EUROPEAN CENTRAL BANK

EUROSYSTEM

# Working Paper Series

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## Investment funds, risk-taking, and monetary policy in the euro area

No 2605 / October 2021

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**Abstract**

We examine the transmission of monetary policy via the euro area investment fund sector using a BVAR framework. We find that expansionary shocks are associated with net inflows and that these are strongest for riskier fund types, reflecting search for yield among euro area investors. Search for yield behaviour by fund managers is also evident, as they shift away from low yielding cash assets following an expansionary shock. While higher risk-taking is an intended consequence of expansionary monetary policy, this dynamic may give rise to a build-up in liquidity risk over time, leaving the fund sector less resilient to large outflows in the face of a crisis.

**JEL classification:** E32; G11; G23

**Key words:** Monetary policy; non-bank financial intermediation; liquidity management

## Non-technical summary


The investment fund sector has more than doubled in size since the global financial crisis. As the sector grows, so does its importance for the funding of economic activity and the transmission of monetary policy. But excessive risk-taking by funds can also have damaging effects for the wider financial system when it contributes to high levels of corporate leverage or when risky asset holdings need to be unwound quickly in times of market stress, as occurred in March 2020.

Traditionally banks have been central to the transmission of monetary policy within the euro area but, as the composition of the financial system changes, it becomes increasingly important to understand how other players react to monetary policy. Investment funds could contribute to the transmission of monetary policy via a risk-taking channel. Following expansionary monetary policy, investors may engage in search for yield, substituting away from safe bank deposits and towards investment fund shares. Investors may also substitute towards riskier fund types and fund managers themselves may rebalance their portfolios towards riskier assets. This in turn can ease funding conditions in the real economy.

This paper examines how euro area investment funds between 2007 and 2019 responded to monetary policy shocks using Bayesian vector auto-regressions. We examine aggregate flows into bond, money market and equity funds and compare flow responses across funds with different investment strategies. This allows us to infer how the response of investors to monetary policy affects the size, composition and riskiness of the fund sector. We then examine how fund managers respond to monetary policy in terms of asset allocation within funds, focusing on implications for liquidity risk-taking. Finally, we compare the response of both flows and liquidity buffers following long- and short-end yield curve shocks, as a proxy for the response to conventional and unconventional policies.

We find that expansionary monetary policy is indeed associated with fund inflows. The response is heterogeneous across asset classes, with riskier asset classes such as high yield funds and corporate bond funds receiving the largest proportional inflows. This suggests that monetary policy is transmitted via the fund sector, with fund investors responding to expansionary monetary policy with clear search for yield behaviour. Results point towards a stronger risk-taking response to unconventional monetary policy tools in terms of fund flows.

We also provide new insights into the response of fund managers to monetary policy. We find that across bond funds, expansionary monetary policy is followed by a drop in cash holdings. On one hand, higher risk-taking is an intended consequence of expansionary monetary policy, as increased demand for non-cash assets by fund managers will help ease financing conditions to the real economy. However, this dynamic may give rise to a build-up in liquidity risk over time, leaving the fund sector less resilient to large outflows in the face of a crisis. Indeed, outflows from corporate and high yield bond funds following the outbreak of the coronavirus crisis in Europe exceeded their cash holdings, resulting in forced asset sales which may have amplified the original market shock.

These side effects could be addressed through macroprudential tools which limit funds' capacity to take excessive liquidity risk. Given the increasingly important role of investment funds in the transmission of monetary policy in the euro area, policy tools that effectively mitigate the build-up of risks in the fund sector ex-ante could help to not only limit the liquidity risk in individual funds, but also to prevent system-wide liquidity strains. These could include, for instance, minimum liquid asset buffers or restrictions on redemption frequency and minimum redemption notice periods.

# 1 Introduction

The role of the non-bank sector in funding the euro area real economy has grown steadily over the last decade. The share of monetary financial institution (MFI) loans in total euro area non-financial corporation (NFC) financing (net of intra-sectoral financing) shrank from around 65% to 46% between 2008 and 2018, while the share of debt securities issuance and non-bank loans increased from 24% to 36%. Among non-banks investment funds stand out as the sector which has seen the largest growth over this period, almost tripling in size both in absolute terms and relative to the size of the banking sector (Figure 1).

Traditionally banks have been central to the transmission of monetary policy within the euro area but, as the composition of the financial system changes, it becomes increasingly important to understand how other players react to monetary policy shocks. Investment funds could contribute to the transmission of monetary policy via a risk-taking channel. Following an expansionary monetary policy shock, investors may engage in search for yield, substituting away from safe bank deposits and towards investment fund shares. Investors may also substitute towards riskier fund types and fund managers themselves may rebalance their portfolios towards riskier assets. This in turn can ease funding conditions in the real economy.

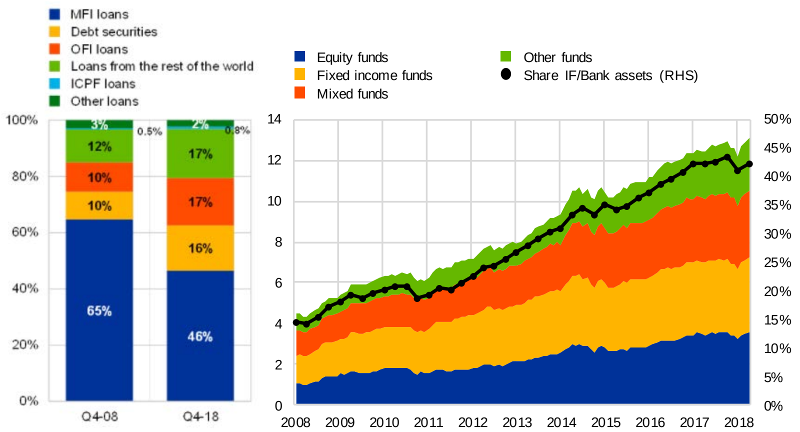



Figure 1: Financing structure of euro area non-financial corporations by instrument and total assets under management of euro area investment funds.

*Notes:* Left panel: Axis shows percentage of total borrowing. MFI stands for monetary financial institution, OFI for other financial institution and ICPF for insurance corporation or pension fund. Figure is taken from European Central Bank (2019). Right panel: Left axis in EUR trillions, right axis in percentages. The black dotted line shows percentage ratio of total assets of investment funds relative to banks in the euro area.

This paper examines how euro area investment fund flows between 2007 and 2019 responded to monetary policy shocks, using a BVAR framework and the monetary policy shock identification method recently developed in Jarociński and Karadi (2020). We examine aggregate flows into bond, money market and equity funds and compare flow responses across funds with different investment strategies, geographic focus and investor base. This allows us to infer how the response of investors to monetary policy shocks affects the size, composition and riskiness of the fund sector. We then examine how fund managers respond to monetary policy shocks in terms of asset allocation within funds, focusing on implications for liquidity risk-taking. Finally, we compare the response of both flows and liquidity buffers following long- and short-end yield curve shocks, as a proxy for the response to conventional and unconventional policies.

Jarociński and Karadi (2020) point out that many monetary shock identification methods, including those used in the existing investment fund literature, fail to separate two key types of shocks that can arise from monetary policy announcements: Changes in the monetary policy stance and information regarding the state of the macroeconomy. They propose a novel identification method which combines high-frequency identification with sign restrictions and separates these two shock types based on the response of equity markets to monetary policy announcements. We show that this method can yield better results for several euro area financial markets variables by instead using the response of bond market spreads after monetary policy announcements.

The main focus of our analysis is on unconventional monetary policy shocks. We find that expansionary monetary policy shocks are indeed associated with fund inflows. The response is heterogeneous across asset classes, with riskier asset classes such as high yield funds and corporate bond funds receiving the largest proportional inflows. A breakdown of the results by investor type reveals that these inflows are driven both by retail and institutional investors, with the latter being relatively more responsive to the monetary policy shocks. We also find evidence of investors substituting into funds buying non-euro area assets after the easing of euro area monetary policy. This suggests that monetary policy is transmitted via the fund sector, with fund investors responding to expansionary monetary policy with clear search for yield behaviour. However, the international component of these flows indicates that the full effect may not be felt in the euro area.

We also provide new insights into the response of fund managers to monetary policy shocks. We find that across bond funds, expansionary monetary policy shocks are followed by a drop in cash holdings. On one hand, higher risk-taking is an intended consequence of expansionary monetary policy, as increased demand for non-cash assets by fund managers will help ease financing conditions to the real economy. However, this dynamic may give rise to a build-up in liquidity risk over time, leaving the fund sector less resilient to large outflows in the face of a crisis. Indeed, outflows from corporate and high yield bond funds following the outbreak of the coronavirus crisis in Europe exceeded their cash holdings, resulting in forced asset sales which may have amplified the original market shock.

Finally, we compare the response of investment funds to conventional and unconventional monetary tools, as proxied by shocks to the short- and long-end of the yield curve. Results point towards a stronger risk-taking response to unconventional tools in terms of fund flows. Liquidity of equity funds has a stronger response to conventional shocks, reflecting the primary importance of the return on cash holdings to liquidity choices. Bond funds have a similar response across both shock types. While conventional policies affect the cost of cash, unconventional policies improve wider bond market liquidity. This suggests that the risk-taking channel may be particularly pronounced during periods when both accommodative conventional and unconventional monetary instruments are used. While this type of monetary policy can be necessary for central banks to achieve price stability goals, it may have unintended side effects from a financial stability perspective, particularly in terms of fund liquidity.

These side effects could be addressed through macroprudential tools which limit funds' capacity to take excessive liquidity risk. Given the increasingly important role of investment funds in the transmission of monetary policy in the euro area, policy tools that effectively mitigate the build-up of risks in the fund sector ex-ante could help to not only limit the liquidity risk in individual funds, but also to prevent system-wide liquidity strains. These could include, for instance, minimum liquid asset buffers or restrictions on redemption frequency and minimum redemption notice periods.

