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ASSESSMENT OF THE EFFECT OF REGULATOR'S COMMUNICATION ON THE FINANCIAL MARKET PARTICIPANTS

Kristaps FREIMANIS*, Maija ŠENFELDE[2]

Faculty of Engineering Economics and Management, Riga Technical University, Kalnciema 6, Riga, Latvia

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Abstract. There is significant discussion in the academia and industry regarding over-regulation and under-regulation of the financial markets. Some discussion has been devoted to the transparency requirements for market players imposed by the regulator and their impact on the financial market. However, in the view of the authors, there is a lack of discussion on the effects of regulator communication on financial market participants. Thus, the aim of this paper is to contribute to this discussion. Authors review methods used in assessing central banks' communication effects on the financial markets and based on them develop the approach for regulator's (in this case central bank) communication effect assessment on the financial market participants. The model is validated on the euro area central bank and two major economies. The results show that a lot of adverse market participants' reactions on the signals from the central bank's speeches have been observed.

Keywords: government intervention, financial market, market failures, market indices, regulator's communication.

JEL Classification: D60, G18.

Introduction

Morris and Shin (2002) raised the awareness of the effects of communication to the financial market participants. Since then, several approaches have been developed to assess the effects of communication, e.g., effects of stress tests on returns of bonds and stocks of the financial market participants (Petrella & Resti, 2013; Morgan et al., 2014; Candelon & Sy, 2015; Sahin & de Haan, 2016; Flannery et al., 2017; Neretina et al., 2020), ways of processing the information about stress tests (Faria-e-Castro et al., 2017; Pacicco et al., 2020), effects in a laboratory environment (Ferri & Morone, 2014; Halim et al., 2019; Ruiz-Buforn et al., 2021).

At the same time, central banks have done more broader analysis on central bank communication to the financial markets, e.g., Born et al. (2011). In this paper, authors contribute to the literature by combining approaches used for analysis of stress tests' results and analysis of central bank's communication.

The aim of this paper is to review the existing approaches and to develop the approach to be used for the assessment of policymakers' communication on the individual financial market participant. The developed model is to be validated on the euro area central bank and two major economies – Germany and France. The model parameters are evaluated using econometrics.

The results show that a lot of adverse market participants' reactions on the signals from the central bank's speeches have been observed, i.e., a lot of optimistic speeches have caused a negative reaction on the financial instruments of market participants.

1. Effect of the policy makers' communication on the market participants

The debate on the impact of policymakers' communication started with Morris and Shin (2002) when dissemination of public information through the media and disclosures by market participants with high public visibility was discussed.

Researchers have analysed the effects of European and the U.S. stress tests on returns of bonds and stocks of the financial market participants (Petrella & Resti, 2013; Morgan et al., 2014; Candelon & Sy, 2015; Sahin & de Haan, 2016; Flannery et al. 2017; Neretina et al., 2020) using the event study framework.

* Corresponding author. E-mail: *kristaps.freimanis_5@rtu.lv*

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Pacicco et al. (2020) have contributed with assessment of empirical results how market participants process information about stress test results. They provide factual evidence on how authorities' enhanced communication affects financial markets' stability. The results provide empirical evidence to support Faria-e-Castro et al.'s (2017) theoretical findings, demonstrating that severe stress tests, if enacted in countries with credible fiscal capacity such as the U.S., can lead agents to revise their risk estimations downwards for all banks, notwithstanding their performance in the exercise.

Ruiz-Buforn et al. (2021) study the information aggregation process in a laboratory financial market where traders have access to costly private and free public imperfect information. They show that the reduction in price informativeness is a direct consequence of the overweighting of public information when aggregated in prices.

Born et al. (2011) in their research of effects of the central bank's communication on the financial market developed the approach of identification of events in the context of event study framework.

Some researchers analyse effects of communication in the laboratory financial market environment to achieve greater control over variables impacting the outcome, e.g., Ferri and Morone (2014), Halim et al. (2019).

2. Assessment methodology

2.1. Assessment of the effect on the market participant

Neretina et al. (2020) to measure the impact of an event have used the term "the abnormal return of a security", which is calculated as the difference between the actual return and the normal return over certain so-called "the event window". The term "the event window" means the period of time when the event has been observed, measured in days. Normal returns are estimated using the market model as follows,

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t}, \quad (1)$$

where $R_{i,t}$ is the daily return of equity of bank i at time t, and $R_{m,t}$ is the return of a market portfolio (the S&P 500 returns index).

