# The Formula, Month by Month

184 Real-Time Refits of Bitcoin's Power Law, 2011 to 2026

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## Abstract

A power-law formula fitted to all of Bitcoin's history fits that history well, but the fit is made with hindsight. This paper asks what the formula looked like *at the time*. For every month-end from July 2011 to October 2026 we refit $\log_{10}(\text{price}) = a + b \cdot \log_{10}(\text{days since 3 January 2009})$ on the daily closes known at that date only, giving 184 real-time formulas, and test each one against what happened afterwards.

The findings:

1. **The exponent settled in 2016.** Monthly refits made before 2016 put the exponent anywhere from 5.50 to 12.28. Every refit since January 2016 lies between 5.56 and 5.99 (standard deviation 0.09), and every refit since January 2018 between 5.64 and 5.90. The published exponent, 5.688, sits inside both ranges.
2. **The formula's view of today stabilised with it.** Refits made at the end of 2013 and 2014 put the trend for October 2026 at 336% and 704% above the published formula. Every monthly refit since January 2017 lands between 25% below and 32% above it, and the last three year-end refits within 1.3%.
3. **A floor drawn in real time broke far more often than the published floor suggests.** A floor at 0.42× each month's own trend held afterwards in only 13% of the 118 months from January 2016 that have a year of later data. A floor at 0.30× held in 98%. The record of the 0.42× floor is partly a record of hindsight.
4. **The published formula has held in 124 of 130 months since January 2016,** by the monthly test this site now runs: three months with a single close below the floor, and three months under review after the November 2022 collapse.

The paper is a living document. Its charts and verdict record are refreshed every month from the same code.

## 1. Why refit month by month

Every chart of the power law shows one line fitted through all the data. That line is the best description of the past, but nobody could have drawn it in 2015, 2018 or 2022. Someone planning with the formula at those dates had the data up to that day and nothing more.

So the useful question is not "how well does the formula fit?" but "how much did the formula people would have used at each date differ from the one we use now, and would its floor have held?" A formula that changes a great deal as data arrives is a description of the past. One that settles, and whose real-time version kept making the right calls, starts to earn the word model.

Earlier work on this site refit the formula once a year (Reproducing the Power Law). This paper refits it every month, keeps every version, and tests each version on the data that came after it.

## 2. Data and method

**Data.** 5,950 daily closing prices in US dollars from 18 July 2010 to 31 October 2026, the same dataset that drives every calculator on btcpowerlaw.nl.

**The formula.** $\log_{10}(\text{price}) = a + b \cdot \log_{10}(t)$, with t the number of days since the genesis block on 3 January 2009. The published parameters used across the site are a = −16.493 and b = 5.688. The floor is 0.42× the trend, a statistical lower boundary used for planning, not a price prediction.

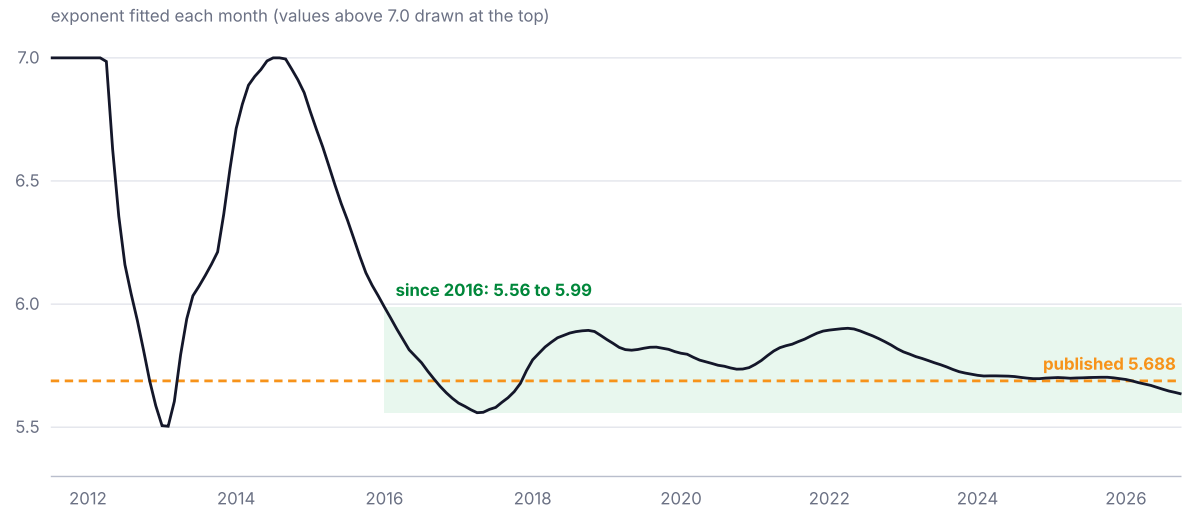
**Vintages.** At every month-end with at least 365 days of data, we fit a and b by ordinary least squares on all closes up to and including that day. The first vintage is July 2011, the last October 2026: 184 vintages. No vintage uses any later price.

