EFFECTS OF QUANTITATIVE EASING ANNOUNCEMENTS ON EQUITIES: EU EVIDENCE

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Abstract: In this paper we examine effects of the Quantitative easing (QE) related statements made by the European Central Bank (ECB) on major equity indices in the Europe (EU). We consider days, when announcements had been made, as events for the event-study. We approach this methodology with aim to calculate excess returns on particular announcement day for representative indices in the old continent. Admitting complexity of those statements, and difficulty to isolate effects linked only to QE related information, we analysed statements individually, to be able to extrapolate deviations more accurately. Results indicate positive excess returns (above average performance over previous 60 days) on indices in average following especially information linked to prolongation or expansion of existing QE programme.

Keywords: Quantitative easing, Quantitative tightening, Equity markets, Event-study.

1 Introduction

Once the crisis fully took place in 2007 and 2008, respectively, standard monetary policy instruments become inadequate, or performed scantily, which lead central banks to introduce non-standard measures in order to fulfil their mandate (for purposes of this research, we will be dealing only with high profile form of unconventional monetary policy (UMP) - so called quantitative easing or QE). Reason for this decision lies upon the fact that the QE is the most significant instrument among the other UMP's instruments considering volume and spectrum of assets included (de Haan et al., 2015).

The main objective of this work is to determine manner and magnitude in which information about high profile instrument of unconventional monetary policy – QE – affected equity markets in after-crisis period. We accept broad evidence of large and persistent effects of the QE on the fixed income securities, and various effects on macroeconomic indicators, hence we contribute to existing literature by attempt to quantify effects of the QE on the equity markets in the EU from short-term perspective. We argue, that proper explanation and examination of relationship between the QE linked information and the equity markets should reflect to profitable positioning or effective hedging during possible next periods, where such instruments should take place.

Delivorias (2015) describes QE simply as "an unconventional form of monetary policy where a central bank creates new money to buy financial assets, like government bonds." The term – QE – was firstly used in line with Japan's situation that followed real-estate bubble burst, and deflationary pressures in 1990s. With interest rates at the zero-lower bound (ZLB), the Bank of Japan (BoJ) decided to boost cash reserves of banks by purchasing particular assets – government bonds – from banks. Main idea was, that providing cash to banks will support lending across the market and consequently extenuate deflationary pressures, after banks will achieve required level of cash reserves. Logically, balance sheet of the BoJ expanded significantly. Analogically, similar programmes were introduced by the Bank of England (BoE), the Federal Reserve (FED), and the ECB.

Compared to the FED, the ECB reacted to crisis moderately, considering volumes of purchases and scale of assets included, also with respect to timing of launching the QE, which was delayed significantly in comparison to the FED (see e.g. Hausken and Ncube, 2013). Even though, there were early programmes operated by the ECB, which are recognized as unconventional monetary policy instruments. First UMP programme – long-term refinancing operation (LTRO) – started in early 2008 and was followed by other programmes such as outright monetary transactions (OMT), covered bond purchase programme (CBPP), targeted long-term refinancing operation (TLTRO) and asset backed purchase programme (ABPP), while those were all oriented on very specific assets, subjects or transactions, therefore, their effects in macro point of view were limited. However, in this paper we specifically aim to investigate the effects caused by announcements linked to these particular programmes regarding to initial (short-term) markets reaction.

After years of running above stated programmes, Governing Council of the ECB realized that there is no sign of substantial recovery, with subdued inflation and very moderate pace of economic growth. Considering the experience from the BoJ, the BoE, and the FED, the ECB finally approached the asset purchase programme (APP). After a severe drop in inflation rates and medium-term inflation expectations during 2014 (Urbschat and Watzka, 2017; Mestan et al., 2020), the APP was announced on 22nd January, 2015, and started officially in March 2015 with expected duration to September 2016, as of monthly pace of purchases at €60 billion (bn), €1.1 trillion (tn) in total. The APP is part of package of measures that also includes TLTRO and includes all purchase programmes under which the private sector securities and the public sector securities are purchased to address the risks of a too prolonged period of low inflation over the medium term. The APP consists of corporate sector purchase programme (CSPP), public sector purchase programme (PSPP), asset-backed securities purchase programme (ABSPP) and third covered bond purchase programme (CBPP3).

Instead of following given outlook for duration of this programme, governing council announced in March 2016 extending "size and duration" of the programme to €80 bn monthly of asset purchases till December 2016, because of "subdued inflationary pressures, and moderate pace of economic growth". Again, in December 2016 Mario Draghi announced extending the programme till December 2017, with decreasing volume of purchases to €60 bn (from April 2017 onwards), because of same reasons. Even this deadline was extended, with the QE continuing till September 2018 with tapered monthly pace of €30 bn. On the meeting in the June 2018 Governing Council of the ECB decided to keep €15 bn of monthly purchases from September 2018 to December 2018, and finally, quit the programme. In order to examine market reactions strictly to policy announcements, further easing in extremely volatile market environment after the COVID-19 is excluded from our sample.

Additionally, we consider gradual tapering and normalization of monetary policy along with shrinking the bank's balance sheet as an inevitable consequence of the QE. We argue, that tapering and balance sheet unwinding (quantitative tightening – QT) linked effects should be taken into consideration as effects of consequences of the QE.

