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Macroeconomic News and Sovereign Interest Rate Spreads before and during Quantitative Easing

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Abstract

This paper studies how macroeconomic news affected the spreads of Italian sovereign bonds before and during the quantitative easing by the European Central Bank. Daily changes in the bond spreads are regressed on macroeconomic news shocks, where the news shocks are computed as the difference between the published data and the preceding private-sector forecasts. The analysis shows that macroeconomic news shocks had economically and statistically significant effects in 2012–2014 before quantitative easing, but the effects were negligible afterwards with a possible exception of a period in 2019 when the net asset purchases were paused.

JEL Codes: E44, E58

Keywords: sovereign bond spreads, macroeconomic news, quantitative easing, monetary policy

The views expressed are those of the authors and do not necessarily represent the official views of Luminor Bank, Eesti Pank or the Eurosystem.

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Non-technical summary

This paper studies the effects of macroeconomic news shocks on Italian sovereign bond spreads before and after the speech by Mario Draghi, president of the European Central Bank at the time, at the Jackson Hole symposium on 22 August 2014. The speech is widely seen as marking the starting point of quantitative easing in the euro area, in order to support the monetary transmission channel and ensure price stability.

The speech was followed by the announcement of private sector asset purchases a few weeks later, and in January 2015 the ECB committed to large-scale public asset purchases by announcing the expanded Asset Purchase Programme (APP). The net asset purchases were paused from the beginning of 2019 but were restarted in November that year. The APP was complemented by the Pandemic Emergency Purchase Programme (PEPP) after the outbreak of the coronavirus pandemic; the net purchases under PEPP started in March 2020 and were wound up in March 2022.

The paper compares the effects of macroeconomic news shocks on Italian sovereign bond spreads before and after Mario Draghi's speech at the Jackson Hole symposium. We use daily data and our full sample runs from the beginning of January 2012 until the middle of March 2022. The period from January 2012 until 22 August 2014 is taken as the reference period, while the period from 23 August 2014 is the exposure period. We compare the effects of macroeconomic news shocks in the reference period and in the exposure period.

Daily changes in the bond spreads between Italian and German bonds are regressed on proxies of macroeconomic news shocks and various control variables, where the news shocks are computed as the difference between the first release of data and the previous private-sector forecasts. The news shocks thus represent surprises that would lead investors to update their expectations for the future, and this could affect the pricing of government bonds and so the interest rate spread. The effects of the macroeconomic shocks on Italian bond spreads are estimated separately for the reference period from 1 January 2012 to 22 August 2014 and for the exposure period after 25 August 2014.

The regression analyses show that the macroeconomic news shocks had economically and statistically significant effects during the reference period, but the effects were generally negligible in the exposure period. Additional analyses that consider various sub-divisions of the exposure period suggest that the interest rate spread became somewhat more sensitive to macroeconomic news shocks during the pause in net asset purchases in 2019, a finding that receives some support from the rolling regressions. The overall conclusion is that the Italian bond spread appears to have been insulated from macroeconomic news during quantitative easing.

Contents

1. Introduction

The period after the global financial crisis of 2008–2009 posed numerous fiscal and macroeconomic challenges for some euro area countries and even led to discussions about the break-up of the currency union (Shambaugh et al. 2012). At the Jackson Hole symposium on 22 August 2014, the president of the European Central Bank (ECB), Mario Draghi, set out how the ECB would take measures to fight high unemployment and inflation being below its target (Draghi 2014). His speech paved the way for large-scale asset purchases by the Eurosystem, following the quantitative easing of the United States (Varghese & Zhang 2018).

The quantitative easing in the euro area had various components. The ECB first announced two private sector asset purchase programmes in September 2014 and a few months later, in January 2015, it announced the expanded asset purchase programme (APP) of large-scale public asset purchases "to support the monetary transmission mechanism and safeguard price stability" (ECB 2022). The public sector asset purchases started in March 2015 and ended in December 2018, but they were restarted in November 2019 and were still operating at this paper was written in May 2022. The APP was complemented by the Pandemic Emergency Purchase Programme (PEPP) after the outbreak of the coronavirus pandemic. Net asset purchases under the PEPP started in March 2020 and were wound up in March 2022, though maturing principal payments are being reinvested until the end of 2024.

Quantitative easing, in the form of purchases like those under the APP and PEPP, may affect economic outcomes in various ways. It is clear however that since quantitative easing operates through financial markets, it has the potential to affect directly and indirectly the pricing of the assets traded in those markets. The ECB's quantitative easing could influence the pricing of sovereign bonds issued by countries in the euro area, and so affect their yields. This influence may include how the interest rates on sovereign bonds react to unanticipated macroeconomic news. Such macroeconomic news shocks might lead market participants to update their expectations for the net present value of holding sovereign bonds and therefore influence the implied interest rate on the bonds. Empirical studies suggest that macroeconomic news shocks can affect interest rates or the spreads of sovereign bonds (Caporale et al. 2018, Beetsma et al. 2013).

Studies have identified three key channels that quantitative easing or asset purchases may operate through, and that may make sovereign interest rates less sensitive to macroeconomic news shocks (Krishnamurthy et al. 2011, Woodford 2012, Andrade et al. 2021, Vayanos et al. 2021). The first is the market stabilisation channel, which asserts that the liquidity provided by asset purchases eases congestions in financial markets. The second is the portfolio rebalancing channel, which argues that asset purchases may reduce the yields on safe long-term securities and shift investments towards higher-risk assets with higher expected returns. The third is the

signalling channel, which asserts that asset purchases send the signal that a central bank intends to keep policy rates lower for longer.

It is effectively an empirical question to which extent quantitative easing has helped to reduce the sensitivity of sovereign interest rates to macroeconomic news shocks.[1] This paper compares the effects of macroeconomic news shocks on Italian sovereign bond spreads before and after quantitative easing was introduced by the ECB. We use daily data from 1 January 2012 until 15 March 2022. We consider the period from 1 January 2012 until 22 August 2014 as the reference period, given that Mario Draghi's speech at the Jackson Hole symposium may have helped lead markets to expect large-scale asset purchases (Varghese & Zhang 2018). Other ECB programmes were of limited scope during this period. In the baseline specification, we compare the effects of macroeconomic news shocks in the reference period with those in the period of quantitative easing, the exposure period.

We focus on the sovereign bond spreads for Italy for a number of reasons. First, the Italian economy, like a number of others in the euro area, was widely seen as vulnerable to debt financing problems and other financial disruptions after the outbreak of the global financial crisis. Nonetheless, Italy did not receive direct financial support, unlike some other vulnerable countries in the euro area, and so the sovereign bond spreads in Italy were not affected by direct support measures. Second, the Italian economy is the third largest in the euro area and severe financial problems could lead to severe consequences for the entire currency union (Gros 2018). Finally, regular private-sector forecasts are available for Italy for several macroeconomic variables, so it is possible to compute a relatively large number of macroeconomic news shocks.

