About Being Stable, Stability and Stabilized in Crypto: A Beginner's Guide.

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While discussing Nebula, I'm often asked what "stabilized" means. This is a significant question, as it captures the essence of Nebula's purpose. To clarify, let's take a step back and start from a different place: what does "fixed" mean? (You'll soon see why this matters.)

It's straightforward and almost intuitive: it means being attached to something or having a constant relationship between two quantities. This idea of "fixing" one thing to another shows up in many domains, including finance.

In the world of cryptocurrencies, the most prominent examples are stablecoins. So, what exactly are they? Stablecoins are digital assets that maintain a fixed value relative to another asset, typically the U.S. dollar (USD). This relationship is known as a peg. Picture it as something (the crypto asset) glued to something else (the USD).

Moreover, stablecoins can be converted back to their linked asset at the fixed value defined by the peg, whatever that value is. Here, it's important to note that this convertibility is distinct from the peg itself. Although anything can be represented in terms of "something else," the existence of a fixed (and discernible) relationship between assets does not necessarily imply them being interchangeable. For that, you require a market.

The "stable" in stablecoins means the peg not only holds now but is expected to last into the future, making it unlikely to fail. Imagine a shelf attached to a wall: if it is mounted with weak materials or poor workmanship, under load it might fall to the floor. In other words, something can be pegged in place, but inadequate support can render it unstable and make it fail.

Does the future mean tomorrow, next week, next year, or long after we're gone? For simplicity, let's define it as far off in time. Bluntly put, if the peg breaks after we're dead, it hardly matters. What counts is that it holds while we're alive and invested in the asset.

However, stablecoins can struggle to keep the peg. Think of the strength (or perhaps even the amount) of glue securing that shelf to the wall. Pegging is essential, but it's not enough, as shown by the 2023 Silicon Valley Bank (SVB) collapse and the resulting de-peg of USD Coin (USDC) issued by Circle Ltd. This happened because Circle's reserves were partly tied to SVB, and stability returned only when the Federal Deposit Insurance Corporation (FDIC) bailed out SVB's depositors, including Circle.

Circle's USDC wobble sheds light on what being "stabilized" means. The de-peg was brief because the FDIC stepped in, much like steel cables steadying a suspension bridge against wind and weight. To be stabilized implies that something (or someone) is helping keep things steady, making them unlikely to give way or overturn.

That could happen either actively like a central bank when acting as a lender of last resort (as the steel cables of a bridge), or passively like the confidence of having a backup (or the existence of the FDIC) would do. It thus explains why the glue's strength and quantity used matters, or else a reliable process must be in place, be it to secure a shelf to the wall, peg a currency, or prevent it from fluctuating wildly.

Steel is needed in some types of buildings, and concrete for others; each provides the right mechanism to avoid collapse. Stabilization, in relation to cryptocurrencies, is the mechanism that anchors the currency's value. For traditional stablecoins, this means collateralization as the preferred system to hold the peg. In Nebula, it involves substituting the peg for low volatility. Incidentally, this achieves the function that most of the collateral used by traditional stablecoins natively perform, while forgoing any (implied or contractual) obligations typically imposed by a fixed peg system.

This leads us to ask: stabilized relative to what? The answer lies in the asset (or combination of assets) that are used as a reference point. It would typically involve stable assets themselves, like the Swiss Franc or similar alternatives, or "representative assets" identified by some chosen metric (for example, international trade). There are many possibilities.

However, additional criteria might apply, such as choosing assets that have a history of being reasonably uncorrelated with cryptocurrencies and that trade in highly liquid markets. This ensures their volatility stems mainly from fundamentals, not market sentiment (so there is no or little pass-through of any events impacting crypto markets) while liquidity helps absorb any shocks effectively, acting as a buffer in crises.

Stabilization thus depends on a mechanism, be it algorithmic, asset-backed, or hybrid, much like a suspension bridge needs steel cables and precise calculations to determine their type and placement. For Nebula, it's a hybrid: an algorithmic intervention function (embedded in a system of coupled stochastic differential equations; not detailed here) paired with a secondary instrument (a derivative product) tracking a portfolio of assets. This is why Nebula is defined as a dual-asset system.

The strength of Nebula's model ensures the intervention function works as intended, as confirmed by thorough simulations. Together with the secondary instrument, it offers the targeted stability to keep Nebula's price steady over time.

Since Nebula avoids a fixed peg, its price will vary. By how much? Plausibly by no more than the volatility of its reference assets, which will be selected by their inherent characteristics or past performance to be stable. Nebula would "inherit" their stability to a good degree.

Stability, on the other hand, doesn't exclude growth. An asset can increase in price steadily, with only minor fluctuations along the way, and Nebula is designed to allow this. How much growth? That's a policy choice: Nebula could, for instance, track the average inflation rate of developed economies (like the G7) while keeping volatility low (say, 2 to 3 percentage points around its mean).

