How does European Central Bank communication effect on yield curves?

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Outline

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Data Aggregation

- **ECB Communication** Official speeches of ECB
- **Yield to maturity** *3-month, 1-year, 2-year, 5-year, and 10-year* government bonds interest rates.
- **Date** 1st January, 2018 - 31st May, 2021

Outline

Topic Extraction

- Latent Dirichlet Allocation (LDA) will be applied on the speeches data to **extract 15 main topics**.
- Certain sentences corresponding to those macroeconomics-relating topics are selected, then we **eliminate the other sentences**.

Sentimental Analysis

- Our data in this stage includes macroeconomics-topic-relating **corpus of each month**.
- These corpus of each month will be converted from text to a numerical value using **VADER lexicon**.
- **Input**: Text of each month - **Output**: positive score — negative score — neutral score — compound score.

Regression Equation

$$yield_i = \alpha + \beta * Communication_{narrative} + \epsilon$$

Outline

Topic Extraction

	Term per Topic
Topic1	const, resort, harmonisation, wholesale, leaning, risen, lender, compensation, floor, fluctuation, depositor, permanent, belief, grown, reflection
Topic2	difficulty, standardised, successfully, equal, aftermath, decrease, concerning, strategic, fsb, reap, dealing, equivalent, mitigating, tangible, accepted
Topic3	psd, sensitivity, converge, shadow, virtual, deleveraging, mortgage, constant, meant, concrete, prudent, outflow, reliable, genuine, otherwise
Topic4	contributes, incident, anticipated, emerged, granted, fair, complementary, complexity, narrow, raised, rose, database, separate, journey, calculated
Topic5	buy, weight, balanced, frontier, stood, costly, recovered, aligned, store, surrounding, diffusion, characterised, break, tends, indicated
Topic6	diversification, continuing, fear, anchored, revolution, backdrop, enabling, acceptance, understood, trough, fragmented, planning, determining, disinflationary, feed
Topic7	ssm, yves, accept, simulation, author, outright, creates, safeguarding, regional, delay, amid, turned, proportionate, consistently, automation
Topic8	statute, triggered, employed, contained, ground, argument, boom, box, democracy, proper, prepare, emir, described, shifting, challenged
Topic9	application, counterparty, bear, deutsche, anchoring, pick, signalling, thinking, discipline, peak, caput, issuing, conditional, appreciation, recognition
Topic10	surprise, albeit, commerce, spirit, coordinated, lecture, passed, adapt, slower, volatile, inflow, carried, parameter, multiple, reversal
Topic11	search, platform, perceived, obstacle, category, room, inflationary, systemically, shortcoming, safer, pursuit, resulted, adopt, muted, assistance
Topic12	bubble, moderation, picture, encouraging, bund, sized, materialise, showed, phenomenon, foresee, occasion, redemption, warrant, complemented, precisely
Topic13	tariff, ester, presentation, rating, sudden, vc, surplus, undermine, srf, partner, exit, try, protracted, persistently, legitimacy
Topic14	svensson, legislative, peer, integrity, eurozone, skill, serious, actor, cumulative, highlighted, moved, crypto, failed, durable, notable
Topic15	praet, claim, concentrated, ec, bottom, whose, peter, construction, communicate, widespread, property, kind, applies, disaster, tackle

Topic extraction

Six economy-related topics are selected from 15 topics. They are:

- Topic 1: A topic mentioned about lender and liquidity.
- Topic 3: A topic which is focusing on mortgage.
- Topic 11: A topic concerning inflation.
- Topic 12: Another topic about the risk of the economy.
- Topic 13: A topic about tariff.
- Topic 14: The last topic covering legislative and yield curves with Svensson model.

