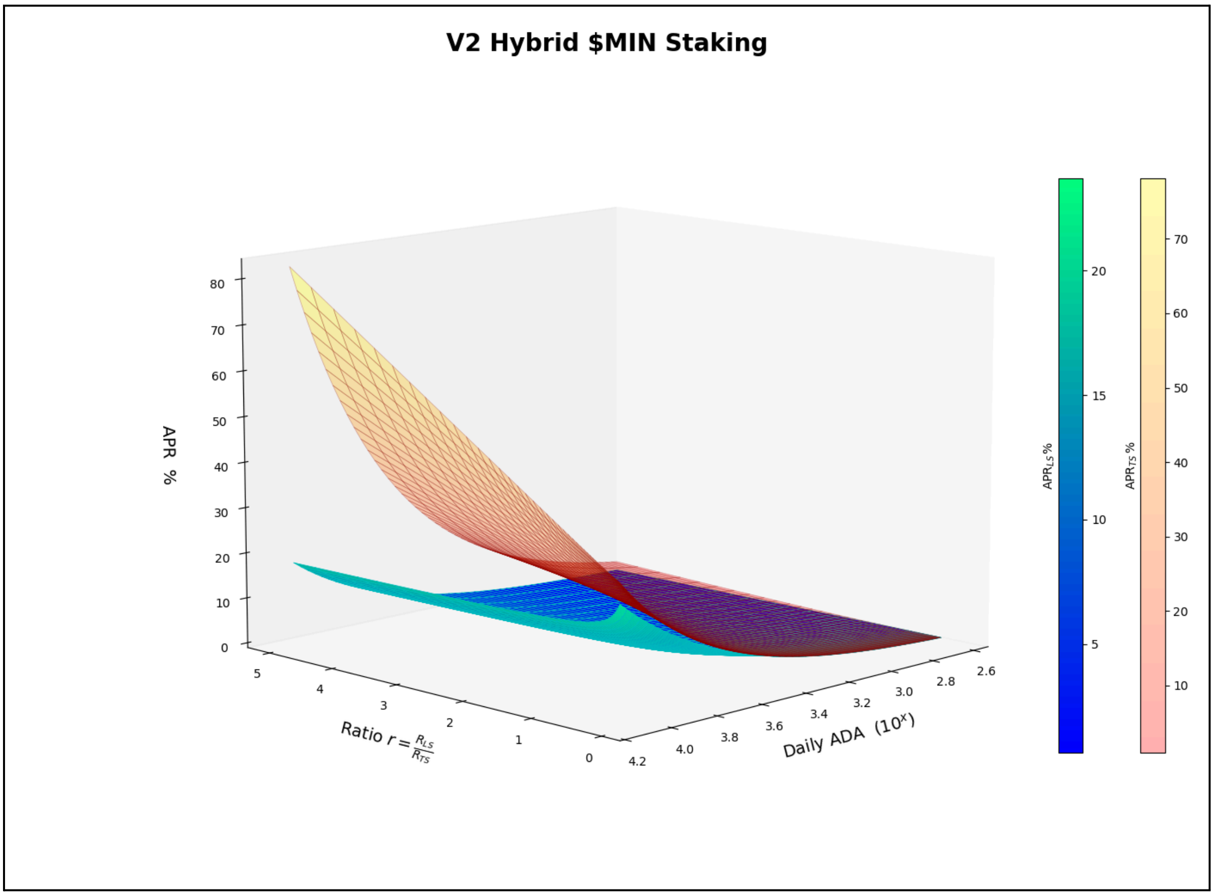


Hybrid $MIN Staking V2

Key motivations for the implementation of V2.

Author: @CWSchub

1. Abstract

This proposal finalises the hybrid $MIN Staking mechanism introduced in [MIP 2.2] by resolving its shortcomings at all ends of the market-performance spectrum. It first analyses the collapse and saturation problems in the current (V1) model, then introduces a smooth, exponentially-decaying APR formula that replaces the previous piece-wise γ definition. Formal proofs show that the new formula guarantees predictable, non-negative APRs and fair auto-balancing under all conditions. Minor parameter fixes (dynamic ADA-delegation rate, LBE-reward “dust” handling) are also included. The improved stability unlocks further use cases—most notably Liquid Staking Derivatives—without altering the underlying fee-switch revenue share. For intellectual-property reasons, the full formula is withheld until DAO approval. Finally, the proposal quantifies the financial impact of V1 versus V2 and sets out a scope of work that underpins the requested compensation.

2. Scope of Change

The proposal tackles two sets of optimisations, depending on whether they affect the rewards-splitting logic or not:

2.1. Peripheral Optimisations:

1. Most tax systems operate on a yearly basis. For this reason, it makes sense to **extend the Tiered Option from** a **9-month** period **to** a **12-month** period. Simplifying tax implications.

2. Apply Early Redemption fees to $ADA and $MIN tokens only. This avoids LBE "dust" from accumulating after the distribution period has finished.

3. Adjust how Early Redemption Rewards scale. Instead of using a linearly scaling system, redeeming rewards ***too early*** should be **punished harder** and the fees should be **increasingly forgiving** when ***approaching maturity*.**

4. The current reward distribution system relies on the $**ADA delegation APR** to compute the relative performance between $MIN staking and $ADA staking. However, this APR has been **hardcoded as a constant value of 2.86 %**, which is both **inaccurate and unfair**, as it fails to reflect real-time network conditions. Cardano's delegation rewards vary due to SPO performance and protocol-level monetary policy.
   To improve accuracy and fairness, the $ADA delegation APR should instead be **dynamically sourced** from the **monthly average yield** of the **Stake Pool Operators (SPOs)** to which Minswap delegates its $ADA (see [ADA Delegation Proposal]). This change would ensure the staking mechanism is grounded in actual on-chain performance rather than fixed assumptions.

2.2. Core Optimisations:

1. **Enable a smooth transition** between low-yield and high-yield regimes. The current model suffers a collapse to equivalence in low-yield conditions ($\gamma \approx 1$), where Tiered and Liquid APRs become indistinguishable. This breaks the equilibrium between strategies, as Tiered staking must always outperform Liquid staking to justify its higher risk.
2. **Redistribute rewards more evenly** across all market conditions—from weak to strong performance—so that no single option is always dominant. This preserves strategic tension and justifies the coexistence of both staking modes.

Intellectual-property notice. The full closed-form V2 formula is withheld until DAO approval to protect the author's IP while sufficient formal proof of its behaviour is provided in this document.

3. Background and Problem Statement

3.1. Historical Overview of Hybrid $MIN Staking V1

Minswap's Hybrid $MIN Staking mechanism started with an initial implementation on 29 October 2024, where Early Redemptions were introduced and only the 9-month staking option was made available. Following the implementation of Liquid staking on 18 February 2025, there has been an observed growth in total $MIN Staked of 146 Million since the first implementation in October, despite turbulent market conditions in the overall cryptocurrency space.

Figure 1. Total $MIN Staked over time. The recorded amount of $MIN staked on the 29th of October was 433 million $MIN tokens. To date, this number has organically increased by approximately 33.7% to a total of 579 million $MIN tokens staked.

The implementation of V1 Hybrid $MIN Staking was designed with two main objectives:

1. The introduction of Early Redemption Fees.
2. Simplification while retaining the same capabilities as its predecessor.

These are the two key drivers behind the current $MIN Staking mechanism. The result is a system which adjusts dynamically to market conditions and stake distribution by introducing a reward redistribution function.

Notably, the design did not include a comprehensive game-theoretic study of strategic incentives, which has led to the identification of important blind spots now addressed in this proposal.

3.2. The gamification of $MIN Staking

Assuming that users behave strategically, optimising their expected returns based on risk and time preferences, this transforms $MIN Staking into a well-defined system suitable for **game-theoretic analysis**.

Element	Description
Players	All $MIN stakers
Actions	Choose option (Liquid or Tiered), and unlock time ($t \in [1, T]$)
Payoffs	Effective APR (based on time-averaged returns minus early redemption penalties)
Strategy	Maximise effective APR
Information	Fee-switch rewards and stake distributions are known

Table 1. Elements of the staking game model. Each $MIN staker is treated as a rational agent who chooses a strategy to maximise their effective APR, based on publicly known fee-switch rewards and stake distributions.

A Nash equilibrium occurs when no participant can improve their effective APR by unilaterally changing their strategy (switching options or unlocking earlier/later), based on: $MIN Price, Daily Rewards, Total $MIN Staked and stake distribution (Liquid vs. Tiered).

In simple terms:

The equilibrium is reached when every $MIN staker, based on their own expectations and the behaviour of others, is making the **best possible choice for themselves**, and everyone agrees they **wouldn't gain anything by changing** their strategy.

3.3. Diversity of strategies

An equilibrium can be observed in the $MIN Staking mechanism when the distribution of stake between Liquid and Tiered options stabilises over time. However, that is not necessarily a Nash equilibrium.

The distribution of staked $MIN stabilises, we must ask:

"Is one option clearly dominant under current conditions?"
If the answer is yes, and all rational stakers converge to that strategy, then we face a **trivial equilibrium**—a sign of flawed game design. In such cases, the presence of multiple staking options becomes cosmetic rather than functional.

For a dual-option system like $MIN Staking to remain justified, both strategies must be viable across a broad range of market conditions. This means that **no single option should be overwhelmingly optimal at all times**, and the redistribution mechanism must preserve strategic tension between the two.

3.4. A Game of Redistribution

In the hypothetical scenario where rewards are equally distributed among all participants, it would not be possible to strategise and find the most suitable product (or combination thereof) available to each individual's needs. All stakers would yield the same baseline APR.

To enable **higher yields** in the **Tiered option**, the system must **reduce the yields** in the **Liquid option** by a proportionate amount, defined as **the redistribution premium**. This is a necessary consequence of the **zero-sum nature** of the fee-switch reward pool: redistribution does not create new value, it reallocates existing rewards among participants.

Accordingly, the $MIN Staking mechanism can be engineered in many ways depending on what principles it aims to uphold. As a consequence of the findings in this report, the reward-splitting logic must follow certain design principles.

Design Principles

a) There are two options: Liquid Staking and Tiered Staking

   i) **Liquid Staking**: Users can stake any amount of $MIN at any time and withdraw freely. There are no lockups or penalties.

   ii) **Tiered Staking**: Users commit $MIN to a predefined time-lock (currently 9 months) and incur a penalty if they redeem early.

b) The redistribution logic must be **highly responsive to market conditions**.

c) The **Tiered** option must always offer a **higher nominal APR** than the Liquid option.

d) The redistribution logic must **maximise smoothness in strategy equilibrium**.

e) There must be **no triviality between strategies** at all times.

The "Premium Redistribution Problem"

The redistribution problem starts by obtaining a Base amount of yield all participants would earn if there were no options available.

Once obtained, the problem is initiated by asking the question: ***"How much of a premium should apply to the Liquid option to make the Tiered option viable but not overwhelmingly dominant?"***, and viceversa.

This is not an arbitrary decision. Because users behave **strategically** and respond to differences in effective yield (after penalties and time discounting), the problem naturally becomes a **game-theoretical optimisation**. The redistribution premium must be large enough to make Tiered staking attractive to long-term holders, yet small enough to keep the Liquid option active and relevant.

3.5. V1 Hybrid $MIN Staking Design

Compared to its predecessor "Boosted Staking", V1's reward distribution approach introduces an auto-balancing factor based on the relative amounts of $MIN staked in the Tiered staking option R_{LS}/R_{TS}, leading to significant changes in the resulting APRs for that option. This implementation is powerful because **it enables dynamic auto-balancing** in a predictable manner, supported by strategically designed constraints.

The gamma (γ) parameter: "relative yield" or "cost to stake":

The transition from "Boosted Staking" (1, 3, 6 or 9 month lockups) to V1 Hybrid $MIN staking required an external constraint in order to reduce the premium redistribution problem to a single solution.

The idea was to constrain the Liquid Staking APR such that it was slightly higher than the yield obtained by holding and delegating $ADA. The solution statement was:

"Instead of holding and delegating $ADA, why not purchase the corresponding amount in $MIN and earn a higher yield in $ADA rewards plus other tokens"

Taking the base $ADA delegation APR as 2.86%, and the Base APR for $ADA-only rewards yielded from $MIN Staking,

$$\begin{array}{l} \text{dAPR} \equiv \text{ADA Delegation APR} \\ \text{sAPR} \equiv \text{Base APR (\$ADA only)} \end{array} \Rightarrow \begin{cases} \text{dAPR} & = 2.86\% \\ \text{sAPR} & = 365 \cdot 100 \cdot \frac{\text{Daily \$ADA Rewards}}{\text{Total \$MIN Staked} \cdot \text{\$MIN Price}} \% \end{cases}$$

the γ parameter is defined as:

$$\gamma \equiv \frac{\text{dAPR}}{\text{sAPR}} = 7.83561 \cdot 10^{-5} \cdot \frac{\text{Total \$MIN Staked} \cdot \text{\$MIN Price}}{\text{Daily \$ADA Rewards}}$$

This parameter measures the relative cost (ignoring token inflation) of the base APR for $MIN Staking relative to delegating ADA. Its inverse is a measure of relative yield.

Scenario	Interpretation
$\gamma < 1$	High relative yield, low cost to stake $MIN
$\gamma \sim 1$	Similar relative yield and cost to stake $MIN
$\gamma > 1$	Low relative yield, high cost to stake $MIN

Table 2. Summary of γ regimes. The ratio γ compares ADA delegation yield to MIN staking yield in ADA terms, serving as a proxy for $MIN's relative performance.

V1 Hybrid $MIN Staking Formulas:

The final formulas that are used to calculate the corresponding APRs for the Liquid and Tiered Staking options are as follows. Firstly, the baseline APR (tAPR) is calculated:

$$\begin{cases} \text{tAPR} \equiv \text{Base APR of \$MIN Staking} \\ \text{tAPR} = 365 \cdot 100 \cdot \left(\dfrac{\text{Daily \$ADA Rewards}}{\text{\$MIN Staked} \cdot \text{\$MIN Price}} + \dfrac{\text{Daily \$MIN Rewards}}{\text{\$MIN Staked}} + \dfrac{\text{Daily \$LBE Rewards}}{\text{\$MIN Staked} \cdot \text{\$MIN Price}} \right) \end{cases} \tag{3.0}$$

With tAPR, the redistribution is as such:

$$APR_{LS} = \gamma \cdot tAPR \tag{3.1}$$

$$APR_{TS} = tAPR \cdot \left[1 + (1-\gamma) \frac{R_{LS}}{R_{TS}} \right] \tag{3.2}$$

As can be observed, the γ parameter is used to scale up or down an initial tAPR calculation. It is important to note that there has been a previous restriction:

$$\gamma = min\left(\frac{\text{dAPR}}{\text{sAPR}}, 1\right) \Rightarrow \gamma = \begin{cases} \gamma & \text{if } \gamma \leq 1 \\ 1 & \text{if } \gamma > 1 \end{cases} \tag{3.3}$$

In (3.3), the gamma parameter is **defined as a piecewise function with a restricted range** of (0,1) **to prevent catastrophic events** such as "negative APRs". If its domain weren't restricted to remain less than or equal to 1, the expression in (3.2) would allow for negative values in the Tiered Staking option. This restriction causes the (3.1) and (3.2) to "collapse" to the same value of *tAPR* in low yield conditions (see Table 1).

3.6. Shortcomings of the V1 Hybrid Model

While the mechanism was an extraordinary step forward in terms of complexity compared to the first version of $MIN Staking, there are some considerable critical issues which need to be addressed in order to ensure real stability and fairness for both Liquid stakers and Tiered stakers across all market conditions.

Collapse of APR_{LS} and APR_{TS} into $tAPR$

As has been described earlier, the current description of the Liquid staking APR in (3.1) requires $\gamma \leq 1$. Otherwise, when $\gamma > 1$, it opens the possibility for negative APRs in the Tiered Staking contract. Thus, the parameterization of gamma such that $\gamma \equiv min\left(\frac{dAPR}{sAPR}, 1\right)$ where $\gamma = 1$ describes a 3D surface where both APRs collapse into tAPR, as seen in Figure 2.

