

Pairs Regime Trading

A Market-Neutral Strategy Using 32-State Divergence Signals

Strategy Brief | January 2026

Executive Summary

Pairs regime trading is a market-neutral strategy that profits from the relative performance of two assets, regardless of overall market direction. By using the same 32-state classification system that powers our directional strategy, we identify when one asset is oversold (STRONG_BUY) while another is extended (STRONG_SELL), then bet on convergence.

Key Results: +46% annual return, 1.21 Sharpe, profitable in both bull AND bear markets, with near-zero correlation to the crypto market (-0.06).

1. What Is Pairs Trading?

Pairs trading is a strategy that simultaneously buys one asset and sells another, profiting from the change in their relative prices rather than their absolute direction. It is one of the oldest quantitative strategies, pioneered by Morgan Stanley in the 1980s.

The Core Concept

Traditional investing requires predicting market direction — will prices go up or down? This is extremely difficult. Pairs trading sidesteps this problem entirely by asking a different question: **Which asset will outperform the other?**

Approach	Question Asked	Requires
Long Only	"Will this asset rise?"	Direction prediction
Short Only	"Will this asset fall?"	Direction prediction
Pairs Trading	"Will A outperform B?"	Relative prediction only

How It Works: A Simple Example

Suppose ETH appears oversold and ZEC appears extended. We execute a pairs trade:

- **LONG \$10,000 of ETH** — Buy it, own it, profit if it rises
- **SHORT \$10,000 of ZEC** — Borrow it, sell it, profit if it falls

Scenario	ETH (Long)	ZEC (Short)	Net Result
Bull Market: Both rise	+15%	-10% (loss)	+5% profit
Bear Market: Both fall	-10%	+15% (gain)	+5% profit
Convergence (Ideal)	+8%	+5% (gain)	+13% profit

The key insight: **We profit whenever the long leg outperforms the short leg**, regardless of whether the overall market rises or falls. This is the essence of market neutrality.

2. The 32-State Signal System

Our pairs trading strategy leverages the same 32-state classification system used for directional trading. This system classifies each asset into one of 32 market states based on price position relative to moving averages and the alignment of those averages.

State Classification

Each asset is classified by combining two components:

Component	States	What It Measures
Price Position	8 states	Price vs MA on 3 timeframes (24h, 72h, 168h)
MA Alignment	4 states	Short-term MA vs longer MAs (momentum)
Combined	32 states	$8 \times 4 = 32$ unique market conditions

Simplified States for Pairs Trading

For pairs trading, we simplify the 32 states into four categories based on the historical hit rate (probability of positive next-day return) for each state:

State	Hit Rate	Interpretation	Pairs Role
STRONG_BUY	$\geq 55\%$	Oversold, bounce likely	LONG leg
BUY	$\geq 50\%$	Mildly bullish	Neutral
SELL	$\geq 45\%$	Mildly bearish	Neutral
STRONG_SELL	$< 45\%$	Extended, pullback likely	SHORT leg

Trade Logic

A pairs trade is triggered when we detect **state divergence** — one asset in STRONG_BUY while another is in STRONG_SELL. This divergence suggests the oversold asset will outperform the extended asset as both revert toward their means.

Entry Rule: When Asset A = STRONG_BUY and Asset B = STRONG_SELL
→ LONG Asset A / SHORT Asset B

Exit Rule: When states converge OR maximum 10-day holding period reached

3. Backtest Results

We backtested the pairs regime trading strategy across six cryptocurrency pairs (XLM, ZEC, ETC, ETH, XMR, ADA) from 2018 to 2025. The backtest uses expanding-window hit rates to prevent look-ahead bias, ensuring realistic, achievable results.

Overall Performance

Metric	Value	Assessment
Total Return	+1,323%	Strong absolute performance
Annual Return	+46.2%	Consistent yearly gains
Sharpe Ratio	1.21	Good risk-adjusted return
Maximum Drawdown	-58.3%	Needs risk management
Win Rate	50.1%	Edge from asymmetric payoffs
Convergence Rate	97%	Mean reversion validated

The Source of Edge

With only a 50% win rate, where does the profit come from? The answer lies in **asymmetric payoffs**: winners are larger than losers.

Metric	Value
Average Winner	+4.94%
Average Loser	-3.74%
Profit Factor	1.32

The 32-state system identifies genuine mispricings. When we go long an oversold asset (STRONG_BUY) and short an extended asset (STRONG_SELL), the long leg outperforms by more in winning trades than it underperforms in losing trades.

4. Market Neutrality: Performance by Regime

The critical test of a market-neutral strategy is whether it makes money in both rising and falling markets. Our results confirm genuine market neutrality.

Performance by Market Period

Period	Market (ETH)	Strategy	Result
2018 Bear	-83%	+21.4%	✓ Profitable
2019 Recovery	-8%	-6.9%	~ Flat
2020 COVID + Recovery	+466%	+60.1%	✓ Profitable
2021 Bull Run	+403%	-9.7%	✗ Missed upside
2022 Bear	-68%	+3.8%	✓ Profitable
2023 Recovery	+90%	+20.5%	✓ Profitable
2024 Bull	+42%	+108.6%	✓ Outperformed

Summary by Regime Type

Regime Type	Avg Market Return	Avg Strategy Return	Trades
BULL Markets	+131.7%	+28.1%	1,354
BEAR Markets	-75.5%	+12.6%	455
MIXED Markets	+465.8%	+60.1%	273

Correlation Analysis

Metric	Value	Interpretation
Correlation with Market	-0.062	Essentially zero — market neutral
Beta	-0.030	No sensitivity to market moves
Return on UP Days	+0.069%	Positive in rising markets

Return on DOWN Days	+0.166%	More positive in falling markets
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Key Finding: The strategy returns MORE on down days (+0.166%) than up days (+0.069%). This is the hallmark of a true hedge — it provides protection precisely when you need it most.

