



# Striking Gold in Software Repositories ?

An *Econometric Study of Cryptocurrencies on GitHub*

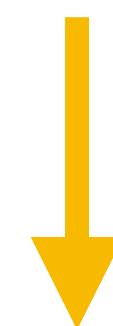
**Asher Trockman**, Rijnard van Tonder, Bogdan Vasilescu  
MSR '19, May 26–27, Montréal, QC, Canada



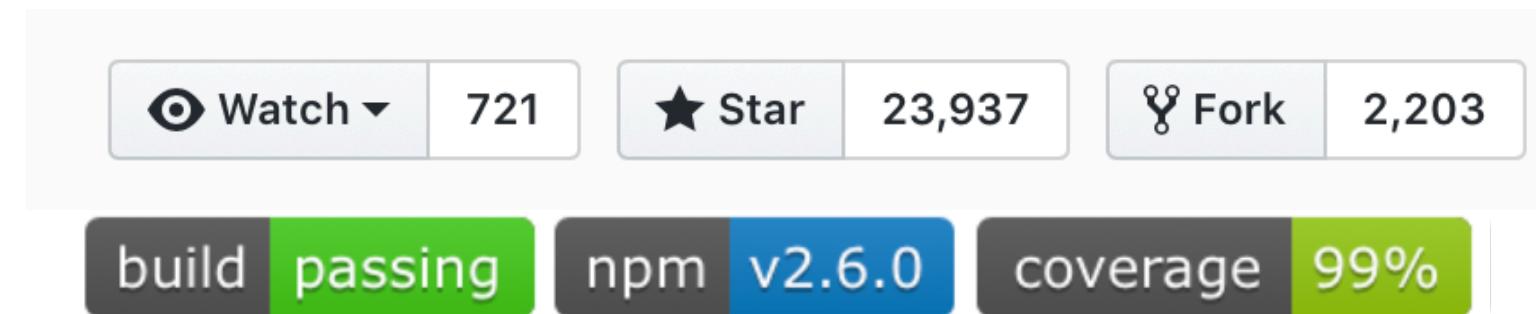
# Why do we think there is “gold”?

Dabbish et al. 2012, Trockman et al. 2018

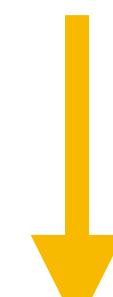
## 1.) Visible Signals on GitHub Influence Perceptions of Software Quality



Kristoufek 2013, 2015;

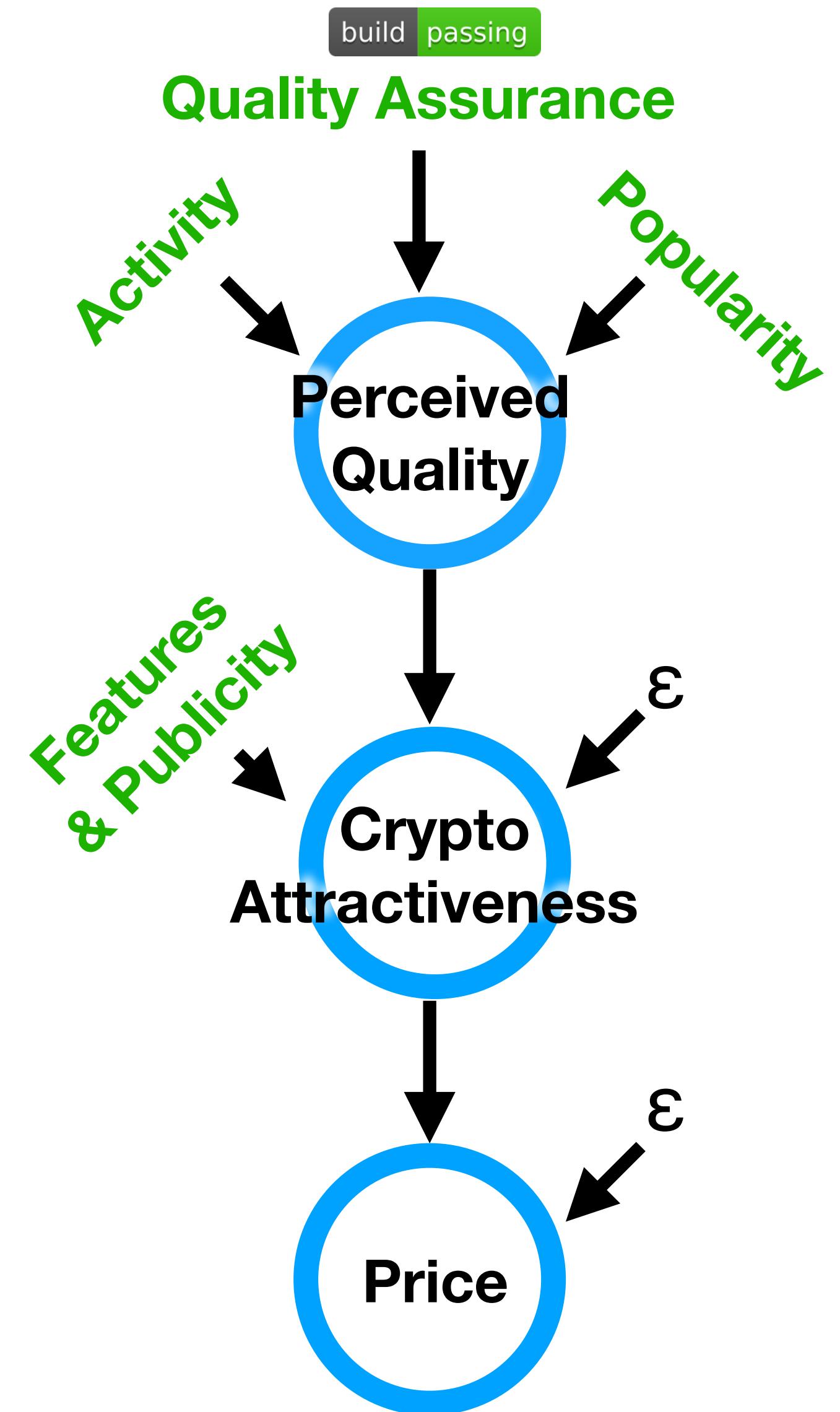


## 2.) “Attractiveness” Influences Crypto Speculators



Garcia et al. 2014

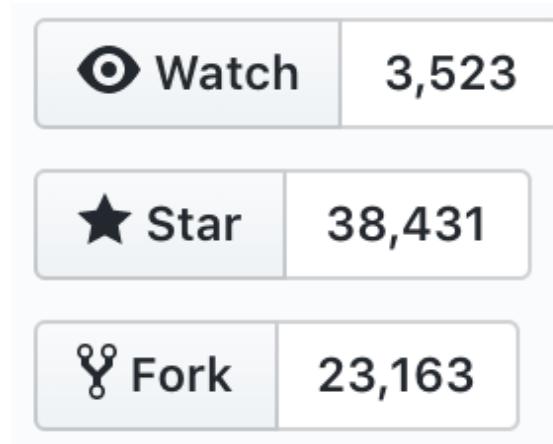
## 3.) Informed? Speculators Drive Price



