# Crypto as an Asset Class

## Bitcoin, Portfolios, and the ETF Revolution

Digital Finance Course

FS 2026

# Learning Objectives

**After this lecture you can:**

- Define what makes an asset class and classify Bitcoin on four institutional criteria
- Analyse Bitcoin's risk-return profile: 10-year CAGR, annualised volatility (≈54%), Sharpe ratio (≈0.96)
- Apply mean-variance portfolio theory: correlation matrix, efficient frontier shift, optimal BTC weight (≈5%)
- Explain the 2024 ETF revolution: $164B+ AUM, correlation regime change, institutional adoption trajectory
- Apply the Cryptoeconomics Lens to evaluate Bitcoin's role in institutional portfolios

## The Central Question

Is Bitcoin digital gold, a high-beta tech stock, or an entirely new asset class?

We will answer this with data.

# What You Need to Know Before This Lecture

**Finance concepts:**

- **Asset:** anything that stores value or generates returns
- **Return:** percentage change in value over a period
- **Volatility:** standard deviation of returns (annualised)
- **Sharpe ratio:** (return − risk-free rate) / volatility
- **Diversification:** combining assets to reduce portfolio risk
- **Efficient frontier:** optimal portfolios (Markowitz 1952)

**Crypto basics:**

- **Bitcoin:** decentralised digital currency, capped at 21M BTC
- **Blockchain:** append-only distributed ledger
- **Fixed supply:** ≈19.7M BTC already mined (as of 2025)
- **Proof-of-work:** consensus mechanism securing Bitcoin
- **Market cap:** price × circulating supply
- **Halving:** block reward halved every ≈4 years

# Opening Problem: Pick a Team

## Team A: Digital Gold

Fixed supply (21M), decentralised, no issuer risk. Hedge against dollar debasement. Same scarcity logic as physical gold.

## Team B: Tech Equity

Correlated with NASDAQ. Institutional "risk-on" bet. Drops alongside equities during crises.

## Team C: New Asset Class

Neither fully applies. Needs its own analytical framework. Asymmetric growth, not inflation hedge.

*We will return to this question at Frame 18 with data.*

# What Makes an Asset Class?

**Four institutional criteria:**

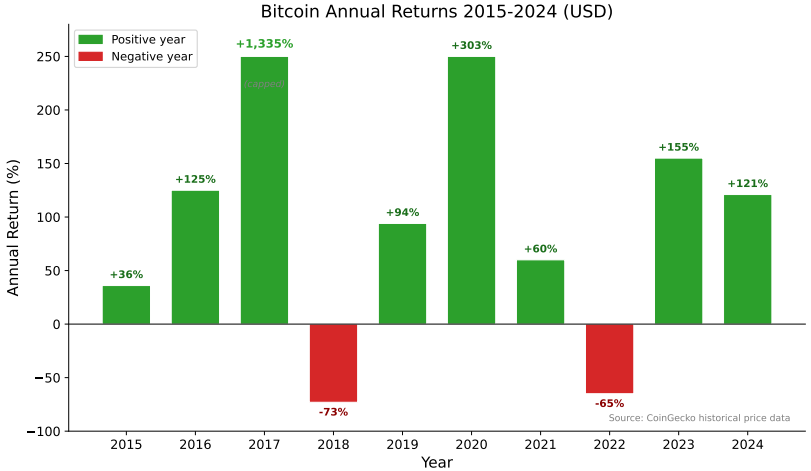
1. **Distinct risk-return profile:** cannot be replicated by blending other asset classes
2. **Low correlation:** provides genuine portfolio diversification benefit
3. **Sufficient market size:** supports institutional-scale entry and exit
4. **Legal/regulatory framework:** institutional mandates require regulated access

## Bitcoin Check (as of 2024/25)

- ✓ **Distinct:** 54% vol, 50%+ CAGR (10yr)
- ✓ **Low corr.:** bonds $-0.12$; gold 0.06
- ✓ **Size:** ≈\$1.5T cap (as of 2025); \$20–40B daily volume
- ✓ **Regulatory:** US spot ETFs Jan 2024; MiCA-compliant ETPs in EU since 2015

Gold met these criteria by 1971 (Nixon shock) but gained an ETF only in 2004. Bitcoin met them by 2021 but waited until 2024. The regulatory lag, not the asset's properties, was the bottleneck.

