Crypto Crash and Financial Stability

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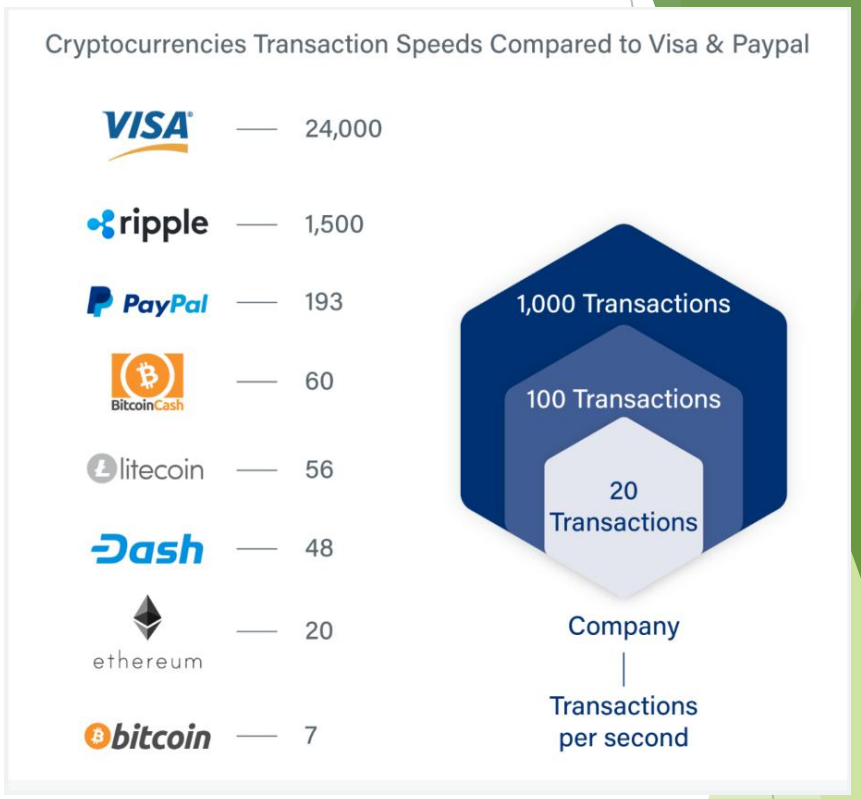
When AI, Finance, and Art meet

Financial Stability: Bubbles and Crashes in Cryptocurrency Market

- Bubbles and crashes are hallmarks of cryptocurrencies, creating concerns of **financial stability**. E.g., the 80% crash of Bitcoin in the 2018 “Great Crypto Crash”.
- Our Research: Can crypto crashes be **predicted** and thus **hedged**?
  - We mainly focus on cross-sectional crashes but will also have implications on time series via hedging.

Our Intuitions 1: Capital is Slow-moving or Inelastic for Cryptocurrencies

Trilemma on Scalability, decentralization, and security



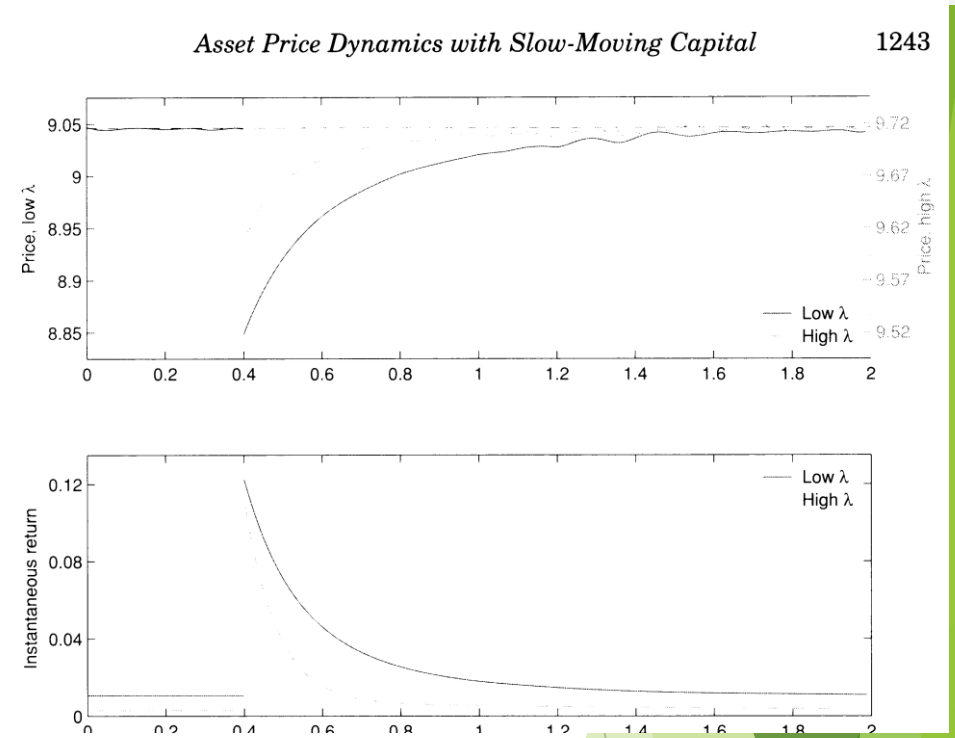
From "*A Deep Dive Into Blockchain Scalability*"