The residuals or abnormal returns (AR) implied by the market model are given by,

$$AR_{i,t} = R_{i,t} - \left(\widehat{\alpha_i} + \widehat{\beta_i} R_{m,t}\right), \quad (2)$$

where the circumflex indicates that the parameter concerned is estimated. The abnormal returns are summed over the relevant window around the event date to compute the cumulative abnormal return (CAR). In their base line model, abnormal returns are cumulated for the 3-day window (–1; +1).

Born et al. (2011) for the purpose of the assessment of central bank's communication on the financial stability have used more complex approach considering effects observed in all financial market,

$$R_{i,t} = \alpha_{0i} + \alpha_{1i} R_{i,t-1} + \alpha_{2i} R_{m,t-1} + \alpha_{3i} R_{m,t} + \alpha_{4i} R_{m,t+1} + \alpha_{5i} D_t + \alpha_{6i} T_{i,t-1} + \alpha_{7i} S_{i,t-1} + \alpha_{8i} M_{i,t-1} + \varepsilon_{i,t}, \quad (3)$$

where $R_{i,t}$ is the daily local currency return on the stock market index of the financial market for country i on day t, $R_{m,t}$ is the daily United States dollar return on Datastream's stock market index of the global financial market, and D_t denotes dummy variables for Monday through Thursday. $T_{i,t-1}$ stands for the trend in stock markets covering the 20 days before to the event, $S_{i,t-1}$ stands for the standard deviation of daily stock market returns over the 20 days before the event, and $M_{i,t-1}$ for the so-called "misalignment" of stock indices on the day preceding the event, measured as the percentage deviation of the stock indices from their national average over the entire sample period.

Both approaches differ in the scope of assessed parameters and width of the window.

Picault and Renault (2017) as well have used returns of stocks and volatility to analyse monetary policy communication's effect on the financial market analysing ECB meetings as primary source of communication.

When media perception is analysed, other measures have been used as market variables, e.g., money market rates (Bennani et al., 2019; Ehrmann, Fratzscher, 2009), foreign exchanges rates (Gertler & Horwath, 2018), forward rates (Pesci, 2016), sovereign spreads (Gade et al., 2013).

2.2. Identification of the event

Born et al. (2011) assessed speeches and interviews of central bank governor with the following conditions:

- each speech was allocated to a certain trading day. Communications during weekends were allocated to the following Monday, communications in the evening – such as dinner speeches – to the subsequent trading day,
- only the first report about a given statement were chosen, which typically originated from a newswire service. This choice has the advantage that the reporting is very timely, usually comes within minutes of each statement, and that it is mostly descriptive without providing much analysis or interpretation. To avoid double counting, all subsequent reports or analysis of the same statement were discarded,
- the search was conducted only in English language.

In these speeches and interviews Born et al. (2011) were looking for specific words which characterize the communication related to the financial stability, such as "volatile", "volatility", "risk", "adverse", "pressures". Based on the software for automated textual analysis, they computed a score for each individual speech or interview. Then they transformed the resulting scores into a discrete variable, which takes the value of –1 for the lowest third of the distribution, the value of 0 for the middle

part of the distribution, and the value of +1 for the upper third of the distribution. That is, a value of +1 corresponds to a relatively optimistic text, while a value of –1 corresponds to a relatively pessimistic statement.

2.3. Authors' adjustments to previous approaches

Authors have chosen to continue the work of Petrella and Resti (2013), Morgan et al. (2014), Candelon and Sy (2015), Sahin and de Haan (2016), Flannery et al. (2017), Neretina et al. (2020) enlarging the scope of covered events. Those researchers focused on the stress tests as events affecting returns of financial market participants' equities and bonds. The authors move further with speeches from central bank spokespersons, which have been released several times a month. Those events have certain specifics covered to released information about stress tests' results:

- they happen more frequently thereby it is expected to have more short-term effect as new speech is in place in a few days or weeks at latest,
- they have more general nature as target is all financial market thereby it is expected that only speeches with more optimistic or pessimistic tone should affect returns of financial market participants' equities and bonds.

Meanwhile Hwang et al. (2021) in conclusions of their analysis of the effect central bank speeches have on business executives' opinions of their central banks' impact on the economy notes that central bank governors provide a consistent message over time, whereas other board members are more likely to convey diverging messages that confuse the receivers. This could lead to ambiguous results in the analysis.

2.4. Adjustment of the event identification

When it comes to speech allocation to specific trading day authors use similar approach as presented per Born et al. (2011), i.e., each speech is allocated to certain trading day. Communications during weekends are allocated to the following Monday, communications in the evening – to the subsequent day of trade.

