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Pressure is high – and rising

The Inflation Perception Indicator (IPI) to 30 April 2022 – a Research Note Analysis

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1. Introduction

For inflation to become a self-enforcing process, expectations need to adjust to rising cost-of-living levels. Consumers demand higher wages to make up for prospectively dearer products; companies pass higher costs on to customers; governments try to compensate recipients of transfers for lost real incomes. When inflation is becoming “entrenched”, in central banking lingo, it’s getting hard to slow down. For decades, this wasn’t a problem, as inflation was stubbornly low, some thought too low, and consumers’, companies’ and investors’ inflation expectations were “well-anchored”. Over the past months, though, the landscape has changed drastically.

Inflation rates have soared, starting in the fall of 2021, and one of the most pressing economic policy questions at present is to what extent they are feeding into expectations. A recent survey conducted by Deutsche Bundesbank found that German citizens expected CPI rises of seven per cent over the next twelve months, five per cent over five years, and only a little less over the next ten years.¹ However remarkable these figures are, given that expectations roughly doubled in less than a year, they warrant some caution. They may simply represent a snapshot at a time of elevated uncertainty following a series of highly unusual events that have hit the economy, namely the Covid-19 pandemic and ensuing supply bottlenecks, extraordinary stimulus packages on both sides of the Atlantic, and the Russian invasion of Ukraine. As people tend to extrapolate the recent past, they may be over-reacting. It’s not inconceivable that inflation expectations will come down as soon as it becomes clear that “peak inflation” has been reached and price level rises start subsiding, as some analysts are predicting now for the US economy.

A blooming field of research is dealing with how people actually form inflation expectations (Andre et al. 2022; Carroll 2003; Coibion et al. 2018; Conrad et al. 2021). Besides personal experience media consumption is a major influence. By watching TV news, reading newspapers or websites, citizens inform themselves about what’s going on in the society they live in. Thereby, they not only pick up some numeric values of inflation rates and professional forecasters predictions, but also narratives about the particular causes and consequences of inflation. What drives prices? Who is to blame? Who are the victims, who are the villains? What can individuals and policy makers do about it?

To map the narrative landscape, we’ve constructed the Inflation Perception Indicator, IPI (see Müller et al. (2022) for details). It’s based on a corpus of roughly three million articles published by German broadsheet newspapers. Making use of a newish dynamic topic modeling approach, RollingLDA (Rieger et al. 2021), the IPI enables us to isolate reporting patterns with regard to inflation, that can be interpreted as national media narratives. In Müller et al. (2022), we presented the model and the initial results up to February 28 2022. This short research note provides an update, factoring in data up to April 30. The next section presents our most recent findings. Section 3 draws some conclusions. The appendix gives a brief overview of the method and the IPI model.

¹ See <https://www.bundesbank.de/en/bundesbank/research/survey-on-consumer-expectations/inflation-expectations-848334>

2. Results: New Territories, Old Fears

Inflation has become one of the major issues in political discourse. About a tenth of newspaper articles published in April 2022 dealt with inflation in some way, up from two per cent a year ago (Figure 1). The current focus on inflation is also far above the historical norm; between 2001 and 2021 an average of two and half per cent of newspaper coverage was concerned with inflation. Starting in the fall of 2021, post-Covid price surprises gradually took center-stage. The war in Ukraine and the ensuing scarcities of oil, gas, grains, other raw materials and some intermediate products due to military actions, boycotts and embargos, or the fear thereof, have aggravated the situation since.