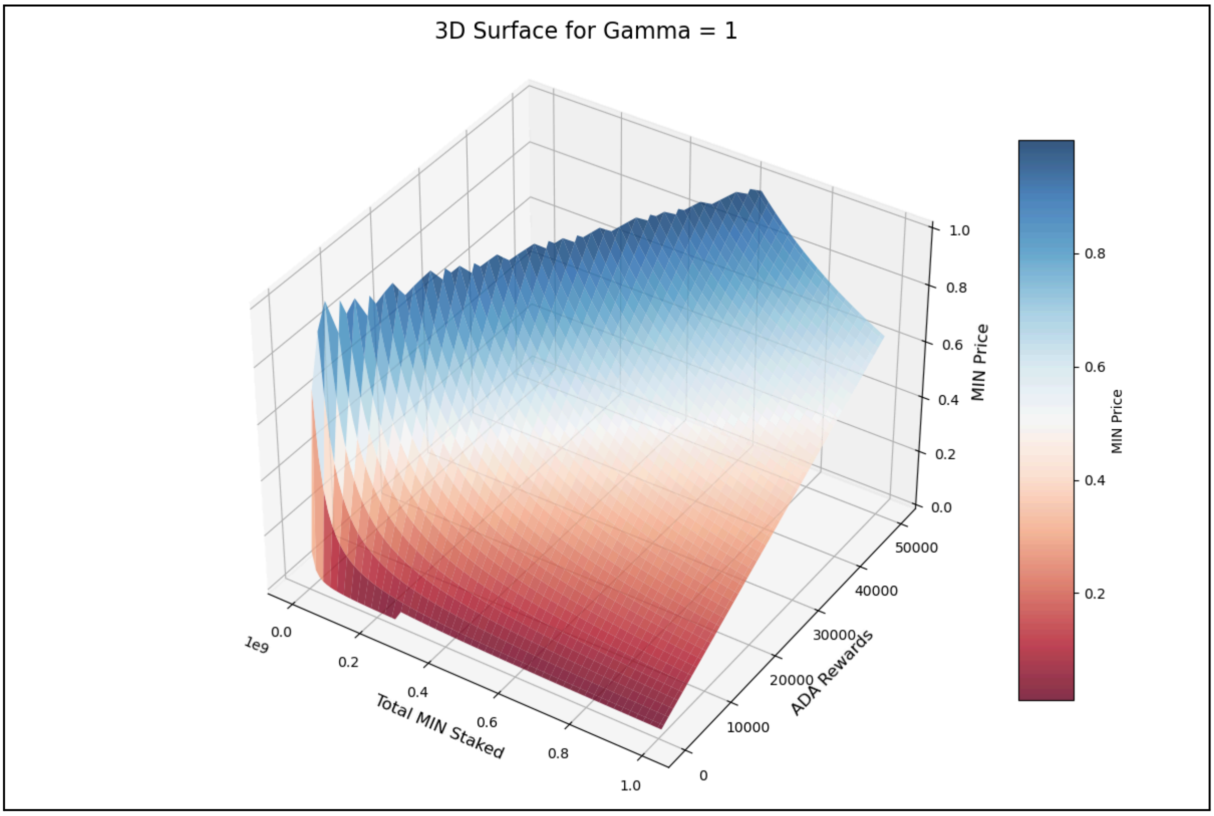


Figure 2. The collapse of APR_{LS} and APR_{TS} into $tAPR$ is represented by an infinite amount of points along a 3D surface

While **Liquid Staking participants can freely adapt** to these conditions, as they can enter or exit their staking position without penalty, **the same does not apply to Tiered Staking users**, because they incur an **early redemption fee.**

The risk-reward disparity is too great. In these circumstances, **Liquid Staking becomes the overwhelmingly preferred choice**, resulting in another "illusion of choice" through trivial decision-making

High Yield Triviality: When $\gamma \ll 1$

This section will not dive deep into the behaviour of stake distribution (the ratio R_{LS}/R_{TS}). It is discussed in the section on Capital Flow, which will provide further insight on what happens to the distribution of stake under all types of market conditions. Nonetheless, a first mention must be made.

Figure 3 shows how, **when the relative cost to stake $MIN decreases** (high yield regime), APR_{LS} remains constant for all values of $\gamma < 1$. As the relative cost keeps decreasing, **the APR disparity between both options grows further**. The result is, again, trivial decision-making.

When comparing a constant 3% APR in the Liquid option to the 8.5% APR obtained in the Tiered option, there is little room for debate over the preferred option. As seen in Minswap's Staking page:

https://minswap.org/staking

V1 Design Principles “Checklist”:

How well does the V1 implementation align with the established Design Principles?

a)	There are two options - **Correct** alignment
b)	The mechanism is highly responsive - **Correct** alignment
c)	Not *always* satisfied - **Incorrect** alignment
d)	The collapse $\gamma > 1$ breaks smoothness in strategy equilibrium - **Incorrect** alignment
e)	The redistribution logic causes triviality in high/low yield - **Incorrect** alignment

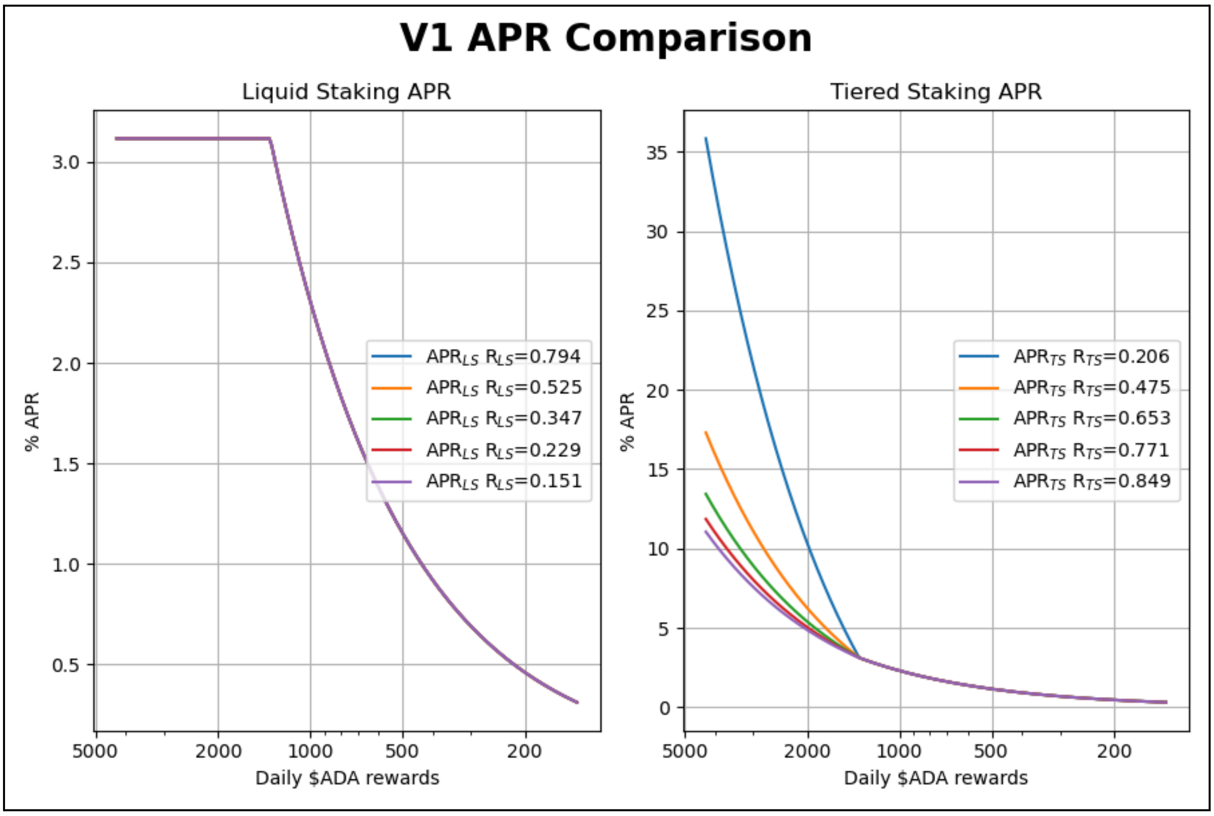


Figure 3. APR comparison for Liquid (left) and Tiered (right) staking under V1. The collapse in Liquid APR at low yield reflects the γ = 1 discontinuity (see Eqs. 3.1–3.2), while Tiered APR varies with the stake ratio $r = R_{LS}/R_{TS}$.

3.7. Simplified expression for $tAPR$ and APR_{LS}:

The expression for the baseline APR (tAPR) is obtained in equation (3.0). By breaking down the definitions:

$$\Delta_{\text{Daily}} \equiv \quad \text{Daily Rewards denominated in \$ADA}$$
$$\Delta_{\text{Daily}} = \quad \Delta_{\text{\$ADA}} + \Delta_{\text{\$MIN}} \cdot \text{P}_{\text{\$MIN}} + \textstyle\sum_i \Delta_{\text{LBE}_i} \cdot P_{\text{LBE}_i}$$

$$\Omega_{\text{\$MIN}} \equiv \text{Total \$MIN Staked}$$

$$\gamma \equiv \frac{d\text{APR}}{s\text{APR}} = \frac{2.86}{365 \cdot 100} \cdot \frac{\Omega_{\text{\$MIN}} \cdot P_{\text{\$MIN}}}{\Delta_{\text{\$ADA}}}$$

This leads to a reformulation,

$$\text{APR}_{LS} = \gamma \cdot t\text{APR} = \frac{2.86}{365 \cdot 100} \cdot \frac{\Omega_{\text{\$MIN}} \cdot P_{\$MIN}}{\Delta_{\text{\$ADA}}} \cdot \frac{\Delta_{\text{Daily}}}{\Omega_{\text{\$MIN}} \cdot P_{\text{\$MIN}}} \cdot 365 \cdot 100$$

$$\text{APR}_{LS} = 2.86 \cdot \frac{\Delta_{\text{Daily}}}{\Delta_{\text{\$ADA}}}$$

This result establishes the value of V1's Liquid Staking APR in terms of the total daily rewards and the daily ADA rewards. This final simplification would be preferable if it could be expressed in terms of γ.

Therefore, assuming a new variable ω , such that

$$\frac{\Delta_{\text{Daily}}}{\Delta_{\text{\$ADA}}} - 1 = \omega \Rightarrow \Delta_{\text{Daily}} = \Delta_{\text{\$ADA}}(1+\omega)$$

We can now redefine $APR_{LS}(\gamma, \omega)$ as:

$$\begin{cases} \text{APR}_{LS} = \gamma \cdot t\text{APR} = 2.86 \cdot (1+\omega) & \text{if } 0 < \gamma \leq 1 \\ \text{APR}_{LS} = t\text{APR} = 2.86 \cdot \frac{1+\omega}{\gamma} & \text{if } 1 < \gamma \end{cases} \qquad (3.4a)$$

Where ω is the relative difference between the total daily rewards and daily ADA rewards. For example, if the ex-ADA rewards represent a 20% of the total daily rewards (measured in ADA), then $\omega = 0.2$.

Expression (3.4a) is especially useful in order to define the baseline APR (tAPR) as,

$$t\text{APR} = 2.86 \cdot \frac{1+\omega}{\gamma} \qquad (3.4b)$$

4. V2 Hybrid $MIN Staking Design

Redesigning the logic behind the rewards redistribution mechanism must follow the core principle designs established in Section 3.4.

In order to accomplish this, it is critical to understand how the redistribution of APRs is calculated.

4.1. The Premium Redistribution Problem

Once the baseline APR defined by tAPR (see Eq. 3.0) is established, we must define the **redistribution premium** as the relative difference between the base yield and the Liquid Staking APR_{LS}. This premium captures the proportion of rewards withheld from the Liquid pool and redistributed to Tiered Staking participants.

Additionally, if impose the condition $APR_{LS} \propto tAPR$, we obtain:

$$\text{Redistribution Premium "C"} \equiv \frac{1}{t\text{APR}}\left(t\text{APR} - \text{APR}_{LS}\right) \Rightarrow \text{APR}_{LS} = t\text{APR}\left(1 - C\right)$$

When defining an arbitrary redistribution premium *C,* the Tiered Staking APR is solvable as:

$$\begin{cases} \text{Ratio "r"} \equiv \dfrac{R_{LS}}{R_{TS}} \\ \text{APR}_{TS} \equiv t\text{APR} + C \cdot r \Rightarrow \text{APR}_{TS} = t\text{APR}\left(1 + C \cdot r\right) \end{cases}$$

As a result, the primary objective of this design is to specify a suitable form for the premium redistribution function ***C***. This function must be evaluated in terms of how well it satisfies the **design principles**—including incentive fairness, strategic diversity, smoothness of equilibria, and responsiveness to market conditions.

4.2. Assessment of the Redistribution Logic

We have established that gamma's true domain: $\gamma \in (0, \infty)$.

Constraints on the Premium Redistribution Function:

In order to satisfy the design principles, the following are necessary conditions for *C*:

$$\begin{cases} C(\gamma, r) \geq 0 \in (0,1) & (i) \\ C(\gamma, r) \subset C^k,\ k \geq 2 & (ii) \\ \lim\limits_{\gamma \to \infty} C(\gamma, r) = 0 & (iii) \end{cases} \qquad (\bigstar)$$

Condition (i) imposes that the value of the function is positively bound between 0 and 1

Condition (ii) imposes continuity in the first and second derivative, ensuring smoothness.

Condition (iii) imposes a boundary constraint aligning with zero APR at $\gamma \to \infty$.

As a result of ($\star$), we can now compare the V1 and V2 PR functions $C(\gamma, r)$:

Element	V1 Formulation	V2 Formulation
Baseline APR	tAPR	tAPR (no changes)
Gamma (γ) parameter	$\gamma = min\left(\frac{d\text{APR}}{s\text{APR}}, 1\right)$	$\gamma = \frac{d\text{APR}}{s\text{APR}}$
Redistribution Premium "C"	$C_{\text{V1}}(\gamma) = 1 - \gamma$	$C_{\text{V2}}(\gamma, r) \propto \frac{f(e^{-\gamma/r})}{g(\gamma + K)}$ (4.1) **
Condition (i)	Satisfied	Satisfied
Condition (ii)	Not Satisfied $\forall\gamma > 0$	Satisfied $\forall\gamma > 0$
Condition (iii)	Satisfied	Satisfied

Table 3. A comparative list of elements for Hybrid $MIN Staking V1 and V2.

Using equation (3.4b) and V2's PR function:

$$\begin{cases} t\text{APR} = & 2.86 \cdot \frac{1+\omega}{\gamma} \\ C_{\text{V2}}(\gamma, r) \propto & \frac{f(e^{-\gamma/r})}{g(\gamma+K)} \end{cases}$$

It then follows that, for V2:

$$\begin{cases} \text{APR}_{LS} = t\text{APR} \cdot [1 - C_{\text{V2}}(\gamma, r)] & (4.2) \\ \text{APR}_{TS} = t\text{APR} \cdot [1 + r \cdot C_{\text{V2}}(\gamma, r)] & (4.3) \end{cases}$$

V2 Design Principles "Checklist"

a)	There are two options - **Correct** alignment
b)	The mechanism is highly responsive - **Correct** alignment
c)	Always satisfied - **Correct** alignment
d)	γ is no longer defined piecewise, smoothness is ensured - **Correct** alignment
e)	Redistribution function C_{V2} changes with γ and r - **Correct** alignment

Figure 4 represents the **drastic improvement in APR behavior** introduced by the V2 mechanism, particularly in the high-performance regime ($\gamma < 1$). Unlike V1, which exhibits discontinuous flattening of Liquid APR, V2 ensures smooth, monotonic transitions for both staking options—maintaining incentive alignment and strategic diversity across all market conditions.

**Reminder: equation (4.1) will be released if option A is voted.

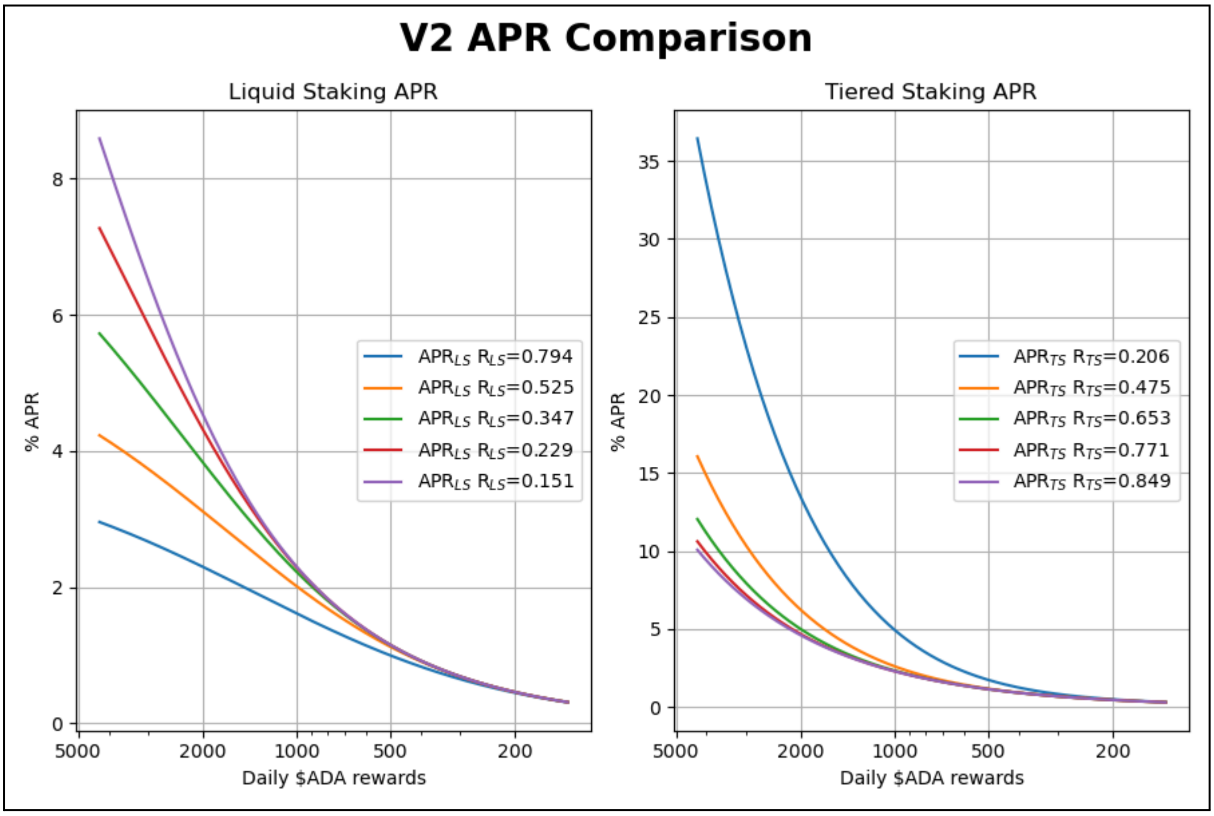


Figure 4. V2 APRs across performance regimes. Liquid APR varies smoothly for $\gamma < 1$, eliminating the V1 plateau. Tiered APR continues to scale with the stake ratio $r = R_{LS}/R_{TS}$ preserving the "higher-risk, higher-reward" structure.

4.3. Technical documentation with full formulaic approach.

The final formulas that express the calculations for $MIN Staking's V2 APRs will be made available if this proposal passes and option B is the winning option.