**Tests.**

- *Exponent path.* How b moved from one vintage to the next.
- *View of today.* Each vintage's trend for 31 October 2026, compared with the published formula's trend for that day ($157,997).
- *Real-time floor.* For each vintage, the lowest close in all the data after it, divided by that vintage's own trend on that day. If this minimum stays at or above 0.42, a floor drawn at 0.42× that vintage's trend was never broken afterwards. We test vintages from January 2016 to October 2025, the 118 that have at least a year of later data.
- *Monthly verdict.* The test the site runs each month on the published formula (Section 3.4).

## 3. Results

### 3.1 The exponent settled in 2016



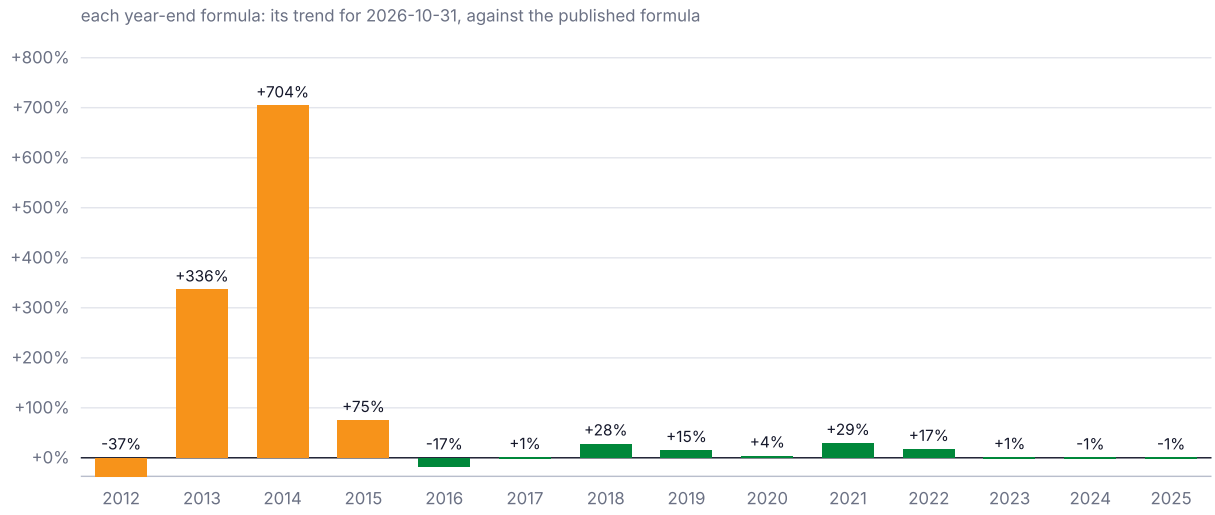

*The exponent refitted every month. Values above 7.0 are drawn at the top of the chart.*

| Vintages from | Count | Exponent range | Standard deviation |
|---|---|---|---|
| July 2011 | 184 | 5.50 to 12.28 | 0.97 |
| January 2014 | 154 | 5.56 to 7.02 | 0.36 |
| January 2016 | 130 | 5.56 to 5.99 | 0.09 |
| January 2018 | 106 | 5.64 to 5.90 | 0.07 |
| January 2022 | 58 | 5.64 to 5.90 | 0.08 |

