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Abstract

This paper examines portfolio rebalancing at the security level during the ECB's Asset Purchase Programme (APP). Search for yield via portfolio rebalancing is one of the possible channels through which Quantitative Easing (QE) may affect real economic activity. This paper shows that during QE, European investors significantly increased their relative holdings of debt denominated in emerging market currencies. In addition, a significant rebalancing has taken place within the euro area, as investors increased their relative holdings of debt issued by vulnerable European countries. This increase has been driven by investors located in peripheral countries, while investors in other countries were net sellers. QE thus has a heterogeneous impact on security holdings across euro area countries and sectors. These findings are relevant for policymakers to assess the (side-)effects of QE and the potential impact of monetary tightening.

JEL classification: E52, E58, G10, G11, G15

Keywords: Portfolio rebalancing, Quantitative Easing, Asset purchases, Unconventional monetary policy, Heterogeneity

1.   **Introduction**

In response to a prolonged period of low inflation, the Eurosystem (the European Central Bank (ECB) plus the euro area's national central banks) introduced unconventional monetary policy measures in an attempt to steer inflation towards its target of close to, but below two percent.[1] By the end of 2019, the Eurosystem had acquired almost EUR 2600 billion worth of assets as part of its Expanded Asset Purchase Programme (APP). The main component of the APP is the Public Sector Purchase Programme (PSPP). The PSPP was announced in January 2015, while the first purchases were made in March 2015. Just before the start of the COVID-19 crisis, PSPP holdings comprised 82% of all debt securities acquired by the Eurosystem (ECB, 2022a).

By lowering the cost of capital and stimulating economic activity, the APP aimed to bring inflation back to levels in line with the ECB's price stability mandate (ECB, 2015; Albertazzi et al., 2021). Search for yield via portfolio rebalancing is one of the possible channels through which Quantitative Easing (QE) may affect real economic activity. Asset purchases lower the yield of targeted securities of the purchase programmes (such as European government bonds), which in turn incentivises investors to look for higher yielding alternatives. More practically, investors selling their assets to the Eurosystem receive cash and start looking for alternatives to European government bonds (as the Eurosystem acts as a buy-and-hold investor). This shift increases demand for substitute instruments and thereby compresses risk (and term) premia, resulting in lower interest rates which may incentivise real investment (Rajan, 2006; Krishnamurthy and Vissing-Jorgensen, 2011). These portfolio adjustments led to significant net capital flows out of the euro area (Bergant et al., 2020), which in 2016 reached an all-time high of nearly five percent of euro area GDP (Coeuré, 2017). Foreign investors accommodated most of the Eurosystem's purchases (Koijen et al., 2021), contributing to the outflows, but other

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[1] As a result of the ECB's Strategy Review (2021), this target has been adjusted to a symmetric target of two percent.

euro area investors were also a major driving force behind these outflows (Bergant et al., 2020). This may have contributed to imported inflation via a depreciation of the euro, although the relationship between cross border capital flows and depreciation is far from clear (Coeuré, 2017).

The net purchase of securities outside the euro area took place almost entirely in the form of long-term bonds, as investors rebalanced their portfolios towards the closest substitute to PSPP-eligible assets outside the euro area (Bergant et al., 2020). Figure 1 shows that both euro area investors (as measured by *Securities Holdings Statistics Sectors*, SHS-S) and foreign investors have decreased their share of euro area government debt since the beginning of QE in the euro area.

[Insert Figure 1 about here]

This net flow out of the euro area may be driven by different components. For example, increased exposure to US sovereign debt may result from a preference for exposure to USD denominated securities, or for a specific exposure to the US government. The first aspect can also be achieved via exposure to other countries issuing their debt in USD, as the debt of many countries is denominated in USD to some extent (see, for example, Echavarria et al., 2021). Consequently, there is a difference between investing in a certain country or in a certain currency. Additional rebalancing channels may consist of investing in riskier sectors or longer maturities. Bua and Dunne (2019), for example, find evidence that certain types of Irish investment funds move into longer term securities and into non-euro-area bonds issued by non-financial corporations and sovereigns.

Increased exposure to risk can also be achieved by rebalancing to debt of countries that are considered relatively more vulnerable to credit risk within the euro area.[2] Sovereign yields within the euro area diverge, as debt of peripheral European countries is generally deemed to be a more risky investment than debt of core countries (Figure 2). The question is thus to what extent rebalancing towards debt of these more vulnerable countries is observable, as investors may choose first to rebalance to the closest substitute with a higher yield within the euro area, before moving to a substitute outside the euro area (the latter as in Bergant et al., 2020).

[Insert Figure 2 about here]

The objective of this paper is to analyse capital flows during the APP and to identify the main investment categories to which euro area investors rebalance their debt portfolios (in terms of country, currency, sector and maturity). Understanding this is important for identifying the (spill-over) effects of the accommodative monetary policy and to calibrate future policies. Moreover, the quest for higher yielding investments, with accompanying higher risk, may contribute to financial stability risks, as also acknowledged by the ECB (ECB, 2021). The ECB's new monetary policy strategy envisages a flexible approach to considering financial stability, with regular in-depth assessments of the interaction between monetary policy and financial stability (ECB, 2021). This paper sheds light on this risk-taking behaviour by investors, and as such helps to better understand the financial stability implications of QE. Finally, this paper examines the heterogeneity of rebalancing within the euro area between countries and sectors, by exploiting the SHS-S data at the country-sector level. This sheds light on different investment behaviour across sectors and countries, potential concentration of risks and reinforcing or offsetting effects following QE.

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[2] We follow the classification of Altavilla et al. (2017) and Koijen et al. (2021) and classify Cyprus, Greece, Ireland, Italy, Portugal and Spain as vulnerable countries, whereas all other euro area countries are considered non-vulnerable.

As such, this paper aims to provide a comprehensive picture of capital flows since the start of QE, while at the same time exploring the differences between European countries and sectors. The goal of this paper is not to single out all specific contributors to a certain capital flow. Instead, it could be used as a starting point for follow-up work to establish the specific drivers behind all flows.

We find that euro area investors significantly increased their holdings of debt issued by the more vulnerable European countries and that this effect is heterogeneous across euro area countries and sectors. We also find that euro area investors significantly increased their holdings of debt denominated in emerging market currencies (increase of up to 30% compared to investments denominated in EUR). This effect is quite homogeneous across European countries and sectors.

These findings may have important policy implications, for example with an eye to financial stability and in the context of monetary tightening. The (relative) increase of peripheral bond holdings by investors in peripheral countries may contribute to a vulnerability in the financial system (Acharya and Steffen (2015) and Koijen et al. (2017)) and exacerbate fragmentation during market stress. Moreover, if monetary tightening leads investors to reverse the rebalancing they pursued during QE, this may cause additional upward pressure on yields in the more vulnerable European countries. This is particularly relevant in the current context with high inflation and the introduction of measures such as the Transmission Protection Instrument to support the effective transmission of monetary policy. Finally, if during tightening investors would again increase their relative holdings of EUR compared to emerging market currencies, this may contribute to upward pressure on the euro exchange rate.

Related literature

This paper relates to multiple strands of literature. First of all, the paper contributes to the growing empirical literature on portfolio rebalancing. In a recent paper, Bergant et al. (2020) analyse actual capital flows at the security level in a bilateral cross-country-sector setting, based on SHS-S. They show that euro area investors actively rebalanced away from securities targeted under the PSPP (and other euro-denominated debt securities), towards foreign debt instruments, including 'closest substitutes' (long-term government bonds). Georgiadis and Gräb (2016) surprisingly find that the announcement of the APP seems to have induced a substitution from emerging markets to advanced economies. By contrast, Moore et al. (2013) find that the US Federal Reserve's QE resulted in a significant increase in holdings of emerging market debt securities. Chari et al. (2017) also argue that lower yields following QE in the US may incentivise investors to substitute toward emerging market assets in search of higher yields. Vayanos and Vila (2009) explain that rebalancing particularly tends to be towards bonds with similar characteristics (as a result of so-called preferred-habitat investors). Boermans and Vermeulen (2018) show that euro area investors indeed acted as preferred habitat investors. In addition to rebalancing to bonds with similar characteristics, the risk-taking channel may also lead to increased investments in riskier assets (Bergant et al., 2020; Krishnamurthy and Vissing-Jorgensen, 2011).

This paper also relates to literature on heterogeneous investor behaviour across euro area countries. For example, Battistini et al. (2014) report that investors' sovereign exposures respond positively to increases in yields, especially in peripheral countries. They find that peripheral banks increased domestic sovereign exposures during 2008-2012, whereas these banks in general already invest heavily in peripheral government bonds (Acharya and Steffen, 2015). Koijen et al. (2017) report that vulnerable countries have a stronger home bias than non-vulnerable countries. At the same time, De Haan and Vermeulen (2021) find that 'core

investors' react strongly to ratings by significantly reducing exposures to issuer countries with low ratings (peripheral countries). Looking at the effect of QE, Albertazzi et al. (2021) find that rebalancing is concentrated in 'vulnerable' economies, resulting in more credit-risk taking.

Like Bergant et al. (2020), this paper uses the SHS-S database. This database enables us to distinguish the 'active' rebalancing component (transactions) from the 'passive' component (change in valuation). Based on Tille and Van Wincoop (2010), Bergant et al. (2020) show that it makes quite a difference whether actual transactions are used rather than proxies derived from changes in holdings that are based on market values. In this paper, we focus on the 'active' component of rebalancing.

The paper adds to the existing literature in multiple ways. First, it is the first paper to examine the *entire* debt portfolios of euro area investors, regardless of the issuing country, issuing sector or currency of denomination. This makes it possible to distinguish rebalancing investments into (i) other currencies than EUR, (ii) countries outside the euro area, (iii) longer maturities, (iv) other sectors than government and (v) riskier countries within the euro area. For example, an investment in USD may be motivated by the factors i), ii), iii) and iv). This paper investigates whether certain factors are more relevant than others. This implies that all these factors are used in the same regression analysis to be able to determine the decisive factor in rebalancing. This paper is the first to combine all these separate characteristics of securities into one analysis. The empirical strategy is further explained in Section 3.[3]

Second, to the best of our knowledge this paper is the first to examine rebalancing over a relatively long period. Bergant et al. (2020) provide a detailed account of euro area portfolio rebalancing over the first eight quarters of the PSPP period (2015Q1 to 2016Q4), whereas

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[3] Note that SHS-S does not include hedging behaviour. As (part of) the positions investors take in bond markets could be hedged, we are likely not to examine the net exposure of investors towards a certain investment.

Georgiadis and Gräb (2016) only examine the announcement effects. In this paper, we examine how transactions relate to pre-PSPP transactions since 2013Q4 (and even 2009Q1) until the end of 2019.[4]

Third, this paper adds a new dimension to the empirical evidence on portfolio rebalancing by investigating to what extent exposures to the (perceived) riskier countries *within* the euro area increase.

Fourth, this paper sheds light on the heterogeneity of investor behaviour within the euro area, by exploiting the SHS-S holdings data at the country-sector level. This adds both to the panel dimension while at the same time revealing interesting differences between countries and sectors, and even sectors within countries.

In this paper we focus on debt securities, as rebalancing mainly occurs *within* asset classes and not between asset classes (Joyce et al., 2014). In addition, Koijen et al. (2017) note that flows in equity and foreign assets are relatively small compared to flows in fixed income markets (Koijen et al., 2017), while Bua and Dunne (2019) do not find evidence for rebalancing towards equities either. Last but not least, the purchase programmes mainly comprise bond purchases (ECB, 2022).

Section 2 describes the data. Section 3 covers the methodology and while Section 4 discusses the results. We present our conclusions in Section 5.

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[4] This means that we do not only look at pre-PSPP holdings as in Bergant et al. (2020), but also at actual investor behaviour before the introduction of QE. 2013Q4 is the first quarter that SHS-S data is fully accurate. As an additional check, we also look into the *experimental* SHS-S data that is available as of 2009Q1. Only the domestic holdings are incomplete before 2013Q4 (see also De Haan and Vermeulen, 2021), but the data may still provide an indication of rebalancing behaviour within the euro area.

2. Data

The main data source for this analysis is the ESCB *Securities Holdings Statistics by Sector* (SHS-S) database, containing security-level portfolio holdings and transactions of all euro area countries on a sectoral level. The dataset covers short-term (<1 year) and long-term (>1 year) debt securities, listed shares and investment fund shares. For the reasons mentioned above, we focus on long-term debt securities. This focus helps to construct a manageable dataset, as the segment of long-term debt securities alone has over ten million observations per quarter (before cleaning). The data have been collected on a quarterly basis since 2009Q1.[5] We use data until 2019Q4, to exclude the effect of the COVID-19 crisis and the related monetary response from central banks.

The data included in the SHS-S dataset is very granular, with ISIN-specific information.[6] We examine *all* transactions between 2013Q4 and 2019Q4, and add transactions since 2009Q1 as an additional check. This results in a very large dataset, meaning that using security level data in the regressions is not feasible for calculation purposes. We therefore aggregate the data along the most important dimensions in terms of rebalancing, as well as by the quarter in which the holdings are observed. This contrasts with Bergant et al. (2020), who only look at the accumulated transactions between 2015Q1 and 2016Q4, allowing them to run regressions on an ISIN-level. For further details on the dataset, see also Bergant et al. (2020).

The main variables of interest in the SHS-S data for this analysis are: currency of denomination, residual time to maturity, issuing country, issuing sector, holder country, holder sector. All observations are aggregated along these dimensions. We distinguish between eight sectors: banks (monetary financial institutions, MFI), insurance companies (IC), pension funds (PF),

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[5] Domestic holdings are incomplete before 2013Q4, so we run our regressions both starting in 2009Q1 and from 2013Q4.
[6] ISIN = International Securities Identification Number

investment funds (IF), other financial institutions (OFI), non-financial corporations (NFC), general governments (GOV) and households (HH). This sector breakdown follows to a large extent the European System of Accounts (2010).[7]

In addition to aggregating along these dimensions, we divide the observations into several groups, such as advanced economies and emerging market economies (based on IMF-classification (2022)). Table 1 shows the different variables of interest and the countries included, while Table 2 shows the number of observations per category within the classifications. Table 3a and Table 3b show the aggregate amount of investments by investor country and sector, respectively (to put the results of Section 4 into context).

[Insert Table 1 about here]

[Insert Table 2 about here]

[Insert Table 3a about here]

[Insert Table 3b about here]

3.   Methodology

To quantify capital flows of euro area investors and the extent to which these are driven by QE, we extend the model of Bergant et al. (2020):

$$\ln(flow_{a,i,t}) = \beta_1 * \ln(A_{a,i,t-1}) + \beta_2 * \ln(O_{a,i,t-1}) + \beta_3 * QE_t + \gamma' * x_{a,i,t} + \delta' * x_{a,i,t} *$$
$$QE_t + \alpha_i + \mu_t + \epsilon_{a,i,t} \tag{1}$$

where $ln(flow_{a,i,t})$ represents the log of country-sector i's net transactions (i.e. net sales or purchases) (with i = 1,…,152 country-sector observations) in quarter t (with t = 1,…,44

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[7] The small deviations (distinguishing between IC and PF, adding investment funds as separate category) allow for additional granularity.

quarters) of securities falling within a certain category a (aggregated by Currency of denomination, Issuer Country, Issuer Sector, Residual Maturity Bucket, with $a = 1,\dots,1728$ categories).[8] Note that this is a reduced form equation. As stated before, the goal of this paper is not to single out all specific contributors to a certain capital flow, but to provide a comprehensive picture of capital flows since the start of QE, while controlling for the relevant factors. Moreover, including the price may potentially lead to simultaneity issues, as prices and quantities (flows) are interdependent.