The paper contributes to various strands of the literature on news and the pricing of financial assets. Some studies investigate how news shocks affect sovereign debt yields over an uninterrupted period of time. Caporale et al. (2018) employ textual analysis of Bloomberg news to study how macroeconomic news affects the spreads of bond yields in the euro area. The news surprise variable is constructed as the differences between the realised macro figures and private-sector expectations, with data spanning from 1999 to March 2014. Their analysis shows that negative news contributes significantly to increased yield spreads in Greece, Italy, Portugal and Spain. Beetsma et al. (2013) use an economic and financial newsflash database to construct news variables based on the amount of news about a country that is released on a given date. They show that there being more news raises the domestic spreads on average, but also that the spillover effects from bad news put upward pressure on spreads in other vulnerable countries while having only minor effects on spreads in non-vulnerable countries.

[1] While not the primary objective of the quantitative easing programme, the ECB has argued that in periods of acute financial market stress, stabilising markets through asset purchases may have had a positive effect on stabilising bond spreads (Schnabel 2020).

Some studies investigate changes in the effects of news shocks as monetary frameworks change. Van Der Heijden et al. (2018) construct a database of the macroeconomic news derived from EuroIntelligence news briefings from July 2009 to March 2013. The paper focuses on Cyprus, Greece, Spain, Ireland, Italy and Portugal, and shows that the introduction of the Outright Monetary Transactions (OMT) programme is associated with a decline in sovereign yields and a reduction in the cross-border spillovers of news. Afonso et al. (2018) use a model of time-varying risk and show that the ECB reduced sovereign risks with its OMT announcements and unconventional monetary policy measures. Ehrmann & Fratzcher (2017) find that Italian and Spanish spreads correlated more strongly after the OMT programme, and interpret this as a sign of the programme having strong effects. As the news does not affect different countries differently, the correlation appears to be higher after the introduction of the OMT programme.

Finally, the paper relates to the discussion of the possible time varying effects of macroeconomic announcements, a topic that has been covered in different contexts before. Faust et al. (2007) use US data announcements in a high frequency environment and Ehrmann et al. (2014) use the euro area news as controls in studying how public debate affected the returns in foreign exchange markets during the sovereign debt crisis.

This paper contributes in a number of ways to the literature that investigates the presence of possible structural breaks in how macroeconomic news shocks affect bond market yields. First, we focus on the period of quantitative easing by the ECB, a policy which has received limited attention in the literature. Second, we use a long time sample in the analysis, which covers the introduction of the APP, the pause in net purchases under the APP in 2019, and the introduction of the PEPP. Third, we focus on macroeconomic news and compute the macroeconomic news shocks ourselves, which helps in interpreting the size and direction of the estimated effects. Fourth, we use a number of specifications and estimation methods, which give confidence in the results obtained and further understanding of the underlying mechanisms. Finally, and unlike many other studies, we focus on only one country and have many observations available to us, which means that we avoid having to pool data across countries which may be unwarranted in situations of substantial cross-country heterogeneity.

The rest of the paper is organised as follows. Section 2 discusses the methodology and the data used. Section 3 reports the baseline results for various individual news shocks and for aggregate shocks. Section 4 discusses some robustness checks. Section 5 reports the results from additional analyses. Section 6 summarises the findings of the paper.

2. Method and data

2.1 Estimation methodology

We study how macroeconomic news shocks impacted the spread of the Italian interest rate over the interest rate on German sovereign bonds of the same maturity. We follow the literature and choose a simple empirical specification where the daily change in the spread is regressed on the macroeconomic news shocks and various control variables, including lags of the dependent variable and a constant (Beetsma et al. 2013, Gödl & Kleinert 2016, Van Der Heijden et al. 2018, Stiefel & Vivès 2021). The key feature is that we allow the estimated coefficients to differ between various periods or sub-divisions of the time sample. The empirical specification can be expressed as follows:

$$\Delta\text{Spread}_t = \sum_{n=1}^{N} \alpha_n D_n + \sum_{n=1}^{N} \sum_{\tau=1}^{5} \beta_{\tau n} D_n \Delta\text{Spread}_{t-\tau} + \sum_{n=1}^{N} \gamma_n D_n \text{News}_t + \sum_{n=1}^{N} \delta_n D_n \text{Control}_t + \varepsilon_t \qquad (1)$$

The variable ΔSpread_t is the change in the interest rate spread between Italian and German sovereign bonds between day $t-1$ and day t. The indicator $n = 1, \ldots, N$ depicts each of the N periods into which the time sample is divided. The variable D_n is a dummy variable taking the value 1 in period n and 0 otherwise. The coefficients α_n, $\beta_{\tau n}$, γ_n and δ_n are to be estimated, while ε_t is an error term.

The first term on the right hand side consists of separate constants α_n for each of the N periods. The second term comprises the lagged dependent variables; in total $5N$ coefficients $\beta_{\tau n}$ are to be estimated. The third term contains the variable News_t, which is the macroeconomic news shock computed as the published macroeconomic variable minus the preceding private-sector forecast of the variable. Some versions of the model include more than one news shock. The coefficient γ_n is of most interest in this paper as it measures the impact of news shocks on changes in the interest rate spread. The fourth term in eq. (1) contains the control variable; we use more than one control variable in some robustness analyses.

The use of the dummy variable D_n in eq. (1) means that the specification effectively comprises N separate regressions, though with the same error term across the N different periods. We allow the constant, the coefficients of the five lags of the dependent variable, and the coefficients of the control variable to differ between the various periods, and so we seek to mop up any heterogeneity between the periods that is not related to changes in the coefficient of the news shock variable.

The news shock always takes the value 0 except on days when the statistics for a macroeconomic variable are released from the statistics authorities. On those days, the news shock is computed as the release minus the preceding private-sector forecast of the variable.

The news shock can be 0 on release days if the private sector forecast is exactly equal to the release. Using the surprise component allows us to claim identification of the effect of the macroeconomic news, so that we find the effect of macroeconomic news shocks on changes in the bond spread.

The specification of the news shocks means that the risk of reverse causality from the bond spread to the news shocks is very small. We therefore follow the literature and estimate the various specifications of eq. (1) using ordinary least squares.[2] Differencing the spread and using a large number of lagged dependent variables means that the residuals are unlikely to exhibit autocorrelation, but there may be some heteroskedasticity, as is often seen in financial data. We therefore report robust standard errors throughout the paper.[3]

2.2 Data

We use daily data, and the full sample period runs from 1 January 2012 to 15 March 2022. The start of the sample is chosen so that the turbulent period after the global financial crisis and the acute phase of the European sovereign debt crisis is left out. The data are obtained from Bloomberg if not otherwise stated. The variable SPREAD is the difference between the yield on Italian sovereign bonds and the yield on German bonds of the same maturity. The interest rate spread is denoted in basis points, and we consider the 1-year and 10-year sovereign bonds. Figure 1 shows the dynamics of the two spreads.

[2] Most studies in the literature are panel data studies and they typically use the least squares dummy variables method (Beetsma et al. 2013, Van Der Heijden et al. 2018, Stiefel & Vivès 2021).

[3] To investigate the importance of the standard errors exhibiting heteroskedasticity, we have computed the *jackknife* standard errors for a number of specifications, but they all turned out to be very close to the robust standard errors reported in the paper (not shown).