Selected topics

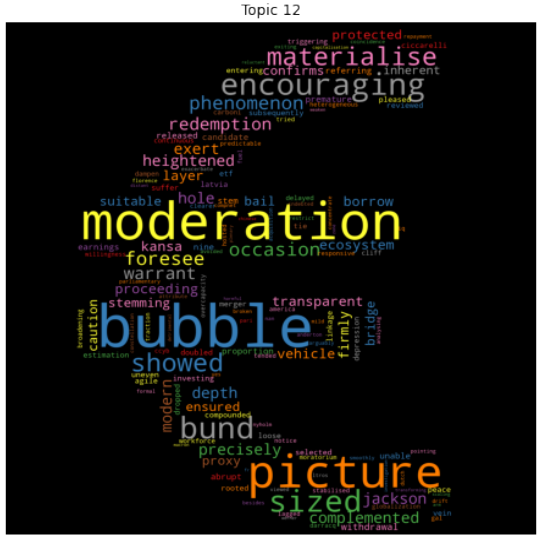
Topic 1 Topic 14

- There are 6 topics which are related to economy aspects are extracted.
- Topic 1: A lender of last resort is the institution provides of liquidity to a financial institution which is unable to obtain it.
- Topic 14: Svensson model which stipulates that the shape of the yield curve.