Our paper adds to a number of strands of existing literature. The literature on monetary policy transmission via non-banks is still in a nascent stage. Analysis by the International Monetary Fund (2016) argues that a growing non-bank sector could change the transmission of monetary policy by decreasing the role of bank-based channels while increasing others, such as the risk-taking channel. Indeed Holm-Hadulla and Thürwächter (2020) show that the overall response of bank lending to monetary policy shocks in the euro area is weaker in countries with a higher ratio of bond to bank financing. Nelson et al. (2018) find that assets of non-bank financial entities involved in securitisation increase rather than decrease after contractionary monetary shocks. We show that the investment fund sector is highly responsive to monetary policy shocks, suggesting that non-banks can support monetary policy transmission if the response of banks weakens.

Regarding the response of investment funds to monetary policy, Hau and Lai (2016) use country-panel regressions to analyse the behaviour of euro area retail investors in equity and money market funds. They document that investors rebalance their portfolios out of money market funds and towards equity funds following a reduction in country-specific real interest rates. Due to their identification strategy, their sample excludes the euro area's two major fund hubs (Ireland and Luxembourg). Banegas et al. (2016) examine US domiciled funds and find inflows to bond funds but outflows from equity funds after an unexpected monetary loosening by the Fed. Both of these papers focus only on conventional monetary policy shocks. Our analysis distinguishes between conventional and unconventional monetary policy changes. To this end, we make use of latest advances in the methods to identify monetary policy shocks. In general, our paper provides a comprehensive analysis of the response of euro area fund investors to monetary policy, comparing responses across different types of funds, investor type and geographic investment focus.

Looking at the international dimension of investment fund flows, Kaufmann (2020) shows that flows towards the investment fund sector expand on a global scale after a surprise loosening of US monetary policy. This aligns with our general conclusions. Results by Bubeck et al. (2018) suggest that passive valuation changes are the main driver of portfolios changes among euro area fund investors following ECB monetary policy announcements. Our results, however, also point towards an active reallocation in terms of flows. Daniel et al. (2021) also provide evidence that after a decrease of interest rates fund investors re-balance their portfolios towards assets that yield higher income, such as high-dividend stocks and high-yield bonds.

We also contribute to the growing literature on liquidity risk in the investment fund sector. Feroli et al. (2014) and Morris and Shin (2016) argue that periods of extended monetary policy may result in the fund sector building up positions that cause wider disruption as they unwind. We show that this dynamic may take place via funds' decreasing cash positions. Our work also shows that fund liquidity risks examined in Chen et al. (2010) and Goldstein et al. (2017) may be more pronounced during periods of accommodative monetary policy. Our results are also related to Morris et al. (2017), who document that investment funds pro-cyclically hoard cash when facing outflows.

Our paper contributes to the literature on the transmission of unconventional monetary policies. In particular, Rogers et al. (2014), Rogers et al. (2018) and Vissing-Jorgensen and Krishnamurthy (2011) examine the effects of quantitative easing on asset prices beyond those bought by the central bank. Our fund flow analysis allows us to directly examine the response of investors to monetary policy. Our results illustrate a mechanism by which purchases of government bonds can transmit to other markets and other jurisdictions. We also show that this effect is persistent.

Finally, our alterations to Jarociński and Karadi (2020)'s method also provide a more effective mechanism for euro area monetary policy shock identification and we show that it can be used to compare conventional and unconventional shocks. Our findings are also robust to alternative identification methods, such as a Cholesky decomposition, and changes in the period examined, namely to include or exclude the global financial crisis.

The rest of this paper is structured as follows: Section 2 provides an overview of our data set and Section 3 explains our methodology. Section 4 presents our core results in relation to fund flows and fund liquidity. Section 5 considers implications for policy and 6 concludes.

## 2 Data set

We use fund flow data from the commercial data provider EPFR Global. We run our analysis on a monthly basis from April 2007 to the end of 2019. Our capacity to run analysis for periods before April 2007 is limited by bond fund flow data availability. EPFR decomposes the evolution of total net assets over time into nominal flows and into valuation changes. This allows us to identify changes in the composition of the sector beyond those which are a mechanical pricing result of monetary policy changes. Changes in flows instead reflect direct buying and selling decisions of investors. We use the cumulative flows in percent of lagged assets under management as our main flows variable because monthly flow series are very noisy. The construction of these series follows the methodology by EPFR Global, which allows for a straightforward interpretation in percentage terms. Throughout our analysis we examine dynamics for euro area domiciled funds.

EPFR also allows for aggregate sectoral fund flows to be calculated with breakdowns by domicile, asset class focus and geographic focus. Using this information we construct aggregate fund flow series for euro area domiciled bond, money market and equity funds. Within bond funds we further decompose flows into those to government, high yield and corporate bond funds. Within equity funds we identify small cap and growth funds, which should represent the riskier-end of this sector. In our baseline analysis we focus on funds buying European assets as these are most relevant to the transmission of monetary policy. We separately examine the response of flows to funds buying American and Emerging Market assets. This level of granularity allows us to build a rich picture of the investment fund sector's response to monetary policy shocks.[1]

To measure fund liquidity, we use fund cash holdings in absolute amounts and relative to total assets. We rely on the ECB Euro area investment funds balance sheet database (ECB IVF) to construct this measure for different open-ended fund types. In particular, we consider as cash holdings all the deposit and loan claims held by funds vis-a-vis monetary financial institutions.[2] This variable is available monthly since October 2008 for each fund type. The ECB data allows us to distinguish aggregate bond and equity funds but not more granular breakdowns.

To construct the high-frequency monetary policy shocks, we make use of the "Euro Area Monetary Policy Event-Study Database" by Altavilla et al. (2019). This intra-day data includes the changes of a broad set of financial market variables in a narrow time window of monetary policy events on all monetary policy meetings of the ECB's Governing Council since January 1999. In particular, we use data for the whole monetary event window that calculates changes in the median quote from the window 13:25-13:35 before the press release to the median quote in the window 15:40-15:50 after the press conference. For the shock identification, we use OIS and Bund yield changes at various maturities as well as the change of the EuroStoxx 50.

We complement this with the daily changes of corporate bond spreads at the monetary policy dates with data taken from iBoxx. We use the spread between bonds issued by euro area non-

[1] The data from EPFR does not cover the full market capitalisation of equites and bonds. However, Kaufmann (2020) shows that total Assets under Management (AuM) of funds reporting to EPFR account for the majority of AuM covered by official statistics.

[2] A more granular breakdown into deposit and loan claims is not available, but we assume that most of these holdings are made of cash deposits.

financial corporations with an average maturity of about 5 years and the 5-year German Bund yield. We use daily instead of intra-day changes in corporate bond spreads for the shock identification to account for to the generally lower liquidity on corporate bond markets compared to government debt or stock markets. As corporate debt securities tend to be traded less frequently, their prices can take more time to adjust to monetary policy innovations. For robustness checks, we calculate the bond spread changes after monetary policy meetings also over longer time windows of up to 10 days.[3] In the baseline case, we stick to the more conservative one-day window, as we risk with longer time spans that the effect of the monetary policy shocks is confounded by other market news.

All other data used in this paper are relatively standard financial and macroeconomic time series from various private and public data providers.

# 3 Monetary policy shock identification and estimation

## 3.1 Monetary policy shock identification

Jarociński and Karadi (2020) propose a method for identifying monetary policy shocks that is based on a combination of high-frequency identification and sign restrictions methods. They show that surprise changes of federal funds rate futures in a 30-minutes window around Federal Open Market Committee announcements do not always coincide with stock market movements in the opposite direction, as would be expected from economic theory. The authors argue that central banks' monetary policy decisions can create two types of shock and these can be distinguished by taking into account the contemporaneous response of the stock market. A pure monetary policy shock can be identified by a negative co-movement of interest rates and stock market growth immediately after policy announcements. A positive co-movement arises instead from a central bank information shock: By loosening interest rates the central bank provides the market with negative information regarding the state of the economy. The authors show that the responses of US macroeconomic and financial market variables can differ decisively under these two types of shocks, suggesting that other methods may be unintentionally conflating the

[3] This is in line with, for example, Anderson and Cesa-Bianchi (2020) and Gertler and Karadi (2015), who use one- and two-week windows for the analysis of corporate bond spreads after monetary policy events, respectively.

effects of information and monetary policy shocks.

However, when the authors apply this method to the euro area the responses of several macroeconomic and financial variables are insignificant or are inconsistent with the predictions of standard economic theory. For example, although the method implements a high-frequency decline of stock prices after a contractionary monetary shock, the response of the monthly stock index remains insignificant. And in contrast to the conventional notion, the monthly BBB bond spread used in their model declines on impact following the contractionary shock. Reliable and plausible results for these variables are of high importance given the relevance of these variables to fund flows. To address these shortcomings we make two adjustments to the original methodology that we describe in the next two subsections.

### 3.1.1 Long-end instead of short-end yield curve shocks

First, we focus on long-end rather than short-end shocks, as most monetary policy variation in our sample period happened in the longer part of the yield curve and less so at the short-end due to interest rates being close to their effective lower bound. Moreover, investment funds are mainly investing in debt securities of a medium-term maturity. Changes in monetary policy that affect this part of the yield curve are therefore expected to have the strongest effects on funds' returns and potentially also on flows and their risk-taking.

To ensure that we capture surprise changes over the whole longer-end of the yield curve, instead of focusing on the potentially idiosyncratic changes of yields at a certain maturity, we apply the method by Gürkaynak et al. (2005) to separate a "target factor" of monetary policy from a "term structure factor". First, we use intra-day data from Altavilla et al. (2019) on changes of the overnight index swap rate (OIS) with maturities of one week, 1, 3, 6 months and 1 year and add changes of the German Bund with maturities of 2, 5, and 10 years to this set. Following the procedure by Gürkaynak et al. (2005), we calculate the first two principal components of this data. After suitable transformations, these can be interpreted as a monetary policy target factor, capturing changes in the current monetary policy stance, and as a term structure factor, which captures monetary policy induced movements throughout the yield curve.

The target factor is normalised such that a one-unit change corresponds to a one percent change of the OIS 1-month. The term structure factor is normalised such that a one-unit change corresponds to one percent change of the 5-year Bund, which we use as a proxy for the euro area safe interest rate. The correlation between the factors and their normalisation partners is high: the correlation between the target factor and the OIS 1-month is 82%, while it reads 98% between the term structure and the 5-year Bund.