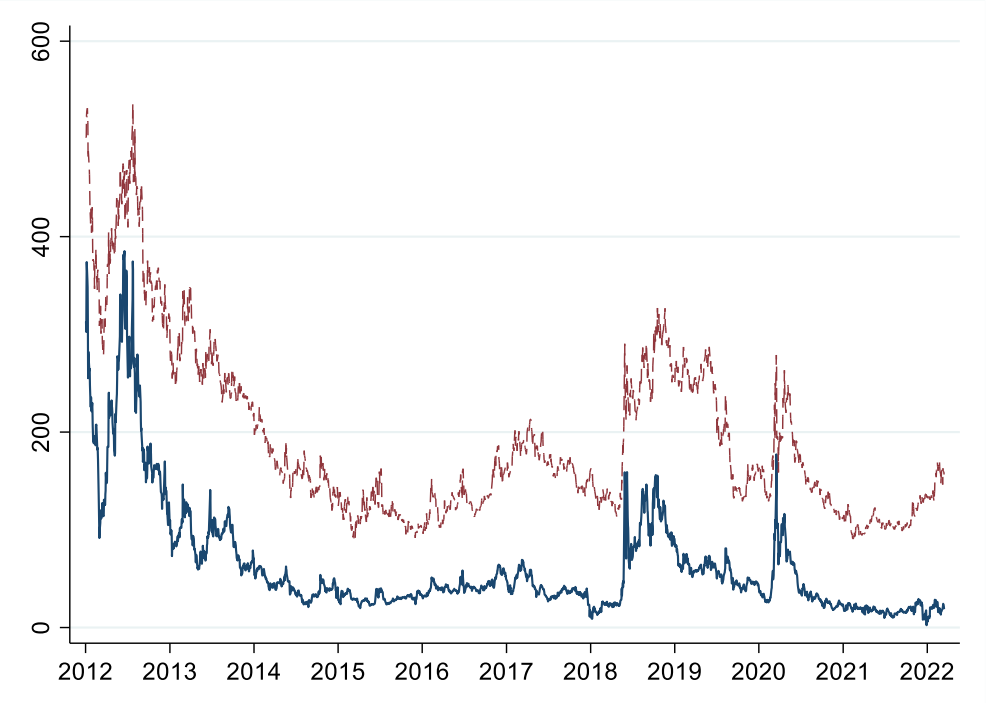

Figure 1: Spread in yield between Italian and German sovereign bonds, basis points

Note: The solid line depicts the 1-year Italian bond spread and the dashed line depicts the 10-year Italian bond spread.

Source: Bloomberg.

The Italian interest rate spreads are positive throughout the time sample, but vary considerably over time. The spread for 10-year bonds is larger than the spread for 1-year bonds. The positive spreads indicate that the default and liquidity risks are perceived to be higher for Italian bonds than for German bonds of the same maturity. The default risk stem partly from the risk of outright delinquency and partly from the risk of currency redenomination.

We use proxies of macroeconomic news shocks as the key independent variables, and these are calculated as the standardised difference between the first data release of the macroeconomic variable and the median of the market expectations of the variable. This means that the macroeconomic news shock is the unanticipated component of the data release. The market survey data are obtained from the Bloomberg survey immediately preceding the data release. The shocks are standardised by dividing the difference between the data release and the survey median by the standard deviation of the shock variable for the full period.[4]

We have two news shocks available at the quarterly frequency. The news shock GDP is the difference between the first release of the year-on-year GDP growth rate and the median survey expectation for the variable, so the shock is denoted in annual percentage points. The variable UNEMPL is the news shock for the unemployment rate, denoted in percentage points. We have

[4] The standard deviation is computed for the frequency at which the data releases are available, which is the monthly or the quarterly frequency.

three news shocks available at the monthly frequency. The news shock PMIMAN is the difference between the Purchasing Managers' Index for manufacturing, which in principle takes values between 0 and 100, and the median survey expectation for the index.[5] The variable SALES is the news shock for the year-on-year percentage growth in retail sales, denoted in percentage points. Finally, the variable IP is the news shock for industrial production, which is denoted in percentage points.

The standard deviation of the various shocks is 0.676 for the GDP news shock, 0.134 for the unemployment shock UNEMPL, 2.451 for the industrial production shock IP, 2.143 for the retail sales shock SALES, and 1.260 for the news shock for the PMI for manufacturing (PMIMAN). The standard deviation is relatively high for the fast-moving variables for industrial production, retail sales and the PMI index, and lower for the slow-moving variables GDP and UNEMPL.

The news shocks are used in estimations using daily data. The conversion to a daily frequency means that each shock variable takes the value 0 on days when there are no announcements or no surprises, and it takes the value of the surprise on the days with unanticipated information in the macroeconomic releases.

The data coverage of the survey data for Italian macroeconomic news is overall relatively good, though there are some gaps in the data on retail sales as the survey results were in some instances not published by Bloomberg because there were too few respondents to a survey or because no survey was conducted. In total the sample has 423 days with macroeconomic data releases but only 347 days of non-zero news shocks, reflecting that the median of the survey coincided with the actual release on some days or that the survey results were not published.

The individual standardised news shocks will be used as covariates, but we will also aggregate them in order to obtain a variable with more non-zero data points. We compute the aggregate news shock by summing four of the news shocks and subtract the unemployment news shock. In algebra, the aggregation takes the form: AGG5 = GDP – UNEMPL + IP + SALES + PMIMAN. It is important in this context to note that the various macroeconomic releases occur on different days, so there are never two pieces of news on the same day. Figure 2 shows the dynamics of the aggregate news shock.

[5] In the sample, the Purchasing Managers' Index for manufacturing takes values between 10.9 and 59.1. The index signifies an unchanged situation if its value is 50, an improved situation if it is above 50 and a worsened situation if it is below 50.

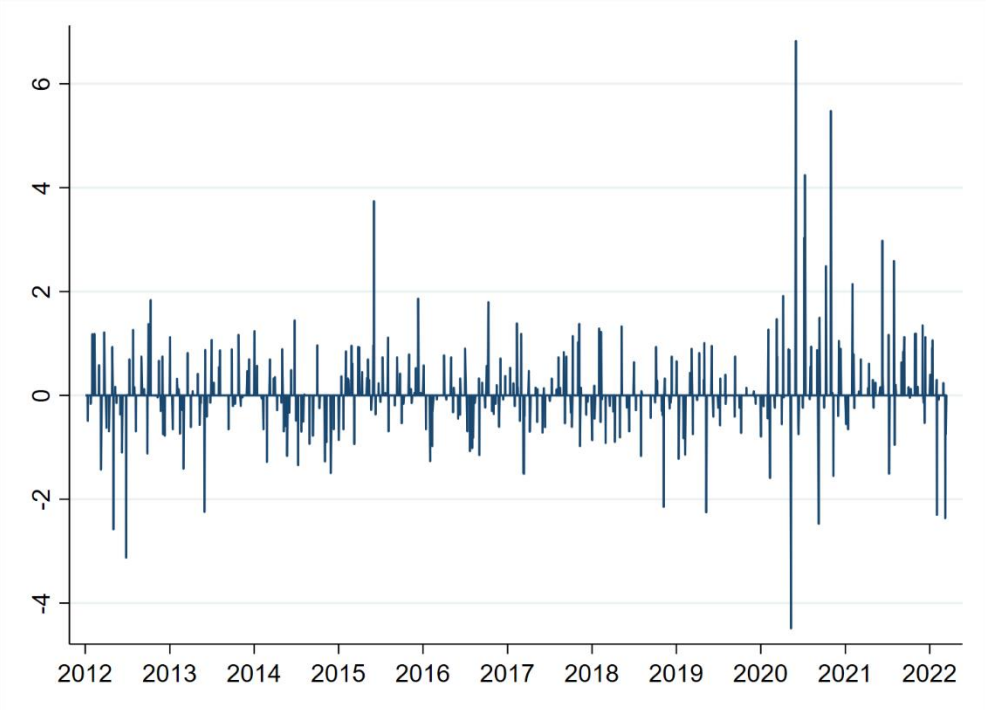

Figure 2: Aggregate news shock, AGG5

Note: The aggregate news shock is computed as the sum of the individual news shocks for GDP, industrial production, sales and PMI manufacturing, minus the news shock for unemployment.