When several speeches appear on the same day, the authors choose the one whose speaker has the position of the governor of the central bank. This approach is selected considering findings of Hwang et al. (2021) about consistency of provided messages. It could happen that two different governors are speaking on the same day. In such a case, the governor of higher rank has been selected.

In order to assess speeches authors use the following approach: each speech has categorized as "optimistic +", "optimistic", "neutral", "pessimistic" or "pessimistic –", based on the number of certain words in the speech. In the case of "optimistic +" speech number of optimistic words is at least two times higher than number of pessimistic words. The same is applicable for the "pessimistic –" speech: number of pessimistic words is at least two times higher than the number of optimistic words. Those two more polarized categories have been selected considering that speeches are of more general nature (not directly targeted to some specific financial market participant normally) and slightly optimistic or pessimistic speeches are not expected to affect returns of that financial market participant's equities or bonds.

In Table 1 are summarized the words used for speech evaluation, i.e., "recovery", "stable" (and "stability"), "grow" (and "growth"), "positive" and "sustainable" (and "sustainability") for optimistic speech and "uncertainty", "volatile" (and "volatility"), "adverse", "recession" and "pressure" for pessimistic speech.

Table 1. Words used for the speech assessment (source: authors' made)

Speech category	Word	Used in search
Optimistic	Recovery	"recover"
Optimistic	Stable/ stability	"stab"
Optimistic	Grow/ growth	"grow"
Optimistic	Positive	"positive"
Optimistic	Sustainable/ sustainability	"sustainab"
Pessimistic	Uncertainty	"uncertain"
Pessimistic	Volatile/ volatility	"volatil"
Pessimistic	Adverse	"adverse"
Pessimistic	Recession	"recession"
Pessimistic	Pressure	"pressure"

Further in the search, authors use shortened versions of those words to catch various contexts and expressions these words are used in.

Technically authors have used the following formula to find abovementioned words in the speeches,

$$N = \frac{x - x'}{y}, \tag{4}$$

where N – number of strings found, x – number of characters in the speech, x' – number of characters in the speech, which is exempt from the string to be searched, y – number of characters in the string to be searched.

The next step is to assess the speech, i.e., when optimistic words are more than pessimistic words, the speech is assessed as optimistic. Vice versa, if pessimistic words are more than optimistic words, the speech is assessed as pessimistic. If those numbers are equal, the speech is assessed as neutral. On top that come special cases with "optimistic +" and "pessimistic –" assessment described before.

2.5. Adjustment to the assessment of the effect on the market participant

The authors have chosen the approach of assessing normal and abnormal returns to assess the reaction of central bank communication.

For assessing normal returns Equation (1) has been used with a note that $R_{m,t}$ is the return of relevant market portfolio, e.g., S&P500 for U.S. market or EURO STOXX 50 for euro area market (Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain), or country specific indices in the euro area, like CAC40 in France and DAX in Germany. Considering Born et al. (2011) approach with daily stock market returns over the 20 days prior to the event, authors have chosen to choose one event (one speech) per month so at least 15 working days are available for the model of normal returns training purposes.

Abnormal returns are calculated based on Equation (2) with the comment that the window has been adjusted. Considering that the day prior to the central bank communication is not relevant as market participants have not heard it yet so price is not expected to include effects. The window is adjusted to 5 working days so it looks like (0; +4). The cumulative abnormal return (CAR) is calculated to see the full effect.

In the Table 2 authors have summarized the assessment of financial market participant's reaction on the central bank communication.

Table 2. Summary of market participant's reaction (source: authors' made)

Speech category	Value of CAR	Assessment of reaction
Optimistic	CAR > 0	Expected reaction (positive)
	CAR < 0	Adverse reaction (negative)
	CAR = 0	No reaction
Pessimistic	CAR > 0	Adverse reaction (positive)
	CAR < 0	Expected reaction (negative)
	CAR = 0	No reaction
Neutral	CAR > 0	Adverse reaction (positive)
	CAR < 0	Adverse reaction (negative)
	CAR = 0	Expected reaction (no reaction)

For optimistic speech, expected reaction is positive CAR, subsequently for pessimistic speech, negative CAR. Other reactions are "adverse" or "no reactions".

2.6. Data used in the research

The authors have selected the speeches of the European Central Bank (2021). European Central Bank issue speeches regularly (every week), however authors have selected the sample of speeches to cover most important topics, which can affect financial market, and to provide space for opportunity to train the model of normal returns. The list of selected speeches is disclosed in the Appendix 2. The sample covers 2020 and 2021, in total 24 speeches.