- Blockchain scalability and slow-moving capital:
  - The fundamental property of blockchain limits the speed and scale at which capital can flow.
    ➔ slow-moving and inelastic capital

Our Intuitions 2: Capital Inelasticity May Contribute to Crashes

- Why does Inelastic capital create crashes

  - Inelastic capital (Duffie 2010) ➔
  - Large price jumps followed by reversal ➔
  - Investor withdraw capital (due to inconvenient) when capital inelasticity is high ➔
  - **Inelastic crashes** arise as a result



- How to hedge: applying inelasticity to momentum
  - Inelastic capital contradicts momentum winners ➔ Buy **Elastic Winners**.
  - Inelastic capital exacerbate momentum losers ➔ Sell **Inelastic Losers**.

How to Measure Capital Inelasticity

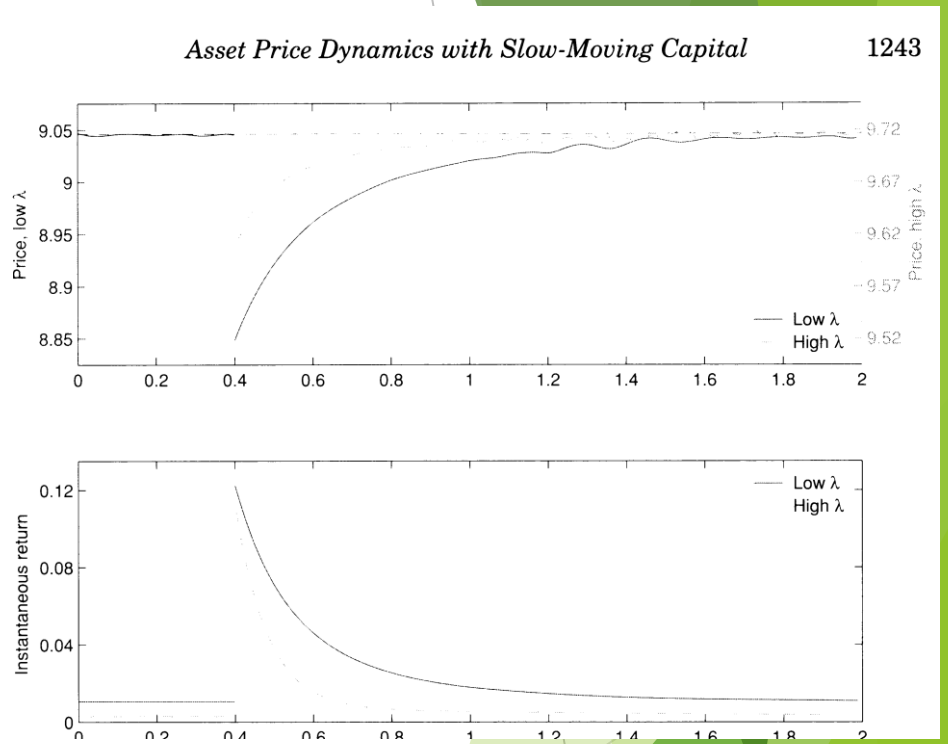
- Inelasticity Rank = Large Price Movements in Opposite Directions