Source: Bloomberg and authors' calculations.

The specification in eq. (1) also includes a control variable. Omitted variables bias may emerge if a backdoor path is open due to omitted concomitant variables. The risk of omitted variables bias is however small given that the news shocks are very "spiky" with many zeros and a relatively small number of non-zero observations; the correlation between the news shocks and possible control variables may therefore be small.[6] We include the US sovereign bond yields, labelled US1Y for the 1-year maturity and US10Y for the 10-year maturity. The US bond yields are taken as proxies for sentiments in international bond markets, and it may as such be correlated with both the Italian interest rate spread and the news shocks. In some robustness analyses we use the 1-year and 1-year German sovereign bond yields and the volatility indexes VIX and VDAX, which depict the pricing of risks in the US and German stock markets respectively.

In the baseline estimations, we split the sample into two parts, a reference period and an exposure period. The choice of the cut-off date between the two periods is complicated and subject to some ambiguity. The Outright Monetary Transactions (OMT) programme was introduced in September 2012, but the programme has strict eligibility requirements and imposes stringent conditions on participating countries. The OMT programme was never used to purchase any government bonds, including Italian ones. The interest rates of the European

[6] It is noticeable that the literature investigating the impact of news shocks on the yields or spreads of government bonds typically uses no or very few control variables.

Central Bank were kept very low throughout 2012 and 2013, and in June 2014 the interest rate on the main refinancing operations was set at 0.15 per cent and the deposit rate at –0.1 per cent, as the inflation rate remained well below target.

We choose to let the reference period run from the beginning of the sample on 1 January 2012 to 22 August 2014, which is the date of Mario Draghi's speech at the Jackson Hole symposium, a speech that has been considered as an indirect promise of quantitative easing (Varghese & Zhang 2018).[7] It is clear that although the speech at the Jackson Hole symposium signalled a change in the ECB's use of monetary policy instruments, the expectations of the change may not have changed so abruptly and it could have occurred over time, perhaps to some extent both before and after the speech at the Jackson Hole symposium.[8]

The exposure period runs from 25 August 2014 to 15 March 2022. The ECB announced its first programmes under the APP in September 2014, and in January 2015 it announced the expanded APP, which committed the Eurosystem to large-scale public asset purchases starting in March of that year. The net asset purchases had been halted by the end of 2018, but they were restarted in November 2019 and the purchases were still continuing at the time this paper was written in May 2022. The Pandemic Emergency Purchase Programme (PEPP) was started in March 2020 after the outbreak of the coronavirus pandemic, and the net purchases were wound up in March 2022.

We use the size of the Eurosystem's asset purchases under the APP and PEPP in some estimations. Figure 3 shows the dynamics of the two variables APP and PEPP. The sum of the APP and PEPP in billions of euros is labelled ASSETS. Finally, we also use data on net purchases of Italian public sector securities, which have been downloaded from the ECB website.

[7] Although there were some net asset purchases during the reference period under the Securities Market Programme and the Covered Bond Purchase Programme 2, they were of limited scope and size.
[8] De Santis (2020) uses market news on quantitative easing to study the effects of quantitative easing on long-term sovereign yields in the euro area. The study finds sizable reductions in spreads even before the official announcement was made, a result that is in contrast to the findings in studies for the USA and UK.

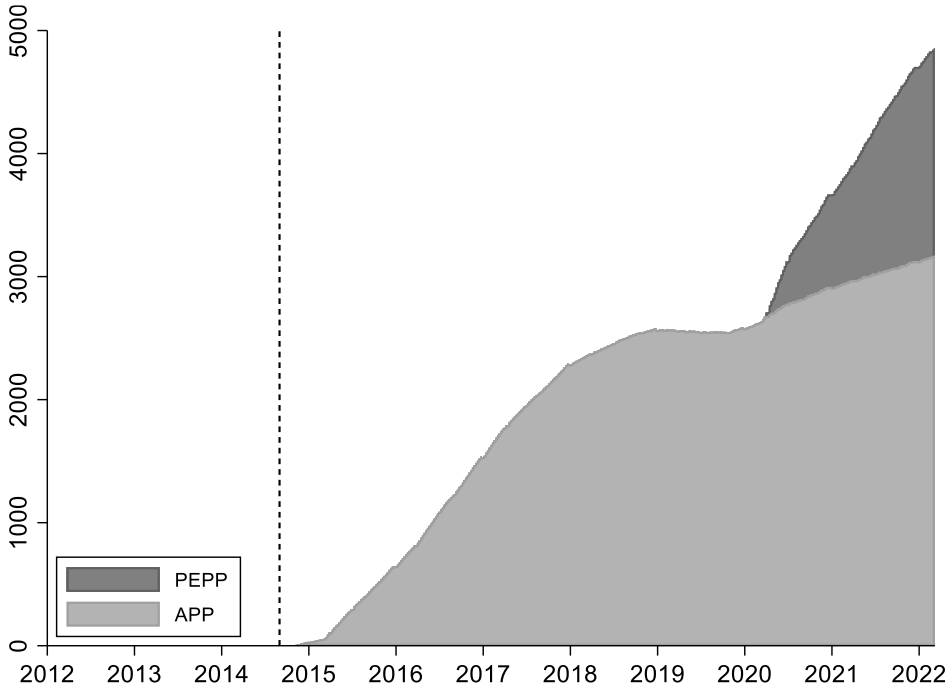

Figure 3: Eurosystem holdings under the APP and PEPP, 1 January 2012 – 15 March 2022, billions of euros

Source: Bloomberg.

We have run simple augmented Dickey-Fuller tests to ascertain the time series properties of the variables that enter in eq. (1). The 1-year and 10-year spreads are stationary in both the reference and the exposure periods, and so are the differenced spreads (ΔSPREAD) that enter as dependent variables (not shown). The individual news shocks and the aggregate shocks (AGG5, AGG3) are also stationary in the reference and the exposure periods, an expected finding given the construction of the variables. The control variables ΔUS1Y and ΔUS10Y are the differenced US bond yields and they are stationary in both the reference and the exposure period.

3. Baseline results

We start by estimating eq. (1), where the two periods are the reference period from 1 January 2012 to 22 August 2014, and the exposure period from 25 August 2014 to 15 March 2022.[9] The change in the sovereign interest rate spread between Italian and German bonds is regressed on five individual news shocks, the dependent variable lagged one to five days, changes in the interest rate on US sovereign bonds, and finally the dummies, which are period-specific constants. All of the coefficients are estimated separately for the two periods. We estimate the model using ordinary least squares and report robust standard errors, as the residuals may exhibit heteroskedasticity. Table 1 presents the results.

