The Terra Classic Re-Peg: Updated Proposal

Alex Forshaw, Edward Kim, Maximilian Bryan

Abstract

We propose to restructure Terra Classic's USTC via creation of an Algorithmic Fungible Token, USTN, collateralized by a Decentralized Reserve initially of BTC (60%) and LUNC market capitalization (variable), safeguarded by a Capital Control System with major improvements relative to Terra's legacy CCS.

Disclaimers

Any uses of traditional-finance terms with securities connotations, such as "debt," "equity,", "bond," etc. are for simplification purposes only, to make educational analogies for readers who are newer to web3. Nothing in this paper should be construed as any kind of statement, admission, or insinuation that LUNC, USTC, USTN, or any other Terra-native tokens are securities, commodities, or any other form of custodial asset.

We take the legal position that under current law, LUNC and USTN are not securities. We also do not believe USTN should be considered a "stablecoin" (Wikipedia definition: "cryptocurrencies where the price is designed to be pegged to a reference asset"[1]), but rather an Algorithmic Fungible Token (AFT) whose supply and demand are protocol-managed according to joint references to the US Dollar, a decentrally-operated exchange system, a substantial Decentralized Reserve, algorithmic capital controls, and genuinely decentralized protocol governance.

While we algorithmically hardwire USTN to mimic roughly .99:1 parity with the USD most of the time, we forthrightly acknowledge that this will not hold under 100% of probable supply/demand scenarios, and provision to manage those unforeseeable contingencies in a way that prevents catastrophic "death spirals" to the best of our ability. **We believe USTN should <u>never</u> be seen as synonymous with USD and disavow any attempt to market it as such.**

==

Every number in this proposal is for illustrative purposes only and is subject to a governance vote. However, *every key parameter has significant co-dependencies with other parameters which should be respected in the governance process* (they should be voted on in groups, as opposed to individual vote). Parameters subject to governance approval are denoted with braces: {Parameter}.

==

---

[1] For a detailed review of current US law referencing stablecoins, please see:
https://crsreports.congress.gov/product/pdf/LSB/LSB10753#:~:text=Enter%20stablecoins%E2%80%94cryptocurrencies%20whose%20value,assets%20denominated%20in%20fiat%20currency.
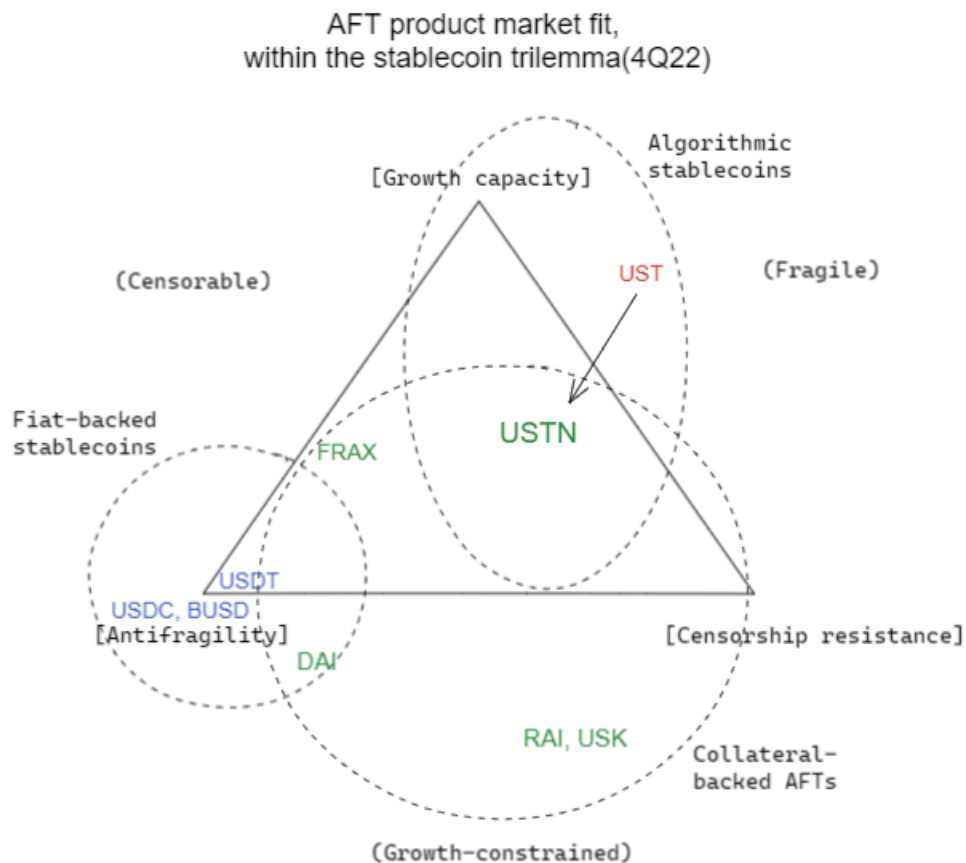
Mission Statement

We believe a decentralized economy needs decentralized money.

We see USTN as a groundbreaking financial innovation, offering unique costs and benefits that differentiate it from custodial stablecoins (USDC, USDT, BUSD), non-custodial crypto-overcollateralized stablecoins (DAI, RAI, USK, others), or undercollateralized fully-convertible stablecoins (FRAX).

The proposed USTN's key differences vs. UST would consist of:
- higher censorship resistance;
- a smart-contract-based, decentralized reserve management system;
- a much higher level of exogenous reserves, with a reduced growth capacity;
- augmented capital controls; and
- native interest rates set by market forces.

AFT product market fit,
within the stablecoin trilemma(4Q22)

[Growth capacity]

Algorithmic stablecoins

(Censorable)

UST

(Fragile)

Fiat-backed stablecoins

FRAX

USTN

USDT

USDC, BUSD

[Antifragility]

DAI

[Censorship resistance]

RAI, USK

Collateral-backed AFTs

(Growth-constrained)

We believe UST's decentralized stability mechanisms and backing via decentralized assets (mainly BTC) were visionary product design features which validated its claim as the first truly self-sovereign 'decentralized stablecoin.' USTN strives to evolve these product design decisions, not abandon them, to meet the significant demand for sovereign-yet-stable utility in the crypto economy which isn't currently being met.

We see the US Dollar as much more than another fiat currency; we see it as a key strategic asset of the United States, the software backbone of global commerce, and a potential key partner of our Protocol. We believe our industry can bring much-needed upgrades to a monetary operating system that's 50 years old, weighed down by ever-greater inefficiencies unable and unwilling to be fixed from within.

