# Technical Leverage Analysis in the Python Ecosystem

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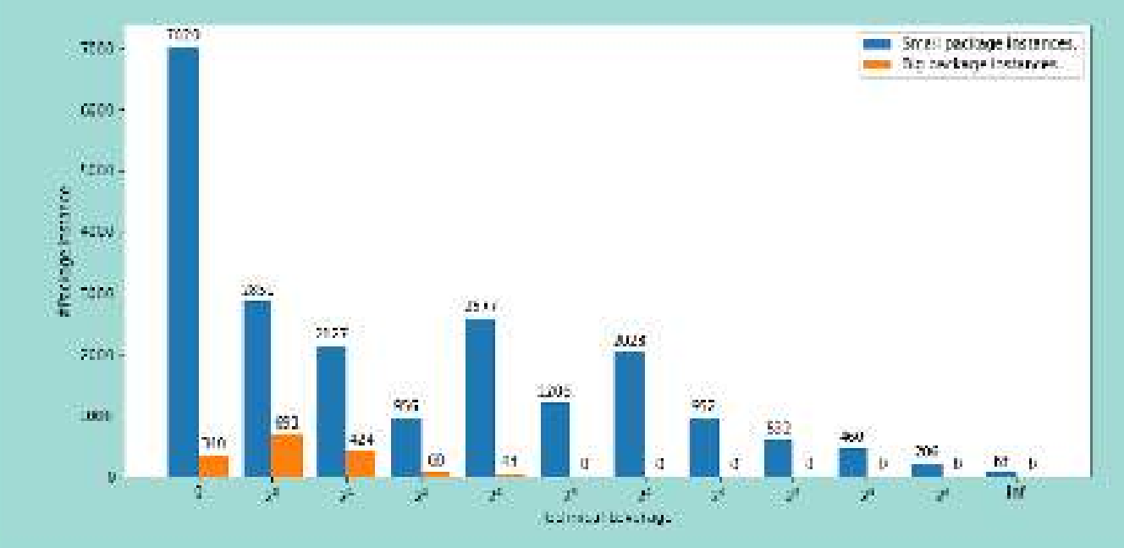
## What is Technical Leverage?

A novel metric for measuring dependencies: Ratio between the **dependency codes** and the **original codes** in a software package (Massacci and Pashchenko, ICSE'2021).

$$\textbf{Technical Leverage} = \frac{\textbf{LOC of Dependency code}}{\textbf{LOC of Own code}}$$

H2020 Program
AssureMOSS
(Grant n.952647)