[9] This corresponds to $N = 2$ in eq. (1) in Subsection 2.1.

Table 1: Italian bond spreads and five individual news shocks

	(1.1)	(1.2)	(1.3)	(1.4)
	1-year bonds		**10-year bonds**	
	Reference	**Exposure**	**Reference**	**Exposure**
GDP	–5. 387**	–0.201	–16.236***	1.348***
	(2.303)	(0.889)	(6.230)	(0.415)
UNEMPL	2.590*	0.542	0.621	–0.251
	(1.524)	(0.869)	(2.653)	(1.743)
IP	–3.501	0.115	–2.581	–0.067
	(2.396)	(0.370)	(2.547)	(0.400)
SALES	–5.824**	0.403	–3.640	–0.168
	(2.823)	(0.478)	(2.322)	(0.674)
PMIMAN	–2.573	–0.399	–7.715***	–0.905**
	(1.969)	(0.204)	(2.803)	(0.415)
ΔSPREAD(–1)	0.222***	0.138*	0.0012	–0.0091
	(0.068)	(0.081)	(0.051)	(0.047)
ΔSPREAD(–2)	–0.024	–0.179***	–0.047	–0.096**
	(0.066)	(0.067)	(0.038)	(0.039)
ΔSPREAD(–3)	–0.075	–0.083	–0.097	0.017
	(0.055)	(0.073)	(0.049)	(0.061)
ΔSPREAD(–4)	–0.128**	–0.088	–0.031	–0.093**
	(0.064)	(0.064)	(0.043)	(0.038)
ΔSPREAD(–5)	–0.014	0.062	–0.051	0.070
	(0.056)	(0.075)	(0.048)	(0.076)
ΔUS1Y	–1.432***	–0.231**	..	..
	(0.523)	(0.106)		
ΔUS10Y	..	..	–0.909***	–0.280***
			(0.081)	(0.057)
DUMMY	–0.537	0.021	–0.634*	0.00063
	(0.371)	(0.110)	(0.365)	(0.145)
Observations	2534		2555	
R^2	0.106		0.132	

Note: The dependent variable is ΔSPREAD, the interest rate spread between Italy and Germany. Robust standard errors are reported in round brackets, *** p < 0.01, ** p < 0.05, * p < 0.1.

Columns (1.1) and (1.2) show the results for the reference period and the exposure period for 1-year government bonds. We start by discussing the results for the control variables in the lower part of the table. The coefficients of the dependent variable lagged one day are positive and statistically significant at least at the 10 per cent level, while the results for the dependent variable lagged more than one day vary somewhat across the two periods. The coefficients of the changes in the US sovereign interest rate are negative in both periods and relatively precisely estimated. The coefficients of the dummies or period-specific constants are statistically insignificant.

We next consider the coefficients of the individual Italian news shocks for the reference period; see column (1.1). The signs of the estimated coefficients are generally reasonable, as

unanticipated GDP growth, unanticipated growth in industrial production, unanticipated sales growth and unanticipated growth in the PMI index for manufacturing are associated with a narrower spread, while unanticipated high unemployment is associated with a wider spread. Some of the coefficients are statistically significant, while others are not.[10] The coefficients are all around 3–5 in absolute terms, so a one standard deviation of each of the shocks has more or less the same effect in absolute terms on changes in the spread. We will shortly use this finding to define the aggregate news shock variable.

We can learn more about the economic significance of the estimated coefficients by looking at the standard deviations of the various news shocks. The standard deviation of the GDP news shock is around 0.7 percentage point and the coefficient of the GDP news shock is around –5.2, so if the private sector expectations are 2 percentage points higher than the published first release, then the effect is an increase of almost 15 percentage points in the 1-year bond spread on the day of the release. Given that the sum of the coefficients of the lagged dependent variable is around 0, the longer-term effect will be an increase in the spread of around 15 percentage points, an economically notable effect. The other macroeconomic news shocks in the model have also effects on the sovereign bond spread in the reference period which are economically meaningful.

Column (1.2) shows the results for the individual news shocks in the exposure period. None of the estimated coefficients attains statistical significance, and they are generally small in numerical terms and much smaller than those from the reference period. The upshot is that various individual news shocks appear to have had economically and statistically significant effects on the spreads of Italian government bonds before Mario Draghi's speech at the Jackson Hole symposium in August 2014, but this is not the case afterwards.

Columns (1.3) and (1.4) present the results for the spread between the interest rates on the 10-year government bonds of Italy and Germany. The results are largely similar to those for the 1-year bonds and this also applies for the coefficients of the individual news variables. While the news shocks generally seem to be of importance in the reference period, this is mostly not the case in the exposure period.

We have examined the robustness of the results in Table 1 in various ways (not shown). We removed all of the lags of the lagged dependent variable and we excluded the independent control variables, but the results change very little. We also tried to enter the individual news shocks into the regression one by one, but the results for the news shocks are very similar to those shown in Table 1, which is unsurprising given that the correlations between the various individual news shocks are very small.

[10] The absence of statistical significance is arguably not surprising given the characteristics of the individual news variables. These variables contain only non-zero observations each month or each quarter so there is very little day-to-day variation in the variables.

We noted from Table 1 that the coefficients of the five news shock variables in the reference period were of the same magnitude in numerical terms. For the 1-year bond, a Wald test cannot reject the hypothesis of equality between the coefficients of the four news shocks computed for GDP, industrial production (IP), retail sales (SALES) and the Purchasing Managers' Index for manufacturing (PMIMAN) and minus the coefficient of the unemployment news shock (UNEMPL) ($p = 0.726$). For the 10-year bond, there is some variation between the numerical values of the estimated coefficients of the five news shocks in the reference period, but a Wald test can still not reject the hypothesis of the coefficients being identical in numerical terms ($p = 0.084$).

Given that the numerical coefficients of the individual news shocks are very similar in both economic and statistical terms, we compute the aggregate macroeconomic news shock variable AGG5, which is defined as AGG5 = GDP – UNEMPL + IP + SALES + PMIMAN. It is reasonable to aggregate the individual news shocks by simply adding them up given that the individual news shocks always occur on different days. We discussed the aggregate news shock variable AGG5 in some detail in Subsection 2.2, and we will use it as the main variable of interest in the remaining part of the paper.

Table 2 shows the results when the estimations in Table 1 are repeated but the five individual news shocks are replaced by the aggregate news shock AGG5. For clarity the coefficients of the five lags of the dependent variable, the control variable ΔUS1Y or ΔUS10Y, and the dummy variable are not reported in the table. For the 1-year bonds, the coefficient of the aggregate news shock is around –4.0 and statistically significant at the 1 per cent level in the reference period, an estimate that is in line with those of the individual shock variables shown in Table 1. The coefficient of the aggregate news shock is very close to 0 and statistically insignificant in the exposure period. The F-test in the table reports the test statistic and p-value for the null hypothesis that the coefficients are identical in the two periods. The hypothesis is rejected at the 1 per cent level. The results for the 10-year bonds are in line with those of the 1-year bonds.