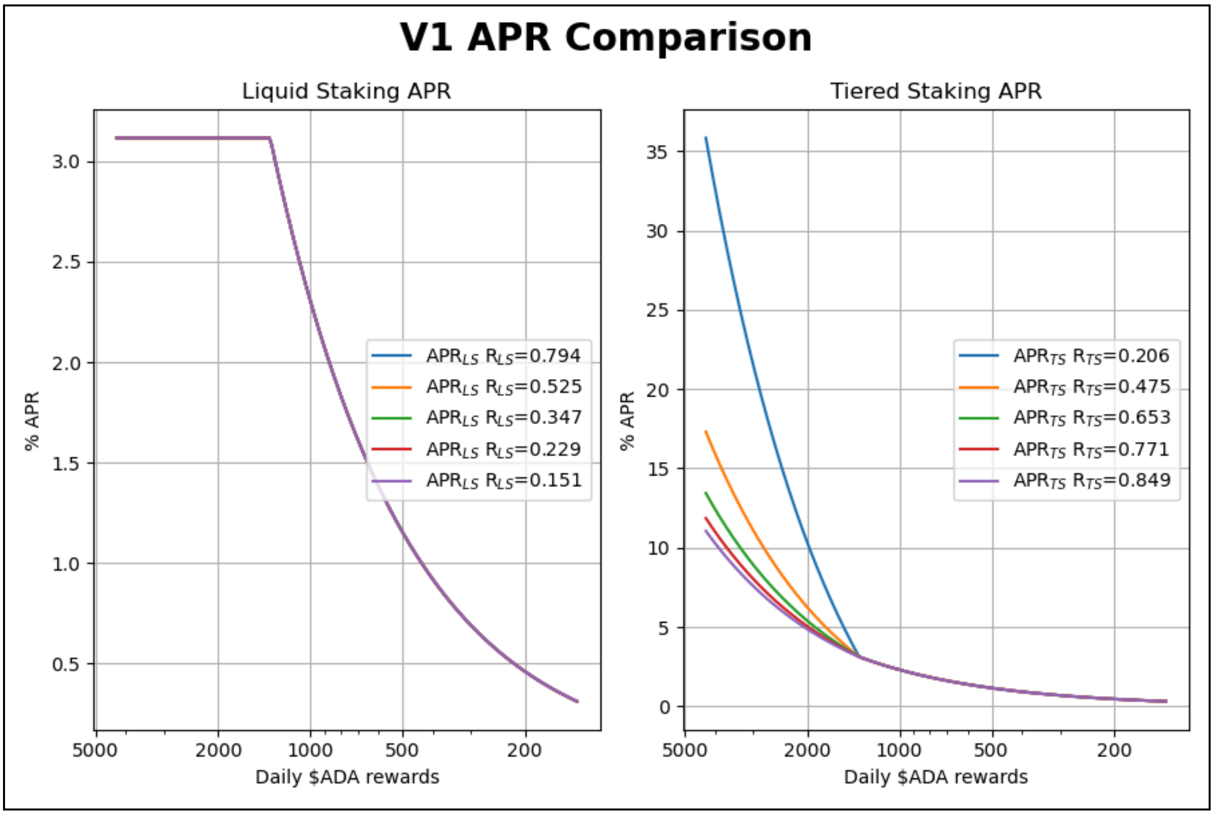
Said formulas don't follow an immediate derivation and require additional corrections after imposing an initial "model" function.

Nonetheless, in order to justify this proposal, a graphical representation of the new formulaic approach will be presented and used to contrast and compare with the V1 Hybrid Staking formulation.

5. Graphical comparison: V1 and V2.

5.1. APRs Based on Strategy and Yield Regime

This section will provide a brief description of APR based on the dynamic redistribution premium (RP) across different yield regimes. Reusing figures 3 and 4.

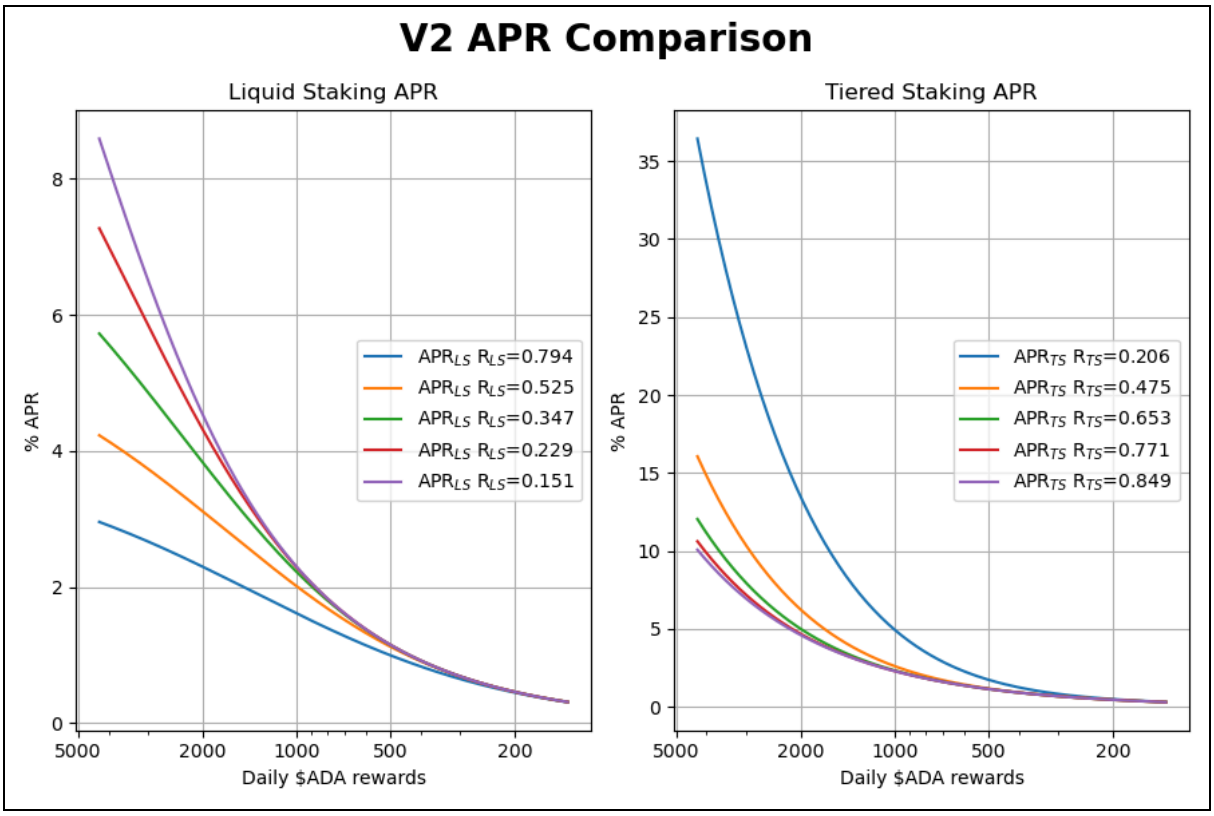


V1 Liquid Staking:

Regime\Strategy	Strategy: Liquid $(r > 1)$	Strategy: Tiered $(r < 1)$
High yield $(\gamma < 1)$	Abusive RP causes low APRs, but does not depend on preferred strategy.	Abusive RP causes low APRs, but does not depend on preferred strategy.
Low yield $(\gamma > 1)$	Inexistent RP causes highest yield possible (baseline)	Inexistent RP causes highest yield possible (baseline)

V1 Tiered Staking:

Regime\Strategy	Strategy: Liquid $(r > 1)$	Strategy: Tiered $(r < 1)$
High yield $(\gamma < 1)$	Abusive RP causes unsustainable APRs and stake will migrate to Tiered	Abusive RP causes lowest yield possible (baseline)
Low yield $(\gamma > 1)$	Inexistent RP causes lowest yield possible (baseline) equal to Liquid	Inexistent RP causes lowest yield possible (baseline) equal to Liquid



V2 Liquid Staking:

Regime\Strategy	Strategy: Liquid $(r > 1)$	Strategy: Tiered $(r < 1)$
High yield $(\gamma < 1)$	Increased RP causes unsustainable APRs and stake will migrate to Tiered	Dampened RP pushes APR to the highest sustainable yield (baseline).
Low yield $(\gamma > 1)$	Increased RP pushes APR to the lowest sustainable yield	Decreased RP causes unsustainable APRs and stake will migrate to Liquid.

V2 Tiered Staking:

Regime\Strategy	Strategy: Liquid $(r > 1)$	Strategy: Tiered $(r < 1)$
High yield $(\gamma < 1)$	Increased RP causes unsustainable APRs and stake will migrate to Tiered	Dampened RP pushes APR to the lowest possible yield (baseline).
Low yield $(\gamma > 1)$	Increased RP pushes APR to the highest sustainable yield	Decreased RP causes unsustainable APRs and stake will migrate to Liquid.

Further Visual Analysis between V1 and V2

In order to further clarify the differences between V1 and V2, a series of comparative charts under different circumstances will be provided. These graphs analyse the following:

1. Liquid Staking APR comparison for all market conditions.
2. Tiered Staking APR comparison for all market conditions.
3. Overlapped comparison for all market conditions
4. % Difference between V1 and V2

These comparisons aim to fully flesh out how V2 $MIN Staking is able to mimic the desired behaviours of V1 and provide a solution to the issues described in section 3.6. Nonetheless, there are very specific situations where V1 slightly outperforms V2. This will be studied in Section 7.2

1. Liquid Staking APR comparison for all market conditions.

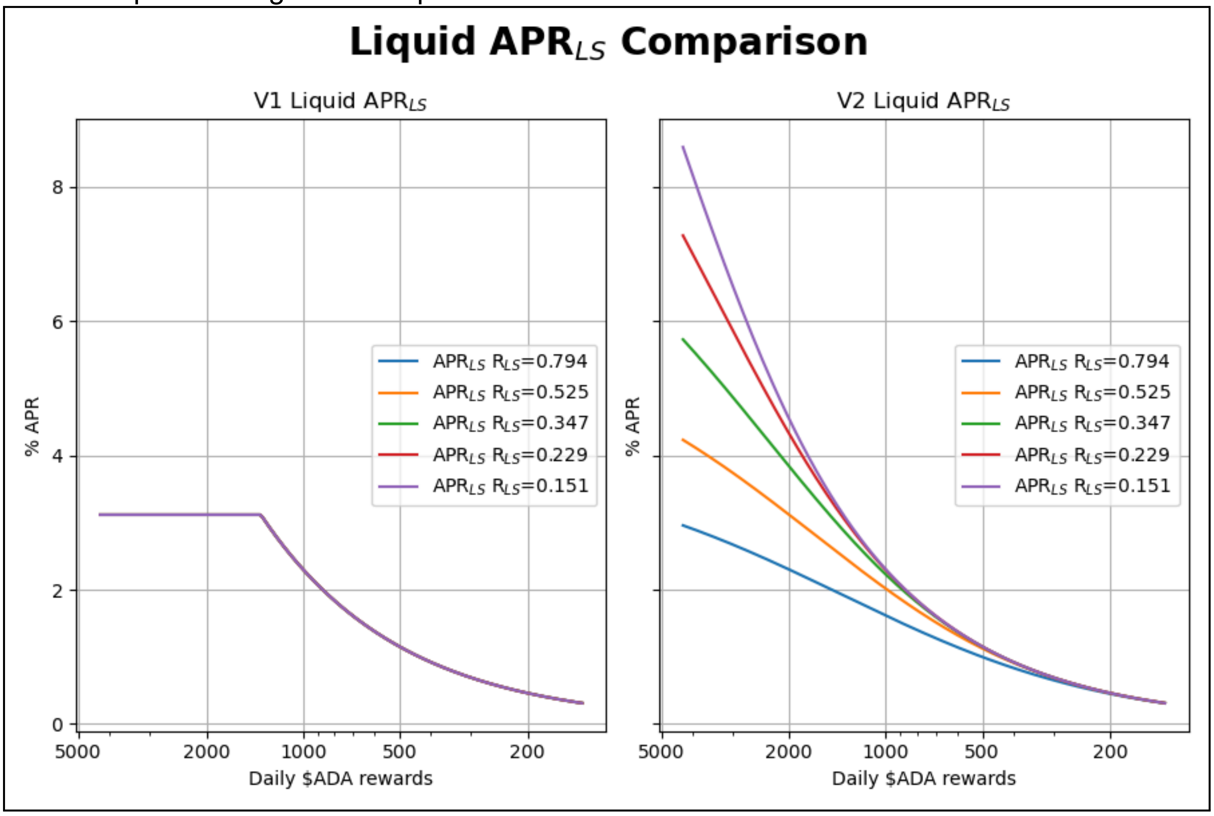


Figure 5. Left, V1 Liquid Staking changes sharply and remains constant once $MIN Staking enters high performance territory. Right, V2 Liquid Staking smoothly converges to a 100% increase in APR

2. Tiered Staking APR comparison for all market conditions.

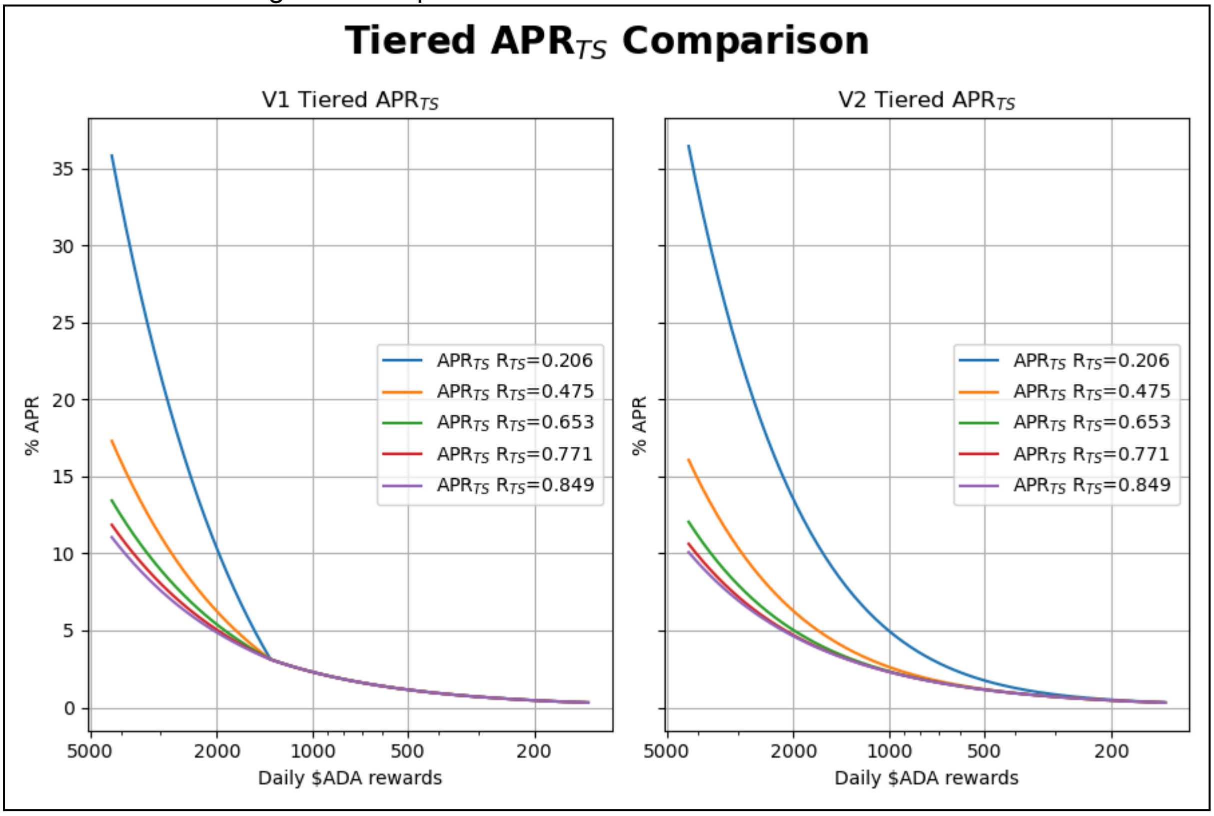


Figure 6. Left, V1 Tiered Staking, with exponential behaviour as $MIN Staking performance increases. Right, V2 Tiered Staking, with exponential behaviour as $MIN Staking performance increases. No qualitative changes.

3. Overlapped comparison for all market conditions

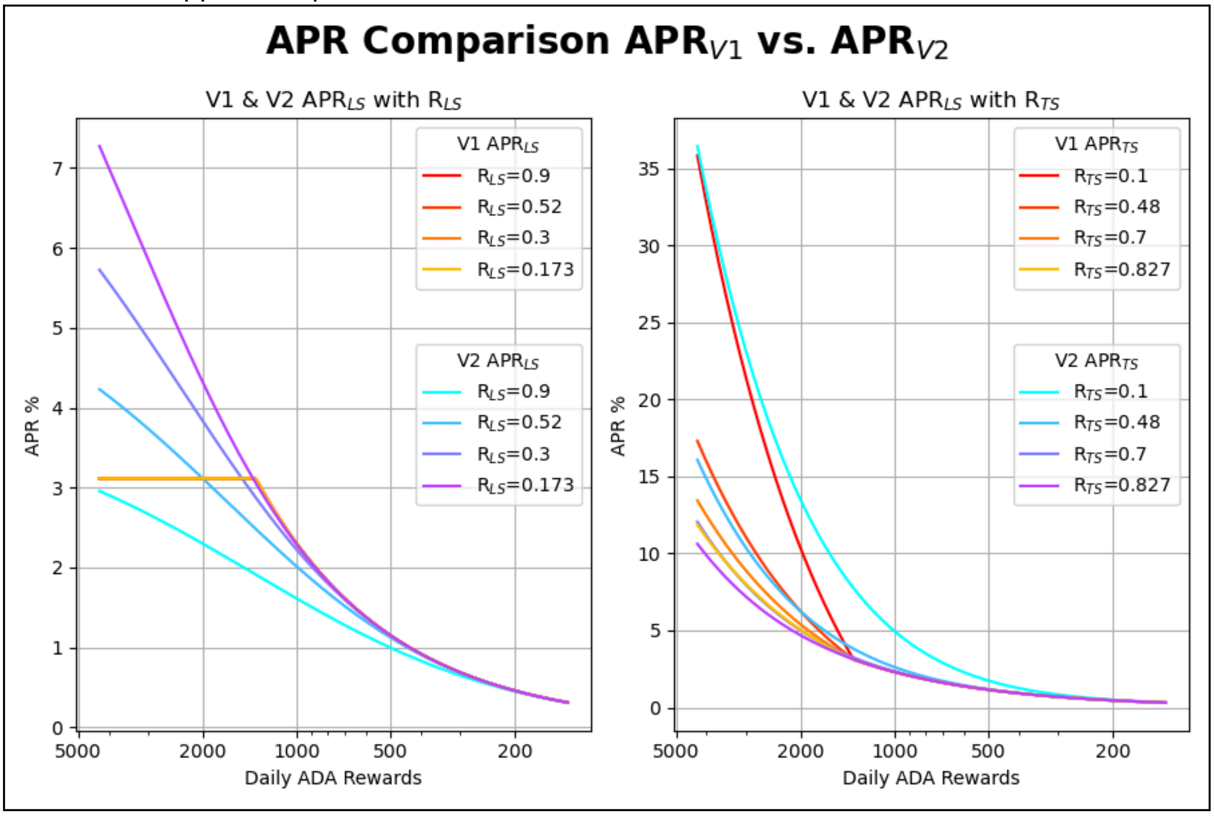


Figure 7. Comparison of V1 and V2 APRs across stake ratios. Left: Liquid APRs; Right: Tiered APRs. V2 preserves key incentive structures while introducing smoother and more balanced behavior.