The first five years are noise: a young asset with few data points, and two bubbles that tilt any line drawn through them. After 2016 the exponent moves inside a band about 0.4 wide and drifts with the cycle: up during bull markets, down while price sits below trend. The latest refit, October 2026, gives 5.635, at the bottom of the band, after a year in which price spent most days well below trend.

The fit improved alongside. $R^2$ at each year-end rose from 0.88 (2015) to 0.89 (2016), 0.92 (2018), 0.94 (2020), 0.95 (2022) and 0.96 (2025). These are in-sample values; Paper 12 reports the out-of-sample picture.

## 3.2 What each year's formula said about today

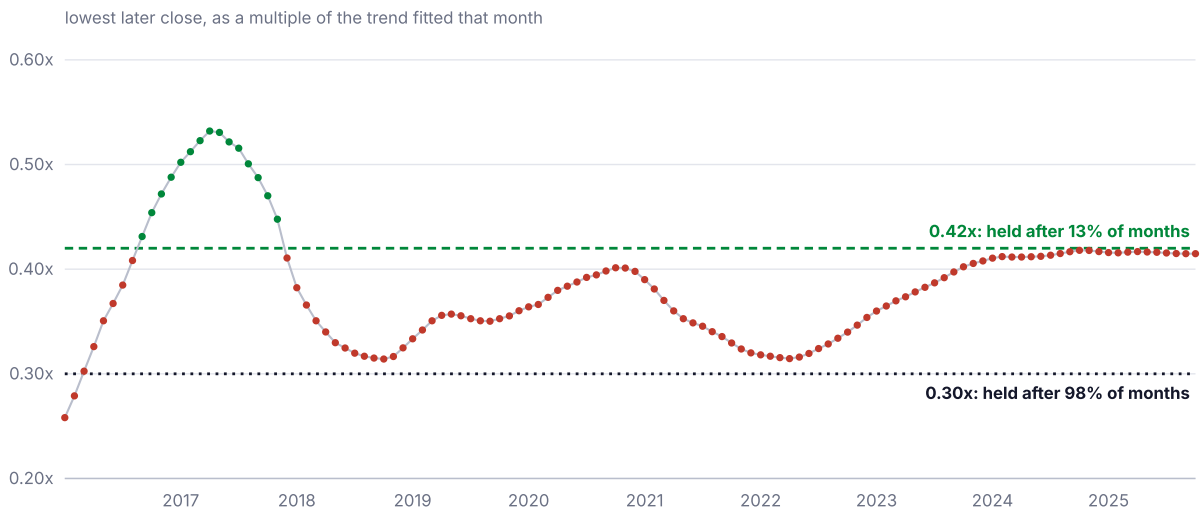



*Each year-end formula's trend for 31 October 2026, against the published formula. December 2011 (+44,648%) is left off the scale.*

| Year-end formula | Exponent | Its trend for 31 Oct 2026 | Against published |
|---|---|---|---|
| 2013 | 6.551 | $688,167 | +336% |
| 2014 | 6.859 | $1,269,896 | +704% |
| 2015 | 6.033 | $275,858 | +75% |
| 2016 | 5.618 | $131,807 | −17% |
| 2017 | 5.730 | $158,983 | +1% |
| 2018 | 5.873 | $201,515 | +28% |
| 2019 | 5.807 | $181,445 | +15% |
| 2020 | 5.742 | $164,093 | +4% |
| 2021 | 5.890 | $204,602 | +29% |
| 2022 | 5.819 | $184,784 | +17% |
| 2023 | 5.715 | $159,972 | +1% |
| 2024 | 5.699 | $156,523 | −1% |
| 2025 | 5.697 | $156,155 | −1% |

Before 2016 the formula would have misled anyone using it for a ten-year plan, by up to a factor of eight. Since January 2017, every monthly refit puts today's trend within −25% and +32% of the published formula. The misses are not random. Refits made in the year after a peak lean high (December 2018: +28%, December 2021: +29%), because the bubble still pulls the line up at the right-hand end, where it matters most for the future.

