

# Banks through the Lens of the Media

Eva A. Arnold

Hochschule Fresenius, senticon GmbH

Narodowy Bank Polski and SGH Warsaw School of Economics  
Conference

*Recent trends in the real estate market and its analysis – 2023 edition*

29 November 2023

# Outline

Motivation

Text data

Bank Coverage and Sentiment Analysis

Media Bias

Conclusion

## Why news on banks?

### Media's impact on risk perception

- ▶ Using banks' balance sheet data, a previous study has shown that German private depositors react to bank risk (Arnold et al., 2016).
- ▶ The Basel Committee additionally acknowledges that even if banks disclose their condition publicly, depositors are not able to monitor banks effectively due to a lack of training.
- ▶ Especially in times of financial crises, information on banks is crucial in preventing undesirable events as bank runs.
- ▶ Slovic (1986) highlights the media's great significance for informing and educating the general public about risk.
- ▶ Indeed, the Basle Committee on Banking Supervision (1998) considers the media as a secondary source of information, on which market participants may rely as a replacement for credible and comprehensible public disclosure of bank risks.
- ▶ Yet, we don't know the media's role in informing the general public about bank risk.

## Research Questions

- ▶ The main research questions are:
  1. Which banks and bank types are covered?
  2. How does the media evaluate banks and bank types?
  3. Do we find systematic differences between local and national outlets?
  
- ▶ This is the first study on bank coverage and sentiment in the media that considers
  - ▶ all bank types Differences in Governance Models
  - ▶ regional and national newspapers
  - ▶ the period 2007-2012

## Appropriate news sources

- ▶ The German population ranks daily newspapers as the second important news source after public service broadcasting authorities (Jackob et al., 2019).
- ▶ Moreover, Kearney and Liu (2014) emphasize that a wide selection of news sources should be used.
- ▶ We collect articles from the database *LexisNexis*, *Handelsblatt*, and *Frankfurter Allgemeine Zeitung (FAZ)*. In total, we analyze
  - ▶ 457,398 articles
  - ▶ from 51 regional and 6 national daily newspapers
- ▶ Articles are included if they contain the word (part) “bank” or “Sparkasse” (savings bank), capturing individual bank names, bank types as well as additional institutions like Bundesbank, ECB, BaFin.
- ▶ For our analyses we use 224,446 articles that contain information on 1,514 **individual** banks.
- ▶ We identify 1,071 (1,129) unique banks in national (regional) newspapers.
- ▶ We can infer which banks are connected through the eyes of daily newspapers.

## Regional newspapers and covered banks

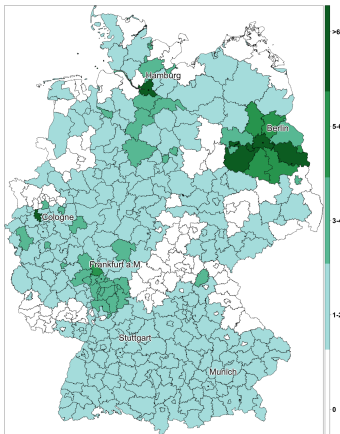


Figure 1: Regional Newspapers

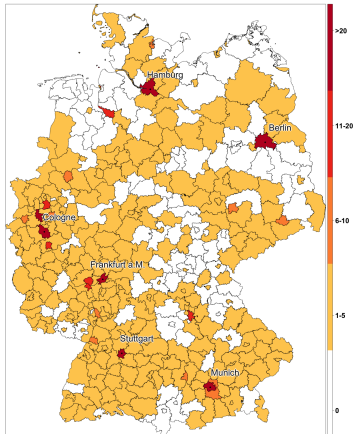
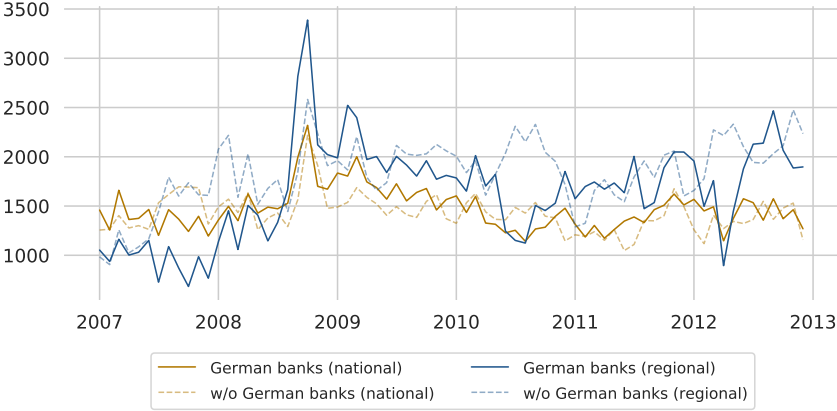