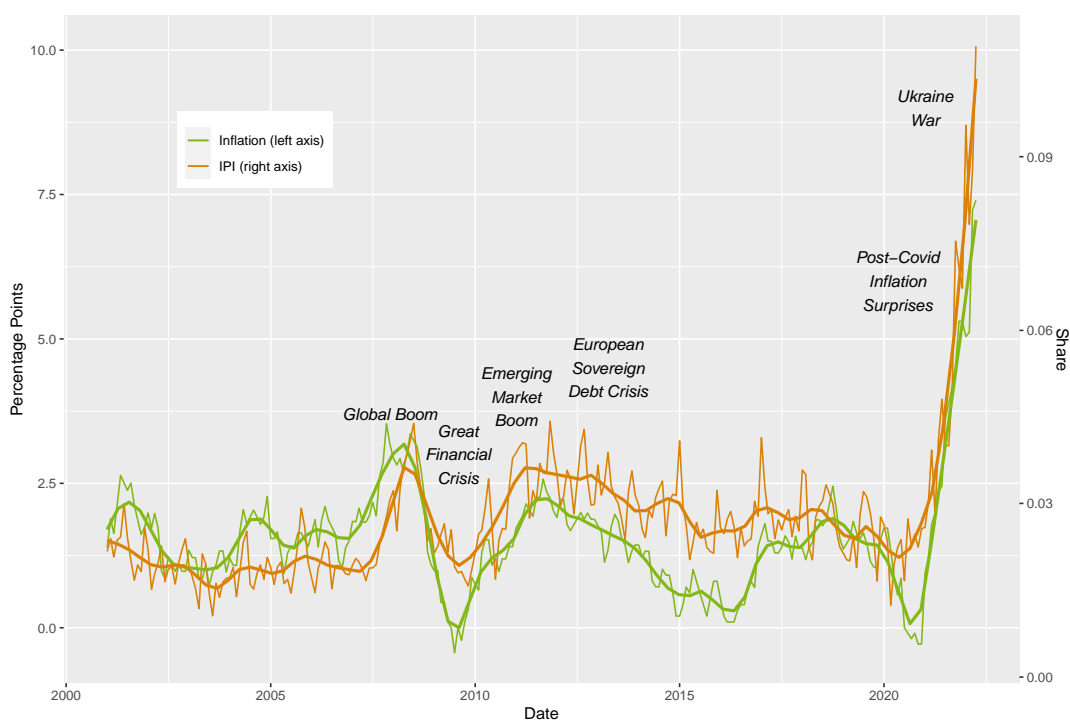


Figure 1: Inflation (CPI for Germany, y-o-y percentage change) and overall IPI (rhs) (share of analysis corpus relative to entire corpus). Source: authors' calculations, Deutsche Bundesbank

While it may hardly be surprising that the coverage of a phenomenon is roughly in line with its prevalence in statistics and markets over most of the time-span covered, the key question is what's behind the figures. After all, it's not just pure numbers that inform people's expectations, but also the associated explanations and circumstances. Following Conviction Narrative Theory (Tuckett and Nikolic 2017), inflation expectations are most likely to shift permanently, becoming "entrenched", if inflation figures – and personal experiences – are accompanied by a convincing and easy-to-grasp economic narrative: socially shared convictions concerning the causes and consequences of inflation. By narratives we mean collectively shared stories, since it is the social dimension of a narrative

that provides for much of its persuasive power.² Only if large social groupings share a narrative, it matters in a macroeconomic context. If it makes sense to and is shared by many people, it is also likely to stick and become part of collective memory, henceforth influencing economic behavior and altering the formation of expectations.

The IPI topic modeling analysis makes it possible to disentangle the inflation discourse. Out of nine relevant topics of our model (see Table 1 in appendix) four are related to potential causes of inflation. While raw material prices are an obvious short-term cost-push factor, monetary and fiscal policy are at the core of what economists believe is driving inflation over the medium and long term. Redistribution policies through government transfers and collective wage settlements can be interpreted as secondary drivers of inflation. All of these influences are pictured in Figure 2. Inflation and its causes became an issue during the global boom preceding the financial crisis, when all four topics reached local peaks.