We believe the day will come when US regulators see us and our industry not as threats, but rather as key partners who could buttress the USD as the core operating system of global commerce for the next 100 years.

We believe this proposal preserves the best of Terra's uniquely self-sovereign feature set, dramatically enhances its antifragility, and best positions Terra Classic for the next chapter in the greatest turnaround in digital asset history.

–Alex, Ed & Max

1. Re-peg: Order of Operations

The basic steps envisioned here are:

1. Use some of the time between now and the CosmWasm upgrade (estimated ~5 weeks) to rewrite the Terra Classic modules sitting atop the currently-outdated Cosmos SDK.
2. After the CosmWasm upgrade completes, airdrop a new token, USTN, to existing USTC holders on a 1:1 basis, excluding a TFL-and-related-party Blacklist, along the lines of previous public discussions.[2] (The supply of USTN would then be collapsed by ~97% in a subsequent step.)
3. Regarding the 49.79% of USTC supply in the Blacklist addresses, instead of airdropping USTN to them, airdrop the USTN that would've gone to them into the Community Pool instead.
4. Mimic the effects of the previously-discussed USTC-based one-off burn via the new USTN token, by applying a {Burn Rate} of appx. (1 - USTC market price)% to the airdropped USTN, <u>leaving all USTC intact, but signaling that on a going-forward basis, we intend to back USTN – and not USTC – with the protocol's assets</u>.
   a. Example: If there are 10.736bn USTC-equivalent "stablekwon" tokens (9.81bn USTC, 902m USTC worth of SDTC, 28m USTC worth of KRTC, plus other dust) in circulation today, and USTC is $.03/BUSD, **USTN** supply at the end of the USTN to Equity Swap would be 97% (1 - .03) below current USTC-equivalent supply for a current USTC holder.
5. The Community would agree on a {Swap Rate} for LUNC:USTN, the amount of new LUNC ("newLUNC") to be airdropped per each burnt USTN. This proposal assumes a ~48.5:1 LUNC:USTN Swap Rate, retiring USTC 'bad debt' at a 50% premium to face value (currently $.032).
   a. The Swap Rate determines not just the amount of LUNC given to USTN holders, but also the amount of LUNC given to the Community Pool necessary to buy the BTC needed to collateralize USTN. In other words, 49.83% of the minted newLUNC will be exchanged at market prices for BTC, which will insure LUNC against death-spirals in the future.
   b. The community should closely scrutinize the market Swap Rate after this proposal is aired.
6. Execute the "Debt for Equity Swap," creating a new supply of [504bn] LUNC, 49.8% (251bn) of which would go into the Community Pool, and 253bn of which would go to off-Blacklist USTN holders.
   a. Stake the USTN Holders' 253bn newLUNC across the existing validator set, thus improving network security, and applying the standard 21-day staking lock on newly minted LUNC.
7. Migrate 80% of the LUNC in the community-owned smart contracts (Terra Oracle Rewards[3] & Distribution Core[4]) into the Community Pool.
8. Create a Terra-wrapped-BTC (twBTC) functionality, which doesn't currently exist, to securely manage the Reserve's BTC collateral on-chain and ensure Community control over the twBTC at all times.[5]

---

[2] If USTC within the Blacklist wallets started to move in reaction to this proposal, we'd be forced to snapshot the airdrop to before those movements began. Were this to happen, we'd expect USTC's market value to quickly plunge in value, reflecting the pointlessness of holding USTC past the time of snapshot.

[3] Address: terra1jgp27m8fykex4e4jtt0l7ze8q528ux2lh4zh0f

[4] Address: terra1jv65s3grqf6v6jl3dp4t6c9t9rk99cd8pm7utl

[5] In Terra Classic's old version, the Luna Foundation Guard's assets were necessarily spread out across multiple chains in wallets that seemed to be largely under Do Kwon's control. Although significant pieces of information remain missing, we have found no evidence that Kwon did anything illegal or improper with any of these assets. However, this is a major, unnecessary central point of failure which should be eliminated. Any single individual or MultiSig owner of these assets would effectively have life-or-death power over the stablecoin and the wider protocol.

  a. Additionally, the Community must control the Bridge where the BTC (which creates the twBTC) is vaulted: putting that BTC in a foreign bridge would give another protocol life-or-death power over our survival.

9. Create a Smart Contract Auction to swap the Community Pool's LUNC to twBTC at a {Discount Rate} sufficient to fund the Reserve. (we over-pessimistically model a 10% discount).

10. Once the twBTC Auction is complete, move the twBTC into the Reserve Tranches to collateralize USTN.

11. Re-open the swap with extremely tight parameters, <u>thus aggressively taxing USTN which inevitably exits the system at first</u>.
  a. Arbitrageurs attempting to opportunistically leech the 50% arb spread (meant as an outstretched hand to wounded USTC holders who are still committed to remaining with the Terra Classic Community) would find themselves being slapped with a 40%+ exit swap tax if they tried to leave immediately.

12. Slowly widen the swap parameters over time.

1a. Why USTN instead of USTC?

After extensive input from the community, we decided that executing the previously-discussed "Debt for Equity Swap" via a new token (USTN) carried several compelling advantages over the previous plan of mass-burning USTC.

1. **Democratic legitimacy:** We'd respect the free will of USTC holders:
  a. We'd maximize USTC holders' democratic choice by not unilaterally burning their USTC tokens;
  b. We'd allow USTC holders to retain their original tokens in the event of a future airdrop by LUNA 2.0 or any other entity; and
  c. We'd allow USTC holders to retain any residual value of their USTC after we communicate to the market that we'd no longer back USTC.

2. **Legal:** We'd deflect inevitable legal accusations of seizing or destroying others' USTC without their consent, especially USTC subject to legal claims within the Luna Foundation Guard. By taking the USTN route, <u>we wouldn't be interacting with the LFG or other wallets in any way – we'd simply be declining to include them in an airdrop, which anyone has the right to do, and then shifting our protocol's intentions from backing USTC to backing a new USTN token</u>. No interaction = no basis to litigate.

3. **Breaking with TFL:** By creating a new token, we'd underscore the break TFL while also emphasizing USTN's more prudent and decentralized implementation of UST's original vision.