4. % Difference between V1 and V2

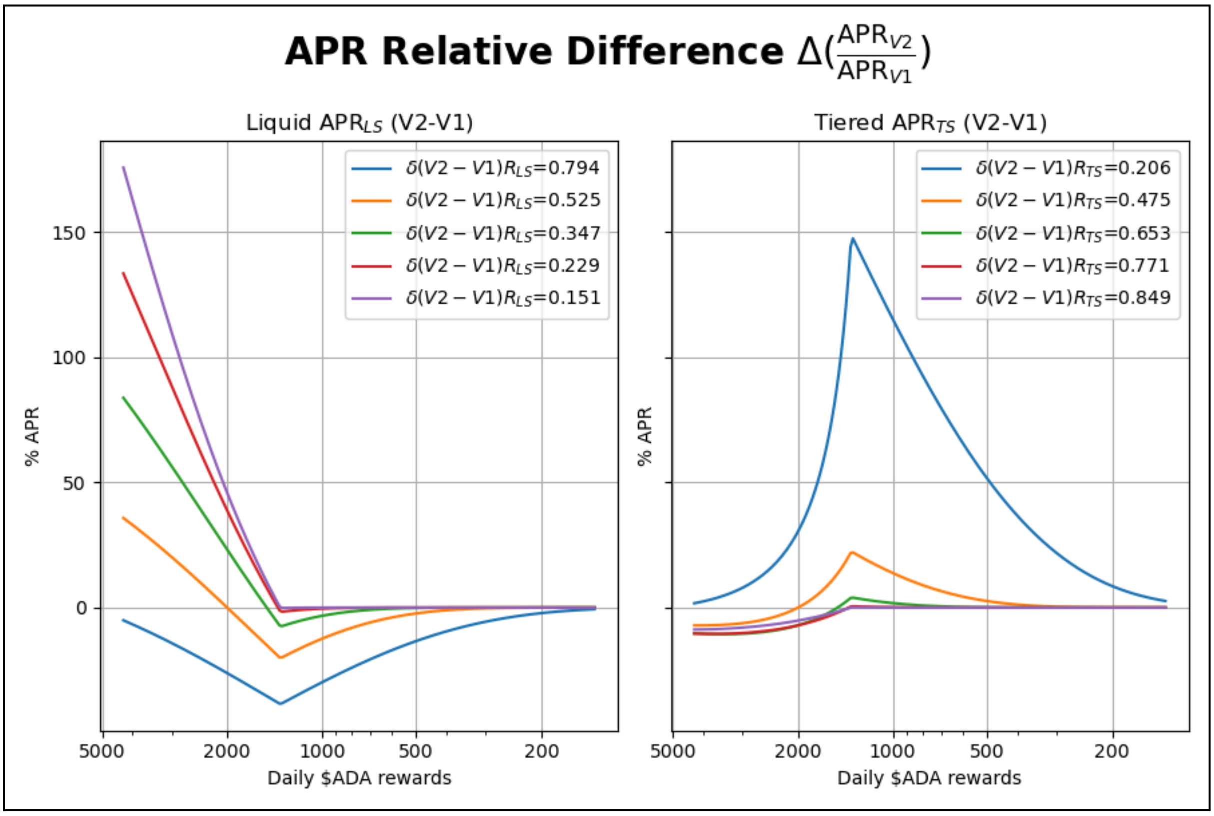


Figure 8. Left: Percentage difference between V2 and V1 Liquid APRs. Right: Percentage difference for Tiered APRs. V2 shows significant uplift in high-performance regimes, especially for Liquid staking.

In essence, this section shows that the V2 formulation, driven by a smooth and γ-sensitive premium, achieves three things at once:

First, it **eliminates the "collapse" and flat-APR artefacts** that plagued V1, ensuring Liquid yields scale continuously instead of freezing when $MIN out-performs $ADA.

Second, it **preserves the higher-risk / higher-reward hierarchy**: Tiered APR always sits above Liquid APR.

Thirdly, the **maximisation of strategy diversity,** as a result of equation (4.1), and it will be presented in-depth in the next section on Capital Flow, which introduces the framework in order to model stake distribution.

6. Capital flow

This section presents a formal method of estimation for the dynamic behaviour of the stake-allocation ratio:

$$r = \frac{R_{LS}}{R_{TS}}$$

Due to the fact that the APR formulas are explicit functions of r and γ, this translates to a "tug of war" where participants are able to influence the resulting APRs, thus forming a coupled feedback loop. We refer to the resulting, r-and-γ-driven migration of $MIN between the Liquid and Tiered pools as **capital-flow dynamics**.

From a game-theoretic standpoint, **stakers continuously rebalance** until they reach a **Nash equilibrium** in which no one can improve their effective APR by unilaterally switching pools. Mapping $r(\gamma)$ therefore tells us:

A) Whether the mechanism satisfies the **design principles** of:
   a) **responsiveness** (r reacts smoothly to γ),
   b) **strategic diversity** (0 < r < ∞ over a broad γ range), and
   c) **minimal triviality** (neither pool is ever strictly dominant)

B) What "expected" APR band is consistent with equilibrium behaviour.

Put simply, **capital flow** in $MIN Staking is the bidirectional movement of tokens between Liquid and Tiered pools as rational agents chase the higher effective APR. Quantifying this flow is essential for demonstrating that the V2 redistribution logic yields stable, incentive-compatible equilibria across all market conditions.

Remembering the definitions from section 4.1,

Baseline APR (tAPR) and stake distribution ratio:

$$\begin{cases} t\mathrm{APR} = 2.86 \cdot \left(\dfrac{1+\omega}{\gamma}\right) \\ r = \dfrac{R_{LS}}{R_{TS}} \end{cases} \tag{6.1}$$

Redistribution Premium function C:

$$C \equiv \text{Redistribution Premium} = \frac{1}{t\mathrm{APR}}\left(t\mathrm{APR} - \mathrm{APR}_{LS}\right) \tag{6.2}$$

The general expressions both staking options' APRs using the terms in (6.1) and (6.2):

$$\begin{cases} \mathrm{APR}_{LS} = t\mathrm{APR} \cdot (1 - C) \\ \mathrm{APR}_{TS} = t\mathrm{APR} \cdot (1 + r \cdot C) \end{cases} \tag{6.3}$$

With the correct definition of the PR function $C(\gamma, r)$, it is possible to satisfy all conditions in $(\bigstar)$ while remaining aligned with the established design principles.

6.1. Modelling Capital Flow

By definition, the total amount of staked $MIN tokens are broken down into two groups:

$$\begin{aligned} \Omega_{\$\mathrm{MIN}} \equiv & \$\mathrm{MIN\ Staked\ (Total)} \\ S_{\mathrm{Liquid}} \equiv & \$\mathrm{MIN\ Staked\ (Liquid)} \Rightarrow \Omega_{\$\mathrm{MIN}} = S_{\mathrm{Liquid}} + S_{\mathrm{Tiered}} \\ S_{\mathrm{Tiered}} \equiv & \$\mathrm{MIN\ Staked\ (Tiered)} \end{aligned} \tag{6.4}$$

Therefore, in order to perform an effective distribution of rewards, the relative stake distributions must be defined (as seen in eq. 6.1):

$$R_{LS} \equiv \frac{S_{\mathrm{Liquid}}}{\Omega_{\$\mathrm{MIN}}}, \quad R_{TS} \equiv \frac{S_{\mathrm{Tiered}}}{\Omega_{\$\mathrm{MIN}}} \Rightarrow r = \frac{R_{LS}}{R_{TS}} \tag{6.5}$$

(R is not to be confused with “rewards”)

By providing a specific PR function, from (6.3)

$$(\mathrm{V1}) \begin{cases} \mathrm{APR}_{LS} = & t\mathrm{APR} \cdot (1 - C_{V1}(\gamma)) \\ \mathrm{APR}_{TS} = & t\mathrm{APR} \cdot (1 + r \cdot C_{V1}(\gamma)) \\ C_{V1}(\gamma) = & 1 - \gamma \end{cases} \tag{6.6}$$

While the V2 formulation has a similar form with a change in the PR function:

$$(\mathrm{V2}) \begin{cases} \mathrm{APR}_{LS} = & t\mathrm{APR} \cdot (1 - C_{V2}(\gamma, r)) \\ \mathrm{APR}_{TS} = & t\mathrm{APR} \cdot (1 + r \cdot C_{V2}(\gamma, r)) \\ C_{V2}(\gamma, r) = & \dfrac{f(e^{-\gamma/r})}{g(\gamma + K)} \end{cases} \tag{6.7}$$

Solving for $r(\gamma)$:

As expressed in earlier sections, the core problem lies in obtaining the curve $\widetilde{r}(\gamma)$, defined as the “expected stake distribution”. Which results from obtaining an equilibrium point where the entire population of stakers consider “fair value”, i.e. there is just the right amount of $MIN tokens staked on either option.

Performing a quick differential analysis on (6.3)

$$\begin{cases} \delta\mathrm{APR}_{LS}(\gamma, r) = & \dfrac{\partial}{\partial\gamma}\mathrm{APR}_{LS}(\gamma, r)\delta\gamma + \dfrac{\partial}{\partial r}\mathrm{APR}_{LS}(\gamma, r)\delta r \\ \delta\mathrm{APR}_{TS}(\gamma, r) = & \dfrac{\partial}{\partial\gamma}\mathrm{APR}_{TS}(\gamma, r)\delta\gamma + \dfrac{\partial}{\partial r}\mathrm{APR}_{TS}(\gamma, r)\delta r \end{cases} \tag{6.8}$$

It is sensible to assume the existence of a state function $\Gamma(\gamma, r)$ that remains stationary along a path of $(\gamma, \tilde{r})$. Said state function would be a suitable candidate for variational analysis. A sensible approach to this problem is, in fact, performing variational analysis on a net yield functional given by $\delta I(\Gamma(\gamma, r), \nu)$ where ν allows for a measure of sluggishness or viscosity when it comes to users adapting to market conditions. The difficulty lies in determining an accurate description of δI, as not enough information is available at this point.

Therefore, solving for $r(\gamma)$ requires an initial simplified framework based on a-priori assumptions and constraints. The author will assume simplifications in the following sections in the form of qualitative analysis in order to avoid resorting to variational methods for an initial base model.

In the following sections, **the exercise of deduction and interpolation will result in obtaining a curve for $\tilde{r}(\gamma)$ such that a certain quantity remains stationary,** this quantity will be described as **the "break-even timer"**

Effective APR and Rational Stakers

Every $MIN Staking participant must perform the same two actions at least once; the act of **choosing the preferred option** and **stake withdrawal**. This choice is **based** on the **available information** at the time and their own **expectations** and **needs**, as described in Section 3.2.

The following concepts will provide helpful in order to define a Nash equilibrium:

The **effective APR** ($effAPR$) is the equivalent yield corresponding to a particular strategy at a given point in time, regardless of the chosen option. Nonetheless, the effective APR corresponding to Liquid Staking is trivial, making it typical to apply the concept for Tiered Staking only.

$$\mathrm{effAPR}_{TS} = \frac{T}{9} \cdot \left[\frac{1}{\sum_i t_i} \sum_i \mathrm{APR}_i \cdot t_i \right]$$

This value differs significantly from the nominal APR, given it is a time average and reflects any incurred redemption fees. For simplicity, it does not reflect any changes in principal/stake value, making it a simple time-average.

Within this model, a **rational staker** is an economically-motivated agent who:

1. **Maximises** expected **effective APR**
2. **Responds** to incentives **instantaneously**.
3. **Ignores** non-economic **frictions**

Under this assumption (and to smooth edge cases) **we treat the entire population as rational**. A direct consequence is the existence of a *minimum lock duration* T_{min}. A participant will not exit the Tiered pool while:

$$\mathrm{effAPR}_{TS}(T_{min}) < \mathrm{APR}_{LS}$$

6.2. Boundary Conditions on Capital Flow

In the context of V1, the **daily yield** distributed to $MIN stakers (i.e. a certain value of γ) **impacts how stakers distribute their principal** between both Liquid and Tiered options and, in turn, **determines the profitability** between either option. This is a reflection of the **feedback mechanism between profitability and capital flow**. It is also a reflection of the equilibrium between chosen strategies in terms of game-theory.

This feedback loop adds a layer of complexity such that an analytical approach or a functional description for $r(\gamma)$ becomes extremely difficult. Therefore, instead of focusing on the gray areas, **the solution comes from interpolation** between upper and lower bounds **and numerical methods for expectation values**.

Upper and lower bounds for $effAPR_{TS}$ and definition of T_{min}

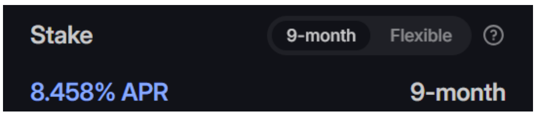
If the staking period lasts 9 months, $1 < T_{min} < 9 \Rightarrow T_{min}$ represents the **break-even** point in time. Unlocking rewards before the break-even event implies that it would have been a better choice to avoid the Tiered Staking option. By definition, **rational stakers won't withdraw their principal before breaking even.**

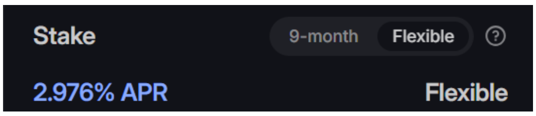
From (3.3) we know $APR_{LS} < APR_{TS}$, $\forall\gamma < 1$, and they collapse to equivalence when $\gamma \geq 1$.

When

$$\begin{aligned} \text{effAPR}_{TS} = & \text{effAPR}_{LS} \Rightarrow \text{APR}_{TS} \cdot \frac{T_{min}}{9} = \text{APR}_{LS} \\ \Rightarrow & T_{min} = 9 \cdot \frac{\text{APR}_{LS}}{\text{APR}_{TS}} \qquad (6.9) \end{aligned}$$

A simple, illustrative example with the following data:





$$T_{min} = 9 \cdot \frac{2.976}{8.458} \simeq 3.157\ months.$$

A $MIN Staking participant who has chosen the Tiered option will be forced to wait for 3.157 months to break-even. After that, we imagine the unlock timer to be effectively random.

If $T_{min} \rightarrow 1$ this means that participants will break even right after the first month of staking in the Tiered option, this would imply that $effAPR_{TS} \sim 9APR_{LS}$. While if $T_{min} \approx 9$, the break-even timer implies stakers unlock slightly before expiry, such that $effAPR_{TS} \sim APR_{LS}$.

Assuming rational stakers, it is possible to obtain the upper and lower bounds of $effAPR_{TS}$ such that $effAPR_{TS} \in \left[APR_{LS}, 9APR_{LS}\right]$. This implies that the break-even point is also bound.

Due to the lack of a functional description that determines how rational stakers will distribute their positions between the Liquid and Tiered options, we will take a probabilistic approach with an initial proposition:

> *"Every possible configuration of stake-allocations such that the resulting break even timer t lies between 1 and T_{min}, is equally likely"*
>
> $$\begin{cases} \text{effAPR}_{TS} \in [\text{APR}_{LS}, 9\text{APR}_{LS}] & \Rightarrow T_{min} \in [1,9] \\ \rho(t) \begin{cases} \frac{1}{t-1}, & t \in [1, T_{min}] \\ 0, & \text{otherwise} \end{cases} & T_{min} = 1, 2, \ldots, 9 \end{cases} \tag{6.10}$$
>
> - *Principle of equal a-priori probability*

This proposition states that participants will allocate their stake between the Liquid and Tiered options in any possible combination such that the resulting APR for Tiered Staking is bound by the range $\left[APR_{LS}, 9APR_{LS}\right]$ and every configuration is equally likely.

Limit case where $APR_{TS} > 9APR_{LS}$ regardless of $r(\gamma)$

For V1, there is a limit case which must be studied in order to add further constraints to the model. It represents a scenario where Minswap's staking rewards are "hyper-performing". This boils down to the Tiered Option being better since "day 1", in other words, where the break-even is reached before the first month, i.e. $T_{min} < 1$.

Another reasonable assumption under these conditions is that rational stakers will chase the better option, leading to $r(\gamma) = R_{LS}/R_{TS} \rightarrow 0$.

$$\begin{aligned} \text{effAPR}_{TS} = \ & \frac{T_{min}=1}{9} \cdot \text{APR}_{TS} > \text{APR}_{LS} \\ \Rightarrow \qquad & 1 > 9\frac{1-C_{V1}(\gamma)}{1+r\cdot C_{V1}(\gamma)} \end{aligned} \tag{6.11}$$

Knowing that $C_{V1} = 1 - \gamma$ and $r(\gamma \rightarrow 0) = 0 \ \Rightarrow \ \gamma_0 < 1/9 \sim 0.111...$

> Therefore, for $\gamma \leq \gamma_0$ there is no point in evaluating the effective APRs, because **the Tiered option is strictly better at all times.**
>
> This is an important undesired consequence which occurs in V1. **Since it violates design principle E**

The existence of such a limit case depends on the PR function and how it behaves in critical regions, such as $\gamma \rightarrow 0$ or $\gamma \rightarrow \infty$. It will be shown that under the V2 formulation, the stake allocation ratio will never be 0 or "infinite" (very large) $r(\gamma) \neq 0, \infty$.