For transactions that are not denominated in EUR, we take the EUR-equivalent (also available in SHS-S). Note that in – contrast to Bergant et al. (2020) – we use the residual maturity at the last day of each quarter instead of the original maturity of a security, as the residual maturity of a security should be the decisive factor to determine the relevant price and whether it is a suitable substitute.

The dependent variable is regressed on holdings of a security category in the preceding quarter. We control for this pre-existing level of a sector's investment in a specific category $ln(A_{a,i,t-1})$ and for the total outstanding amount of securities within a certain category $ln(O_{a,t-1})$.[9] New issuance has to be held somewhere by investors and does not necessarily reflect active rebalancing. The variable $x_{a,i,t}$ captures the characteristics we are interested in: currency of denomination, issuer country, issuer sector and residual maturity bucket in a certain period. These are included as dummies, where currency of denomination, issuer country, issuer sector are time invariant, whereas the residual maturity bucket is time variant. The reference categories are included **in bold** in Table 1. For example, we examine how investments in other

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[8] If net transactions during a quarter are negative (net sales), the logarithm of the absolute value is taken, multiplied by -1 (following Levy Yeyati et al. (2007) and Bergant et al. (2020)).

[9] There may be a concern about the presence of a unit root in the amount outstanding or in the lagged holdings (as stocks are the sum of flows). However, our results do not change when using the difference in the amount outstanding. For the lagged holdings there is no alternative measure, while also the unit root tests for panel data cannot be applied (as we have an unbalanced panel). However, in an attempt to approximate whether there is a unit root in the lagged holdings, the application of an autoregressive model including fixed effects provides a coefficient of 0.84 with a standard error of 0.004, resulting in a test statistic of -40. Hence, the null hypothesis that a unit root is present in lagged holdings can be rejected.

currencies changed compared to EUR investments, or how investments into NFC debt changed compared to government debt.

The empirical strategy allows us to assess heterogeneity among groups of investors (by sector and country), as the data are aggregated along these dimensions. Like Bergant et al. (2020), we can therefore estimate varying coefficients across sectors, country groups, or even sectors within countries. Regression (1) is therefore applied at multiple levels: (i) the euro area as a whole, including all observations per holder country-sector; (ii) country level, to examine differences between countries; (iii) sector level, to examine differences between sectors; (iv) country-sector level, to examine unique features of sectors within a certain country.

When applying regression (1) to the euro area as a whole, we include interacted holder country-sector fixed effects (α_i) and quarter-time fixed effects (μ_t). Depending on the specification of the QE variable (see below), μ_t is either a set of seasonal dummies or a unique dummy per quarter.[10] In contrast to Bergant et al. (2020), we do not include *issuing* country-sector fixed effects, as the rebalancing into other country-sectors is one of the dimensions we are interested in. As is conventionally done in these type of models, standard errors are clustered at the holding country-sector level, as residuals $\epsilon_{a,i,t}$ might be correlated with country-specific and sector-specific demand factors.

When applying regression (1) at the country level, we include sector-time fixed effects. When applying it at the sector level we include country-time fixed effects. When applying it at the country-sector level, we only include time fixed effects. In all cases, we apply robust standard errors.

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[10] When QE is included as a dummy variable, the quarter-time fixed effects (μ_t) control for seasonality and are not fixed effects per separate quarter. For example, the first quarter of each year has the same dummy, the second quarter of the year has the same dummy, etc. Including unique time effects per quarter would not make it possible to capture the effect of QE with a dummy. When QE is included via the purchased amount, the time fixed effects are included as unique dummies per quarter.

As the objective of this paper is to analyse capital flows during QE and to identify the main investment categories that euro area investors rebalance to, the main variables of interest consist of the terms that are interacted with a variable of QE.[11] These are defined in multiple ways.

First, we use a dummy that is 1 during the period of *net* asset purchases by the Eurosystem (2015Q1 – 2018Q4 + 2019Q4). For the analysis starting in 2013Q4, however, this implies that the dummy captures the biggest part of the analysed period (17 out of 25 quarters), which may not properly identify the effect of QE.

We therefore also analyse two alternative specifications, focusing on (i) the announcement quarter of QE and (ii) the actual volume of net purchases by the Eurosystem. Note that the latter does not try to distinguish between so-called *stock* and *flow* effects, but aims to approximate the effect of QE in general.

The announcement dummy is only 1 around the announcement and start of the PSPP in 2015Q1. In efficient markets, one would expect the announcement of the PSPP to be directly captured in investor behaviour and market prices, meaning that most of the changes should already happen in the first quarter of 2015. For example, Eser et al. (2019) show that more than half of the 10-year term premium compression during the purchase period was associated with the APP announcement in January 2015.

Our second alternative specification uses the natural log of the quarterly amount of net purchases (aggregated for the Eurosystem) to approximate QE. This also makes it possible to better capture the time effects, as there is no longer an issue of multicollinearity between time dummies and the QE dummy. In this case, the time dummy no longer is a quarter-dummy to capture seasonality, but a unique dummy per quarter.

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[11] Note that the use of a reduced form equation may imply that we are potentially underestimating the effect of QE on capital flows, as there may also be an impact via lower yields in general (which are partially due to QE). However, it is not the aim of this paper to distinguish between these two effects, but to provide a comprehensive picture of capital flows since the start of QE.

Finally, we add an analysis starting in 2009Q1. The advantage of using data since 2009 is that it is easier to compare periods with and without QE (24 quarters pre-QE, 20 quarters since QE; compared to 5 quarters pre-QE and 20 quarters since QE otherwise). We acknowledge however that domestic holdings are not fully accurate before 2013Q4 (see also De Haan and Vermeulen, 2021). The regression starting in 2009 therefore only serves as a robustness check and should not be taken as baseline result. Nevertheless, as the cross-border holdings are accurately reflected, it may still provide an insight into the European capital flows before QE started.

Note that the literature on international capital flows often refers to push and pull factors, which are both found to be important. In the aftermath of the financial crisis, these factors gained prominence in explaining international capital flows (see Koepke (2018) for an overview of the empirical literature). This paper does not include push and pull factors in the empirical analysis, however. The goal is not to explain the specific determinant of a flow (i.e. the balance between push and pull factors), but to see how international capital flows from euro area investors have changed since the introduction of QE. Our analysis can be used as a starting point for follow-up work to establish specific drivers behind all flows, however.

4. Results

Given the granularity of the data and the multiple dimensions (combinations of countries and sectors) to consider, the results are structured from aggregate to more detailed level. We start by providing results on an euro area aggregate level. Subsequently, we further explore whether specific countries or sectors drive these results. Note that all tables only include the interacted variables, to keep the output concise. The interacted variables contain the effect of QE on flows to a specific investment characteristic, compared to the respective reference category.

Nonetheless, all regressions have been run with the full set of explanatory variables in addition to the interaction terms shown. All results and coefficients that are not presented here are available upon request. Finally, it should be noted that the results should be compared to the base categories to accurately understand the impact; the estimated coefficients thus relate to the rebalancing relative to the base category.

4.1   Euro area aggregate

Table 4 shows the aggregated results of regression (1) for the euro area, starting in 2013Q4. QE is associated with a significant increase in relative investments by euro area investors into debt issued by vulnerable (compared to non-vulnerable) countries. This is not only the case when using a dummy during QE (columns 1 and 2), but also when using the amount of purchases under the PSPP (columns 3 and 4). Using the sample covering the longer period shows similar results (Table 5). Concretely, holdings of debt issued by 'vulnerable' countries increased between 5.3% and 10.1% compared to holdings of the 'non-vulnerable' euro area countries during QE. This indicates that there is indeed a channel of portfolio rebalancing through which instruments from countries that are perceived to be riskier saw a relative higher demand from euro area investors compared to their portfolio pre-QE.[12]

[Insert Table 4 about here]

[Insert Table 5 about here]

In addition to the search for yield channel *within* the euro area, euro area investors seem to reallocate their portfolios towards debt denominated in currencies of emerging markets. During

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[12] To put this into perspective: euro area investors *de*creased their holdings of EUR denominated government debt, issued by non-vulnerable European countries, with around 180 billion between 2014-Q4 and 2019-Q4, while the holdings of non-vulnerable debt 'only' *de*creased with 40 billion. As the results in the regression are relative outcomes, this may show up as a relative *in*crease in the holdings of 'vulnerable' debt in the debt portfolios of investors (controlling for all relevant factors).

QE, these holdings increased almost 30% compared to holdings of debt denominated in EUR. The significant increase of investments in emerging market currencies is in line with, for example, Moore et al. (2013), who find a similar effect during the QE programmes of the Federal Reserve. By contrast, however, Bergant at al. (2020) do not find evidence of broad-based shift by euro area investors towards EME currencies (they only find such an effect for banks). This difference may reflect the fact that we analyse a considerably longer period, and explicitly distinguish between currency denominations and issuing countries. Like Bergant et al. (2020), we only find limited evidence of rebalancing to emerging market *countries*. The significant effect we find is mainly applicable to debt denominated in emerging market *currencies*.

Note that the two effects mentioned above are not visible in the first quarter of QE (2015Q1, columns 5 and 6). On the contrary, during the first quarter of QE investors rebalanced into debt denominated in currencies of advanced economies. This is in line with Georgiadis and Grab (2016), who find that the APP announcement (January 2015) did not lead to an increase in portfolio flows to emerging market economies, but in turn induced a rebalancing out of emerging into advanced economies. This implies that the impact of QE on the reallocation of portfolios is not instantaneous upon announcement but takes several periods to happen, which is consistent with the flows observed after the implementation of the APP (Figure 3) (Coeuré, 2017, 2018). This could be due, for example, to (i) the stickiness of portfolios, which take time to adjust; (ii) the potential need to change investment mandates; or (iii) because investors rebalance as the impact of QE on yields materialise and not on expectations.

Nonetheless, QE also led to an increase of investments in securities issued by other advanced economies (outside the EU). QE thus not only contributed to increased risk-taking, but also to rebalancing towards closest substitutes outside the euro area (as in Bergant et al.,

2020). We also find that QE coincides with a significant increase in holdings of supranational debt, up to 35% compared to the base category of debt of non-vulnerable euro area countries. As supranational debt typically offers higher returns than risk-free debt while carrying low credit risk, these flows are consistent with search for yield dynamics out of advanced economies. To illustrate this, Figure 4 shows the yields of debt issued by the European Financial Stability Facility and the German government.

Using interacted fixed effects (to control for events that may affect a specific investing country-sector in a particular period) does not make any significant difference for the results (even numbered columns compared to uneven numbered columns).

[Insert Figure 3 about here]

[Insert Figure 4 about here]

Looking at issuing sectors, Tables 3 and 4 do not indicate a risk-taking channel towards riskier sectors compared to government debt. Apparently, rebalancing towards riskier countries within the euro area was a more attractive option than rebalancing towards riskier sectors.

We do not find compelling evidence for a search for yield via the duration risk channel, as the remaining time to maturity does not show consistent patterns throughout Tables 4 and 5. The inconsistent results may (partially) be driven by offsetting effects throughout the euro area. Bergant et al. (2020) for example argue that mainly insurance corporations and pension funds rebalance into longer term maturities, while households are likely to sell PSPP-eligible debt (including the longer maturities).

The next section examines whether these aggregate effects are homogeneous throughout the euro area, or whether there are differences between countries and sectors.

4.2   Country-/sector-results

Country-level analysis

Running regression (1) on a country-by-country level shows that the euro area aggregate results are not homogeneous across countries, and that QE led to different portfolio reallocations by investors from different jurisdictions. In particular Italian and, to a lesser extent, Spanish investors rebalance their portfolios towards debt of the more vulnerable countries (Table 6 and Tables A1-A5 in the Annex).[13] This not only applies to domestic debt, but also to debt of other vulnerable countries.[14] These findings are in line with previous literature reporting that vulnerable countries have a stronger home bias than non-vulnerable countries (Acharya and Steffen, 2015; Koijen et al., 2017). Our results suggest that QE reinforces this effect, implying that risk concentration in vulnerable countries increases (see also the country-sector level analysis).

If we look at what type of investors in these countries increase their holdings of debt issued by vulnerable European countries, we find that in Italy this is the case not only for banks, but also for households and non-financial corporations. This implies a worsening of the Italian sovereign-bank nexus, leaving the banks vulnerable to episodes of sovereign distress (see e.g. Dell'Ariccia et al., 2018; Cifarelli et al., 2020). We also find that French and German households significantly increase their holdings of debt issued by vulnerable European countries. Conversely, there are also investors who actively reduce their holdings of vulnerable debt during QE. This is the case for Dutch and French banks, as well as German insurers.[15] This implies that QE as a side-effect increased risk concentration.

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[13] When running country-by-country regressions we focus on the five biggest countries (France, Germany, Italy, Spain and the Netherlands).

[14] Italian investors not only increased their (relative) holdings of Italian debt, but also of Spanish and Portuguese debt. Similarly, Spanish investors not only increased their (relative) holdings of Spanish debt, but also of Italian debt.

[15] For the sake of space the results of each unique country-sector combination are not included in this paper, but are available upon request.

The rebalancing into emerging market currencies seems more broad-based, with the biggest effect in Spain, followed by Italy and Germany. In contrast, Dutch investors decrease their relative exposure to debt denominated in emerging market currencies. Figure 5 summarizes the effects on a country-level with regard to the issuing country and currency of denomination.

[Insert Table 6a about here]

[Insert Table 6b about here]

[Insert Figure 5 about here]

Sector-level analysis

Running the regressions on a sectoral level, i.e. not distinguishing by the investor domicile, shows significant rebalancing into debt of more vulnerable countries by households, insurers and pension funds. Insurers and pension funds have a need for certain liability matching investments and therefore act as *preferred habitat investors*. While we find rebalancing to closest substitutes *outside* the euro area as in Bergant et al. (2020), the rebalancing *within* the euro area indicates that it could well be the case that preferred habitat investors also want to increase holdings of higher yielding government debt *within* the euro area. Presumably, insurers and pension funds are largely driven by interest and currency hedging and therefore prefer to remain in EUR securities. At the same time, insurance corporations and pension funds have more autonomy in their portfolio choice than for example banks (see e.g. Bergant et al., 2020), giving them more scope to take duration and credit risk. This could explain why these investors move to vulnerable countries and banks do not.

The increase of debt holdings denominated in emerging market currencies seems to be broad-based across sectors (with non-financial corporations being the only exception) (Table 7). Figure 6 summarises the effects on a sector-level for the issuing country and currency of denomination.

The relative increase of emerging market currencies and vulnerable debt across sectors and countries may imply more risk-taking. However, the holdings of supranational debt also show a relative increase during QE, for all sectors and countries except for Spain. Apparently, the characteristics of supranational debt as a safe investment makes it attractive to different types of investors (see also section 4.1).

[Insert Table 7a about here]

[Insert Table 7b about here]

[Insert Figure 6 about here]

All these findings combined show that QE has a heterogeneous impact on security holdings across euro area countries and sectors, where some effects in one country or sector may counteract some of the behaviour of financial market participants elsewhere in the euro area. The significant increase of holdings of debt issued by the vulnerable European countries is heterogeneously distributed across the euro area, whereas the relative increase of holdings of emerging market denominated debt is broad-based (both by country and sector). This implies leakage of QE, which is likely to reduce its effectiveness. At the same time, this may contribute to imported inflation via a depreciation of the euro (although the relationship between cross-border capital flows and depreciation is far from clear (Coeuré, 2017)).