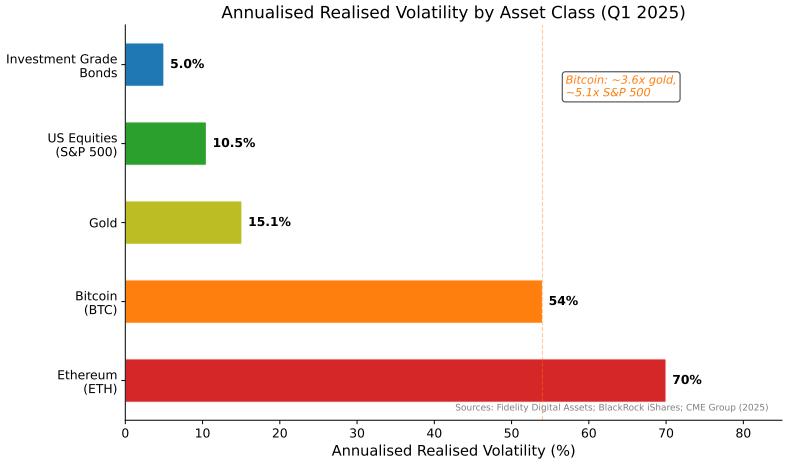
# Bitcoin Return History 2015–2024




Bitcoin annual return 2015–2024 (USD). 8 of 10 years positive; worst year (2018: −73%) followed by a three-year run totalling +1,150% (2019–2021).

Annual returns calculated Jan 1 to Dec 31. (Source: CoinGecko historical price data)

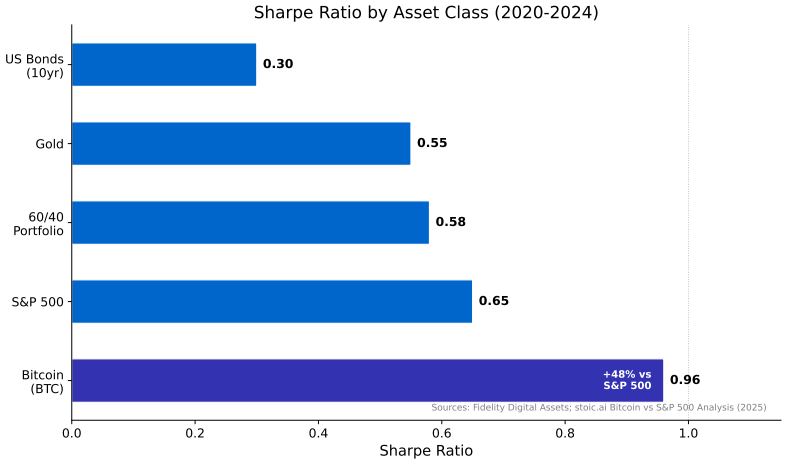
# The Volatility Premium




Annualised realised volatility by asset class (approx. Q1 2025). Bitcoin's volatility is declining over time but remains 3–5× higher than traditional assets.

Bitcoin annualised vol ≈52–54% (as of Q1 2025). (Source: Fidelity Digital Assets; BlackRock iShares Volatility Trends 2025). S&P 500: ≈10.5%, Gold: ≈15.1%. (Source: CME Group 2025)

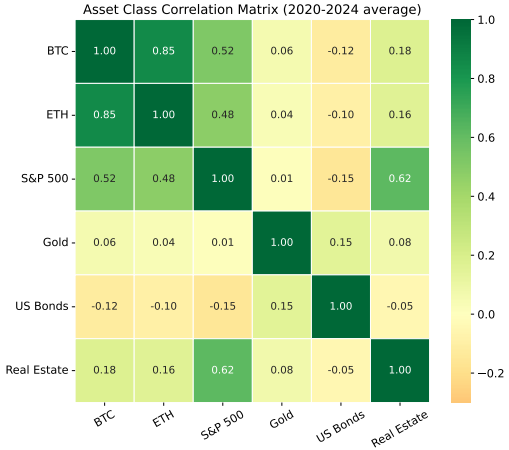
# Risk-Adjusted Returns: Sharpe Ratio 2020–2024




Sharpe ratio by asset class, 2020–2024. Bitcoin investors were more than compensated for taking on higher volatility relative to equities and gold.