Figure 2: Covered Banks

Source: Geographical data is from <http://gadm.org/>. Data on newspaper coverage is from ZMG-Verbreitungsanalyse (2015). Bank names and their postal codes are kindly provided by the Deutsche Bundesbank and were broadened to include variations in spellings. Own visualization.

# Monthly coverage in regional and national daily press 2007-2012



## Sentiment analysis

- ▶ Media-expressed sentiment reflects the positive or negative tone contained in these news stories.
- ▶ We use a dictionary  $D^{SWS}$  containing sentiment-bearing words  $w^{SWS}$  from Remus et al. (2010), where

$$D^{SWS} = \{w^{SWS} \mid w \in L\}.$$

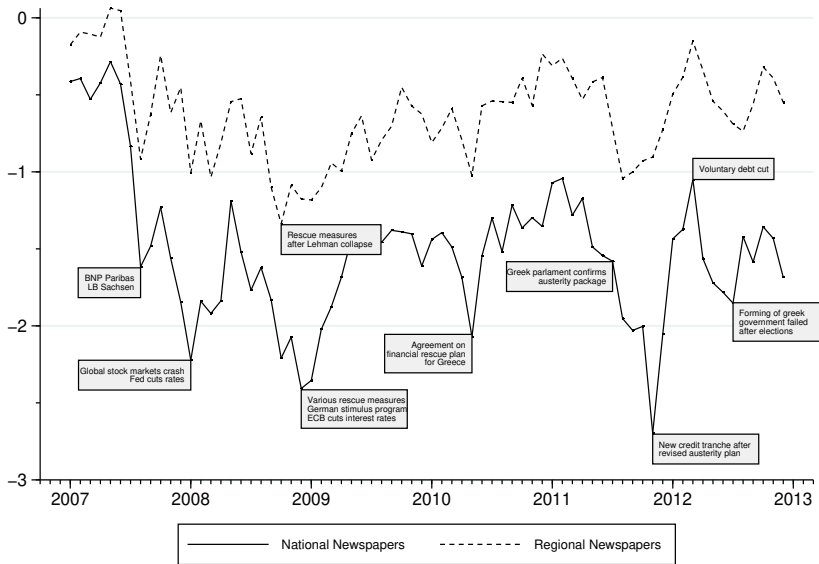
- ▶ Furthermore, each sentiment word  $w^{SWS}$  is assigned a polarity score  $c^{SWS} \in \{1, \dots, c\}$ :

$$c^{SWS} = \begin{cases} \{c^{SWS} \mid -1 \leq c^{SWS} < 0\} & \text{negative tone} \\ \{c^{SWS} \mid 0 > c^{SWS} \leq 1\} & \text{positive tone} \end{cases}$$

- ▶ For each piece of text the sum of identified polarity weights reflects the sentiment of this text.



# Overall average article-based sentiment



Source: LexisNexis, Handelsblatt, FAZ, own calculations

## Identifying Bank-Related Coverage

- ▶ We are primarily interested in individual bank coverage.
- ▶ However, newspaper articles are comparably long and can contain multilayered information.
- ▶ We deal with this by assuming that content belonging together also is located semantically close to each other (Rössler, 2010).
- ▶ Therefore, information on banks should occur in the neighborhood of bank names.

### Definition of a bank statement

A bank statement comprises the sentence in which the bank occurs, together with one preceding and one succeeding sentence.

- ▶ This procedure yields 699,789 statements:
  - ▶ 402,807 on individual banks and
  - ▶ 296,982 statements on bank types or institutions.

