VALUATION FRAMEWORKS

What Is Stock-to-Flow?

The scarcity model that made Bitcoin famous — how it works, the price targets that turned it into legend, why it broke, and the one thing it is still genuinely good for.

BY **ALAIN AI LAB** · RESEARCH DESK · PUBLISHED JULY 3, 2026

BITCOIN S2F	GOLD S2F	MODEL IMPLIES	ACTUAL PRICE
~122	**~62**	**$500K+**	**~$61.3K**
Post-2024 halving	The old benchmark	2024–28 cycle	~8x below model

THE BOTTOM LINE

Stock-to-flow (S2F) measures scarcity: it divides the existing supply of an asset by the amount produced each year. Bitcoin's S2F now sits near **122** — roughly twice gold's — and after the 2024 halving the famous model implied a price of **$500,000 or more**. Bitcoin instead trades near **$61,300**. That gap is the whole story. S2F is a brilliant way to *describe* Bitcoin's programmed scarcity, but a broken way to *predict* its price — because scarcity is only half of what sets value, and this model ignores the other half entirely.

01 What stock-to-flow actually is

Stock-to-flow is a scarcity ratio borrowed from commodities. It answers a simple question: **how many years of current production would it take to reproduce the entire existing supply?** The higher the number, the harder the asset is to inflate — and, the theory goes, the more it behaves like sound money.

The formula is deliberately plain. **Stock-to-flow = stock ÷ flow**, where **stock** is the total circulating supply and **flow** is the new supply created in a year. A high ratio means new production is tiny next to what already exists, so no miner, central bank, or producer can meaningfully dilute holders.

Precious metals set the benchmark. **Gold** carries an S2F of roughly **62** — there is about sixty years of mining output already above ground — which is precisely why it has served as a monetary store of value for millennia. **Silver** sits near **22**. Consumable commodities like copper or oil have very low ratios; they are produced to be used, not hoarded. Bitcoin's entire monetary claim rests on landing at the extreme scarce end of that spectrum — and then going further.

The insight that captured the market was that Bitcoin does not merely match gold's scarcity but is engineered to **exceed** it on a fixed timetable. Where gold's flow can rise if prices spike and mines reopen, Bitcoin's flow only ever falls. That one-way ratchet is what made analysts reach for a commodity framework in the first place.

02 The model that made Bitcoin famous

The metric became a phenomenon in March 2019, when a pseudonymous Dutch institutional investor known only as **PlanB** published "Modeling Bitcoin's Value with Scarcity." His move was audacious: he plotted Bitcoin's S2F ratio against its market value on a log-log chart and fit a regression through it — and the fit was astonishing, with an R^2 near **95%**. The relationship looked like a clean power law: as scarcity rose, value rose in a mathematically predictable way.

For an asset that resists every traditional valuation tool, this was intoxicating. S2F converted an abstract belief — "Bitcoin is digital gold" — into a single, falsifiable, headline-ready number. The original 2019 paper implied a market value near **$1 trillion** after the 2020 halving, or roughly **$55,000** per coin. In 2020 PlanB extended the idea into a cross-asset version (S2FX) that fit gold, silver, and Bitcoin on one line and pointed to a startling **$288,000**.

The narrative took over. A widely repeated target of **$100,000 by the end of 2021** — PlanB's later "floor model," not the original equation — became a rallying cry across crypto. S2F gave the digital-gold thesis a price tag, and a generation of investors anchored to it.

03 How halvings power the model

What makes Bitcoin uniquely suited to S2F is that its **flow is fixed by code**, not by markets. Roughly every four years — every 210,000 blocks — the reward paid to miners is cut in half. Each "halving" slashes new issuance while the stock keeps growing, so Bitcoin's S2F ratio **roughly doubles overnight**. No commodity on earth has a supply schedule this rigid or this transparent.

HALVING	BLOCK REWARD	APPROX. S2F AFTER
Nov 2012	50 → 25 BTC	~25
Jul 2016	25 → 12.5 BTC	~50
May 2020	12.5 → 6.25 BTC	~57
Apr 2024	6.25 → 3.125 BTC	~120

After the April 2024 halving, block rewards fell to **3.125 BTC** and Bitcoin's S2F climbed past **120** — overtaking gold to become, on this measure alone, the scarcest major monetary asset in the world. The next halving, expected around **2028**, will drop the reward to 1.5625 BTC and push the ratio toward **240**. For the deeper mechanics and market history of these events, see our companion report on the Bitcoin halving and why it matters.

04 Where the model broke

Then reality intervened. The S2F model implied Bitcoin should hold well above $100,000 through the 2021–2022 cycle. Instead, the price collapsed. PlanB's specific floor targets — roughly **$98,000 for November 2021** and **$135,000 for December 2021** — missed immediately; Bitcoin closed November 2021 near **$47,000** and kept falling.

By November 2022, amid the Terra, Three Arrows, and FTX failures, Bitcoin bottomed near **$15,500** — more than 80% below where the model said it should be. The divergence was not a rounding error; it was a structural failure. The 2024–2028 version of the model implies a cycle price somewhere between **$500,000 and $1**

million. Bitcoin trades near **$61,300**, roughly 50% below its own October 2025 high of about $126,000 — and some seven to eight times below what S2F predicts. A model can survive being early. It cannot survive being off by an order of magnitude in the wrong direction.

Defenders argued the model was simply "early" and that price would eventually revert to the line. But a forecast that is perpetually one cycle away from being right is indistinguishable from one that is wrong. By its own timetable, S2F has now missed across two consecutive halving cycles — long enough to conclude the miss is the rule, not the exception.