The main disadvantages of going with a new token would be:

1. **Airdrop execution uncertainty:** Given how much USTC is on CEXs as opposed to the chain, there would be significant uncertainty in terms of how many USTC users would be allocated their USTN. Airdrops have been a longtime severe pain point with CEXs and if anything, this one will be significantly worse than average, given the number of overlapping technical issues.

2. **Data integrations:** We'd have to integrate this new token into major arteries of the DeFi ecosystem such as Uniswap and Curve, web portals like CoinMarketCap, and list the token on CEXs. The CEX listings in particular will cost a non-trivial amount of time and money.

This proposal emphasizes the financial aspects of the USTN AFT's re-launch, with a high-level review of its Decentralized Reserve and Capital Control System (CCS). The technical details of the Decentralized Reserve and the CCS will be fleshed out in separate white papers.

2. USTN Feature Set

Our product design has one goal: ***to create a high-growth, highly-differentiated ecosystem capable of <u>sustainably</u> reversing the seigniorage-run-amok that drove LUNC to ~0***. To this end, we prioritized our product design features in terms of primary (essential) features, vs. secondary/optional features.

Must-have features

1. **Balanced restructuring of "bad debt":** Shrink USTC-equivalent supply in as one-off of a manner as possible[6] to return USTC to 1 USTN : $1, while compensating USTN holders with equity in LUNC that our community could afford, that's also material to USTC holders' existing balances of USTC, but not enough to erode LUNC holders' support for the proposal.
   a. For our AFT to have the confidence of the market, and especially **third-party arbitrageurs defending our AFT's currency peg in future crises, we should, within reasonable means, respect the prior risk symmetry** of USTC holders vs. LUNC holders by giving USTC holders fair consideration for a shrunken USTN balance.
      i. UST holders had upside capped at $1, but first loss protection from LUNC holders; from a risk perspective, they were bondholders (above equity holders in the capital stack, ie, equity holders took total losses before they took material losses)
      ii. LUNA holders had unlimited upside in protocol success, in return for providing first-loss protection to USTC holders; risk-wise, they were equivalent to equity holders
      iii. If LUNC holders throw USTC holders to the wolves, USTN-LUNC arbitrageurs would assume they'd be treated equally poorly in a future crisis and would be less inclined to defend the peg in tail risk scenarios
   b. Under TradFi precedent, "debt holders" (USTC holders, sort of) would vote on a debt restructuring. However, USTC holders have no votes in this process, because the "equity" (LUNC) is the base-layer governance token. Out of ethical fairness as well as long-term credibility of the USTN asset, we (LUNC holders) should act with USTC holders' interests in mind even though we have no short-term financial incentive to do so.
2. **Recollateralize the Reserve:** Find – on our own – sufficient exogenous collateral backing for USTN (BTC or something else) so that the new USTN could have enough exogenous backing to be safe. Based on our conversations with potential outside investors, ***we believe 50% BTC***

---

[6] We also considered a gradual demurrage / factor-rebase of USTC with a very limited daily swap limit. However, we believe that by re-enabling the swap, we would cause arbs to close the market cap gap between LUNC and USTN and make the potential dilution LUNC holders would face a) much higher and b) less predictable, vs. a completely one-off rebasing.

collateralization is the minimum exogenous collateralization level required for market credibility.
Our proposal assumes a 60% BTC Collateralization Ratio.

3. **Reserve decentralization:** Manage the USTN's reserve in a ***passive, fully on-chain, programmatic*** manner, to eliminate key-man risk, maximize transparency, and increase investors' confidence during volatile market periods by making protocol operations fully and publicly visible.
    a. Make sure that the on-chain reserve could, on its own, retire 100% of the balance of the USTN in the event of a failure of the Capital Controls System (CCS) – understanding that the CCS *will certainly fail* at some point in the future due to some unforeseen confluence of improbable events, and equip the Reserve to be a failsafe that prevents another hyperinflationary catastrophe.
    b. Create a twBTC (Terra-wrapped-BTC) implementation for Terra Classic, which doesn't currently exist
4. **Overhaul the Capital Control System (CCS):** Figure out everything that went wrong with Terra Classic's prior CCS, and materially upgrade it.
5. **Retain Terra's lack of fiat umbilical cord**, which gave Terra a unique layer of decentralization and regulatory insulation relative to fully-collateralized stablecoins such as USDC.
6. In late 2022 or early 2023, open the LUNC-USTN swap with very restrictive parameters.

Nice-to-have features

1. Build and finance important adjacent infrastructure that can drive quick growth, such as
    a. An on-chain BTC-USTN liquidity pool for low-slippage day-to-day reserve open market operations
    b. A small USTN-USDT/USDC/3Pool Curve pool on Mainnet
    c. A protocol-owned bridge capable of securely storing the keys for protocol-owned BTC

We believe our proposal satisfies most of the nice-to-have goals on this ambitious list, and all of the essentials. At certain points, when the market cap ratio of LUNC to USTC was significantly higher, the protocol was also positioned to satisfy all of them; however, at current LUNC price levels, that is no longer the case.

3. "Debt-to-Equity Swap" Assets, Liabilities, and Mechanics

First, we mapped all the assets of TFL and key related parties which we could theoretically use to capitalize USTN. The community already owns **4.75% of all LUNC supply**. Community smart contracts, the LFG, and TFL related party addresses collectively control at least **49.8% of all USTC supply**.