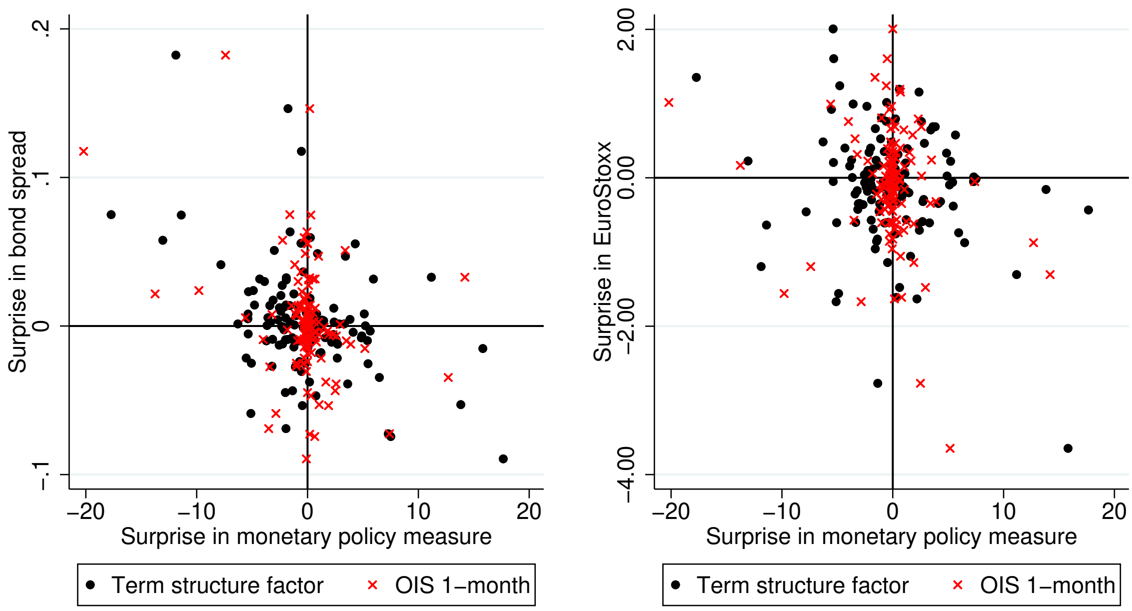



Figure 2: Surprise changes of monetary policy and financial markets variables on ECB Governing Council meeting dates

*Notes:* Horizontal axis in basis points. Vertical axis left panel in percent, vertical axis right panel in index points. Each dot/cross represents one ECB Governing Council meeting between April 2007 and June 2019.

Figure 2 plots the surprise change of the term structure factor as our long-rate shock and of the OIS 1-month as a short-rate shock against the surprise changes in bond spreads and the EuroStoxx 50. The figure demonstrates the significantly higher variation of the term structure factor compared to the short-end shock. Econometrically, this higher variability facilitates the identification of monetary policy shocks over our sample period. Table 1 shows summary statistics on the different shock measures, confirming the higher variation in the longer-rate shocks.

Table 1: Summary statistics of monetary policy shock alternatives

| | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|
| OIS 1-month | -0.10 | 3.31 | -20.2 | 14.2 |
| OIS 3-month | -0.08 | 3.37 | -12.4 | 16.2 |
| Target factor | 0.00 | 3.42 | -19.79 | 11.92 |
| Bund 5-year | -0.33 | 4.82 | -19.75 | 15.3 |
| Term structure factor | -0.20 | 4.70 | -17.72 | 17.66 |

*Notes:* The table shows summary statistics on monetary policy shock measures at the 129 ECB Governing Council meetings between April 2007 and June 2019. An increase of the term structure (target) factor by one unit reflects a 100bps increase of the 5-year German Bund (1-month overnight index swap) rate. All statistics are given in bps.

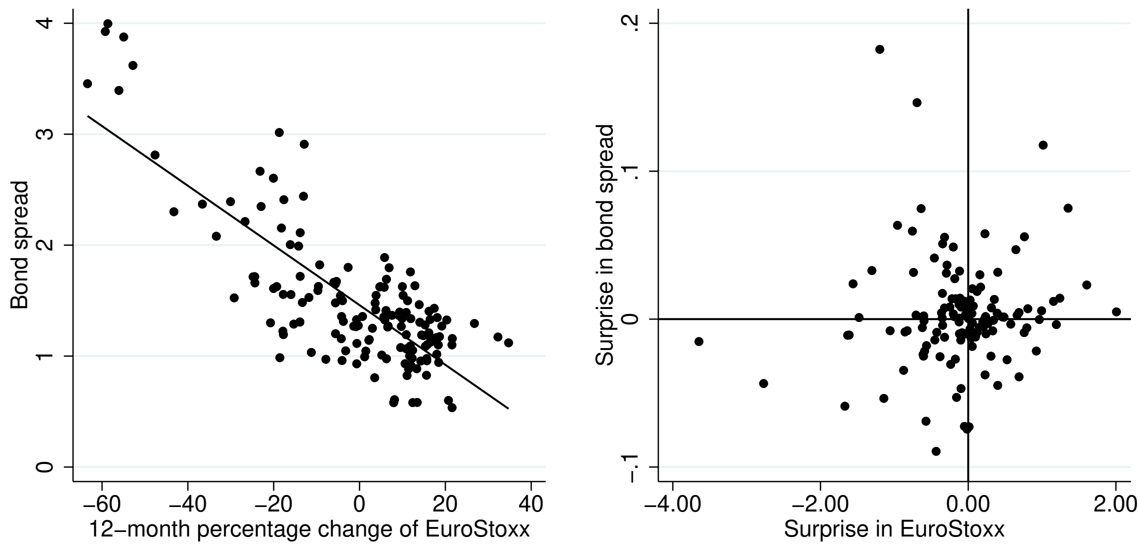



Figure 3: Monthly and high-frequency surprise changes of bond spreads and the EuroStoxx

*Notes:* Left panel: Monthly observations of NFC bond spreads in percent against the 12-month percentage change of the EuroStoxx 50. Right panel: High-frequency surprise change of NFC bond spreads in percent against surprise change of the EuroStoxx 50 in index points. Each dot represents one ECB Governing Council meeting between April 2007 and June 2019.

#### 3.1.2 Bond spreads instead of stock indices

Second, the original method by Jarociński and Karadi (2020) identifies genuine monetary policy shocks by focusing on negative co-movement incidents between monetary policy measures and stock market surprises on monetary policy ECB Governing Council meeting dates. Instead of using equity market surprises, we use surprise changes of NFC bond spreads at meeting dates. A monetary policy shock in this case is identified as a positive co-movement between a surprise change in a monetary policy measure and a surprise change in the bond spread.[4] Both methods are closely related to each other as bond spreads and equity markets are strongly inversely correlated. Nevertheless, we find that our method based on bond spreads yields more realistic ("correctly signed") and significant responses of financial market variables after monetary policy shocks. This may reflect findings in the literature that the link between equity markets and monetary policy is found to be stronger in the US (the primary country examined by Jarociński and Karadi, 2020) than in other countries (Rogers et al., 2014).

In our sample, the correlation between the monthly NFC bond spread and the 12-month change of the EuroStoxx 50 reads -80%. The left panel of Figure 3 plots the monthly series of the two variables as used in our analysis. Although this inverse relationship is well-established and deeply-inherent in financial markets, we find that the surprise changes of bond spreads and equity markets on Governing Council dates are almost uncorrelated with a *positive* correlation coefficient of 8%. This low correlation is also visible in the right panel of Figure 3 that plots the surprise change of both variables on the Governing Council dates.

As a result of the low correlation, the attribution of event dates as monetary policy shocks differs between the two approaches in about 50% of the cases. This is shown in Figure 4, where solid dots indicate events that are classified as monetary policy shocks based on a positive co-movement between the term structure factor and the bond spread surprises (54 out of 129). 29 of these cases are classified as a monetary policy shock both under spread-based and stock-based identification (black dots), while 25 events would not be identified as a monetary policy shock using stock market surprises (red dots).

[4] In support of our approach, Anderson and Cesa-Bianchi (2020) use high-frequency data for the US to show that NFC bond spreads rise after a monetary policy tightening shock that is identified as in Jarociński and Karadi (2020) via co-movement with stock market surprises.

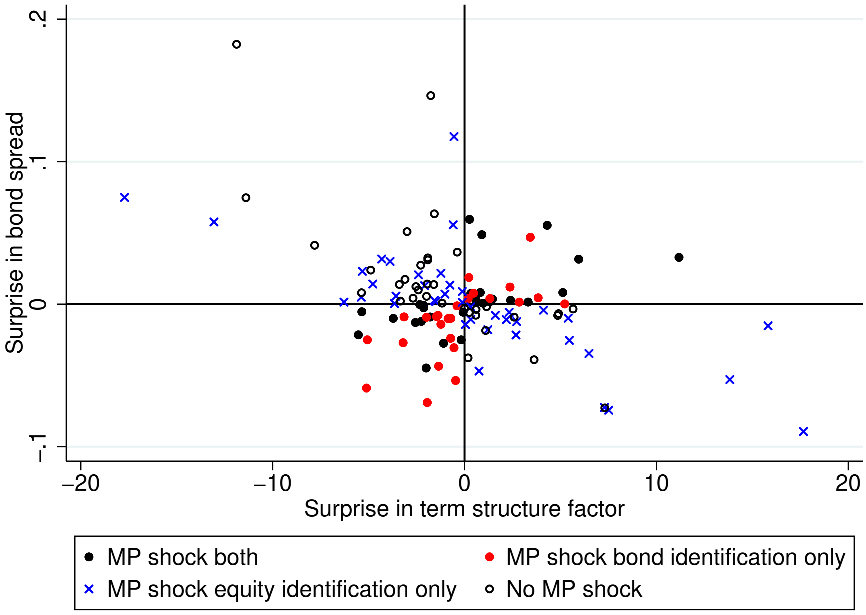



Figure 4: Monetary policy shock classification using bond spreads and stock indices

*Notes:* Vertical axis in percent, horizontal axis in bps. Each dot represents one ECB Governing Council meeting between April 2007 and June 2019.