Sharpe = (return − risk-free rate) / volatility. BTC ≈0.96, S&P 500 ≈0.65, Gold ≈0.55 over 2020–2024. (Source: Fidelity Digital Assets; stoic.ai Bitcoin vs S&P 500 Analysis 2025)

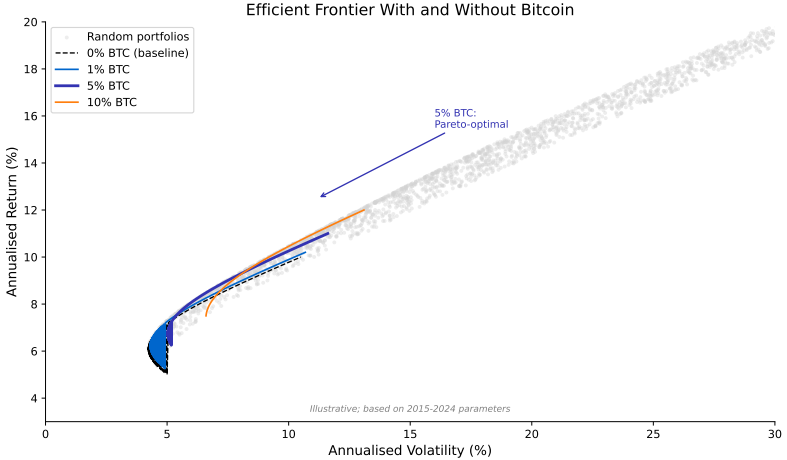
# Diversification: The Correlation Matrix




Sources: arxiv 2501.09911; Fidelity Digital Assets; stoic.ai (2025)

BTC-gold ≈6% (as of 2024), BTC-bonds ≈ −12%: genuine diversification. Correlations spike during market stress (see Frame 15). (Source: arxiv 2501.09911; Fidelity Digital Assets 2024)

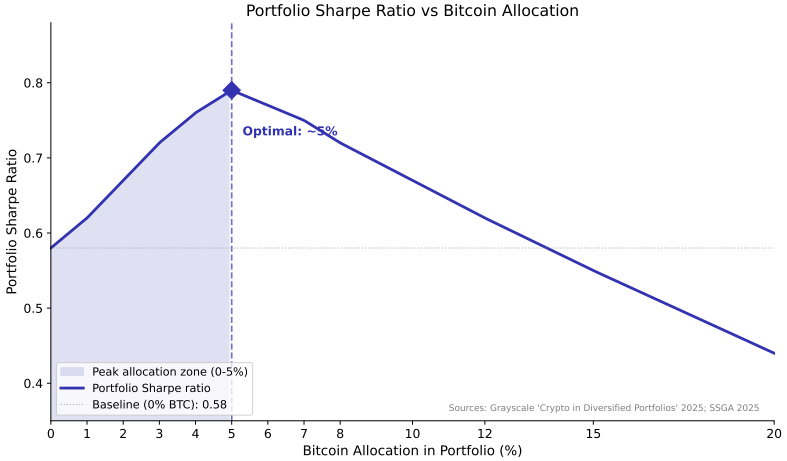
# The Efficient Frontier Shifts With Bitcoin




**Adding Bitcoin shifts the efficient frontier upward-left, improving expected return for the same risk level. The improvement is largest at 1–5% BTC allocation.**

Efficient frontier simulated using 2015–2024 annual return parameters; assumes annual rebalancing. Methodology follows Grayscale "Crypto in Diversified Portfolios" 2025; SSGA Bitcoin and Gold for Retail Portfolios, Sep 2025.

# Optimal BTC Allocation: The Sharpe Peak




Portfolio Sharpe ratio peaks at ≈5% Bitcoin allocation. Below 1%, the contribution is negligible; above 10%, volatility drag erodes risk-adjusted returns.

(Source: Grayscale "Crypto in Diversified Portfolios" 2025; State Street SPDR "Better Together: Bitcoin and Gold" Sep 2025). This is a 2015–2024 backtest; past performance does not guarantee future results.

# Why Does 5% Bitcoin Work?

**Three mechanisms:**

- **Low equity correlation** (≈0.52): enough below 1.0 to shift the efficient frontier measurably
- **Asymmetric upside:** one Bitcoin "up year" (+100%+) compensates multiple below-average equity years
- **Volatility budget:** at 5% weight, BTC's 54% vol adds only ≈2.7% to total portfolio volatility

**Portfolio metrics (2015–2024 backtest):**

| BTC | Ann. Ret. | Ann. Vol | Sharpe |
|---|---|---|---|
| 0% | 8.0% | 8.0% | 0.58 |
| 1% | 8.3% | 8.1% | 0.62 |
| 5% | 9.5% | 8.5% | **0.79** |
| 10% | 11.0% | 9.8% | 0.67 |

Illustrative backtest values; consistent with Grayscale 2025 and SSGA 2025 analysis. Past performance does not guarantee future results.