2 Literature review

We find across the existing literature, that mainstream research examining the QE implications is oriented on bond yields. To be more concrete, common ground among the authors is, that the QE lowered both government and corporate bonds' yields persistently and significantly. Especially Joyce et al. (2012) provides the wide-spectral and deep literature analysis. After describing "base point" from which the UMP is launched, authors explain impact of the QE on the domestic demand, the equities and the yields in theory. Authors also contribute to consensus found among other studies, that the QE is effective with respect to lowering long-term yields (Gagnon et al., 2011; Ihrig et al., 2012). On the other hand, Xing (2018) express some warning, that "persistently low long-term bond yields increase the probability and magnify the impacts of balance sheet crises." Kiley (2018) then suggests, that such declines in long-term interest rates further stimulated spending and supported the

economic recovery and limited the fall in the inflation (see also Engen et al., 2015).

Broader study of Hausken and Ncube (2013) examines both effects of the QE on the interest rates and the yields and the broader economic effects using event-study and Bayesian Vector Autoregression (BVAR) models. Results of event studies from Japan, the United Kingdom (UK), the United States (US) and the EU are in line with others – the QE caused significant drop in sovereign yields, affecting the whole yield curve. In addition, authors provide evidence, that the FED and the BoE were more effective in lowering yields compared to the BoJ and the ECB. Authors argue, that in general for all four mentioned areas, effects of the QE on the gross domestic product (GDP) were rather limited, or insignificant. On the other hand, in order to push the inflation higher, the QE is effective tool in ZLB terms according to the BVAR results presented in this study.

Considering now only the ECB's QE, in general we find similar results (lowering yields along the whole yield curve) compared to the US, although the magnitude of the effects is lower. This is in our point of view caused by less developed and less interconnected capital and credit markets in Europe compared to the US (Suchy and Safar, 2017). We also argue that effects and implications of the ECB's QE are less examined (in comparison to the FED's QE programmes) because of shorter duration of the programme. On the other hand, before the QE was launched, there were other narrower-scale programmes, which are commonly included in studies dealing with the QE.

Andrade et al. (2016) analyse – in line with other studies – effects of the ECB's APP on sovereign yields, additionally explaining implications to macroeconomy. Using "New Area – Wide Model" authors came to conclusion, that announcement of the QE programme reduced significantly and persistently sovereign long-term bond yields. To add on, authors present that share prices of the banks with more sovereign bonds in their portfolios soared – which is in line with portfolio rebalancing channel theory, taking into account reducing risk of duration. Study also provides some insights about effects on economy in the Euro area. Using weighted average least squares (WALS) and Bayesian model averaging (BMA), Afonso and Jalles (2017) contributes by assessing the determinants of sovereign bond yield spreads in the period from 1999 to 2016 with respect to unconventional monetary policy measures. Besides identifying such baseline determinants, authors points out that the CBPP reduced yield spreads in all Euro area countries examined, particularly in between 2011 and 2013. Authors express conclusion, that long-term refinancing operations contributed to reducing the yield spreads in most countries.

Urbschat and Watzka (2017) studied the short-term financial markets reaction after APP press releases, analysing the development of bond yields and spreads around these releases estimating the different asset price channels by quantifying the cumulative decrease of spreads using event regressions for several Euro area countries. According to authors, effects in yields and spreads reduction were most pronounced for the initial announcement on the PSPP but declined afterwards for additional announcements. They conclude that rather modest effects from the portfolio rebalancing are present (for all countries examined).

On the other hand, Boermans and Vermeulen (2018) investigates whether the ECB's PSPP affected Euro area investors' demand for bonds by using granular securities holdings data. Empirical results of this study show that the PSPP did not affect the coefficients of bond demand functions among the Euro area investors. This suggests that investors' preferred habitat for certain bonds remained stable over the period 2013-2016 despite the QE programme.

Gambetti and Musso (2017) describes the transmission channels and provide empirical evidence of the macroeconomic impact of the APP. Evidence from this study (using Vector Autoregression – VAR model) suggests that the QE had significant upward effect on both real GDP and inflation in Euro area during first two years. Considering time frame, impact on real GDP appears to be stronger in the short-term, while impact on inflation appears to be more significant in the medium-term according to authors. Such results find some support in Hutchinson and Smets (2017), where main focus is put on successfulness of reaction function and the way it is communicated, besides examining reactions of the GDP and inflation to monetary policy "package". Results suggest, that policy package absenting, inflation on average, would be almost half a percentage point lower than currently projected in each year over 2016–2019.

From different perspective of view, Blattner and Joyce (2016) examines how shocks to the net supply of government bonds affect the Euro area term structure of interest rates and the wider economy. Authors use the BVAR model, while results provide evidence of significant lowering of Euro area 10-year bond yields. According to the results, authors argue that the QE propped up both the inflation and the output gap in the Euro area.

Considering spillovers of the ECB's QE, Falagiarda et al. (2015), describes effects of the QE announcements on non-eurozone members' (Czech Republic, Hungary, Poland and Romania) bond yields. Authors present results of their event-study suggesting strong spillover effect via the portfolio rebalancing and signaling channels (excluding Hungary) which is in line with conclusions in studies examining the FED's QE spillovers.