# Sentiment Analysis

## Differences in sentiment between national and regional outlets

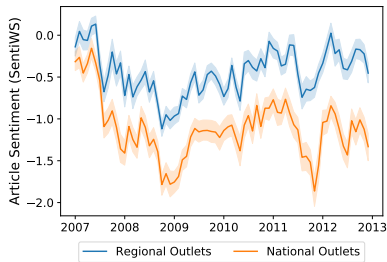


Figure 3: Article-based sentiment

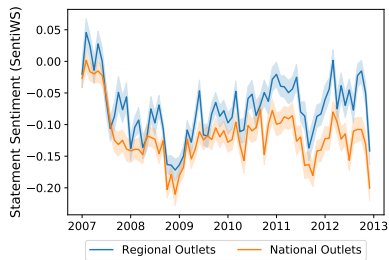


Figure 4: Statement-based sentiment

Source: LexisNexis, Handelsblatt, Frankfurter Allgemeine Zeitung (FAZ), own calculations.

Notes: Calculations are based on articles containing information on individual banks, bank types and institutions, respectively.

# Media Bias

## Monthly bank type coverage and sentiment in national and regional outlets

- ▶ Bank types receive different amounts of attention in regional and national news outlets.

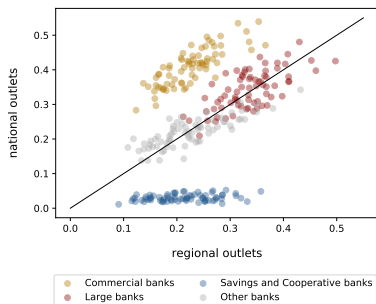


Figure 5: Attention to bank types

- ▶ The average monthly sentiments for savings banks is higher in regional than in national newspapers.

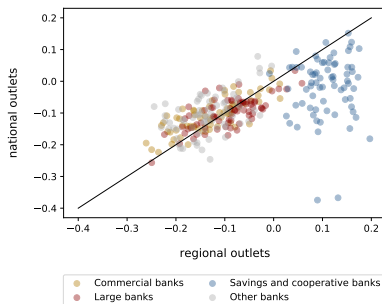


Figure 6: Average bank type sentiment

Source: LexisNexis, Handelsblatt, Frankfurter Allgemeine Zeitung (FAZ), own calculations.

Notes: Calculations are based on articles containing information on individual banks, bank types and institutions, respectively.

## Bank Network

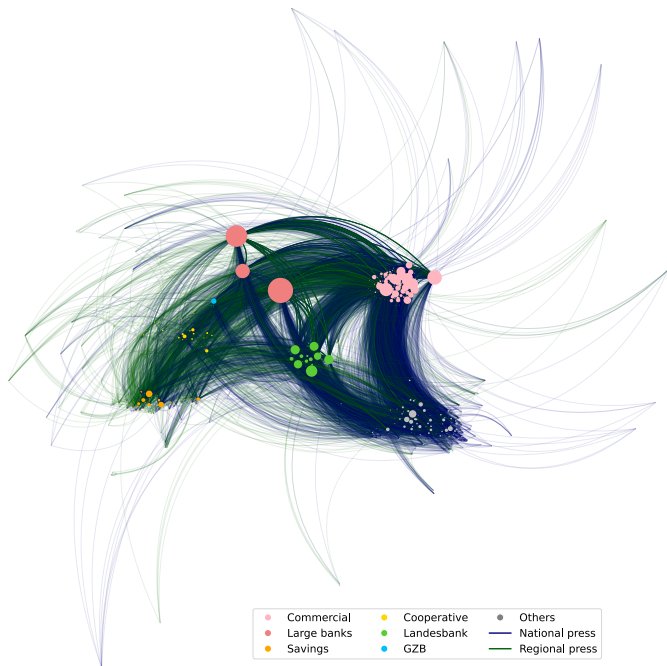
- ▶ The set  $N = 1, \dots, n$  of nodes represents banks covered in articles.
- ▶ An undirected link  $g_{ij} = g_{ji}$  is formed for articles mentioning bank  $i$  and bank  $j$  such that  $ij \in g$ .
- ▶ Links receive the attributes news source  $r_g \in \textit{regional}, \textit{national}$ , and average normalized *SentiWS*-sentiment  $s_g \in [-1; 1]$ .
- ▶ To elaborate the relationship between bank types, banks of the same bank type  $k_i = k_j$  are graphically pulled together by setting a community-weight  $w$  for a link between the two banks  $g_{ij}^k$  to

$$w_k = \begin{cases} 10 & \forall ij \in \{k\} \\ 1 & \text{else.} \end{cases}$$