Airdrop Blacklist - 10/2/2022	Label	USTC holdings	LUNC holdings	Other (US$)	
terra1gr0xesnseevzt3h4nxr64sh5gk4dwrwgszx3nw	LFG Wallet	1,847,079,782	222,710,000		
0x46F9dC7492A0164Eb920eE07979EBbc08a949cE5	LFG AVAX			$33,096,500.58	1,973,554
0x36236fa003Ac2E5371E3264276f82D355180a102	LFG BNB			$11,232,198.74	39,914
bc1q9d4ywgfnd8h43da5tpcxcn6ajv590cg6d3tg6axemvljvt2k76zs50tv4	LFG BTC			$5,998,303.83	313
terra1jgp27m8fykex4e4jtt0l7ze8q528ux2lh4zh0f	Terra Oracle Rewards	1,052,000,000	305,000,000,000		
terra1jv65s3grqf6v6jl3dp4t6c9t9rk99cd8pm7utl	Terra Distribution Core	70,000,000	16,700,000,000		
terra1qyw695vaxj7jl6s4u564c6xkfe59kercg0h88w	Ozone Treasury contract	800,000,000			
terra1sepfj7s0aeg5967uxnfk4thzlerrsktkpelm5s	Anchor Market contract	504,000,000			
terra1tmnqgvg567ypvsvk6rwsga3srp7e3lg6u0elp8	Anchor Overseer contract	119,125,000			
terra17yap3mhph35pcwvhza38c2lkj7gzywzy05h7l0	Anchor bLUNA rewards	26,512,000			
terra1q9cs4d4x67u6yvsaswecf0usp2rygdnmrflzfj	Anchor rewards dispatcher	3,251,000	932,000,000		
terra1dp0taj85ruc299rkdvzp4z5pfg6z6swaed74e6	TFL SDR wallet	896,018,978	293,000,000		
terra1x04xgtwlw72gtfzrq7nfwmr6eexla8ecljw28z	Project Dawn	5,477,120			
	Other - 1	22,096,992	4,974,726,541		
	Other - 2				
	Total	5,345,560,872	327,899,726,541	0	
Total USTC-equivalent (USTC & SDTC), pre-swap	10,736,297,899	$171,057,947.90	$108,206,909.76	$50,327,003.15	
Total LUNC, pre-swap	6,900,000,000,000	4,449,541,894			
Community % share of USTC	49.79%				
Community % share of LUNC	4.75%				

There are 3 groups of relevant entities here.

- Luna Foundation Guard wallets (1.847b USTC & 222.7m LUNC on-chain, USD $51.3m of AVAX[7]/BNB[8]/BTC[9] off-chain)
- Community-owned smart contracts (the Oracle Rewards Distributor[10] and Distribution Core[11]: 1.2bn USTC & 320bn LUNC). These assets are already community-owned.
- TFL & related parties: 3.25bn USTC, 6bn LUNC
  - This includes the TFL SDR wallet, which owns 700m of uSDRs swappable for ~900m USTC. The TFL SDR wallet also includes 1 billion "vesting SDRs" which we ignored, as they hadn't properly entered the money supply.

3a. Off-chain assets: LFG AVAX, BNB, BTC

Unfortunately, the $53.5m of off-chain AVAX, BNB, and BTC are beyond our reach. ***We strongly oppose the proposed redistribution of these assets to pre-depeg USTC holders,*** *because it arbitrarily prioritizes them – who likely sold out of their USTC at much more favorable prices – over current USTC holders, and* ***thus represents an expropriation of wealth from the LUNC/USTC community.*** However, our understanding is that these assets are wrapped up in legal processes beyond our control (or the LFG's). It would require a change of heart not just by the LFG, which is very legally constrained in what it can do, but also an extremely diverse set of class-action litigants whose interests are fundamentally at odds with those of *current* USTC holders.

3b. On-chain assets: USTC & LUNC

In Terra Classic's prior system, LUNA collateralized not just the uUSD stablekwon token (USTC), but 21 other stablekwon tokens as well, interchangeable at oracle prices determined by several data feeds to TradFi FX markets. As of this writing, the only three stablekwon pools of any significance were uUSD/USTC (91.33%), uSDR/SDTC (8.4%), and uKRW/KRTC (.26%).

---

[7] 0x46F9dC7492A0164Eb920eE07979EBbc08a949cE5
[8] 0x36236fa003Ac2E5371E3264276f82D355180a102
[9] bc1q9d4ywgfnd8h43da5tpcxcn6ajv590cg6d3tg6axemvljvt2k76zs50tv4q
[10] terra1jgp27m8fykex4e4jtt0l7ze8q528ux2lh4zh0f
[11] terra1jv65s3grqf6v6jl3dp4t6c9t9rk99cd8pm7utl

10/2	($-equivalent)	
UUSD	$9,815,453,639	**91.42%**
UAUD	$18,544	0.00%
UCAD	$7,450	0.00%
UCHF	$12,269	0.00%
UCNY	$9,755	0.00%
UDKK	$608	0.00%
UEUR	$57,275	0.00%
UGBP	$28,124	0.00%
UHKD	$523	0.00%
UIDR	$458,684	0.00%
UINR	$652	0.00%
UJPY	$23,605	0.00%
UKRW	$27,173,129	0.25%
UMNT	$68,855	0.00%
UMYR	$23,927	0.00%
UNOK	$1,060	0.00%
UPHP	$287	0.00%
USDR	$892,858,978	**8.32%**
USEK	$90,990	0.00%
USGD	$1,146	0.00%
UTHB	$6,424	0.00%
UTWD	$1,976	0.00%
	$10,736,297,899	100.00%

If 100% of non-uUSD stablekwon tokens were swapped into uUSD (USTC) at market rates, the supply of USTC would be 10.736bn, 49.79% of which would be claimable by the community. The assets we can use to redistribute via governance sum up to 4.47bn USTC 700m of uSDR stablekwons (903m USTC-equivalent) in the TFL SDR wallet, and 328.4bn LUNC, or **5.37bn USTC & 328.4bn LUNC.** In USD terms, it's ~$270m.

3c. USTC's intrinsic value

As an unbacked token, USTC's intrinsic value dropped to ~0 when TFL disabled the LUNC-USTC (then LUNA-UST) swap in mid-May, creating the blockchain equivalent of a debt default. USTC's intrinsic value today has 3 sources:

1. The option value of the LUNC chain partially recollateralizing USTC
2. The option value of LUNA 2.0 or any other chain/entity partially recollateralizing USTC
3. An unclear relationship with the USTC holder's share in the airdrop of $50m of LFG off-chain assets, to the extent that the airdrop takes current USTC ownership into account (we aren't sure how it will work)

Thus, despite USTC's lack of formal backing, USTC has consistently traded at a very high correlation to LUNC, but also at a large market cap discount, reflecting the reality that any sustainable recollateralization of USTC couldn't overly dilute LUNC holders or leave a dangerously low equity buffer. USTC has also shown significant sensitivity to very large upward moves in LUNA's value (see: Sept. 8-9th, 2022).

3d. The LUNC:USTN Airdrop Parameter

The LUNC-per-USTN airdrop parameter for the swap (48.485 in the below example) will ultimately have to be fixed in a governance vote, balancing LUNC holders' tolerance for dilution with compensating USTC holders fairly, and also with a safe level of BTC collateralization. The airdrop parameter applies to both private USTC holders and to the amount of LUNC gifted to the Community Pool Smart Contract, the latter of which will help underwrite the BTC we will need to collateralize USTN.