4.3   Robustness checks[16]

As a first robustness check, we adjust the outstanding volume of securities by the amount that is held by the Eurosystem. Over the years, the Eurosystem's share in the debt of European countries started to diverge (Figure 7). As the Eurosystem is a buy-and-hold investor with its

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[16] Not all tables with robustness checks are included here, but are available on request.

monetary policy portfolios, its purchases reduce the free float of certain bonds, i.e. the scope for other investors to obtain a share. By adjusting the outstanding amount of debt for the share that is held by the Eurosystem, we obtain a better indication of what is actually available to private investors. This adjustment does not significantly change our results, however (Tables 7 and 8).

[Insert Figure 7 here]

[Insert Table 8 here]

[Insert Table 9 here]

As a second robustness check we label the euro area countries differently, by dividing them into 'core', 'periphery' and 'other' (see Table 1 for the classifications). This does not lead to substantially different results, as there is still a significant increase in the holdings of debt issued by peripheral European countries. Similarly, there is no major difference when the issuer category of supranational institutions is split between European and non-European supranational institutions.

Third, we use a QE-dummy that is 1 during the period of gross asset purchases (2015Q1-2019Q4) instead of a dummy that is only 1 during the period of net asset purchases. This does not lead to significantly different results.

The baseline analyses contain a variable for issuer country and for the currency of denomination. For many observations, however, this may potentially lead to multicollinearity. As a fourth robustness check, we therefore also run analyses dropping the issuing country or the currency of denomination. This results in similar effects and magnitudes for the remaining variables of interest. For example, when the currency of denomination is dropped from the analysis, holdings of debt issued by vulnerable European countries increase around 9% during QE compared to the base category.

Fifth, fixed effects are applied in multiple ways: interacted with time, separate for country/sector and time, or not used at all. This does not lead to major changes in the results.

Sixth, when running the regression on the sector level, we control for the TLTRO take-up when analysing the behaviour of banks, to see whether QE triggered the rebalancing or whether this resulted from TLTRO. This does not lead to major differences in the results either.

Finally, we replace the residual maturity of the securities with their original maturity. The original maturity is used by other papers assessing this topic, such as Bergant et al. (2020). This does not lead to major differences in the results either.

5.   Conclusion and discussion

This paper sheds light on the impact of the Eurosystem's accommodative monetary policy on investor behaviour in the euro area, using ISIN-level security holdings data between 2009 and 2019. Since the start of QE, European investors have increased their relative exposure to debt issued by vulnerable European countries (compared to non-vulnerable ones). This is new evidence of a risk-taking channel induced by QE. The increase in vulnerable debt holdings is mainly driven by peripheral countries, whereas some sectors in other countries were even net sellers of vulnerable debt. QE thus has a heterogeneous impact on security holdings across euro area countries and sectors.

The increased holdings of debt issued by vulnerable countries may reinforce the stimulus of asset purchase programmes, as the risk premium in vulnerable countries is likely to be compressed to a greater extent - compared to a situation without rebalancing. This potentially reduces the amount of purchases needed by the Eurosystem to obtain a similar effect compared to the amount needed without the rebalancing towards vulnerable debt. On the other hand, this may also have implications during monetary policy tightening, potentially worsening the impact on debt of vulnerable countries if investors reverse the purchases they conducted during

QE. This is particularly relevant in the current context with high inflation, and the introduction of measures such as the Transmission Protection Instrument to support the effective transmission of monetary policy (ECB, 2022b, 2022c). The findings are thus important with an eye to the calibration of future policy.

Moreover, the (relative) increase of peripheral bond holdings by investors in peripheral countries increases their home bias, contributing to a vulnerability in the financial system (Acharya and Steffen (2015) and Koijen et al. (2017)) and exacerbating fragmentation risks during market stress. As it is not up to monetary policy to address the specific issue of home bias, this may have to be addressed by adjusting regulatory and macroprudential policies. The ECB's Strategy Review points out that macroprudential policies are the first line of defence against the build-up of systemic risk (ECB, 2021). Hudepohl et al. (2021) also argue that QE should be complemented by adjusting macroprudential requirements to contain the build-up of risk in the financial system. In this particular case, prudential requirements may be considered, such as appropriate risk weights and large exposure limits for sovereign exposures.

At the same time, the heterogeneity between European countries and sectors is something policy-makers should take into account when assessing the effectiveness of monetary policy measures. This heterogeneity between countries may undermine the effectiveness of monetary policy (both when easing and when tightening), in particular when investors in some countries offset the behaviour of others.

Still, one potential advantage of the different investment behaviour of countries and sectors could be that it reduces the build-up of systemic risk in European financial markets on an aggregate level, given the different exposures of investors. If this is considered desirable, it would be better to achieve lower exposures to systemic risks via sufficiently diversified portfolios at the *individual* investor level. This is because achieving the diversification for the

euro area as a whole may still be associated with concentrated risks at the country- or sector-level.

In addition, we see a broadly driven increase in holdings of debt denominated in emerging market currencies. It can be questioned to what extent an increase of up to 30% compared to EUR-denominated debt is a desirable effect of monetary policy. This may boost to inflation via the exchange rate channel of QE (depreciation of the euro, importing inflation), but the relationship between cross border capital flows and depreciation is far from clear (Coeuré, 2017). However, one could also argue that the rebalancing channel of QE ideally and mainly takes place within the currency area itself instead of leading to outflows (to more risky countries). Policy-makers may have to take this trade-off into account when designing asset purchase programmes. The euro capital outflows are likely to have added to downward pressure on global bond yields, but central banks need to calibrate their policies according to their domestic mandates (Coeuré, 2018).

We conclude with suggestions for further research. This paper provides a broad overview of changes in bond portfolios by European investors during QE. However, it does not include hedging behaviour. As part of the positions investors take in bond markets is likely to be hedged, our results do not show the impact on net exposures to a certain investment category. It would therefore be interesting to complement the bond holdings data with derivative positions. Also, this paper does not quantify the main determinants and the interaction with factors abroad. The results in this paper can be taken as a starting point for follow-up work, for example to determine the balance between *push* and *pull* factors. In addition, it could be of interest to examine whether there is a certain 'threshold' yield level where the rebalancing effects start or accelerate. For example, what level of yields would trigger investors to increase their holdings of vulnerable debt or of debt denominated in an emerging market currency? Also,

SHS-S data does not cover flows *within sectors* within a country. Studying flows within sectors would provide an even more accurate picture of investor behaviour in the euro area. Finally, this analysis focusses on holdings of euro area investors. The repositioning of euro area investors can only be achieved, however, if there is also someone willing to sell their securities. Follow-up work could investigate which investors sold their securities to euro area investors (and what factors triggered them to do so).

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Figures and Tables

Figures

Figure 1: Share of investors in euro area government debt
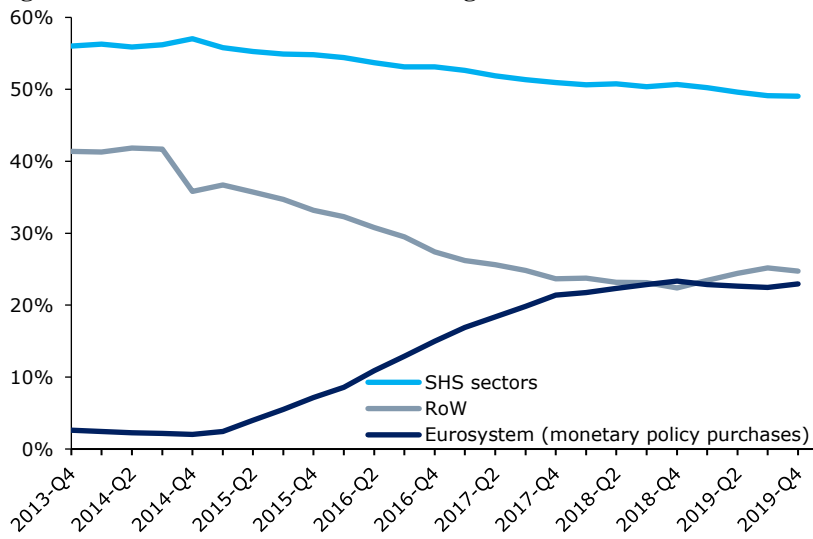
Figure 2: Development of 10-year government bond yields in the euro area
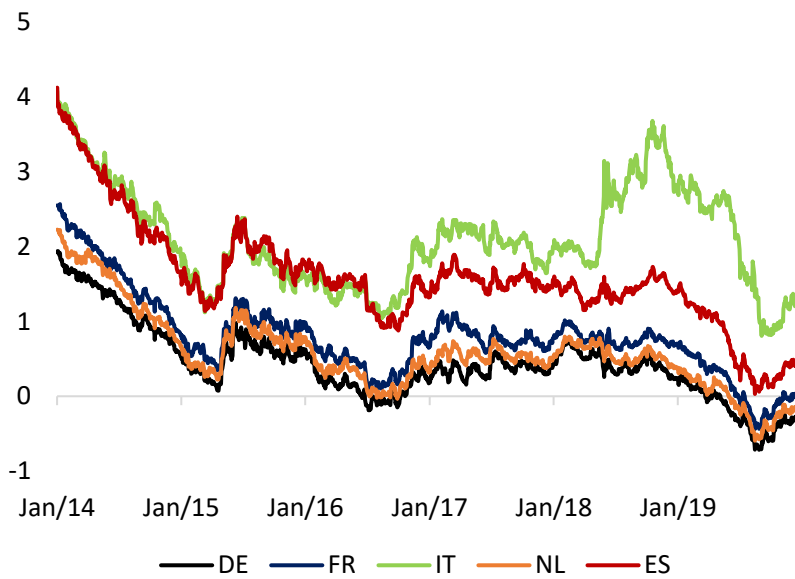
Figure 3: Net capital outflows since the start of QE
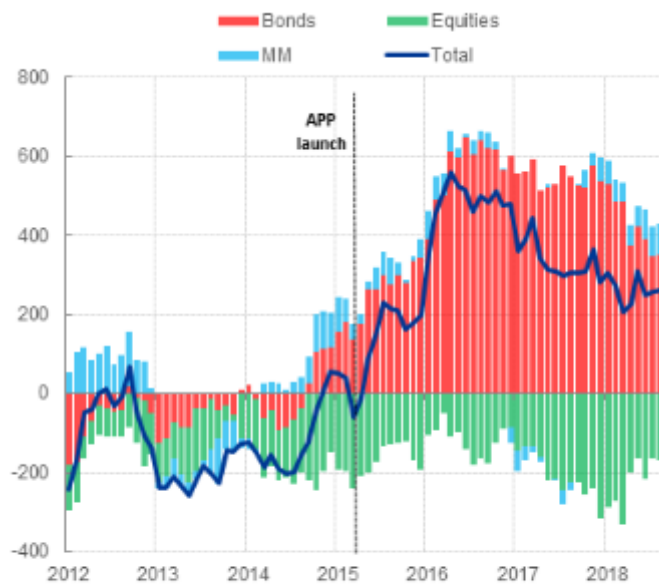
Source: ECB. Last observation: August 2018. Notes: A positive (negative) number indicates net outflows (inflows) from (into) the euro area. Equity includes investment fund shares. APP stands for Asset Purchase Programme and MM for Money Market instruments.

Figure 4: Development of 10-year government bond yields in the euro area
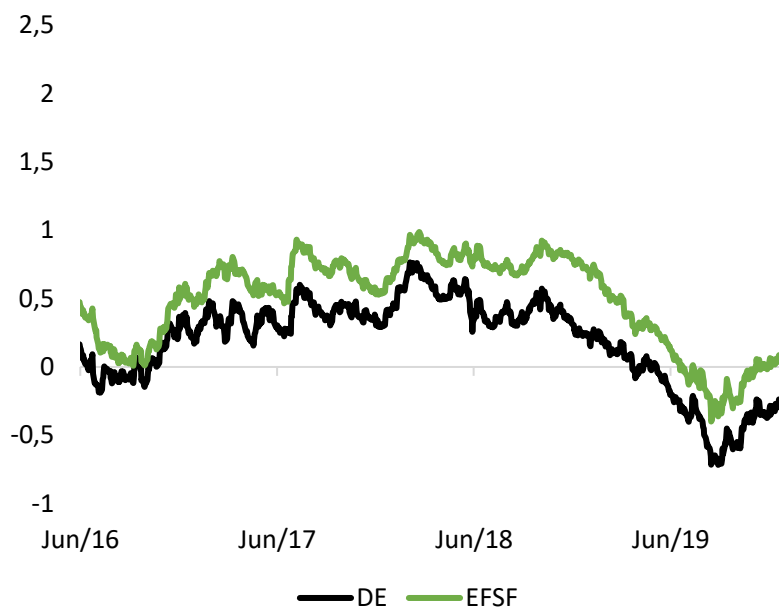
Figure 5: QE effects on the country-level for issuing country and currency of denomination

		DE	FR	ES	IT	NL
Issuing country (Europe non-vulnerable as reference)	Advanced	++	+	0	++	+
	Emerging	+	-	0	+	+
	EUR vulnerable	0	-	+	++	0
	EU other	+	--	-	0	+
	Supranational	++	++	0	++	++
Currency of denomination (EUR as reference)	USD	0	0	++	++	--
	GBP	-	0	+	-	--
	JPY	+	0	+	++	0
	CNY	--	0	0	0	0
	EMEC	++	+	++	++	--
	Advanced Europe (other than EUR)	+	+	+	++	0
	Advanced other	-	0	++	--	-

This table aims to summarise the different effects between five euro area countries. - - is assigned when the coefficient for the particular dummy is significantly negative in both periods of analysis (i.e. both starting in 2009 and in 2013Q4). – is assigned when the coefficient is significantly negative for only one of both periods. 0 is assigned when there are no significant effects, or when the effects in both periods of analysis have the opposite sign. + is assigned when the coefficient is significantly negative for only one of both periods, while ++ is assigned when the coefficient is significantly positive in both periods of analysis

Figure 6: QE effects on the sector-level for issuing country and currency of denomination

		HH	NFC	INS	PF	MFI	INV
Issuing country (Europe non-vulnerable as reference)	Advanced	++	++	++	0	0	++
	Emerging	++	+	++	0	-	+
	EUR vulnerable	++	0	++	++	0	0
	EU other	-	0	++	0	-	0
	Supranational	++	+	++	++	+	++
Currency of denomination (EUR as reference)	USD	++	++	++	++	0	+
	GBP	+	--	+	+	-	-
	JPY	++	+	++	++	++	0
	CNY	0	--	0	0	+	--
	EMEC	++	0	++	++	++	++
	Advanced Europe (other than EUR)	++	++	++	++	--	++
	Advanced other	+	0	++	0	0	-

This table aims to summarise the different effects between five euro area countries. - - is assigned when the coefficient for the particular dummy is significantly negative in both periods of analysis (i.e. both starting in 2009 and in 2013Q4). – is assigned when the coefficient is significantly negative for only one of both periods. 0 is assigned when there are no significant effects, or when the effects in both periods of analysis have the opposite sign. + is assigned when the coefficient is significantly negative for only one of both periods, while ++ is assigned when the coefficient is significantly positive in both periods of analysis

