

Detecting manipulations in accounting data of EU organizations

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Work conducted joined with the Text and Data Mining Unit of the JRC and the University of Parma

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This presentation will be divided in two parts:

1. Benford analysis of *individual line items* of financial statements of companies
2. Benford analysis of the *overall financial statements* as well as *individual line items* of financial statements of political parties

Example of a Balance Sheet

BALANCE SHEET COMPANY JRC - 31/12/2019

ASSETS

Current assets

Cash and cash equivalents	12,000.00
Account receivable	35,000.00
Inventory	120,000.00
Investments	8,000.00
Total current assets	167,000.00

Long-term assets

Land	126,000.00
Buildings	300,000.00
Furniture and fixtures	50,000.00
Equipment	125,000.00
Total long-term assets	601,000.00

TOTAL ASSETS **768,000.00**

EQUITY AND LIABILITIES

Current liabilities

Accounts payable	60,000.00
Notes payable	25,000.00
Accrued expenses	30,000.00
Deferred revenue	25,000.00
Total current liabilities	140,000.00

Equity

Shareholders' Equity	322,000.00
Common stock	250,000.00
Retained earnings	56,000.00
Total equity	628,000.00

TOTAL EQUITY AND LIABILITIES **768,000.00**

Example of an Income Statement

INCOME STATEMENT COMPANY JRC - 31/12/2019

INCOME

Revenue from Sales	250,000.00
Financial Income	25,000.00
Other Income	4,800.00
Other Income	2,500.00
	4,800.00
Total Income	282,300.00

NET INCOME **69,450.00**

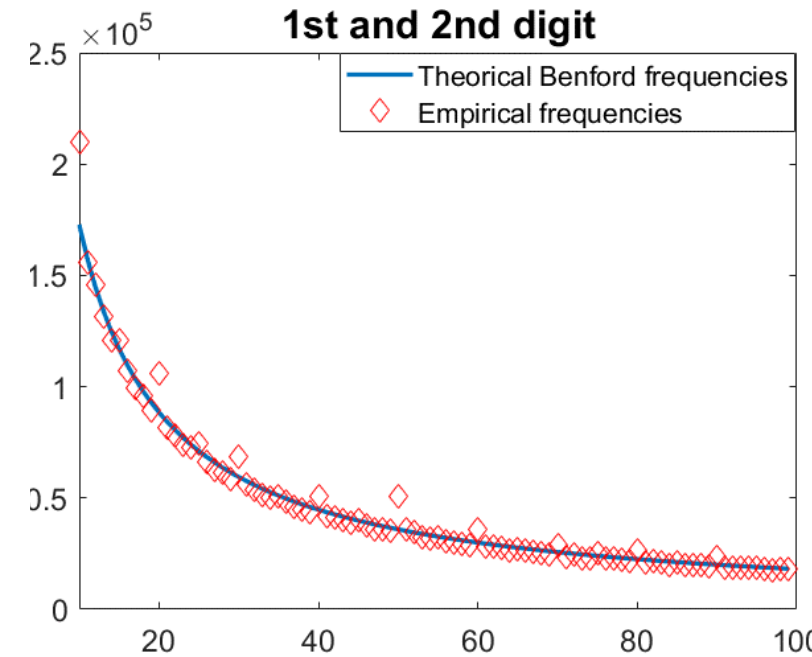
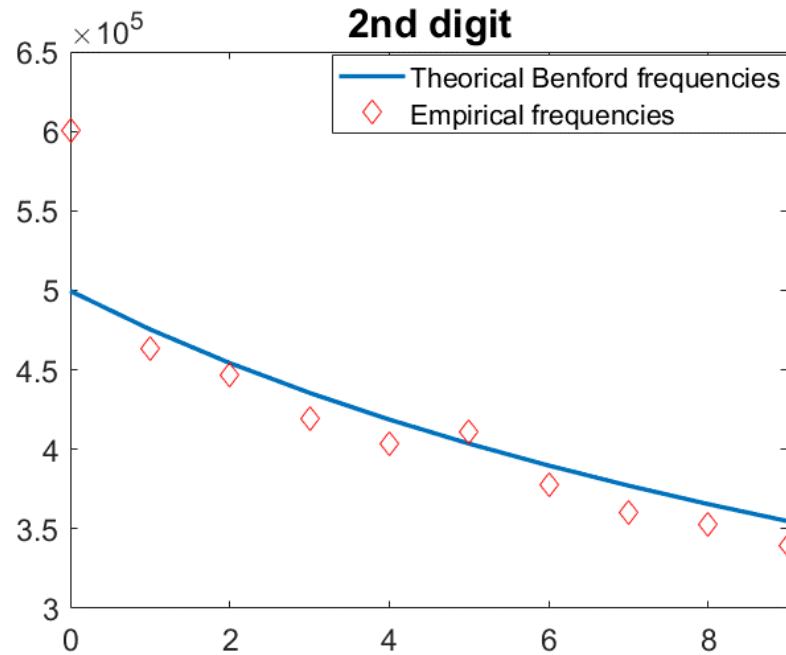
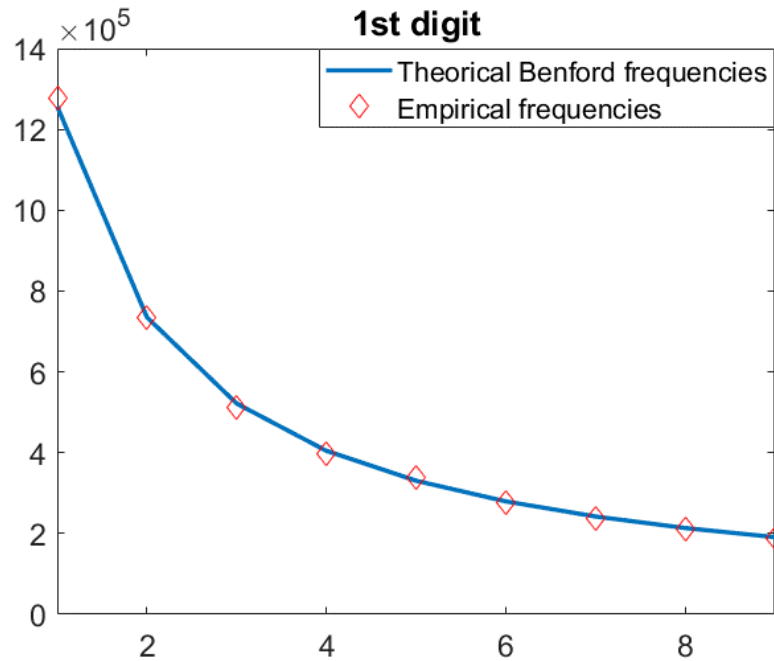
EXPENSES