As financial market participant was selected the largest euro area's bank BNP Paribas SA (France) and as market index – CAC40, and Deutsche Bank (Germany) and as market index – DAX. Thereby two most important economies accounting for half of the euro area GDP with their largest banks are covered. These market players are most affected by the decisions and communication of the European Central Bank (hereinafter – ECB) in the banking sector due to their significant exposure. Two different markets as well are chosen to validate results, i.e., looking for potentially opposite reactions to the same signal.

3. Results

Authors performed the speech assessment based on the speeches of the ECB reflected in the Appendix 2 (European Central Bank, 2021). The results are disclosed in the Table 3. With column "Balance" is understood difference between the numbers of optimistic and pessimistic words (optimistic minus pessimistic words).

Table 3. Summary of speech assessment (source: authors' made based on European Central Bank, 2021)

Date	Optimistic	Pessimistic	Balance
08.12.21	58	10	48
15.11.21	30	1	29
16.10.21	34	14	20
13.09.21	34	4	30
24.08.21	6	0	6
11.07.21	5	0	5
28.06.21	25	7	18
06.05.21	20	1	19
26.04.21	1	0	1
27.03.21	0	3	-3
22.02.21	10	2	8
25.01.21	10	0	10
16.12.20	4	0	4
26.11.20	32	19	13
19.10.20	19	6	13
28.09.20	9	6	3
27.08.20	1	0	1
22.07.20	11	6	5
08.06.20	23	1	22
22.05.20	1	4	-3
16.04.20	10	12	-2
02.03.20	11	5	6
06.02.20	17	4	13
27.01.20	13	1	12

As a next step econometrically were assessed parameters for Equation (1) in the case of BNP Paribas are as follows,

$$R_{i,t} = 0 + 1,439 \times R_{m,t} + \varepsilon_{i,t} \quad (5)$$

and in the case of Deutsche Bank,

$$R_{i,t} = -0,001 + 1,351 \times R_{m,t} + \varepsilon_{i,t}. \quad (6)$$

Both models have moderate description power and low error level, statistics are enclosed in the Table 4. In

both cases, the parameter for $R_{m,t}$ is statistically significant with 95%.

Table 4. Summary of model statistics (source: authors' made based on Bloomberg Finance L.P., n.d.)

Parameter	BNP Paribas	Deutsche Bank
Observations	388	388
Multiple R	0.834	0.769
R Squared	0.695	0.591
Standard Error	0.016	0.019
p-value	1.5×10^{-101}	7.4×10^{-77}

Based on the Equation (2) with results of equations (5) and (6) abnormal values were calculated, and CAR values summed for BNP Paribas and Deutsche Bank. Further in the Table 5 results of CAR are matched with results from the speech assessment (see Table 3).

Table 5. Summary of model statistics (source: authors' made based on Bloomberg Finance L.P., n.d.; European Central Bank, 2021)

Date	CAR, BNP	CAR, Deutsche	Balance (speech)
08.12.21	–0.3%	1.3%	48
15.11.21	–3.0%	–3.1%	29
16.10.21	–0.5%	1.0%	20
13.09.21	3.4%	3.6%	30
24.08.21	0.5%	–0.4%	6
11.07.21	–0.5%	–1.4%	5
28.06.21	–2.2%	–1.7%	18
06.05.21	4.4%	2.9%	19
26.04.21	5.4%	18.8%	1
27.03.21	–2.8%	–5.3%	–3
22.02.21	3.7%	9.1%	8
25.01.21	–3.6%	–1.4%	10
16.12.20	–4.5%	–1.7%	4
26.11.20	2.4%	0.3%	13
19.10.20	–0.5%	8.8%	13
28.09.20	–2.0%	4.2%	3
27.08.20	–2.2%	–5.2%	1
22.07.20	–1.3%	–2.2%	5
08.06.20	–0.8%	5.3%	22
22.05.20	20.3%	7.6%	–3
16.04.20	–3.0%	–1.1%	–2
02.03.20	–8.1%	-10.7%	6
06.02.20	4.9%	17.4%	13
27.01.20	1.4%	12.0%	12

The results in the Table 5 show that no speech was neutral (number of pessimistic and optimistic words equal). Most of the speeches were optimistic signalling about ECB's desire to push for the drive in the economy.

Based on those results authors summarized BNP Paribas and Deutsche Bank reactions on the statements from the European Central Bank in the Table 6.