Table 2: Italian bond spreads and aggregate news shocks

	(2.1)	(2.2)	(2.3)	(2.4)
	1-year bonds		**10-year bonds**	
	Reference	**Exposure**	**Reference**	**Exposure**
AGG5	–3.966***	–0.093	–4.515***	–0.128
	(1.358)	(0.197)	(1.280)	(0.323)
F-test	7.96 [0.005]		11.05 [0.001]	
Observations	2534		2555	
R^2	0.105		0.126	

Note: The dependent variable is ΔSPREAD. The coefficients of the five lags of the dependent variable, the control variable ΔUS1Y or ΔUS10Y and the dummy variable are not reported. Robust standard errors are reported in round brackets, *** p < 0.01, ** p < 0.05, * p < 0.1. The F-test reports the statistic and the p-value in square brackets.

The results in Table 2 paint a clear picture. While unexpected macroeconomic data releases affected the bond spread in economically and statistically significant ways in the reference period before quantitative easing, this was not the case in the exposure period after quantitative easing was anticipated or implemented. These findings point to a structural break, after which the sovereign spreads became insulated from news shocks.

The structural break is placed at 22 August 2014, given the definitions of the reference and exposure periods, but this choice is evidently somewhat subjective. We have experimented with moving the cut-off date between the two periods back and forth, and the main results remain unchanged even when the cut-off is moved several months forward or several months back (not shown). These experiments suggest that the effect of macroeconomic news shocks changed over the year 2014 but the change is unlikely to have been sudden and discrete. The cut-off date of 22 August 2014 is in this context a reasonable choice.

We have sought to investigate these findings in more detail by running rolling regressions of 250 days but not allowing for any structural breaks within the 250 days.[11] The sample length of 250 is approximately the number of trading days in a year. Figure 4 shows the coefficient of the aggregate news shock AGG5 along with its confidence interval. The day on the horizontal axis shows the final day of the 250-day sample used in the estimations.

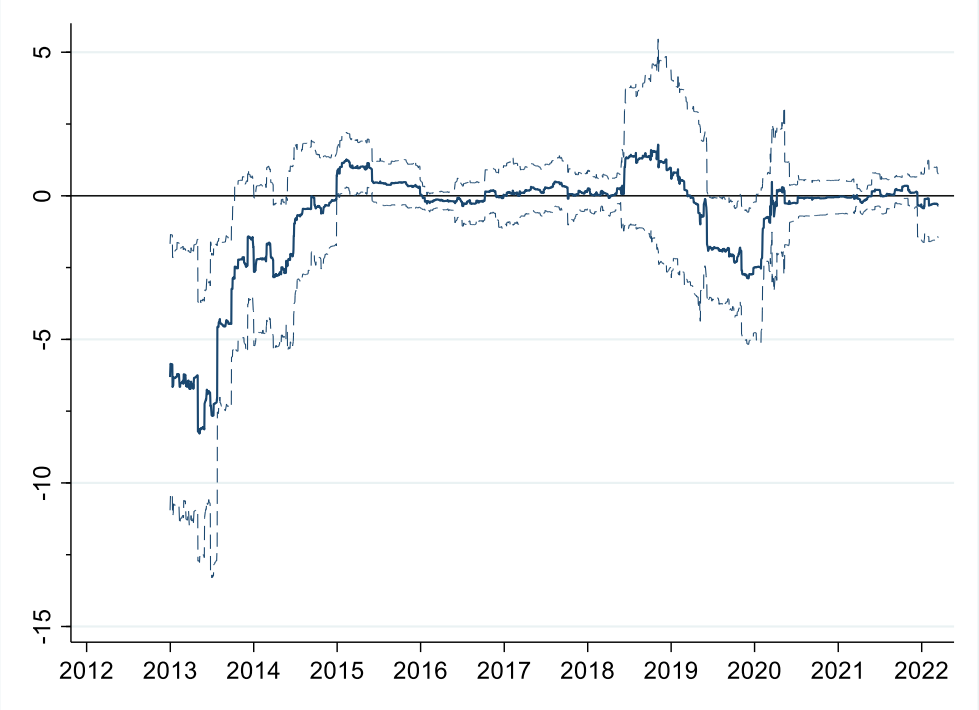

Figure 4: Coefficients of 250-day rolling regressions, 1 January 2012 – 15 March 2022

Note: The solid line depicts the coefficient of AGG5 for the 250-day sample period *preceding* the day indicated on the horizontal axis. The dashed lines depict the confidence interval computed as 2 times +/– the robust standard error.

[11] This corresponds to $N = 1$ in eq. (1) in Subsection 2.1.

Figure 4 reveals some instability in the coefficient of APP5 within the middle of 2014.[12] The estimated coefficients of APP5 are negative and statistically significant at least at the 10 per cent level in the 250-day rolling regressions until this time, while the coefficients of APP5 in the rolling regressions after this period are typically close to 0 and do not attain statistical significance. The change in the estimated coefficients appears broadly to coincide with Mario Draghi's speech at the Jackson Hole symposium in August 2014, or it may have occurred a few months earlier, perhaps because market participants were anticipating a change of policy.

Another feature in Figure 4 is the short-lived but relatively noticeable decline in the coefficient of APP5 that starts with the rolling regressions that ended in the middle of 2019 and stops with the rolling regressions that ended in the beginning of 2019. The year 2019 may thus be one when macroeconomic news shocks were of some importance for the spread on Italian sovereign bond spreads. We investigate this issue in more detail in Section 5.

A number of studies have examined possible contagion of news shocks, where news shocks in one country affect the sovereign bond spread or other financial variables in another country (Beetsma et al. 2013, Van Der Heijden et al. 2018). Working along these lines, we have sought to construct aggregate news shock variables for the euro area and for the large euro area countries Germany, France and Spain, using the same methodology that was used to construct AGG5. When we included the these external news shocks into the regression for the sovereign spread for Italy, none of the coefficients attained economic or statistical significance, neither in the reference period nor in the exposure period (not shown). It should be noted however that the construction of the aggregate news shocks for the euro area and the three large euro area countries was hampered by some of the data series missing in Bloomberg or the series being very unreliable with many missing observations. We conclude that, using data from Bloomberg, it is not possible to detect cross-border contagion of news shocks on the Italian sovereign risk spread.

4. Robustness

This section presents the results of analyses that seek to shed light on the robustness of the results in Section 3. We begin by presenting the results when we compute a narrow aggregate of the macroeconomic news shocks that we call AGG3, and that we define as AGG3 = GDP + IP + SALES. The rationale for leaving out the unemployment news shock is that unemployment may be a lagging indicator of the business cycle, while the rationale for

[12] The abrupt and relatively large changes in the coefficient estimates of APP5 in the samples containing data for 2013 and 2014 are partly the result of substantial volatility in ΔSPREAD; see Figure 1. We have experimented with rolling regressions where extreme observations of ΔSPREAD are left out, and this results in less abrupt changes in the coefficient estimates of APP5.

leaving out the PMIMAN news shock is that the PMI for manufacturing is a subjective survey measure.

Table 3 shows the results when eq. (1) is estimated using the narrow aggregate news shock AGG3. For 1-year bonds, the coefficient of AGG3 in the reference period is larger in numerical terms than the corresponding coefficient of AGG5 in Table 2, but the difference is small. For 10-year bonds, there is no difference between the coefficients of AGG3 and AGG5 in the reference period. The main result remains unchanged, as the news shocks affect the Italian sovereign spread in the reference period but not in the exposure period.