# The ETF Revolution: January 2024

**Key milestones:**

| | |
|---|---|
| **2013** | First BTC ETF application (Winklevoss) – rejected |
| **Oct 2021** | ProShares BITO (futures-based) approved |
| **Jan 2024** | SEC approves 11 US spot BTC ETFs |
| **Jan 2024** | Trading begins; $4.6B first-day volume |
| **Jul 2024** | US Ethereum spot ETFs begin trading |
| **Dec 2024** | BTC ETF AUM surpasses gold ETF AUM |

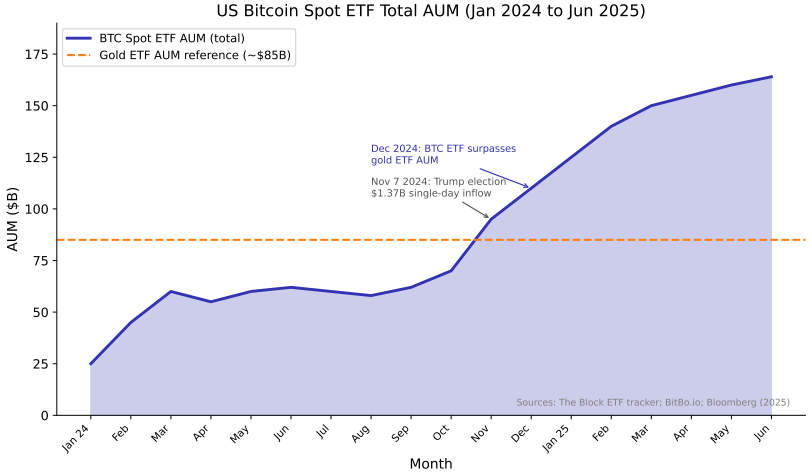
## Why 11 Years?

Three SEC preconditions:

- Surveillance-sharing: Coinbase/Nasdaq/NYSE
- Institutional custodian (Coinbase Prime)
- Evidence against large-scale manipulation

(Source: SEC Approval Order, January 10, 2024). Futures-based BITO tracked spot at ≈90% with a 5–8%/year roll cost; spot ETFs eliminate this cost entirely.

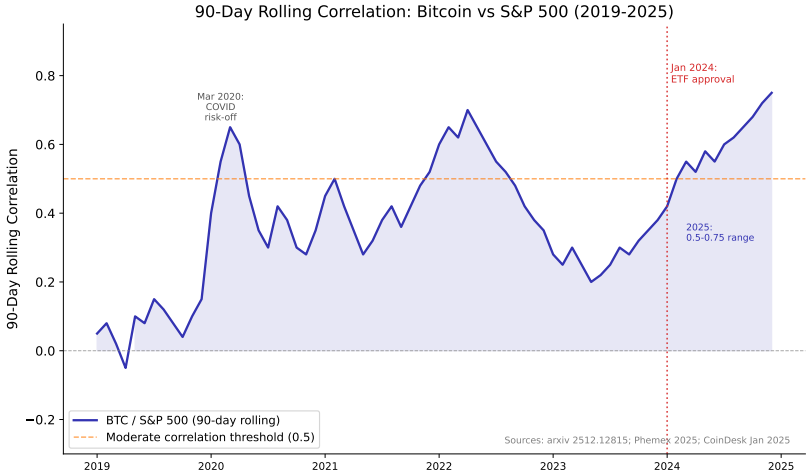
# US Spot Bitcoin ETF AUM Growth




US Bitcoin spot ETF total AUM: $0 to over $164B in 18 months – the fastest AUM ramp in ETF history. Gold ETFs (GLD+IAU combined) took 20 years to reach ≈$85B.

BlackRock IBIT: $70.6B AUM (as of Jan 2026); fastest ETF to approach $100B (435 days vs. record 2,011 for Vanguard VOO). (Source: The Block ETF tracker; BitBo.io; BlackRock Jan 2026)

# The Correlation Regime Change




90-day rolling correlation: Bitcoin vs. S&P 500 (2019–2025). ETF approval in January 2024 marks a structural break – Bitcoin is now embedded in the equity risk cycle.

(Source: arxiv 2512.12815 "Bitcoin ETF Approval and Bitcoin's Hedging Properties"; Phemex Dec 2025). Correlation rose from near-zero (2019) to 0.5–0.86 by 2025 depending on measurement window.