Intermediate Regions, $r\left(\gamma, T_{min}\right) \rightarrow 1 < T_{min} < 9$

Considering $1 < T_{min} < 9$, if $r(\gamma) \neq 0$, then there exist a pair of ratios (r_{min}, r_{max}) such that

$$\mathrm{APR}_{LS} < \mathrm{effAPR}_{TS} < 9\mathrm{APR}_{LS}$$

$$\mathrm{effAPR}_{TS}(\gamma, r_{min}) < \mathrm{effAPR}_{TS}(\gamma, r) < \mathrm{effAPR}_{TS}(\gamma, r_{max})$$

The distribution of stake across options reflects the underlying Nash equilibrium in terms of choice of strategy, and how this changes dynamically in different yield regimes.

For example, it will be increasingly hard for APR_{TS} to go above $9APR_{LS}$ ("better since day 1 scenario") because capital will flow towards this option. It is crucial to understand that the upper and lower bounds of $r(\gamma)$ aren't fixed. The distance between the two points changes relative to the γ parameter. Furthermore, due to the fact that $t \in \left[1, T_{min}\right]$ can be considered a random variable, it can be inferred that $r(\gamma)$ behaves randomly too.

A) Obtaining r_{min}:

When the Tiered Staking option is overwhelmingly favoured by all participants, the stake allocation ratio $r = R_{LS}/R_{TS}$ tends towards the lowest possible value within the profitability requirements. This causes APR_{TS} to also decrease (eq. 6.3) and converge to the baseline APR. The break-even requirement is:

$$T_{min} < 9 \Rightarrow \mathrm{APR}_{LS} \leq \frac{T_{min}}{9}\mathrm{APR}_{TS} \tag{6.12}$$

Following the same procedure as in (6.11), with the relationship from (6.6):

$$\begin{aligned} 1 - C_{V1}(\gamma) &\leq \tfrac{T_{min}}{9}\left(1 + r_{min}C_{V1}(\gamma)\right) \\ r_{min} &= \tfrac{1}{C_{V1}(\gamma)T_{min}}\left[9(1 - C_{V1}(\gamma)) - T_{min}\right] \end{aligned} \tag{6.13}$$

With the non-negativity condition that $r \geq 0$

$$r \in [0, \infty] \Rightarrow r_{min} = max\left\{0, \frac{1}{C_{V1}(\gamma)T_{min}}\left[9(1 - C_{V1}(\gamma)) - T_{min}\right]\right\} \tag{6.14}$$

B) Obtaining r_{max}:

In the event where the Liquid Staking is the overwhelmingly chosen option, the ratio $r = R_{LS}/R_{TS}$ will increase to a point where APR_{TS} is attractive enough again. The limit where rational stakers are "forced" to switch their positions is when $T_{min} \sim 1$, the "better since day 1" regime:

$$\lim_{T_{min} \to 1} \mathrm{effAPR}_{TS} \Rightarrow \frac{1}{9}\mathrm{APR}_{TS} \leq \mathrm{APR}_{LS} \tag{6.15}$$

As before:

$$1 - C_{V1}(\gamma) \leq \frac{1}{9}\left(1 + r_{min} C_{V1}(\gamma)\right)$$
$$r_{max} = \frac{1}{C_{V1}(\gamma)}\left[9(1 - C_{V1}(\gamma)) - 1\right] = \frac{8}{C_{V1}(\gamma)} - 9 \tag{6.16}$$

Again,

$$r \in [0, \infty] \Rightarrow r_{max} = max\left\{0, \frac{8}{C_{V1}(\gamma)} - 9\right\} \tag{6.17}$$

Thus we have obtained the upper and lower bounds for $r(\gamma)$:

These constraints on the upper and lower APR bounds are applicable regardless of the PR function, as the game theoretical approach is the same. Adapting expressions (6.16) and (6.17) to consider V1 and V2's $C(\gamma, r)$ function:

V1	V2
$r_{min} = \frac{1}{C_{V1}(\gamma)}\left(\frac{9}{T_{min}} - 1\right) - \frac{9}{T_{min}}$ $r_{max} = max\left\{0, \frac{8}{C_{V1}(\gamma)} - 9\right\}$	$r_{min} = \frac{1}{C_{V2}(\gamma,r)}\left(\frac{9}{T_{min}} - 1\right) - \frac{9}{T_{min}}$ $r_{max} = max\left\{0, \frac{8}{C_{V2}(\gamma,r)} - 9\right\}$

Table 4. Expressions for the higher and lower bound of stake distribution, r_{min} and r_{max} for V1 and V2. Although they are valid for any *C* function.

Graphical representation of r_{min} & r_{max}

The aim of this section is to visually demonstrate how stakers decide to "place their bets" based on the study of capital flow. Because there is no information regarding the behaviour of capital flow in the intermediate regions, we start by comparing the stake allocation ratios exactly on the upper and lower bounds, given a break-even timer T_{min}

The lower bound r_{min} represents the scenario where Tiered Staking is the preferred option given minimum profitability requirements. For V1, figure 9 shows how –in low yield regimes– minimum profitability "forces" stake allocation towards the Liquid option ($r \gg 1$). But, as market conditions improve, the allocation quickly flows towards the Tiered option ($r \ll 1$).

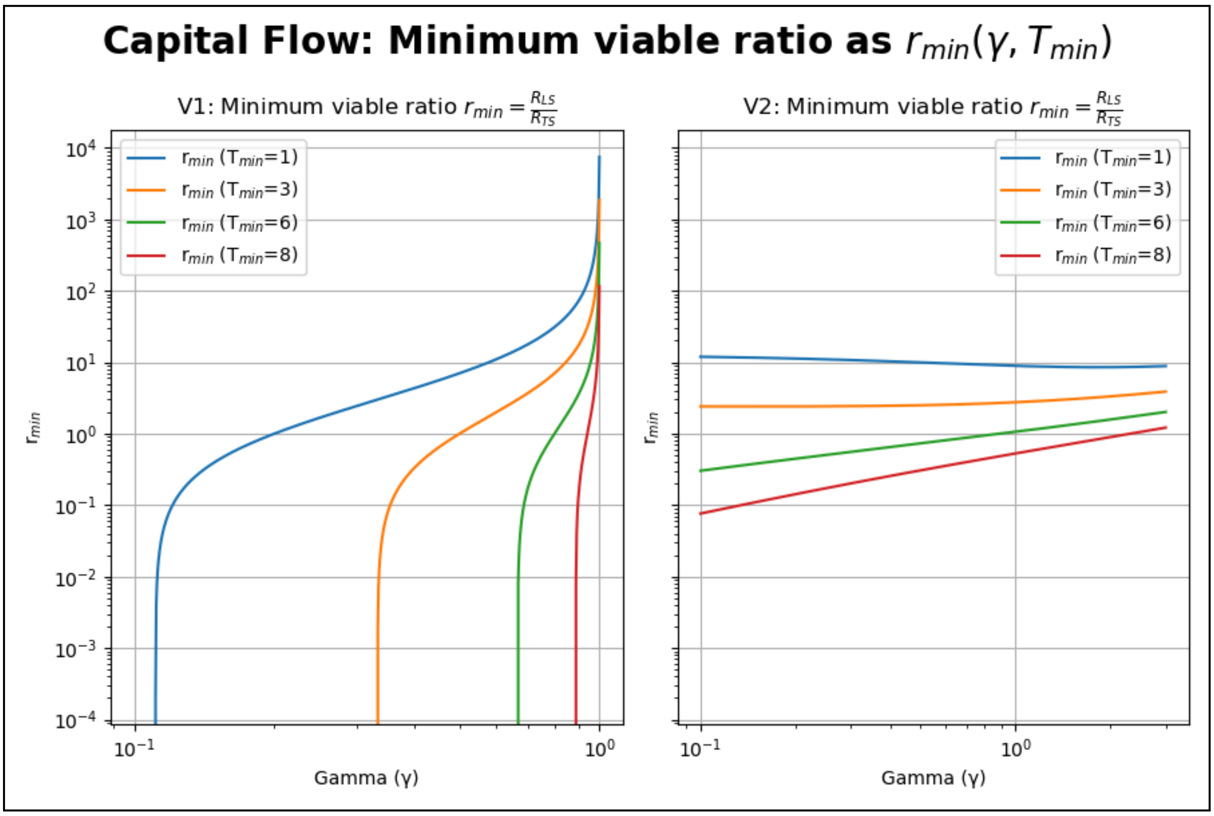


Figure 9. Comparison of stake allocation r_{min} for V1 and V2. Left, capital flows bidirectionally $r \ll 1 \leftrightarrow r \gg 1$ regardless of allocation preference, resulting in trivial choices depending on market conditions. Right, capital flows modestly, respecting the overall preferences based on break even timers.

The upper bound r_{max} describes exactly the opposite, where Liquid Staking is the preferred option, also bound by profitability restrictions ($T_{min} = 1$). Figure 10 isolates the blue lines in figure 9 to demonstrate the difference between capital flow dynamics for V1 and V2.

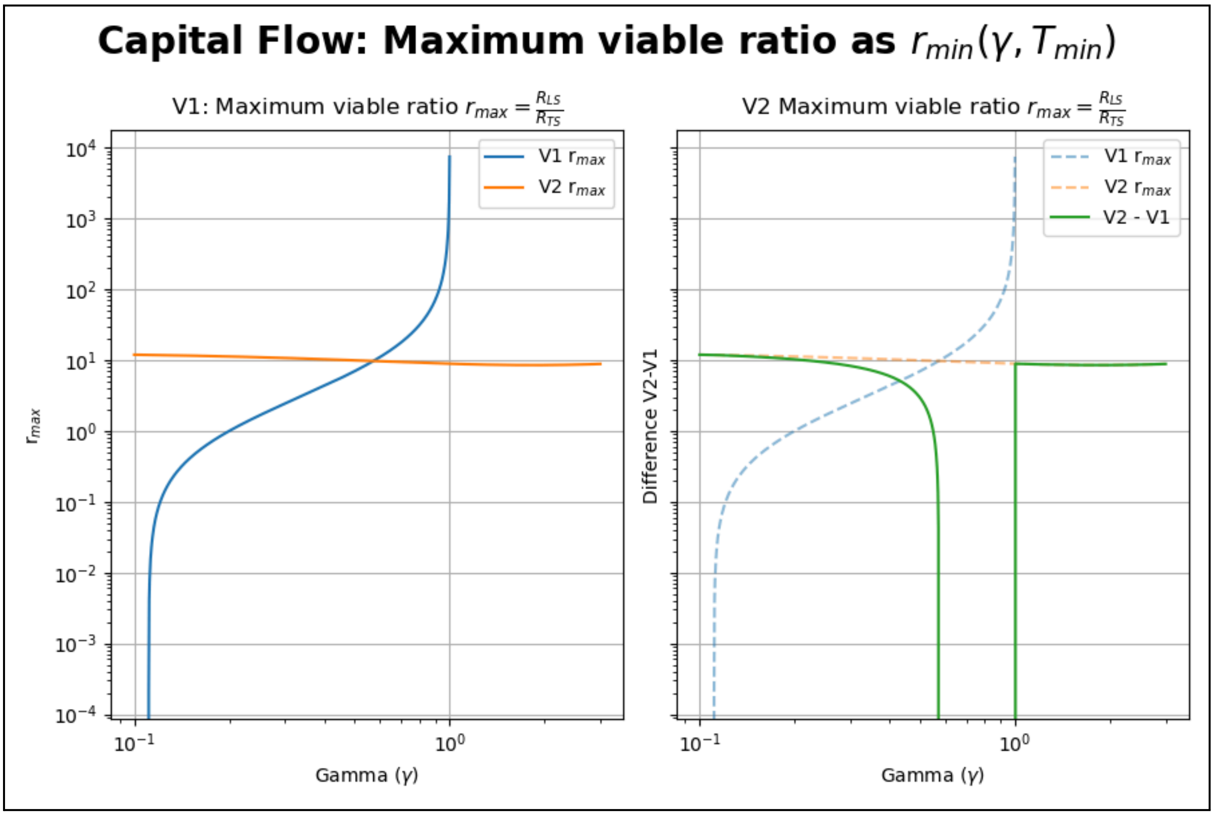


Figure 10. Left, upper bound of the ratio r_{max} for both V1 (blue) and V2 (orange). Again, V2 extends past $\gamma = 1$ without showing a tendency towards a preferred option the way V1 does (Tiered staking at high performance and Liquid staking at low performance). Right, the difference between V1 and V2 has been included in green.

The ability to **constrain the stake allocation ratio to non-arbitrary upper and lower bounds** allows one to determine an **effective range based on market conditions**.

While it is not yet possible to determine how stakers behave within this range (effectively allowing us to obtain $\tilde{r}(\gamma, T_{min})$, an initial analysis of the highest and lowest values for the ratio is **key to understand what strategies are and aren't viable in a certain yield regime**.

It is important to remember that V1 and V2 behave differently due to the PR functions governing the respective APRs. $MIN holders will favour Tiered or Liquid staking differently under the same yield regime. Therefore, the comparison must be established through internal relative performance:

- Liquid vs. Tiered APR comparison using capital flow
- Liquid vs. Baseline APR using capital flow
- Tiere vs. Baseline using capital flow
- V1 vs. V2 assuming the same break-even timer.

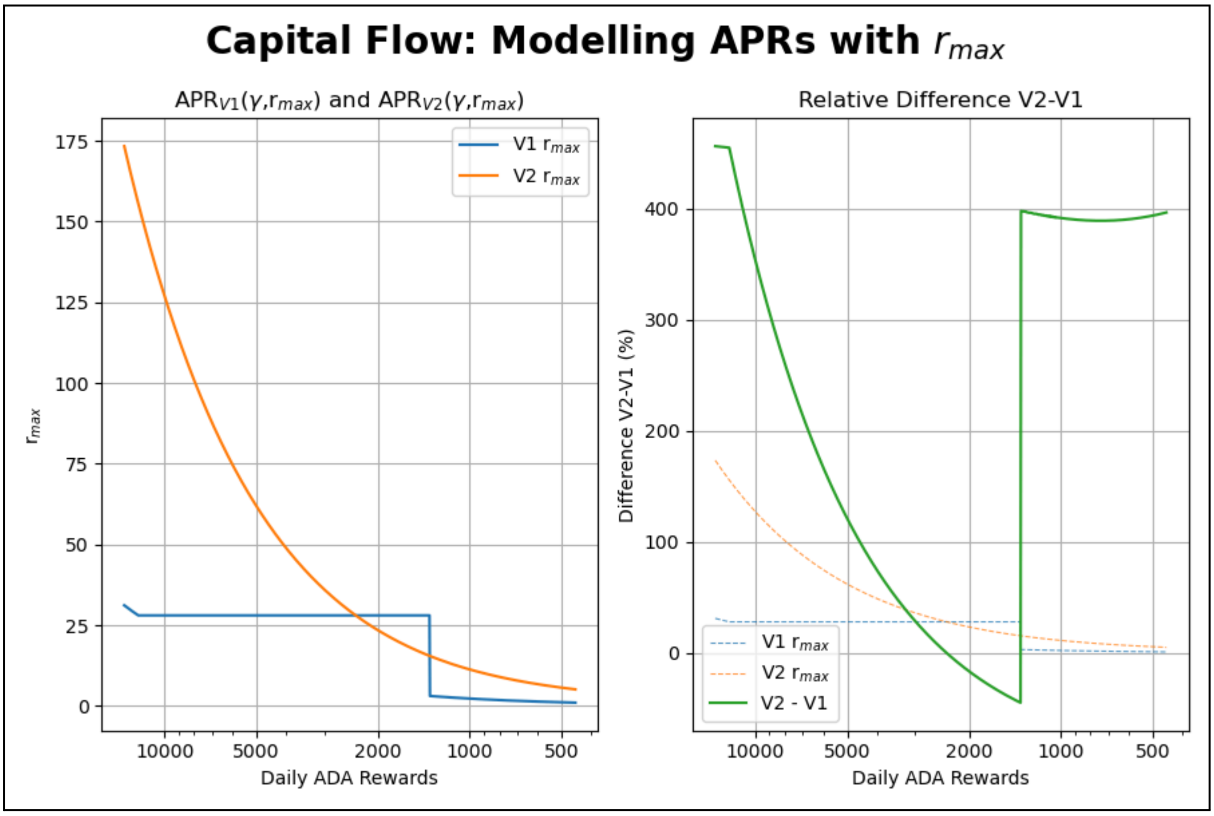


Figure 11. Left, plot of the highest APR possible for both V1 (blue) and V2 (orange) Tiered Staking. Right, the relative difference between the plots on the left in green.

Figure 6 in Section 5 illustrates how similarly both V1 and V2's Tiered Staking APRs behave when the ratios are the same, but **the functional behaviour of their redistribution premiums** causes them to **differ greatly when applying the concepts of rational stakers and break-even timers.**

Notice how, in reality, **V2 outperforms V1 in almost all market conditions** when considering the highest possible APR. Figure 12 shows the different APR calculations for V2 and V1 when imposing minimum break-even times, which range from 1 to 8.

For instance, if $T_{min} = 8$, this translates into the scenario where rational stakers have distributed their positions in a way such that the break-even timer sits at 8 months.

It is important to highlight that **transitioning to high yield** regimes under V1 causes r_{min} to collapse towards zero sooner or later, as seen in Figure 9. This means that **the Tiered staking option is the overwhelmingly preferred** strategy.

The opposite is also true, when **transitioning to lower performance** scenarios, the **Liquid staking** option becomes the **absolute favourite**.