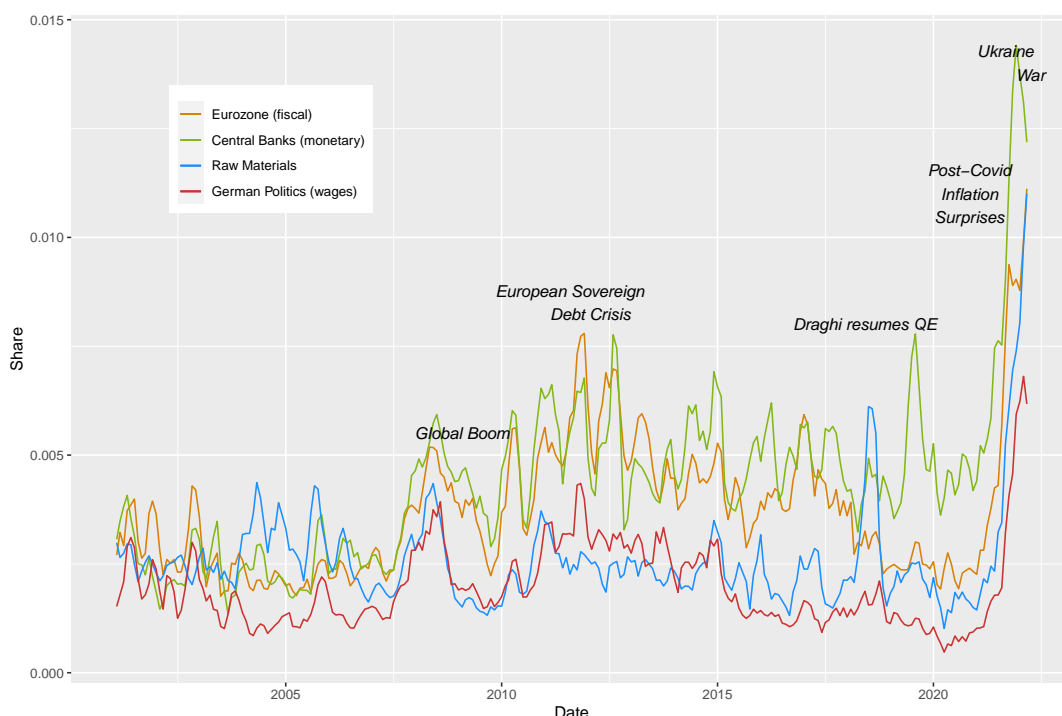


Figure 2: “Causal” IPI topics (three-month moving averages). Source: authors’ calculations

Afterwards, short-term (raw material prices) and secondary factors (wages and transfers) largely faded from inflation discourse. Monetary and fiscal policy stayed on the agenda, though, as the Euro area sovereign debt crisis raised questions about the sustainability of public finances and the appropriateness of the European Central Bank’s loose policies. As the crisis petered out, the debate lost some steam, though criticism of the ECB caused a temporary spike when outgoing president Mario Draghi reanimated its bond buying

² We refer to the definition by Roos and Reccius (2021), who state that “a collective economic narrative is a sense-making story about some economically relevant topic that (...) suggests actions” (p. 13). However, Roos and Reccius stress the emanating bottom-up nature of economically relevant narratives, as also suggested by Shiller (2017). Here, we are concerned with the media’s role in narrative formation, that certainly is connected to the bottom-up approach, but particularly stresses the specifics of media environments.

scheme (quantitative easing) in late summer of 2019, and the nomination of former French finance minister Christine Lagarde to be become his successor raised fears of the bank’s politization.

Recently all four causal topics have shot up simultaneously, underlining the breadth and force of price dynamics. In the spring, as the fall-out of the Ukraine war became ever more obvious, raw material prices have come to the fore as inflation drivers, slightly easing the pressure on the ECB to act decisively. Redistribution policies and wage settlements – the second-round effects that may set off a wage-price spiral – have also picked up, but, so far, the debate about compensating citizens for lost real purchasing power remains somewhat subdued.

Turning to the perceived consequences of inflation, three topics can clearly be attributed to this issue (Figure 3). A fourth one, “News”, contains mainly neutral news briefs, a topic that has risen to unprecedented heights as well. The consequences of inflation are mainly seen through the lens of investors. In the past, a primary concern in the “Private Investment” topic was low interest rates that made it hard for average-earners to make positive returns on their savings. Now it is about making portfolios inflation-proof, as well as profiting from still cheap mortgages.