## Dataset

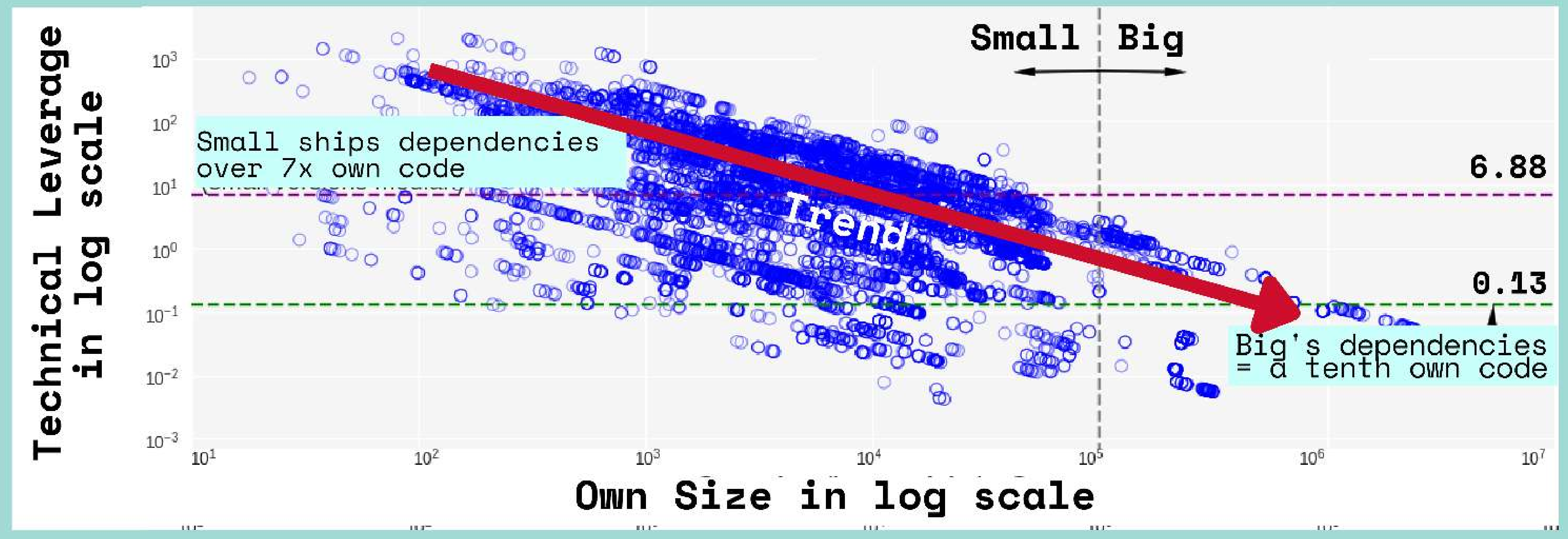


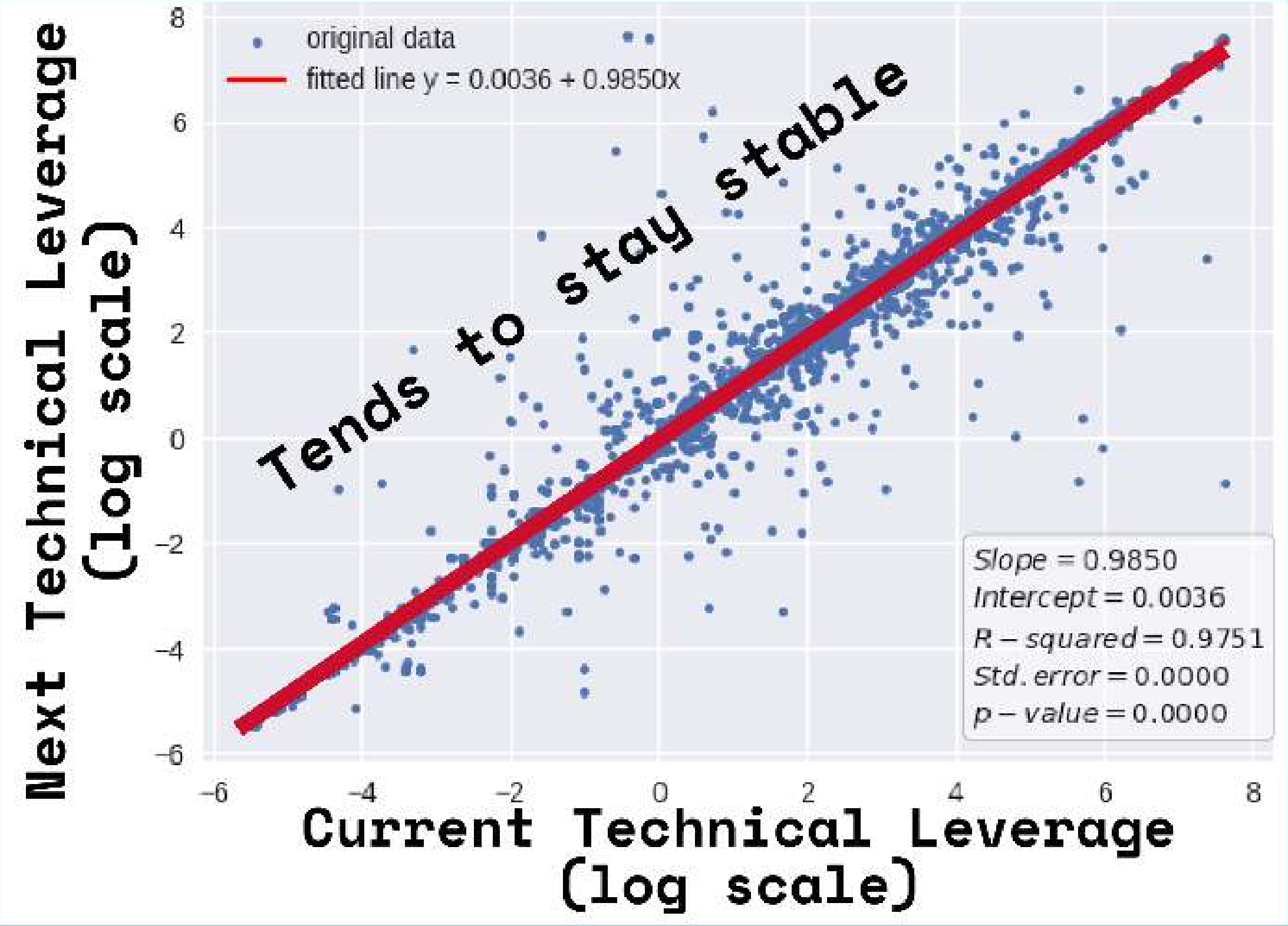
**21,205** package versions in PyPI FROM **482** different top Python packages

## Analysis Procedure

1. Statistical Analysis
2. Mathematical Estimations
3. Simulations

## Data in Details





**RQ1** How is the Python ecosystem regarding technical leverage and developers' behavior?

**As in Java, Python developers also tend to ship a lot of other people's code.**

**RQ2** How does the technical leverage metric change across versions in a package?

**If you are highly leveraged, you will stay so.**

## Probabilities of Getting Safe Package Versions

| Package Group | Standard Calculation #VulnVersion/#Versions | Our Formula for What Developers Actually Experience | |
|---|---|---|---|
| | | Not considering downloads | Considering downloads |
| No dependencies (TL = 0) | 78.85% | **89.41%** | **78.60%** |
| Below industry avg. (0<TL<=4) | 71.89% | **81.01%** | **77.05%** |
| Above industry avg. (TL > 4) | 68.93% | **89.91%** | **81.65%** |

**RQ3** How does the technical leverage metric affect the risk of having vulnerabilities in Python ecosystem?

**The CHANCE of getting a SAFE PACKAGE VERSION is HIGHER than just reporting the percentage of vulnerable versions.**

## Future Works

1. How do packages' security states evolve over time?
2. How to do security MSR research with the available knowledge at a certain point in time?

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