05 Why it failed: the demand blind spot

The flaw is not statistical trickery — it is economic, and it is fundamental. **S2F models only supply.** It has no variable for demand at all. But price is set by supply *and* demand together, and scarcity alone creates nothing: an asset can be perfectly scarce and still worthless if no one wants it.

The clearest proof comes from gold itself. At essentially the *same* stock-to-flow ratio, gold's market value has ranged across history from tens of billions to many trillions of dollars. Identical scarcity, wildly different value — because demand, not supply, did the real work. Bitcoin's 2022 collapse was exactly this: issuance kept falling on schedule, S2F kept rising, and yet price cratered because **demand evaporated** under monetary tightening and industry contagion. The scarcity was intact; the buyers were gone.

This is why the real drivers of Bitcoin's price increasingly sit on the demand side — global liquidity, institutional flows, and macro conditions that S2F cannot see. We explore that other half of the equation in depth in the M2–Bitcoin correlation, which tracks how the money supply, not the mining schedule, has driven recent cycles.

06 The statistical case against it

Beyond the missing demand variable, econometricians raised a deeper objection: the model may be a **spurious regression**. Both Bitcoin's price and its S2F ratio simply trend upward over time. When you regress one ever-rising series on another, you can manufacture a sky-high R^2 even when there is no true causal link — a classic statistical trap. The real driver may just be *time*: Bitcoin grew, and S2F grew alongside it, without one actually causing the other.

Three further critiques compound the problem. First, the model is **backward-looking** — fit to a handful of past cycles and prone to failing out-of-sample, exactly as it did after 2021. Second, it leads to **absurdity at the limit**: as issuance approaches zero, the S2F ratio approaches infinity, so the equation eventually implies an infinite price and a market cap larger than all the wealth on Earth. Third, under the **efficient-market** lens, Bitcoin's issuance schedule is public and known to everyone, so any reliable predictive power should already be priced in. Even Ethereum's co-founder **Vitalik Buterin** weighed in during the 2022 crash, warning that models giving "a false sense of certainty and predestination that number-will-go-up are harmful and deserve all the mockery they get." His point was not about one equation — it was about the danger of mistaking a curve for a promise.

There is also a reflexivity trap. A price target as vivid as S2F does not sit outside the market observing it; it becomes a story that shapes behavior, drawing in buyers on the way up and amplifying disappointment on the

way down. A model that helps manufacture the very euphoria it later fails to justify is not a neutral measuring stick — it is part of the cycle it claims to predict.

07 What stock-to-flow is still good for

So should you throw it out? No — you should **demote it**. Stock-to-flow fails as a price oracle but succeeds as a teaching lens. One analyst put it best: S2F is "a philosophy, not a model."

Its enduring value is that it makes Bitcoin's single most important property **visible and quantifiable**: a supply that is programmatically fixed, disinflationary, and utterly indifferent to price or politics. No central authority can print more; the schedule marches toward 21 million coins regardless of demand, greed, or fear. That is a genuinely radical monetary fact, and S2F communicates it in one number better than any paragraph can.

Use it, then, as **context rather than prophecy**. Let S2F frame *why* Bitcoin is scarce and how each halving tightens that scarcity — but never treat its price line as a destination. For the actual condition of the market, turn to demand-and-valuation tools that measure what investors are really doing, such as the MVRV ratio. The disciplined investor holds both ideas at once: deep respect for Bitcoin's scarcity, and deep skepticism toward any chart that claims to know the price in advance. Scarcity is a fact you can lean on. A forecast is only ever a guess wearing a lab coat.

THE ANALYST'S TAKEAWAY

Stock-to-flow told the truth about Bitcoin's scarcity and a lie about its price. Honor the first and ignore the second. The supply is guaranteed; the target never was. Treat scarcity as your foundation and demand as your compass — and let no model convince you the future is already written.

08 The bottom line for investors

Stock-to-flow earned its fame honestly: it gave the world a clean, memorable way to grasp why a string of code could be scarcer than gold. That contribution is real and lasting. But its rise and fall is also a lesson in humility — a reminder that markets are not machines, that a 95% fit to the past guarantees nothing about the future, and that certainty is the most expensive thing an investor can buy. Understand S2F for what it teaches about scarcity, respect what it cannot see about demand, and you will hold it exactly the way a professional does: as one useful idea among many, never as a crystal ball.

"The heart of man plans his way, but the LORD establishes his steps." — Proverbs 16:9

METHODOLOGY & SOURCES. Data verified as of July 3, 2026 against PlanB ("Modeling Bitcoin's Value with Scarcity," March 2019, and the S2FX cross-asset model, 2020), CoinDesk, Bitcoin Magazine, CoinGecko, and on-chain supply data. Key figures: gold S2F ~62, silver ~22; Bitcoin S2F ~120–122 after the April 2024 halving (block reward 3.125 BTC; circulating supply ~20.05M). The original 2019 model implied ~$55K post-2020-halving; the widely cited ~$100K (end-2021) figure was PlanB's later "floor model" target, which failed as Bitcoin closed 2021 near $47K and bottomed ~$15.5K in November 2022. S2FX implied ~$288K. The 2024–2028 model range (~$500K–$1M) contrasts with actual spot ~$61.3K. Next halving expected ~2028 (reward 1.5625 BTC, S2F ~240). PlanB remains publicly

active; no specific dated 2026 statements are attributed here. Figures are provider-dependent and approximate. This report is research and education, not investment advice.