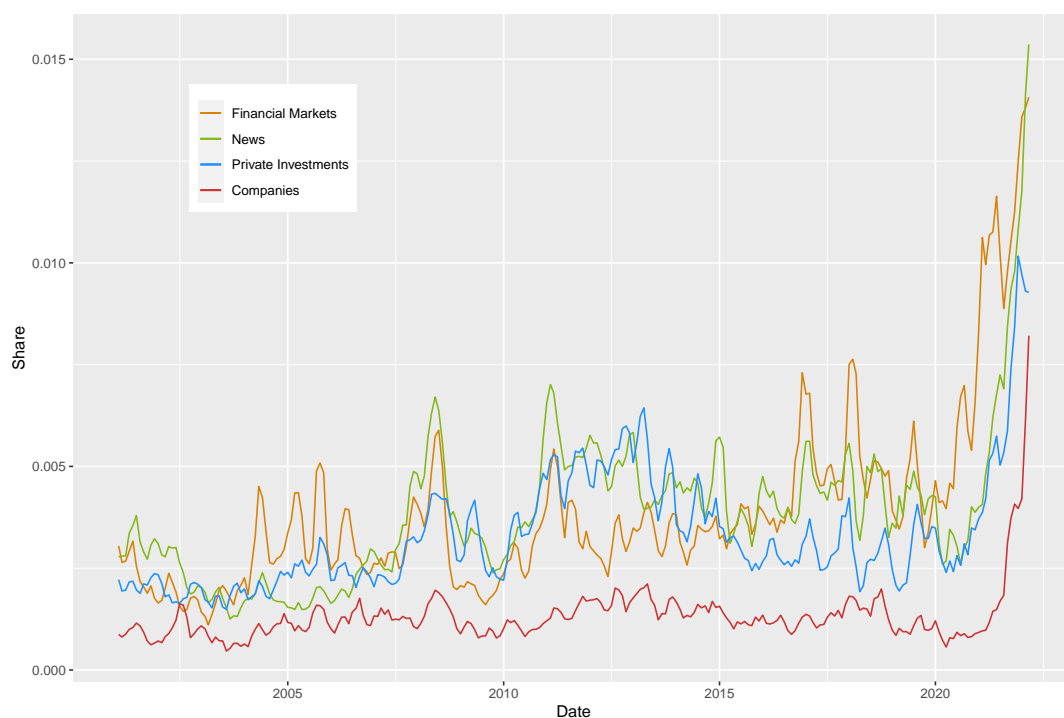


Figure 3: “Consequences” IPI topics (three-month moving averages). Source: authors’ calculations

A striking development is the hike in the “Financial Markets” topic. Over two decades, pronounced inflation wasn’t a key driver of financial markets. Money was cheap, yields were low, quotations high, and when risks arose central banks were ready to step in. Between January 2001 and December 2020, the financial market-associated inflation topic averaged just 0.3 per cent of total news coverage. This has changed rapidly, with the topic’s share increasing five-fold in recent months. As yields rise and central banks are

tightening, or, in the case of the ECB, prepare to do so, financial markets brace themselves for a prolonged period of volatility.

Interestingly, companies' troubles with dearer inputs and upset customers are getting more and more attention, too. In the past, this wasn't much of an issue. Now the recent hike in the topic "Companies" is another indication of the broadening inflationary panorama.

3. Conclusion: How's the story going to continue?

At a time when the atrocities of Russia's invasion of Ukraine and the ongoing war have overwhelmed public attention, the rise in awareness of inflation is an accompanying issue, that affects people personally one way or another. After all, the two developments are directly linked by the increases of energy and raw material prices. The decomposition of the IPI into different aspects shows that raw material prices are being watched more and more intensely. At the same time, the focus of attention shifts slightly away from the ECB. In the current situation, Vladimir Putin occupies center stage in the blame game, taking some public pressure from the ECB in the short term. However, this is unlikely to last, given the strength and breadth of recent price dynamics.

For now, inflation-related awareness of re-distributional issues (wages, social transfers) has not increased any further. The loss of purchasing power has not led the German public to drift into inflation-panic mode, at least not yet. Second-round effects, though, may well become a dominant inflation-related theme in coming months, when collective bargaining rounds in large sectors will be on the domestic agenda.