Debt-to-equity swap	Pre-swap	Swap Stage 1
LUNC per USTC exchange rate (market price)	96.97	
LUNC per USTC bondholder @ {50%} Swap Rate	48.485	0.016
USTC:USD exchange rate	0.032	
USTC required burn percentage	96.8%	
Total USTC supply	10,736,297,899	343,561,533
Total LUNC supply	6,900,000,000,000	6,900,000,000,000
Total newLUNC supply	0	503,890,248,065
Assumed (LUNC + newLUNC) post-swap market cap (USD)	2,277,000,000	2,277,000,000
Community owned BTC market cap		

Community Pool Smart Contract	Pre-swap	Swap Stage 1	Swap Stage 1 ($)	Swap Stage 2 (US$ equivalent)	Swap Stage 3 (US$ equivalent)
Community Pool USTN	5,345,560,872	171,057,948	$171,057,948	$171,057,948	$0
Community Pool LUNC	263,559,726,541	263,559,726,541	$81,055,429	$0	$0
Community Pool newLUNC	0	250,884,990,250	$77,157,427	$0	$0
Community owned (LUNC + newLUNC)	263,559,726,541	514,444,716,791	$158,212,856	$0	$0
Community owned BTC - assume slippage of -0.07	0	0	0	$147,137,956	$147,137,956
Total USTC in circulation, post-burn, stage 1	343,561,533				
Total USTC in circulation, post-burn, stage 2	343,561,533				
Total USTC in circulation, post-Stage 3	172,503,585				
BTC percentage backing of USTC supply, post-stage 3	85.30%	<--some extra btc left over vs 60% collat tgt for bridges, BTC<>USTC pool			
LUNC market cap backing of USTC supply, post-stage 3	1263.04%				
Assumed LUNC<>BTC slippage	-7%				
Percentage of oracle / TDC contracts' LUNC to be reallocated	80%				

The Community's 513bn LUNC (250.884bn newLUNC, combined with 263.559bn LUNC from the Oracle Rewards Distributor & Distribution Core smart contracts) would be converted into community BTC which never leaves the Community's possession and acts as insurance against LUNC hyperinflation during high-stress scenarios. At that point, the USTN in the Community Pool Smart Contract would be burnt, leaving $172.5m USTN in circulation, 100% in the hands of private holders.

Net of the LUNC sold by the Community Pool to buy BTC for the Community Pool, the community is only looking at ~250bn newLUNC (3.6%) created. This 250bn newLUNC would then be auto-staked across the active validator set, and not be available for sale for at least 21 days.

4. Post-Swap: Where We'd End Up

The ecosystem: In this example, we'd end up with USD $172.5m of USTN, backed by $147.13m USD worth of twBTC. In this model, there would be a very significant amount of twBTC (25.3% USD value relative to stablecoin supply, or >USD $40M). The excess money, whether in twBTC or USTN or something else, would bootstrap infrastructure essential for re-enabling cross-chain liquidity via protocol-owned assets,

such as a $10M:$10M on-chain twBTC-USTN liquidity pool, a USTN Curve pool, and a protocol-owned (or completely decentralized?) BTC bridge.

Alternately, instead of selling that excess LUNC for BTC, the excess LUNC (around 100bn) could simply be burnt (reducing the total dilution required from 500bn to 400bn).

The ecosystem would also start collecting tax revenue from the .5% USTN-LUNC {minimum swap tax}, which it would inherit from the UST-LUNA regime. The purpose of this tax was to discourage oracle manipulation attacks, and this to us would be a much more efficient tax than the current 1.2% {TobinTax} on most protocol interactions.

Community Pool Smart Contract	Pre-swap	Swap Stage 1	Swap Stage 1 ($)	Swap Stage 2 (US$ equivalent)	Swap Stage 3 (US$ equivalent)
Community Pool USTN	5,345,560,872	171,057,948	$171,057,948	$171,057,948	$0
Community Pool LUNC	263,559,726,541	263,559,726,541	$81,055,429	$0	$0
Community Pool newLUNC	0	250,884,990,250	$77,157,427	$0	$0
Community owned (LUNC + newLUNC)	263,559,726,541	514,444,716,791	$158,212,856	$0	$0
Community owned BTC - assume slippage of -0.07	0	0	0	$147,137,956	$147,137,956
Total USTC in circulation, post-burn, stage 1	343,561,533				
Total USTC in circulation, post-burn, stage 2	343,561,533				
Total USTC in circulation, post-Stage 3	172,503,585				
BTC percentage backing of USTC supply, post-stage 3	85.30%	<--some extra btc left over vs 60% collat tgt for bridges, BTC<>USTC pool			
LUNC market cap backing of USTC supply, post-stage 3	1263.04%				
Assumed LUNC<>BTC slippage	-7%				
Percentage of oracle / TDC contracts' LUNC to be reallocated	80%				

A USTC holder with 1,000 USTC (valued at USD $30) would keep his 1000 USTC (which would probably plunge in value post-airdrop to something greater than 0 but much less than $30), and additionally have 30 USTN (valued at $30), and 48,485 of newLUNC ($15) staked across the active validator set with the typical 21-day staking lockup. His USTN would be 60% backed by BTC. If he immediately dumped his USTN after the swap were re-enabled, he'd face a severe swap tax (unless very few others dump, in which case he'd be free to leave) and his "free lunch" would be taken away from him by the protocol.

Basically, through a <u>completely voluntary</u> process, the LUNC Protocol would be buying back the USTC holder's debt at a premium of [50% + USTC post-airdrop residual value - (USTN exit tax, if the USTC holder chose to dump his USTN)].

A LUNC holder would face 503890/6900 = 7.3% dilution in this example (the actual amount would depend on the LUNC:USTN Swap Rate). In return, he'd have voting control over a viable new product, USTN, with a unique balance of decentralization, growth potential, and resilience not offered by any stablecoin on the market today, which could power the protocol's next leg of growth. USTN adoption would in turn start to refill the Oracle Rewards Distributor, which LUNC stakers and validators depend upon to generate staking yields. He would also have voting control over the excess assets of the protocol, required to stake the basic infrastructure we'll need to reactivate the chain.

A validator would see the amount of LUNC staked to him go up by ~50% relative to current levels (staked LUNC would go from ~630b to ~925b). This would significantly increase network security. If a significant amount of USTN immediately tries to exit the system at the re-peg, the swap tax would aggressively tax their USTN and slowly redistribute it to the active validator set over a 2-year period (this was what gave the ORD such a large USTC balance in the first place).