This approach would keep Nebula's value steady in real terms, relative to that inflation measure. Why? With a traditional stablecoin like USDC, if you exchange one dollar for one USDC today and redeem it a year later, you'll get that same dollar back. But its purchasing power (in dollar terms) will likely differ from when you bought such digital scrip. Nebula can avoid that, by design.

The fixed peg also explains why stablecoins are mostly used for entering or exiting crypto, moving liquidity between blockchains, or yield farming (which indirectly locks liquidity that supports ramping and transfers across chains). The fact that roughly 90% of the stablecoin trade flows via Automatic Market Makers (AMM) and bots provides a simple confirmation of this fact.

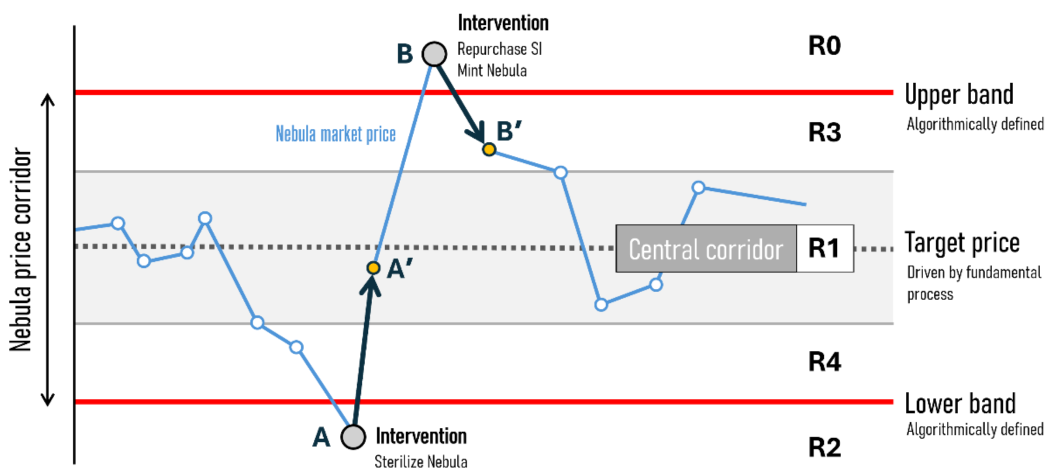
Remittances seem promising but haven't caught up due to the hassle and cost of converting to crypto and back to fiat.

Nebula, by contrast, aims to be a cryptocurrency that encourages users to stay in the ecosystem. It does so by offering stability comparable to the most trusted traditional currencies. Plus, it uses a secondary financial instrument tracking assets largely decoupled from crypto's volatility, though, in today's world and due to technology, markets are invariably connected.

This discussion feels a bit too abstract. How can stability be easily visualized?

Of course it can. Although the notion of a "price corridor" (or "target zone") is intuitive, let's try connecting all the dots in Nebula's design.

The graph in the next page illustrates the mechanism. We depict Nebula's price evolution (in blue), the upper and lower price bands (in red) defining the width of the price corridor, a central sub-corridor around Nebula's mean price (grayed area) and five "price regions" identifying different operational regimes (denoted R1 to R5).



Under normal market conditions, Nebula's price should oscillate inside the band defined by the two red lines. Note that band is not fixed, as it may slightly change (they become wider or narrower) depending on market signals processed in real time. Two sub-regimes inside the band (indicated as R3 and R4) allow the algorithm to gauge market pressure (e.g., the price "approaching" either band) triggering small corrective interventions, in the same way the thrusters of a space capsule allow it to maneuver while in orbit.

We have also drawn two "breaches" of the price band, one leading to price A (lower breach) and the other to price B (upper breach). In both instances, intervention brings Nebula's price back inside the corridor. This is depicted by the arrow from A to A (push from below) and B to B (pull from above) showing what a successful intervention looks like.

The nature of each intervention, of course, is different. While in the former case the objective is to sterilize Nebula by removing its circulation from the market, in the latter instance it's the opposite, that is, to expand Nebula's supply. Interventions, handled by Nebula's algorithm, aim to keep its price inside the corridor. Ideally, at least 50% of the time inside the gray sub-corridor marked as R1 in the graph.

