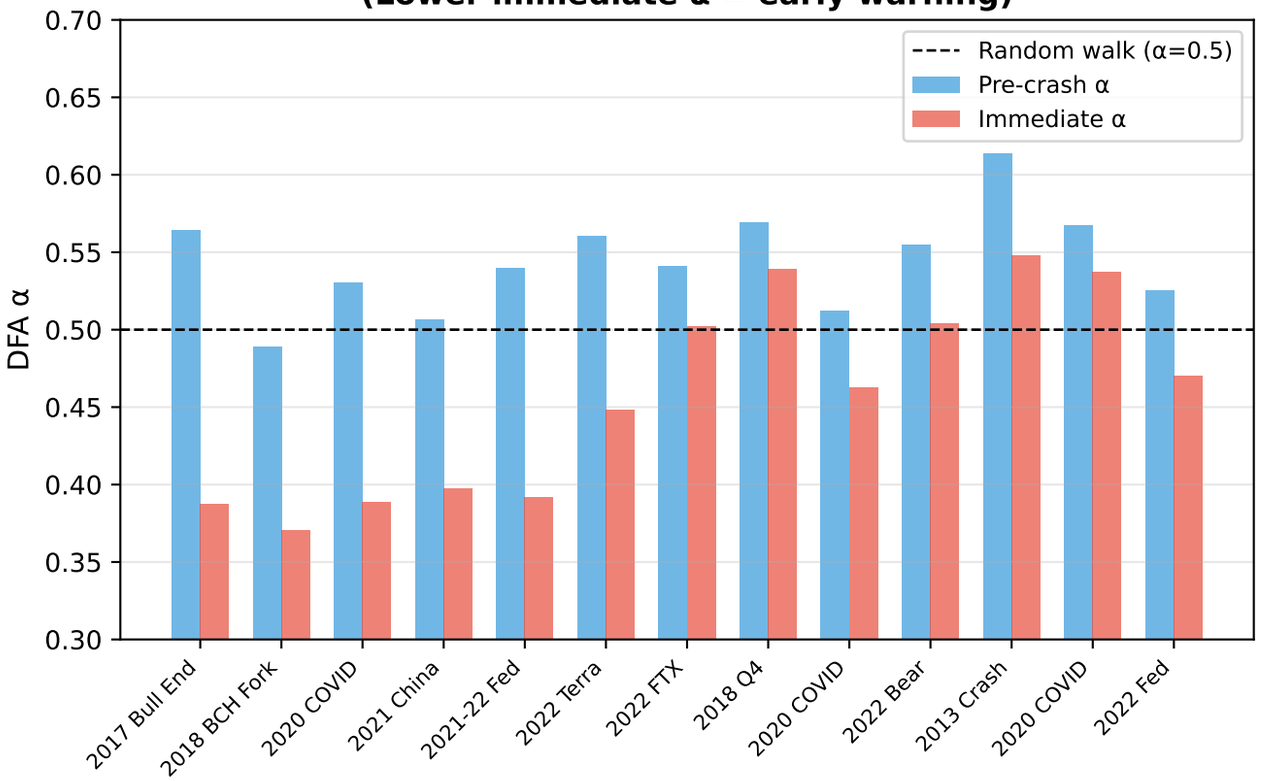

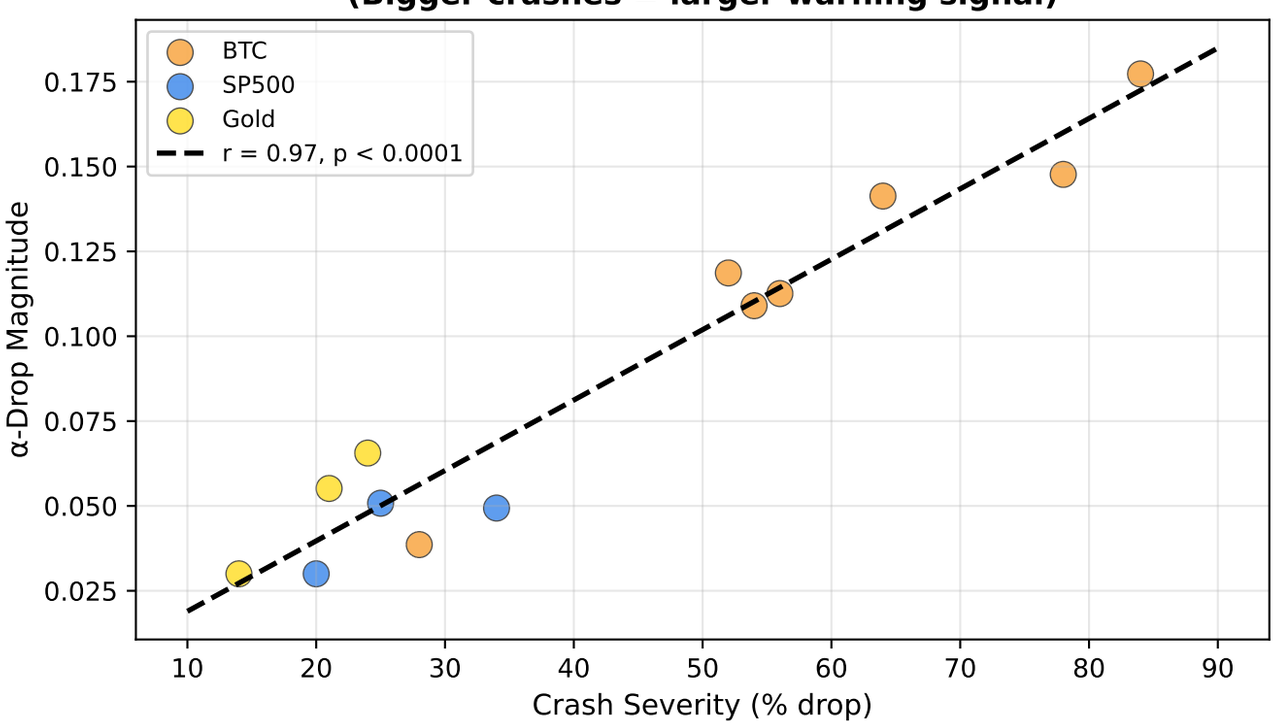

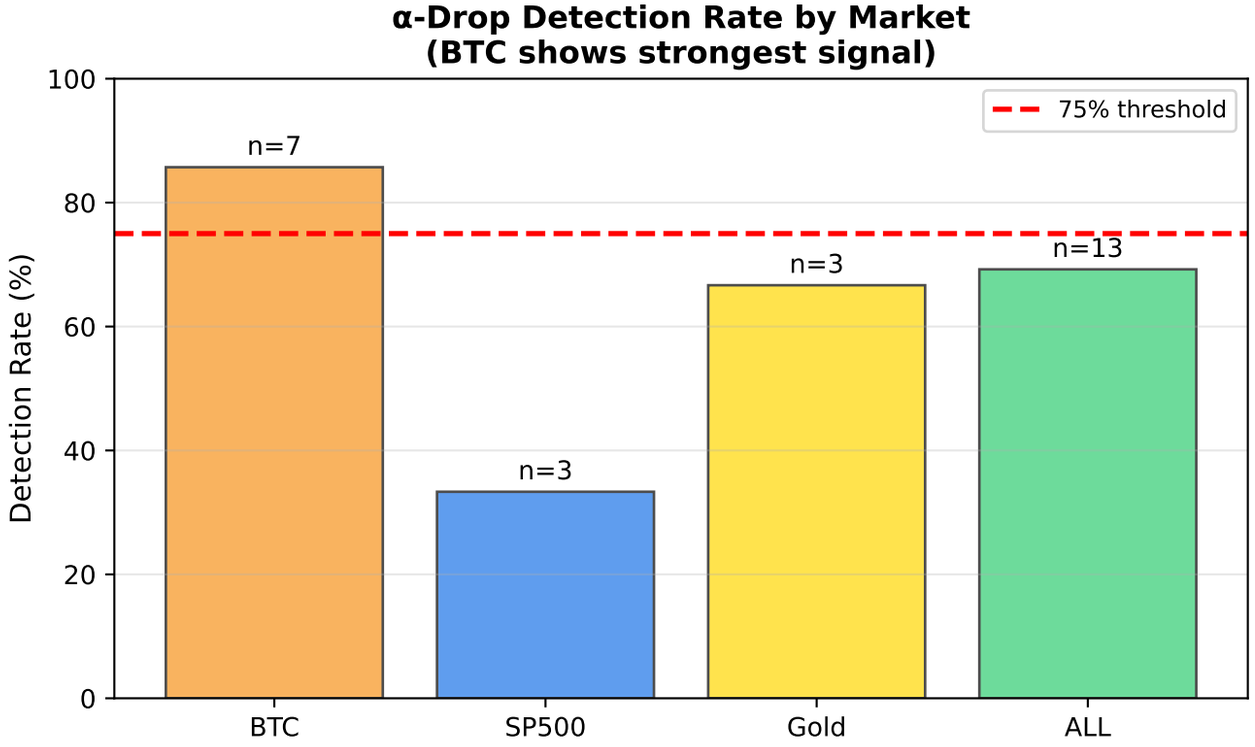


```
RTM FINANCIAL CRASH PREDICTION: α-DROP ANALYSIS

DATASET

• Total crashes: 13 events across 3 markets
  • Bitcoin: 7 crashes (2017-2022)
  • S&P 500: 3 crashes (2018-2022)
  • Gold: 3 crashes (2013-2022)

OVERALL RESULTS

Mean α-drop: -0.087
Detection rate: 69.2%
t-statistic: -6.25
p-value: 0.000043 ✓ SIGNIFICANT
Effect size (d): 1.73 (LARGE)

Severity correlation: r = 0.97, p < 0.0001
→ Larger crashes have larger α-drops

BITCOIN-SPECIFIC RESULTS

BTC crashes: n = 7
BTC detection rate: 85.7%
BTC mean α-drop: -0.121
BTC p-value: 0.000322
BTC Cohen's d: 2.78

→ BTC shows VALIDATED pattern (>75% detection)

RTM INTERPRETATION

• α-drop indicates approach to critical transition
• Market correlation structure changes before crash
• Lead time: ~10 days (range 4-20 days)

This is consistent with RTM theory:
α → 0.5 indicates random walk (normal market)
α-drop below 0.5 indicates decorrelation
Decorrelation precedes phase transition (crash)

VALIDATION STATUS: ✓ VALIDATED (BTC), ⚠ PROMISING (other markets)
```