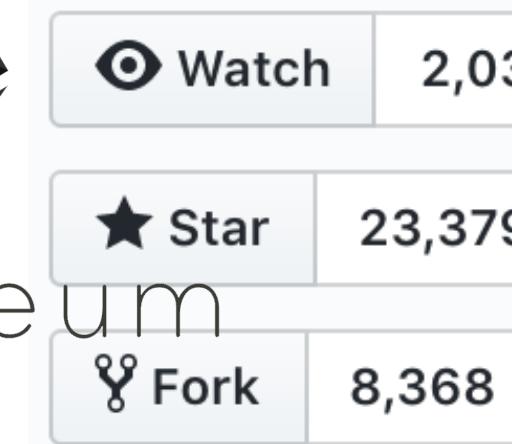
# Collecting Crypto Financial & Development Data



# GitHub



# Ethereum



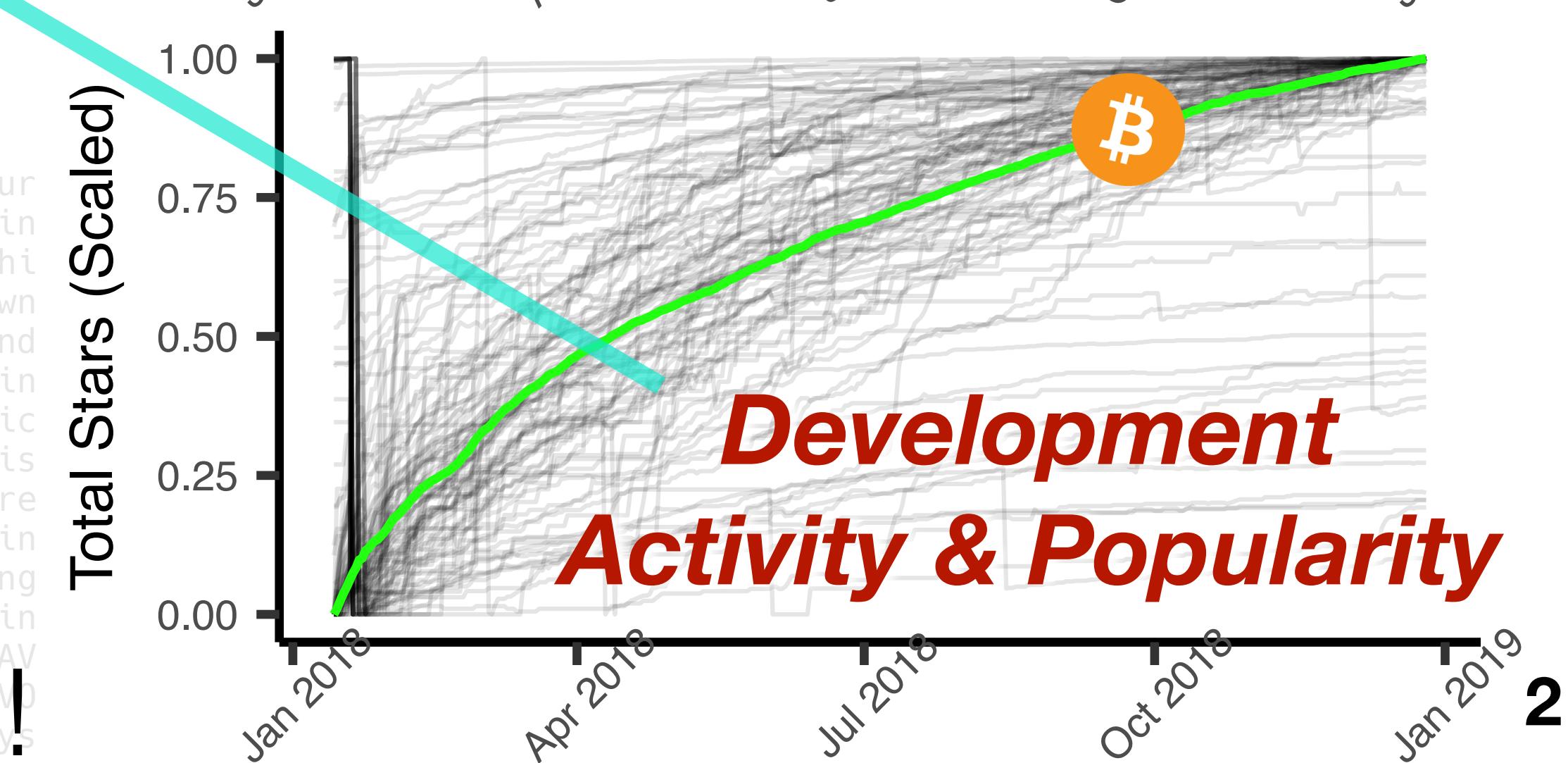
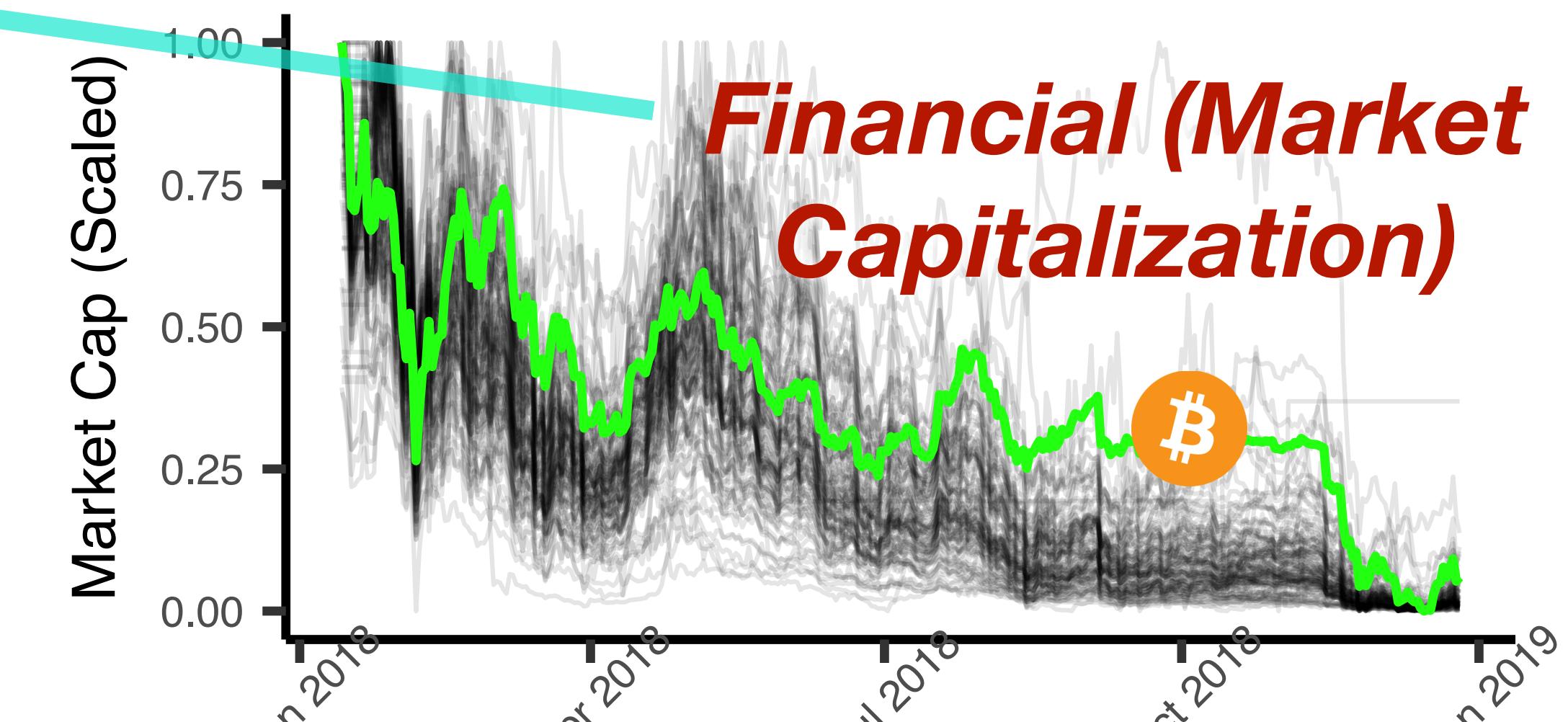
...and 239 other cryptocurrencies:

*(different availability for different parts of the study)*



...and more

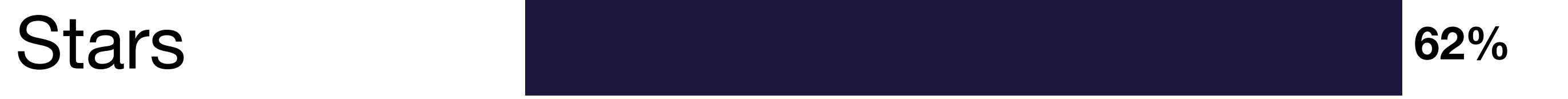
# *347 Days of Daily Measurements*



# Correlation with Avg. Market Cap = (price × coins)



## *Popularity Metrics*

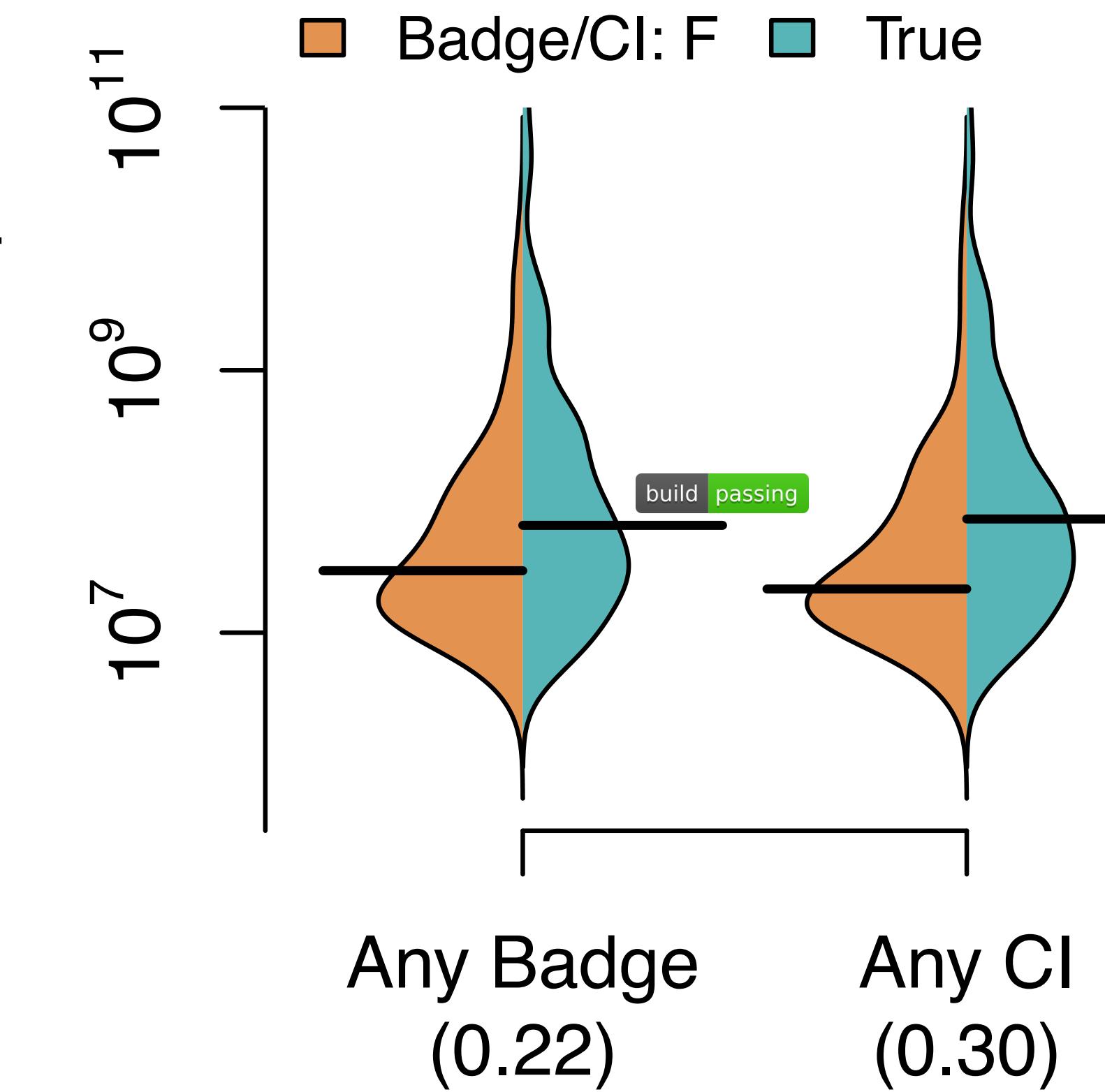


## *Activity Metrics*

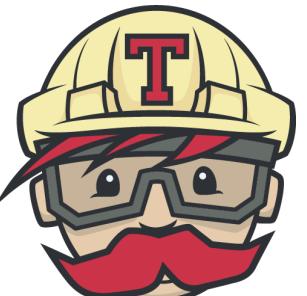


0%  
33%  
66%

## *Quality Assurance Indicators*



build passing



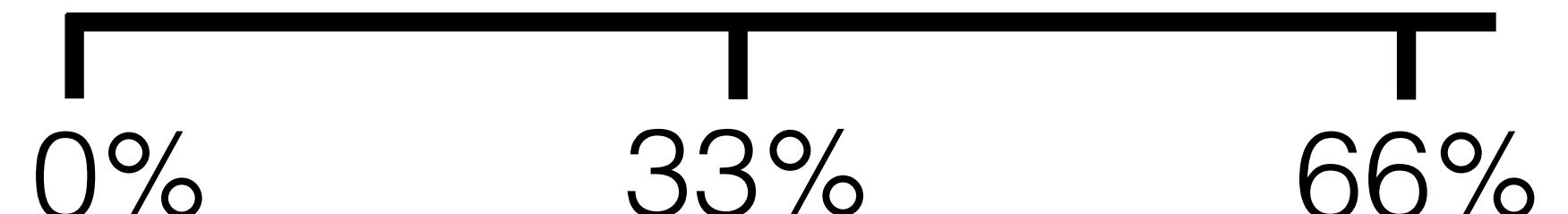
# Linear Models of Avg. Market Cap = (price × coins)



## Popularity Metrics



Only **popularity metrics** are **significantly and positively** associated with avg. market cap.