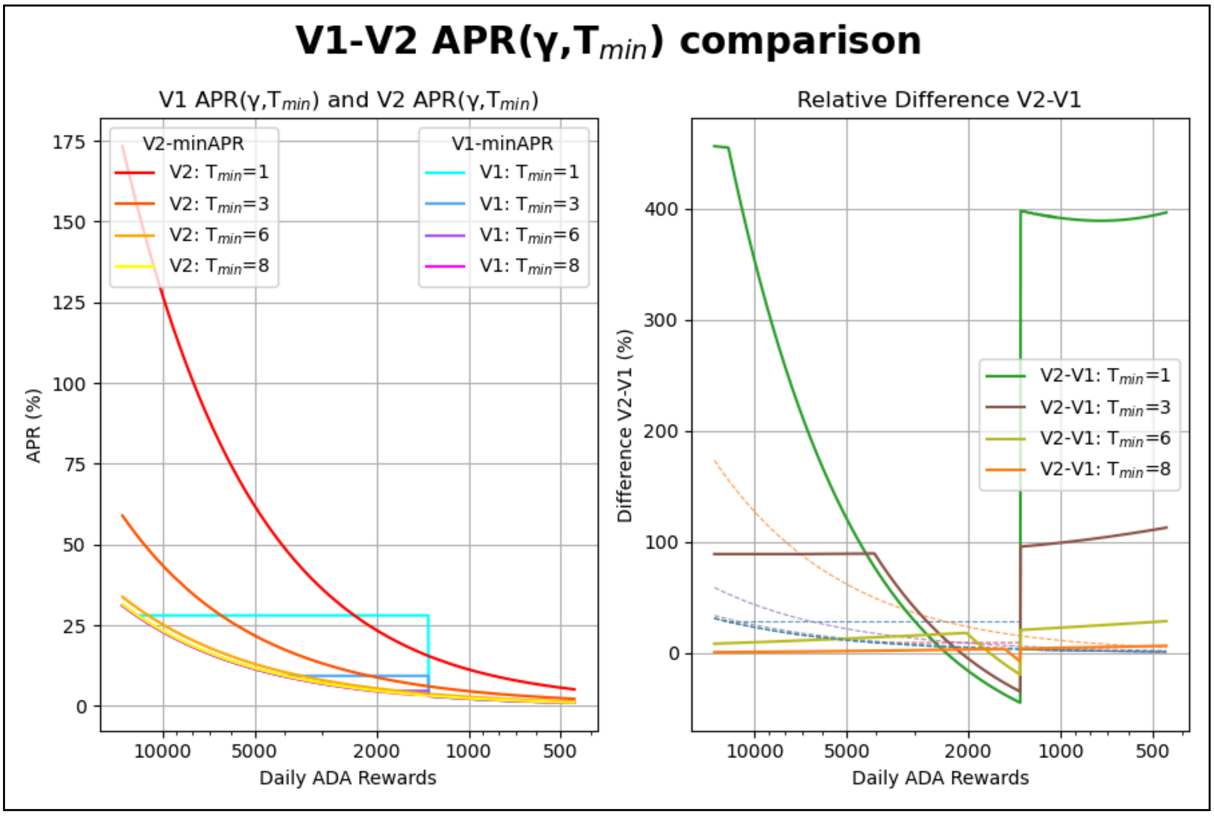


Figure 12. Left, plotted APR for V2 in warm colours and V1 in cold colours. The yellow line hugs the baseline APR (tAPR), transitioning to high yield regimes causes V1's APRs to converge towards the base sooner or later depending on the break-even timer. Left, the relative difference between both.

Expected stake distribution ratio $E(r)$ using $t \sim Beta(\alpha, \beta)$ as a prior.

In section 6.2, we assumed that $T \in \left[1, T_{min}\right]$ followed a uniform distribution, provided there is no a-priori knowledge. Such that:

$$\rho(t) \begin{cases} \frac{1}{t-1}, & t \in [1, T_{min}]; \quad T_{min} = 1, 2, \dots, 9 \\ 0, & \text{otherwise} \end{cases}$$

By inference, if the break even timer is random, so is the stake allocation ratio. For a uniform distribution, the expected ratio:

$$E(r) = \frac{1}{2}(r_{max}(\gamma) + r_{min}(\gamma))$$

Obtaining $\gamma = 0.3639$ (Section 3.5), supposing $T_{min} = 6$, using (6.14) and (6.17) :

$$E(r) = \frac{1}{2}[3.576 + 0] = 1.788$$

Unfortunately, the data shows otherwise. As of 18-06-2025, there's 579.86M $MIN tokens staked, of which 32.31M are in the Liquid staking option. Compared to an empirical value

$$r_E(0.3639) = \frac{32.21M}{547.55M} = 0.05899$$

This discrepancy shows that both $\{T_{min}, r(\gamma)\}$ cannot follow a uniform distribution. Empirical data suggests rational stakers are heavily skewed towards the Tiered Staking option. This preference causes the effective APR to drop, leading to higher break-even timers.

A strong candidate distribution function for bound regions is the Beta distribution function. Defining the rescaling parameter:

$$X = \frac{t - T_{min}}{T_{min} - 1} \quad \Rightarrow \quad f(x;\alpha,\beta) = \frac{1}{\mathrm{Beta}(\alpha,\beta)} \cdot x^{\alpha-1}(1-x)^{\beta-1}$$

The next step requires deducing the α, β parameters of the distribution.

The heavy skew towards Tiered staking suggests it's reasonable for the mode of the standard beta distribution to be 1, **which leads to** $\beta = 1$.

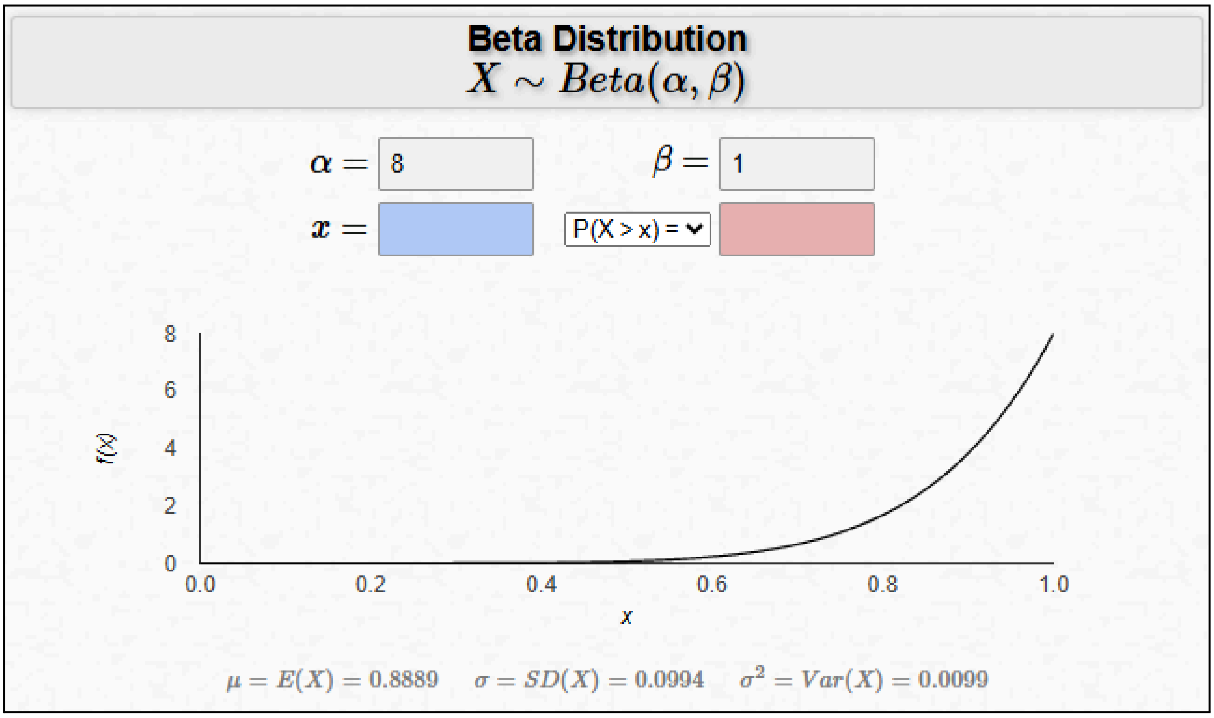


Figure 13. Graphical representation of the beta distribution. Image from: University of Iowa.

Under Bayesian interpretation, a $Beta(\alpha, \beta)$ prior is equivalent to having seen α successes and β failures. In the context of rational $MIN stakers, a success is the equivalent of reaching expiry (staking during 9 months) **given a certain break-even point, then** $\alpha = T_{min}$. Another way of describing the problem which results in the same choice for a prior is, considering rational stakers and a break-even time T_{min}, the probability distribution of the number of months needed to break-even is a geometric distribution, whose prior is the beta distribution.

This is consistent with the idea that, if $lim(T_{min}) \rightarrow 1$, then $Beta(1,1)$ is a uniform distribution, indicating that, under hyper-performing circumstances, unlocking at 9 months or at any time before are equally likely. On the other hand, as T_{min} increases, so do the chances of unlocking at maturity.

$$t = T_{min} + (T_{min} - 1)X; \quad X = \text{Beta}(\alpha, \beta), \quad T_{min} = 1, \ldots, 9 \qquad (6.18)$$

Using $t \in \left[1, T_{min}\right]$ as a Beta distributed prior, we can now obtain the expected values of the ratio. Using the definition for r_{min} at (6.14) and exchanging T_{min} for t, the result is immediate for V1.

$$E[r(\gamma, t)] = \int_{T_{min}}^{1} r(\gamma, t) \cdot X(t) dt = \int_{T_{min}}^{1} max\left\{0, \frac{1}{C_{V1}(\gamma)}\left(\frac{9}{t} - 1\right) - \frac{9}{t}\right\} \cdot X(t) dt \qquad (6.19)$$

In the case of V2, where the PR function also depends on the stake allocation ratio r, the definition of r_{min} does not have an analytical solution. Therefore numerical methods are required to solve for r_{min} first, followed by the relevant calculations in order to obtain the expectation value $E(r)$.

Again, following from (6.14):

$$\begin{aligned} r_{min} &= \tfrac{1}{C_{V2}(\gamma, r)}\left(\tfrac{9}{t} - 1\right) - \tfrac{9}{t} \quad ; \quad C_{V2}(\gamma, r) = \tfrac{f(e^{-\gamma/r})}{g(x+K)} \\ r_{min} &= \tfrac{g(x+K)}{f(e^{-\gamma/r})}\left(\tfrac{9}{t} - 1\right) - \tfrac{9}{t} \end{aligned} \qquad (6.20)$$

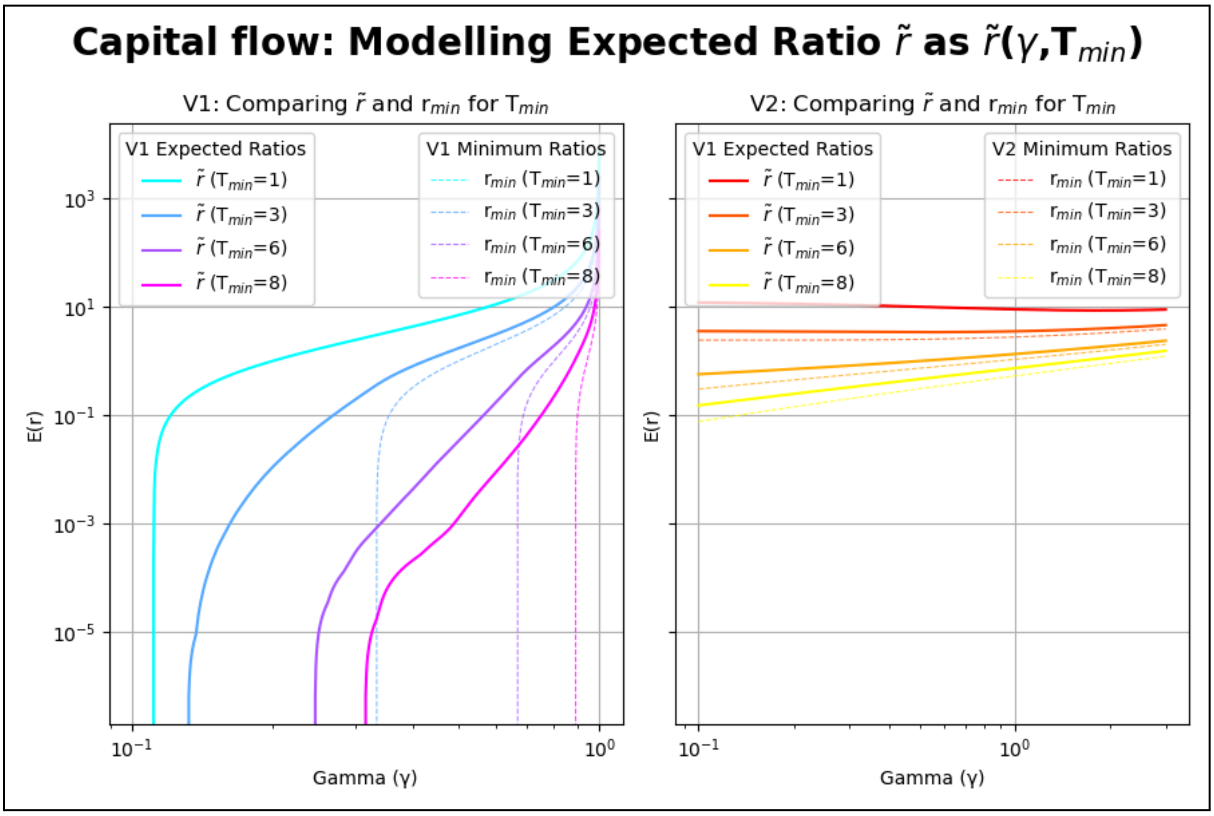


Figure 14. Left, the V1 expected ratios plotted in solid lines and the minimum ratios in dashed lines. Right, the V2 expected ratios plotted in solid lines and the minimum ratios in dashed lines.

It is intuitive that $E(r)$ lies between r_{min} and r_{max}. It is the result of imposing profitability restrictions and a certain PDF, and gives the ability to perform predictions on capital flow.

6.3. APR analysis using capital flow for V1 and V2

From the break-even timer treated as a bounded random variable, we derived Eqs. (6.18) and (6.19), which solve differently once a specific **Premium-Redistribution (PR) function** is chosen.

We obtained a numerical solution for the expected value $E(r)$ as shown in figure X. The **key idea** is to understand that the **Premium Redistribution function fundamentally impacts** how **staked $MIN** is going to be **distributed between** the **Liquid** and **Tiered Staking options depending on yield regimes.**

It is critical to highlight how the illusion of choice may not correspond with reality. **If an option is overwhelmingly popular** compared to another**, is there really a choice?**

The figure below illustrates how different PR schedules (V1 vs V2) influence strategic choice as the market transitions between high- and low-yield regimes.

Notice that the **baseline tAPR curve (dark green) is visible in the V2 panel**, **but not in V1 due to the overlap with the rest of curves**, confirming the redundancy in the reward-splitting logic.

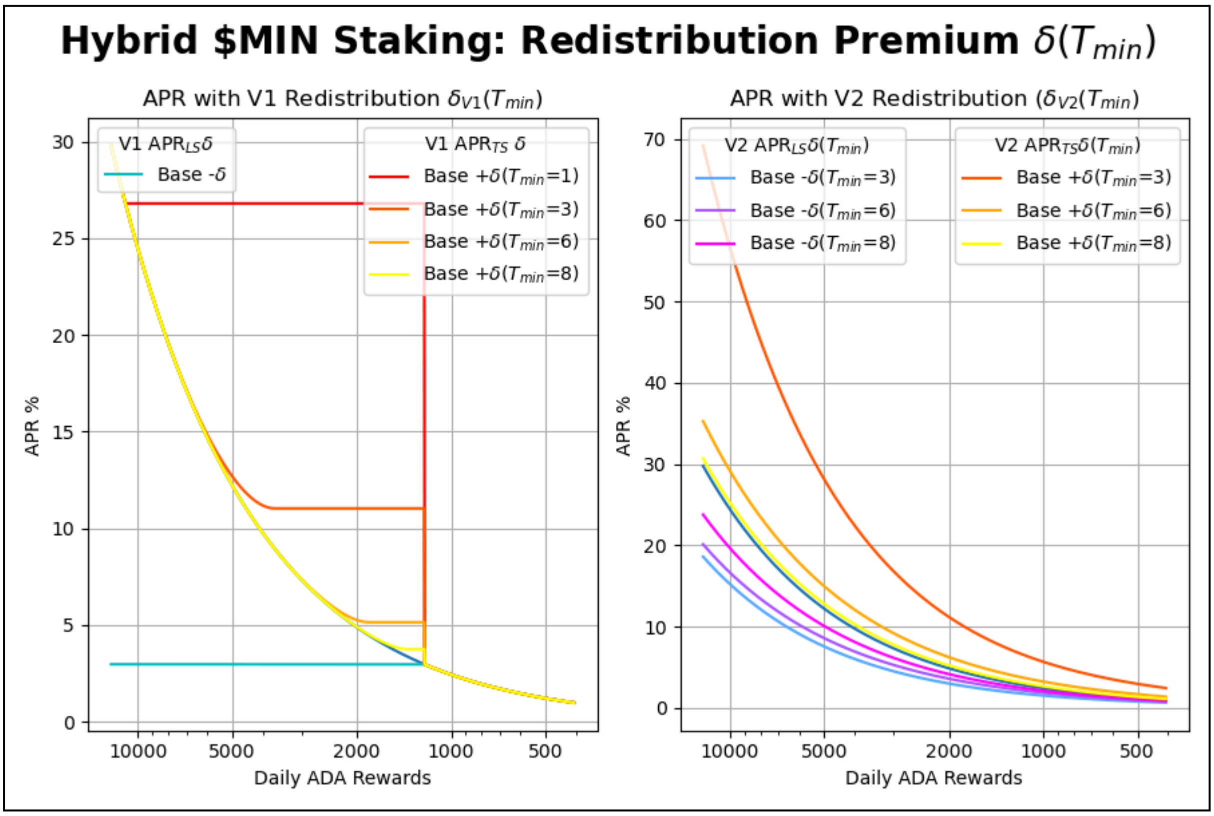


Figure 15. The left panel illustrates how V1's redistribution premium causes all stakers to eventually choose the Tiered option in high yield scenarios, and the Liquid option during low-performance. Both events cause the system to effectively yield the baseline APR. The right panel showcases how V2's redistribution strategy allows for improved yields and strategic diversity under all market regimes, justifying the existence of both options.