However, considering the QE effects on the equity markets, we find veer limited literature background. We point out study of Henseler and Rapp (2018) where authors are interested in the question of which businesses benefited from the ECB's QE stimulus, using the event-study, focusing on substantial cross-sectional variation in a sample of 2,625 non-financial firms in the Eurozone. Results show that the announcement returns are positively correlated with leverage and negatively with size (authors find it consistent with the credit channel). Furthermore, the announcement returns are negatively correlated with the market-to-book ratio, suggesting different exposures of the value and growth stocks. These patterns are more pronounced once the programme initiation announcements are only examined according to this study. Authors also argue, that only "few existing studies analyse aggregate portfolios or even stock indices and report mixed results." For example Rogers et al. (2014) find positive announcement returns for the German equity market. Fratzscher et al. (2017) confirms that for banking sector and country indices and Haitsma et al. (2016) for the Eurostoxx50. In contrast, Hosono and Isobe (2014) find negative returns for both the Eurostoxx Banks and Stoxx600. To sum up, equity markets related research examining effects of the QE is rather scarce, with only very limited sample examined.

3 Empirical Analysis

Based on literature linked to the QE, we find event-studies as most used methodological approach. Papers most related to the event-studies assume that the surprise part can be measured from the excess movements in asset prices in a particular window around the announcement time of the policy decision. Within this method it is therefore assumed that the monetary policy shock is fully captured within some time-window around the chosen event. If this assumption does not hold, the method may be biased (Rigobon and Sack, 2004). Too narrow window may cause that part of the reaction to the announcement news would be missed, too wide window on the other hand may contaminate the announcement with other news. That is why several papers (see e.g. Kholodilin et al., 2009; Sondermann et al., 2009; Hayo and Niehof, 2011 or Rogers et al., 2014) apply the heteroscedasticity-based identification approach of Rigobon and Sack (2004). This approach is robust considering endogeneity and omitted variables problems – therefore relies on weaker assumptions than the event-study approach. Rosa (2011) then provides evidence, that the event-study estimates (of the response of asset prices to monetary policy) contain a significant bias. But more importantly, Rosa (2011) also concludes that

"this bias is fairly small" and the "approach tends to outperform" with respect to the heteroscedasticity-based estimator for both small and large sample sizes, adding, that "in general the event-study methodology should be preferred".

To examine short-term market reactions, i.e. effects of announcements on the equity markets, we use standard event-study methodology to determine excess returns (see e.g. MacKinlay, 1997). Abnormal (excess) returns will be analysed at the same time point (day) as announcement is released[1] using average returns (Brown and Warner, 1985) calculated from previous sixty days (Sosvilla-Rivero and Fernández-Fernández, 2015)[2]:

$$A_{AD} = R_{AD} - \bar{R}_t \qquad (1)$$

$$\bar{R}_t = \frac{1}{60}\sum_{t-60}^{t-1} R_t \qquad (2)$$

Where the A_{AD} represents the excess return on the announcement day (AD) of particular index, the R_{AD} is the return of particular index on the announcement day (calculated as the difference between the closing prices on the announcement day and the previous day, divided by the close price of the previous day – expressed in percentage points), the R_t represents the average return of particular index in the previous sixty days before the announcement day (expressed in percentage points). For purposes of examining the short-term QE information-related effects on the equity markets, we consider the A_{AD} (expressed in percentage points) as the key indicator. This indicator provides us with information how the daily return on index deviate on particular day, after the announcement is made, from its average performance during the previous sixty trading days. Even though the persistency of these effects can be questioned, undoubtedly we get solid information about the sentiment brought to the market participants by the ECB, in order to find out if such a policy is positive or negative impulse for the equities, which we consider as a main advantage of this methodology.

Here we would like to point out, that despite event-study is widely used among authors with respect to the QE (e.g. Henseler and Rapp, 2018; Curcuru et al., 2018; Urbschat and Watzka, 2017; Bauer et al., 2014; Wright, 2012; Swanson, 2011; Gagnon et al., 2011; Joyce et al., 2010; Gregova et al., 2020). Thornton (2017) argues that the event-study approach with announcements used as an events cannot provide statistically significant information about persistence and durability of effects caused on bond yields (or other assets) by those announcements, therefore this approach cannot be used to examine effectiveness of the whole QE in its complexity. We agree with Thornton (2017), that persistence of such effects cannot be examined via this methodology, nevertheless, from daily and intraday perspective it provides valuable knowledge about possible changes of "sentiment" of market participants.

For purposes of this research we used daily close prices of main equity indices representing the Europe's equity markets. As pointed out by Kontonikas et al. (2013), the problem of endogeneity should be less of a concern when daily data are used within an event-study framework. Haitsma et al. (2016) adds, that monetary policy is unlikely to be affected by changes in asset returns on the same day, meaning that the likelihood that results are contaminated by reverse causality going from the equity prices to changes in the monetary policy is minimal (see also Fratzscher et al., 2017). Furthermore, one-day windows are unlikely to be contaminated by other pieces of news.

We are specifically interested in the aspects of using this methodological approach as they pertain to determine whether information related to unconventional monetary policy (or the QE), provided by monetary authority, has positive or negative impact on equity markets via examining returns on benchmark indices on announcement days.

Despite wide research done on the QE topic, we consider the equity markets reactions to the QE related events/information undiscovered robustly. In general, literature coverage is scarce as Shah et al. (2018), Kiley (2014) or Rosa (2012), hence we find it beneficial to examine properly the sentiment brought to the markets by central banks' announcements. Such empirical analysis could provide us with valuable knowledge with respect to establishing profitable positions, or, on the other hand help to hedge against expected losses based on anticipated market reactions.

Main input (besides daily close prices of particular indices) for this analysis would be identification of the QE related announcements. For this purpose, we examined content of each monetary policy linked release from 2008 onwards from the ECB. Such press releases, central bankers' speeches or conferences are held mostly in the afternoon, which gives markets' participants several hours to adjust, and price-in announced information until the markets are closed.