  - MaxRunnup and MaxDrawdown:

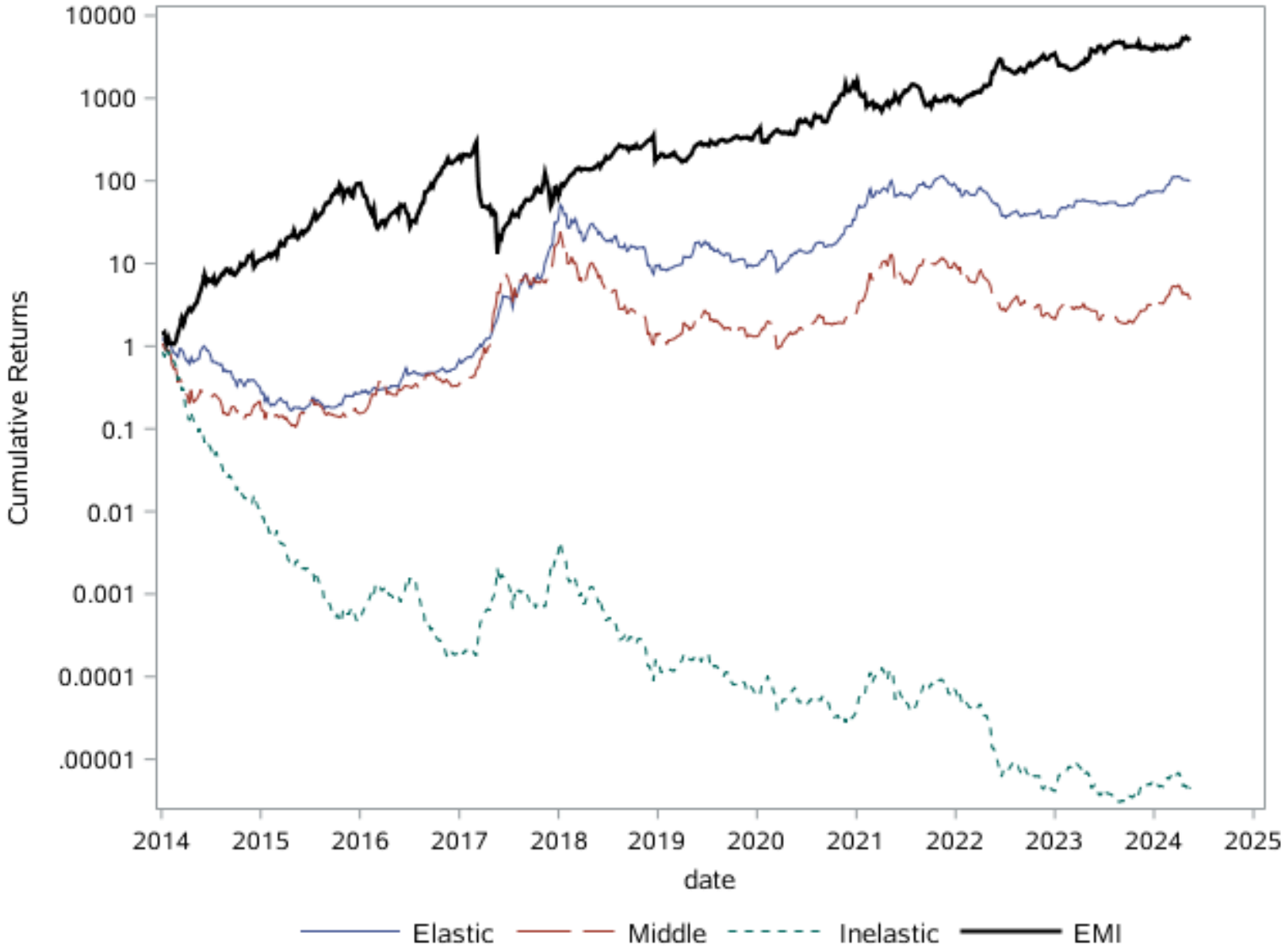
$$MaxRunup = \left(\frac{P_{t-1}}{P_{min}} - 1\right) * \frac{365}{\#Days}$$

$$MaxDrawdown = \left| \left(\frac{P_{t-1}}{P_{max}} - 1\right) \right| * \frac{365}{\#Days}$$