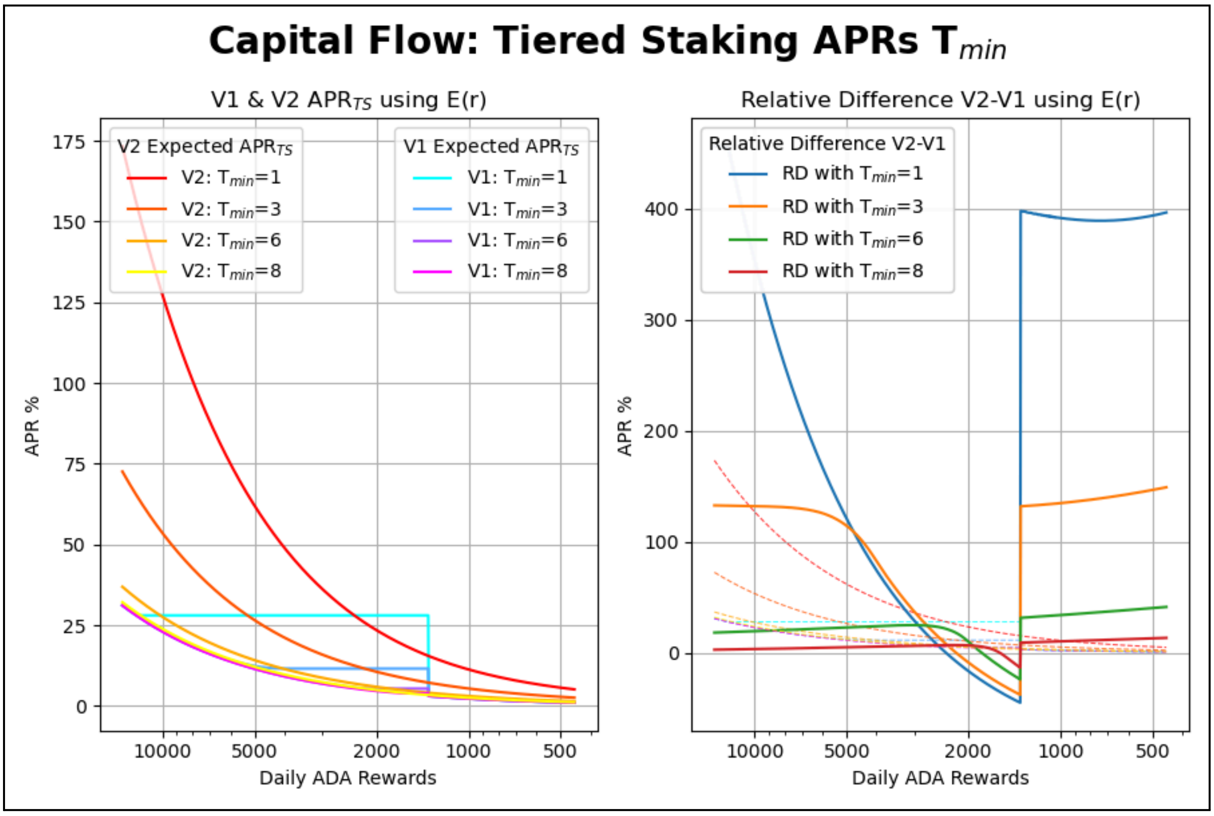


Figure 16. Left, Tiered Staking APR calculations using expected ratios for V1, plotted in cold colours, and V2 plotted in warm colours. Right, the solid lines represent the relative difference in APRs between V1 and V2 for each imposed break-even timer.

Limitations of the Capital Flow model

The capital flow framework developed in this report **aims to assign an** $E(r)$ **curve to a specific break-even timer** T_{min} based on the following feedback loops:

A) Yield regimes → Staking APRs

B) Changing APRs → Token migration between Liquid and Tiered options.

While this **captures the broad strategic behaviour** of rational stakers and is valid for broad statements, its **accuracy depends** on several simplifications that **may diverge from reality** (a stake allocation ratio that corresponds to a different break-even timer):

1. $MIN stakers do not react instantaneously to APRs.

The model assumes that all stakers monitor dashboards continuously and redeploy capital the instant a competing strategy offers a higher *effective* APR. In practice, users log in sporadically, face transaction fees, and may need treasury or multi-sig approval. These frictions introduce a **reaction-time lag** that smooths capital flows and dampens the sharp equilibria predicted by an instantaneous-response model. Ignoring this lag will **over-estimate** both the speed and amplitude of stake migration.

2. **The difference between break even timers for nominal APRs and effective APRs.**

Nominal APR for Tiered Staking is **re-computed and reported to users on a monthly basis**. Consequently, the **effective APR** that a rational staker realises is the **time-weighted average of each month's nominal APR**, not the single headline rate displayed when the stake is opened.

Therefore, stake allocations not only change slowly, but they also reflect the choices of the past. This may result in a **mismatch between real-time the stake allocation ratio and that predicted by the model**.

3. **The chosen probability distribution function.**

The model adopts a Beta prior for the break-even timer **to reflect the observed skew toward "hold-to-maturity"** behaviour. While plausible, other PDFs (e.g., log-normal or Weibull) can fit the data equally well yet yield materially different expected stake ratios $E(r)$. Unless the Beta assumption is validated with longitudinal withdrawal data, f**orecasts carry a specification risk** tied to this modelling choice.

4. **Non-rational actors & large market fluctuations**

Game-theoretic equilibrium presumes economically rational agents, but on-chain reality includes wallets that forget they are staked or "ape-in" speculators who ignore APR maths. Additionally, large market fluctuations can also cause predictability issues.

Empirical data versus model results (V1) reinterpreted

Earlier on, we obtained the value for $\gamma = 0.3639$ together with an empirical $r_E = 0.05899$ and $T_{min} = 3.157$. After performing an interpolation routine for (6.14), the model suggests that the effective break-even timer is $T_{min} = 4.262$ when $E(r) = 0.05899$.

This result showcases the limitations of the model as mentioned previously. But this discrepancy also carries valuable information. Such that there is room for behavioural interpretation.

"The break-even timer is $T_{min} = 3.157$, but stake allocation implies a minimum required profit margin above break-even at $T^{\star}_{min} = 4.262$"

In other words, points 1, 2 and 4 above can be considered as a minimum profitability requirement, a buffer for risk/reward. If a staker aims for break-even, they would choose the Liquid option by default, otherwise they must demand "higher than break-even yield".

The profitability margin in this case is

$$\text{Margin} \equiv 100 \cdot \left(\frac{T^{\star}_{min}}{T_{min}} - 1 \right) = 35\%$$

7. Financial Impact of Hybrid $MIN Staking V1 and V2.

The implementation of Hybrid $MIN Staking V1 started on October 29th 2024 with the introduction of early redemption rewards, with a total 433 Million tokens staked. On February 18th 2025 the implementation ended with the release of Liquid Staking and 505 Million tokens staked.

As of June 19th 2025, there are currently 579 Million $MIN tokens staked (and increase in 33.7%), earning rewards despite the token's price standing at ~74% down from its ATH in USD and 75.6% down from its high of 0.11 ADA back in March 2023.

Figure 17. $MIN's full price action seen in Minswap's V1 pool

Despite the token's performance, Minswap has remained Cardano's #1 DEX with 65% all time dominance. With a total trading volume of 7.45 Billion ADA traded, averaging 6.6M ADA in daily trading volume (approximately) since March 26th 2022. These metrics reflect Minswap's strength and bright future ahead.

Assuming neutral perspective on Minswap's trading volume, such that it continues to deliver an average 6.6 Million daily $ADA trading volume, and the Fee Switch to remain 1/6th of liquidity fees (ranging from 0.3% to 1%), it is safe to assume that daily Staking rewards will continue ranging around 6000 to 9000 $ADA for the foreseeable future.

7.1. Opportunity Cost of Boosted Staking (pre Hybrid v1).

Users who staked on day 1 of Boosted $MIN staking and unlocked on the 28th of June 2024 saw a return on their stake, based on final prices ($MIN was valued at 0.049 $ADA.), of around 10% when using the 9x boost.

In other words, a user who had staked 150k $MIN tokens earnt 594 $ADA at maturity after 9 months of locked staking earnt:

$$\frac{12}{9} \times 100\left(\frac{594}{1.5 \cdot 10^5 \times 0.0491}\right) \sim 10\% \, APR$$

On the other hand, the day that user decided to stake their $MIN, it was valued at 0.067 $ADA. Therefore the result of the total operation in terms of profit was:

$$\frac{100}{1.5 \cdot 10^5 \times 0.067} \cdot \left(1.5 \cdot 10^5 \times 0.049 + 594 - 1.5 \cdot 10^5 \times 0.067\right) = - 20\%$$

If MIN's price decline was of 26.8%, the user was able to mitigate that loss to 20% instead thanks to Boosted MIN staking.

Implementing V1 Hybrid $MIN Staking during a downtrend

Over the course of 12 months before early redemptions were implemented, $MIN Staking saw around 150 Million staked tokens at its lowest (October 2023), and 450 Million tokens (June 2024) at its highest.

In order to perform a conservative analysis, we will suppose 350 Million tokens were staked at an average 7% APR. During a 9 month period, the token's price declined from around 0.065 $ADA to 0.042 $ADA (Nov/Dec 2023 - Aug/Sep 2024).

Principal value of staked $MIN at the start: $3.5 \cdot 10^8 \times 0.065 = 22.75 \, Million \, \$ADA$

Principal value of staked $MIN at the end: $3.5 \cdot 10^8 \times 0.042 = 14.7 \, Million \, \$ADA$

Average rewards after 9 months: $7\% \times 3.5 \cdot 10^8 \times \frac{0.041+0.065}{2} \times \frac{9}{12} \sim 983k \, \$ADA$

As before, the final result in terms of profits was of -29.62% versus the -35.38% in price action over that time period. In other words, at the time of maturity, stakers were at nearly 30% of unrealised losses.

If a user decided to unstake in a midpoint ($Price_3$), and realise their losses in order to buy back later, a simple formula that determines the total profit would be:

$$Price_3 = Price_1 + \left(Price_2 - Price_1\right) \times T/9 \Rightarrow ROI = 100 \times \left[\frac{Price_3}{Price_1} - 1\right]$$

As the $ADA value of the $MIN is calculated as: $N_{\$ADA} = S_{\$MIN} * Price$

Additionally, if early redemptions had been implemented, users would have been able to further mitigate losses with rewards. The following tables illustrate how Hybrid V1 positively impacts $MIN holders' user experience when staking in bearish environments:

APR: 7%			Rewards (ADA)		ROI		
Month	$MIN Staked	Price	Pre-V1	V1	Pre-V1	V1	Mitigated Loss
1	350000000	0,0624	0,00	130.099,54	-3,93%	-3,18%	23,46%
2	350000000	0,0599	0,00	254.981,48	-7,86%	-6,43%	22,29%
3	350000000	0,0573	0,00	374.645,83	-11,79%	-9,74%	21,14%
4	350000000	0,0548	0,00	489.092,59	-15,73%	-13,10%	20,01%
5	350000000	0,0522	0,00	598.321,76	-19,66%	-16,53%	18,90%
6	350000000	0,0497	0,00	702.333,33	-23,59%	-20,02%	17,81%
7	350000000	0,0471	0,00	801.127,31	-27,52%	-23,58%	16,74%
8	350000000	0,0446	0,00	894.703,70	-31,45%	-27,19%	15,69%
9	350000000	0,0420	983.062,50	983.062,50	-30,86%	-30,86%	0,00%

Table 5. Comparison of the ROI mitigated loss between the "Boosted" (Pre-V1) model and V1, based on the amount of redeemable rewards for 350M staked $MIN and the unlock timers.

		Early Redemption Rewards (ADA)			
Price | Mitigated Loss	$MIN Unstaked | Month	1000000	10000000	100000000	350000000
0,0624 | 23,46%	1	371,71	3.717,13	37.171,30	130.099,54
0,0599 | 22,29%	2	728,52	7.285,19	72.851,85	254.981,48
0,0573 | 21,14%	3	1.070,42	10.704,17	107.041,67	374.645,83
0,0548 | 20,01%	4	1.397,41	13.974,07	139.740,74	489.092,59
0,0522 | 18,90%	5	1.709,49	17.094,91	170.949,07	598.321,76
0,0497 | 17,81%	6	2.006,67	20.066,67	200.666,67	702.333,33
0,0471 | 16,74%	7	2.288,94	22.889,35	228.893,52	801.127,31
0,0446 | 15,69%	8	2.556,30	25.562,96	255.629,63	894.703,70
0,0420 | 0,00%	9	2.808,75	28.087,50	280.875,00	983.062,50

Table 6. Early Redemption rewards calculated based on the unlock times and amount of $MIN tokens staked.

Up to 894000 $ADA could have been claimed via early redemptions, mitigating losses for $MIN stakers if they decided to exit their position. This loss mitigation goes up to 23% if they had unstaked after the first month.

In earlier sections, it has been shown that there is a tendency towards unstaking as late as possible (reflected by the tendency to increase the break-even timer as high as possible, as seen in section 6), therefore it is reasonable to consider that Minswap's V1 Hybrid staking mechanism could have mitigated an opportunity cost of 200k-600k ADA.

On the flip side, it is also possible to consider the inverse scenario.

Implementing V1 Hybrid $MIN Staking during an uptrend

By performing the same exercise in reverse, the table looks like this:

APR: 7%			Rewards (ADA)		ROI		
Month	$MIN Staked	Price	Pre-V1	V1	Pre-V1	V1	Added Profit
1	350000000	0,0476	0,00	114.900,46	13,23%	14,11%	6,66%
2	350000000	0,0501	0,00	235.018,52	19,31%	21,17%	9,61%
3	350000000	0,0527	0,00	360.354,17	25,40%	28,32%	11,52%
4	350000000	0,0552	0,00	490.907,41	31,48%	35,57%	12,99%
5	350000000	0,0578	0,00	626.678,24	37,57%	42,92%	14,24%
6	350000000	0,0603	0,00	767.666,67	43,65%	50,35%	15,36%
7	350000000	0,0629	0,00	913.872,69	49,74%	57,89%	16,39%
8	350000000	0,0654	0,00	1.065.296	55,82%	65,52%	17,37%
9	350000000	0,0680	1.221.9370	1.221.937	73,24%	73,24%	0,00%

Table 7. Comparison of the added profits and ROI between the "Boosted" (Pre-V1) model and V1, based on the amount of redeemable rewards for 350M staked $MIN and the unlock timers.

		Early Redemption Rewards (ADA)			
Price | Added Profit	$MIN Unstaked | Month	1000000	10000000	100000000	350000000
0,0476 | 6,66%	1	328,29	3.282,87	32.828,70	114.900,46
0,0501 | 9,61%	2	671,48	6.714,81	67.148,15	235.018,52
0,0527 | 11,52%	3	1.029,58	10.295,83	102.958,33	360.354,17
0,0552 | 12,99%	4	1.402,59	14.025,93	140.259,26	490.907,41
0,0578 | 14,24%	5	1.790,51	17.905,09	179.050,93	626.678,24
0,0603 | 15,36%	6	2.193,33	21.933,33	219.333,33	767.666,67
0,0629 | 16,39%	7	2.611,06	26.110,65	261.106,48	913.872,69
0,0654 | 17,37%	8	3.043,70	30.437,04	304.370,37	1.065.296,30
0,0680 | 0,00%	9	3.491,25	34.912,50	349.125,00	1.221.937,50

Table 8. Early Redemption rewards calculated based on the unlock times and amount of $MIN tokens staked.

If a $MIN holder wanted to exit their staking position (prior to maturity) before the V1 Staking mechanism were implemented, they would be missing on a minimum of 6.66% added rewards on top of the price appreciation. Again, this would entail an overall opportunity cost of 300k-750k $ADA in rewards to $MIN holders in this example.

7.2. Financial Impact of $MIN Staking V2

It is critical to bear in mind that modifications to the PR function (see equations 6.6 and 6.7) do not cause an increase in accrued Fee Switch rewards. The daily rewards remain the same, since they are the result of trading volume. Any effects on $MIN trading volume due to the mechanism's optimisations are considered higher order and will not be studied.