For the EU, we used daily close prices of main equity indices as representatives of the European equity markets (CAC, DAX, Eurostoxx50, FTSEMIB, Stoxx600), while returns/changes were calculated as percentage points[3]. In the Europe, index CAC is a free float market capitalization weighted index reflecting the performance of the 40 largest and most actively traded shares listed on Euronext Paris, DAX is a total return index of 30 selected German blue-chip stocks traded on the Frankfurt Stock Exchange, Eurostoxx50 is leading blue-chip index for the Eurozone, providing blue-chip representation of supersector leaders in the region, covering 50 stocks from 11 Eurozone countries, FTSEMIB consists of the 40 most liquid and capitalized stocks listed on the Borsa Italiana and Stoxx600 represent 600 large companies in Europe, covering more than 90% of market cap in the Europe. Descriptive statistics of indices used we present in Tab. 1:

[1] Announcements are released usually in the afternoon, while markets close several hours later, which gives market participants enough time to absorb information contained in particular announcement.

[2] Sosvilla-Rivero & Fernández-Fernández (2015) uses previous six weeks (30 days) as a timeframe for calculating average returns. We argue that doubling that time to approximately one quarter (twelve weeks) provides more appropriate information with respect to "average" returns.

[3] Returns on announcement days were removed from sample so average returns were calculated without contamination of excess returns on announcement days.

Tab. 1: The EU indices – descriptive statistics

	Obs.	Mean	Median	St. Dev.	Kurt.	Skew.	Min.	Max.	Sum
CAC	2820	0.01%	0.03%	1.46%	6.7723	0.1827	-9.04%	11.18%	20.00%
DAX	2820	0.02%	0.06%	1.42%	6.5652	0.1664	-7.16%	11.40%	62.96%
Eurostoxx50	2820	0.00%	0.00%	1.47%	6.1834	0.1041	-8.62%	11.00%	-0.70%
FTSEMIB	2820	-0.01%	0.03%	1.69%	4.6137	-0.0262	-12.48%	11.49%	-26.02%
Stoxx600	1476	0.02%	0.05%	0.96%	4.5893	-0.5153	-7.03%	4.20%	27.58%

Source: Own elaboration. Data retrieved from Investing.com

In Tab. 2 we present announcements considered as events for the European markets, compiled of every single press release of the ECB from 2008 to 2019Q1, where type of meeting or announcement is shown in second column, with date of announcement in first column. Third column refers to which particular UMP programme is event/announcement linked, with short description highlighting most important part of such announcement. Tab. 2 consists only of announcements linked to UMP and its' programmes, including also predecessors of the APP (recognized as the QE) which started in 2015. Since previous programmes are also identified as nonstandard or unconventional monetary policy instruments and represents assets purchases to some extent, we added them to our study, in order to increase robustness of this analysis.