  - where P_{t-1} represents the close price at week t-1. The expression $\#Days$ indicates the number of days from $Date_{min}$ or $Date_{max}$ to the end of week t-1. The ranking period is 12 weeks.
  - **Inelasticity Rank:** = $\left(Rank_{runup} + Rank_{drawdown}\right)/2$. (high $Rank_{drawdown}$ measures large drawdowns)



Result 1: Inelastic Crashes and Elastic Returns (weekly rebalancing)



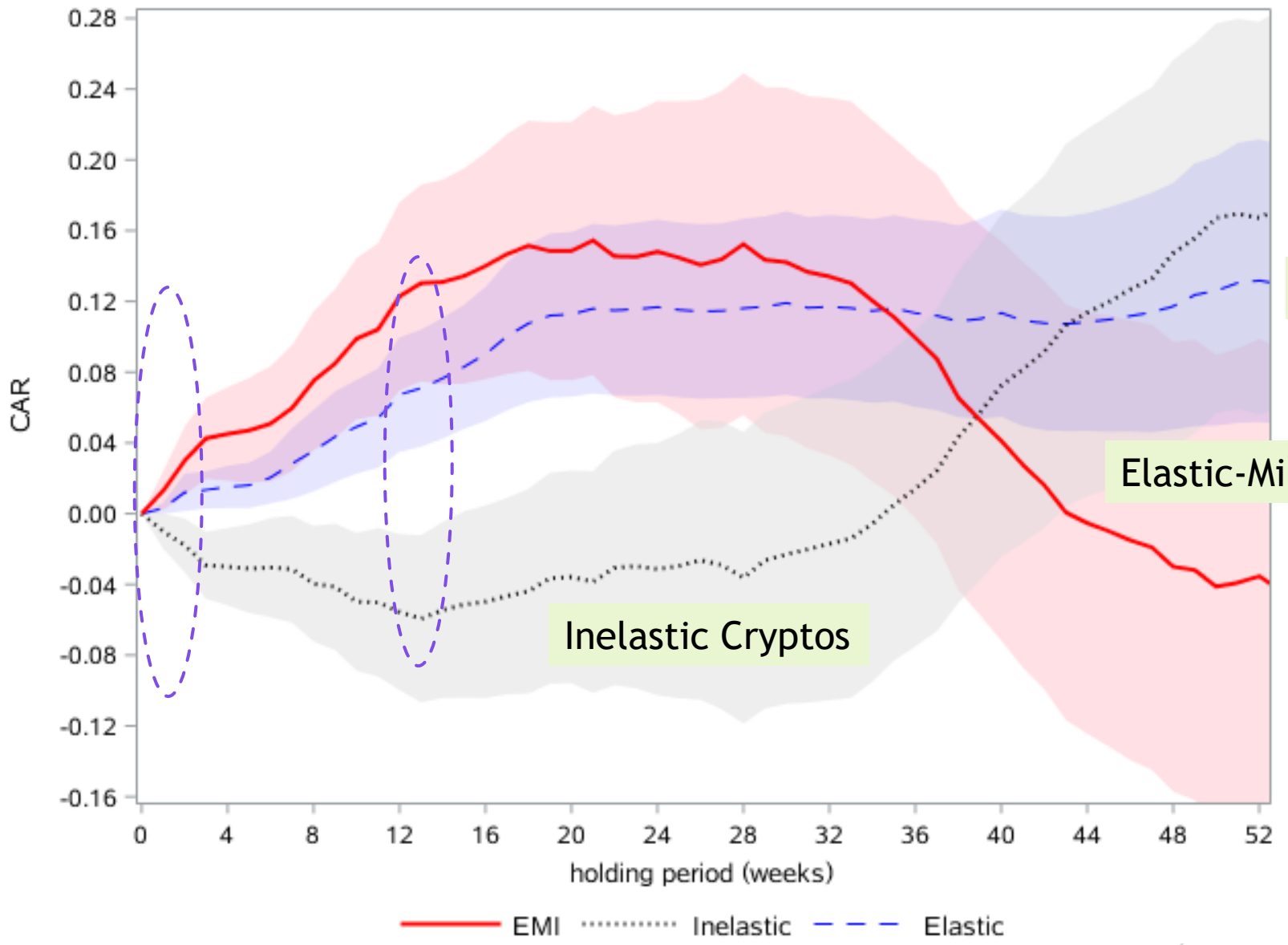
Elastic-Minus-Inelastic

Elastic Cryptos

Middle Cryptos

Inelastic Cryptos

Result 2: Different Holding/Rebalancing Periods (weeks)