The current rise of inflation – and the intensity of its reception – may well trigger long-lasting shift in expectations. As economic narratives help anchoring experiences in collective memory, the breadth of the current discourse on inflation will likely leave its marks. Crucially, there's a prelude: German media covered the ECB from a predominantly skeptical point of view over the last decade, even in times when inflation was very low and central bankers fretted about deflation. It doesn't matter whether the generally critical tone was warranted or unfair. What matters is that it spread doubt. And it's these reservations that now resonate with current inflation experiences, leaving the ECB in the difficult spot of being the villain-in-chief in this story.

How is the narrative going to continue? Here's a prediction: the longer the current inflationary trajectory endures, the less it's going to be driven by raw material prices. Instead, domestic factors, monetary and fiscal policy in particular, will be held responsible for letting inflation get out of hand. Hence, for the ECB the communicative situation is likely to get worse, threatening its credibility and consequently making it even harder to reign in price dynamics.

From a communication perspective, it would be better to act sooner and decisively rather than later and hesitantly. The ECB could yet transform its role in the monetary narrative – from villain to inflation-fighting hero. Of course, the central bank's mandate doesn't include striving for popularity in Germany. It's supposed to keep inflation low and steady

and preserve financial stability in the entire euro area. That's tough enough. But the pressure from the public of the currency area's largest member nation is high – and rising.

References

- Andre, Peter, Ingar Haaland, Christopher Roth, and Johannes Wohlfart (2022). “Narratives about the Macroeconomy”. In.
- Blei, David M., Andrew Y. Ng, and Michael I. Jordan (2003). “Latent Dirichlet Allocation”. In: *Journal of Machine Learning Research* 3, pp. 993–1022. DOI: 10.1162/jmlr.2003.3.4-5.993.
- Carroll, Christopher D. (2003). “Macroeconomic Expectations of Households and Professional Forecasters”. In: *The Quarterly Journal of Economics* 118.1, pp. 269–298. DOI: 10.1162/00335530360535207.
- Chang, Jonathan (2015). *lda: Collapsed Gibbs Sampling Methods for Topic Models*. R package version 1.4.2. URL: <https://CRAN.R-project.org/package=lda>.
- Coibion, Olivier, Yuriy Gorodnichenko, and Saten Kumar (2018). “How Do Firms Form Their Expectations? New Survey Evidence”. In: *American Economic Review* 108.9, pp. 2671–2713. DOI: 10.1257/aer.20151299.
- Conrad, Christian, Zeno Enders, and Alexander Glas (2021). *The role of information and experience for households’ inflation expectations*. Deutsche Bundesbank Discussion Paper 07/2021. DOI: 10.18452/21833.
- DiMaggio, Paul, Manish Nag, and David Blei (2013). “Exploiting affinities between topic modeling and the sociological perspective on culture: Application to newspaper coverage of U.S. government arts funding”. In: *Poetics* 41.6, pp. 570–606. DOI: 10.1016/j.poetic.2013.08.004.
- Griffiths, Thomas L. and Mark Steyvers (2004). “Finding scientific topics”. In: *Proceedings of the National Academy of Sciences* 101.suppl 1, pp. 5228–5235. ISSN: 0027-8424. DOI: 10.1073/pnas.0307752101.
- Müller, Henrik, Tobias Schmidt, Jonas Rieger, Lena Marie Hufnagel, and Nico Hornig (2022). *A German inflation narrative. How the media frame price dynamics: Results from a RollingLDA analysis*. Tech. rep. DoCMA Working Paper.
- Rieger, Jonas (2020). “ldaPrototype: A method in R to get a Prototype of multiple Latent Dirichlet Allocations”. In: *Journal of Open Source Software* 5.51, p. 2181. DOI: 10.21105/joss.02181.
- Rieger, Jonas (2021). *rollinglda: Construct Consistent Time Series from Textual Data*. R package version 0.1.0. DOI: 10.5281/zenodo.5266717. URL: <https://github.com/JonasRieger/rollinglda>.
- Rieger, Jonas, Carsten Jentsch, and Jörg Rahnenführer (2021). “RollingLDA: An Update Algorithm of Latent Dirichlet Allocation to Construct Consistent Time Series from Textual Data”. In: *Findings Proceedings of the 2021 EMNLP-Conference*. ACL, pp. 2337–2347. DOI: 10.18653/v1/2021.findings-emnlp.201.
- Roos, Michael and Matthias Reccius (2021). *Narratives in Economics*. Ruhr Economic Papers 922. DOI: 10.4419/96973068.
- Shiller, Robert J. (2017). “Narrative Economics”. In: *American Economic Review* 107.4, pp. 967–1004. DOI: 10.1257/aer.107.4.967.
- Tuckett, David and Milena Nikolic (2017). “The role of conviction and narrative in decision-making under radical uncertainty”. In: *Theory & Psychology* 27.4, pp. 501–523. DOI: 10.1177/0959354317713158.