Tab. 2: The ECB's announcements

Date	Event	Description
13.12.2018	ECB Press Release	"Regarding non-standard monetary policy measures, the net purchases under the asset purchase programme (APP) will end in December 2018. At the same time, the Governing Council is enhancing its forward guidance on reinvestment. Accordingly, the Governing Council intends to continue reinvesting, in full, the principal payments from maturing securities purchased under the APP for an extended period of time past the date when it starts raising the key ECB interest rates, and in any case for as long as necessary to maintain favourable liquidity conditions and an ample degree of monetary accommodation."
14.06.2018	ECB Press Release	"The Governing Council anticipates that, after September 2018, subject to incoming data confirming the Governing Council's medium-term inflation outlook, the monthly pace of the net asset purchases will be reduced to € 15 bn until the end of December 2018 and that net purchases will then end. The Governing Council expects the key ECB interest rates to remain at their present levels at least through the summer of 2019 and in any case for as long as necessary to ensure that the evolution of inflation remains aligned with the current expectations of a sustained adjustment path."
25.01.2018	ECB Press Release	"Regarding non-standard monetary policy measures, the Governing Council confirms that the net asset purchases, at the new monthly pace of € 30 bn, are intended to run until the end of September 2018, or beyond, if necessary, and in any case until the Governing Council sees a sustained adjustment in the path of inflation consistent with its inflation aim."
26.10.2017	ECB Press Release	APP expanded, monthly pace reduction from € 60 bn/m to € 30 bn/m from 1/2018.
15.12.2016	ECB Press Release	ABSPP change: "The Governing Council of the European Central Bank (ECB) decided yesterday that the Asset-Backed Securities Purchase Programme (ABSPP) should be fully implemented by national central banks rather than relying on the support from external managers."
08.12.2016	ECB Press Release	APP extended to December 2017, monthly pace reduction from € 80 bn/m to € 60 bn/m from 4/2017.
10.03.2016	ECB Press Release	ECB announces new series of targeted longer-term refinancing operations (TLTRO II) + ECB adds corporate sector purchase programme (CSPP) to the asset purchase programme (APP) and announces changes to APP – APP expanded to € 80 bn from April.
09.11.2015	ECB Press Release	Public sector purchasing programme (PSPP) – "As of 10 November 2015, the PSPP issue share limit will be set at 33% per ISIN. This higher issue limit allows for a significant increase in the purchasable amount both for outstanding and for newly issued PSPP eligible securities."
23.09.2015	ECB Press Release	Asset backed securities purchase programme (ABSPP) – Technical details – "The Governing Council of the European Central Bank (ECB) decided to increase the proportion of purchases by national central banks rather than external managers in the Asset-Backed Securities Purchase Programme, as announced when the programme was first launched."
22.01.2015	ECB press conference MPD-GC	Asset purchase programme (APP) initial announcement.
30.10.2014	ECB Press Release	Technical details - ECB appoints executing asset managers for the ABSPP – "The purchases under the ABSPP are expected to start in November 2014, following the approval by the Governing Council of a legal act on the implementation of the programme."
02.10.2014	ECB Press Release	ABSPP + CBPP - technical details – "programmes will last at least two years".
18.09.2014	ECB Press Release	"The European Central Bank has today allotted € 82.6 bn to 255 counterparties in the first of eight targeted longer-term refinancing operations (TLTROs) to be conducted between September 2014 and June 2016. The programme is designed to enhance the functioning of the monetary policy transmission mechanism by supporting bank lending to the real economy."
03.07.2014	ECB Press Release	Long-term refinancing operation (LTRO) – technical details – "For banks that exhibited positive eligible net lending in the twelve-month period to 30 April 2014, the benchmarks are always set at zero."
04.06.2014	ECB Press Release	In pursuing its price stability mandate, the Governing Council of the ECB has today announced measures to enhance the functioning of the monetary policy transmission mechanism by supporting lending to the real economy. In particular, the Governing Council has decided: 1. To conduct a series of targeted longer-term refinancing operations (TLTROs) aimed at improving bank lending to the euro area non-financial private sector, excluding loans to households for house purchase, over a window of two years. 2. To intensify preparatory work related to outright purchases of asset-backed securities (ABS).
06.12.2012	ECB press conference MPD-GC	LTRO + MRO.
31.10.2012	ECB Press Release	Covered bond purchase programme 2 (CBPP2).
06.09.2012	Governing Council Press Release	Announcement of the ECB short-term sovereign bond purchase program (Outright Monetary Transactions, OMT). No purchases were conducted within this program as of July 2014.
02.08.2012	ECB press conference	Outright monetary transactions (OMT).
26.07.2012	M. Draghi speech	M. Draghi promised to do "whatever it takes to save the euro." This speech triggered the expectations of ECB intervention in the sovereign markets.
08.12.2011	Governing Council Press Release	Announcement of the three-year longer-term refinancing operations (LTROs). ECB banks were given the opportunity to obtain all liquidity needed for the period of three years at the interest rate fixed at the average rate of the main refinancing operations over the life of the operation.
06.10.2011	Governing Council Press Release	Announcement ECB covered bond purchase programs (CBPP2) designed to purchase covered bonds, i.e., securities issued by credit institutions backed by mortgages and public-sector debt.
07.08.2011	Governing Council Press Release	Reactivation of SMP announced on Sunday, August 7, 2011, when the Spanish and Italian sovereign bond markets came under tension.
30.06.2010	Governing Council Press Release	CBPP / LTRO.
10.05.2010	Governing Council Press Release	Announcement of the longer-term sovereign bond purchase program (Securities Markets Programme, SMP). The ECB Governing Council decided to launch the SMP in the midst of the Greek crisis on Sunday, May 9, 2010. A related press release was published the next day.
07.05.2009	Governing Council Press Release	Announcement of ECB covered bond purchase program (CBPP1) designed to purchase covered bonds, i.e., securities issued by credit institutions backed by mortgages and public-sector debt.
15.10.2008	Governing Council Press Release	Announcement of the fixed-rate full-allotment (FRFA) procedure: Long-term Refinancing Operations (LTRO).
13.10.2008	Governing Council Press Release	Announcement of the fixed-rate full-allotment (FRFA) procedure: US dollar funding.
08.10.2008	Governing Council Press Release	Announcement of the fixed-rate full-allotment (FRFA) procedure: Main Refinancing Operations (MRO).
28.03.2008	Governing Council Press Release	Long-term refinancing operation (LTRO).

Note: MPD-GC – Monetary Policy Department, Governing Council; Similar announcements used as events regarding UMP could be found in Szczerbowicz (2015) or Sosvilla-Rivero & Fernández-Fernández (2015).
Source: Own elaboration. Information retrieved from the ECB.

4 Results and discussion

In Tab. 3 we present calculated excess returns for main indices of Germany (DAX), France (CAC), Italy (FTSEMIB), Eurostoxx50 and Stoxx600 on ECB announcement days presented in Tab. 2. We point out, that in Tab. 3 are excess returns calculated both for the UMP programmes before the QE started same as for the announcements regarding the QE after January 2015.

From these results, we would like to point out several remarks. Firstly, if we are considering "index movements" above or below one standard deviation of performance over reference period as a strong magnitude reaction, we can conclude, that in period before the QE (started by announcement on 22.01.2015) market reactions were more volatile than in period after the QE started. We put this conclusion in the context of decreasing volatility in the markets all over the world after crisis.

With respect to reactions in late 2018 and, in general, hard and soft data revised down across the globe along with other geopolitical tensions drove also sentiment among the European equity markets. Especially indicators such as inflation expectations and growth expectations were revised down (by the OECD, the ECB or the IMF), and beaten more than expected in several EU countries, which put some pressure on the ECB and its projected policy, especially with regards to future rates-hiking path and the policy normalization. However, for the ECB, we did not record any significant policy change-related announcement in particular timeframe. Further in Tab. 4 we provide some descriptive overview of calculated excess returns. Average reactions over the whole reference period (2008-2019Q1) are in slightly positive range, although we do not consider it as a significant information linked only to the QE.

