Benford's Law for fraud detection.
Foundations, methods and applications

Stresa, July, 11, 2019

Empirical evidence of financial statement manipulation in going concern and bankrupted companies

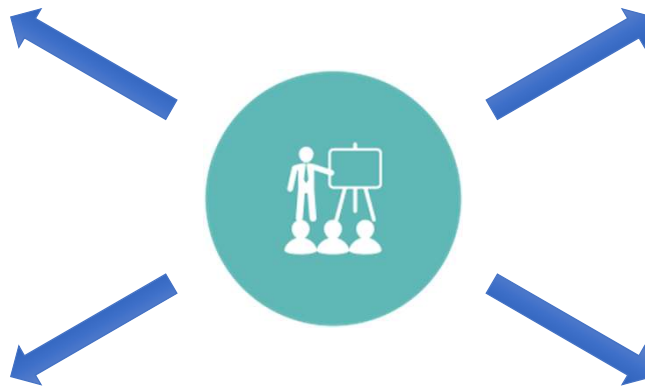*Bradley Barney*   *Kurt Schulzke*   *Pier Luigi Marchini*

AGENDA

1. Aim of the research

2. Main references

3. Sample and Research Method

4. Expected findings, limitations

① Aim of the research

This study aims to use archival data to discover _whether_ and _to what extent_ Benford's Law performance is a leading indicator of financial distress (i.e., insolvency _or_ bankruptcy)

Italian unlisted companies (no IAS/IFRS)

Analysis of all available financial statement items (BS and IS)

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② **Main References**

➢ **Nigrini, Mark (2012)**. *Benford's Law: Applications for Forensic Accounting, Auditing, and Fraud Detection*. Wiley, 2012.

➢ **Barney, B. J. and Schulzke, K. S. (2016).** *Moderating "'Cry Wolf'" Events with Excess MAD in Benford's Law Research and Practice*, Journal of Forensic Accounting Research, 1(1), pp. A66–A90.

➢ **Da Silva, C. G. and Rodrigues Carreira, P. M. (2019).** *Estimating the Proportion of Misstated Records in an Audit Data set using Benford's Law*, Journal of Accounting, Finance & Auditing Studies, 5(2), pp. 146–162.

➢ **Heilig, F. and Lusk, E. J. (2018).** *Testing the Small Size Effect Bias for Benford Screening: The False Negative Signaling Error*, Business Management Dynamics, 8(6), pp. 23–35.

➢ **Druică, E., Oancea, B. and Vâlsan, C. (2018).** *Benford's law and the limits of digit analysis*, International Journal of Accounting Information Systems, 31, pp. 75–82.

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② Main References

- **Li-Jung Lin, Teng-Shih Wang and Fengyi Lin (2018).** *Applying Digital Analysis to Corporate Governance and Financial Reporting Quality During Global Financial Upheavals*, International Journal of Business & Information, 13(3), pp. 295–320.

- **El Mouaaouy, F. and Riepe, J. (2018).** *Benford and the Internal Capital Market: A Useful Indicator of Managerial Engagement*, German Economic Review, 19(3), pp. 309–329.

- **Amiram, D., Bozanic, Z., and Rouen, E. (2015).** *Financial Statement Errors: Evidence from the Distributional Properties of Financial Statement Numbers*, Review of Accounting Studies, 20(4), pp. 1540-1593. BB5

- **Sadaf, R. (2017).** *Advanced Statistical Techniques for Testing Benford's Law*, Annals of the University of Oradea, Economic Science Series, 26(2), pp. 229–238.

Benford Law application on bankrupt entities

Only one available study on Municipalities (PhD thesis)

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BB5   I added this one because it is the reference for the FSD (mentioned later)
Bradley Barney; 09/07/2019

③ Sample and research method

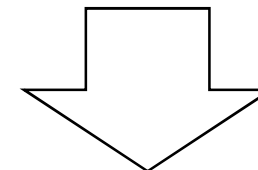| Sample of companies: |
| --- |
| - unlisted |
| - going concern (active)   vs insolvent vs bankrupt |
| - Italian companies |

Going concern

1.377.284 companies

Bankrupt and insolvent companies

(follows)

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③ Sample and research method

↓

Bankrupt and insolvent companies

Legal status:

➢ **Insolvent companies**
  ➢ Active (default of payment)
    ➢ State of insolvency
  ➢ Active (receivership)
    ➢ Composition with creditors

➢ **Bankrupt companies**
  ➢ Bankruptcy
  ➢ Controlled administration
  ➢ Compulsory administrative liquidation
  ➢ Post-bankruptcy composition with creditors

111.359 companies

→ **5 years of financial statements**

③ Sample and research method

- **Company-year level Benford's Law conformance metrics:**
  - Mean absolute deviation (MAD) for first digit
  - Excess MAD for first two digits
  - Financial statement divergence (FSD) score

- **Match bankrupted/insolvent/going concern companies**
  - Available financial statements for same five fiscal years
    - Control for time-varying economic fluctuations, regulatory changes, etc.
  - Same or similar industry
  - Similar number of employees

- **Analyses:**
  - Test for significant differences in first year (of the five), second year, etc.
  - Determine lead time at which differences are manifest
  - Characterize conformance trajectories over time
  - Create multivariable logistic regression model for predicting future status

④Expected findings and limitations

Research Hypothesis 1:
- ➢ The Benford's law conformity of the financial statement numbers of insolvent or bankrupt companies differs from the conformity of active companies.

Research Hypothesis 2:
- ➢ The Benford's law conformity of the financial statement numbers of bankrupt companies differs from the conformity of insolvent companies.

Limitations:
- ➢ Pre-distress financial statement data is missing for some companies;
- ➢ Difficulty to make a deeper analysis of insolvent companies that were later reclassified as going concern