Nonetheless, as will be shown in this section, ***a more efficient redistribution does cause a general uplift in APRs without requiring an increase in daily rewards.***

Taking the following data:

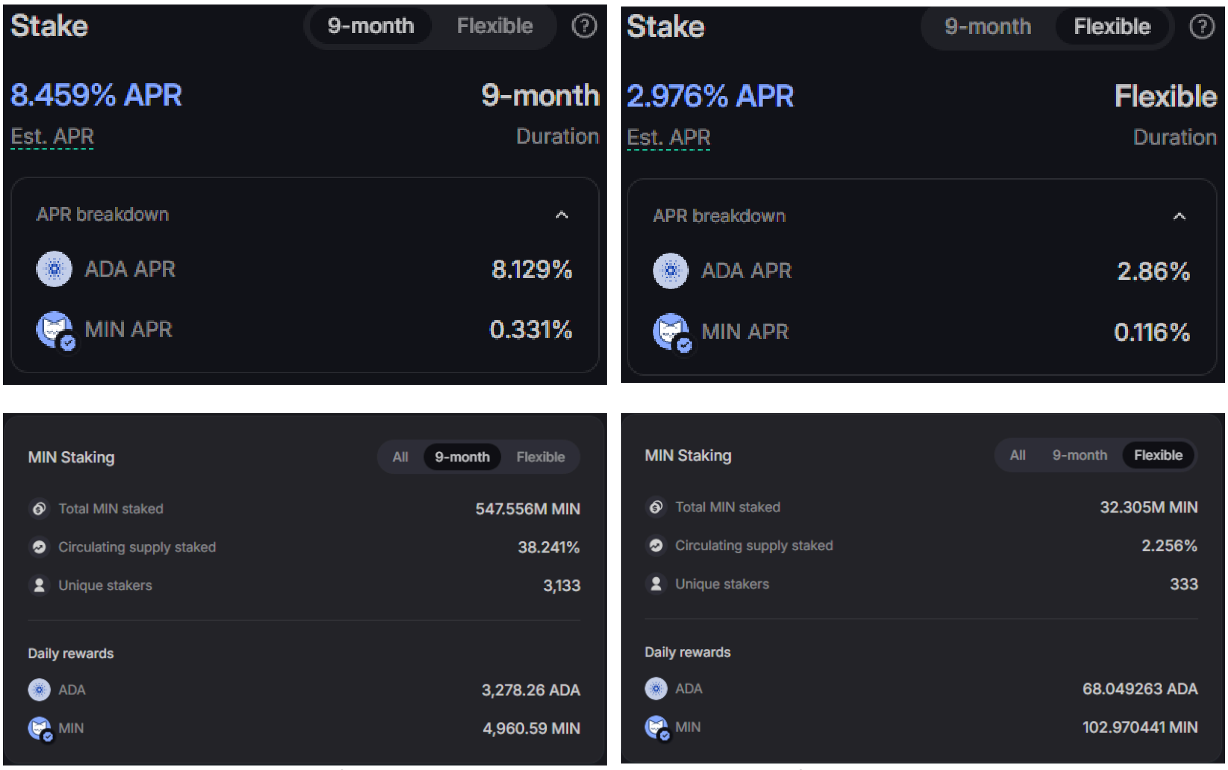


Figure 18. Accrued data as of 18-06-2025. For updated data, kindly refer to https://minswap.org/staking and https://minswap.org/analytics/yield-dashboard.

We obtain the following:

$$T_{min} = 9 \cdot \frac{2.967}{8.459} = 3.157$$

Using (6.19) we interpole $T^{\star}_{min} = 4.262 \Rightarrow E\left[r(\gamma, T^{\star}_{min})\right] = \frac{30.1}{521.1} = 0.05899$

With current values for both $T_{min} = 3.157$ and $T^{*}_{min} = 4.262$ it is then possible to compare what the APR curves will look like. The analysis establishes the comparison between minimum yield for V1 and V2 and the expected yield (consequence of $E(r)$).

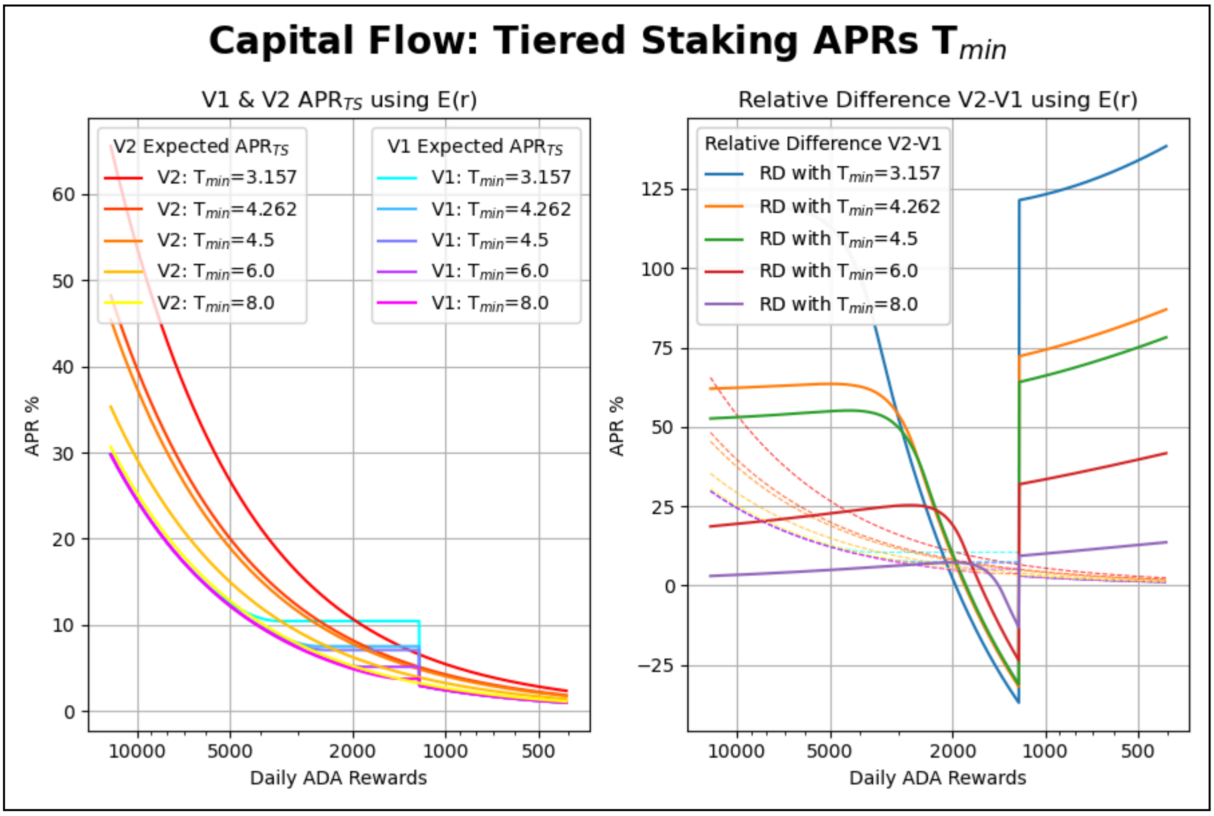


Figure 20. Left, the expected APR obtained in Minswap's V1 (cold) and V2 (warm) Tiered Staking option. Right, their relative difference.

At current market conditions, we have evaluated that $MIN stakers are behaving as if the break-even time were at 4.262 months instead of 3.157 using the model developed in section 6.

At $T^{\star}_{min} = 4.262$ the model predicts an APR for V1 of 13.584% at current market conditions. A 59.34% discrepancy regarding empirical data.

The total area covered by the relative difference curve is also positive, meaning the overall impact is net positive.

Break even (Tmin)	Positive Area	Negative Area	Absolute Ratio
3.157	296.161	-8.10191	36.5545
4.262	186.032	-6.05002	30.7489
4.5	166.791	-5.78042	28.8545
6	88.1095	-3.25688	27.0534
8	27.8558	-0.968274	28.7685

Table 9. Comparison between the positive and negatives areas between the Tiered Staking APR curves for V2 and V1 across all yield regimes.

Consequences of not implementing V2 for Tiered Stakers

As can be seen in figure X and table 9, V2's reward splitting logic benefits Tiered Stakers by orders of magnitude more than it affects them negatively when comparing performance to V1.

Using data obtained on 18-06-2025 (total $MIN staked, $MIN price and daily rewards), the current value γ = 0.3634.

γ = 0.3634	Expected ratio E(r)		$MIN Staked (TS)		Expected Tiered Staking APR		
Break even (Tmin)	V1	V2	V1	V2	V1	V2	Monthly Cost
3.157	0.43487	3.11890	404123303.2	140781276.6	10.46%	17.88%	23,339.08
4.262	0.05995	1.86298	547065714.5	202538613.6	8.51%	13.54%	22,791.91
4.5	0.03608	1.65879	559672418.3	218093192.8	8.38%	12.84%	21,741.22
6	0.00230	0.88285	578532923	307971753.4	8.20%	10.23%	13,963.72
8	0.00003	0.37249	579844079.1	422489586.5	8.19%	8.68%	4,623.82
				Avg	8.75%	12.64%	17,291.95

Table 10. Calculations showing the additional yield rewarded to the remaining staked $MIN in the Tiered option depending on break even timers.

Table 10 shows an average increase from 8.75% APR to 12.64%, corresponding to a 44.5% increase yield by correcting the redistribution logic. The transition to V2 would result in a massive capital flow. Stakers choosing to remain are currently seeing an average monthly cost of 17k $ADA.

On the other hand, we must also analyse the amount of rewards Tiered Stakers would be earning in the transition to low yields in V2 compared to V1.

For V1 it's not possible to calculate the expected ratios at γ > 1,therefore we calculate E(r) for γ = 0.9921 and supposing a jump to γ = 1,023 in order to estimate how many $MIN tokens get "stuck" in the Tiered Staking option. For V2, this is not needed.

γ = 1,023	Expected ratio E(r)		$MIN Staked (TS)		Expected APR (TS)		
Break even (Tmin)	V1	V2	V1	V2	V1	V2	Monthly Cost
3.157	316.5870	3.2871	3282790	34767135	2.98%	6.64%	4,939.23
4.262	192.4140	2.2474	52323208	55323506	2.98%	5.17%	2,903.81
4.5	174.0700	2.0702	8127562	85908509	2.98%	4.92%	8,901.93
6	91.1143	1.3378	10034236	106051274	2.98%	3.96%	8,701.41
8	31.9576	0.7277	43310800	415253598	2.98%	3.28%	27,536.19
						Avg	10,596.52

Table 11. Calculations of the forfeited rewards distributed to all $MIN Staked in the Tiered option in low yield regimes.

The average monthly costs 10600$ADA for $MIN holders who selected Tiered Staking.

Consequences of not implementing V2 for Liquid Stakers

The primary motivation regarding implementing V2 for Liquid Stakers is to provide better returns when $MIN Staking enters into high performance market conditions. The following table provides an estimate Oportunity Cost on a monthly basis for $MIN Stakers who have selected the Liquid Staking option if the transition to V2 didn't happen at current prices ($1\$MIN = 0.0346\$ADA$).

Table 12. Shows the overall positive impact V2 Liquid Staking has compared to V1. Except for one scenario where the overall negative impact is around -20%, this is justifiably offset by the 3500% positive impact in the Tiered Staking comparison in table 9.

Repeating the process to calculate the overall positive/negative impact in terms of areas.

Break even (Tmin)	Positive Area	Negative Area	Absolute Ratio
3.157	61.6014	-76.4945	0.805304
4.262	65.9175	-63.3943	1.0398
4.5	67.2467	-60.3856	1.11362
6	77.8208	-43.752	1.77868
8	103.307	-21.8367	4.73089

Table 12. Comparison between the positive and negatives areas between the Liquid Staking APR curves (figure 21) for V2 and V1 across all yield regimes.

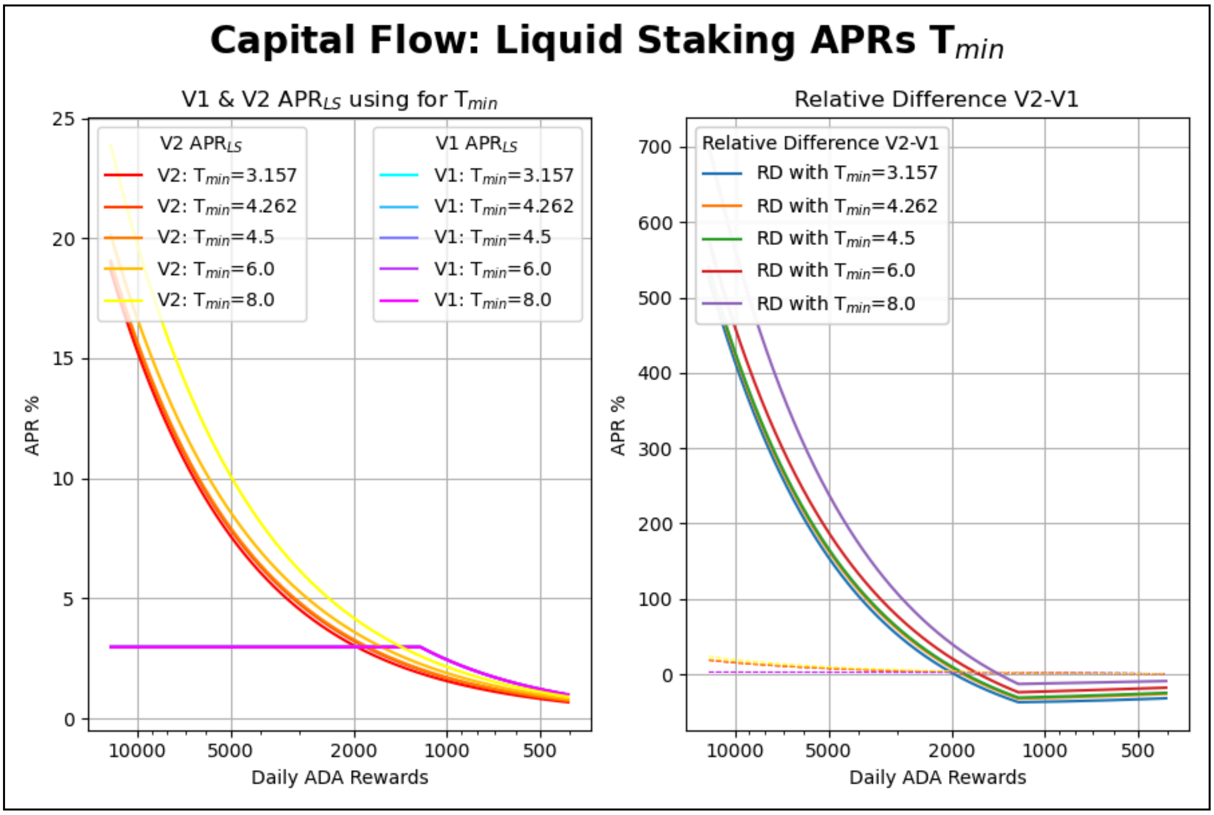


Figure 21. Left, the APR obtained in Minswap's V1 (cold) and V2 (warm) Liquid Staking option. Right, their relative difference.

An analysis of the APR increase at current market conditions shows:

γ = 0.3634	Expected ratio E(r)		$MIN Staked (LS)		Expected APR (LS)		
Break even (Tmin)	V1	V2	V1	V2	V1	V2	Monthly Cost
3.157	0.43487	3.11890	175740696.8	439082723.4	2.98%	5.09%	38,188.90
4.262	0.05995	1.86298	32798285.49	377325386.4	2.98%	5.32%	42,653.32
4.5	0.03608	1.65879	20191581.67	361770807.2	2.98%	5.39%	42,193.66
6	0.00230	0.88285	1331076.979	271892246.6	2.98%	5.88%	35,613.69
8	0.00003	0.37249	19920.89124	157374413.5	2.98%	6.88%	24,168.00
				Avg	2.98%	5.71%	36,563.52

Table 13.

The average monthly costs round up to 12900$ADA for $MIN holders who selected Liquid Staking.

7.3. Choosing A Future-Proof Staking Mechanism.

As Minswap progresses into new stages of Cardano DeFi, with a bright looking future as we await the onboarding of UTXO DeFi and higher stablecoin liquidity, it cannot afford to offer a subpar $MIN Staking product which:

a) Has by-design redundancies.
b) Offers subpar Premium Redistribution logic.
c) Gives unfair treatment in certain yield regimes
d) Does not justify the existence of two options

It is critical to maximise capital efficiency, obtaining the best possible results with the least resources necessary. In order to achieve this, $MIN Staking needs to be improved.

If not, $MIN staking needs to be simple, easy and predictable: without multiple options, early redemption rewards or lockup timers.

V1 Hybrid $MIN Staking is not future-proof. There is currently a single dominant option with 547M staked tokens compared to the 32M staked tokens. When an option is so overwhelmingly popular, there is only an illusion of choice, a sign of a design-flaw. Therefore, a decision must be made sooner rather than later.

This report has provided the necessary knowledge and proofs in order to allow for an informed decision without revealing the V2 Premium Redistribution function $C_{V2}(\gamma, r)$.

8. Conclusion

The current state of $MIN Staking is, unfortunately, not a sustainable one in the long term. The only real solution to offering a fair reward-splitting logic is by attacking the APR formulation.

Therefore, the author has reached the conclusion that $MIN Staking will only be sustainable in a future where:

A) There are no locking periods and there is only one Liquid $MIN Staking option.
B) A non-piecewise definition for the γ parameter is provided, enabling smooth transitions between low performance to high performance **and** Tiered Staking beats Liquid Staking at all times. V2 offers an elegant future-proof solution.

9. Scope of Work

9.1. **Research & analysis** – collapse/saturation study; capital-flow, RP, triviality.
9.2. **Mathematical development** – PR function, proofs, calibration.
9.3. **Simulation tooling** – Sheets/GeoGebra calculators; matplotlib suite.
9.4. **Financial impact study** – V1 vs V2 cost/benefit in yield regimes.
9.5. **Technical documentation** – V2 $MIN Stakind report, redacted formula, full appendix on approval.
9.6. **Implementation support** – liaise with Minswap Labs for contract upgrade.
9.7. **Comms** – article, forum posts, DAO Q-&-A.

10. Proposed Compensation

1. Projected hours worked

Research & analysis: 60h
Mathematical development: 75h
Simulation tooling: 45h
Financial impact study: 35h
Technical documentation: 30h
Implementation support: 10h
Comms: 20h

Total: 275 billable hours.

2. Rate

Freelance rate: **US $70 per hour**.

275 h × $70 = **US $19250 rounded to $20000** or the equivalent in $ADA

4. Proposed compensation:

4.a 10000 $ADA upon approval and release of full formulaic description.

4.b $0.5\% \times \frac{Total\ \$MIN\ Staked\ after\ 9\ months}{Total\ \$MIN\ Staked\ upon\ implementation} \times Daily\ \$ADA\ Rewards \times 270\ days$

In the event of the winning voted options are A) or C)

4.c 15000 $ADA upon approval so as to honour the dedicated time.

4.b describes 0.5% of total daily $ADA (excluding LBE) rewards over the course of 9 months distributed by Minswap's MIN staking, multiplied by a performance coefficient. This coefficient is to be determined utilising the 60-day moving average of total $MIN staked to prevent malicious behaviour.

11. Voting Options

A) Implement V2 hybrid $MIN Staking. (4a + 4b Compensation)
B) Transition to fully Liquid Staking. (4c Compensation)