- ▶ We measure banks' size by nodes' degrees in the network  $g$ , where a node  $i$ 's degree  $d_i(g)$  is

$$d_i(g) = \#\{j : g_{ij} = 1\} = \#N_i(g).$$

# Bank Network Visualization



# Regression Analysis

## Testing for two types of media bias

1. Outlets can be biased based on **banks' location** due to a “customer proximity” effect to benefit advertisers (Baker, 1992; Ellman & Germano, 2009; Reuter & Zitzewitz, 2006):

### Customer proximity bias

**H1:** Regional outlets evaluate close banks more positively than national newspapers.

**H2:** National outlets evaluate strongly connected banks more favorably than regional newspapers.

2. Outlets may slant towards **bank types** in order to match their readers' interests and divide the market for news (Mullainathan & Shleifer, 2002, 2005):

### Ideological Bias

**H3:** Regional newspapers report less negatively about savings and cooperative banks than national outlets.

**H4:** National newspapers evaluate commercial banks less negatively than regional papers.

## Difference-in-difference estimations

The general estimation approach follows DellaVigna and Hermle (2017):

$$sent_{m,o} = \alpha + \beta_1 D_m + \beta_2 D_o + \gamma D_m * D_o + \epsilon_{m,o}, \quad (1)$$

where  $sent_{m,o}$  is a sentiment-score of bank  $m$  in outlet  $o$ .

The indicator variables vary depending on the hypothesis:

- ▶ The dummy variable  $D_m$  indicates whether
  - H1: bank  $m$  is close to the outlet,
  - H2: bank  $m$  has a central position in the bank network,
  - H3: bank  $m$  belongs to the group of savings and cooperative banks,
  - H4: bank  $m$  belongs to the group of commercial banks.
- ▶ The dummy variable  $D_o$  indicates the type of outlet (regional or national).
- ▶ **The interaction term  $D_m * D_o$  captures potential media biases.**



## Testing for media bias in outlet's bank sentiment $sent_{m,o}$

Dependent variable	Sentiment score (SentiWS) for bank $m$ in national outlet $o$			
	(H1)	(H2)	(H3)	(H4)
<b>Hypothesis</b>				
<b>Panel A: Regional Newspapers</b>				
Indicator for close bank	-0.0042			
Indicator for regional outlet	0.0435*			
Indicator for close bank in regional outlet	<b>0.0186</b>			
Indicator for region-oriented bank			-0.1419***	
Indicator for regional outlet			0.0445*	
Indicator for region-oriented bank in regional outlet			<b>0.0607***</b>	
<b>Panel B: National Newspapers</b>				
Indicator for highly connected bank		0.1130***		
Indicator for national outlet		-0.0710**		
Indicator for highly connected bank in national outlet		<b>0.0272**</b>		
Indicator for commercial bank				0.0661***
Indicator for national outlet				-0.0655**
Indicator for commercial bank in national outlet				<b>0.0354***</b>
Constant	-0.0947***	-0.1636***	-0.0947***	-0.0404
$R^2$	0.04	0.04	0.04	0.04
Observations	468.509	468.509	468.509	468.509
Number of banks	677	677	677	677
Number of statements with conflict of interest	71.938	219.830	25.415	158.063

Note: Estimations include time, bank, and outlet fixed effects. Banks that are only covered in regional or national newspapers are excluded. Sentiment scores are calculated using the *SentiWS*-dictionary from Remus et al. (2010) for statements in bank-related articles from *LexisNexis*, *Handelsblatt*, and *Frankfurter Allgemeine Zeitung (FAZ)*. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. Standard errors are clustered by bank.