A negative co-movement between the surprise monetary policy change and the bond spread change occurred on the remaining 75 of 129 cases. In the terminology of Jarociński and Karadi (2020), these shocks could either be interpreted as noise or as central bank information shocks. 40 of these dates are, however, identified as monetary policy shocks under the stock-based approach, but not under the spread-based approach (blue Xs). Finally, 35 dates are not a monetary policy shock under both approaches (black hollow circles). As we are interested in the response of various investment fund variables to a genuine monetary policy shock, we focus in the following only on the positive co-movement shocks (solid dots), and ignore the negative co-movement shocks (Xs and hollow circles). In the VAR, the negative and positive co-movement shocks are separated by means of sign restrictions as shown in Table 2 in Appendix A. Figure 16 in the same appendix shows the appearance of the two types of shock over time. As in Jarociński and Karadi (2020)'s euro area examination, we add an additional sign restriction such that the monthly interest rate series that we use as the monetary policy indicator respond in the same direction as the shock for at least the initial month.

As we will show, our main results regarding the investment fund sector can be obtained both using the original stock-based and the new spread-based method. The new refined method, however, yields a much better performance for several financial market variables in our models and generally allows for a more significant identification of effects.

### 3.2 Estimation of the Bayesian VAR

The model is estimated as a Bayesian VAR with four lags and a constant term for each variable using the Independent Normal-Wishart prior.[5] The Bayesian approach allows us to incorporate a relatively large number of endogenous variables in our analysis despite the relatively short time series of available data. Unless stated otherwise, we use the following hyperparameter values that are standard in the related literature.

As a prior belief about the regression coefficients, we assume that each endogenous variable follows a unit root process in its own first lag and has zero coefficient values for all further own and cross-variable lags. The overall tightness parameter for this prior belief is assumed to be $\lambda_1 = 0.1$. The cross-variable weighting parameter that determines the tightness of the prior belief for cross-variable lags is set to $\lambda_2 = 0.5$. The lag decay parameter, determining the speed at which the lag coefficients converge to 0 with greater certainty, reads $\lambda_3 = 2$. For the constant term, a diffuse prior is implemented by setting the exogenous variable tightness to $\lambda_4 = 100$.

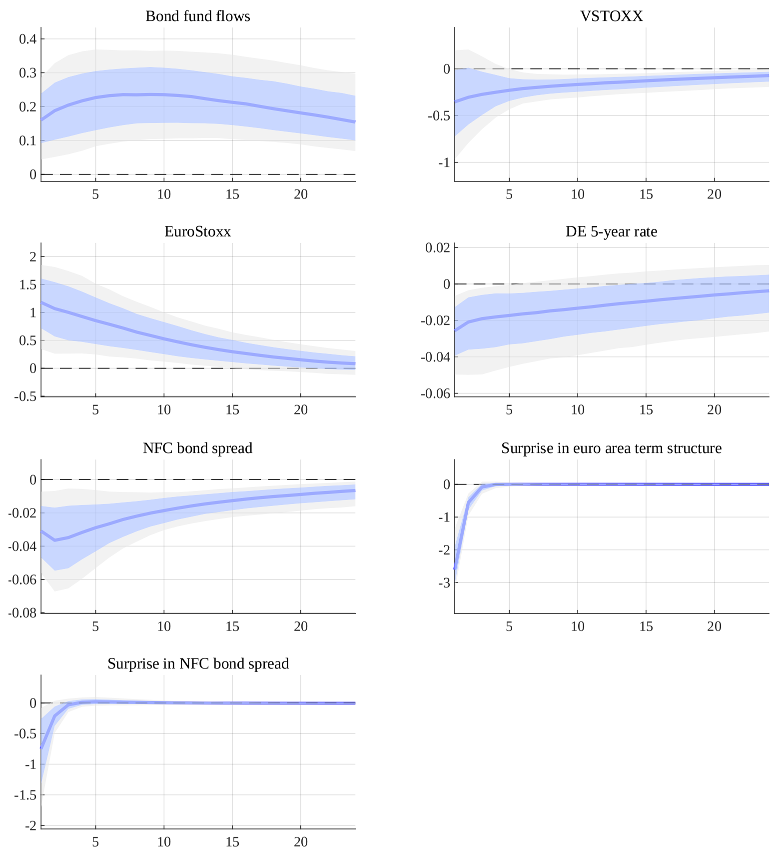
The total number of iterations is set to 2000 with 1000 burn-in iterations. The number of lags is set to four on the basis of comparing model marginal likelihoods. The results continue to hold with a higher number of lags. The results are robust to using other priors, including the Litterman (1986) "Minnesota" prior and a conventional Normal-Wishart prior.

Testing indicates that some but not all of our core cumulative flow series are stationary. However we ensure that all estimated models are stationary, which is not a necessary requirement for valid inference when using Bayesian methods. In practise, credibility intervals are, however, often very wide in models where not all roots of the characteristic polynomial lie inside the unit circle.

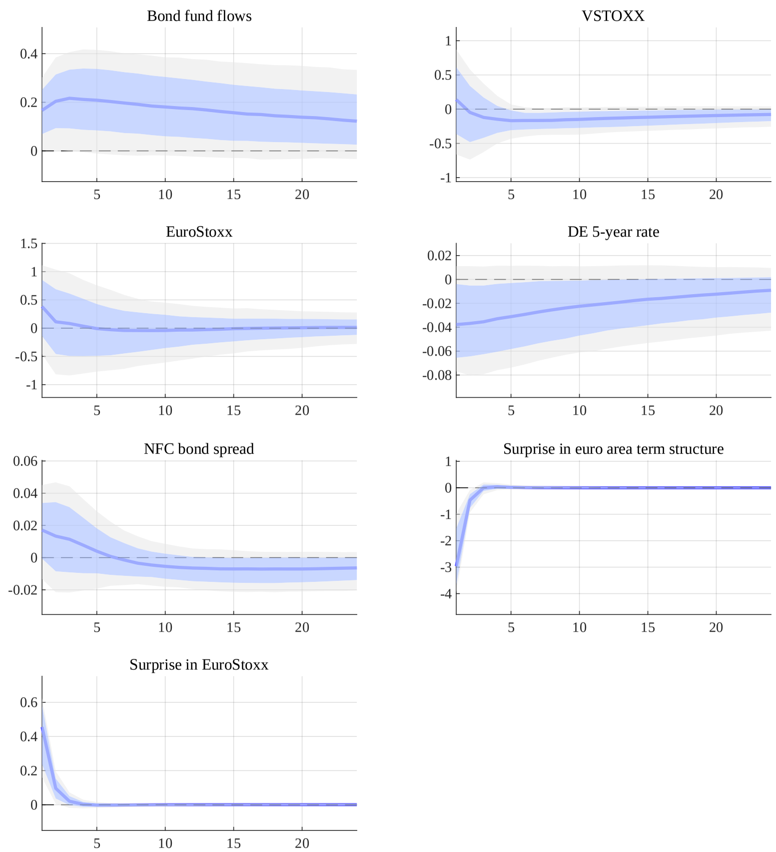
[5] For the estimation we use the BEAR toolbox Version 4.2 by Dieppe et al. (2016).

Figure 5: Impulse responses in baseline model with European focused bond fund flows

(a) spread-based identification




(b) stock-based identification




*Notes:* Impulse responses to an expansionary euro area monetary policy shock inducing a decrease of the 5-year German Bund rate (blue lines) with 68% (blue-shaded areas) and 90% (grey-shaded areas) credibility intervals obtained from a structural BVAR with high-frequency sign restriction identification. Panel (a): Monetary policy shocks identified as positive co-movement between high-frequency change in bond spread and term structure factor. Panel (b): Monetary policy shocks identified as negative co-movement between high-frequency change in stock index and term structure factor.

# 4 Results

## 4.1 Monetary policy shocks and fund flows

This section examines the risk-taking channel of monetary policy transmission, as carried out by investment fund flows. We provide evidence that euro area fund flows significantly change following monetary policy shocks. Also, we show that fund investors respond to expansionary monetary policy with clear search for yield behaviour, with funds flowing into riskier fund types and into funds with non-euro area investment focus.

First, we analyse the bond fund sector. Our baseline model includes the two high-frequency surprise variables: the surprises in the euro area term structure and in the NFC bond spread. We add five further endogenous variables reflecting wider conditions in euro area markets, namely the 5-year Bund yield, 5-year euro area NFC bond spreads, Eurostoxx price growth and its volatility, as captured by VSTOXX. The latter is added to capture changes in investor's risk sentiment (Bekaert et al., 2013). Finally we include aggregate cumulative flows to euro area domiciled bond funds buying European securities. Figure 5 shows the impulse responses of bond fund flows and the further financial market variables following an expansionary monetary policy shock. The y-axis of all responses indicate percentage changes in all variables, except for those of the VSTOXX index that is included in levels. The surprise changes of the term structure and the NFC bond spread are given in basis points.

Using our spread-based identification, an expansionary monetary policy shock leads the euro area term structure factor to decrease by about 2.5 bps. This implies a reduction of the monthly German 5-year sovereign bond rate by about 0.02%. The high-frequency NFC bond spread decreases by 0.6 bps, leading to a reduction in the monthly NFC bond spread by 0.035%. In this environment, investors become less risk-averse and market volatility, as proxied by the VSTOXX index, decreases by 0.4, while the price of the Eurostoxx index increases by over 1%. Euro area bond funds experience persistent and significant inflows from end-investors by up to 0.23%, with the maximum effect arising after 6 months. In other words, a 25 bps surprise decrease in the euro area risk-free yield curve drives inflows in euro area bond funds by 2.3% of their net asset value.