Tab. 3: Excess returns on the ECB's announcements

Date	CAC	DAX	Eurostoxx50	FTSEMIB	Stoxx600
13.12.2018	-0.10%	1.77%	0.26%	0.72%	0.02%
14.06.2018	1.33%	**3.28%**	1.34%	1.26%	**1.86%**
25.01.2018	-0.26%	-0.89%	-0.36%	0.34%	-0.40%
26.10.2017	1.41%	1.28%	1.21%	1.54%	**1.03%**
15.12.2016	0.93%	0.98%	1.08%	1.89%	0.82%
08.12.2016	0.75%	1.66%	1.28%	1.49%	**1.18%**
10.03.2016	***-1.64%***	-2.19%	-1.39%	-0.26%	***-1.56%***
09.11.2015	***-1.49%***	-1.58%	***-1.44%***	-1.84%	***-1.06%***
23.09.2015	0.21%	0.65%	0.29%	0.26%	0.23%
22.01.2015	1.37%	1.08%	**1.47%**	2.37%	**1.50%**
30.10.2014	0.74%	0.35%	0.42%	0.15%	0.56%
02.10.2014	***-2.80%***	-1.89%	***-2.76%***	***-3.91%***	***-2.39%***
18.09.2014	0.78%	1.47%	1.07%	0.12%	**0.99%**
03.07.2014	1.03%	1.15%	1.14%	0.98%	0.90%
04.06.2014	1.01%	0.11%	0.82%	1.43%	0.36%
06.12.2012	0.27%	1.04%	0.40%	-0.71%	-
31.10.2012	-0.83%	-0.36%	-0.49%	0.08%	-
06.09.2012	**2.87%**	2.70%	**3.19%**	**4.03%**	-
02.08.2012	***-2.73%***	-2.23%	***-2.70%***	***-4.59%***	-
26.07.2012	**4.13%**	2.82%	**4.35%**	**5.82%**	-
08.12.2011	***-2.63%***	-2.18%	***-2.60%***	***-4.44%***	-
06.10.2011	**3.71%**	**3.51%**	**3.46%**	**3.87%**	-
07.08.2011	***-4.35%***	***-4.74%***	***-3.40%***	-2.14%	-
30.06.2010	0.64%	0.33%	1.01%	0.83%	-
10.05.2010	**9.69%**	**5.18%**	**10.40%**	**11.41%**	-
07.05.2009	***-4.58%***	***-3.39%***	***-4.23%***	***-3.17%***	-
15.10.2008	-1.08%	-1.68%	-1.37%	-1.63%	-
13.10.2008	***-6.48%***	***-6.07%***	***-6.12%***	***-4.95%***	-
08.10.2008	**11.51%**	**11.82%**	**11.36%**	**11.88%**	-
28.03.2008	***-6.16%***	***-5.64%***	***-6.26%***	***-5.46%***	-

Note: Bold labelled are excess returns above standard deviation of daily returns, excess returns below standard deviation of daily returns are shown in *italics*. Stoxx600 data set is available only from 2013 onwards.
Source: Own elaboration. Daily data from 2008Q1 to 2019Q1 retrieved from Investing.com.

Considering now only period from 2015 onwards (Tab. 5), we face again slightly positive reactions on every index in average: CAC +0.25%, DAX +0.60%, Eurostoxx50 +0.37%, FTSEMIB +0.78% and Stoxx600 +0.36%, which is well above the average daily returns over reference period[4] (CAC +0.0169%, DAX +0.0145%, Eurostoxx50 +0.0033%, FTSEMIB +0.0181% and Stoxx600 +0.0048%). Results suggest, that regarding the QE announcements made after the January 2015, indices reacted positively (6 situations out of 10 on CAC, with average upside +0.65%, 7 situations out of 10 on DAX, Eurostoxx50 and Stoxx600 with average upside +0.96%, +0.87% and +0.66%, respectively, while FTSEMIB increased in 8 out of 10 situations with average gain +0.55%).

Tab. 4: Descriptive overview of the EU indices' excess returns

Descriptive overview	CAC	DAX	Eurostoxx50	FTSEMIB	Stoxx600
Std. Dev. overall	1.41%	3.01%	1.43%	2.51%	0.95%
Average excess return	0.24%	0.28%	0.38%	0.58%	0.27%
Number of positive returns	17	18	18	19	11
Positive returns (Ratio)	57%	60%	60%	63%	73%
Average upside on pos. ret.	2.49%	2.29%	2.48%	2.66%	0.86%
Number of negative returns	13	12	12	11	4
Negative returns (Ratio)	43%	40%	40%	37%	27%
Average downside on neg. ret.	-2.84%	-2.83%	-2.89%	-3.15%	-1.35%

Note: Std. Dev. refers to standard deviation of daily excess returns over examined period.
Source: Own elaboration.

We add on, that the ECB only approached closing of its APP programme in December 2018. Hence, we find only two tapering, policy normalizing or tightening-related announcements from the ECB in our sample. First was made on 25th January 2018, where M. Draghi announced reduced monthly pace of purchases from €60 bn to €30 bn, suggesting possible end of the QE in September 2018. After this particular announcement, we faced negative, however muted, reactions (except from FTSEMIB): CAC -0.26%, DAX -0.89%, Eurostoxx50 -0.36%, Stoxx600 -0.40%. Relative mild reactions' magnitude could be consequence of already partially priced in information by equities and other asset classes. We consider this as a result of clear, foreseeable and stable communication from the ECB, therefore clear understanding of the ECB's reaction function by market participants.