$\mu \log \text{Market Cap (1y)}$

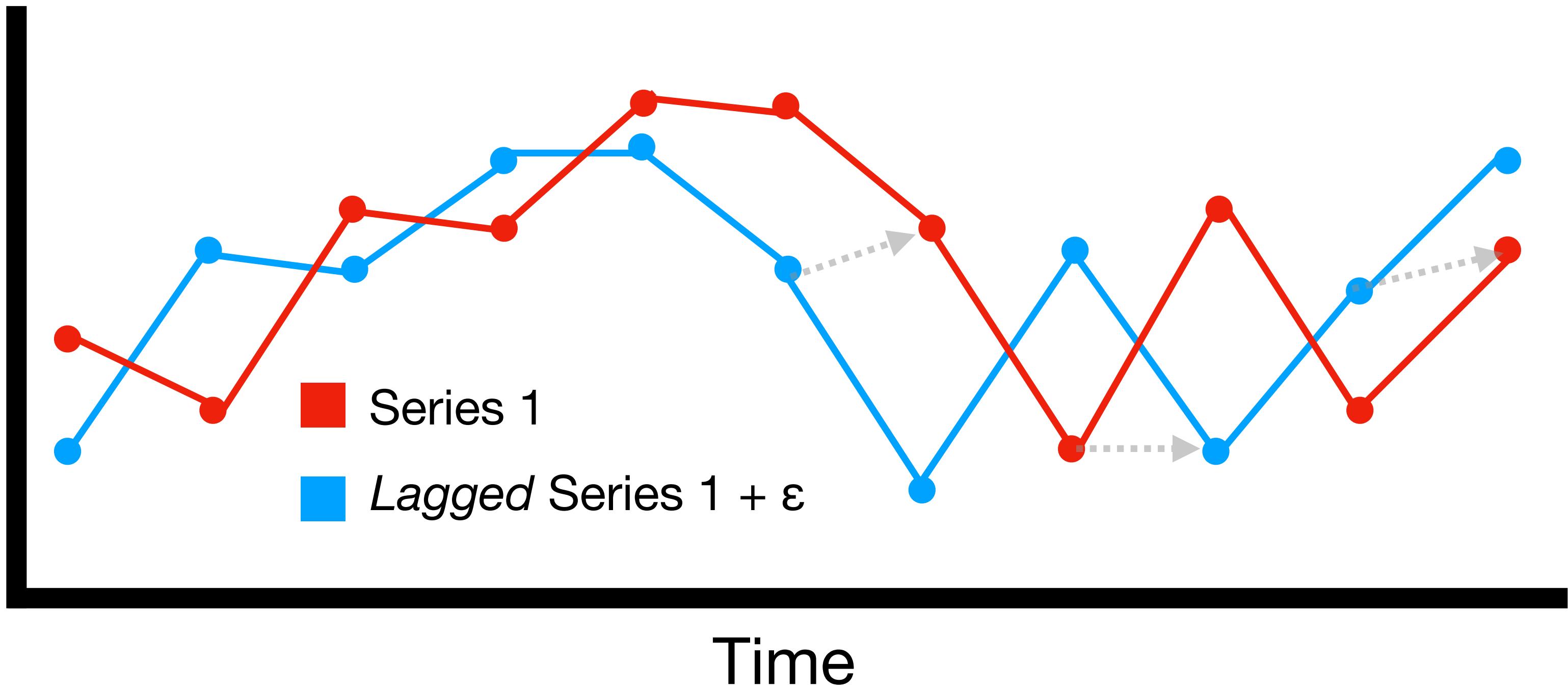
## Full Model With forks

|                            |                 |              |
|----------------------------|-----------------|--------------|
| $\mu \log \text{Stars}$    | 0.29 (0.18)     | Joint<br>*** |
| $\mu \log \text{Watchers}$ | 0.03 (0.20)     |              |
| $\mu \log \text{Forks}$    | 0.47 (0.17)     |              |
| $\mu \log \text{Commits}$  | 0.35 (0.30)     |              |
| $\mu \log +\text{LOC}$     | 0.08 (0.08)     |              |
| $\mu \log -\text{LOC}$     | 0.08 (0.08)     |              |
| $\mu \log \text{Contrib.}$ | 0.31 (0.31)     |              |
| HasBadge                   | 0.21 (0.21)     |              |
| HasCI                      | 0.23 (0.23)     |              |
| (Intercept)                | 14.0 (0.48) *** |              |

|              |       |
|--------------|-------|
| Observations | 149   |
| Adj. $R^2$   | 55.6% |

# Granger “Causality”

Metrics  $\xleftrightarrow{?}$  Market Cap

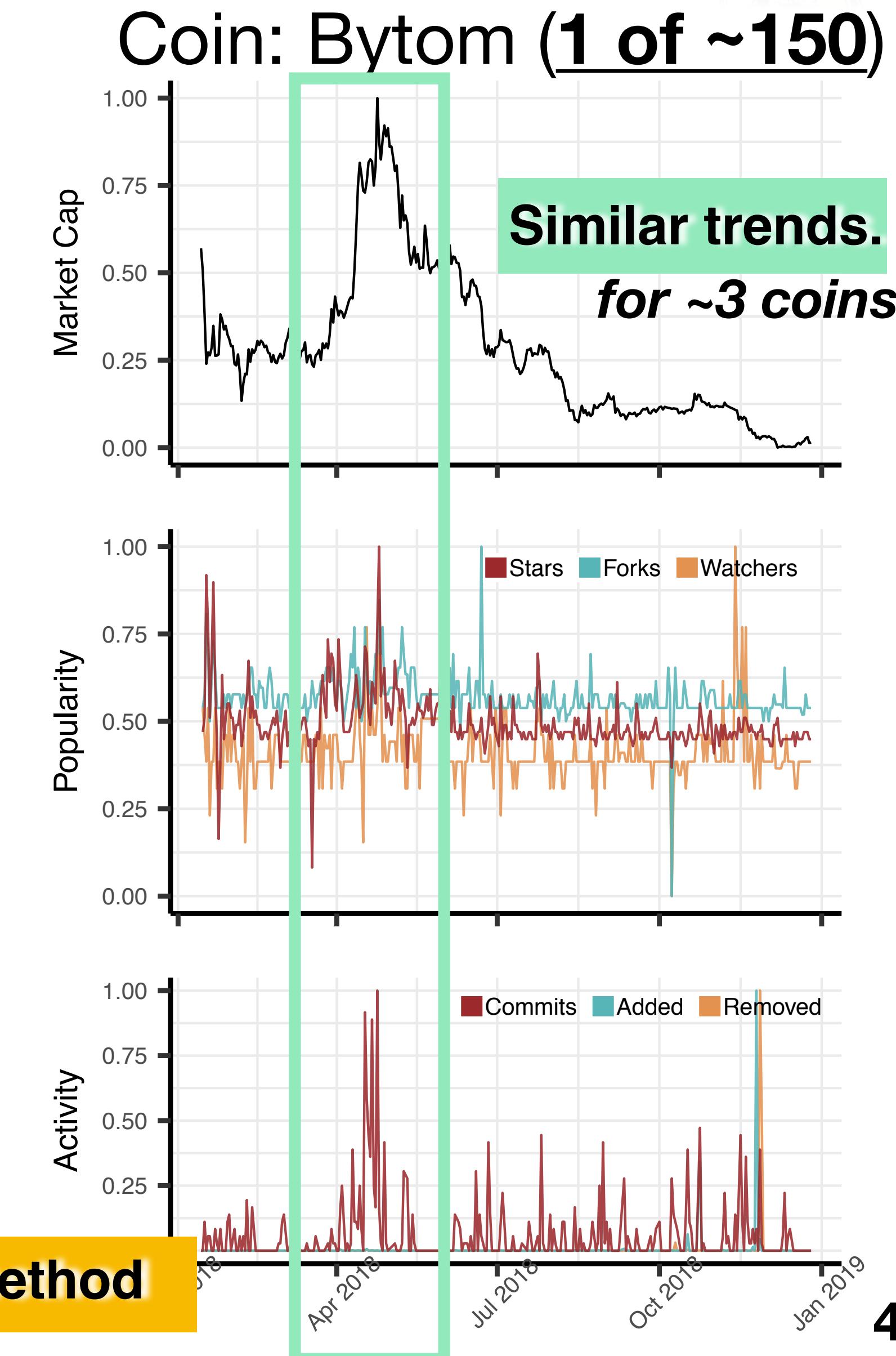


$$y_t = \delta_0 + \sum_{j=1}^p \alpha_j y_{t-j} + \sum_{j=1}^p \gamma_j x_{t-j} + \epsilon_t$$

*Past Levels of Dependent Variable*      *Past Levels of Independent Variable*

**Dependent Variable**

Note:  
Toda-Yamamoto method



# Metrics $\longleftrightarrow$ Market Cap **Not compelling.**



We see evidence of Granger causality in only a few projects.

Correcting for multiple hypotheses, this is insignificant.