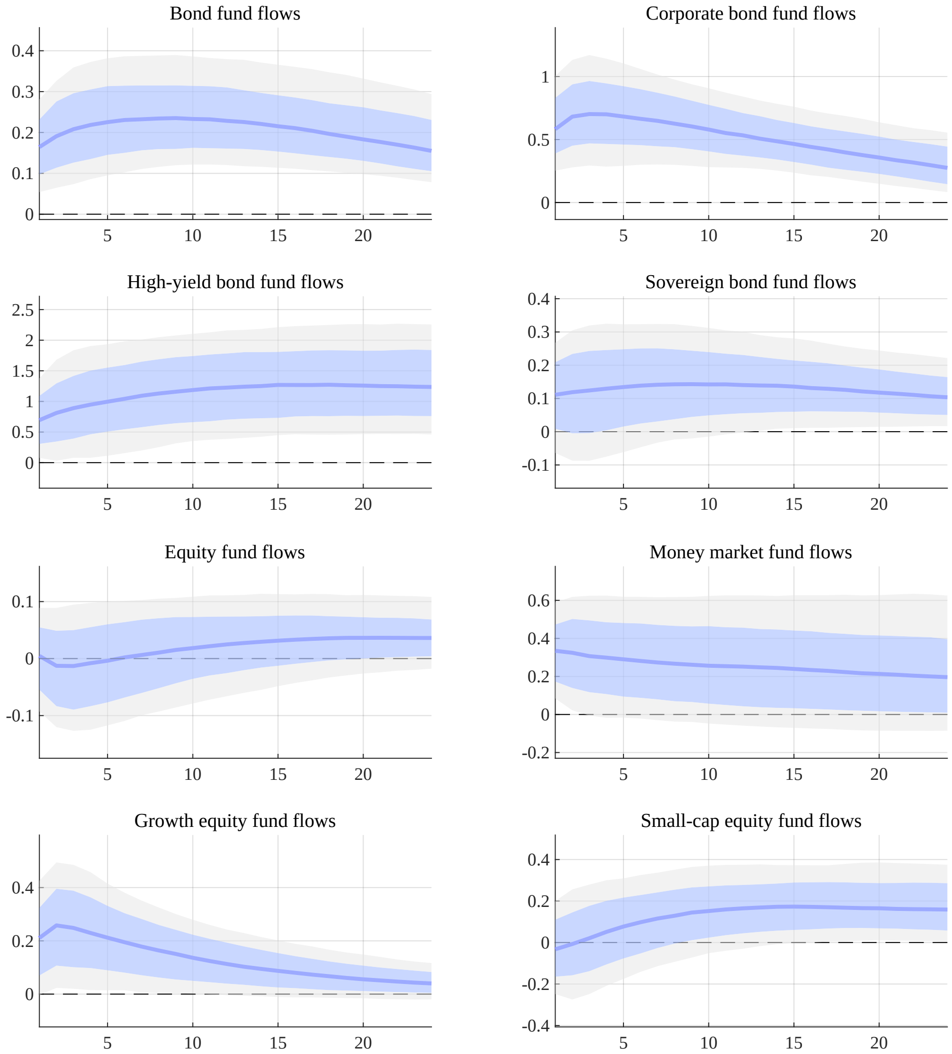



Figure 6: Response of flows to European focused funds across a range of asset classes

*Notes:* Impulse responses to an expansionary euro area monetary policy shock inducing a decrease of the 5-year German Bund rate (blue lines) with 68% (blue-shaded areas) and 90% (grey-shaded areas) credibility intervals obtained from a structural BVAR with high-frequency sign restriction identification. Each variable added separately to the baseline model in Figure 5.

For the sake of robustness, Figure 5 also shows the response of fund flows using the standard equity-based identification from Jarociński and Karadi (2020). Again, we see clear inflows into bond funds. However, the response of financial market variables to the monetary loosening is less intuitive. There is limited response in the monthly equity price variable and NFC spreads appear to rise temporarily. As a result we keep the spread-based approach as our baseline.[6]

[6]Our results remain fully robust if we use 2-, 3-, 5-, or 10-day changes of the corporate bond spreads instead of the one-day change for the identification of the monetary policy shocks. See Figure 17 in Appendix B for results of the baseline model using the 5-day change.

Macroeconomic variables, such as GDP growth and inflation, and credit supply variables, such as bank lending and debt securities issuance, respond as expected to this baseline specification (see Figure 18 in Appendix B).

Second, we explore the heterogeneity of our fund flows sample to investigate potential differences across fund types. Figure 6 shows the impulse responses of flows into funds with a European investment focus to an expansionary monetary policy shock. The top four panels refer to bond funds, while the bottom four panels to equity and money market funds (MMF). We find evidence that investors' responses to accommodative monetary policy shocks are larger for riskier fund types within asset classes. In case of bonds, corporate bond funds and high-yield corporate bond funds experience significant and persistent inflows of over 0.7% following a 2.5 bps decrease in the risk-free yield curve, while inflows to sovereign bond funds increase by only 0.1%. Among equity funds there is also evidence of riskier fund types, such as growth and small-cap equity focused funds, receiving larger inflows. MMFs also obtain inflows, which is surprising in the context of the risk-taking dynamics discussed above. However, this may reflect agents making use of the additional liquidity created by quantitative easing policies.

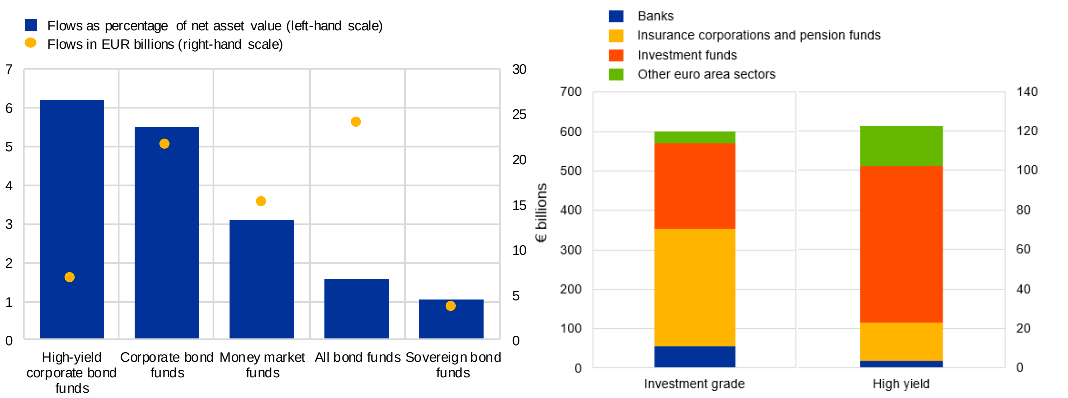



Figure 7: Flow response to 25bps monetary easing in absolute and proportional terms (left) and the role of funds in NFC bond markets (right)

*Notes:* Left panel: The bars are based on the impulse responses in the first month after the shock. Flows as percentage of net asset value on the left axis, and flows in EUR billions on the right axis. Right panel: Data is taken from the ECB Securities Holdings Statistics by Sector and the Centralised Securities Database. The figure excludes the volumes of securities purchased by the Eurosystem and non-euro area investors, as well as non-rated securities. Money-market funds are included in the investment fund sector.

These results are robust to various further changes to the specification, including the removal of the global financial crisis from our sample and the use of a standard high-frequency or simpler

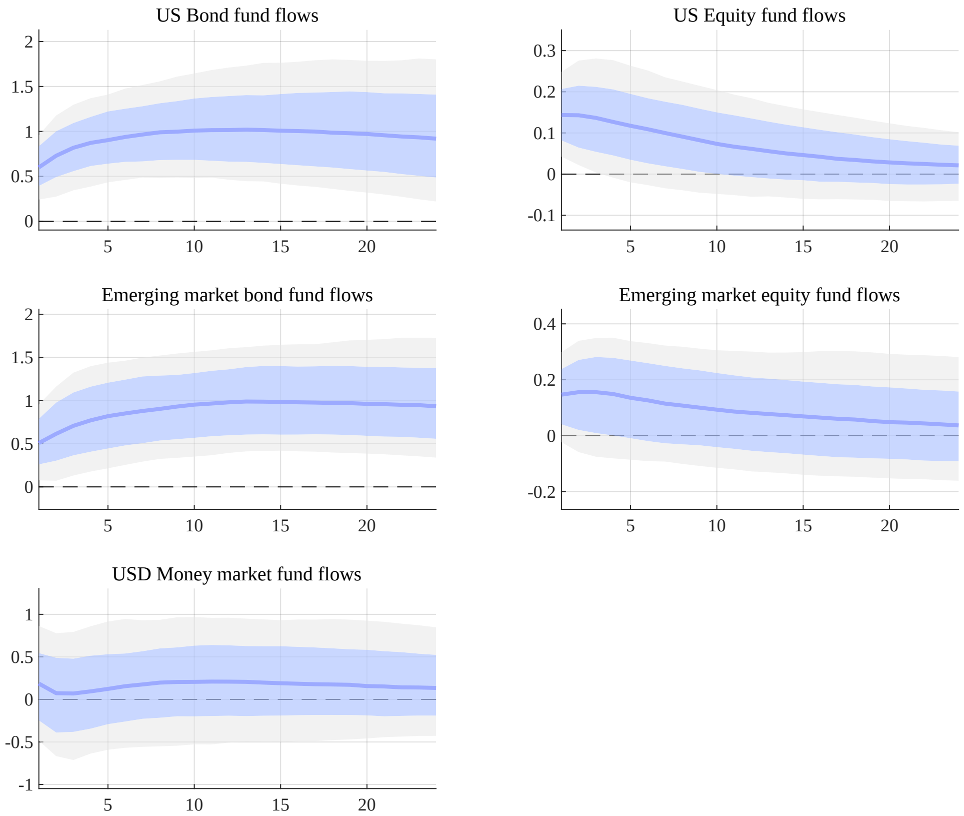



Figure 8: Response of flows to funds buying non-euro area assets across a range of asset classes

*Notes:* Impulse responses to an expansionary euro area monetary policy shock inducing a decrease of the 5-year German Bund rate (blue lines) with 68% (blue-shaded areas) and 90% (grey-shaded areas) credibility intervals obtained from a structural BVAR with high-frequency sign restriction identification. Each variable added separately to the baseline model in Figure 22.

Cholesky identification method. Output can be found in Figures 19 to 21 in Appendix B.