Raw Material	95,000.00
Staff Costs	115,200.00
Administrative Expenses	
Office supplies expense	1,250.00
Office equipment expense	1,400.00
Total Expenditures	212,850.00

Companies financial statements dataset

- **Data source:** Bureau Van Dijk AIDA database of Italian companies' financial statements.
- **Data selected:** 54,358 ordinary financial statements of Italian registered companies for the year 2017.
- **Elements details:** each financial statement contains 240 line items (including sub-items) of which 163 come from the balance sheet and 77 from the income statement.

Benford law applied on all elements of the financial statements of all companies



Benford's law applied to each line item, on all values from all companies

- **Objective:** identify the line items that are more exposed to manipulations.
- **Use:** non-Benford compliant line items can drive auditors' analyses.
- **Results:** 215 of 240 line items with at least 30 non-zero values analyzed. Of the 215 line items, 71 (33%) comes from the income statement (IS) and 144 (67%) from the balance sheet (BS).

Results of the Benford test on each line item

- 58 line items are **Benford** according to the first, second, first and second digits tests. Of these, 22 from IS and 36 from BS.
- 55 line items are **non-Benford** according to the first, second, first and second tests. Of these, 18 from IS and 37 from BS.
- 102 line items present incoherent test results.

Some items which are always Benford

Line Item	Financial Statement	Results
Amortization of material assets	IS	B
Current taxes	IS	B
Anticipated taxes	IS	B
Deferred taxes	IS	B
Amortization fund of material assets	BS	B
Tax debts	BS	B
Supplier debts	BS	B

Some items which are always non-Benford

Line Item	Financial Statement	Results
Amortization of immaterial assets	IS	NB
Credit devaluation	IS	NB
Provision for risks	IS	NB
Legal reserve	BS	NB
Surcharge reserve	BS	NB
Common stock	BS	NB
Participation in other companies	BS	NB

Fondi Lega, the sentence on reimbursed frauds: Umberto Bossi and Francesco Belsito were also convicted on appeal

of FQ | 26 November 2018



In Genoa confirmed convictions and confiscation of 49 million. Penalties lower than the first degree because in the meantime the 2008 fraud was prescribed. According to the accusation, the party now led by Matteo Salvini obtained the electoral reimbursements against the Parliament, between 2008 and 2011, falsifying reports and the balance. More mild penalties also for former reviewers all found guilty of undue receipt of disbursements to the detriment of the State after the reformulation of the crime

ENGLISH

Minister Salvini, it is Time to Tell the Truth About the Money of the Lega

Where does the money raised by the party of Italy's vice Prime Minister come from? And who is lying about the association involved in funding the Lega that our investigative reporting unearthed? L'Espresso pieced the financial galaxy of the Italian government party Lega and the too many inconsistencies that prompted prosecutors in Rome and Genoa to coordinate their probes together.