Selected topics

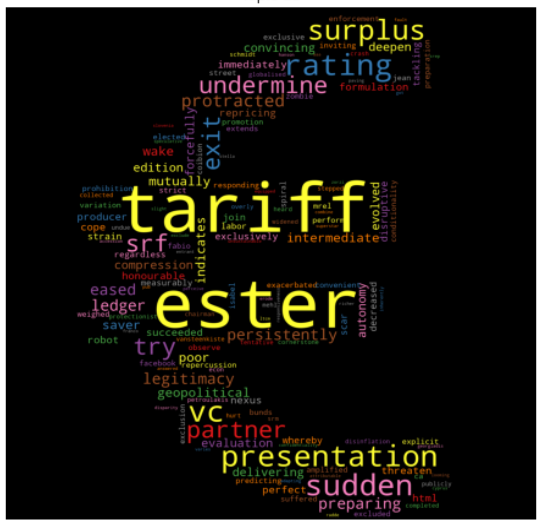
Topic 3

Topic 12

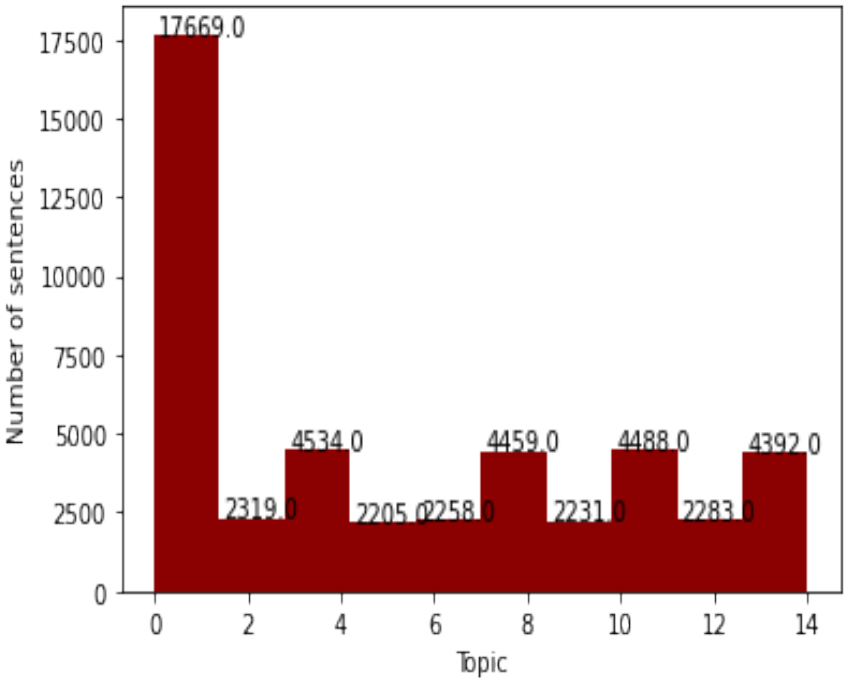


Topic 11

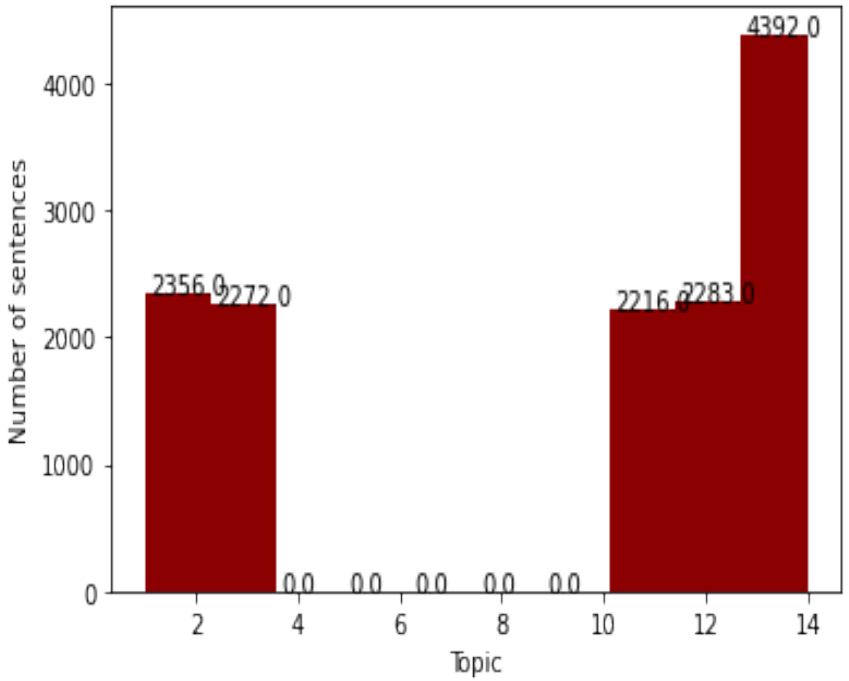
Topic 13



Eliminating Irrelevant Sentences



Topic Distribution



Remained Topic Distribution

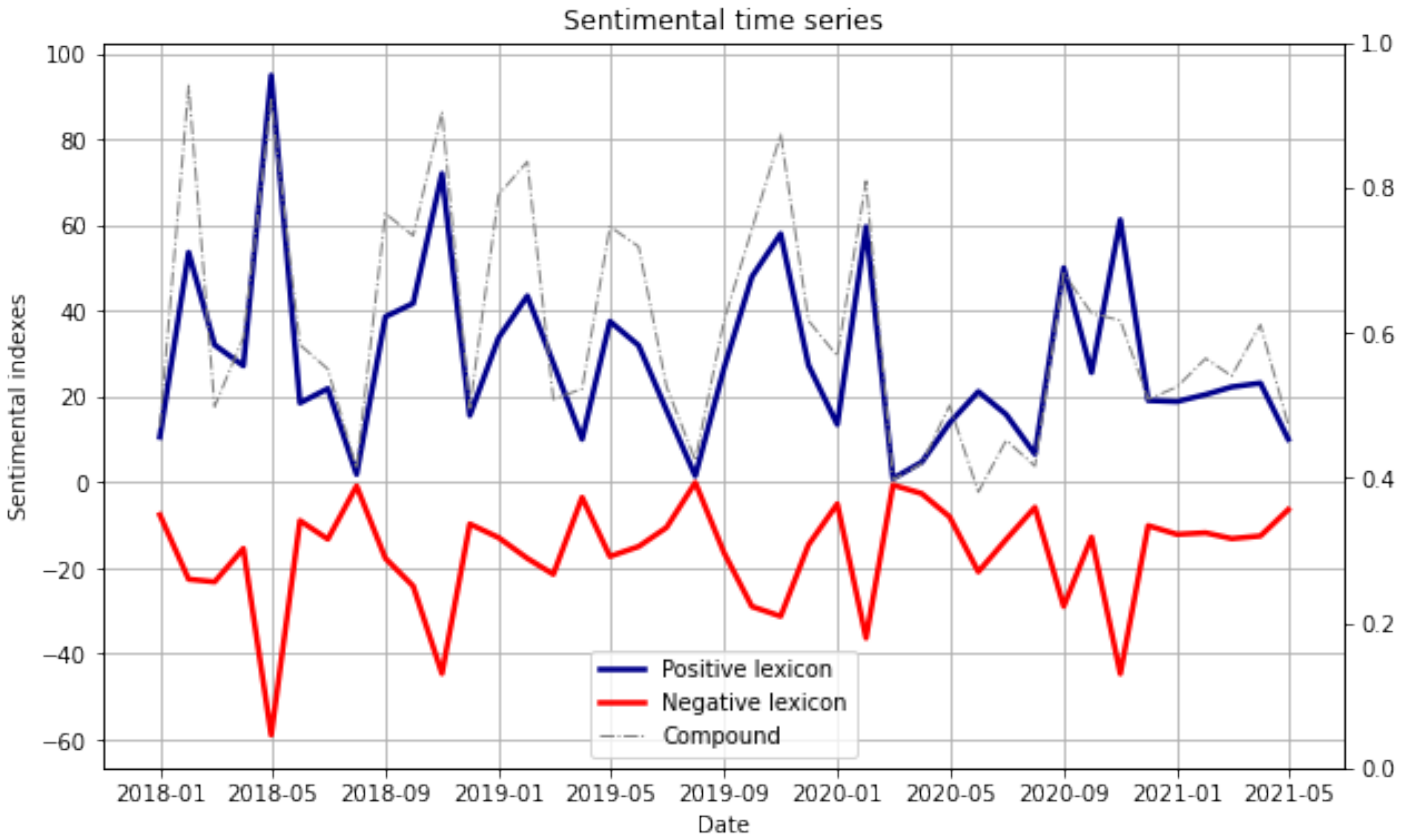
- Remained topic: 1, 3, 11, 12, 13, 14

TexttoNum Example

mm	sent	topic	neg	neu	pos	compound