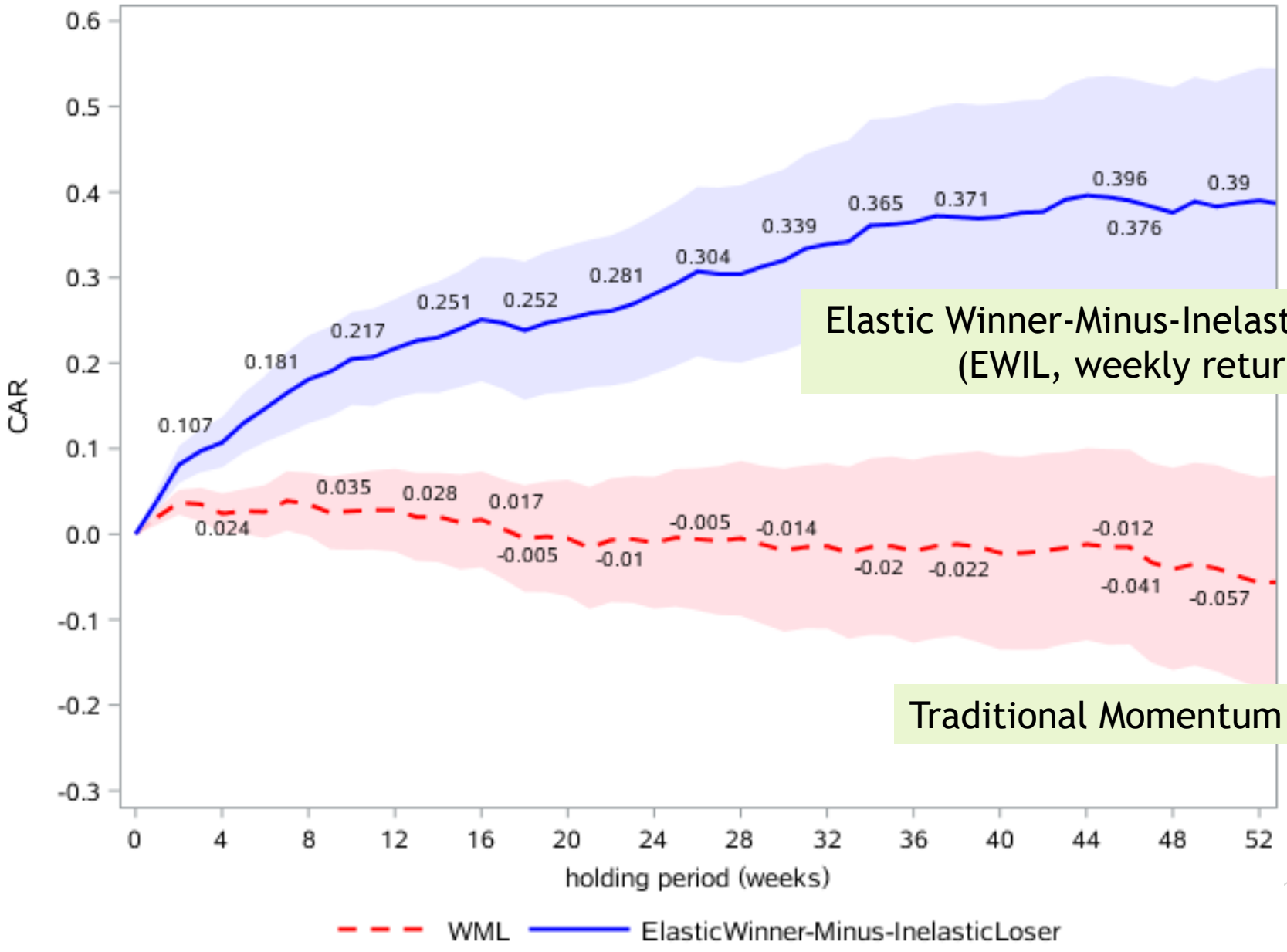


Elastic Cryptos

Elastic-Minus-Inelastic

Inelastic Cryptos

Result 3: Performance of Elastic Winner-Minus-Inelasticity Loser



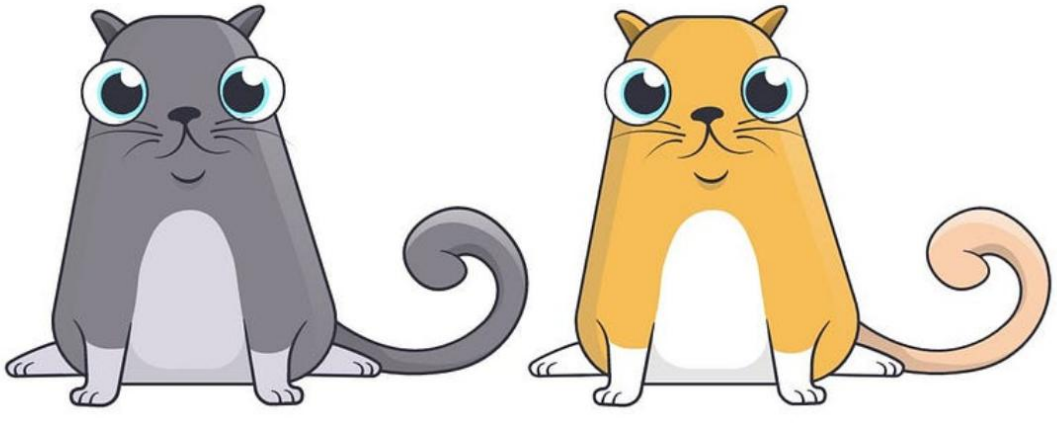
Elastic Winner-Minus-Inelasticity Loser (EWIL, weekly returns)

Traditional Momentum

Identification Attempt: ICO-induced Inelasticity

- ICO-induced congestion (background)

  - On November 28, 2017, Ethereum was stuck by the ICO of CryptoKitties.
  - According to ETH Gas Station, the **CryptoKitties** game accounts for over 10% of network traffic on Ethereum. As traffic increases, transactions become more expensive to execute quickly.