5. Implementation Requirements

Exchange Requirements

Pairs trading requires the ability to both buy (long) and sell borrowed assets (short). This has specific exchange requirements:

- **Margin Account:** Required for short selling
- **Short Availability:** Exchange must allow shorting these assets
- **Borrow Rates:** Cost of borrowing assets for shorting
- **Margin Requirements:** Capital held as collateral

Kraken Considerations

On Kraken, margin trading and short selling are available for major pairs. Key considerations:

- Margin trading available for ETH, XMR, and other major assets
- Leverage up to 5x available (we use much less)
- Funding costs apply to borrowed positions
- Some smaller altcoins may have limited short availability

Alternative: Perpetual Futures

An alternative to spot short selling is using perpetual futures contracts. These allow synthetic short exposure without borrowing the underlying asset. Benefits include deeper liquidity and no borrow fees, though funding rates apply.

6. Risk Management Considerations

The backtest shows a -58% maximum drawdown, which is survivable but painful. Several risk management enhancements should be considered for live trading:

Sources of Risk

Risk	Description	Mitigation
Imperfect Hedge	Correlations are 0.5-0.7, not 1.0	Position limits per pair
Correlation Breakdown	In panic, spreads can widen	Spread stop-loss
Multiple Positions	All spreads widen together	Cap concurrent trades
Liquidity	Slippage on entry/exit	Smaller position sizes

Recommended Enhancements

- **Position Size Reduction:** Use 5% per leg instead of 10%
- **Concurrent Trade Limit:** Maximum 3-5 open spread trades
- **Pair Selection:** Focus on highest-correlation pairs (ETC-ETH, ETH-ADA)
- **Spread Stop-Loss:** Exit if spread widens by more than 10%
- **Tighter Entry:** Only trade STRONG_BUY vs STRONG_SELL (not moderate divergence)

7. Integration with Directional Strategy

The pairs trading strategy and the directional 32-state strategy use the same signal system but monetize it differently. Together, they can provide enhanced risk-adjusted returns.

Complementary Return Drivers

Aspect	Directional Strategy	Pairs Strategy
Alpha Source	When to be in market	Spread convergence
Market Exposure	Long ($\beta > 0$)	Neutral ($\beta \approx 0$)
Best Environment	Bull markets	Any market
Annual Return	+66%	+46%
Sharpe Ratio	1.99	1.21
Max Drawdown	-19%	-58%

Allocation Approaches

Option 1: Fixed Allocation

Allocate 70% to directional strategy, 30% to pairs. Simple and always-on.

Option 2: Regime-Based Allocation

Use the 32-state signals to determine regime, then shift allocation accordingly:

Regime	Directional	Pairs	Rationale
Bull (most assets INVEST)	80%	20%	Ride the bull market
Bear (most assets AVOID)	30%	70%	Pairs generates returns
Mixed/Transition	50%	50%	Balanced exposure

Key Benefit: When directional strategy reduces exposure (AVOID states), capital can be deployed to pairs trading instead of sitting in cash. This converts "cash drag" into alpha generation.

8. Recommended Next Steps

Immediate Actions

1. Verify Short-Selling Capability

Confirm that Kraken (or alternative exchange) supports margin trading and short selling for the target pairs: XLM, ZEC, ETC, ETH, XMR, ADA. Document borrow rates and margin requirements.

2. Refine Risk Parameters

The -58% drawdown is too high for comfortable live trading. Test reduced position sizes (5% per leg), concurrent trade limits (max 3), and spread stop-losses (10% max spread widening) to target drawdown under 30%.

3. Pair Selection Analysis

Not all pairs perform equally. Focus on pairs with highest correlation and best historical spread returns. Top candidates: ZEC-ADA (+4.12% avg return), ZEC-ETH (+2.83%), XMR-ADA (+2.47%).

Development Priorities

4. Combined Backtest

Build an integrated backtest running both directional and pairs strategies simultaneously, with regime-based allocation. Measure combined Sharpe ratio, drawdown, and correlation between strategies.

5. Execution Infrastructure

Pairs trading requires simultaneous execution of two legs. Build execution logic that: places both orders atomically, handles partial fills gracefully, and monitors spread exposure in real-time.

6. Paper Trading Phase

Before live capital deployment, run the pairs strategy in paper trading mode for 2-3 months. Validate signal generation, execution timing, and P&L; tracking against backtest expectations.

Conclusion

Pairs regime trading offers a genuinely market-neutral return stream that complements the directional 32-state strategy. With +46% annual returns, 1.21 Sharpe, and demonstrated profitability in both bull and bear markets, this strategy warrants further development.

The immediate priority is validating execution feasibility on Kraken and refining risk parameters to reduce maximum drawdown. Once operational, pairs trading can convert "cash drag" periods into active alpha generation.