Appendix

A. Data and Method

The IPI is based on a corpus of three leading nation-wide German newspapers: Süddeutsche Zeitung (center left), Die Welt (center right) and Handelsblatt (business). The data was obtained from LexisNexis and from the publishing houses. Articles published between 1 January 2001 and 30 April 2022 were considered. In a first step, the corpus is cleaned. For example, all words are converted to lower case and umlauts are resolved. Afterwards, we delete an extended selection of stop words that do not contribute to the generation of topics or that might even involve noise. Following these preprocessing steps, an issue-specific analysis corpus (roughly 50,000 texts) was produced as a sub-set of the entire newspaper corpus by using the following search term: `inflation* OR teuerung OR geldentwertung* OR preissteigerung*`.³ It comes with a recall value of 0.808 and a precision value of 0.576. The selection of its individual components is based on both intuition and statistics.

The topic modeling method Latent Dirichlet Allocation (Blei et al. 2003) produces what can be called mean macro-content analysis. We are not looking for extreme occurrences on the edges of a polarized media sphere, but at some kind of average thematic media coverage on inflationary developments in mainstream media. Classic LDA is well-suited for the identification of media frames (DiMaggio et al. 2013). Frame being an inherently static concept and LDA being a static method, they fit together well over limited time-horizons and for thematically limited text corpora. For longer time horizons, however, the correspondence between research object and method is less obvious. After all, we are interested in detecting the development of thematic trends - and in monitoring potential changes in consecutive updates of the model. Classical LDA, in contrast, builds upon the assumption of structural stable topics over time, which contradicts the more fluid nature of narratives, which can change over time and even be altered in hindsight. Rieger et al. (2021) construct a dynamic version of LDA, RollingLDA, that allows topic structures to change over time by modeling the fading of collective memory as newer versions of narratives overwrite older ones. New data are fitted to a topic model calculated based on a rolling window of previous observations.

This approach has two major advantages. First, it solves the problem of arbitrariness that plagues the classical LDA method, which generates fundamentally different models at each run due to the random initialization of the Gibbs sampler (Griffiths and Steyvers 2004), even when exactly identical data and parameter settings are used, which runs counter to the scientific requirement of reproducibility. Second, RollingLDA allows us to produce a consistent, updatable time series of the Inflation Perception Indicator. More specifically, we use a combination of the selection method LDAPrototype (Rieger 2020) and RollingLDA. At the start of the modeling process, a prototypical LDA is selected.

³ Note that all words are written in lowercase (as is our whole corpus). Furthermore, “teuerung” is included as a word, not a pattern, which keeps us from getting false positives due to the words “besteuerung” or “steuerung”. More information on the search term and the pattern selection in Müller et al. (2022)

This method solves the mentioned problem of arbitrary selection and thus improves the reliability of the results (Rieger 2020). Prototyping follows a typical statistical approach: for a given parameter combination, several models are computed (usually around 100). The similarities of two LDA models are calculated based on the deviation of strictly topic matching. The LDA that has the highest average similarity to all others is selected as the prototypical LDA. The methodology is implemented in the corresponding R package `ldaPrototype` (Rieger 2020).