DI GIOVANNI TIZIAN AND STEFANO VERGINE

06 luglio 2018



LA STAMPA



“Falso il bilancio 2010” Fini blocca 17 milioni di rimborsi alla Lega

La lettera, su carta intestata della Presidenza della Camera e firmata da Gianfranco Fini, è arrivata ai primi d'agosto al nuovo segretario amministrativo della Lega Nord, Stefano Stefani. E non ha precedenti, perchè contesta ai vertici del Carroccio di avere falsificato i bilanci del 2010 e dunque di non avere diritto ai rimborsi elettorali di quell'anno. Una ventina di righe, non di più che non hanno certo fatto piacere ai vertici del Carroccio e che sono state trasmesse dal legale di via

Applying Benford's Law to Political Parties

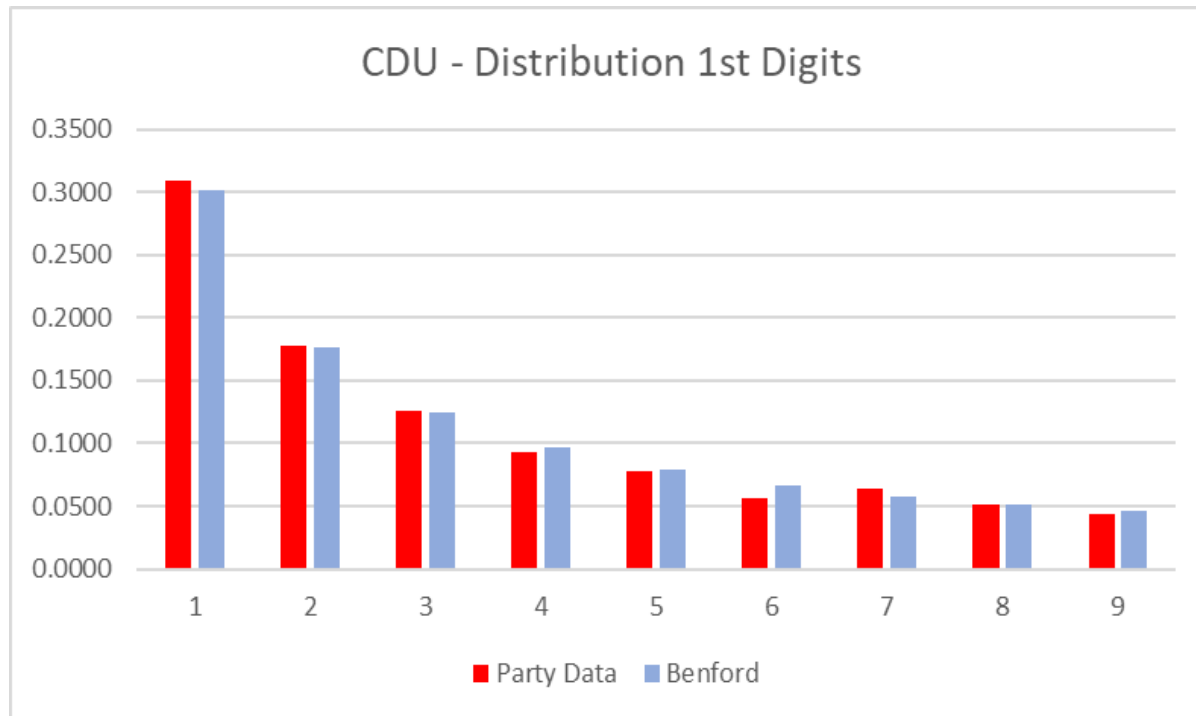
- **Objective:**
 - Can Benford's Law be applied to financial statements of political parties?
 - And if yes, can it find inconsistencies?
 - We take the case of the Lega Nord to find this out and compare it to another major European political party