## 3.3 The real-time floor




*The lowest later close, as a multiple of the trend fitted in each month. Green: a 0.42× floor drawn that month was never broken afterwards. Red: it was.*

| Floor, as a multiple of that month’s own trend | Months from Jan 2016 where it held afterwards |
|---|---|
| 0.42× | 13% |
| 0.40× | 37% |
| 0.38× | 49% |
| 0.35× | 72% |
| 0.33× | 81% |
| 0.30× | 98% |

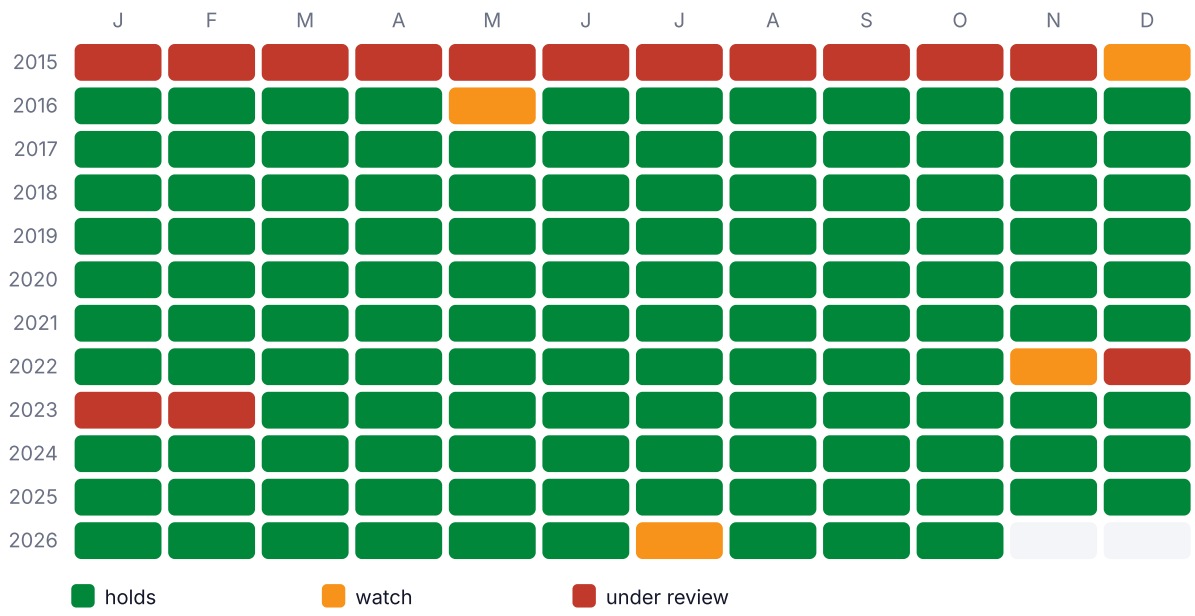
This is the uncomfortable finding. The 0.42× floor on the published formula has been broken on 78 of 4,322 daily closes since 2015, 1.8%. But the published formula is fitted with all the data, including the lows it is judged against. A planner who drew 0.42× on the formula available to them would have seen that floor broken afterwards in 103 of 118 months; it held in 15.

The reason is visible in Section 3.2. Real-time trends since 2016 have erred by up to about a third, and a floor is a fixed fraction of the trend, so it inherits the error. The worst vintage is January 2016: fitted after the 2013 and 2015 extremes, its exponent was 5.99 and its trend for today 61% above the published one, so later prices fell to 0.26× of its trend. The December 2018 and December 2021 vintages saw later lows at 0.32× to 0.33× of their own trends.