These findings point to a significant risk-taking channel of monetary policy operating through investment funds. Figure 7 (left-panel) normalises the initial flow response across fund types to a 25 bps loosening shock and estimates the effect in absolute terms on the basis of fund balance sheet data from April 2020.[7] The flow responses are also economically significant, with bond fund categories experiencing inflows of between EUR 4 and 24 billion. This risk-taking channel may have particularly pronounced effects given the dominant role of investment funds in markets where proportional inflows are largest. Figure 7 (right-panel) shows that euro area investment funds own approximately two thirds of outstanding euro area high yield securities and approximately 40% of outstanding euro area corporate bonds. As such, aggregate inflows will

[7] The ECB IVF data is used to capture total sector size, given EPFR data only covers a subset of funds.

translate into increased demand for high-yield and corporate bonds, and thus easing financing conditions for euro area firms.

Our data set also allows us to analyse the response of flows into funds buying non-euro area assets following an expansionary monetary policy shock. Where this shock type reduces the returns on euro area assets, investors may substitute towards markets with higher yields, such as the US or Emerging Markets. Due to smaller underlying fund samples in the earlier years, we run our analysis on high-level Bond, Equity and MMF categories only. Figure 8 shows that bond funds buying US assets and those buying Emerging Market assets receive persistent inflows of almost 1% following a 2.5 bps decrease in the risk-free yield curve. Funds buying equities outside of Europe also see inflows although the overall effect is smaller at about 0.2%. This points towards international spillovers of monetary policy and suggests that the full effect of fund flows on real economy financing may not be felt within the euro area. We also see some evidence of inflows to USD money market funds, although the overall effect is not credible.

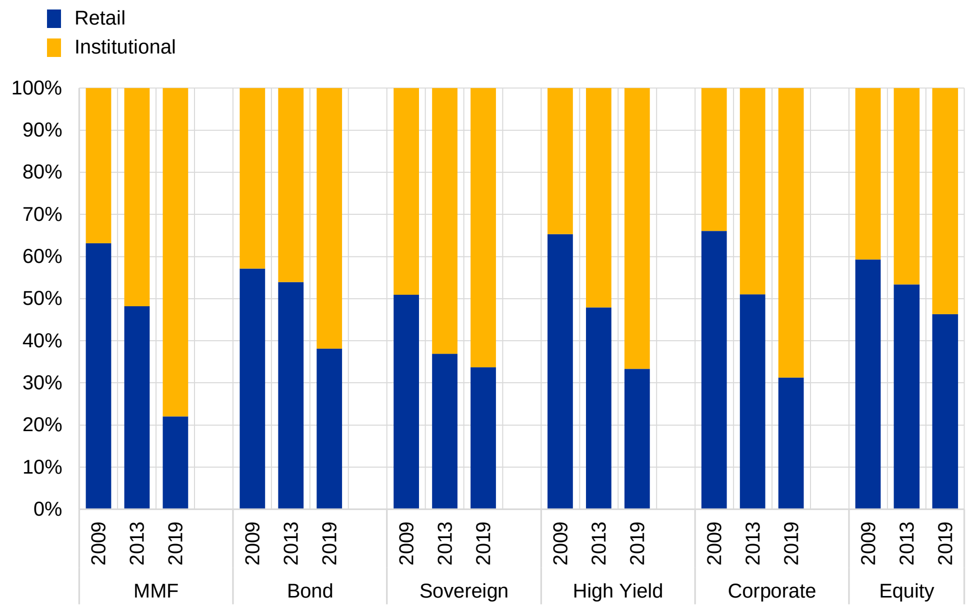



Figure 9: Investor composition across asset classes - share of total assets

Finally, we examine the response of flows across funds with predominantly retail or institutional investor bases. This allows us to understand where inflows are coming from and how monetary policy shocks could affect the risk exposures of different types of financial agents. Figure 9 shows the split between institutional and retail funds in total asset terms at three points of the examined period. We can see a growing role of institutional investors over time across all asset classes and by 2019 institutional investors make up the majority of all asset classes.[8]

Figure 10 shows that the response to an expansionary monetary policy shock varies noticeably across institutional and retail investors. For bond funds, the overall response of institutional investors is larger, with cumulative flows peaking at 0.6% compared to 0.07% among retail investors. There is evidence of search for yield across both investor types, with sovereign bond funds receiving proportionately lower inflows than riskier categories. Flows into MMFs are also substantially larger for institutional investors, possibly reflecting the greater role of this investor type in selling assets to the Eurosystem and as such receiving liquidity created by these purchases. When samples are split by investor base, equity funds do not provide clear results.

[8]Changes in composition could also be driven by changes in EPFR reporting samples. EPFR identifies retail funds as those with a minimum investment equal to or less than USD 100,000, those which are not ETFs and those with all share classes available to any investor.

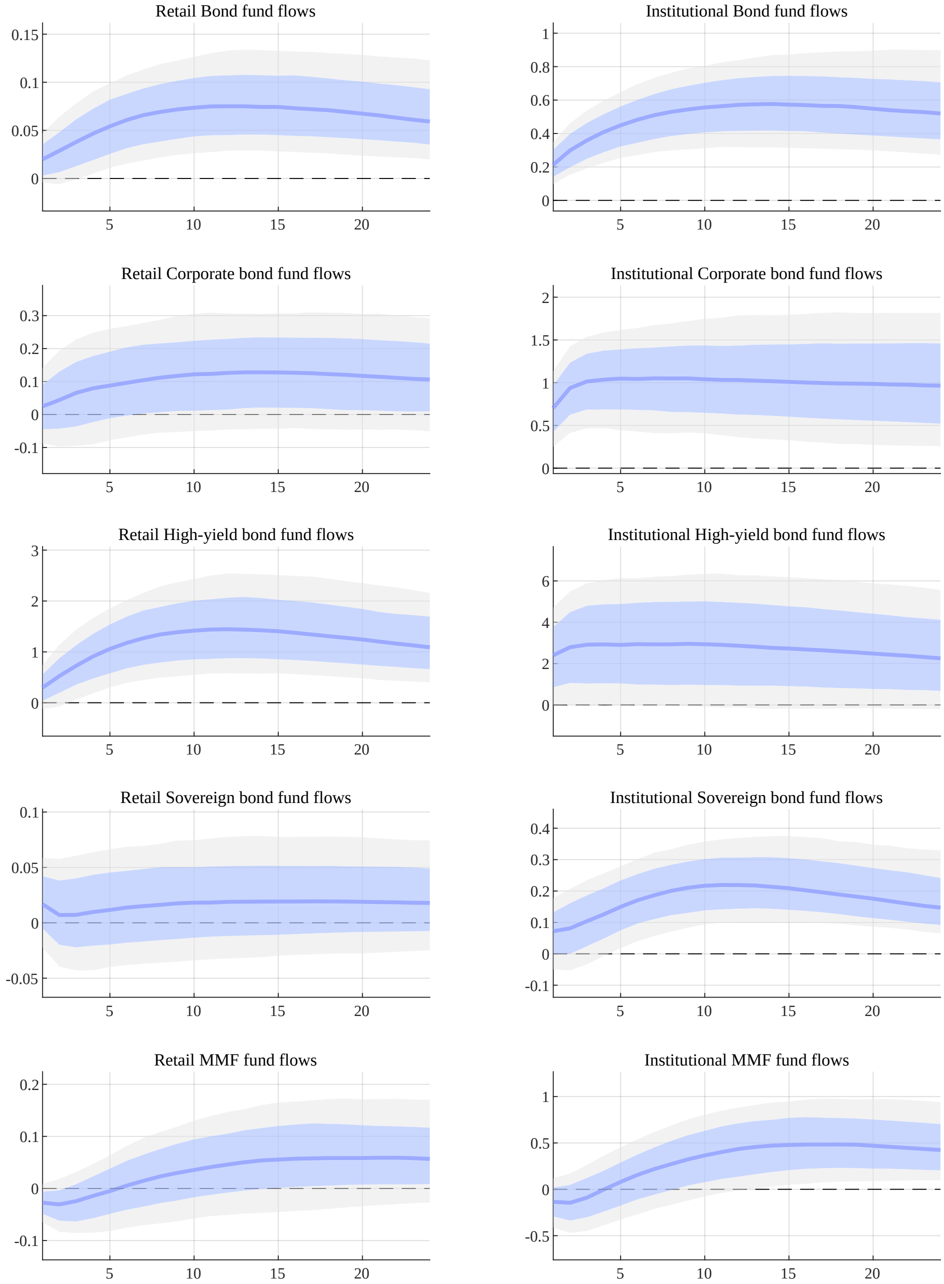



Figure 10: Response of flows from retail and institutional investors across a range of asset classes

*Notes:* Impulse responses to an expansionary euro area monetary policy shock inducing a decrease of the 5-year German Bund rate (blue lines) with 68% (blue-shaded areas) and 90% (grey-shaded areas) credibility intervals obtained from a structural BVAR with high-frequency sign restriction identification. Each variable added separately to the baseline model in Figure 5.

## 4.2 Monetary policy shocks and fund cash buffers

While responses suggest that fund *investors* change the size and composition of the investment fund sector following monetary policy shocks, fund *managers* may also play an additional role. Managers typically cannot influence the overall size of their fund but they can make portfolio allocation decisions following market shocks. By increasing their demand for risky assets they may decrease funding costs for the real economy. However, where this is done by reducing overall liquid asset holdings, this may also result in the build-up of liquidity risk in the sector.

We add a simple measure of the liquidity or riskiness of fund assets to our baseline model: The share of total assets held as cash. All remaining aspects of the specification are kept the same as in our baseline. The left panels of Figure 11 show the response of this simple liquidity measure to an expansionary monetary policy shock. On aggregate fund managers respond by decreasing their cash buffers by over 0.03% after a -2 bps monetary policy shock. When funds are broken down by asset class, this dynamic can be seen among both bond and equity funds.

In the right panels of Figure 11, we report the results obtained using another measure of fund liquidity, i.e. the absolute amount of cash in euros held by different fund types. This is to ensure that results are not driven by the positive valuation effects of the monetary policy shock on funds' non-cash assets. In theory this could lead to a declining cash to assets ratio even as funds increase absolute cash holdings. However, responses are negligible in absolute terms, suggesting that flows are used in their entirety to purchase new assets and as a result cash buffers decline.