# The Two Faces of Higher Correlation

**Why higher correlation is beneficial:**

- Institutional capital can now flow in via ETFs: $164B in 18 months
- Price discovery improved – BTC now moves with macro data (CPI, Fed rate decisions)
- Reduced manipulation risk in a deeper, more liquid market

**Why higher correlation is problematic:**

- Diversification benefit erodes as BTC acts like a leveraged equity bet during drawdowns
- "Safe haven" narrative unsupportable with 2024/25 data
- ETF outflows during equity bear markets can amplify BTC price drops

CME Group (2025): "Bitcoin's daily standard deviation runs roughly 3–5× higher than the S&P 500, meaning BTC acts as a leveraged bet on the same risk-on/risk-off cycle." A feature for growth investors; a limitation for hedgers.

# Institutional Adoption: Survey Data and Access Ladder

**Investor survey data:**

- 60% of institutional investors hold a positive perception of digital assets
- 80%+ view digital assets as having a portfolio role (as of Q2 2025)
- 1.29 million BTC (≈$128B) held in US spot ETFs (as of August 2025)
- Ethereum spot ETF AUM: ≈$46.2B by Q4 2025

## Institutional Access Ladder

1. **CME Futures (2017):** cash-settled, no custody
2. **OTC/Prime (2018+):** Coinbase Prime, Genesis
3. **Futures ETF (2021):** BITO; ≈90% tracking
4. **Spot ETF (2024):** exact tracking; 0.15–0.25% fees
5. **Direct custody:** largest endowments and SWFs

(Source: Fidelity Digital Assets Institutional Survey Q2 2025; Coinglass ETH ETF tracker; XT Exchange 2025 Scorecard)

# Verdict: Digital Gold, Tech Stock, or New Asset Class?

| Criterion | Digital Gold? | Tech Stock? | New Asset Class? |
|---|---|---|---|
| Low equity corr. | Partial (long-run) | No (0.52 S&P) | ✓ Own regime |
| Inflation hedge | Weak in crises | No | Needs more data |
| Store of value | ✓ 10yr CAGR 50%+ | N/A | ✓ Yes |
| Safe haven 2022 | × (−65% vs −19%) | × No | × Risk-on only |
| Asymmetric upside | × Gold is capped | Partial | ✓ **Yes** |

## Verdict

Bitcoin is a **risk-on, asymmetric growth asset** with some store-of-value properties. "Digital gold" is useful narrative but fails empirically during stress. **New Asset Class best fits the data.**

2022: BTC −65%, S&P 500 −19%. This definitively broke the inflation-hedge and safe-haven narratives. (Source: CoinGecko; Bloomberg 2022)

# The Cryptoeconomics Lens

**1. Problem:** Institutional investors need digital asset exposure without self-custody risk or regulatory uncertainty.

**2. Incentives:** ETF sponsors earn 0.15–0.25% fees on $164B AUM (≈$245–410M/year). Custodians earn spread. Investors get regulated exposure.

**3. Benefits/Costs:** 1.29M BTC accessible via regulated wrappers; democratised brokerage access. Cost: Coinbase Prime holds 90%+ of US spot ETF BTC (concentration risk).

**4. Failure mode:** "Buy the rumour, sell the news": BTC fell 15% the week of ETF approval despite positive news (Jan 2024). First large-scale "news already priced in" event for crypto at institutional scale.

**5. Design choices:** Spot vs. futures ETF (futures: ≈5–8%/yr roll cost); surveillance-sharing as gatekeeping; US vs. European ETP structure.

**6. Alternatives:** Ban (China model): eliminates risk, forfeits market. Self-custody: trustless but not institutional-viable. European ETP: smaller scale.

The six Cryptoeconomics Lens questions: Problem, Incentives, Benefits/Costs, Failure Mode, Design Choices, Alternatives. Apply this framework to any crypto topic.

# Design Space: Why the ETF Wrapper Won

**Four institutional blockers solved by ETF:**

1. **Familiar wrapper:** DTCC-clearable, T+1 settlement, accessible via any brokerage account
2. **No custody risk:** CIO does not explain private key management to the board
3. **Regulatory certainty:** SEC-registered product; fund sponsor has fiduciary duty
4. **Reputation transfer:** BlackRock's $10T AUM brand confers trust to a new asset class

**Why European ETPs achieved smaller scale:**

- European institutional AUM is ≈1/10th of US
- ETPs are OTC-traded; less liquid than ETF primary/secondary market
- No BlackRock/Fidelity brand stamp on early European products
- MiCA full implementation: December 30, 2024

US Bitcoin spot ETF approval required 11 years and three structural preconditions (see Frame 13). The European ETP market operated since 2015 with a clean track record but attracted only a fraction of US AUM.