Figure 7: Eurosystem share in sovereign debt (monetary policy purchases)
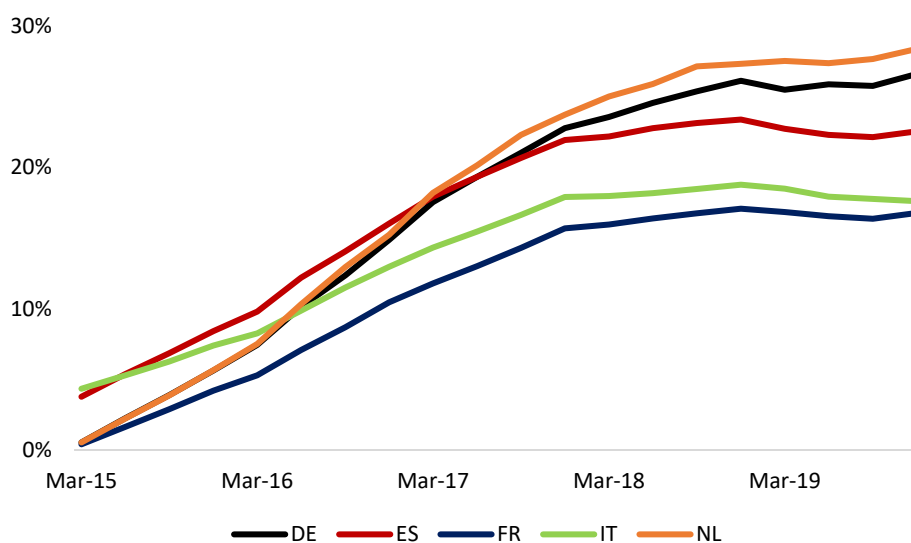
Tables

Table 1: Countries / currencies included in categories

Variable	Categories	Robustness check	Countries/currencies included
Issuing country	**EUR non-vulnerable**		AT, BE, DE, EE, FI, FR, NL, LT, LU, LV, MT, SI, SK
	EUR vulnerable		CY, ES, GR, IE, IT, PT
		EUR core	AT, DE, FI, FR, NL, LU
		EUR periphery	CY, ES, GR, IT, PT
		EUR other	BE, EE, IE, LT, LV, MT, SI, SK
	EU other		BG, CZ, DK, HR, HU, PL, RO, SE
	Supranational	Supra EU	4A, 4C, 4H, 4S, 4U
		Supra other	1E, 1F, 1M, 5C, 5D, 5E, 5F, 5G, 5H, 5K, 5L, 5T, 5U, 5V, 7C, 7E, 7G, 7H, 7I, 7L, 7M, 7Z
	Advanced other		AU, CA, CH, CZ, DK, GB, HK, IL, IS, KR, JP, MO, NO, NZ, PR, SE, SG, SM, TW, US
	Emerging Market Economies		AR, AE, AL, AM, AO, AZ, BA, BB, BD, BH, BI, BJ, BN, BO, BR, BT, BW, BY, BZ, CG, CI, CL, CN, CM, CO, CR, DM, DO, DZ, EC, EG, ET, FJ, GA, GD, GE, GH, GM, GT, HN, ID, IL, IN, IQ, IR, JM, JO, KE, KW, KZ, LA, LB, LC, LK, LR, MA, MD, ME, MK, ML, MN, MU, MV, MX, MY, MZ, NA, NC, NG, NI, OM, PA, PE, PF, PG, PH, PK, PY, QA, RS, RU, RW, SA, SC, SD, SN, SR, SV, SZ, HN, TG, TH, TJ, TK, TN, TR, TT, TZ, UA, UG, UY, UZ, VC, VE, VN, ZA, ZM, ZW
Currency of denomination	**EUR** USD GBP JPY CNY		
	Advanced Europe		CHF, CZK, DEK, DKK, NOK, SEK, ISK
	Advanced other		AUD, CAD, HKD, NZD, SGD, KRW, ILS, MOP, TWD
	Emerging Market currencies		AED, AMD, AOA, ARS, BAM, BDT, BGN, BHD, BRL, BWP, BYR, CLF, CLP, COP, COU, CRC, DOP, EP, GEL, GHC, GHS, GTQ, HRK, HUF, IDR, INR, IRR, JMD, JOD, KES, KGS, KWD, KZT, LBP, LKR, MAD, MKD, MXN, MXV, MYR, MZN, NAD, NGN, NPR, OMR, PEN, PHP, PKR, PLN, PYG, RON, RSD, RUB, RUR, RWF, SAR, SIT, THB, TRY, TWD, TZS, UAH, UGX, UYI, UYU, UZS, VEB, VND, XAF, XOF, XPF, XSU, ZAR, ZMK, ZMW

This table shows the countries and currencies included in certain categories. Abbreviations are used for the sake of space and based on the European System of Accounts (2010). Names in **bold** are the reference categories for the dummies. Classification is based on IMF (2022): Fiscal Monitor Comparative Report - Economy Groupings - IMF Data

Table 2: Number of observations per category

Variable	Categories	In regression tables	Robustness	N (from 2009)	N (from 2013Q4)
Issuing country	**EUR non-vulnerable**	*Reference*		1.266.113	811.073
	EUR vulnerable	EUR vulnerable		496.051	310.186
			EUR core	1.101.699	694.478
			EUR periphery	372.875	232.812
			EUR other	287.590	193.969
	EU other	EU-other		112.060	73.915
	Supranational	Supranational		194.058	156245
			Supra EU	82.575	82.330
			Supra other	111.483	111.403
	Advanced other	Advanced		1.317.434	913.609
	Emerging Market Economies	Emerging		479.780	360.207
Currency of denomination	**EUR**	*Reference*		1.982.741	1.295.361
	USD	USD		945.370	688.389
	GBP	GBP		193.559	139.101
	JPY	JPY		32.177	17.682
	CNY	CNY		15.634	12.886
	Advanced Europe (all but EUR)	Advanced Europe		242.537	167.970
	Advanced Other	Advanced Other		229.092	170.642
	Emerging Market Currencies	EMEC		224.386	170.512
Maturity bucket	**<3M**	*Reference*		455.608	343.341
	3M – 1Y	3M – 1Y		575.146	383.584
	1Y-2Y	1Y-2Y		675.231	454.361
	2Y-5Y	2Y-5Y		1.074.628	728.002
	5Y-10Y	5Y-10Y		739.810	516.604
	>10Y	>10Y		345.073	236.831
Issuer Sector	**Government**	*Reference*		933.972	624.783
	Banks	MFI		1.195.035	796.923
	Non-Financial Corporations	NFC		812.151	586.854
	Other Financials	OFI		857.853	654.0945
	Insurers	INS		62.300	45.306
	Investment Funds	INV		4.115	4.082

This table shows the number of observations (transactions) aggregated per category. Names in **bold** are the reference categories for the dummies. Table 1 elaborates which countries and currencies are included in each category.

Table 3a: Size of total bond investments by investing country (nominal levels, EUR bn)

	2009-Q1	2013-Q4	2019-Q4
DE	2,284	2,419	2,519
ES	385	1,165	898
FR	2,082	2,233	2,307
IT	1,598	2,059	1,774
NL	622	807	912
Total euro area	8,236	11,629	12,319

Note that total euro area also includes investments made by investors in the remaining euro area countries

Table 3b: Size of total bond investments by investing sector (nominal levels, EUR bn)

	2009-Q1	2013-Q4	2019-Q4
HH	1,103	1,058	470
IC	1,473	2,343	2,867
PF	355	296	513
INV	1,046	2,639	4,018
MFI	3,816	4,646	3,778
NFC	223	210	151
Total euro area	8,236	11,629	12,319

Note that total euro area also includes some investments by governments and money market funds
(investing in debt with a residual maturity < 1 year)

Table 4: Regression euro area since 2013Q4

QE variable	1	2	3	4	5	6
	QE dummy	QE dummy	PSPP amount	PSPP amount	2015Q1	2015Q1
Holdings previous period	0.960***	0.960***	0.960***	0.960***	0.960***	0.960***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
Outstanding	0.116***	0.116***	0.115***	0.115***	0.117***	0.117***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Advanced#QE	0.089***	0.090***	0.005***	0.005***	-0.061**	-0.065**
	(0.016)	(0.016)	(0.001)	(0.001)	(0.027)	(0.028)
Emerging#QE	0.065**	0.067**	-0.000	-0.001	0.065	0.072
	(0.030)	(0.030)	(0.002)	(0.002)	(0.047)	(0.048)
EUR vulnerable#QE	0.053**	0.053**	0.003**	0.003**	0.026	0.033
	(0.023)	(0.023)	(0.001)	(0.001)	(0.036)	(0.036)
EU other#QE	0.048	0.050	-0.004	-0.003	0.288***	0.268***
	(0.050)	(0.050)	(0.003)	(0.003)	(0.085)	(0.084)
Supranational#QE	0.215***	0.213***	0.008***	0.008***	0.146***	0.151***
	(0.029)	(0.029)	(0.002)	(0.002)	(0.053)	(0.052)
USD#QE	0.111***	0.109***	0.009***	0.009***	0.513***	0.551***
	(0.030)	(0.030)	(0.002)	(0.002)	(0.063)	(0.065)
GBP#QE	-0.008	-0.008	0.009***	0.009***	0.410***	0.447***
	(0.030)	(0.030)	(0.002)	(0.002)	(0.080)	(0.081)
JPY#QE	0.246**	0.248**	0.010**	0.009***	0.448***	0.506***
	(0.101)	(0.102)	(0.004)	(0.003)	(0.089)	(0.091)
CNY#QE	-0.162**	-0.160**	-0.005*	-0.005**	0.679***	0.747***
	(0.066)	(0.066)	(0.003)	(0.002)	(0.137)	(0.139)
EMEC#QE	0.291***	0.290***	0.011***	0.012***	0.050	0.108
	(0.048)	(0.048)	(0.002)	(0.002)	(0.084)	(0.084)
Advanced other#QE	-0.006	-0.007	0.001	0.002	0.285***	0.348***
	(0.034)	(0.035)	(0.002)	(0.002)	(0.063)	(0.065)
Advanced Europe#QE	0.123**	0.123**	0.006**	0.006***	0.581***	0.640***
	(0.053)	(0.052)	(0.002)	(0.002)	(0.073)	(0.073)
INS#QE	0.029	0.028	-0.006**	-0.007**	0.012	0.030
	(0.035)	(0.035)	(0.003)	(0.003)	(0.062)	(0.061)
INV#QE	0.256	-0.249	0.101***	0.097***	-0.623**	-0.581**
	(0.222)	(0.223)	(0.014)	(0.014)	(0.282)	(0.283)
MFI#QE	-0.031	-0.031	-0.005***	-0.005***	0.007	0.019
	(0.021)	(0.021)	(0.001)	(0.001)	(0.037)	(0.038)
NFC#QE	-0.007	-0.007	-0.004**	-0.004**	0.039	0.052
	(0.025)	(0.025)	(0.002)	(0.002)	(0.054)	(0.054)
OFI#QE	-0.070**	-0.071**	-0.007***	-0.007***	-0.057	-0.042
	(0.027)	(0.027)	(0.002)	(0.002)	(0.045)	(0.045)
3M-1Y#QE	0.050**	0.051**	0.008***	0.007***	0.039	0.017
	(0.020)	(0.020)	(0.001)	(0.001)	(0.050)	(0.049)
1Y-2Y#QE	0.040*	0.041*	0.008***	0.007***	0.192***	0.171***
	(0.024)	(0.024)	(0.001)	(0.001)	(0.053)	(0.052)
2Y-5Y#QE	-0.047**	-0.044**	0.001	0.007***	0.151***	0.124**
	(0.022)	(0.022)	(0.001)	(0.001)	(0.052)	(0.052)
5Y-10Y#QE	-0.026	-0.023	0.001	0.000	0.190***	0.160***
	(0.026)	(0.026)	(0.002)	(0.001)	(0.059)	(0.058)
>10Y#QE	0.041	0.045	0.006***	0.005***	0.382***	0.360***
	(0.027)	(0.027)	(0.002)	(0.002)	(0.052)	(0.052)
Country # Sector FE	Yes	No	Yes	No	Yes	No
Time FE	Yes (quarter)	No	Yes (period)	No	Yes (quarter)	No
Country # Sector # Time FE	No	Yes	No	Yes	No	Yes
Adjusted-R^2	0.527	0.528	0.530	0.537	0.527	0.528
Number of observations	1974773	1974773	1974773	1974773	1974773	1974773

This table shows the outcome of regression (1), applied to the entire euro area. The dependent variable is the log of country-sector i's net transactions in period t of securities falling within a certain category a. Each holder country-sector combination is used as a panel dimension. The variables of interest is the interaction of QE with the dummies that represent the issuing country, currency of denomination, issuing sector and residual maturity (from top to bottom in the table). See also Table 1 and 2 for a clarification of the variables. For the sake of space this table only shows the outcome of the interacted variables, but all regressions also include the variables that are part of the interaction separately. Time FE capture seasonality when QE is included as dummy, and the unique period when QE is approximated by the amount of purchases. Sample period: 2013Q4-2019Q4. Robust standard errors clustered at the holder country-sector level are given in parentheses. Significance levels: * p<0.1, ** p<0.05, *** p<0.01

Table 5: Regression euro area since 2009Q1

	1	2	3	4	5	6
QE variable	QE dummy	QE dummy	PSPP amount	PSPP amount	2015Q1	2015Q1
Holdings previous period	0.939***	0.939***	0.940***	0.943***	0.938***	0.938***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Outstanding	0.118***	0.118***	0.120***	0.118***	0.118***	0.118***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Advanced#QE	0.082***	0.083***	0.003***	0.002***	-0.036	-0.038
	(0.019)	(0.019)	(0.001)	(0.001)	(0.029)	(0.029)
Emerging#QE	0.021	0.023	-0.002	-0.003	0.073	0.079
	(0.048)	(0.048)	(0.002)	(0.003)	(0.059)	(0.059)
EUR vulnerable#QE	0.101***	0.101***	0.004***	0.003***	0.068*	0.077*
	(0.027)	(0.027)	(0.001)	(0.001)	(0.040)	(0.041)
EU other#QE	-0.103**	-0.101**	-0.007***	-0.005**	0.220***	0.201**
	(0.051)	(0.051)	(0.002)	(0.002)	(0.083)	(0.082)
Supranational#QE	0.353***	0.352***	0.007***	0.006***	0.279***	0.286***
	(0.031)	(0.031)	(0.002)	(0.002)	(0.058)	(0.057)
USD#QE	0.089*	0.088*	0.004*	0.003	0.527***	0.564***
	(0.049)	(0.049)	(0.002)	(0.002)	(0.067)	(0.068)
GBP#QE	0.013	0.013	0.004	0.003	0.431***	0.466***
	(0.059)	(0.059)	(0.003)	(0.002)	(0.079)	(0.080)
JPY#QE	0.168	0.172*	0.006	0.005	0.448***	0.503***
	(0.103)	(0.103)	(0.004)	(0.004)	(0.088)	(0.091)
CNY#QE	-0.040	-0.036	-0.005	-0.006**	0.733***	0.795***
	(0.101)	(0.101)	(0.004)	(0.003)	(0.134)	(0.135)
EMEC#QE	0.298***	0.299***	0.010***	0.008***	0.110	0.158**
	(0.071)	(0.071)	(0.003)	(0.003)	(0.078)	(0.079)
Advanced other#QE	-0.046	-0.047	-0.004	-0.004*	0.279***	0.333***
	(0.055)	(0.055)	(0.002)	(0.002)	(0.064)	(0.066)
Advanced Europe#QE	0.103	0.102	0.002	0.001	0.592***	0.642***
	(0.075)	(0.075)	(0.003)	(0.002)	(0.064)	(0.064)
INS#QE	-0.084	-0.085	-0.009***	-0.010***	-0.019	-0.006
	(0.056)	(0.056)	(0.003)	(0.003)	(0.061)	(0.061)
INV#QE	-0.054	-0.050	0.074***	0.071***	-0.531*	-0.496*
	(0.214)	(0.215)	(0.015)	(0.016)	(0.277)	(0.279)
MFI#QE	-0.036	-0.036	-0.003**	-0.003**	-0.005	0.005
	(0.032)	(0.032)	(0.001)	(0.001)	(0.033)	(0.033)
NFC#QE	0.002	0.002	-0.002*	-0.003**	0.052	0.062
	(0.030)	(0.030)	(0.001)	(0.001)	(0.053)	(0.053)
OFI#QE	-0.093***	-0.093***	-0.005***	-0.006***	-0.097**	-0.084*
	(0.030)	(0.030)	(0.001)	(0.001)	(0.045)	(0.044)
3M-1Y#QE	0.551***	0.553***	0.030***	0.029***	0.262***	0.245***
	(0.041)	(0.041)	(0.002)	(0.002)	(0.051)	(0.051)
1Y-2Y#QE	0.513***	0.516***	0.028***	0.028***	0.399***	0.382***
	(0.042)	(0.042)	(0.002)	(0.002)	(0.054)	(0.054)
2Y-5Y#QE	0.445***	0.448***	0.025***	0.025***	0.349***	0.326***
	(0.043)	(0.043)	(0.002)	(0.002)	(0.053)	(0.053)
5Y-10Y#QE	0.450***	0.453***	0.024***	0.023***	0.387***	0.361***
	(0.048)	(0.048)	(0.002)	(0.002)	(0.058)	(0.058)
>10Y#QE	0.532***	0.535***	0.028***	0.027***	0.598***	0.578***
	(0.053)	(0.053)	(0.002)	(0.002)	(0.050)	(0.051)
Country # Sector FE	Yes	No	Yes	No	Yes	No
Time FE	Yes (quarter)	No	Yes (period)	No	Yes (quarter)	No
Country # Sector # Time FE	No	Yes	No	Yes	No	Yes
Adjusted-R^2	0.528	0.529	0.531	0.540	0.527	0.528
Number of observations	2837574	2837574	2837574	2837574	2837574	2837574