Tab. 5: Descriptive overview of the EU indices' excess returns – 2015 onwards

Descriptive overview (22.01.2015 onwards)	CAC	DAX	Eurostoxx50	FTSEMIB	Stoxx600
Average excess return	0.25%	0.60%	0.37%	0.78%	0.36%
Number of positive returns	6	7	7	8	7
Positive returns (Ratio)	60%	70%	70%	80%	70%
Average upside on pos. ret.	0.65%	0.96%	0.87%	0.55%	0.66%
Number of negative returns	4	3	3	2	3
Negative returns (Ratio)	40%	30%	30%	20%	30%
Average downside on neg. ret.	-0.87%	-1.55%	-1.06%	-1.05%	-1.01%

Source: Own elaboration.

On the other hand, this announcement was followed by announcement made on 14th June 2017, where another prolonging of programme came, with additional dovish remarks towards rate hiking. Whatever anticipated this prolonging-related information was, initial reactions overall were highly positive (again, in line with our assumption, that prolonging or expanding current programme cause positive reactions on equities): CAC +1.33%, DAX 3.28%, Eurostoxx50 1.34%, FTSEMIB +1.26%, Stoxx600 +1.86%. The second tapering related announcement came on 13th December 2018. Besides announcing, that the QE programme will end, which was, by the way already widely expected, some significant, sentiment maintaining remarks came along, such as: *"Accordingly, the Governing Council intends to continue reinvesting, in full, the principal payments from maturing securities purchased under the APP for an extended period of time past the date when it starts raising the key ECB interest rates…"* Initial reactions were therefore mixed (CAC -0.10%, DAX +1.77%, Eurostoxx50 +0.26%, FTSEMIB +0.72%,

[4] Considering period from 2015 to 2018.

Stoxx600 +0.02%). We put this into context with market expectations, and again, understanding of reaction function. Several studies approached more sophisticated methods to identify only announcements considered as an unconventional monetary policy "surprises", in order to examine only movements and reactions on such days (see e.g. Hutchinson and Smets, 2017). Hence, there are some announcements that need individual approach. On 2nd December 2012, the OMT programme was announced, which was followed by initial negative reactions, however for next three days were significantly positive from indices examined perspective. We argue this is in line with portfolio rebalancing channel, same as the situation on 8th August 2011 after reactivation of SMP (announced on Sunday, 7th August 2011), when the Spanish and Italian sovereign bond markets came under tension, and investors rebalanced their portfolios towards the programme linked assets. Another announcement that caused significant portfolio rebalancing, was made on 7th May 2009, when CBPP1 was announced, therefore we faced sell-offs in equities. Besides these announcements, followed by significant sell-offs in equities, we identified, that even initial reactions on some announcement days[5] were negative, further trading days brought significant positive returns. Consequently, we separated excess returns on announcement days containing information about announcing, expanding or prolonging the QE (25 announcement days, 13 for Stoxx600, respectively[6]).

Tab. 6: Excess returns on announcing, expanding or prolonging the QE

Date	CAC	DAX	Eurostoxx50	FTSEMIB	Stoxx600
14.06.2018	1.33%	3.28%	1.34%	1.26%	1.86%
26.10.2017	1.41%	1.28%	1.21%	1.54%	1.03%
15.12.2016	0.93%	0.98%	1.08%	1.89%	0.82%
08.12.2016	0.75%	1.66%	1.28%	1.49%	1.18%
10.03.2016	-1.64%	-2.19%	-1.39%	-0.26%	-1.56%
09.11.2015	-1.49%	-1.58%	-1.44%	-1.84%	-1.06%
23.09.2015	0.21%	0.65%	0.29%	0.26%	0.23%
22.01.2015	1.37%	1.08%	1.47%	2.37%	1.50%
30.10.2014	0.74%	0.35%	0.42%	0.15%	0.56%
02.10.2014	-2.80%	-1.89%	-2.76%	-3.91%	-2.39%
18.09.2014	0.78%	1.47%	1.07%	0.12%	0.99%
03.07.2014	1.03%	1.15%	1.14%	0.98%	0.90%
04.06.2014	1.01%	0.11%	0.82%	1.43%	0.36%
06.12.2012	0.27%	1.04%	0.40%	-0.71%	-
31.10.2012	-0.83%	-0.36%	-0.49%	0.08%	-
06.09.2012	2.87%	2.70%	3.19%	4.03%	-
26.07.2012	4.13%	2.82%	4.35%	5.82%	-
08.12.2011	-2.63%	-2.18%	-2.60%	-4.44%	-
06.10.2011	3.71%	3.51%	3.46%	3.87%	-
30.06.2010	0.64%	0.33%	1.01%	0.83%	-
10.05.2010	9.69%	5.18%	10.40%	11.41%	-
15.10.2008	-1.08%	-1.68%	-1.37%	-1.63%	-
13.10.2008	-6.48%	-6.07%	-6.12%	-4.95%	-
08.10.2008	11.51%	11.82%	11.36%	11.88%	-
28.03.2008	-6.16%	-5.64%	-6.26%	-5.46%	-
Average	0.77%	0.71%	0.87%	1.05%	0.34%
NoPR	17	17	17	17	10
PosRatio	68%	68%	68%	68%	77%

Note: NoPR – Number of Positive Returns; PosRatio – Ratio of positive returns.
Source: Own elaboration.