Table 3: Italian bond spreads and a narrow measure of the aggregate news shock

	(3.1)	(3.2)	(3.3)	(3.4)
	1-year bonds		**10-year bonds**	
	Reference	**Exposure**	**Reference**	**Exposure**
AGG3	–4.871***	0.177	–3.688**	0.208
	(1.868)	(0.283)	(1.699)	(0.354)
F-test	7.14 [0.008]		5.04 [0.025]	
Observations	2534		2555	
R^2	0.104		0.121	

Note: The dependent variable is ΔSPREAD. The coefficients of the five lags of the dependent variable, the control variable ΔUS1Y or ΔUS10Y and the dummy variable are not reported. Robust standard errors are reported in round brackets, *** p < 0.01, ** p < 0.05, * p < 0.1. The F-test reports the statistic and the p-value in square brackets.

The estimations of eq. (1) are carried out using ordinary least squares and so the results may be unduly influenced by extreme observations. To assess the importance of extreme observations of AGG5, the key variable of interest, we repeat the baseline estimations for the spreads of the 1-year and 10-year bonds but remove observations for which AGG5 is smaller than –1.25 or larger than 1.25, meaning that 45 observations are removed. The results are shown in Table 4. When the results in Table 4 are compared with those in Table 2, it is apparent that removing the extreme aggregate news shocks has little effect on the results. Removing extreme observations of the dependent variable ΔSPREAD similarly has very little effect on the estimation results (not shown).

Table 4: Italian bond spreads and trimmed aggregate news shocks

	(4.1)	(4.2)	(4.3)	(4.4)
	1-year bonds		**10-year bonds**	
	Reference	**Exposure**	**Reference**	**Exposure**
AGG5	–3.643**	–0.029	–4.844**	0.494
	(1.690)	(0.554)	(2.287)	(0.786)
F-test	4.13 [0.042]		4.87 [0.027]	
Observations	2490		2510	
R^2	0.088		0.121	

Note: The dependent variable is ΔSPREAD. The aggregate news shock is trimmed so that -1.25 ≤ AGG5 ≤ 1.25. The coefficients of the five lags of the dependent variable, the control variable ΔUS1Y or ΔUS10Y and the dummy variable are not reported. Robust standard errors are reported in round brackets, *** p < 0.01, ** p < 0.05, * p < 0.1. The F-test reports the statistic and the p-value in square brackets.

In the next robustness check we split the AGG5 variable into one variable consisting of positive realisations of the aggregate news shocks and another consisting of negative realisations of them. Table 5 shows the results when the two AGG5 variables are included in eq. (1). Perhaps surprisingly, the coefficient of the positive AGG5 news shocks is larger in numerical terms than the coefficient of the negative AGG5 news shocks.[13] This particularly applies for the 1-year bonds but less so for the 10-year bonds.

It is noticeable however that there is still evidence of a structural break. Positive and negative news shocks influence the Italian sovereign bond spread in the reference period to a greater or lesser extent, while the positive and negative news shocks do not appear to influence the spreads in the exposure period. The hypothesis of the coefficients of the positive and negative AGG5 news shocks being identical in the reference and exposure periods is rejected in all cases except for the negative AGG5 news shocks for 1-year bonds.

Table 5: Italian bond spreads and positive and negative aggregate news shocks

	(5.1)	(5.2)	(5.3)	(5.4)
	1-year bonds		**10-year bonds**	
	Reference	**Exposure**	**Reference**	**Exposure**
AGG5 (pos.)	–5.933**	–0.038	–5.714**	–0.169
	(2.628)	(0.236)	(2.664)	(0.409)
AGG5 (neg.)	–2.620*	–0.195	–3.684***	–0.037
	(1.561)	(0.359)	(1.188)	(0.522)
F-test (pos.)	4.99 [0.026]		4.23 [0.040]	
F-test (neg.)	2.29 [0.130]		7.90 [0.005]	
Observations	2534		2555	
R^2	0.106		0.127	

Note: The dependent variable is ΔSPREAD. The coefficients of the five lags of the dependent variable, the control variable ΔUS1Y or ΔUS10Y and the dummy variable are not reported. Robust standard errors are reported in round brackets, *** p < 0.01, ** p < 0.05, * p < 0.1. The F-test reports the statistic and the p-value in square brackets.

[13] This outcome could emerge if market participants are on guard for negative surprises and incorporate these in their portfolio decisions, but pay less attention to the possibility of positive surprises and so react more strongly if they occur.

We next consider the importance of the control variables included. We replace the changes in the interest rate on US bonds with the changes in the interest rate on German bonds, with the changes in the volatility indexes VIX and VDAX, but the results for the AGG5 variable are in all cases qualitatively unchanged (not shown). The reason that the control variables are of little or no importance can be found in the nature of news shocks variables. The news shocks resemble heart monitor readouts, with numerous flat segments of zeros interspersed by the occasional non-zero observation. Any correlation between the spiky news shocks and relatively smooth control variables will be small.

We estimate the models with OLS following the bulk of the literature considering the impact of news shocks on sovereign returns. We have experimented with various GARCH models, but the results are somewhat sensitive to the exact specification of the model; see also Caporale (2018). The exponential general autoregressive conditional heteroskedastic model (EGARCH) is often used for modelling financial time series. When we estimate EGARCH(1,1) models for the reference period and the exposure periods, most of the autoregressive coefficients are estimated more precisely, but the results are in qualitative terms close to those of the baseline specification (not shown).

5. Further analysis

5.1 Three exposure periods

Our reference period runs from 1 January 2012 to 22 August 2014, and the end aligns with Mario Draghi's speech at the Jackson Hole symposium. The exposure period starts on 25 August 2014 and runs until the end of the sample on 15 March 2022. In this subsection, we further subdivide the exposure period into three to account for the pause in asset purchases from 1 January 2019 to 11 September 2019, which is the day before it was announced that the net purchases under the APP would be restarted from 1 November 2019. During the eight and a half months from 1 January 2019 to 11 September 2019 the Eurosystem reinvested the maturing principal payments, but it did not add to the stock of APP assets and the future of the APP was not known.

Table 6a shows the results of the estimations of the 1-year bond spread when the exposure period is divided into three periods.[14] The coefficient of AGG5 estimated in the reference period is very close to those in the baseline estimation in Table 2. The coefficients of AGG5 in the first period from 25 August 2014 to 31 December 2018 and in the third period from 12 September 2019 to 15 March 2022 are both close to zero and statistically insignificant. The

[14] This corresponds to $N = 4$ in eq. (1) in Subsection 2.1.

coefficient of AGG5 in the second period from 1 January to 11 September 2019 is approximately –2.4 and it is statistically significant at the 5 per cent level. This result suggests that the macroeconomic news shocks affected the Italian bond spread to some extent in this intermediate period when the purchases under the APP were halted and the future of the ECB's quantitative easing was uncertain.

Table 6a: Italian bond spreads and three exposure periods, 1-year bonds

	(6a.1)	(6a.2)	(6a.3)	(6a.4)
	Reference	**25 Aug. 2014 – 31 Dec. 2018**	**1 Jan. 2019 – 11 Sept. 2019**	**12 Sept. 2019 – 15 Mar. 2022**
AGG5	–3.955***	0.438	–2.407**	–0.162
	(1.363)	(0.347)	(1.142)	(0.233)
F-test	4.74 [0.003]			
Observations	2534			
R^2	0.114			

Note: The dependent variable is ΔSPREAD. The coefficients of the five lags of the dependent variable, the control variable ΔUS1Y or ΔUS10Y and the dummy variable are not reported. Robust standard errors are reported in round brackets, *** p < 0.01, ** p < 0.05, * p < 0.1. The F-test reports the statistic and the p-value in square brackets.