# How Does the Media Cover Banks?

## Conclusions

- ▶ Newspapers cover a wide range of banks and capture information on individual banks, bank types, and systemic risks.
- ▶ National outlets assess banks more critically than regional newspapers, on average.
- ▶ This is mainly driven through regional newspapers' relatively positive sentiment towards savings and cooperative banks.
- ▶ News outlets divide the market for news depending on bank type:
  - ▶ Regional newspapers slant towards local banks.
  - ▶ National newspapers slant towards private and highly connected banks, respectively.
- ▶ Media-based risk measures should therefore use many different news sources in order to
  - ▶ gather information on all bank types from all regions and
  - ▶ mitigate the effect of media bias.

THANK YOU FOR YOUR ATTENTION!

## Variety of Bank Governance Models in Germany

	Commercial banks	Savings banks	Cooperative banks
<b>Ownership</b>	Privately owned Operate mainly as stock-holding companies Regional banks under private law	Independent institutions Subject to public law	Owned by their members
<b>Objective</b>	Profit maximization	Economic welfare of their region	Well-being of their members
<b>Intra-group Organization</b>	Competition btw individual banks Independent Organizations	No competition between the members of the financial network Embedded in their own financial association network Support member banks to enhance the supply of financial services Network acting as clearing house and internal capital market	
<b>Deposit Insurance</b>	At the level of the respective umbrella association Funds depend on banks' riskiness		
	Auditing association can impose extra conditions Guarantees a bank's deposits up to 30% of the liable capital (until 2014) <b>Since 2009 formal right protects deposits up to 100,000 €</b>	Auditing and monitoring system Additionally provision of management training programmes  <b>Institutional guarantee</b>	

# Collecting and processing text data

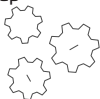
## Data Sources



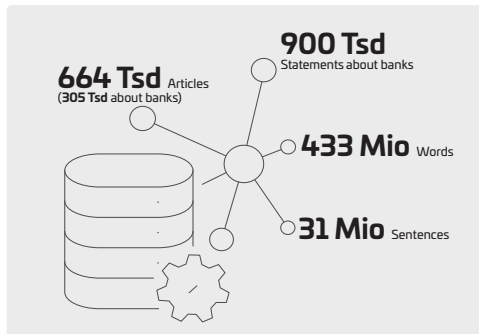
Lexis Nexis  
FAZ  
Handelsblatt

 **9.3 Gb** raw data

## Cleanup



- ⌘ Remove irrelevant categories
- ⌘ Remove event calendars
- ⌘ Remove sheets (stock market etc)



## Text Mining



- ⌘ Identify banks
- ⌘ Identify "relevant" articles
- ⌘ Calculate Sentiments and Readability



## From text to data

- ▶ For a statistical analysis, the text needs to be transformed into a document-term matrix (DTM)  $\mathbf{M}$ .

$$\mathbf{M}_{i \times j} = \begin{matrix} & \text{word}_1 & \text{word}_2 & \dots & \text{word}_j \\ \begin{matrix} \text{doc}_1 \\ \text{doc}_2 \\ \vdots \\ \text{doc}_i \end{matrix} & \begin{pmatrix} n_{11} & 0 & \dots & n_{1j} \\ 0 & n_{22} & \dots & n_{2j} \\ \vdots & \vdots & \ddots & \vdots \\ n_{i1} & 0 & \dots & n_{ij} \end{pmatrix} \end{matrix} \quad (2)$$

- ▶ Rows correspond to  $i$  text documents and columns represent the various words  $w_j$  used in the documents that are drawn from a set of possible words  $\Sigma^*$  over the alphabet  $\Sigma$  of the German language  $L$ .
- ▶ Each line, thus, contains a vector  $\mathbf{w}$  of all words  $w^i$  used in this text  $i$ , where

$$L^i = \{w^i \mid w \in L\}.$$

## Readability ease measure

- ▶ For newspaper articles only formal indicators based on statistical measures are manageable due to long text lengths.
- ▶ We use the Flesch Readability Ease ( $RE$ ) measure (Flesch, 1948), adapted for the German language by Amstad (1978):

$$RE_i^{FA} = 180 - 58.5wl_i - sl_i \quad (3)$$

- ▶ The average word length  $wl_i$  indirectly captures word complexity.
- ▶ Sentence complexity is measured by texts' average sentence length  $sl_i$ .
- ▶  $RE_i^{FA} \rightarrow 100$  indicates elementary texts;
- ▶ highly difficult texts result in  $RE_i^{FA} \rightarrow 0$
- ▶ Bank-related articles are, on average, slightly (but statistically significant) easier to read in regional ( $RE_i^{FA} = 50.4$ ) compared to national newspapers ( $RE_i^{FA} = 49$ ).