Tab. 6 indicates that each index remained in positive range in average, while in 68% of observed announcement days CAC, DAX, Eurostoxx50 and FTSEMIB returned positively, Stoxx600 in 77% of observed announcement days, respectively. Considering now only period starting in January 2015, we present similar table (Tab. 7) with group of announcing, prolonging or expanding the QE programmes linked information:

Tab. 7: Excess returns on announcing, expanding or prolonging (2015 onwards)

Date	CAC	DAX	Eurostoxx50	FTSEMIB	Stoxx600
14.06.2018	1.33%	3.28%	1.34%	1.26%	1.86%
26.10.2017	1.41%	1.28%	1.21%	1.54%	1.03%
15.12.2016	0.93%	0.98%	1.08%	1.89%	0.82%
08.12.2016	0.75%	1.66%	1.28%	1.49%	1.18%
10.03.2016	-1.64%	-2.19%	-1.39%	-0.26%	-1.56%
09.11.2015	-1.49%	-1.58%	-1.44%	-1.84%	-1.06%
23.09.2015	0.21%	0.65%	0.29%	0.26%	0.23%
22.01.2015	1.37%	1.08%	1.47%	2.37%	1.50%
Average	0.36%	0.65%	0.48%	0.84%	0.50%
NoPR	6	6	6	6	6
PosRatio	75%	75%	75%	75%	75%

Note: NoPR – Number of Positive Returns; PosRatio – Ratio of positive returns.
Source: Own elaboration.

From Tab. 7 we see, that in 75% of observed announcement days, each index remained in positive range. We add on, that both announcements[7] when we faced negative reactions, were followed by at least two consequent days of significant gains in each index. Again, we explain it as a rebalancing towards other, programme-linked, assets. Results from January 2015 onwards are again in line with theory that that the equity indices tend to react positively on announcing, prolonging or expanding the QE programmes linked information. We find similar results in study examining equities in the United States regarding the QE of the FED (Safar and Sinicakova, 2019). Still literature coverage of examining equities reaction to the ECB's QE is scarce in general, therefore possibility to put our results in comparison with other authors is rather limited. On the other hand, original assumption is partially in line with Henseler and Rapp (2018), who suggests that positive reactions to the QE follow only regarding leveraged companies, however we examined not only non-financial companies as the authors did. Our results support conclusion of Shah et al. (2018), that the role of QE in explaining excess returns is important in the short-run. On the other hand, having only two announcements linked to tapering, quitting the QE or policy normalizing, we cannot verify assumption, that indices tend to react negatively to such type of information.

Individual analysis of specific announcements, and reactions that followed brought us to the conclusion, that after the announcement containing initial information about a new programme, we can expect sell-off in equities, which is caused by rebalancing the portfolios towards assets directly linked to the programme being announced, or similar assets. Strong effects found in the EU regarding programme initiation announcements we consider in line with Henseler and Rapp (2018). This, even from the short-term perspective, supports the portfolio rebalancing channel, broadly discussed and examined in literature from long-term perspective (see e.g. Hausken and Ncube, 2013; Krishnamurthy and Vissing-Jorgensen, 2011; Joyce et al., 2011; Gertler and Karadi, 2011).

Additionally, we observe decreasing volatility of reactions (see e.g. Ghosh and Saggar, 2017; Xing, 2018), especially after the "whatever it takes" speech by Mario Draghi in 2012. Strong commitment from the ECB depressed the volatility, and improved communiqué helped market participants to understand the ECB's reaction function more accurately. Concluding such necessity of the reaction function communiqué, we find also in Hutchinson and Frank (2017). The signalling channel, we consider as very important both from long-term perspective (Hausken and Ncube, 2013; Bhattarai et al., 2015, Bernanke et al., 2004; Eggertsson and Woodford, 2003) and short-term perspective – if we take into account the market participants' expectations, that the short-term interest rates (yields respectively) will remain low in the future (based on the forward guidance), we can observe bidding down yields on long-term securities, and also pushing up equity prices (mainly because of future earnings expectations). However, regarding tapering, or policy normalization linked information, we get mixed results, and we have only two such announcements yet, therefore we cannot provide significant results. Mixed equity index reactions we put in context of, *inter alia*, combination of well reaction function understanding on the one hand, and unprecedent character of such move on the other.

[5] 10th March 2016, 30th October 2014, 31st October 2012, 2nd August 2012, 8th December 2011.
[6] Announcements described individually above, that caused significant portfolio rebalancing and therefore sell-offs in equities, we consider as unprecedented, hence we do not add them to Group 1 announcements.

[7] On 9th November 2015 PSPP share limit per ISIN was increased, and on 10th March 2016 TLTROII was announced.

5 Conclusion

From short-term, European market participants' reactions perspective, we approached most representative equity indices on daily basis along with using the ECB's announcements in our event-study. Despite the fact, that event-study is very common and popular among the authors, we contribute to existing literature as one of the first attempts to use this methodology in order to explain equity markets' participants sentiment changes brought to markets by the central banks' announcement. Our results show, that announcement of continuance, expanding or extending the QE programmes cause positive equity markets reactions. On the other hand, initial announcements about intended non-standard monetary policy instruments cause portfolio rebalancing towards assets that are subject of direct matter from the intended programme's perspective, however those initial reactions are overwhelmed by positive returns during next periods – supporting portfolio rebalancing theory. Additionally, we argue, that the QE decreased volatility also in the equity markets over the reference period (see e.g. Dondoni et al., 2018; Bhansali and Harris, 2018). Obtained results should serve as guidance for positioning in environment where the QE will be applied. However, inevitable policy normalization or quantitative tightening should be examined in the future, along with other less significant equity indices.

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Primary Paper Section: A

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