This table shows the outcome of regression (1), applied to the entire euro area. The dependent variable is the log of country-sector i's net transactions in period t of securities falling within a certain category a. Each holder country-sector combination is used as a panel dimension. The variables of interest is the interaction of QE with the dummies that represent the issuing country, currency of denomination, issuing sector and residual maturity (from top to bottom in the table). See also Table 1 and 2 for a clarification of the variables. For the sake of space this table only shows the outcome of the interacted variables, but all regressions also include the variables that are part of the interaction separately. Time FE capture seasonality when QE is included as dummy, and the unique period when QE is approximated by the amount of purchases. Sample period: 2009Q1-2019Q4. Robust standard errors clustered at the holder country-sector level are given in parentheses. Significance levels: * p<0.1, ** p<0.05, *** p<0.01

Table 6a: Different countries with QE dummy

	1	2	3	4	5	6
Country	DE	DE	FR	FR	NL	NL
Start of analysis	2013Q4	2009	2013Q4	2009	2013Q4	2009
Holdings previous period	0.899***	0.886***	0.961***	0.944***	0.912***	0.910***
	(0.003)	(0.002)	(0.004)	(0.003)	(0.005)	(0.004)
Outstanding	0.097***	0.099***	0.120***	0.114***	0.065***	0.093***
	(0.003)	(0.003)	(0.005)	(0.004)	(0.005)	(0.004)
Advanced#QE	0.048*	0.081***	0.152***	0.059	0.054	0.081**
	(0.027)	(0.020)	(0.052)	(0.038)	(0.053)	(0.039)
Emerging#QE	0.026	0.089**	-0.095	-0.439***	0.041	0.237***
	(0.049)	(0.037)	(0.094)	(0.069)	(0.063)	(0.049)
EUR vulnerable#QE	0.023	0.000	-0.068	-0.108**	-0.060	-0.041
	(0.041)	(0.030)	(0.071)	(0.052)	(0.072)	(0.055)
EU other#QE	0.202*	-0.031	-0.350*	-0.489***	0.050	0.406***
	(0.115)	(0.079)	(0.211)	(0.158)	(0.119)	(0.088)
Supranational#QE	0.122**	0.277***	0.308***	0.379***	0.293**	0.318***
	(0.054)	(0.049)	(0.111)	(0.105)	(0.114)	(0.110)
USD#QE	0.087**	-0.097***	-0.015	-0.056	-0.135***	-0.293***
	(0.035)	(0.026)	(0.060)	(0.044)	(0.052)	(0.039)
GBP#QE	-0.020	-0.245***	-0.042	0.104	-0.268***	-0.485***
	(0.053)	(0.039)	(0.097)	(0.076)	(0.090)	(0.065)
JPY#QE	0.345***	0.085	-0.205	0.097	0.151	-0.041
	(0.081)	(0.059)	(0.243)	(0.193)	(0.163)	(0.104)
CNY#QE	-0.198**	-0.269***	-0.247	0.168	0.745	0.521
	(0.096)	(0.084)	(0.252)	(0.221)	(0.704)	(0.510)
EMEC#QE	0.349***	0.186***	-0.042	0.459***	-0.122*	-0.484***
	(0.047)	(0.037)	(0.097)	(0.092)	(0.067)	(0.049)
Advanced other#QE	0.032	-0.161***	-0.111	-0.086	-0.057	-0.277***
	(0.034)	(0.027)	(0.085)	(0.065)	(0.082)	(0.060)
Advanced Europe#QE	0.166***	0.003	-0.075	0.129*	0.026	-0.019
	(0.042)	(0.032)	(0.091)	(0.074)	(0.107)	(0.071)
INS#QE	-0.015	-0.182**	-0.146	-0.485***	0.039	-0.049
	(0.114)	(0.083)	(0.174)	(0.124)	(0.117)	(0.087)
INV#QE	-0.543	-0.441	0.431	0.798	-0.394	-0.380
	(0.414)	(0.388)	(0.605)	(0.581)	(0.515)	(0.512)
MFI#QE	-0.036	-0.069**	-0.104	-0.067	-0.016	-0.015
	(0.036)	(0.028)	(0.082)	(0.059)	(0.053)	(0.041)
NFC#QE	0.023	-0.079***	-0.148*	-0.114*	0.129**	-0.015
	(0.040)	(0.030)	(0.082)	(0.059)	(0.054)	(0.042)
OFI#QE	-0.023	-0.124***	-0.202**	-0.187***	0.018	-0.030
	(0.040)	(0.030)	(0.086)	(0.062)	(0.059)	(0.045)
3M-1Y#QE	0.025	0.556***	0.131	0.592***	0.069	0.788***
	(0.053)	(0.041)	(0.097)	(0.072)	(0.088)	(0.073)
1Y-2Y#QE	0.025	0.543***	-0.065	0.510***	-0.044	0.544***
	(0.053)	(0.040)	(0.095)	(0.072)	(0.088)	(0.073)
2Y-5Y#QE	-0.038	0.465***	-0.070	0.495***	-0.033	0.490***
	(0.051)	(0.039)	(0.091)	(0.069)	(0.082)	(0.068)
5Y-10Y#QE	-0.075	0.423***	0.061	0.501***	-0.019	0.451***
	(0.054)	(0.041)	(0.099)	(0.074)	(0.084)	(0.069)
>10Y#QE	0.031	0.516***	0.004	0.538***	-0.004	0.464***
	(0.059)	(0.045)	(0.113)	(0.085)	(0.087)	(0.071)
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes (quarter)	Yes (quarter)	Yes (quarter)	Yes (quarter)	Yes (quarter)	Yes (quarter)
Sector # Time FE	No	No	No	No	No	No
Adjusted-R^2	0.537	0.540	0.333	0.358	0.440	0.395
Number of observations	276788	403894	182448	276908	135564	213726

This table shows the outcome of regression (1), applied to the five biggest euro area countries. The dependent variable is the log of each sector's net transactions in the respective holder country in period t of securities falling within a certain category a. Each holder sector is used as a panel dimension. The variables of interest is the interaction of QE with the dummies that represent the issuing country, currency of denomination, issuing sector and residual maturity (from top to bottom in the table). See also Table 1 and 2 for a clarification of the variables. For the sake of space this table only shows the outcome of the interacted variables, but all regressions also include the variables that are part of the interaction separately. Time FE capture seasonality. Robust standard errors clustered at the holder sector level are given in parentheses. Significance levels: * p<0.1, ** p<0.05, *** p<0.01

Table 6b: Different countries with QE dummy

	7	8	9	10
Country	ES	ES	IT	IT
Start of analysis	2013Q4	2009	2013Q4	2009
Holdings previous period	0.950***	0.941***	0.847***	0.821***
	(0.005)	(0.004)	(0.003)	(0.002)
Outstanding	0.217***	0.201***	0.145***	0.138***
	(0.007)	(0.006)	(0.003)	(0.003)
Advanced#QE	0.057	-0.006	0.091***	0.134***
	(0.062)	(0.048)	(0.029)	(0.021)
Emerging#QE	0.076	-0.119	0.053	0.092***
	(0.138)	(0.114)	(0.040)	(0.030)
EUR vulnerable#QE	0.079	0.221***	0.112***	0.207***
	(0.064)	(0.050)	(0.034)	(0.024)
EU other#QE	0.008	-0.323*	-0.004	0.028
	(0.232)	(0.169)	(0.083)	(0.059)
Supranational#QE	0.075	0.141	0.185***	0.348***
	(0.146)	(0.139)	(0.052)	(0.047)
USD#QE	0.160***	0.287***	0.144***	0.057***
	(0.061)	(0.049)	(0.029)	(0.021)
GBP#QE	0.108	0.300**	-0.025	-0.100***
	(0.139)	(0.125)	(0.044)	(0.033)
JPY#QE	0.636**	0.270	0.309***	0.235***
	(0.253)	(0.196)	(0.090)	(0.061)
CNY#QE	-0.723	-0.341	-0.145	-0.200
	(0.515)	(0.492)	(0.175)	(0.162)
EMEC#QE	0.891***	0.919***	0.286***	0.300***
	(0.142)	(0.117)	(0.052)	(0.039)
Advanced other#QE	0.207**	0.215***	-0.155***	-0.268***
	(0.085)	(0.067)	(0.047)	(0.037)
Advanced Europe#QE	-0.061	0.226**	0.127**	-0.146***
	(0.125)	(0.102)	(0.053)	(0.042)
INS#QE	0.022	-0.088	0.081	0.006
	(0.163)	(0.129)	(0.082)	(0.059)
INV#QE	1.257**	1.197*	-1.905***	-1.681***
	(0.632)	(0.628)	(0.603)	(0.601)
MFI#QE	-0.196**	-0.190***	-0.063*	-0.027
	(0.087)	(0.067)	(0.032)	(0.023)
NFC#QE	-0.275***	-0.115	-0.023	0.021
	(0.089)	(0.070)	(0.033)	(0.024)
OFI#QE	-0.387***	-0.389***	-0.117***	-0.069***
	(0.089)	(0.071)	(0.037)	(0.027)
3M-1Y#QE	-0.000	0.372***	0.100*	0.666***
	(0.089)	(0.072)	(0.059)	(0.044)
1Y-2Y#QE	-0.163*	0.308***	0.188***	0.695***
	(0.088)	(0.072)	(0.057)	(0.042)
2Y-5Y#QE	-0.191**	0.300***	0.048	0.624***
	(0.083)	(0.068)	(0.054)	(0.040)
5Y-10Y#QE	-0.029	0.437***	0.106*	0.659***
	(0.094)	(0.075)	(0.055)	(0.041)
>10Y#QE	-0.059	0.399***	0.229***	0.823***
	(0.114)	(0.089)	(0.060)	(0.045)
Sector FE	Yes	Yes	Yes	Yes
Time FE	Yes (quarter)	Yes (quarter)	Yes (quarter)	Yes (quarter)
Sector # Time FE	No	No	No	No
Adjusted-R^2	0.405	0.395	0.571	0.609
Number of observations	97440	137164	220258	327716

This table shows the outcome of regression (1), applied to the five biggest euro area countries. The dependent variable is the log of each sector's net transactions in the respective holder country in period t of securities falling within a certain category a. Each holder sector is used as a panel dimension. The variables of interest is the interaction of QE with the dummies that represent the issuing country, currency of denomination, issuing sector and residual maturity (from top to bottom in the table). See also Table 1 and 2 for a clarification of the variables. For the sake of space this table only shows the outcome of the interacted variables, but all regressions also include the variables that are part of the interaction separately. Time FE capture seasonality. Robust standard errors clustered at the holder sector level are given in parentheses. Significance levels: * p<0.1, ** p<0.05, *** p<0.01

Table 7a: Different sectors with QE dummy

	1	2	3	4	5	6
Sector	HH	HH	INS	INS	PF	PF
Start of analysis	2013Q4	2009	2013Q4	2009	2013Q4	2009
Holdings previous period	1.003***	0.970***	1.039***	1.033***	1.123***	1.107***
	(0.002)	(0.001)	(0.003)	(0.002)	(0.004)	(0.004)
Outstanding	0.109***	0.107***	0.150***	0.152***	0.069***	0.068***
	(0.002)	(0.002)	(0.003)	(0.003)	(0.005)	(0.004)
Advanced#QE	0.136***	0.103***	0.118***	0.103***	0.038	-0.035
	(0.020)	(0.015)	(0.026)	(0.020)	(0.045)	(0.033)
Emerging#QE	0.197***	0.168***	0.260***	0.254***	0.038	-0.023
	(0.031)	(0.023)	(0.040)	(0.033)	(0.045)	(0.047)
EUR vulnerable#QE	0.101***	0.090***	0.164***	0.242***	0.147***	0.160***
	(0.029)	(0.021)	(0.034)	(0.026)	(0.051)	(0.038)
EU other#QE	0.008	-0.245***	0.298***	0.260***	-0.144	-0.106
	(0.063)	(0.045)	(0.082)	(0.064)	(0.119)	(0.090)
Supranational#QE	0.261***	0.398***	0.311***	0.388***	0.184*	0.281***
	(0.034)	(0.030)	(0.052)	(0.048)	(0.099)	(0.093)
USD#QE	0.120***	0.258***	0.167***	0.214***	0.115***	0.185***
	(0.022)	(0.016)	(0.026)	(0.020)	(0.042)	(0.031)
GBP#QE	-0.012	0.053**	0.059	0.213***	-0.077	0.113**
	(0.033)	(0.025)	(0.037)	(0.031)	(0.059)	(0.047)
JPY#QE	0.827***	0.699***	0.345***	0.276***	0.285**	0.406***
	(0.171)	(0.126)	(0.108)	(0.080)	(0.130)	(0.093)
CNY#QE	-0.107	0.087	-0.139	0.075	-0.564	-0.555
	(0.092)	(0.084)	(0.152)	(0.148)	(0.941)	(0.815)
EMEC#QE	0.485***	0.619***	0.210***	0.254***	0.161**	0.295***
	(0.031)	(0.024)	(0.054)	(0.046)	(0.080)	(0.060)
Advanced other#QE	0.007	0.102***	0.115***	0.300***	0.067	0.088
	(0.026)	(0.020)	(0.040)	(0.034)	(0.077)	(0.062)
Advanced Europe#QE	0.107***	0.162***	0.362***	0.519***	0.430***	0.442***
	(0.029)	(0.023)	(0.043)	(0.037)	(0.088)	(0.073)
INS#QE	0.163**	0.019	0.025	0.117*	0.102	0.020
	(0.069)	(0.054)	(0.079)	(0.062)	(0.102)	(0.075)
INV#QE	-0.818**	-0.410	-0.315	-0.111	-1.327**	-1.151**
	(0.401)	(0.405)	(0.373)	(0.367)	(0.531)	(0.535)
MFI#QE	0.022	0.159***	-0.036	0.038	0.012	0.070*
	(0.025)	(0.018)	(0.031)	(0.024)	(0.048)	(0.036)
NFC#QE	0.075***	0.155***	-0.049	0.004	0.085*	0.085**
	(0.026)	(0.020)	(0.032)	(0.025)	(0.046)	(0.035)
OFI#QE	-0.074***	0.010	-0.029	0.021	0.057	0.092**
	(0.029)	(0.021)	(0.034)	(0.026)	(0.051)	(0.038)
3M-1Y#QE	0.047	0.511***	0.017***	0.527***	0.094	0.573***
	(0.034)	(0.027)	(0.002)	(0.042)	(0.086)	(0.068)
1Y-2Y#QE	0.047	0.511***	0.021***	0.502***	0.102	0.492***
	(0.034)	(0.027)	(0.002)	(0.040)	(0.080)	(0.064)
2Y-5Y#QE	0.047	0.316***	0.014***	0.502***	0.002	0.401***
	(0.034)	(0.025)	(0.002)	(0.040)	(0.072)	(0.059)
5Y-10Y#QE	-0.163***	0.274***	0.014***	0.502***	-0.019	0.389***
	(0.033)	(0.026)	(0.002)	(0.040)	(0.073)	(0.059)
>10Y#QE	-0.092**	0.396***	0.020***	0.484***	0.057	0.587***
	(0.038)	(0.030)	(0.002)	(0.042)	(0.077)	(0.062)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes (quarter)	Yes (quarter)	Yes (quarter)	Yes (quarter)	Yes (quarter)	Yes (quarter)
Country # Time FE	No	No	No	No	No	No
Adjusted-R^2	0.576	0.593	0.576	0.536	0.452	0.469
Number of observations	432068	622110	220258	423031	138287	192858