The validators would also see the ORD start to replenish, as the ORD needs a functioning dual-token mechanism in order to be replenished (as things stand today, it's being gradually depleted with no replenishment in sight).

5. Decentralized Reserve: Basics

Reserve Allocation Example (USTN 1bn, 60% BTC Reserved)

.95 - $1: No Reserve Defense
(Arbs only)

$.90: Tranche1 initiates SELL BTC / BUY USTN @ .90 limit (tgt 66.67m USTN repurchased)

$.80: Tranche2 initiates SELL BTC / BUY USTN @ .80 limit (tgt 75m USTN repurchased)

$.70: Tranche3 initiates SELL BTC / BUY USTN @ .70 limit (tgt 85m USTN repurchased)

$.60: Tranche4 initiates SELL BTC / BUY USTN @ .60 limit (tgt 100m USTN repurchased)

$.50: Tranche5 initiates SELL BTC / BUY USTN @ .50 limit (tgt 120m USTN repurchased)

$.40: Tranche6 initiates SELL BTC / BUY USTN @ .40 limit (tgt 150m USTN repurchased)

$.30: Tranche7 initiates SELL BTC / BUY USTN @ .30 limit (tgt 200m USTN repurchased)

$.20: Tranches 8-10 initiates SELL BTC / BUY USTN @ .20 limit (tgts 300m / 300m / 300m USTN repurchased)

If Tranche10 balance = 0, (terminate LUNC/USTN swap immediately)

| Tranche1: $60M BTC |
| Tranche2: $60M BTC |
| Tranche3: $60M BTC |
| Tranche8: $60M BTC |
| Tranche9 + Tranche10: $120M BTC |

Key concepts:
- Tranching: Partition the Reserve into 10 tranches.
  - The first tranche begins swapping out of BTC and into USTN when the peg hits that tranche's Limit Entry Price
  - The Protocol seeks out the best price for wBTC, primarily via Ethereum Mainnet
- Re-racking: At semirandomized but regular intervals, or at every {5%} change in the price of BTC, "re-rack" the Reserve's tranches such that the bottom tranches are filled first.

The Decentralized Reserve is designed as a programmatic, fully on-chain, fully transparent, protocol-owned replacement to the Luna Foundation Guard. Its sole purpose is to use non-Terra reserve assets (BTC in our example) to defend the USTN:USDC peg.

The Protocol would set a {Reserve Target} (we assume 60%), the target level of BTC to remain in reserves relative to USTN in circulation. Whenever the Reserve were below its Target, the protocol would do two things:

1. Redirect all revenues from taxes to buying BTC until the Reserve is topped up.
2. At regular intervals, "re-rack" the tranches to fill them up from the bottom.

3. Once the Protocol had breached its reserve level, the {minimum swap tax} would be raised to 1%, and all protocol taxes excluding the CCS would be redirected into the Reserve. These revenues would generally be collected in the form of USTN, and governance could decide what to do with the revenues at a later date.
4. All tax revenues ex-CCS fees would be reallocated towards LUNC burning, in line with LUNA's Columbus-3 upgrade.

The Decentralized Reserve has 6 key product requirements:

- Smart contract-based, automated defense of the USTN peg using BTC reserves.
- At full Reserve capacity, guarantee that the protocol can, at current BTC prices, retire 100% of currency in circulation *even in the event of total CCS failure,* thus averting a death spiral.
- Structure the Reserve in such a way that it **profits** from taking the other side of efforts to market-sell large volumes of USTN, and cannot be "tricked" into emptying its reserves defending the peg at a very small discount to 1 USTN : 1 {USDC | USDT | BUSD}.
- Be able to flexibly adjust in the event of a gradual BTC bear market, such that the Reserve can, at some lower VWAP, still retire up to 100% of USTN in circulation, *even in the event of a total failure of the capital control system,* while using excess Tobin tax revenues to gradually refill successively higher tranches of the Reserve.
- In the event of a significant price change in BTC relative to USD (we recommend 5% as a threshold level) caused by a catastrophic event, the tranches automatically re-rack lower, maintaining the Reserve's capability to retire all USTN in circulation and avert a death-spiral
- Build in a deep margin of safety (the DeFi industry standard, which has withstood multiple severe bear markets, is 15ppts) to account for unforeseeable, such as USTN/BTC swap rates, significantly higher transaction fees during high congestion periods, etc.

Overcollateralized implementations of the Decentralized Reserve already operate on mainstream DeFi platforms that have withstood multiple bear markets, such as Aave, Compound, and Maker. In these constructs (whether stablecoin or not), vaults of ETH, wBTC, etc. are liquidated when key risk thresholds are breached. These protocols held up extremely well during the 2022 DeFi-pocalypse. The on-chain transparency of their liquidation transactions, running well into the billions of dollars, showed the world that the model fundamentally works, even under the severe stress of a -80% bear market.

Our protocol proceeds from these design principles, but takes a path of <100% endogenous collateralization, offset by significantly reduced convertibility during periods of systemic stress. Which brings us to another of Terra's key elements: its Capital Control System.

6. Capital Control System: Basics

The key concept behind Terra's Capital Control System (CCS) was that swap taxes from UST to LUNA were generally very low when nobody else was 'withdrawing' UST (swapping UST into LUNA), but would rise dramatically as more people withdrew more capital in a shorter period of time – basically taxing withdrawals

in proportion to how many other withdrawals were simultaneously being attempted – and redistributing a significant percentage of their profits to the ecosystem's most committed participants (stakers and validators).

The CCS, combined with LUNA equity, was UST's key line of defense under the prior system, much more so than the LFG Reserve. As UST depositors fled the system in greater numbers, the protocol would collect an escalating tax on their withdrawals, deposit the UST into the Oracle Rewards Distributor, and redistribute the income to stakers over a 2-year period from time of collection. This would perform 2 roles: taking UST out of circulation, and redistributing it from the system's weakest, fleeing users to its most dedicated supporters: LUNA stakers.

At the same time, LUNA could be purchased on the open market by new traders willing to bet on LUNA's survival, or existing members bringing more outside capital to defend the protocol.

Most of the time, even in the 1Q22 bear market when crypto crashed in general and the Anchor Protocol's TVL fell over 25%, the CCS worked as intended. However, it wasn't enough. In the May crash, the CCS managed to retire ~45% of total UST in circulation ($18.8B to $10.3B), and only around 30% after accounting for the 2.75bn UST repurchased by the Luna Foundation Guard during the crash.