In addition to the `ldaPrototype` method for initial estimates of the model, we employ an implementation of LDA that uses preceding LDA results as an initialization for subsequent quarters. We modify an existing implementation of LDA (Chang 2015) by iterating the collapsed Gibbs sampler over the new data only: the topic assignments of all the previously modeled articles remain constant and we obtain assignments to the existing topics solely for all new articles. The process of fitting new data to a predefined topic model is known as “seeding”. The described procedure as a combination of a prototyping and rolling approach is implemented in the R package `rollinglda` (Rieger 2021).

After a thorough content analysis we chose the model’s parameter $K = 10$ topics and accordingly as Dirichlet parameters $\alpha = \eta = 1/K$, while the Gibbs sampler iterates over the dataset 200 times.

B. The IPI model

The resulting model consists of ten clearly interpretable topics, nine of which are clearly related to our research interest. Table 1 gives an overview of the topics.

Table 1: Overview of the LDA model’s topics, January 2001 to May 2022

No.	Label	Share	Content	Protagonists	Key Events
1	Central Banks	14	Speculation about policy measures of advanced economies’ central banks (rate changes, asset purchases/sales etc.)	ECB, Fed, Draghi, Trichet, Bernanke, Bundesbank, Weidmann, Lagarde, Yellen	7-08 (rate hike), 11-11 (rate drop), 1-15 (before QE), 7-19 (disc. of QE restart), 21/22 (inflation surprise)
2	News	12.6	News briefs covering data releases (CPI, market rates, oil price etc.)	Consumers, renters, statisticians	inflation spikes (7-08, 2-11, 12-21), QE (1-15)
3	Emerging Markets	6.5	Inflationary developments in Argentina, Turkey, Venezuela, Iran ...	Government, Argentina, Turkey, president, Kirchner, Chavez, Iran, Mugabe	EM booms (7-08, 1-11), Iran uprising (1-18), inflation spike (12-21)

4	Eurozone	12.3	Policy discussions and developments in other Eurozone countries and at EU level (fiscal stance, Stability and Growth Pact etc.)	Germany, EU, Greece, France, states, government, citizens	Sov. Debt crisis (11-11), Greek stand-off (1-15), post-covid inflation surprise (10-21)
5	Private Investment	10.8	How to cope with low real yields, “private saver” perspective, focus on inflation hedges (Gold, Real Estate...)	customers, funds, banks, insurers	Boom (7-08), EZ uncertainty (sev. peaks 3-11 – 11-13), post-cov-19 inflation surprise (12-21)
6	Misc.	11.4	Diverse		
7	Financial Markets	12.5	Financial Market developments and reactions to inflation risks	Investors, analysts, USA, Fed, experts, traders	Nat. election (10-05), EM Booms (7-08, 3-11), Inaug. Trump (1-17), trade war (2-18), post-covid rally (3-21)
8	Companies	4.4	Developments in certain companies and sectors in Germany, focus on shareholder meetings and earnings calls, many calendar previews	Company, Corporation, Berlin, Paris, Lufthansa Stuttgart	Post-covid 19 inflation surprise (12-21)
9	German Politics	6.7	Collective bargaining, social, tax, fiscal policies – reactions to inflation	SPD, government, CDU, trade unions, employers, workers	Inflation surprises in 7-08, 11-11 and 11-21)
10	Raw Materials	8.9	Inflationary developments in EMs with particular focus on raw material demand and prices (gold, oil, copper, wheat...)	China, Russia, Turkey, India, Investors, Venezuela	Price hikes due to trade tensions (most pronounced spike: 8-18), also inflation surprise 11-21

C. Stability of the RollingLDA model over time

Figure 4 shows the cosine similarity of all ten topics to earlier or later points in time of the same topic. The month-to-previous-month similarity is plotted in black, month-to-first-month in red, month-to-last-month in blue and the quarter-to-previous-quarter similarity in gray. Topic 9 shows a noticeable change in wording during the period from 2015 to 2020; for topic 3 the short-term similarity decreases with time; topic 10 shows a similar, though not as pronounced, behavior as topic 3, and topic 8 shows a relatively large diachronic change in word usage. Topics 1, 2, 4, 5, 6 and 7 are comparatively stable over

the whole observation period. Topics 8 and 9 experience a strong increase in similarity at the current border of the observation period. The vocabulary used within these topics is therefore very similar across the last months.