# Failure Modes

**Higher probability / lower impact:**

- **Correlation convergence** (already underway): diversification benefit erodes as BTC becomes a permanent equity-risk asset
- **ETF fee compression:** fees fell from 1.5% to 0.15–0.25%; revenue pressure on small issuers

**Lower probability / higher impact:**

- **Custodian concentration:** Coinbase Prime holds 90%+ of US spot ETF BTC – one failure event would be systemic for the entire ETF ecosystem
- **Regulatory reversal:** lower risk post-2024 but not eliminated (new SEC rulemaking possible)
- **Narrative collapse:** extended 5-year+ drawdown could permanently break the store-of-value thesis

The ETF structure adds counterparty risk that direct BTC ownership eliminates. For true store-of-value properties, self-custody remains the only trustless option – but institutional mandates prohibit it.

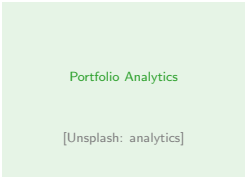
# Key Takeaways

1. Bitcoin qualifies as an asset class on all four institutional criteria: distinct risk-return, measurable diversification, \$1.5T+ market size, and regulatory framework (ETF) – but it sits closer to "high-beta equity" than "digital gold" post-2024.
2. Risk-adjusted returns (Sharpe $\approx$0.96) outperformed equities ($\approx$0.65) and gold ($\approx$0.55) over 2020–2024, driven by outsized annual returns despite high volatility ($\approx$54% annualised, declining from triple digits pre-2020).
3. The 2024 ETF revolution unlocked \$164B+ in institutional AUM in 18 months, permanently raising Bitcoin's equity correlation (0.5–0.86 on 90-day rolling basis) – a structural, not temporary, change.
4. Mean-variance analysis supports an optimal BTC allocation of $\approx$5%; the Sharpe ratio peaks there and declines above $\approx$10% due to volatility drag.

# Crypto in Context: The Institutional Shift


2024: Bitcoin enters mainstream institutional finance


Fixed supply: 21M BTC, $\approx$19.7M already mined (as of 2025)




Sharpe ratio: institutional standard for risk-adjusted return comparison

Replace tikz placeholders with CC0 photos before teaching delivery (Unsplash or Pexels).

# Quiz: Crypto as an Asset Class – Questions 1–5

**Q1.** Bitcoin annualised volatility as of Q1 2025?
A) ≈15%  B) ≈30%  **C) ≈54%**  D) ≈80%

**Q2.** Bitcoin Sharpe ratio over 2020–2024?
A) 0.30  **B) 0.96**  C) 1.45  D) 0.65

**Q3.** BTC-S&P 500 90-day correlation after Jan 2024?
A) Fell to near-zero  **B) Increased structurally**
C) Stayed at ≈0.3  D) Became negative

**Q4.** At which BTC allocation does Sharpe ratio peak?
A) 1%  B) 10%  **C) ≈5%**  D) 15%

**Q5.** When were US Bitcoin spot ETFs approved?
A) Nov 2021  B) Mar 2023  **C) Jan 2024**  D) Jul 2024

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## Answers

Q1: C  Q2: B  Q3: B  Q4: C  Q5: C

# Quiz: Crypto as an Asset Class – Questions 6–10

**Q6.** US Bitcoin spot ETF AUM by mid-2025?
A) $42B B) $85B **C) ≈$164B** D) $240B

**Q7.** Bitcoin's long-run correlation with gold?
**A) ≈6% (near-zero)** B) 35% C) 55% D) 80%

**Q8.** 5% BTC portfolio vs. 0% BTC (2015–2024 backtest)?
**A) Higher return, modest vol increase, higher Sharpe**
B) Lower return, lower vol C) Same return, higher vol

**Q9.** What risk does the ETF structure ADD vs. direct BTC?
A) Blockchain network risk
**B) Custodian concentration (Coinbase ≈90%)**
C) Fixed-supply inflation risk

**Q10.** The 2022 data (BTC −65%, S&P −19%) shows: A) Confirms safe-haven status
**B) Rejects it: BTC is risk-on, not a safe haven**
C) Inconclusive

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## Answers

Q6: C Q7: A Q8: A Q9: B Q10: B