Table 6b shows the results of the estimations of the 10-year bond spread when the exposure period is divided into three periods. The results resemble those for 1-year bonds, but the coefficient of AGG5 is –1.6 in this case and the estimated coefficient is not significant at conventional levels of statistical significance. This means the evidence for structural breaks around the period of reinvestment is stronger for the 1-year bond spread than for the 10-year spread.

Table 6b: Italian bond spreads and three exposure periods, 10-year bonds

	(6b.1)	(6b.2)	(6b.3)	(6b.4)
	Reference	**25 Aug. 2014 – 31 Dec. 2018**	**1 Jan. 2019 – 11 Sept. 2019**	**12 Sept. 2019 – 15 Mar. 2022**
AGG5	–4.502***	0.303	–1.570	–0.195
	(1.283)	(0.652)	(1.478)	(0.414)
F-test	4.03 [0.005]			
Observations	2555			
R^2	0.133			

Note: The dependent variable is ΔSPREAD. The coefficients of the five lags of the dependent variable, the control variable ΔUS1Y or ΔUS10Y and the dummy variable are not reported. Robust standard errors are reported in round brackets, *** p < 0.01, ** p < 0.05, * p < 0.1. The F-test reports the statistic and the p-value in square brackets.

5.2 Interaction terms

The estimations in Section 3 reveal a structural break in the Italian sovereign interest rate spread around the announcement of quantitative easing by the ECB. Macroeconomic news shocks affect the sovereign bond spreads in Italy before the announcement, but not afterwards. In this subsection, we seek to ascertain whether the reduced sensitivity to news shocks is related to the

quantities of asset purchases made by the Eurosystem, or whether the effect may be ascribed to other factors.

We construct the daily variable Δ30ASSETS, which is the net asset purchases over 30 days under the APP and PEPP programmes, in billion euros. The variable ranges from a minimum of –15.8 billion euros in the middle of the repurchase period in 2019 to a maximum of 267.6 billion euros in the middle of 2020, which was when substantial APP and PEPP purchases were being made at the same time. We consider the variable to be a suitable proxy of the extent of quantitative easing in the exposure period.

Table 7 shows the results when the baseline estimation from Table 2 is extended by the interaction term Δ30ASSETS×AGG5 in the exposure period.[15] The coefficient of AGG5 remains small and statistically insignificant in the exposure period for both the 1-year and 10-year bonds. Meanwhile, the coefficient of the interaction term is small and statistically insignificant, again for both the 1-year and 10-year bonds. The upshot is that it is not possible to establish a simple relationship between the insulation of sovereign bond spreads and the quantities of assets bought under the Eurosystem's quantitative easing.

Table 7: Italian bond spreads and Eurosystem net asset purchases

	(7.1)	(7.2)	(7.3)	(7.4)
	1-year bonds		**10-year bonds**	
	Reference	**Exposure**	**Reference**	**Exposure**
AGG5	–4.295***	0.275	–4.765***	0.302
	(1.362)	(0.496)	(1.175)	(0.839)
Δ30ASSETS	..	–0.0020	..	0.00019
		(0.0016)		(0.0026
Δ30ASSETS ×AGG5	..	–0.0028	..	–0.0035
		(0.0029)		(0.0049)
Observations	2509		2530	
R^2	0.112		0.128	

Note: The dependent variable is ΔSPREAD. The coefficients of the five lags of the dependent variable, the control variable ΔUS1Y or ΔUS10Y and the dummy variable are not reported. Robust standard errors are reported in round brackets, *** p < 0.01, ** p < 0.05, * p < 0.1. The F-test reports the statistic and the p-value in square brackets.

We have tried various other specifications of the interaction between the aggregate news shock and the Eurosystem's asset purchases under the APP and the PEPP. We have interacted the news shock with the net purchases over 60 and 90 days and we have interacted the news shock with the *stock* of APP and PEPP assets, but the results are in all cases that the coefficient of the interaction terms is small and statistically insignificant (not shown). We have also tried to interact the aggregate news shock variable with the Eurosystem's net purchases of *Italian* assets under the APP and PEPP programmes over 30 days, but the results were very similar to those presented in Table 7 (not shown).

[15] The reformulation means that the marginal effect of the aggregate news shock will be the estimated coefficient of AGG5 plus the estimated coefficient of Δ30ASSETS×AGG5 multiplied by Δ30ASSETS.

It is tempting to bring together the results in Tables 6 and 7. It is difficult to link the insulation of the Italian sovereign spreads from macroeconomic news shocks with the quantities purchased under the APP and the PEPP. It appears however that the sensitivity of the spread to macroeconomic news shocks increased somewhat during the pause in net asset purchases in 2019, a finding that receives some support when the exposure period is split into three periods, and also when the results of the rolling regressions in Section 3 are taken into account. This would suggest that the expectations derived from announcements and other sources of information are more important than the specific amounts of assets bought under quantitative easing.

6. Final comments

This paper studies the effects of macroeconomic news shocks on Italian sovereign bond spreads before and after the speech by Mario Draghi, president of the European Central Bank at the time, at the Jackson Hole symposium on 22 August 2014. The speech is widely seen as marking the starting point of quantitative easing in the euro area, in order to support the monetary transmission channel and ensure price stability.

The speech was followed by the announcement of private sector asset purchases a few weeks later, and in January 2015 the ECB committed to large-scale public asset purchases by announcing the expanded Asset Purchase Programme (APP). The net asset purchases were paused from the beginning of 2019 but were restarted in November that year. The APP was complemented by the Pandemic Emergency Purchase Programme (PEPP) after the outbreak of the coronavirus pandemic; the net purchases under PEPP started in March 2020 and were wound up in March 2022.

The paper compares the effects of macroeconomic news shocks on Italian sovereign bond spreads before and after Mario Draghi's speech at the Jackson Hole symposium. We use daily data and our full sample runs from the beginning of January 2012 until the middle of March 2022. The period from January 2012 until August 2014 is taken as the reference period, while the period from September 2014 is the exposure period. We compare the effects of macroeconomic news shocks in the reference period and in the exposure period.

Daily changes in the bond spreads between Italian and German bonds are regressed on proxies of macroeconomic news shocks and various control variables, where the news shocks are computed as the difference between the first release of data and the previous private-sector forecasts. The news shocks thus represent surprises that would lead investors to update their expectations for the future, and this could affect the pricing of government bonds and so the interest rate spread. The effects of the macroeconomic shocks on Italian bond spreads are

estimated separately for the reference period from 1 January 2012 to 22 August 2014 and for the exposure period after 25 August 2014.

The regression analyses show that the macroeconomic news shocks had economically and statistically significant effects during the reference period, but the effects were generally negligible in the exposure period. Additional analyses that consider various sub-divisions of the exposure period suggest that the interest rate spread became somewhat more sensitive to macroeconomic news shocks during the pause in net asset purchases in 2019, a finding that receives some support from the rolling regressions. The overall conclusion is that the Italian bond spread appears to have been insulated from macroeconomic news during quantitative easing.

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