Crypto Carry and Term-Structure Arbitrage

Introduction

Crypto derivatives markets have consistently exhibited a persistent and economically significant feature: structurally elevated carry.

Unlike traditional asset classes, crypto assets:

- have no intrinsic yield,
- face limited natural shorting pressure,
- exhibit a strong retail long bias, and
- support widespread leverage through perpetual swaps, futures, and options.

These structural characteristics result in chronically rich futures pricing. Contracts frequently trade at meaningful premia to spot, creating positive carry for strategies that are long spot (or ETFs) and short futures.

While the traditional spot–futures basis trade has been widely recognized and profitable, a more consistent opportunity emerged within the **futures term structure itself**. The price relationships between adjacent futures contracts repeatedly deviated from simple time-value logic.

Over a fifteen-month period during 2024–2025, I deployed approximately $500,000 of personal capital to trade crypto carry strategies. The approach evolved from a classic basis trade into a systematic calendar-spread arbitrage strategy across BTC and ETH futures, focused on a recurring distortion between **28-day and 35-day maturity gaps**.

Performance improved materially as the strategy evolved:

Period	CAGR	Sharpe	t-stat	Max Drawdown
Full 15 months	8%	1.4	1.6	–6.5%
Last 6 months	18%	4.0	2.8	–0.7%

This paper describes:

- The structural drivers of crypto carry
- The traditional basis trade
- Behavior of the futures term structure
- The 28/35-day calendar spread strategy

Structural Drivers of Crypto Carry

Several features of the crypto ecosystem contribute to persistent futures richness.

Market Structure

Crypto assets generate no natural yield and incur no storage costs. Demand is driven primarily by speculative positioning rather than hedging or financing needs.

Key characteristics include:

- Strong retail long bias
- Widespread use of leverage
- Limited institutional arbitrage capital relative to traditional markets
- Significant activity in perpetual swaps and short-dated futures

Institutional Flow Effects

The presence of the **BITO ETF** further reinforces front-end futures demand. Because the fund maintains exposure through CME Bitcoin futures, it must continually roll long positions forward. Market participants anticipate this activity, contributing to elevated pricing in longer-dated contracts and increasing roll costs.

Resulting Market Behavior

These structural forces produce:

- Persistent contango
- Elevated implied funding and carry
- A steep short-end term structure
- Frequent relative mispricings across maturities

In effect, crypto futures behave like a commodity market with chronic long demand and constrained arbitrage capacity.

Traditional Spot–Futures Basis Trade

The classic implementation involves:

- Long spot exposure (or crypto ETF)
- Short futures
- Holding until convergence at expiry

Alternatively, the position can be maintained by rolling futures forward.

Economics

Returns are driven by:

- Capturing the futures premium (basis)
- Realizing convergence to spot at expiry

Annualized implied yields frequently exceeded 8% during the period.

Risks

- Margin asymmetry between instruments
- Liquidity shocks during stress events
- ETF tracking error (when applicable)
- Expiry-related volatility

While effective, this strategy is increasingly crowded and operationally complex.

Calendar Spread Arbitrage

The strategy ultimately focused on relative value **within the futures curve**.

Term Structure Mechanics

Monthly crypto futures expire on the last Friday of each month. The number of days between successive expiries alternates between:

- 28 days (four weeks)
- 35 days (five weeks)

The price difference between adjacent contracts represents the market's implied "interest" over that period.

A five-week interval should therefore command approximately **25% more carry** than a four-week interval.

However, the market frequently priced both intervals at similar absolute levels.

Observed Mispricing

A recurring pattern was observed in both BTC and ETH:

- 28-day spread overpriced
- 35-day spread underpriced
- Or both spreads trading at the same dollar value

Example:

- 28-day spread = $500

- 35-day spread = $500

This implies materially different annualized rates despite identical pricing, representing a clear violation of time-value consistency.

These distortions appeared regularly and persisted long enough to trade systematically.

Trade Construction

Position Structure

When spreads were compressed or equal:

- **Buy the 35-day calendar spread**
- **Sell the 28-day calendar spread**

Position sizing:

- Long 4 × 35-day spreads
- Short 5 × 28-day spreads

The ratio reflects the time relationship:
35 / 28 ≈ 1.25

This structure balances:

- Time exposure
- Carry sensitivity
- Delta drift

The resulting position isolates **term-structure relative value** with minimal directional exposure.

Entry and Exit

Entry Signals

- Relative deviation from the 35/28 time-value ratio
- Equal absolute spread pricing
- 2–3 standard deviation relative dislocation
- Implied carry divergence relative to short-term interest rates

Exit Conditions

- Reversion to theoretical ratio band
- Convergence of implied carry

- Time decay realization
- Pre-expiry roll when necessary

Typical holding periods ranged from several days to three weeks.

Risk Profile

Limited Exposure To

- BTC or ETH directional moves
- Spot volatility

Primary Risk Factors

- Changes in the overall term-structure regime
- Liquidity gaps during stress
- Expiry-related distortions
- Execution slippage

Spread volatility was materially lower than outright futures, resulting in smoother P&L behavior.

Execution and Infrastructure

Operational advantages included:

- Futures-only implementation (no borrow required)
- Low transaction costs
- Tight bid–ask spreads
- Efficient margin usage
- Straightforward scalability

The research and monitoring framework used Python for:

- Market data ingestion
- Spread and implied carry calculation
- Signal generation
- Execution monitoring

Trades were executed manually or semi-automatically.

Risk Controls

- Diversification across BTC and ETH
- Avoidance of expiry-week liquidity conditions

Performance Characteristics

Observed strategy behavior:

- High frequency of small, repeatable gains
- Low correlation to underlying crypto price movements
- Capital efficiency due to spread margining
- Limited large loss events

Performance improved as the strategy focused more narrowly on the structural 28/35-day distortion.

Why the Opportunity Existed

Several factors contributed to persistent inefficiency:

- Retail participation focused on directional exposure and perpetual swaps
- Limited participation by dedicated calendar or relative-value traders
- Adjacent maturities should be mechanically linked but were priced independently
- Term-structure relationships were often managed heuristically rather than quantitatively

In summary:
Retail leverage demand + limited arbitrage capital + simple but overlooked time-value relationships = persistent carry inefficiency

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Risks and Limitations

- Regime shift to backwardation
- Liquidity stress or exchange outages
- Expiry-related volatility
- Funding and roll costs
- Capacity constraints at larger scale

The opportunity is structural but may vary with market conditions.

Lessons Learned

- Term-structure relative value offers cleaner risk than spot basis trades

- Small maturity differences can generate large annualized carry discrepancies
- Ratio relationships are more informative than absolute spread levels
- Crypto derivatives remain less efficient than traditional futures markets
- Relative value strategies provide a more stable risk profile than directional trading