This table shows the outcome of regression (1), applied to European holder sectors based on the European System of Accounts (2010). The dependent variable is the log of each holder country's net transactions in the respective sector in period t of securities falling within a certain category a. Each holder country is used as a panel dimension. The variables of interest is the interaction of QE with the dummies that represent the issuing country, currency of denomination, issuing sector and residual maturity (from top to bottom in the table). See also Table 1 and 2 for a clarification of the variables. For the sake of space this table only shows the outcome of the interacted variables, but all regressions also include the variables that are part of the interaction separately. Time FE capture seasonality. Robust standard errors clustered at the holder sector level are given in parentheses. Significance levels: * p<0.1, ** p<0.05, *** p<0.01

Table 7b: Different sectors with QE dummy

	7	8	9	10	11	12
Sector	INV	INV	MFI	MFI	NFC	NFC
Start of analysis	2013Q4	2009	2013Q4	2009	2013Q4	2009
Holdings previous period	0.996***	0.984***	0.993***	0.958***	1.065***	1.035***
	(0.002)	(0.001)	(0.004)	(0.003)	(0.004)	(0.003)
Outstanding	0.106***	0.106***	0.033***	0.050***	0.091***	0.094***
	(0.002)	(0.001)	(0.005)	(0.004)	(0.004)	(0.003)
Advanced#QE	0.040**	0.033**	0.016	-0.086	0.089***	0.043*
	(0.017)	(0.013)	(0.052)	(0.054)	(0.034)	(0.025)
Emerging#QE	0.049**	-0.012	-0.207*	-0.494***	0.133**	0.020
	(0.021)	(0.017)	(0.110)	(0.078)	(0.055)	(0.041)
EUR vulnerable#QE	0.029	0.020	-0.090	0.051	-0.032	0.019
	(0.023)	(0.018)	(0.065)	(0.046)	(0.047)	(0.036)
EU other#QE	0.046	0.003	0.063	-0.285***	0.192	-0.087
	(0.043)	(0.031)	(0.159)	(0.109)	(0.124)	(0.085)
Supranational#QE	0.216***	0.268***	0.075	0.281***	0.084	0.129**
	(0.032)	(0.029)	(0.098)	(0.091)	(0.063)	(0.056)
USD#QE	0.028*	-0.012	0.107*	-0.160***	0.077**	0.050*
	(0.017)	(0.013)	(0.060)	(0.042)	(0.035)	(0.026)
GBP#QE	-0.033	-0.050**	-0.089	-0.239***	-0.160***	-0.143***
	(0.027)	(0.020)	(0.112)	(0.081)	(0.060)	(0.045)
JPY#QE	0.119**	-0.077**	0.289*	0.219*	0.522*	0.227
	(0.052)	(0.036)	(0.160)	(0.120)	(0.271)	(0.157)
CNY#QE	-0.301***	-0.291***	0.383	0.785***	-0.393**	-0.333**
	(0.060)	(0.053)	(0.315)	(0.272)	(0.170)	(0.155)
EMEC#QE	0.067***	0.067***	0.411***	0.449***	-0.160***	0.523***
	(0.020)	(0.020)	(0.127)	(0.094)	(0.060)	(0.042)
Advanced other#QE	0.017	-0.073***	-0.021	-0.092	-0.028	-0.032
	(0.028)	(0.021)	(0.082)	(0.061)	(0.046)	(0.036)
Advanced Europe#QE	0.146***	0.152***	-0.223**	-0.157**	0.138***	0.244***
	(0.028)	(0.022)	(0.094)	(0.067)	(0.053)	(0.041)
INS#QE	-0.004	-0.102***	-0.274	-0.666***	0.047	-0.165*
	(0.046)	(0.035)	(0.309)	(0.220)	(0.118)	(0.091)
INV#QE	0.121	0.248	-0.037	0.136	0.274	0.343
	(0.217)	(0.208)	(0.564)	(0.527)	(1.193)	(1.187)
MFI#QE	-0.056***	-0.066***	-0.017	0.013	-0.033	-0.065**
	(0.018)	(0.014)	(0.069)	(0.049)	(0.045)	(0.033)
NFC#QE	-0.076***	-0.105***	-0.022	0.027	0.123***	0.071**
	(0.018)	(0.014)	(0.078)	(0.056)	(0.045)	(0.034)
OFI#QE	-0.043**	-0.036**	-0.059	-0.086	-0.021	0.071**
	(0.020)	(0.016)	(0.074)	(0.054)	(0.049)	(0.034)
3M-1Y#QE	0.084***	0.513***	-0.004	0.635***	0.192***	0.793***
	(0.032)	(0.026)	(0.104)	(0.074)	(0.061)	(0.048)
1Y-2Y#QE	0.100***	0.487***	0.005	0.616***	0.198***	0.775***
	(0.031)	(0.025)	(0.103)	(0.074)	(0.059)	(0.047)
2Y-5Y#QE	0.019	0.406***	-0.073	0.583***	0.017	0.615***
	(0.028)	(0.024)	(0.100)	(0.072)	(0.055)	(0.044)
5Y-10Y#QE	-0.023	0.330***	0.090	0.678***	-0.009	0.589***
	(0.029)	(0.024)	(0.108)	(0.077)	(0.058)	(0.046)
>10Y#QE	0.049	0.430***	0.020	0.574***	0.167**	0.826***
	(0.031)	(0.026)	(0.129)	(0.093)	(0.067)	(0.052)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes (quarter)	Yes (quarter)	Yes (quarter)	Yes (quarter)	Yes (quarter)	Yes (quarter)
Country # Time FE	No	No	No	No	No	No
Adjusted-R^2	0.606	0.605	0.250	0.267	0.536	0.551
Number of observations	534608	748012	263804	443254	174195	262237

This table shows the outcome of regression (1), applied to European holder sectors based on the European System of Accounts (2010). The dependent variable is the log of each holder country's net transactions in the respective sector in period t of securities falling within a certain category a. Each holder country is used as a panel dimension. The variables of interest is the interaction of QE with the dummies that represent the issuing country, currency of denomination, issuing sector and residual maturity (from top to bottom in the table). See also Table 1 and 2 for a clarification of the variables. For the sake of space this table only shows the outcome of the interacted variables, but all regressions also include the variables that are part of the interaction separately. Time FE capture seasonality. Robust standard errors clustered at the holder sector level are given in parentheses. Significance levels: * p<0.1, ** p<0.05, *** p<0.01

Table 8: Regression euro area since 2013Q4, outstanding amount adjusted for Eurosystem purchases

	1	2	3	4	5	6
QE variable	QE dummy	QE dummy	PSPP amount	PSPP amount	2015Q1	2015Q1
Holdings previous period	0.962***	0.962***	0.962***	0.962***	0.962***	0.962***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Outstanding	0.111***	0.111***	0.111***	0.110***	0.112***	0.112***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Advanced#QE	0.082***	0.083***	0.006***	0.005***	-0.093***	-0.097***
	(0.016)	(0.016)	(0.001)	(0.001)	(0.027)	(0.027)
Emerging#QE	0.045	0.047*	0.000	0.000	0.001	0.008
	(0.028)	(0.028)	(0.002)	(0.002)	(0.044)	(0.044)
EUR vulnerable#QE	0.067***	0.067***	0.005***	0.005***	-0.002	0.003
	(0.021)	(0.021)	(0.001)	(0.001)	(0.034)	(0.035)
EU other#QE	0.016	0.016	-0.003	-0.002	0.187**	0.168*
	(0.048)	(0.048)	(0.003)	(0.003)	(0.088)	(0.087)
Supranational#QE	0.211***	0.209***	0.009***	0.008***	0.133**	0.138***
	(0.029)	(0.029)	(0.002)	(0.002)	(0.053)	(0.051)
USD#QE	0.105***	0.103***	0.009***	0.009***	0.487***	0.524***
	(0.030)	(0.030)	(0.002)	(0.002)	(0.062)	(0.063)
GBP#QE	-0.017	-0.017	0.009***	0.010***	0.381***	0.418***
	(0.030)	(0.030)	(0.002)	(0.002)	(0.079)	(0.080)
JPY#QE	0.233**	0.234**	0.010**	0.010***	0.394***	0.454***
	(0.099)	(0.100)	(0.004)	(0.003)	(0.088)	(0.091)
CNY#QE	-0.162**	-0.160**	-0.005*	-0.004*	0.663***	0.731***
	(0.066)	(0.066)	(0.003)	(0.003)	(0.136)	(0.138)
EMEC#QE	0.286***	0.284***	0.012***	0.013***	0.016	0.074
	(0.048)	(0.048)	(0.002)	(0.002)	(0.081)	(0.081)
Advanced other#QE	-0.014	-0.015	0.001	0.003	0.245***	0.308***
	(0.035)	(0.035)	(0.002)	(0.002)	(0.062)	(0.063)
Advanced Europe#QE	0.117**	0.117**	0.006**	0.007***	0.548***	0.606***
	(0.053)	(0.053)	(0.003)	(0.002)	(0.073)	(0.074)
INS#QE	-0.006	-0.008	-0.006*	-0.006*	-0.089	-0.071
	(0.033)	(0.033)	(0.003)	(0.003)	(0.066)	(0.064)
INV#QE	-0.282	-0.008	0.104***	0.100***	-0.755**	-0.711**
	(0.223)	(0.033)	(0.014)	(0.014)	(0.294)	(0.294)
MFI#QE	-0.060***	-0.061***	-0.005***	-0.004***	-0.089**	-0.077*
	(0.019)	(0.019)	(0.001)	(0.001)	(0.041)	(0.041)
NFC#QE	-0.035	-0.037	-0.003*	-0.003	-0.059	-0.046
	(0.023)	(0.023)	(0.002)	(0.002)	(0.055)	(0.054)
OFI#QE	-0.099***	-0.100***	-0.006***	-0.006***	-0.154***	-0.137***
	(0.025)	(0.025)	(0.002)	(0.002)	(0.047)	(0.046)
3M-1Y#QE	0.048**	0.050**	0.006**	0.007***	0.040	0.018
	(0.020)	(0.020)	(0.003)	(0.001)	(0.050)	(0.049)
1Y-2Y#QE	0.036	0.038	0.007***	0.006***	0.196***	0.174***
	(0.025)	(0.025)	(0.002)	(0.001)	(0.056)	(0.055)
2Y-5Y#QE	-0.040*	-0.036	0.001	0.000	0.189***	0.162***
	(0.022)	(0.022)	(0.001)	(0.001)	(0.054)	(0.053)
5Y-10Y#QE	-0.015	-0.011	0.001	0.000	0.217***	0.188***
	(0.026)	(0.027)	(0.002)	(0.001)	(0.060)	(0.060)
>10Y#QE	0.055*	0.059**	0.006***	0.005***	0.423***	0.402***
	(0.028)	(0.028)	(0.002)	(0.002)	(0.051)	(0.051)
Country # Sector FE	Yes	No	Yes	No	Yes	No
Time FE	Yes (quarter)	No	Yes (period)	No	Yes (quarter)	No
Country # Sector # Time FE	No	Yes	No	Yes	No	Yes
Adjusted-R^2	0.528	0.528	0.531	0.537	0.528	0.529
Number of observations	1947648	1947648	1947648	1947648	1947648	1947648

This table shows the outcome of regression (1), applied to the entire euro area. The dependent variable is the log of country-sector i's net transactions in period t of securities falling within a certain category a. The outstanding amount of a security is adjusted for the amount the Eurosystem holds. Each holder country-sector combination is used as a panel dimension. The variables of interest is the interaction of QE with the dummies that represent the issuing country, currency of denomination, issuing sector and residual maturity (from top to bottom in the table). See also Table 1 and 2 for a clarification of the variables. For the sake of space this table only shows the outcome of the interacted variables, but all regressions also include the variables that are part of the interaction separately. Time FE capture seasonality when QE is included as dummy, and the unique period when QE is approximated by the amount of purchases. Sample period: 2013Q4-2019Q4. Robust standard errors clustered at the holder country-sector level are given in parentheses. Significance levels: * p<0.1, ** p<0.05, *** p<0.01

Table 9: Regression euro area since 2009Q1, outstanding amount adjusted for Eurosystem purchases