**Stars** Granger-cause? Market Cap

Binance, Cryptonex, Diamond, Electroneum, Emercoin, INS Ecosystem, Pandacoin, Vericoин, ZenCash

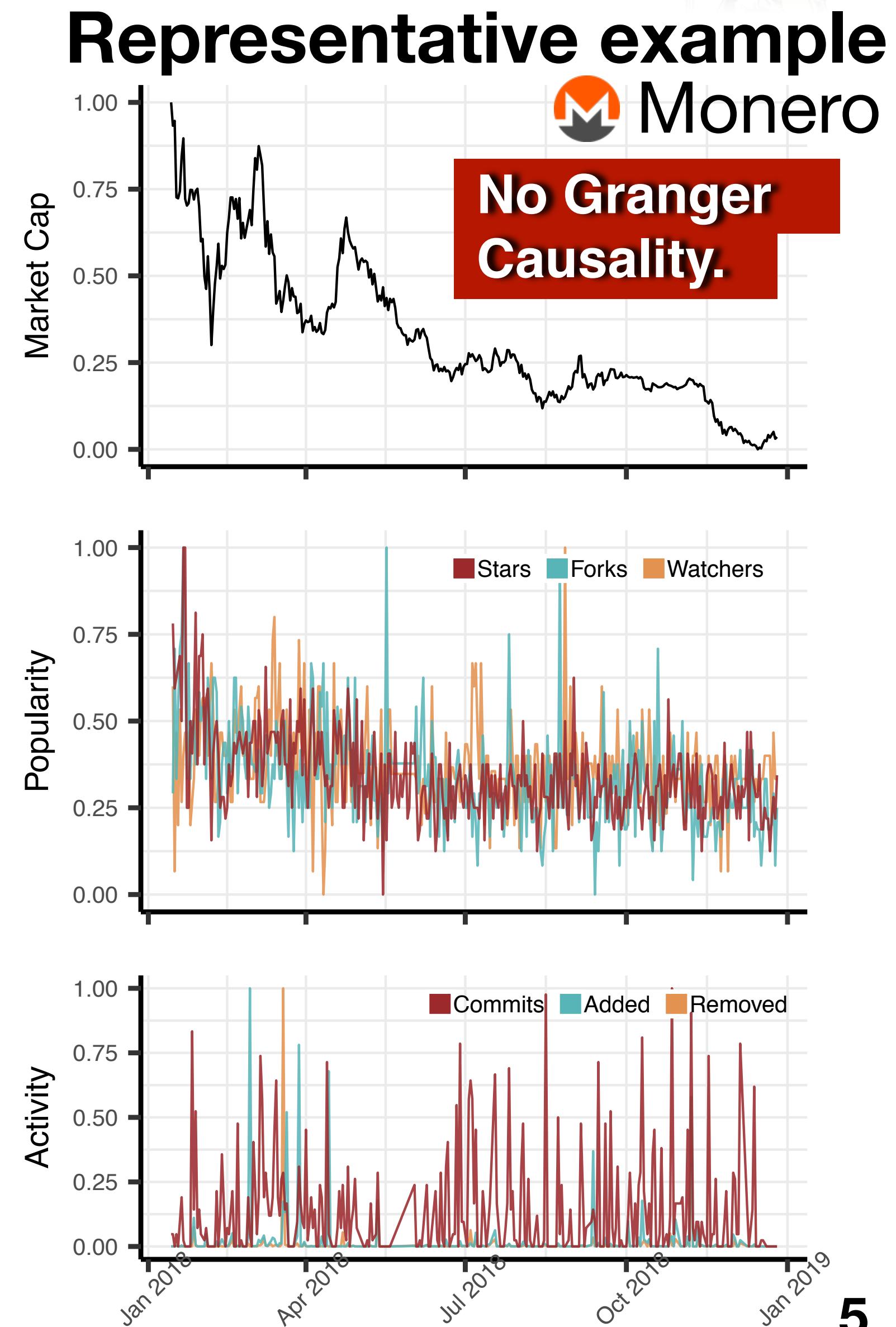
**Watchers** Granger-cause? Market Cap

Ark, Mintcoin, NEM, PIVX

**\*(But we are likely to get similar from random noise.)**



**9/142 coins**



# Metrics $\longleftrightarrow$ Market Cap Not compelling.



Other models reveal a **very weak connection** between popularity and market cap, which is not robust.

**Stars Granger-cause? Market Cap**

Binance, Cryptonex, Diamond, Electroneum, Emercoin, INS Ecosystem, Pandacoin, Vericoин, ZenCash