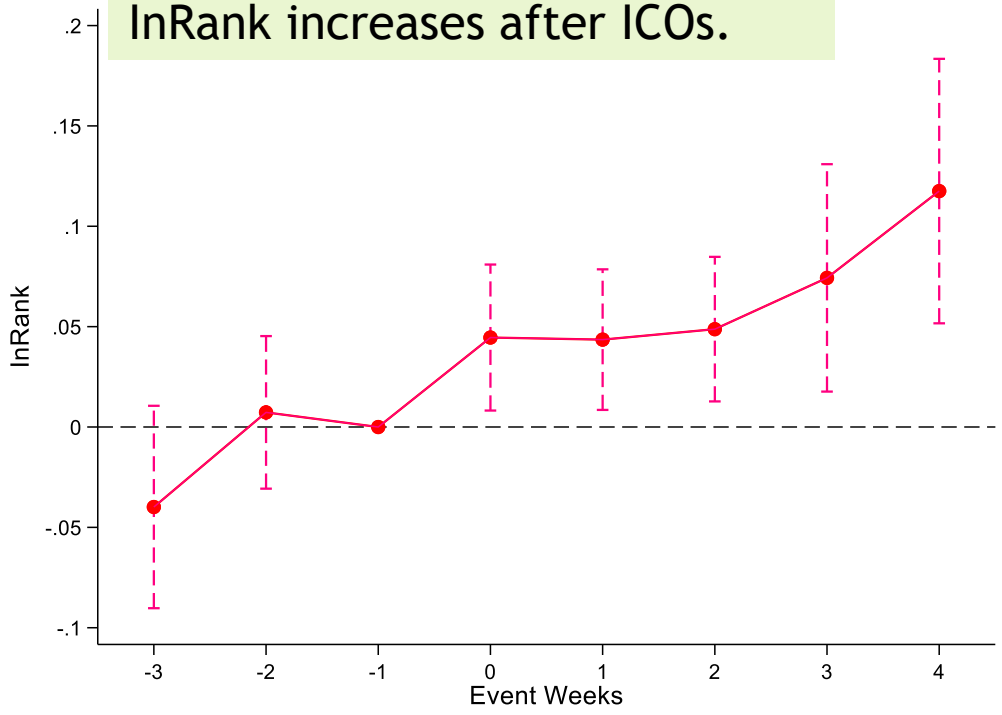


  - Large **ICOs** built on Ethereum likely occupy a significant fraction of the trading capacity of the Ethereum blockchain, which introduces plausibly exogenous shocks to crowd out the transaction capacity for other existing cryptos based on Ethereum (except ETH itself).
  - DID design:
    - Events: top 50 ICOs according to the amount raised in dollars in unit time
    - Mahalanobis-Distance-Matching (MDM, one-to-one) method to match the Ethereum-based and non-Ethereum-based cryptocurrencies according to the characteristics at the end of week τ-1

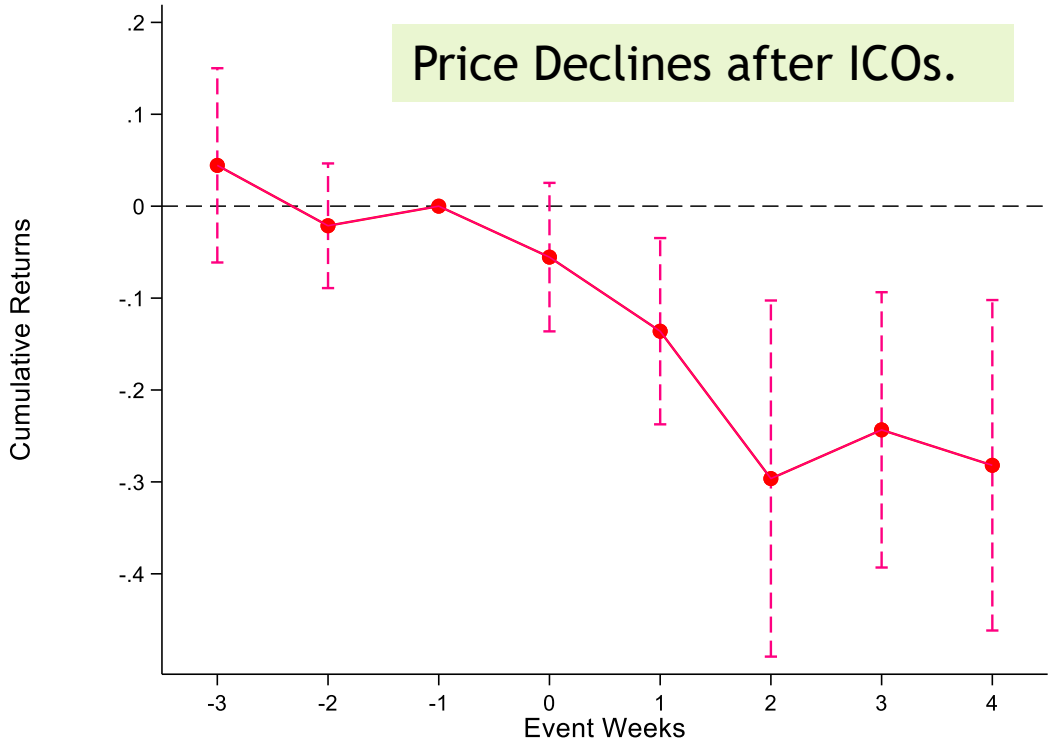
$$Dep\ Var_{i,t} = a + \beta \times DiD_{i,t} + \gamma \times X_{i,t} + u_{i \times Event} + v_{t \times Event} + \varepsilon_{i,t}$$

DiD Regressions

InRank increases after ICOs.



Price Declines after ICOs.



Conclusion

- Inelastic capital predicts crashes in the cross-section of cryptocurrencies
- The crash risk can be largely hedged by avoiding inelastic losers.
- **Financial stability hinges on capital inelasticity.** We need further technological breakthroughs or better market designs to avoid inelastic crashes.

- The PPTs are prepared based on the working paper:
  "**Predictive Crypto Crashes and Asset Pricing Implications: An Inelastic Market Perspective**," joint with, Jennifer Li, Li Liao, and Siyuan Yang.
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=5328940

Thank You