The decision by managers to reduce cash holdings can be understood in relation to both conventional and unconventional monetary policy tools. First, holding cash becomes more expensive in a low/negative interest rate environment and riskier securities are more attractive to improve fund profitability. Second, the introduction of the quantitative easing programmes improved the liquidity conditions in bond markets, which makes it easier for investment funds to liquidate the securities in their portfolios in the event of outflows, reducing their perceived need to hold cash. In either case, the increased demand for risky assets by the fund sector will contribute to easing funding conditions in the real economy.

However, lower cash buffers also widen the liquidity mismatch between funds' assets and liabilities and can increase the risk of procyclical selling in market downturns. In the event of a sudden

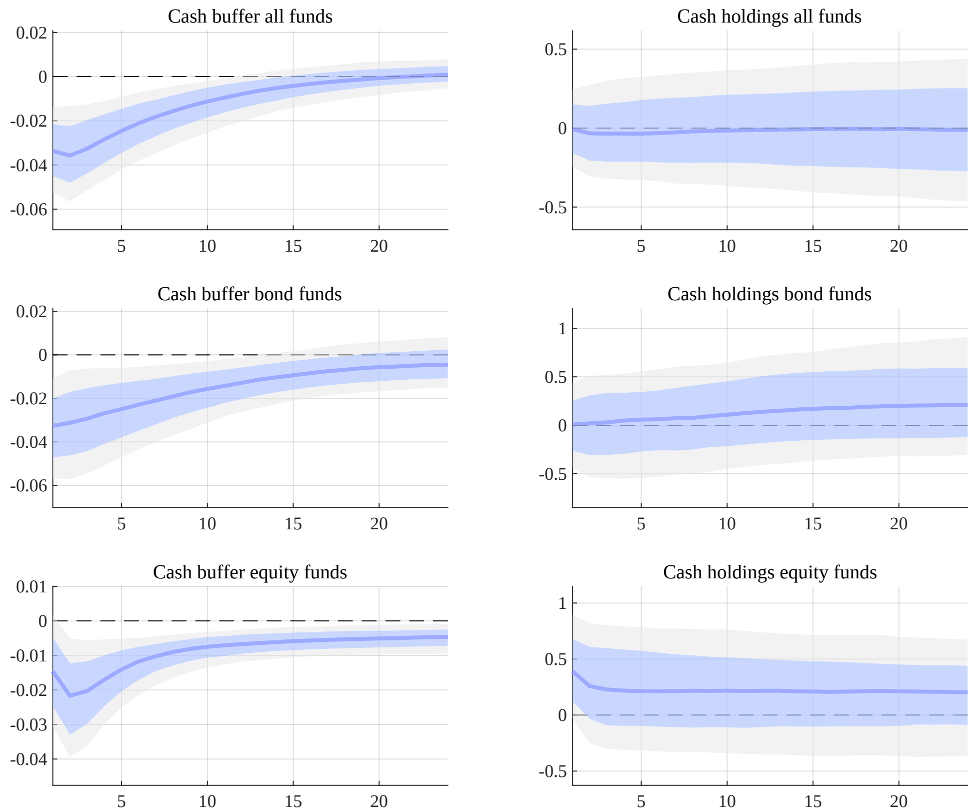



Figure 11: Response of fund cash holdings across a range of asset classes

*Notes:* Impulse responses to an expansionary euro area monetary policy shock inducing a decrease of the 5-year German Bund rate (blue lines) with 68% (blue-shaded areas) and 90% (grey-shaded areas) credibility intervals obtained from a structural BVAR with high-frequency sign restriction identification. Each variable added separately to the baseline model in Figure 23.

and abrupt repricing of financial assets, funds may experience large outflows. This is likely to happen in conjunction with a sharp reduction in wider market liquidity. Where funds do not hold enough cash and liquid securities, they may be forced to sell illiquid assets, thereby amplifying downward movements in asset prices. This could have broad financial stability implications with potential spillovers to the real economy, such as increasing the cost of bond financing. This problem is likely to be most acute in markets for less-liquid assets and markets where funds own a large share of outstanding securities, such as corporate and high-yield bond markets.

Indeed, European Central Bank (2020a,b) and Financial Stability Board (2020) note that insufficient cash buffers prior to the coronavirus crisis may have resulted in forced sales by investment funds, which ultimately exacerbated the original shock. Outflows experienced by euro area corporate and high-yield funds exceeded liquid asset holdings for the majority of funds. To meet these outflows the fund sector was forced to sell illiquid assets, during a period of extreme market illiquidity. Empirical studies carried out before March 2020 also found that cash holdings are not generally sufficient to fulfil redemptions (Chernenko and Sunderam, 2016; Wang, 2015) and that asset managers fail to anticipate outflows well in advance (Morris et al., 2017). While funds hold cash and liquid instruments to manage their liquidity needs under normal conditions, they may lack incentives to internalise the costs of large asset sales and therefore to reduce risk-taking preemptively.

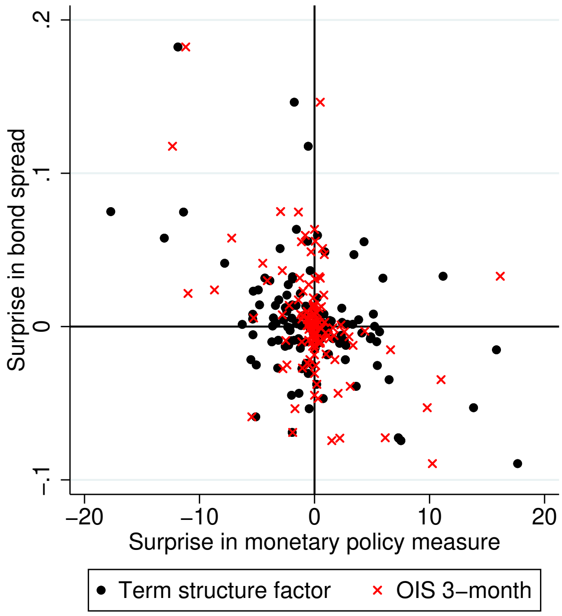



Figure 12: Comparison of short- and long-end shocks

*Notes:* Vertical axis in percent, horizontal axis in bps. Each dot represents one ECB Governing Council meeting between April 2007 and June 2019.

### 4.3 Role of monetary policy instrument selection

Since the global financial crisis the range of tools available to policy makers have proliferated, with central banks adding policies such as quantitative easing to their toolkit. The use of these unconventional methods is likely to continue into the future, highlighted by their use in tackling the crisis emanating from the coronavirus pandemic. Thus it is important to understand whether the funds sector responds differently to different instruments. A central difference between conventional and unconventional tools is the part of the yield curve directly affected by policy. Interest rate changes directly affect the short-end of the yield curve, with transmission to the longer-end occurring via financial markets. However, policies such as quantitative easing directly affect the long-end of the curve, due to central bank intervention in markets for these assets.

As discussed in Section 3, unconventional policy was the main policy type over the period we examine but conventional measures were still present. We proxy the response to conventional (interest rate) and unconventional (quantitative easing) policies using shocks to the short and long-end of the yield curve. As the variation in 1-month OIS shocks is limited (see Figure 2), we use shocks to 3-month OIS at the short-end and continue to use our term structure variable as a long-end measure. Of course the two ends of the yield curve do not operate independently from each other and we would expect, for example, an interest rate shock to also affect the long-end of the curve. Figure 12 shows that our two shock types, while correlated, are sufficiently different for us to measure the impact of different policy types.

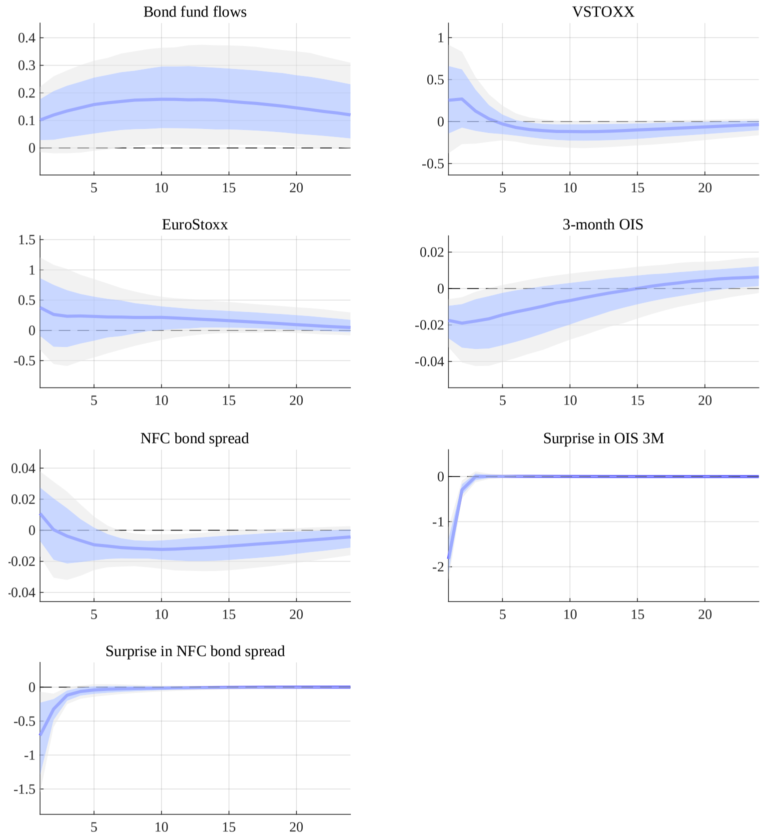
Panel (a) of Figure 13 shows the response of bond fund flows and the other baseline variables following a short-end monetary policy shock. Our overall findings hold, with bond funds receiving positive and consistent inflows. Compared to the Eurostoxx identification method (Panel (b) of Figure 13), our NFC spread identification still provides more intuitive responses from market variables. Next we repeat our liquidity analysis using the short-end shock. Figure 14 shows the baseline set-up where, again, our overall finding that expansionary shocks are followed by decreased fund liquidity continues to hold.