Applying Benford's Law to Political Parties

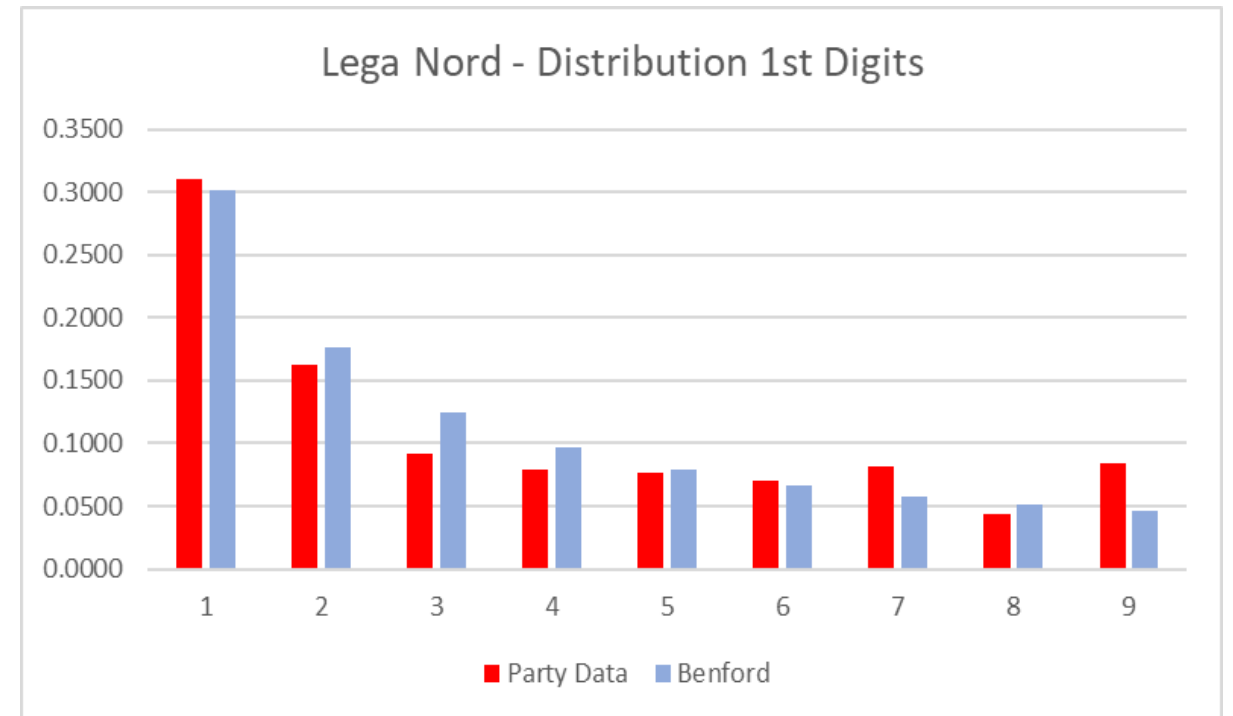
- **Data source:**
 - Gathered data of political parties directly from party's websites or national databases
- **Data selected:**
 - Selected the last 12 years of available data from financial statements, including BS and IS, for both the Lega Nord and Germany's CDU
 - All totals, subtotals, missing values, and values below 0 were excluded from the analysis

Results I

- Results according to the first digit test on the financial statement data for the CDU and Lega between 2005-2016:



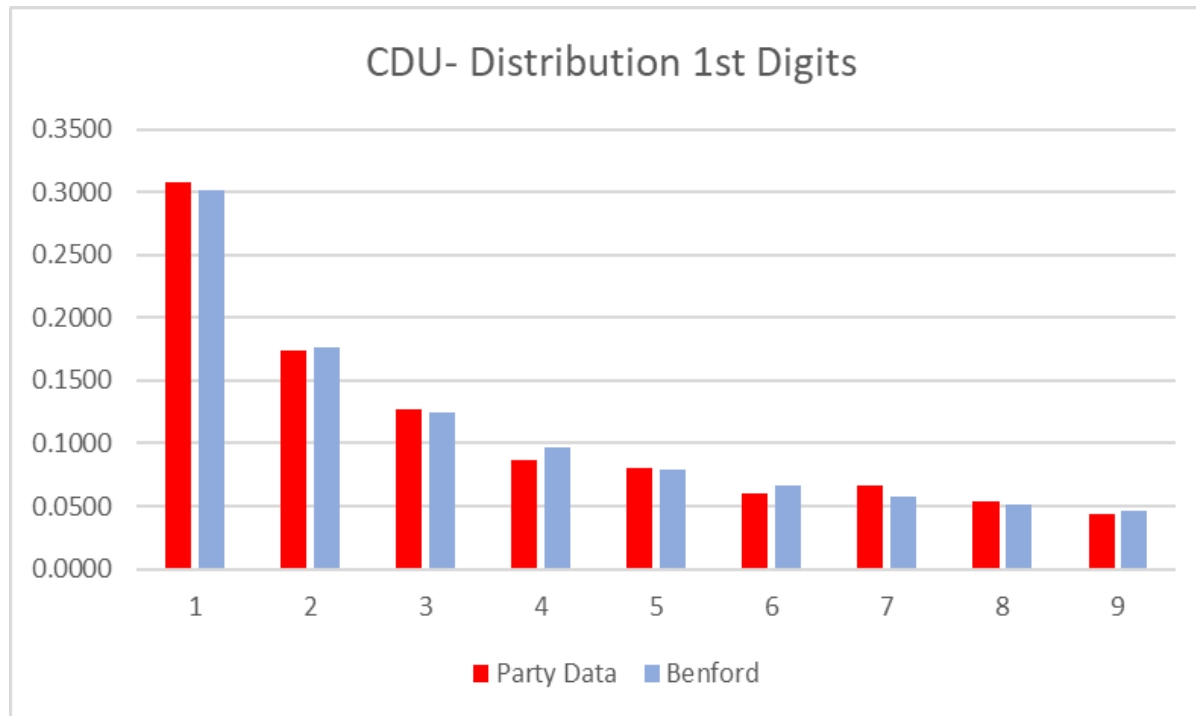
chi square = 7.2191



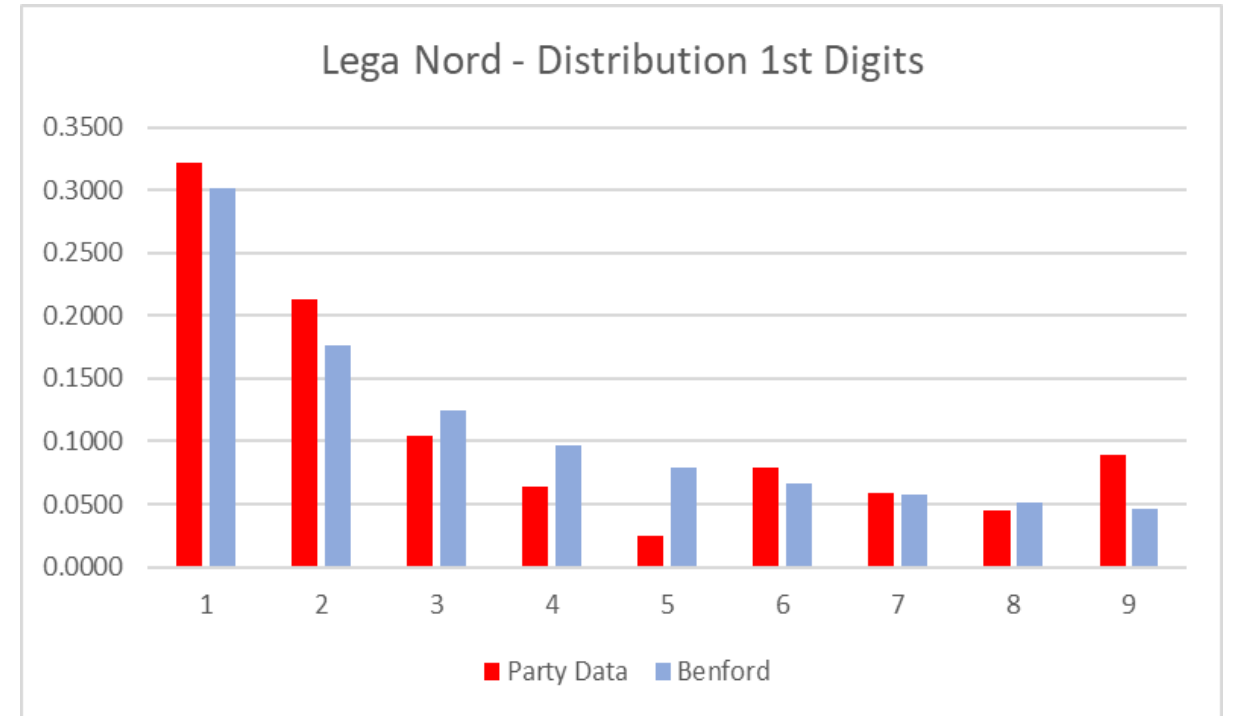
chi square = 29.0910

Results II

- Results according to the first digit test on the financial statement data for the CDU and Lega between 2008-2011:



chi square = 8.3010



chi square = 23.2440

Applying Benford's Law to (more) Political Parties

- Expanded our research to political parties across Europe
- **Data selected:**
 - Collected financial statement data for 28 political parties from different political spectrums across 11 countries for the last 4 years of available data
 - That's 232 financial statements and a total of 8595 values.