**9/142 coins**

**Watchers Granger-cause? Market Cap**

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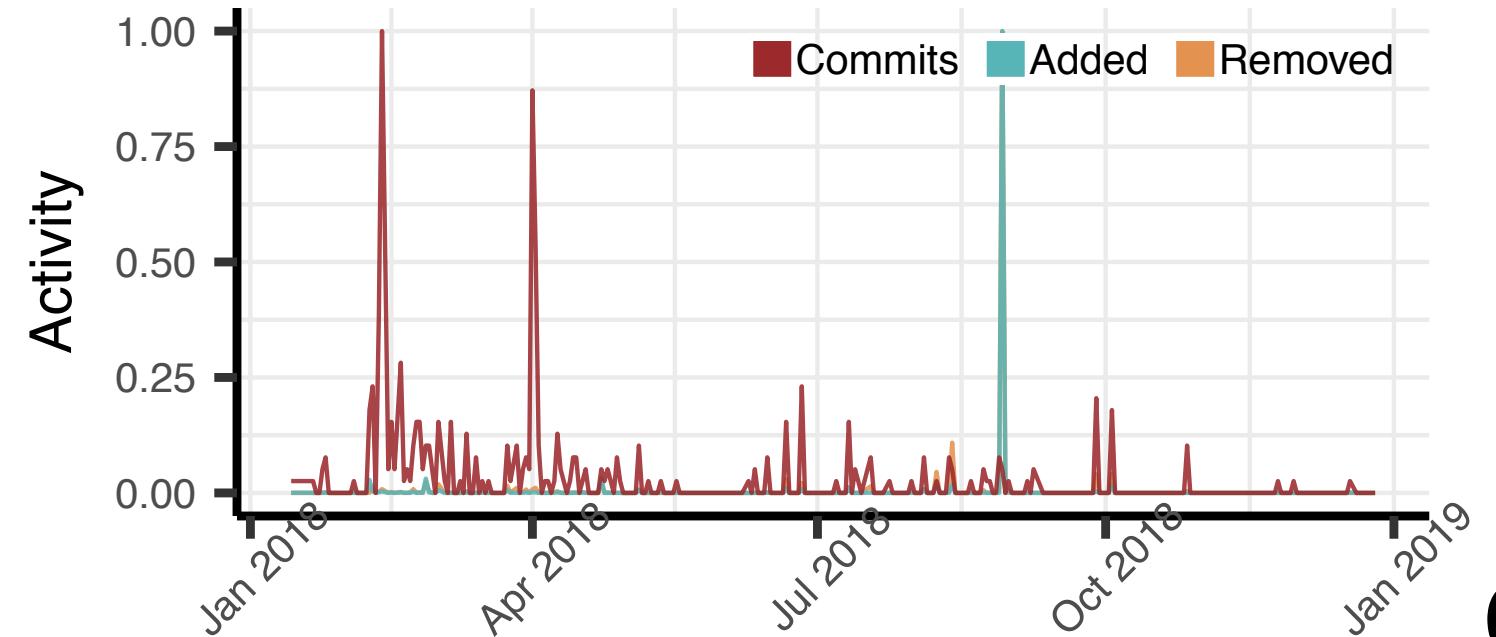
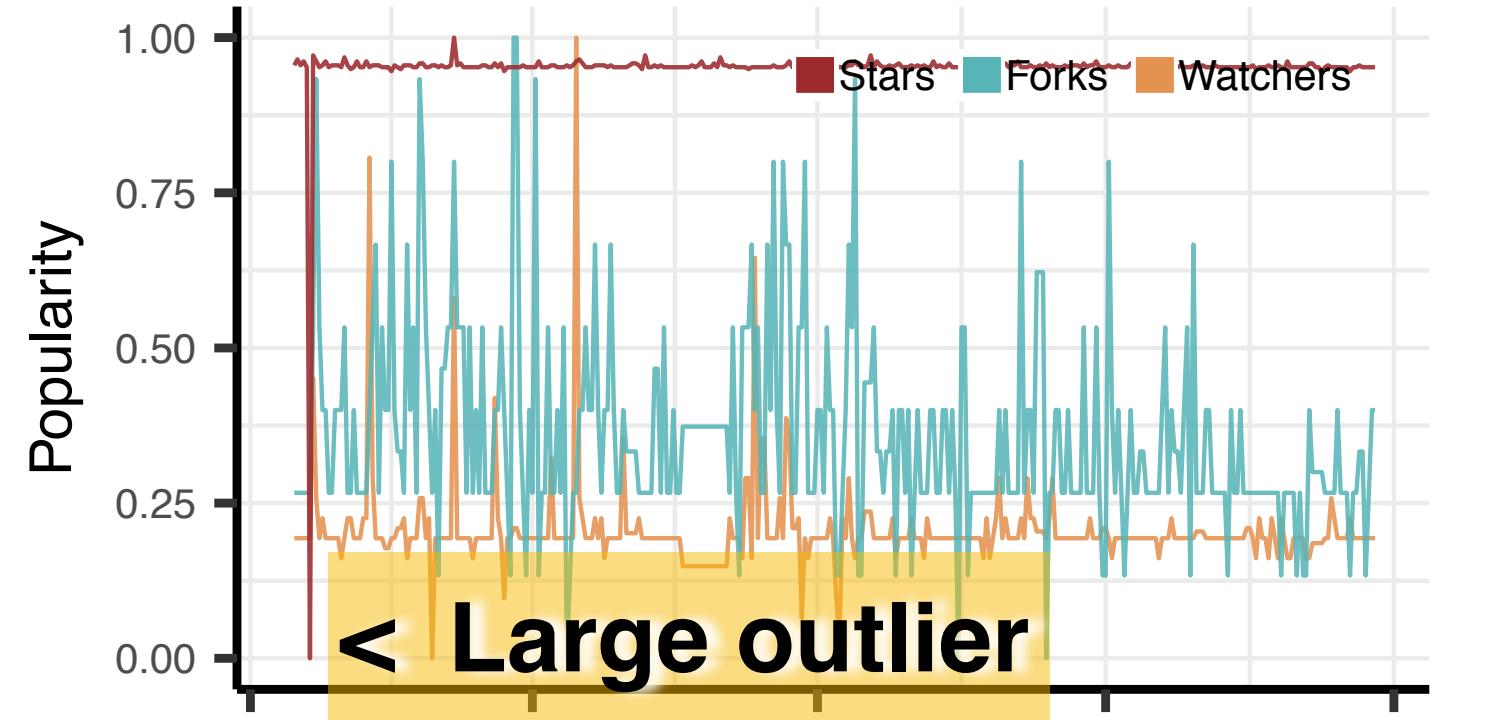
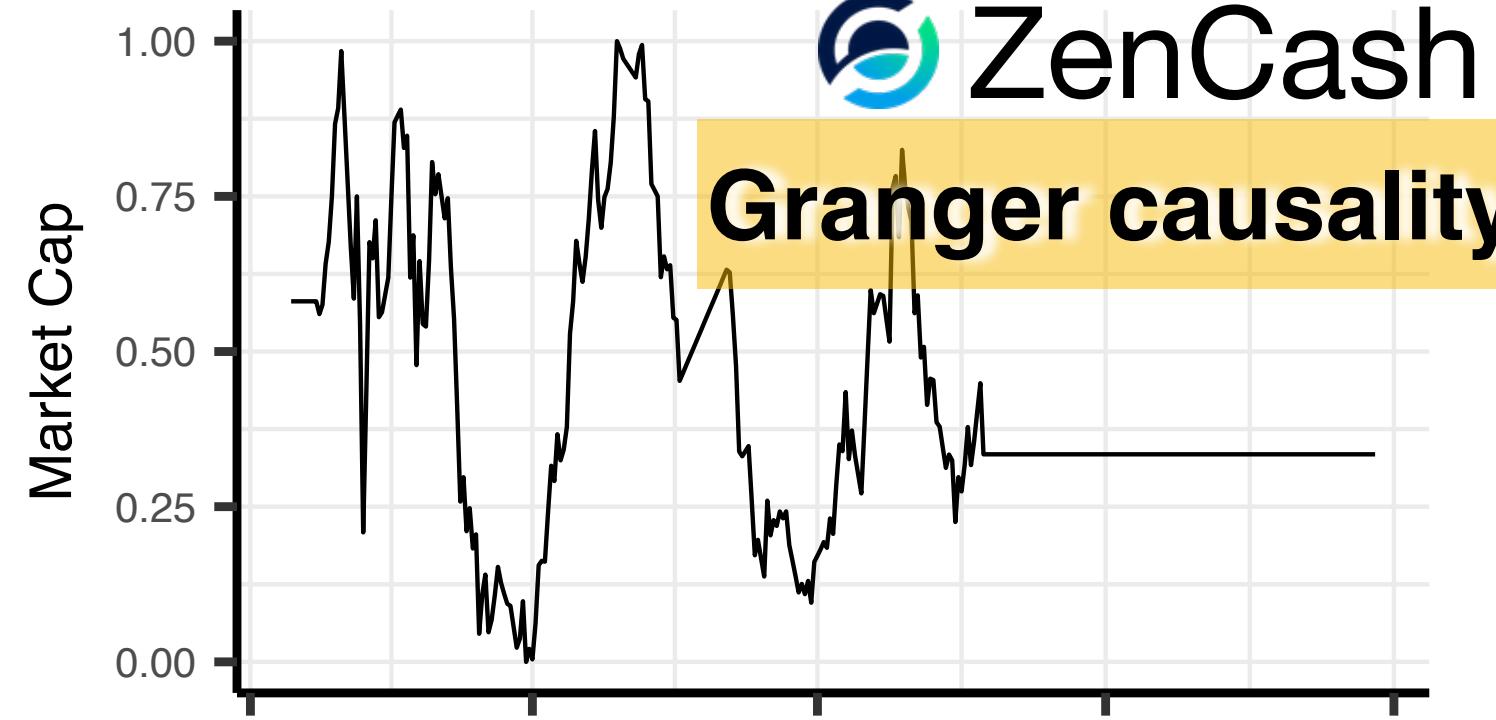
**4/146 coins**