	1	2	3	4	5	6
QE variable	QE dummy	QE dummy	PSPP amount	PSPP amount	2015Q1	2015Q1
Holdings previous period	0.942***	0.942***	0.943***	0.945***	0.940***	0.940***
	(0.013)	(0.013)	(0.012)	(0.013)	(0.013)	(0.013)
Outstanding	0.114***	0.114***	0.116***	0.114***	0.116***	0.116***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Advanced#QE	0.071***	0.071***	0.003***	0.002***	-0.076***	-0.078***
	(0.018)	(0.018)	(0.001)	(0.001)	(0.027)	(0.027)
Emerging#QE	-0.015	-0.013	-0.003	-0.004	-0.011	-0.005
	(0.047)	(0.046)	(0.002)	(0.003)	(0.054)	(0.055)
EUR vulnerable#QE	0.125***	0.125***	0.005***	0.005***	0.047	0.055
	(0.028)	(0.028)	(0.001)	(0.001)	(0.039)	(0.040)
EU other#QE	-0.161***	-0.159***	-0.009***	-0.007***	0.087	0.070
	(0.053)	(0.053)	(0.002)	(0.002)	(0.084)	(0.084)
Supranational#QE	0.346***	0.345***	0.007***	0.006***	0.263***	0.269***
	(0.030)	(0.030)	(0.002)	(0.002)	(0.058)	(0.057)
USD#QE	0.076	0.075	0.003	0.003	0.494***	0.531***
	(0.048)	(0.048)	(0.002)	(0.002)	(0.065)	(0.066)
GBP#QE	-0.005	-0.005	0.003	0.003	0.393***	0.428***
	(0.058)	(0.058)	(0.002)	(0.002)	(0.077)	(0.078)
JPY#QE	0.140	0.143	0.003	0.005	0.379***	0.436***
	(0.100)	(0.100)	(0.002)	(0.004)	(0.090)	(0.094)
CNY#QE	-0.044	-0.039	-0.005	-0.005	0.715***	0.776***
	(0.101)	(0.102)	(0.004)	(0.003)	(0.134)	(0.135)
EMEC#QE	0.285***	0.285***	0.009***	0.008***	0.069	0.118
	(0.070)	(0.070)	(0.003)	(0.003)	(0.075)	(0.076)
Advanced other#QE	-0.061	-0.061	-0.004*	-0.004*	0.230***	0.285***
	(0.054)	(0.053)	(0.002)	(0.002)	(0.063)	(0.064)
Advanced Europe#QE	0.089	0.089	0.001	0.001	0.551***	0.601***
	(0.075)	(0.075)	(0.003)	(0.003)	(0.065)	(0.065)
INS#QE	-0.150***	-0.151***	-0.011***	-0.012***	-0.156**	-0.141**
	(0.053)	(0.053)	(0.003)	(0.003)	(0.063)	(0.062)
INV#QE	-0.111	-0.106	0.075***	0.071***	-0.695**	-0.658**
	(0.216)	(0.217)	(0.015)	(0.016)	(0.290)	(0.292)
MFI#QE	-0.092***	-0.093***	-0.005***	-0.005***	-0.132***	-0.121***
	(0.027)	(0.027)	(0.001)	(0.001)	(0.037)	(0.037)
NFC#QE	-0.051**	-0.052**	-0.004***	-0.004***	-0.076	-0.065
	(0.026)	(0.026)	(0.001)	(0.001)	(0.053)	(0.053)
OFI#QE	-0.149***	-0.150***	-0.007***	-0.007***	-0.224***	-0.209***
	(0.025)	(0.025)	(0.001)	(0.001)	(0.046)	(0.045)
3M-1Y#QE	0.548***	0.549***	0.030***	0.029***	0.262***	0.245***
	(0.041)	(0.041)	(0.002)	(0.002)	(0.051)	(0.051)
1Y-2Y#QE	0.514***	0.517***	0.028***	0.028***	0.405***	0.388***
	(0.043)	(0.043)	(0.002)	(0.002)	(0.057)	(0.057)
2Y-5Y#QE	0.458***	0.461***	0.025***	0.025***	0.394***	0.371***
	(0.043)	(0.043)	(0.002)	(0.002)	(0.055)	(0.055)
5Y-10Y#QE	0.467***	0.470***	0.025***	0.024***	0.423***	0.397***
	(0.050)	(0.049)	(0.002)	(0.002)	(0.059)	(0.058)
>10Y#QE	0.557***	0.560***	0.029***	0.028***	0.649***	0.629***
	(0.054)	(0.054)	(0.002)	(0.002)	(0.050)	(0.050)
Country # Sector FE	Yes	No	Yes	No	Yes	No
Time FE	Yes (quarter)	No	Yes (period)	No	Yes (quarter)	No
Country # Sector # Time FE	No	Yes	No	Yes	No	Yes
Adjusted-R^2	0.529	0.529	0.532	0.541	0.528	0.528
Number of observations	2741945	2741945	2741945	2741945	2741945	2741945

This table shows the outcome of regression (1), applied to the entire euro area. The dependent variable is the log of country-sector i's net transactions in period t of securities falling within a certain category a. The outstanding amount of a security is adjusted for the amount the Eurosystem holds. Each holder country-sector combination is used as a panel dimension. The variables of interest is the interaction of QE with the dummies that represent the issuing country, currency of denomination, issuing sector and residual maturity (from top to bottom in the table). See also Table 1 and 2 for a clarification of the variables. For the sake of space this table only shows the outcome of the interacted variables, but all regressions also include the variables that are part of the interaction separately. Time FE capture seasonality when QE is included as dummy, and the unique period when QE is approximated by the amount of purchases. Sample period: 2009Q1-2019Q4. Robust standard errors clustered at the holder country-sector level are given in parentheses. Significance levels: * p<0.1, ** p<0.05, *** p<0.01

Annex

Table A1: Different specifications of QE-variables, Italy

	1	2	3	4	5	6
QE variable	QE dummy	QE dummy	PSPP amount	PSPP amount	2015Q1	2015Q1
Start of analysis	2013Q4	2009	2013Q4	2009	2013Q4	2009
Holdings previous period	0.847***	0.821***	0.848***	0.821***	0.847***	0.820***
	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)
Outstanding	0.145***	0.138***	0.144***	0.140***	0.145***	0.135***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Advanced#QE	0.091***	0.134***	0.004***	0.005***	0.145***	0.035
	(0.029)	(0.021)	(0.001)	(0.001)	(0.003)	(0.050)
Emerging#QE	0.053	0.092***	0.004**	0.003***	0.223***	0.292***
	(0.040)	(0.030)	(0.002)	(0.001)	(0.065)	(0.063)
EUR vulnerable#QE	0.112***	0.207***	0.006***	0.008***	0.057	0.148**
	(0.034)	(0.024)	(0.001)	(0.001)	(0.064)	(0.063)
EU other#QE	-0.004	0.028	-0.004	-0.001	0.322**	0.379***
	(0.083)	(0.059)	(0.003)	(0.002)	(0.129)	(0.126)
Supranational#QE	0.185***	0.348***	0.004**	0.003	0.175*	0.370***
	(0.052)	(0.047)	(0.002)	(0.002)	(0.092)	(0.092)
USD#QE	0.144***	0.057***	0.010***	0.002***	0.524***	0.515***
	(0.029)	(0.021)	(0.001)	(0.001)	(0.049)	(0.048)
GBP#QE	-0.025	-0.100***	0.008***	-0.002	0.492***	0.468***
	(0.044)	(0.033)	(0.002)	(0.001)	(0.067)	(0.066)
JPY#QE	0.309***	0.235***	0.013***	0.008***	0.256	0.285*
	(0.090)	(0.061)	(0.004)	(0.002)	(0.173)	(0.171)
CNY#QE	-0.145	-0.200	-0.013**	-0.017***	0.907***	0.879***
	(0.175)	(0.162)	(0.007)	(0.006)	(0.243)	(0.238)
EMEC#QE	0.286***	0.300***	0.007***	0.007***	-0.051	0.007
	(0.052)	(0.039)	(0.002)	(0.001)	(0.088)	(0.087)
Advanced other#QE	-0.155***	-0.268***	-0.006***	-0.012***	0.276***	0.213***
	(0.047)	(0.037)	(0.002)	(0.001)	(0.084)	(0.082)
Advanced Europe#QE	0.127**	-0.146***	0.007***	-0.008***	0.967***	0.827***
	(0.053)	(0.042)	(0.002)	(0.001)	(0.084)	(0.083)
INS#QE	0.081	0.006	0.006*	-0.001	-0.325**	-0.303**
	(0.082)	(0.059)	(0.003)	(0.002)	(0.135)	(0.133)
INV#QE	-1.905***	-1.681***	0.312*	0.330**	-0.548	-0.457
	(0.603)	(0.601)	(0.168)	(0.167)	(0.456)	(0.434)
MFI#QE	-0.063*	-0.027	-0.004***	-0.001	-0.096*	-0.084
	(0.032)	(0.023)	(0.001)	(0.001)	(0.055)	(0.054)
NFC#QE	-0.023	0.021	-0.002*	-0.000	0.064	0.101*
	(0.033)	(0.024)	(0.001)	(0.001)	(0.057)	(0.056)
OFI#QE	-0.117***	-0.069***	-0.005***	-0.002***	0.007	0.000
	(0.037)	(0.027)	(0.001)	(0.001)	(0.067)	(0.066)
3M-1Y#QE	0.100*	0.666***	0.017***	0.036***	-0.232**	0.041
	(0.059)	(0.044)	(0.002)	(0.002)	(0.105)	(0.102)
1Y-2Y#QE	0.188***	0.695***	0.021***	0.037***	0.029	0.292***
	(0.057)	(0.042)	(0.002)	(0.001)	(0.097)	(0.095)
2Y-5Y#QE	0.048	0.624***	0.014***	0.034***	-0.065	0.203**
	(0.054)	(0.040)	(0.002)	(0.001)	(0.092)	(0.090)
5Y-10Y#QE	0.106*	0.659***	0.014***	0.034***	-0.020	0.253***
	(0.055)	(0.041)	(0.002)	(0.001)	(0.095)	(0.093)
>10Y#QE	0.229***	0.823***	0.020***	0.041***	-0.004	0.312***
	(0.060)	(0.045)	(0.002)	(0.002)	(0.103)	(0.101)
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes (quarter)	Yes (quarter)	Yes (period)	Yes (period)	Yes (quarter)	Yes (quarter)
Sector # Time FE	No	No	No	No	No	No
Adjusted-R^2	0.571	0.609	0.576	0.614	0.572	0.607
Number of observations	220258	327716	220258	327716	220258	327716

This table shows the outcome of regression (1), applied to Italy. The dependent variable is the log of each sector's net transactions in period t of securities falling within a certain category a. Each holder sector is used as a panel dimension. The variables of interest is the interaction of QE with the dummies that represent the issuing country, currency of denomination, issuing sector and residual maturity (from top to bottom in the table). See also Table 1 and 2 for a clarification of the variables. For the sake of space this table only shows the outcome of the interacted variables, but all regressions also include the variables that are part of the interaction separately. Time FE capture seasonality when QE is included as dummy, and the unique period when QE is approximated by the amount of purchases. Robust standard errors clustered at the holder sector level are given in parentheses. Significance levels: * $p<0.1$, ** $p<0.05$, *** $p<0.01$

Table A2: Different specifications of QE-variables, Netherlands

	1	2	3	4	5	6
QE variable	QE dummy	QE dummy	PSPP amount	PSPP amount	2015Q1	2015Q1
Start of analysis	2013Q4	2009	2013Q4	2009	2013Q4	2009
Holdings previous period	0.912***	0.910***	0.912***	0.909***	0.912***	0.911***
	(0.005)	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)
Outstanding	0.065***	0.093***	0.066***	0.095***	0.065***	0.090***
	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)	(0.004)
Advanced#QE	0.054	0.081**	0.007***	0.005***	-0.182	-0.154
	(0.053)	(0.039)	(0.002)	(0.001)	(0.134)	(0.133)
Emerging#QE	0.041	0.237***	0.002	0.010***	0.033	0.156
	(0.063)	(0.049)	(0.003)	(0.002)	(0.155)	(0.154)
EUR vulnerable#QE	-0.060	-0.041	-0.000	-0.001	-0.121	-0.124
	(0.072)	(0.055)	(0.003)	(0.002)	(0.190)	(0.189)
EU other#QE	0.050	0.406***	0.009	0.019***	0.089	0.317
	(0.119)	(0.088)	(0.006)	(0.003)	(0.208)	(0.208)
Supranational#QE	0.293**	0.318***	0.020***	0.022***	0.053	0.106
	(0.114)	(0.110)	(0.006)	(0.006)	(0.249)	(0.249)
USD#QE	-0.135***	-0.293***	-0.011***	-0.014***	0.595***	0.465***
	(0.052)	(0.039)	(0.002)	(0.001)	(0.130)	(0.129)
GBP#QE	-0.268***	-0.485***	-0.009**	-0.017***	0.694***	0.495**
	(0.090)	(0.065)	(0.004)	(0.002)	(0.230)	(0.228)
JPY#QE	0.151	-0.041	0.006	-0.003	0.509**	0.449*
	(0.163)	(0.104)	(0.008)	(0.004)	(0.244)	(0.237)
CNY#QE	0.745	0.521	0.029	0.021	0.879	0.827
	(0.704)	(0.510)	(0.027)	(0.019)	(1.077)	(1.045)
EMEC#QE	-0.122*	-0.484***	-0.014***	-0.023***	0.326**	0.101
	(0.067)	(0.049)	(0.003)	(0.002)	(0.140)	(0.139)
Advanced other#QE	-0.057	-0.277***	-0.007*	-0.013***	0.084	-0.051
	(0.082)	(0.060)	(0.004)	(0.002)	(0.209)	(0.208)
Advanced Europe#QE	0.026	-0.019	-0.009*	-0.006**	0.464***	0.443***
	(0.107)	(0.071)	(0.005)	(0.003)	(0.170)	(0.168)
INS#QE	0.039	-0.049	0.006	-0.000	0.435**	0.391**
	(0.117)	(0.087)	(0.005)	(0.003)	(0.182)	(0.179)
INV#QE	-0.394	-0.380	0.129	0.128	0.543	0.543
	(0.515)	(0.512)	(0.157)	(0.157)	(0.670)	(0.676)
MFI#QE	-0.016	-0.015	-0.002	-0.001	0.005	-0.004
	(0.053)	(0.041)	(0.002)	(0.002)	(0.119)	(0.119)
NFC#QE	0.129**	-0.015	0.007***	-0.001	0.040	-0.007
	(0.054)	(0.042)	(0.003)	(0.002)	(0.128)	(0.128)
OFI#QE	0.018	-0.030	0.002	-0.001	-0.113	-0.138
	(0.059)	(0.045)	(0.003)	(0.002)	(0.150)	(0.150)
3M-1Y#QE	0.069	0.788***	0.007*	0.035***	-0.036	0.334*
	(0.088)	(0.073)	(0.004)	(0.003)	(0.179)	(0.178)
1Y-2Y#QE	-0.044	0.544***	0.002	0.026***	0.156	0.419**
	(0.088)	(0.073)	(0.004)	(0.003)	(0.176)	(0.176)
2Y-5Y#QE	-0.033	0.490***	-0.002	0.022***	-0.186	0.047
	(0.082)	(0.068)	(0.004)	(0.003)	(0.166)	(0.166)
5Y-10Y#QE	-0.019	0.451***	-0.001	0.020***	-0.034	0.164
	(0.084)	(0.069)	(0.004)	(0.003)	(0.165)	(0.165)
>10Y#QE	-0.004	0.464***	0.001	0.021***	0.135	0.336*
	(0.087)	(0.071)	(0.004)	(0.003)	(0.180)	(0.179)
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes (quarter)	Yes (quarter)	Yes (period)	Yes (period)	Yes (quarter)	Yes (quarter)
Sector # Time FE	No	No	No	No	No	No
Adjusted-R^2	0.440	0.395	0.441	0.398	0.440	0.395
Number of observations	135564	213726	135564	213726	135564	213726

This table shows the outcome of regression (1), applied to The Netherlands. The dependent variable is the log of each sector's net transactions in period t of securities falling within a certain category a. Each holder sector is used as a panel dimension. The variables of interest is the interaction of QE with the dummies that represent the issuing country, currency of denomination, issuing sector and residual maturity (from top to bottom in the table). See also Table 1 and 2 for a clarification of the variables. For the sake of space this table only shows the outcome of the interacted variables, but all regressions also include the variables that are part of the interaction separately. Time FE capture seasonality when QE is included as dummy, and the unique period when QE is approximated by the amount of purchases. Robust standard errors clustered at the holder sector level are given in parentheses. Significance levels: * $p<0.1$, ** $p<0.05$, *** $p<0.01$