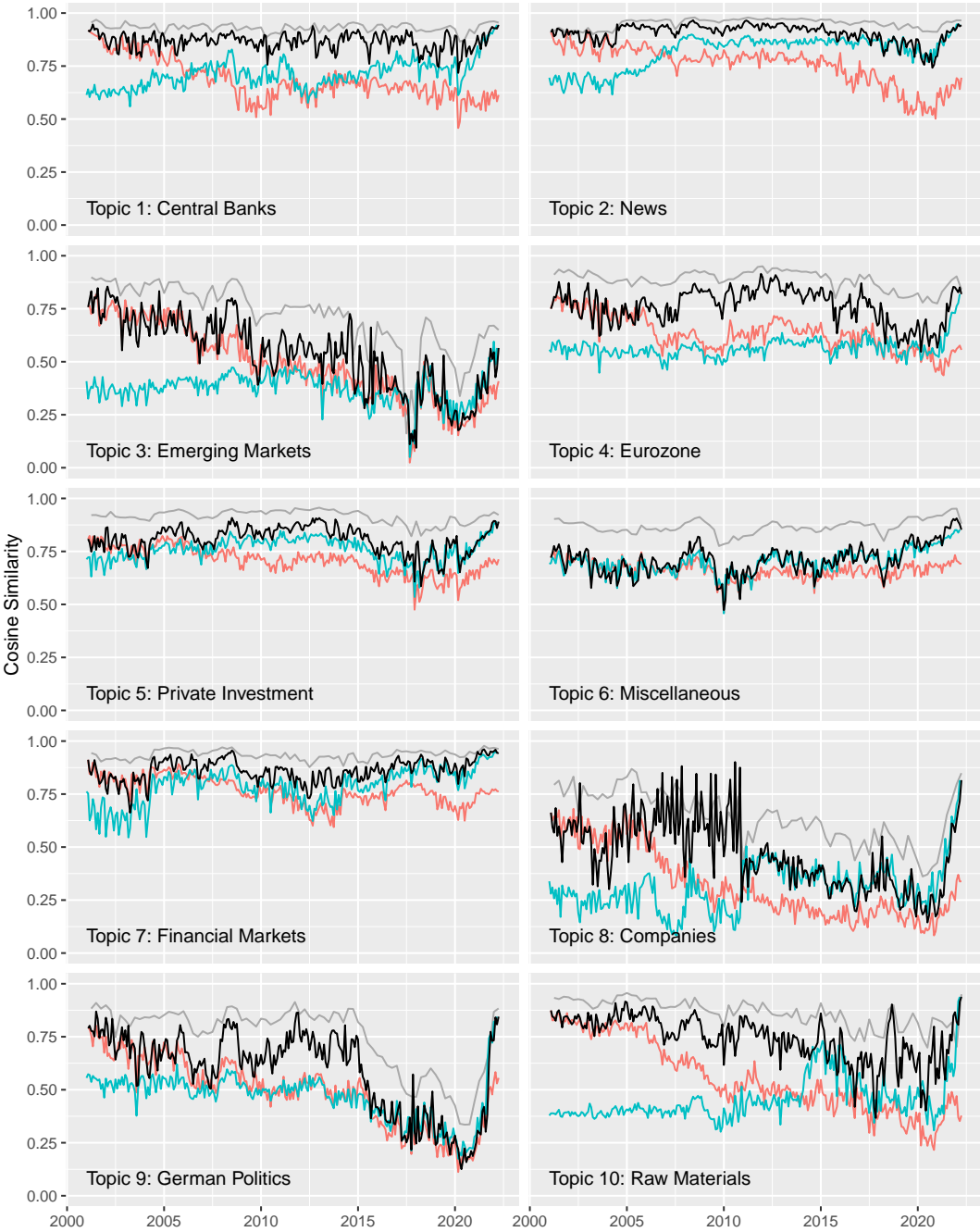


Figure 4: Cosine similarity of topics across different time points. Source: Authors' calculations