2019-07-01	Text	1	0.169	0.725	0.106	-0.6557

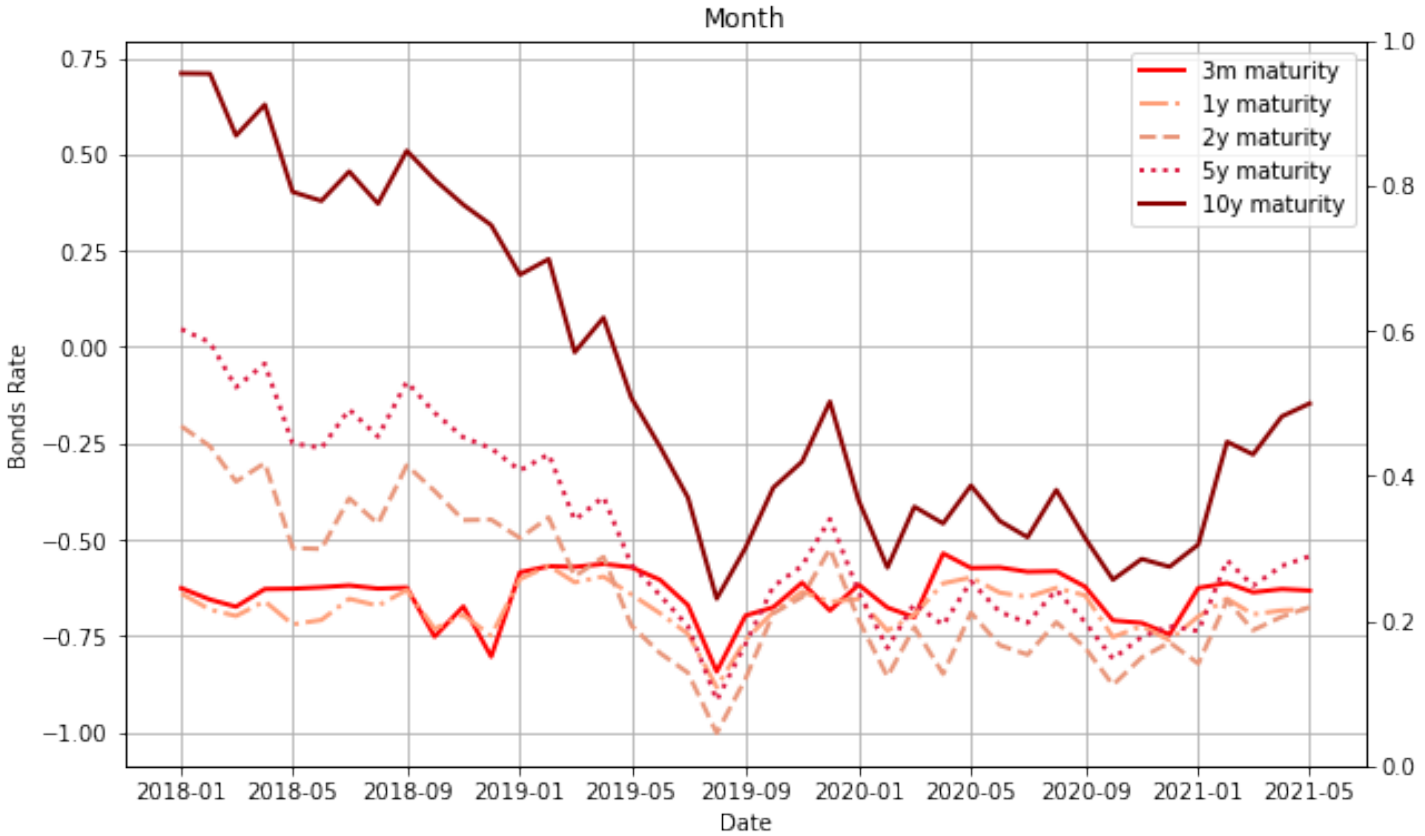
Text = 'To a significant extent, this sequence of low inflation rates reflects the prolonged adjustment dynamics that characterise the aftermath of a major global financial crisis, together with a substantial downward shift in the realisation of shocks to inflation that we have observed in recent years'