The pattern has narrowed. Vintages from June 2023 to October 2025 saw later lows between 0.38× and 0.42× of their own trends: close to the floor, but all just under it. In each case the low was the close of 1 July 2026, the one day in 2026 when price also closed below the published floor.

The practical reading: the published 0.42× floor is today’s best statistical lower boundary, and part of its clean record comes from being fitted after the fact. For planning, a stress test with a floor about 30% lower (0.30× of a real-time trend held after 98% of months) covers what a real-time user would actually have faced.

### 3.4 The monthly verdict record




*Monthly verdict on the published formula, January 2015 to October 2026.*

Since November 2026 the site checks the published formula every month and publishes the result. The check has two tests:

- **Floor:** any daily close below 0.42× the published trend during the month.
- **Refit:** a least-squares fit on all closes through month-end, compared with the published trend on that day. Since 2016 this has moved between −17% and +24% through bubbles and bear markets.

The verdict is **holds** when no close fell below the floor and the refit is within 25%; **watch** when either test fails; **under review** when the floor was broken in two of the last three months or the refit is more than 35% off.

Run back over history, the published formula holds in 124 of the 130 months from January 2016. The exceptions:

- **Watch:** May 2016, November 2022 and July 2026, each with a close below the floor.
- **Under review:** December 2022 to February 2023, after the November 2022 collapse took price below the floor in consecutive months.

2015 is under review almost throughout: price spent 66 days below the floor that year.

## 4. What this means

**The formula has become a stable object.** Ten years of monthly refits inside a narrow exponent band, and recent year-end refits within 1.3% of the published trend, are what a real regularity looks like as data accumulates, and not what a spurious fit looks like. A spurious regression’s parameters keep drifting as data is added.

**The floor is a boundary, not a promise, and its record includes hindsight.** The 0.42× floor on the published formula has held on 98.2% of days since 2015. A floor drawn in real time at the same multiple held after only 13% of months. Both numbers are true; they answer different questions. The site's framing (a statistical lower boundary for planning, not a price prediction) is the right one, and this paper is the evidence for it.

**Plan with a margin.** A plan that only survives if price never closes below 0.42× trend is a plan that relies on hindsight. A floor about 30% lower is the stress test this history supports.

**Watch the exponent.** The October 2026 refit gives 5.635, the lowest since 2017, and a trend 8.7% below the published one. That is inside the historical band and well inside the 25% watch limit, but it is the number to follow. A sustained move of the exponent out of the 5.5 to 6.0 band would be the clearest sign the formula is changing.

## 5. Limitations

- **One asset, one history.** Every test here uses the same 16 years of prices. There is no second Bitcoin to test on.
- **Method.** Ordinary least squares on daily closes is autocorrelated, so in-sample $R^2$ overstates precision; Paper 12 covers this. The published parameters come from a fit made outside this paper; our refits use plain OLS on this site's dataset, which explains part of the gap between 5.635 and 5.688.
- **Choice of model.** The power law was chosen because it fit. Refitting it monthly tests its stability, not whether another model would have done better.
- **Short look-ahead for recent vintages.** Vintages from 2024 and 2025 have one to two years of later data. Their floor record will change.

## 6. A living paper

This paper updates itself. On the first weekly data run of each month, the site reruns the two scripts behind it:

- `analysis/formula_check.py` adds the month's verdict.
- `analysis/formula_vintages.py` adds the month's refit and redraws the four charts on the paper's page.

The numbers are published at btcpowerlaw.nl/formula-check/vintages.json and /formula-check/history.json. The text of this version stays fixed; a new version follows when the findings change.

## Data and code

- Prices: `shared/datasets/btc_historical.json`, 5,950 daily closes through 31 October 2026.
- Analysis: `analysis/formula_vintages.py` (vintages, charts) and `analysis/formula_check.py` (monthly verdict), with unit tests.
- Published parameters: a = −16.493, b = 5.688, floor 0.42× trend, as used across btcpowerlaw.nl; the parameters were first published by Giovanni Santostasi at bitcoinpower.law.

*Educational research. Not financial advice. The floor is a statistical lower boundary, not a guarantee.*