# Text Data

## Different Sentiment Measures

1.  $BankS_{i,\tau}$ 
  - ▶ article sentiment regarding bank  $i$  in outlet  $o$  at publication date  $\tau$  that lies within a month  $t$
  - ▶ a proxy for idiosyncratic risk of banks  $i$  belonging to bank type  $k$
2.  $BankS_t$ 
  - ▶ monthly average across all bank-related sentiment
  - ▶ a proxy for the systemic risk in the banking sector that could enhance panics in times of a banking crisis (Goldstein, 2013)
3.  $BankS_{k,t}$ 
  - ▶ monthly average article sentiment across all articles referring to individual banks belonging to bank type  $k$  within a month  $t$
  - ▶ captures the bank type-specific average sentiment in the news concerning any bank of bank type  $k$
  - ▶ accounts for information regarding a given bank potentially propagating to other banks of the same bank type.
4.  $TypeS_{k,t}$  is the monthly sentiment of articles mentioning bank type  $k$  explicitly



# References

- Amstad, T. (1978). *Wie verständlich sind unsere Zeitungen?* [Doctoral dissertation, Universität Zürich].
- Arnold, E., Gröbl, I., & Koziol, P. (2016). Market discipline across bank governance models: Empirical evidence from German depositors. *The Quarterly Review of Economics and Finance*, 61, 126–138.
- Baker, C. E. (1992). Advertising and a democratic press. *University of Pennsylvania Law Review*, 140(6), 2097–2243.
- Basle Committee on Banking Supervision. (1998). Enhancing bank transparency: Public disclosure and supervisory information that promote safety and soundness in banking systems. <http://www.bis.org/publ/bcbs41.pdf>
- DellaVigna, S., & Hermle, J. (2017). Does Conflict of Interest Lead to Biased Coverage? Evidence from Movie Reviews. *Review of Economic Studies*, 84(4), 1510–1550.
- Ellman, M., & Germano, F. (2009). What Do That Papers Sell? A Model of Advertising and Media Bias. *The Economic Journal*, 119(537), 680–704. <http://www.jstor.org/stable/20485340>
- Flesch, R. (1948). A new readability yardstick. *Journal of applied psychology*, 32(3), 221–233.
- Goldstein, I. (2013). The evidence and impact of financial globalization. <https://doi.org/http://dx.doi.org/10.1016/B978-0-12-397874-5.00038-5>
- Jacob, N., Schultz, T., Jakobs, I., Ziegele, M., Quiring, O., & Schemer, C. (2019). Medienvertrauen im Zeitalter der Polarisierung. *5/2019*, 210–220.
- Kearney, C., & Liu, S. (2014). Textual sentiment in finance: A survey of methods and models. *International Review of Financial Analysis*, 33, 171–185. <https://doi.org/10.1016/j.irfa.2014.02.006>
- Mullainathan, S., & Shleifer, A. (2002, October). *Media Bias* (Working Paper No. 9295). National Bureau of Economic Research (NBER). <https://doi.org/10.3386/w9295>
- Mullainathan, S., & Shleifer, A. (2005). The market for news. *American Economic Review*, 95(4), 1031–1053.
- Remus, R., Quasthoff, U., & Heyer, G. (2010). SentiWS – a Publicly Available German-language Resource for Sentiment Analysis. *Proceedings of the 7th International Language Resources and Evaluation (LREC'10)*.
- Reuter, J., & Zitzewitz, E. (2006). Do ads influence editors? Advertising and bias in the financial media. *The Quarterly Journal of Economics*, 121(1), 197–227.
- Rössler, P. (2010). *Inhaltsanalyse*. UTB basics.
- Slovic, P. (1986). Informing and Educating the Public about Risk. *Risk Analysis*, 6(4), 403–415.