Table A3: Different specifications of QE-variables, Germany

	1	2	3	4	5	6
QE variable	QE dummy	QE dummy	PSPP amount	PSPP amount	2015Q1	2015Q1
Start of analysis	2013Q4	2009	2013Q4	2009	2013Q4	2009
Holdings previous period	0.899***	0.886***	0.900***	0.887***	0.899***	0.885***
	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)
Outstanding	0.097***	0.099***	0.096***	0.100***	0.097***	0.098***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Advanced#QE	0.048*	0.081***	0.004***	0.004***	-0.157**	-0.118*
	(0.027)	(0.020)	(0.001)	(0.001)	(0.070)	(0.069)
Emerging#QE	0.026	0.089**	0.006**	0.005***	0.040	0.094
	(0.049)	(0.037)	(0.002)	(0.001)	(0.125)	(0.124)
EUR vulnerable#QE	0.023	0.000	0.001	-0.000	-0.020	-0.025
	(0.041)	(0.030)	(0.002)	(0.001)	(0.095)	(0.094)
EU other#QE	0.202*	-0.031	0.006	-0.004	0.044	-0.023
	(0.115)	(0.079)	(0.005)	(0.003)	(0.296)	(0.294)
Supranational#QE	0.122**	0.277***	0.010***	0.010***	-0.106	0.020
	(0.054)	(0.049)	(0.003)	(0.002)	(0.140)	(0.140)
USD#QE	0.087**	-0.097***	0.007***	-0.004***	0.536***	0.452***
	(0.035)	(0.026)	(0.002)	(0.001)	(0.092)	(0.091)
GBP#QE	-0.020	-0.245***	0.004*	-0.008***	0.404***	0.277**
	(0.053)	(0.039)	(0.002)	(0.001)	(0.133)	(0.132)
JPY#QE	0.345***	0.085	0.007*	-0.000	0.802***	0.720***
	(0.081)	(0.059)	(0.004)	(0.002)	(0.141)	(0.139)
CNY#QE	-0.198**	-0.269***	-0.015***	-0.016***	0.779***	0.716***
	(0.096)	(0.084)	(0.004)	(0.003)	(0.273)	(0.272)
EMEC#QE	0.349***	0.186***	0.008***	0.002	0.200	0.177
	(0.047)	(0.037)	(0.002)	(0.001)	(0.131)	(0.131)
Advanced other#QE	0.032	-0.161***	-0.002	-0.009***	0.586***	0.495***
	(0.034)	(0.027)	(0.002)	(0.001)	(0.076)	(0.075)
Advanced Europe#QE	0.166***	0.003	0.004**	-0.003**	1.032***	0.964***
	(0.042)	(0.032)	(0.002)	(0.001)	(0.091)	(0.090)
INS#QE	-0.015	-0.182**	-0.007	-0.011***	0.047	-0.018
	(0.114)	(0.083)	(0.005)	(0.003)	(0.296)	(0.295)
INV#QE	-0.543	-0.441	0.073***	0.032	-0.446	-0.425
	(0.414)	(0.388)	(0.027)	(0.023)	(0.374)	(0.369)
MFI#QE	-0.036	-0.069**	-0.002	-0.003***	0.070	0.046
	(0.036)	(0.028)	(0.002)	(0.001)	(0.095)	(0.095)
NFC#QE	0.023	-0.079***	-0.002	-0.005***	0.234**	0.192*
	(0.040)	(0.030)	(0.002)	(0.001)	(0.099)	(0.099)
OFI#QE	-0.023	-0.124***	-0.004**	-0.006***	0.092	0.021
	(0.040)	(0.030)	(0.002)	(0.001)	(0.104)	(0.103)
3M-1Y#QE	0.025	0.556***	0.008***	0.029***	0.147	0.404***
	(0.053)	(0.041)	(0.002)	(0.001)	(0.145)	(0.144)
1Y-2Y#QE	0.025	0.543***	0.006***	0.027***	0.234	0.482***
	(0.053)	(0.040)	(0.002)	(0.001)	(0.147)	(0.146)
2Y-5Y#QE	-0.038	0.465***	0.002	0.024***	0.192	0.414***
	(0.051)	(0.039)	(0.002)	(0.001)	(0.142)	(0.141)
5Y-10Y#QE	-0.075	0.423***	-0.002	0.021***	0.357**	0.572***
	(0.054)	(0.041)	(0.002)	(0.001)	(0.145)	(0.144)
>10Y#QE	0.031	0.516***	0.005**	0.021***	0.636***	0.862***
	(0.059)	(0.045)	(0.003)	(0.001)	(0.158)	(0.157)
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes (quarter)	Yes (quarter)	Yes (period)	Yes (period)	Yes (quarter)	Yes (quarter)
Sector # Time FE	No	No	No	No	No	No
Adjusted-R^2	0.537	0.540	0.540	0.542	0.538	0.540
Number of observations	276788	403894	276788	403894	276788	403894

This table shows the outcome of regression (1), applied to Germany. The dependent variable is the log of each sector's net transactions in period t of securities falling within a certain category a. Each holder sector is used as a panel dimension. The variables of interest is the interaction of QE with the dummies that represent the issuing country, currency of denomination, issuing sector and residual maturity (from top to bottom in the table). See also Table 1 and 2 for a clarification of the variables. For the sake of space this table only shows the outcome of the interacted variables, but all regressions also include the variables that are part of the interaction separately. Time FE capture seasonality when QE is included as dummy, and the unique period when QE is approximated by the amount of purchases. Robust standard errors clustered at the holder sector level are given in parentheses. Significance levels: * p<0.1, ** p<0.05, *** p<0.01

Table A4: Different specifications of QE-variables, Spain

	1	2	3	4	5	6
QE variable	QE dummy	QE dummy	PSPP amount	PSPP amount	2015Q1	2015Q1
Start of analysis	2013Q4	2009	2013Q4	2009	2013Q4	2009
Holdings previous period	0.950***	0.941***	0.951***	0.938***	0.950***	0.943***
	(0.005)	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)
Outstanding	0.217***	0.201***	0.215***	0.205***	0.219***	0.202***
	(0.007)	(0.006)	(0.007)	(0.006)	(0.007)	(0.006)
Advanced#QE	0.057	-0.006	0.000	-0.001	-0.229	-0.238
	(0.062)	(0.048)	(0.003)	(0.002)	(0.164)	(0.164)
Emerging#QE	0.076	-0.119	-0.014**	-0.018***	0.111	0.080
	(0.138)	(0.114)	(0.007)	(0.005)	(0.364)	(0.364)
EUR vulnerable#QE	0.079	0.221***	-0.004	0.005***	0.090	0.205
	(0.064)	(0.050)	(0.003)	(0.002)	(0.145)	(0.143)
EU other#QE	0.008	-0.323*	-0.021**	-0.024***	0.867*	0.733
	(0.232)	(0.169)	(0.010)	(0.006)	(0.452)	(0.449)
Supranational#QE	0.075	0.141	-0.004	-0.002	0.227	0.359
	(0.146)	(0.139)	(0.007)	(0.006)	(0.402)	(0.401)
USD#QE	0.160***	0.287***	0.002	0.007***	0.621***	0.739***
	(0.061)	(0.049)	(0.003)	(0.002)	(0.176)	(0.176)
GBP#QE	0.108	0.300**	0.009	0.013***	0.652*	0.789**
	(0.139)	(0.125)	(0.006)	(0.005)	(0.387)	(0.385)
JPY#QE	0.636**	0.270	0.024**	0.007	0.908	0.869
	(0.253)	(0.196)	(0.010)	(0.007)	(0.628)	(0.614)
CNY#QE	-0.723	-0.341	-0.025	-0.016	1.603***	1.776***
	(0.515)	(0.492)	(0.019)	(0.018)	(0.599)	(0.611)
EMEC#QE	0.891***	0.919***	0.030***	0.029***	0.417	0.570**
	(0.142)	(0.117)	(0.007)	(0.005)	(0.289)	(0.289)
Advanced other#QE	0.207**	0.215***	-0.002	-0.001	0.545***	0.602***
	(0.085)	(0.067)	(0.004)	(0.003)	(0.193)	(0.191)
Advanced Europe#QE	-0.061	0.226**	-0.012**	-0.000	0.527**	0.697***
	(0.125)	(0.102)	(0.005)	(0.004)	(0.230)	(0.227)
INS#QE	0.022	-0.088	-0.027***	-0.017***	0.258	0.252
	(0.163)	(0.129)	(0.007)	(0.005)	(0.347)	(0.345)
INV#QE	1.257**	1.197*	-1.746***	-1.755***		
	(0.632)	(0.628)	(0.665)	(0.669)		
MFI#QE	-0.196**	-0.190***	-0.015***	-0.009***	-0.006	-0.032
	(0.087)	(0.067)	(0.004)	(0.002)	(0.220)	(0.218)
NFC#QE	-0.275***	-0.115	-0.018***	-0.006**	0.187	0.230
	(0.089)	(0.070)	(0.004)	(0.003)	(0.219)	(0.218)
OFI#QE	-0.387***	-0.389***	-0.020***	-0.015***	0.011	-0.073
	(0.089)	(0.071)	(0.004)	(0.003)	(0.234)	(0.232)
3M-1Y#QE	-0.000	0.372***	0.009**	0.023***	0.443**	0.597***
	(0.089)	(0.072)	(0.004)	(0.003)	(0.224)	(0.223)
1Y-2Y#QE	-0.163*	0.308***	0.004	0.022***	0.481**	0.654***
	(0.088)	(0.072)	(0.004)	(0.003)	(0.217)	(0.215)
2Y-5Y#QE	-0.191**	0.300***	-0.001	0.021***	0.236	0.415*
	(0.083)	(0.068)	(0.003)	(0.003)	(0.221)	(0.220)
5Y-10Y#QE	-0.029	0.437***	0.002	0.024***	0.329	0.529**
	(0.094)	(0.075)	(0.004)	(0.003)	(0.227)	(0.225)
>10Y#QE	-0.059	0.399***	0.001	0.022***	0.690**	0.869***
	(0.114)	(0.089)	(0.005)	(0.003)	(0.271)	(0.269)
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes (quarter)	Yes (quarter)	Yes (period)	Yes (period)	Yes (quarter)	Yes (quarter)
Sector # Time FE	No	No	No	No	No	No
Adjusted-R^2	0.405	0.395	0.407	0.400	0.404	0.393
Number of observations	97440	137164	97440	137164	97440	137164

This table shows the outcome of regression (1), applied to Spain. The dependent variable is the log of each sector's net transactions in period t of securities falling within a certain category a. Each holder sector is used as a panel dimension. The variables of interest is the interaction of QE with the dummies that represent the issuing country, currency of denomination, issuing sector and residual maturity (from top to bottom in the table). See also Table 1 and 2 for a clarification of the variables. For the sake of space this table only shows the outcome of the interacted variables, but all regressions also include the variables that are part of the interaction separately. Time FE capture seasonality when QE is included as dummy, and the unique period when QE is approximated by the amount of purchases. Robust standard errors clustered at the holder sector level are given in parentheses. Significance levels: * p<0.1, ** p<0.05, *** p<0.01

Table A5: Different specifications of QE-variables, France

	1	2	3	4	5	6
QE variable	QE dummy	QE dummy	PSPP amount	PSPP amount	2015Q1	2015Q1
Start of analysis	2013Q4	2009	2013Q4	2009	2013Q4	2009
Holdings previous period	0.961***	0.944***	0.961***	0.942***	0.961***	0.945***
	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)
Outstanding	0.120***	0.114***	0.119***	0.116***	0.120***	0.110***
	(0.005)	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)
Advanced#QE	0.152***	0.059	0.009***	0.003**	-0.008	-0.019
	(0.052)	(0.038)	(0.002)	(0.001)	(0.125)	(0.124)
Emerging#QE	-0.095	-0.439***	-0.017***	-0.024***	-0.170	-0.346
	(0.094)	(0.069)	(0.004)	(0.002)	(0.239)	(0.238)
EUR vulnerable#QE	-0.068	-0.108**	-0.003	-0.004**	-0.180	-0.216
	(0.071)	(0.052)	(0.003)	(0.002)	(0.175)	(0.173)
EU other#QE	-0.350*	-0.489***	-0.030***	-0.025***	0.945**	0.793*
	(0.211)	(0.158)	(0.008)	(0.006)	(0.452)	(0.447)
Supranational#QE	0.308***	0.379***	0.020***	0.013***	0.136	0.248
	(0.111)	(0.105)	(0.005)	(0.005)	(0.265)	(0.265)
USD#QE	-0.015	-0.056	0.004*	-0.002	0.348**	0.340**
	(0.060)	(0.044)	(0.003)	(0.002)	(0.150)	(0.149)
GBP#QE	-0.042	0.104	0.008**	0.008***	0.112	0.205
	(0.097)	(0.076)	(0.004)	(0.003)	(0.246)	(0.245)
JPY#QE	-0.205	0.097	-0.006	0.007	0.429	0.560
	(0.243)	(0.193)	(0.011)	(0.007)	(0.436)	(0.429)
CNY#QE	-0.247	0.168	-0.025***	-0.007	1.047***	1.258***
	(0.252)	(0.221)	(0.009)	(0.008)	(0.312)	(0.305)
EMEC#QE	-0.042	0.459***	0.015***	0.015***	0.920***	-0.114
	(0.097)	(0.092)	(0.004)	(0.003)	(0.060)	(0.265)
Advanced other#QE	-0.111	-0.086	-0.002	-0.004*	0.444*	0.460**
	(0.085)	(0.065)	(0.004)	(0.002)	(0.227)	(0.225)
Advanced Europe#QE	-0.075	0.129*	-0.001	0.004	0.693***	0.801***
	(0.091)	(0.074)	(0.004)	(0.003)	(0.230)	(0.229)
INS#QE	-0.146	-0.485***	-0.026***	-0.030***	-0.002	-0.166
	(0.174)	(0.124)	(0.007)	(0.004)	(0.365)	(0.361)
INV#QE	0.431	0.798	0.083	0.064	-0.087	0.098
	(0.605)	(0.581)	(0.077)	(0.051)	(0.615)	(0.614)
MFI#QE	-0.104	-0.067	-0.012***	-0.005**	-0.121	-0.112
	(0.082)	(0.059)	(0.004)	(0.002)	(0.189)	(0.187)
NFC#QE	-0.148*	-0.114*	-0.017***	-0.009***	-0.244	-0.231
	(0.082)	(0.059)	(0.004)	(0.002)	(0.190)	(0.189)
OFI#QE	-0.202**	-0.187***	-0.018***	-0.011***	-0.225	-0.261
	(0.086)	(0.062)	(0.004)	(0.002)	(0.212)	(0.210)
3M-1Y#QE	0.131	0.592***	0.010**	0.030***	-0.239	-0.007
	(0.097)	(0.072)	(0.004)	(0.003)	(0.206)	(0.204)
1Y-2Y#QE	-0.065	0.510***	0.010***	0.031***	-0.278	-0.025
	(0.095)	(0.072)	(0.004)	(0.003)	(0.213)	(0.211)
2Y-5Y#QE	-0.070	0.495***	0.002	0.027***	-0.273	-0.036
	(0.091)	(0.069)	(0.004)	(0.002)	(0.194)	(0.192)
5Y-10Y#QE	0.061	0.501***	0.005	0.026***	-0.206	-0.001
	(0.099)	(0.074)	(0.004)	(0.003)	(0.209)	(0.207)
>10Y#QE	0.004	0.538***	0.002	0.027***	0.492**	0.724***
	(0.113)	(0.085)	(0.004)	(0.003)	(0.216)	(0.213)
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes (quarter)	Yes (quarter)	Yes (period)	Yes (period)	Yes (quarter)	Yes (quarter)
Sector # Time FE	No	No	No	No	No	No
Adjusted-R^2	0.333	0.358	0.335	0.361	0.333	0.356
Number of observations	182448	276908	182448	276908	182448	276908

This table shows the outcome of regression (1), applied to France. The dependent variable is the log of each sector's net transactions in period t of securities falling within a certain category a. Each holder sector is used as a panel dimension. The variables of interest is the interaction of QE with the dummies that represent the issuing country, currency of denomination, issuing sector and residual maturity (from top to bottom in the table). See also Table 1 and 2 for a clarification of the variables. For the sake of space this table only shows the outcome of the interacted variables, but all regressions also include the variables that are part of the interaction separately. Time FE capture seasonality when QE is included as dummy, and the unique period when QE is approximated by the amount of purchases. Robust standard errors clustered at the holder sector level are given in parentheses. Significance levels: * p<0.1, ** p<0.05, *** p<0.01