Sentimental Analysis



Independent Variables

Yield Curves



Yield Curves

Regression Equation

$$yield_i = \beta_0 + \beta_1 * x_{pos} + \beta_2 * x_{neg} + \epsilon \quad (1)$$

$$yield_i = \beta_1 * x_{pos} + \beta_2 * x_{neg} + +\beta_3 * x_{compound} + \epsilon \quad (2)$$

ECBC and 3-month Bonds (1)

Dep. Variable:	3m	**R-squared:**	0.012				
Model:	OLS	**Adj. R-squared:**	-0.040				
Method:	Least Squares	**F-statistic:**	0.2356				
Date:	Wed, 23 Jun 2021	**Prob (F-statistic):**	0.791				
No. Observations:	41	**Log-Likelihood:**	54.262				
Df Residuals:	38	**AIC:**	-102.5				
Df Model:	2	**BIC:**	-97.38				
Covariance Type:	nonrobust						
	coef	**std err**	**t**	**P>—t—**	**[0.025**	**0.975]**	**0.975]**
const	-0.6399	0.018	-35.344	0.000	-0.677	-0.603	-0.603
pos	0.0010	0.002	0.575	0.568	-0.003	0.005	0.005
neg	-0.0019	0.003	-0.658	0.514	-0.008	0.004	0.004

ECBC and Yield (1)

- Executing OLS regression for other yield (1y, 2y,5y,10y)
- P-values of all four model using equation (1) are not significantly. We can not conclude about relationship of ECBC and yield curves.

ECBC and 3-month Bonds (2)

Dep. Variable:	3m	**R-squared (uncentered):**	0.702			
Model:	OLS	**Adj. R-squared (uncentered):**	0.679			
Method:	Least Squares	**F-statistic:**	29.90			
Date:	Wed, 23 Jun 2021	**Prob (F-statistic):**	4.23e-10			
No. Observations:	41	**Log-Likelihood:**	-15.377			
Df Residuals:	38	**AIC:**	36.75			
Df Model:	3	**BIC:**	41.89			
Covariance Type:	nonrobust					
	coef	**std err**	**t**	**P>—t—**	**[0.025**	**0.975]**
pos	0.0714	**0.040**	1.770	0.085	-0.010	0.153
neg	-0.0914	0.045	-2.027	0.050	-0.183	-0.000
compound	-0.0275	0.012	-2.255	0.030	-0.052	-0.003

Model using with 3-month maturity bond applied equation (2) give significant p-value < 0.5.
We have regression model: $yield_{3m} = 0.0714x_{pos} - 0.0914x_{neg} - 0.0275x_{compound}$

ECBC and Yield (2)

- Model using with 1-year maturity bond give significant p-value < 0.5. We have regression model: $yield_{1y} = 0.0773x_{pos} - 0.0989x_{neg} - 0.0294x_{compound}$
- Model using with 2-year, 5-year, 10-year maturity bond do not give significant model.

Outline

ECB Communication and Yield Curves

- ECB communication effects to yields curves in short-term (3-month and 1-year maturity)
- Number of positive words is positive effects to interest rate, meanwhile number of negative words and neutral lexis are negatively affect to interest rtae