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Proposal and Comment Information

Title: Regulatory Capital Rules: Regulatory Capital and Standardized Approach for Risk-weighted Assets, R-1888

Comment ID: FR-2026-0008-01-C225

Submitter Information

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Submitted Date: 06/18/2026

I appreciate the opportunity to comment on the proposed implementation of the Basel Committee's cryptoasset capital framework.

The Basel standard was intentionally designed to be conservative given limited historical data — understandable at the time of formulation. However, Bitcoin's market structure, liquidity, institutional participation, and empirical history have evolved substantially. The implementation framework should remain capable of incorporating validated risk evidence where such evidence exists.

My comment does not request modification of the Basel Committee's internationally agreed 1250% risk weight for Group 2 cryptoassets. Rather, it requests clarification regarding the treatment of empirically validated internal risk models and the supervisory pathway available to institutions seeking risk-sensitive measurement approaches.

To the extent these proposals implement or otherwise affect the treatment of cryptoasset exposures under the Basel framework, including any aspect of SCO60, the following comments are offered.

Recent research has identified a decomposition of Bitcoin price into a long-horizon structural component and a higher-frequency residual component. Under this framework, the residual component exhibits materially lower volatility than raw spot price, while remaining robust under out-of-sample and stressed-period testing. Using standard Expected Shortfall methodology, substituting the residual volatility for raw price volatility produces an Expected Shortfall estimate approximately 39% lower than the conventional single-process approach. Under an extreme stress scenario based on the FTX collapse, the model produces a stressed estimate that remains more conservative than the risk assumption embedded in Basel's unstressed standardized treatment. Full derivation, calibration, and falsification criteria are published at SSRN 6666259 - and are independently reproducible by any supervisory body.

Whether any particular model ultimately satisfies supervisory standards should remain a matter for validation, backtesting, governance review, and supervisory judgment. The relevant policy question is not whether regulators should endorse a specific model. Rather, it is whether institutions should have a clear pathway to demonstrate that a rigorously governed model delivers a defensible, testable measure of risk — rather than relying solely on a standardized assumption developed under conditions of greater uncertainty.

Accordingly, I respectfully request that the Federal Reserve consider the following clarifications:

1) Clarify the availability of Internal Models Approach (IMA) treatment for qualifying Bitcoin exposures.

The proposal should explicitly confirm that banking organizations may seek to use appropriately validated internal market-risk models for Bitcoin trading book positions where supervisory standards are satisfied. This would be consistent with the longstanding Basel principle that standardized approaches provide a conservative default, while approved internal models provide a pathway for more risk-sensitive measurement.

2) Clarify supervisory expectations for cryptoasset model approval.

Institutions considering IMA applications would benefit from greater transparency regarding validation, stress-testing, backtesting, governance, and documentation requirements applicable to cryptoasset exposures. Clear guidance would improve consistency and effectiveness.

3) Commit to periodic review of volatility assumptions and market structure developments.

Bitcoin's market structure has evolved substantially since foundational regulatory assumptions were developed. The Basel Committee announced a targeted review of its cryptoasset standard in November 2025. A formal review process would allow supervisory assessment of whether adjustments are warranted while preserving prudent oversight.

4) Reconsider exposure limits for formally governed cryptoasset exposures.

Consideration could be given to whether formally governed structures with validated risk-management frameworks warrant differentiated treatment from unmanaged spot exposures, without altering the underlying conservatism of the Basel framework.

The objective of these recommendations is not to weaken prudential standards. It is to ensure that the implementation framework remains capable of recognizing demonstrable risk characteristics where sufficient empirical evidence exists. A regulatory system that permits institutions to obtain risk-sensitive treatment through rigorous validation is consistent with the principles that have long governed market-risk supervision. Any such pathway should apply on a technology-neutral basis to cryptoasset exposures meeting equivalent governance standards — not as a Bitcoin-specific exception, but as consistent application of existing supervisory principles.

Thank you for considering these comments.

Technical Memorandum

Internal Models Approach Eligibility Assessment — Signal-Anchored Options Model (SAOM)

Submitted in support of public comment on FR-2026-0008-01

Author: Timo Koskela
Reference: SSRN 6666259, Signal-Anchored Options Model (SAOM)
Date: June 2026

Executive Summary

This memorandum is submitted in support of a request that the Federal Reserve clarify the availability of Internal Models Approach (IMA) treatment for qualifying cryptoasset exposures.

The purpose of this memorandum is not to request approval of any specific model. Rather, it demonstrates that a published Bitcoin market-risk framework exists that exhibits the characteristics ordinarily associated with supervisory review of internal market-risk models:

- Explicit calibration methodology
- Independent validation evidence
- Out-of-sample performance testing
- Stress testing
- Backtesting and robustness analysis
- Stated falsification criteria
- Full independent reproducibility

The framework is published in full and may be independently replicated by any supervisory authority.

1. Model Overview

The Signal-Anchored Options Model (SAOM) decomposes Bitcoin price into:

$$P(t) = S(t) \times \varepsilon(t)$$

where:

- $S(t)$ represents a long-horizon structural component grounded in adoption scaling, mining production economics, and realized holder cost basis
- $\varepsilon(t)$ represents the residual speculative component

Market-risk estimation is performed on the residual process rather than on raw price alone.

The model does not seek preferential regulatory treatment. It provides an empirically testable framework whose performance can be evaluated using standard supervisory tools including validation, stress testing, and backtesting.

2. Calibration Methodology

Data

- 447 weekly log-ε increments
- Full Bitcoin price history from genesis through April 2026

Estimation Method

Maximum likelihood estimation (MLE) applied to the residual Ornstein-Uhlenbeck process.