Table 6. Summary of market participant's reaction (source: authors' made)

Speech category	Value of CAR	Assessment of reaction		
		Reaction	BNP	Deutsche
Optimistic	> 0	Expected:	8	12
	< 0	Adverse:	13	9
	= 0	No:	0	0
Pessimistic	> 0	Adverse:	1	1
	< 0	Expected:	2	2
	= 0	No:	0	0
Neutral	> 0	Adverse:	n/a*	n/a
	< 0	Adverse:	n/a	n/a
	= 0	Expected:	n/a	n/a

Note: *No neutral speeches.

Table 6 shows that the trends in the case of BNP Paribas and Deutsche Bank are similar. A lot of reactions are as expected, however adverse reactions are substantial. This could signal about market participant's critical approach to ECB's statements.

Conclusions

The literature analysis shows that there exist approaches to identify the communication event and to assess the effect of the public authority's communication to the financial market participant. The authors contribute to the event identification methodology with a certain set of words to be used as keywords. The speech assessment could be done by using the following keywords: "recovery", "stable" (and "stability"), "grow" (and "growth"), "positive" and "sustainable" (and "sustainability") for optimistic speech and "uncertainty", "volatile" (and "volatility"), "adverse", "recession" and "pressure" for pessimistic speech. The authors of the top develop the approach to assess the reaction of the market participant based on the cumulative abnormal return.

Analysis of the selected speeches show that most of them were optimistic signalling about ECB's desire to push for the drive in the economy.

In the validation process, authors have the following conclusions: (a) models measuring normal returns could be improved due to their moderate description power, (b) meanwhile models have low error level and (c) parameter for $R_{m,t}$ is statistically significant with 95%.

A lot of reactions (BNP Paribas and Deutsche Bank to speeches of ECB's spokespersons) are as expected, i.e., optimistic speeches cause positive reaction and pessimistic speeches – negative. However adverse reactions are observed as well, mostly optimistic speeches that cause negative reaction, which could signal about market participant's critical approach to ECB's statements.

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APPENDIX 1

Table 1A. The list of selected speeches (source: European Central Bank, 2021)

Date	Speaker*	Topic
8.12.21	Isabel Schnabel	Monetary policy and financial stability
15.11.21	Luis de Guindos	Recovery from the pandemic crisis and challenges for the financial sector
16.10.21	Christine Lagarde	Globalisation after the pandemic
13.09.21	I. Schnabel	New narratives on monetary policy and the spectre of inflation
24.08.21	I. Schnabel	The rise of non-bank finance and its implications for monetary policy transmission
11.07.21	C. Lagarde	Climate Change and Central Banks: Analysing, Advising and Acting
28.06.21	L. de Guindos	Euro area banks in the recovery
6.05.21	C. Lagarde	Towards a green capital markets union for Europe
26.04.21	Philip R. Lane	Maximising the user value of statistics: lessons from globalisation and the pandemic
27.03.21	P. R. Lane	Stabilising the economic outlook
22.02.21	C. Lagarde	Investing in our climate, social and economic resilience: What are the main policy priorities?
25.01.21	Fabio Panetta	Sustainable finance: transforming finance to finance the transformation
16.12.20	F. Panetta	Keeping cyber risk at bay: our individual and joint responsibility
26.11.20	P. R. Lane	Monetary policy in a pandemic: ensuring favourable financing conditions
19.10.20	Yves Mersch	The ECB's monetary policy amid the pandemic
28.09.20	C. Lagarde	Hearing at the Committee on Economic and Monetary Affairs of the European Parliament
27.08.20	P. R. Lane	The pandemic emergency: the three challenges for the ECB
22.07.20	L. de Guindos	Building the Financial System of the 21st Century
8.06.20	C. Lagarde	Hearing at the Committee on Economic and Monetary Affairs of the European Parliament
22.05.20	P. R. Lane	International inflation co-movements
16.04.20	I. Schnabel	The ECB's response to the COVID-19 pandemic
2.03.20	L. de Guindos	Remarks at the European Economics and Financial Centre
6.02.20	L. de Guindos	The euro area financial sector: opportunities and challenges
27.01.20	Y. Mersch	Asset price inflation and monetary policy

Notes: *Positions of speakers: Luis de Guindos – Vice-President of the ECB, Frank Elderson – Member of the Executive Board of the ECB and Vice-Chair of the Supervisory Board of the ECB, Isabel Schnabel, Philip R. Lane, Fabio Panetta – Members of the Executive Board of the ECB, Christine Lagarde – President of the ECB, Yves Mersch – Member of the Executive Board of the ECB and Vice-Chair of the Supervisory Board of the ECB.