Overview of the Data

County	Political Party	Political Position	Years of Data	# of Values	Results 1st digit	Results 2nd digit
Austria	Party 1	Right-wing to far-right	2013-2016	594	NB	B
Austria	Party 2	Centre-right	2013-2016	724	B	B
Austria	Party 3	Centre-left	2013-2016	669	B	B
Belgium	Party 4	Centre-right to right-wing	2014-2017	475	B	B
Belgium	Party 5	Centre-left	2014-2017	564	NB	B
Belgium	Party 6	Centre-right	2014-2017	451	NB	B
France	Party 7	Right-wing to far-right	2014-2017	189	NB	NB
France	Party 8	Centre-right	2014-2017	212	B	B
France	Party 9	Centre-left	2014-2017	237	B	B
Germany	Party 10	Right-wing to far-right	2013-2016	226	B	B
Germany	Party 11	Centre-right	2013-2016	266	B	B
Ireland	Party 12	Center-right	2015-2017	256	B	B
Ireland	Party 13	Center-right	2015-2017	202	B	B
Italy	Party 14	Centre-right	2014-2017	216	B	B
Italy	Party 15	Right-wing to far-right	2013-2016	191	NB	NB
Italy	Party 16	Centre-left	2014-2017	190	B	B
Latvia	Party 17	Center-left	2014-2017	241	B	B
Latvia	Party 18	Right-wing to radical right	2014-2017	270	B	B
Luxembourg	Party 19	Center to center-right	2014-2017	244	B	B
Luxembourg	Party 20	Center to center-right	2014-2017	366	B	B
Luxembourg	Party 21	Center-left	2014-2017	302	NB	B
Malta	Party 22	Center-left	2015-2017	160	B	NB
Malta	Party 23	Center-right	2015-2017	137	B	B
Spain	Party 24	Centre-right to right-wing	2014-2017	249	B	B
Spain	Party 25	Left-wing to far-left	2014-2017	204	NB	B
UK	Party 26	Centre-right	2014-2017	194	B	B
UK	Party 27	Right to far-right	2014-2017	321	B	B
UK	Party 28	Centre-left	2014-2017	245	B	B

Results of the Benford test on 28 political parties

County	Political Party	Political Position	Years of Data	# of Values	Results 1st digit	Results 2nd digit
Austria	Party 1	Right-wing to far-right	2013-2016	594	NB	B
Austria	Party 2	Centre-right	2013-2016	724	B	B
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Germany	Party 11	Centre-right	2013-2016	266	B	B
Ireland	Party 12	Center-right	2015-2017	256	B	B
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Spain	Party 25	Left-wing to far-left	2014-2017	204	NB	B
UK	Party 26	Centre-right	2014-2017	194	B	B
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Applying Benford's Law on all line items of the financial statements of political parties

- **Data selected:**

- financial statements of 518 political parties and organizations ranging from 2002-2017
- each financial statement contains 113 line items (including sub-items) of which 40 come from the balance sheet and 73 from the income statement

Results of the Benford test on individual line items

Out of the 113 line items:

- 31 are Benford according to the first, second, first and second digits tests. Of these, 23 from IS and 8 from BS
- 16 are non-Benford according to the first, second, first and second tests. Of these, 5 from IS and 9 from BS
- 66 present incoherent test results

Some items which are always either Benford or non-Benford

Line Item	Financial Statement	Results
Salaries	IS	B
Social contributions	IS	B
Legal costs	IS	B
Income from party activity	IS	B
Communication	BS	B
Membership subscription	IS	NB
Public Financing	IS	NB
Financial assets	BS	NB
Reserves	BS	NB
Provisions	BS	NB

Conclusions

- Transparency issues
 - Not all parties publish the same amount of information
 - The quality and quantity of information varies substantially between countries and even within a country
 - The data format varies from database format to handwritten financial statements
 - Many countries lack a national database where all the data being published in one place



Any questions?

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