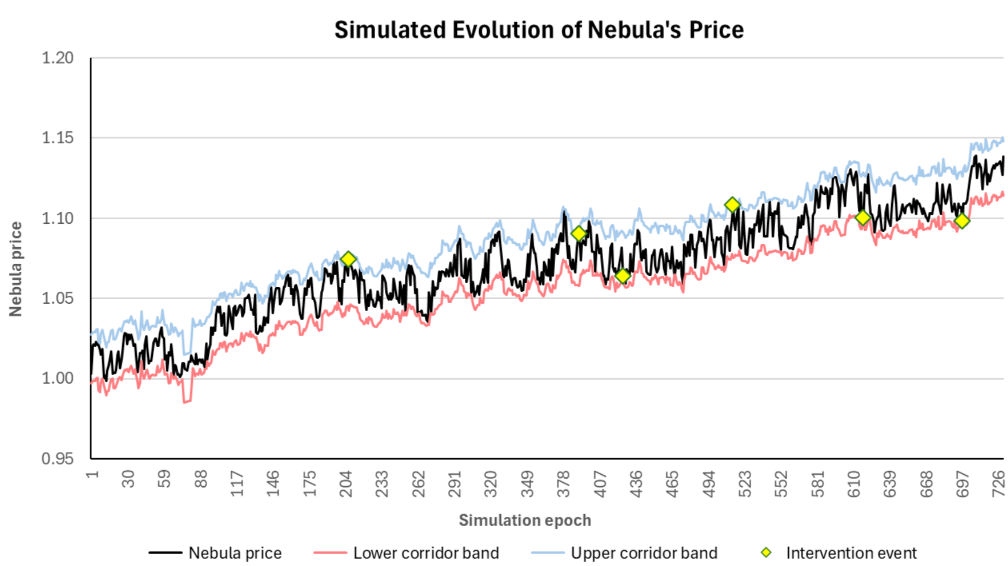
That's the theory. But how does it perform in practice? As Nebula is not yet operational, we will provide a quick overview of an example from a batch of simulations conducted during Nebula's design phase (this testing is ongoing, by the way). To keep it simple, we'll focus here on one randomly chosen example of 46,000 Monte Carlo runs of our model. These experiments have been carried out using a highly sophisticated synthetic model of financial markets.

Let's now overview some features of the simulation code used. We will do so by looking into its key classes (a "class" is computer code that bundles attributes and methods).

- `Market` class – Oversees and coordinates interactions between the various agents in the model. It determines who, when, and how orders are placed in the market, playing a critical role in price discovery by managing the continuous interaction between supply and demand.
- `Agents` class – Designed to offer market realism, by creating agents with different risk profiles, varied trading strategies, learning and adaptation mechanisms (e.g., buy/sell thresholds, decision frequency, memory length, aggression, and price sensitivity). It implements a Dynamic Agent Population (DAP) model simulating the natural evolution of markets over time. This is complemented with a rich information dissemination model (see below) where agents may or may not replicate the behavior of others.
- `OrderBook` class – It embeds a rather sophisticated order book system, incorporating realistic features such as proper order matching logic, price-time priority, use of market depth metrics, and natural price discovery process.
- `MarketInformation` class – It provides a sophisticated market information dissemination system, allowing for realistic information frictions and heterogeneous expectations, crucial for market stability and price discovery.

These and other auxiliary classes allow the algorithm to tie together and realistically simulate the core features of Nebula (fundamental process, price discovery and dynamics, secondary instrument and intervention logic) from an operational standpoint. Stress events (injected through random shocks, such as sudden and significant selling pressure) have also been modeled.

As an illustration, the graph below shows Nebula's price over 730 epochs (equivalent to two calendar years of daily data) from one randomly selected simulation out of 46,000 runs.



In this simulation, Nebula's price (the black line) gradually rose from 1.0029 to 1.1384, equivalent to an average annual increase of 6.54%.

As for the pricing metric, it doesn't matter what unit Nebula is priced in. It's a simulation, so it could just as well be USD or cowries.

The blue and red lines in the graph are the corridor's upper and lower bands (corresponding to the two red lines in the previous diagram). The band's width was set at 3.0% across simulations. Given this allowance for movement, Nebula's average daily price volatility in this case was 0.73%. For comparison, the average daily volatility of the USD against the Swiss Franc was 0.66% over the previous 12 months to March 2025, or 3.31% relative to the Euro.

The yellow diamonds denote episodes when the intervention mechanism kicked in to bring the price back inside the corridor, either from above or below. Nebula's price consistently oscillated within this tightly defined price band; a behavior replicated across all 46,000 simulations. There were no uncontained price episodes, that is, no sustained appreciations or death spirals.

Summing up

The above discussion and example clearly illustrate what stabilized implies: a digital asset that (a) is not impacted by sudden jumps (when they occur, its stabilization mechanism can manage them); (b) evolves along a tight price band (implying a low volatility); and (c) observes a smooth price appreciation, such that it keeps its purchasing power against clear substitutes, e.g., any fiat money enjoying global acceptance.

Concerning the latter, global acceptance is the result of being reliable and accessible at a low cost. The USD clearly fits this definition, leading it to become the predominant fiat instrument for international trade, but there are other examples.

Therefore, Nebula could become a viable digital alternative to such fiat currencies while removing the direct dependence on them that stablecoins (by virtue of their design) are forced to keep. It also offers the benefit of controlled appreciation without directly paying a yield to its holders (because it's market-driven, not contractually guaranteed).

Moreover, our extensive simulations suggest Nebula offers a highly reliable digital-native hedge to Bitcoin and other landmark crypto assets.

That wraps it up. I hope this guide has been helpful, and if you have questions, please feel free to reach out at nebula@forctis.io