The below shows UST/LUNA theoretical swap tax collection curves using a USTN 10M {basePool} under varying levels of systemic stress ({poolDelta} = 0% / 50% / 100% of basePool). The green curve is the expected withdrawal tax collection curve under 0 stress (poolDelta = 0% of basePool), red represents high stress (poolDelta = 50% of basePool), and blue (poolDelta = 100% of basePool) represents extreme stress.
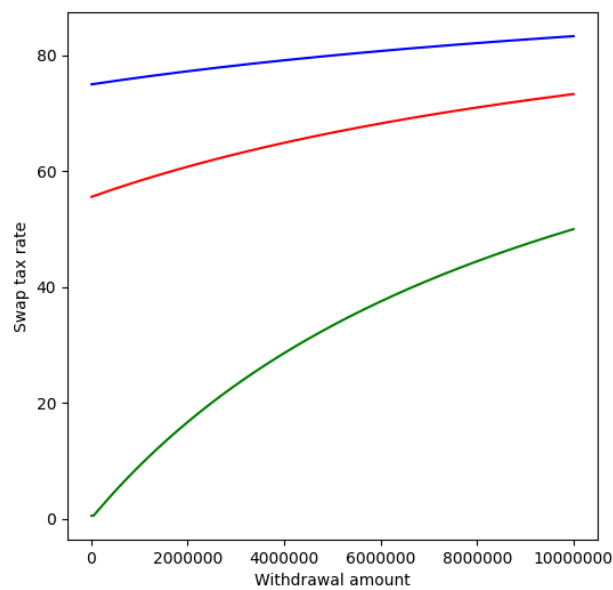
- Green: 10M basePool size, 0 poolDelta size ($0 net withdrawals from UST to LUNA within the prior X blocks)
- Red: 10M basePool size, 5M poolDelta size
- Blue: 10M basePool size, 10M poolDelta size

In addition to the basePool and poolDelta, Terra also had a {poolRecoveryPeriod} (most recently set to 36 blocks), which determined how quickly the poolDelta would renormalize to zero (thus also taking the tax rate on the next withdrawal to near-zero). The rate at which the tax rate went up during capital outflow events, as well as the rate at which the tax rate renormalized to zero, was determined by the interactions between the basePool, poolDelta, and poolRecoveryPeriod parameters.

In reality, the CCS was seemingly managed via ad-hoc, highly centralized parameter adjustments, and as far as we know, it never sustained collection rates above 40 percent for any period of time, even during extreme stress events. We believe this was because arbitrageurs had insufficient incentive to defend the peg during high-stress events when CCS taxes significantly exceeded 40 percent. We suspect that the CCS curve will have to be reconfigured towards an "S" curve with a 45%-ish ceiling vs. the prior system, but this will require extensive further testing and validation.

Terra had a basePool size of $50M, or .26% of its prior money supply, during its crash. However, because so much of Terra's money was mercenary capital sitting at Anchor doing nothing productive (a feature we **must absolutely not emulate**), its $50M basePool was probably >1% of its non-mercenary capital. We suspect that in the absence of mercenary capital, a dynamic basePool size equal to .25% of USTN supply (around $500k USTN) would be a safe initial target; however, this will require further testing.

6a. Capital Controls vs. Convertibility Tradeoffs

While we could guarantee systemic stability via, eg, a 100% tax rate if anybody withdrew more than USTN 1000 from the system, that would clearly be a useless product, because no depositor could have any confidence in ever being able to access his/her money on a reasonably predictable basis. A stable medium of exchange needs to balance *both sides'* need for stability. In the TradFi system, this is "solved" by extremely restrictive deposit withdrawal restrictions on physical cash and less restrictive, but still onerous restrictions on e-cash. When withdrawals accelerate, TradFi ABS systems layer on further restrictions still.

Terra attempted to solve this issue via a dynamic CCS tax instead of hard restrictions on withdrawals. Their approach clearly did not work, and needs some combination of major changes. All of the changes in this paper are subject to governance approval. A working ABS system is one such vector of change, but it comes at a major convertibility cost.

The community should also keep in mind that one of crypto's key advantages over TradFi is its much higher convertibility. ABS-based algorithmic stablecoins such as Ampleforth (AMPL), have been conspicuously unsuccessful: while they have zero chance of death-spiraling, they sacrifice an unquantifiable but vital UX element (predictable convertibility) in return for certainty of stability. As a result, very few people are interested in using them in crypto or the real world.

Appendix 1: LUNC Burn Rates

Modeling LUNC burn rates in a communicable way is very difficult because of the number of assumptions required. A simpler mental model would look like this:

- **Key burnrate driver: LUNC price per token**
    - A lower LUNC token price results in more LUNC volume burned per 1 USTN put into circulation
- **Key burnrate driver: USTN adoption**
    - Under the pre-LFG LUNA/UST system, when $1 of UST was minted into circulation, arbitrageurs would burn ($1 - arb%, usually a very low %) worth of LUNA.
    - After LUNA's May 2021 crash and bailout, which seemed to result in significant dilution over 2Q/3Q21, the Terra Protocol reoriented towards a ~25% BTC-collateralized LFG, which, after netting out many manual steps, should've burned around ($1 - .25) worth of LUNA for every additional $1 of UST minted
        - However, both of these systems featured high instability, which caused significant dilution to LUNA holders when it became severe
    - A 60% collateralization ratio would burn less upfront ($(1-.60) per $1 of USTN minted) but would have much higher stability, far lower volatility-induced, (in LUNA's case it was very high) and virtually no deathspiral risk.
        - This safety premium would be very accretive to LUNC's value, resulting in a significantly higher LUNC market capitalization over time, independent of the burn rate
- An extremely crude estimate of USTN's burn impact to LUNC share supply – *not factoring in any growth in on-chain utilization from other dApps* – might look like this:

USTC Total Supply	LUNC mkt cap	LUNC tkn supply	BTC reserve	LUNC price	VWAP of incr burn
172,503,585	$2,178,787,144	7,403,890,248,065	103,502,151	0.0002943	
500,000,000	$3,357,774,239	7,023,385,742,206	300,000,000	0.0004781	0.00034
1,000,000,000	$5,089,875,433	6,442,456,473,541	600,000,000	0.0007901	0.00055
2,000,000,000	$8,425,646,594	5,715,183,746,269	1,200,000,000	0.0014743	0.00096
3,000,000,000	$11,639,872,264	5,298,995,303,795	1,800,000,000	0.0021966	0.00165
4,000,000,000	$14,738,993,590	5,057,281,119,331	2,400,000,000	0.0029144	0.00238
5,000,000,000	$17,729,040,166	4,888,935,675,565	3,000,000,000	0.0036264	0.00309
6,000,000,000	$20,615,660,317	4,759,586,215,169	3,600,000,000	0.0043314	0.00380
7,000,000,000	$23,404,148,897	4,654,395,564,271	4,200,000,000	0.0050284	0.00451
8,000,000,000	$26,099,472,813	4,565,618,090,367	4,800,000,000	0.0057165	0.00520
9,000,000,000	$28,706,294,484	4,488,701,361,877	5,400,000,000	0.0063952	0.00589
10,000,000,000	$31,228,993,423	4,420,745,835,514	6,000,000,000	0.0070642	0.00656
11,000,000,000	$33,671,686,094	4,359,793,204,680	6,600,000,000	0.0077232	0.00723
12,000,000,000	$36,038,244,214	4,304,460,140,726	7,200,000,000	0.0083723	0.00789
13,000,000,000	$38,332,311,617	4,253,734,113,704	7,800,000,000	0.0090114	0.00853
14,000,000,000	$40,557,319,817	4,206,852,280,966	8,400,000,000	0.0096408	0.00917
15,000,000,000	$42,716,502,371	4,163,225,981,564	9,000,000,000	0.0102604	0.00980
16,000,000,000	$44,812,908,150	4,122,391,697,092	9,600,000,000	0.0108706	0.01041
17,000,000,000	$46,849,413,615	4,083,978,091,402	10,200,000,000	0.0114715	0.01102
18,000,000,000	$48,828,734,156	4,047,683,201,959	10,800,000,000	0.0120634	0.01162
19,000,000,000	$50,753,434,613	4,013,258,254,775	11,400,000,000	0.0126464	0.01221
20,000,000,000	$52,625,939,001	3,980,495,925,468	12,000,000,000	0.0132210	0.01279

- For every $1bn of USTN put into circulation, at a 60% CR, USD $400M of LUNC supply, at a market-determined VWAP (and thus mkt-determined # of tokens) would be burnt
- At USTN ~600m in circulation and a 50% appreciation in LUNC from current levels, all dilution from the "Debt to Equity Swap" would be reversed
- At U5bn – which we think could be easily attained within 12 months – **LUNC supply would be reduced by 2T from current levels / 2.5T from post-dilution levels**, and LUNC's per-token price would be **~12x higher** than it is today
- At Terra's prior peak of 19bn circulating UST, LUNC holders would be looking at a 40x return relative to LUNC's current price and an almost 50% reduction in LUNC supply
  - If LUNC's market cap appreciates much more slowly than these numbers project, the amount of LUNC tokens burnt per USTN adopted would be far higher

- **Key burnrate driver: On-chain utility driving higher tax revenues**
  - In the old LUNA/UST system, the chain never attained meaningful on-chain utility outside of the Anchor Protocol and DeFi protocols that were direct derivatives of Terra's Anchor-driven liquidity bubble (Kujira, Prism, Nexus, etc)
  - This is a key driver of Do Kwon/LUNA 2.0's updated ecosystem strategy, which aims to *build a financial system around pre-existing utility,* not over-financialize and repeat the Anchor mistake
    - This is an intelligent approach which our protocol should emulate
  - Because there's no precedent for a chain of truly successful non-DeFi dapps, this is very difficult to forecast, but the industry is ready and able to launch it
  - However, it's critical for our systemic stability that our protocol include use cases outside of hyperfinancialized DeFi

- **Key burnrate driver: third-party Real-World Assets (RWAs) <u>partially</u> replacing need for exogenous collateralization over time**
  - Real-world asset investments by dapps built on top of the protocol, such as loans to businesses, would have to follow the rules of regulated finance
  - As USTN accumulated in RWAs over time – taking up, say, 10-20% of all USTN in circulation – these would effectively act as a secondary Reserve completely independent of the Decentralized Reserve
    - If a real-world business took out a loan for 1M USTN, converted it into USDC at $.99:1, and then used that USDC in its real-world business, it would generate SMB yields (probably 8-18%ish net of chargeoffs, depending on the quality of the asset)
    - If the USTN peg came under attack, that same RWA borrower would have a very strong incentive to redeem their loan at a large discount to face value (eg, 30% discount at .70:1), thus *defending the currency peg while making a large profit for themselves*.
    - These loans have their own infrastructure and centralization issues, and integrating them into DeFi in a composable way is very challenging – but is already being done by protocols such as Centrifuge and Goldfinch, has performed very well in the downturn so far, and is innovating rapidly
    - As these asset balances grow, the Protocol could safely reduce its Collateralization Level to the 45-50% range, swapping BTC into LUNC which could then be burnt

Appendix 2: Regulatory Comment

Regarding the stablecoin legislation reportedly being drafted in Washington, DC, we don't know anything that anyone else doesn't. It's obviously aimed at the now-defunct Terra model of pre-May 2022, but based on the little we've read thus far, it widely misses the mark.

We would note that the US financial and regulatory regime is already extraordinarily hostile to all kinds of stablecoins. US banks today aren't even allowed to hold USDC – a 100% USD-collateralized token, essentially an e-dollar, and probably the closest thing the US will ever have to a widely adopted CBDC – on their balance sheets. (Subprime mortgages, on the other hand? No problem!)

However, that doesn't stop people around the world from transacting between crypto-tokens of their choice. It does, unfortunately, make it very difficult for DeFi-sourced capital to make a real-world difference in the United States (by financing real-world assets in the US via TradFi-regulated RWA transactions, as these are extremely likely to be securities, and thus must comply with US securities law).

Now, regardless of the current US regulatory climate, *any* national regulator is going to have a big problem whenever a token markets itself as equivalent to that country's cash currency, when it in fact has significantly less exogenous collateralization than that country's cash does (100%). A protocol which advertises its token as "equally as good as (USD)," when it is in fact very different, is basically trafficking in counterfeit currency from the perspective of a reasonable national regulator. So, we need to always be extremely candid about how our model differs from the USD (or a governance-set multiple of AED, SAR, and/or HKD, or whatever other fiat currencies we may choose to reference in the future).