Key Calibrated Parameters

Parameter	Value	Interpretation
Residual volatility σ_ε	40.54%	Operative volatility of the speculative component
Raw price volatility σ_P	70.29%	Conventional single-process estimate
Mean reversion speed κ	0.63/yr	Rate of return toward structural level
Structural growth rate g_S	32.95%/yr	Long-horizon appreciation rate of S(t)

Conditional on the decomposition, substitution of σ_ε for σ_P follows analytically from the no-arbitrage cancellation of the structural growth term within the Black-Scholes framework.

The calibration methodology is fully disclosed in the underlying paper and can be independently reproduced.

3. Out-of-Sample Validation

A primary supervisory concern for any internal model is whether observed behavior persists beyond the calibration period.

Method

- Parameters calibrated using data available through end-2017
- Parameters then frozen — no re-estimation permitted
- Performance evaluated on held-out data: 2018–2026

Results

The residual process retained its mean-reverting characteristics throughout the out-of-sample period:

Metric	Value
Mean reversion coefficient (ϕ)	0.983
Mean reversion speed (κ)	0.91/yr
Structural parameter drift (β)	<1% from full-sample estimate

These results indicate that the model's central statistical properties remained observable on data unavailable during calibration. This addresses a key model-risk concern: whether observed relationships survive beyond the training sample.

4. Stress Testing

A second supervisory concern is model performance under extreme market conditions.

Super-FTX Stress Scenario

The model was subjected to a stress scenario based on the largest observed drawdown in Bitcoin's traded history — the FTX collapse period, November 2022 through March 2023.

Results

Scenario	ES (97.5%, 10-day)
Basel unstressed standardized (σ_P = 70.29%)	28.5%
SAOM first-order (σ_ε = 40.54%)	17.4%
SAOM under FTX stress scenario	24.9%

The stressed estimate of 24.9% remained below the risk assumption embedded in Basel's own unstressed standardized treatment of 28.5%. The framework therefore remains conservative even when subjected to the most extreme observed market conditions.

The first-order substitution alone — replacing σ_P with σ_ε — reduces the Expected Shortfall by approximately 39%.

5. Validation and Robustness Testing

Multi-Estimator Stability

The residual process was estimated across 10 alternative structural signal specifications spanning 4 functional families: simple moving averages (100W, 150W, 200W, 226W, 250W), exponential moving averages (150W, 200W, 250W), a geometric moving average, and a power-law fit.

Observed range across all estimators:

Parameter	Range
ϕ (mean reversion coefficient)	0.981 – 0.989
κ (mean reversion speed)	0.56 – 0.98/yr

Mean reversion in the residual component is confirmed universally across all tested structural signal specifications. The result is not dependent upon any single estimation technique.

Market-Based Validation

Independent validation against market-observable quantities provides external consistency checks beyond the calibration dataset:

Source	Observation
Deribit ATM implied volatility (May 2026 snapshot)	Approximately 38–42% across maturities, consistent with σ_ε = 40.54%
BVXS (Bitcoin Volatility Index, March 2023–May 2026)	Current 37.2%, compressing toward σ_ε from above over the institutional era
CME BVOL index	Consistent compression trajectory

Three independent options markets have converged toward σ_ε without coordination. This convergence provides market-based evidence that the calibrated volatility reflects genuine structural characteristics rather than a sample artefact.

6. Falsification Criteria

A critical supervisory requirement is that model failure conditions be explicitly identified.

The framework specifies documented failure modes and conditions under which the decomposition would no longer be considered valid, including:

- Sustained divergence of σ_ε from its calibrated range over a full market cycle
- Breakdown of mean-reversion in the residual process under extended out-of-sample testing
- Structural break in the power-law relationship between network adoption and price
- Failure of the log-ε increments to satisfy Ornstein-Uhlenbeck distributional assumptions

These criteria are presented in full in Section 7.5 of the published paper. The model therefore provides a clear mechanism by which future evidence may invalidate its assumptions.

7. Reproducibility and Governance

The complete model specification has been publicly disclosed.

Published materials include:

- Mathematical derivation (including the d_1 cancellation proof)
- Calibration methodology and parameter estimates
- Validation procedures and robustness exercises
- Stress-testing framework and scenario specifications
- Falsification criteria and failure-mode taxonomy

Reference:

Koskela, T. (2026). Signal-Anchored Options Model (SAOM). SSRN 6666259. Available at: https://ssrn.com/abstract=6666259

Independent replication requires no proprietary inputs. All calibration data is publicly observable.

Conclusion

The purpose of this memorandum is not to advocate any specific capital treatment.

Rather, it demonstrates that a published Bitcoin market-risk framework exists which exhibits characteristics commonly associated with Internal Models Approach review:

IMA Characteristic	SAOM Status
Explicit calibration methodology	✓ MLE on 447 weekly observations, fully disclosed
Out-of-sample validation	✓ Parameters frozen at 2017; held-out 2018–2026 confirms mean reversion
Stress testing	✓ FTX scenario; stressed ES 24.9% < Basel unstressed benchmark 28.5%
Robustness testing	✓ 10 estimators across 4 families; $\phi \in [0.981, 0.989]$
Market-based validation	✓ Three independent options markets converging toward σ_ε
Falsification criteria	✓ Explicit failure modes documented in §7.5
Independent reproducibility	✓ Full specification published; no proprietary inputs

Clarification regarding the availability of Internal Models Approach pathways for qualifying cryptoasset exposures would allow supervisors to evaluate such frameworks using established prudential standards — rather than relying exclusively on standardized assumptions developed under conditions of greater uncertainty.