**\*(But we are likely to get similar from random noise.)**

**Exceptional example**



**ZenCash  
Granger causality?**



Looks like we haven't struck gold. BUT:



# Future work

# Multi-year trends

# Sophisticated models

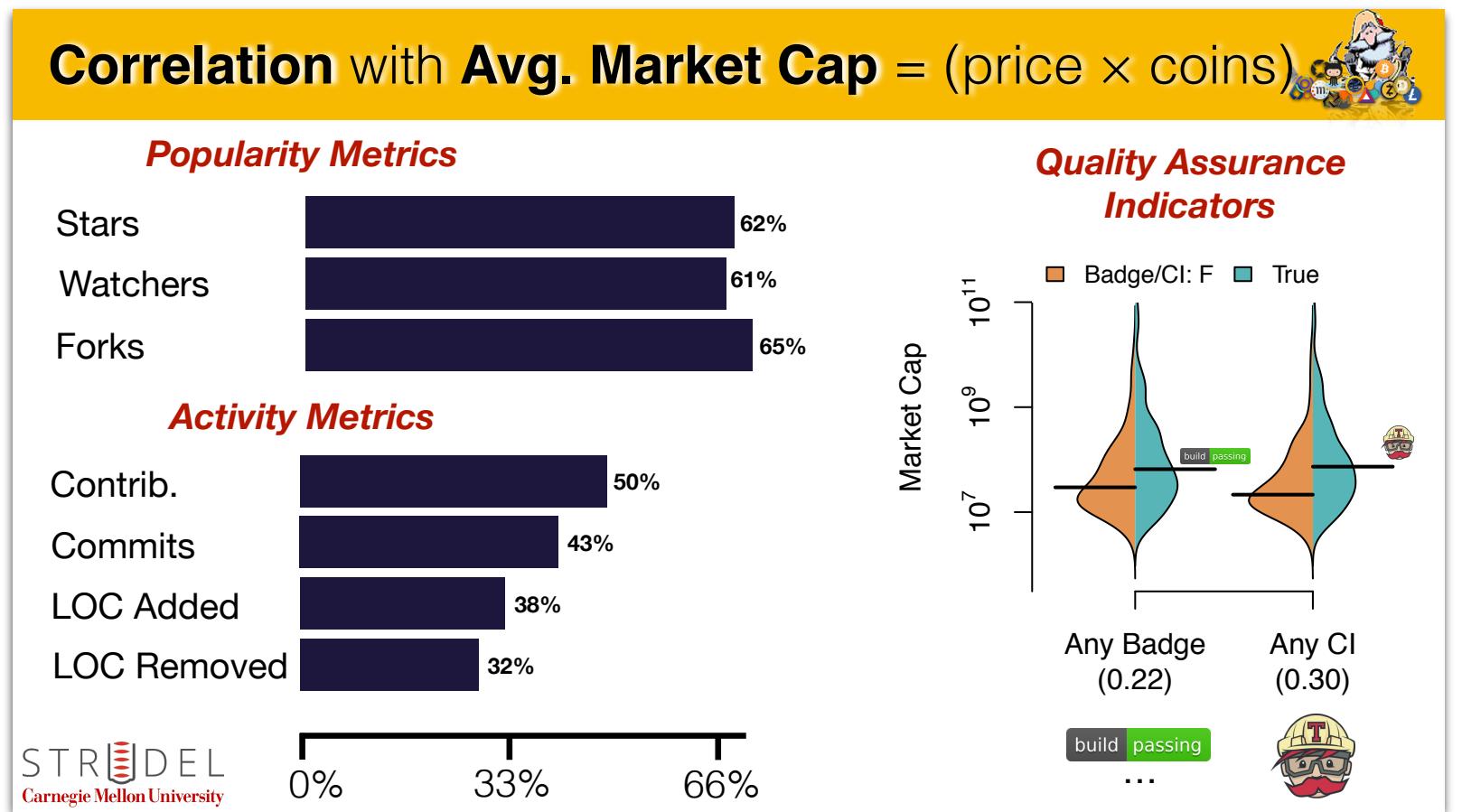
# Volatility or volume

**Check out  
econometric  
techniques  
for future studies!**

# Contact

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**<http://ashertrockman.com>**

# *Long-term: Signals of Pop. & QA*



# *Short-term: Very limited evidence*