Figure 15 (left panel) then compares proportional flow responses following short and long-end shocks of -25bps. Here there are substantial differences at the asset class level. First, there is less evidence of risk-taking after short-end shocks. High-yield funds receive smaller proportional inflows than any other bond asset class and the flow response for corporate and sovereign funds is broadly similar. While long-end shocks are followed by inflows across the investment fund sector, short-end shocks instead appear to be followed by substitution across fund types in line with the direct effect of the shock on asset values. In particular, MMFs experience outflows, likely driven by the direct downward effect on the returns to their short maturity assets. Simultaneously, bond funds experience inflows as their prices rise with the drop in interest rates.

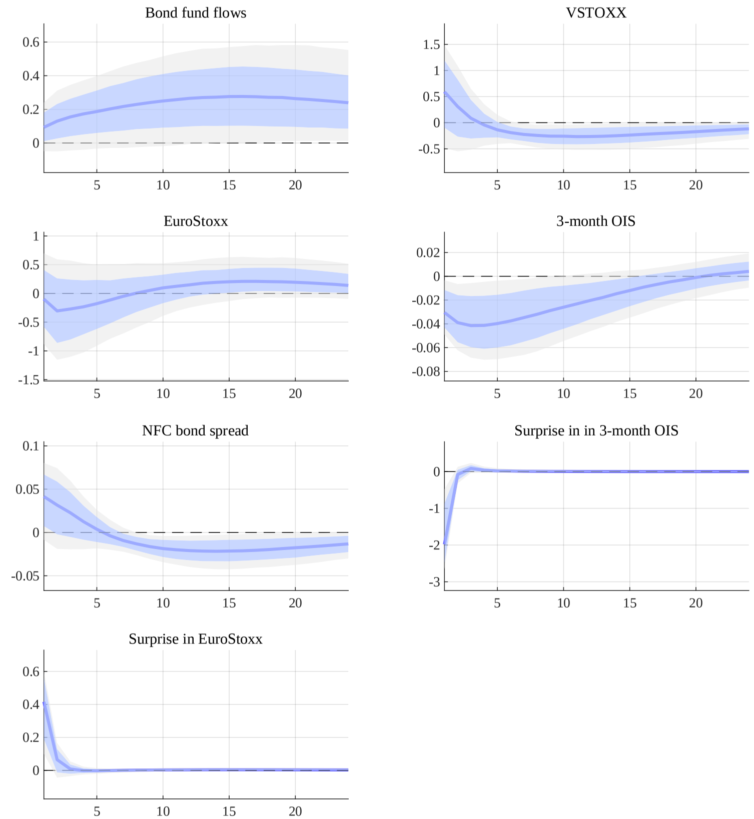
Finally, Figure 15 (right) examines the response of liquidity buffers on aggregate and for bond and equity funds. Previously we explained funds' decision to lower cash buffers in two ways: It is more expensive for funds to hold cash and market liquidity increases. Short-end shocks directly affect the amount of money banks have to pay for holding reserves in the central bank deposit facility, a cost which is then passed on to funds via interest on their deposit accounts. Long-end shocks instead directly affect the liquidity of markets for longer-term assets, where the central bank is directly intervening. The latter may be particularly the case for bond markets. The effect of the short-end shock on fund liquidity is larger than the long end shock, particularly in the case of equity funds. This suggests that for these funds it is the cost of holding cash which drives liquidity decisions following monetary policy shocks. For bond funds the responses are more similar, this suggests that the impact of unconventional policies on bond market liquidity may also play a role in fund manager's decision to reduce cash holdings.

Figure 13: Impulse responses in baseline model with European focused bond fund flows and short-end shocks

(a) spread-based identification




(b) stock-based identification




*Notes:* Impulse responses to an expansionary euro area monetary policy shock inducing a decrease of the 3-month OIS rate (blue lines) with 68% (blue-shaded areas) and 90% (grey-shaded areas) credibility intervals obtained from a structural BVAR with high-frequency sign restriction identification. Panel (a): Monetary policy shocks identified as positive co-movement between high-frequency change in bond spread and 3-month OIS. Panel (b): Monetary policy shocks identified as negative co-movement between high-frequency change in stock index and 3-month OIS.

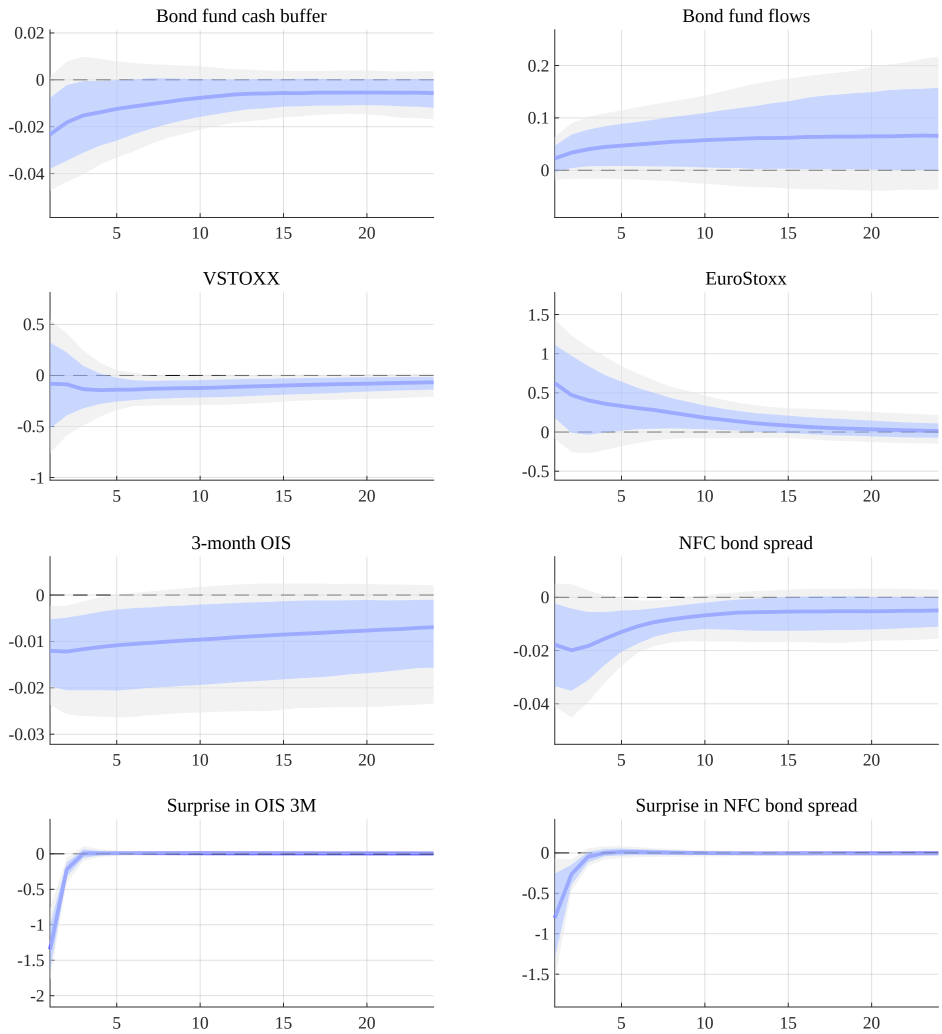



Figure 14: Impulse responses of bond fund cash holdings following short-end shock

*Notes:* Impulse responses to an expansionary euro area monetary policy shock inducing a decrease of the 3-month OIS rate (blue lines) with 68% (blue-shaded areas) and 90% (grey-shaded areas) credibility intervals obtained from a structural BVAR with high-frequency sign restriction identification.

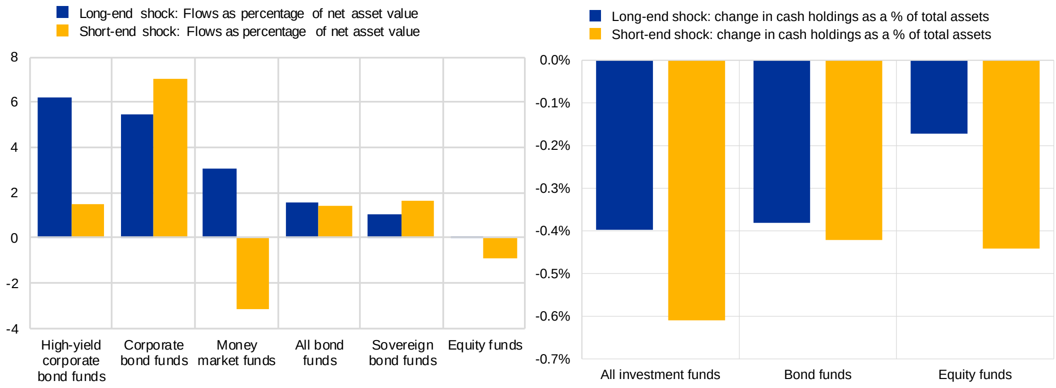



Figure 15: Comparing the response of flows (left) and liquidity (right) to long and short-end shocks of -25bps

*Notes:* The bars are based on the impulse responses in the first month after the shock. The underlying impulse response functions for the long-end shock can be found in Figures 6 and 11. Those for the short-end shock can be found in Figures 24 and 25 in Appendix B.

# 5 Macroprudential policy implications

Our findings suggest that the investment fund sector is one vehicle for the transmission of monetary policy via the risk-taking channel. However, continuous use of accommodative policies may result in a build-up of liquidity risk, particularly when negative interest rates are combined with large bond purchase programmes. The implications of extended accommodative monetary policy for financial stability is a topic that has been discussed extensively in relation to the banking system. One policy solution is the use of macroprudential policies that can increase the resilience of the financial system in a targeted way (see de Guindos, 2021 and Martin et al., 2021 for recent discussions). This should allow for monetary policy to focus on price stability while macroprudential policy focuses on the resilience of the financial system.

In the case of investment funds, suitable policies are not currently available. However, the expansion of macroprudential frameworks beyond the banking system has been a priority of policy makers for a number of years. Suitable macroprudential tools could be limits on illiquid asset holdings or minimum liquidity buffers. Also, restrictions on redemption frequency and minimum notice periods could help align the liquidity of funds' assets and liabilities. These tools could be implemented in a countercyclical fashion, tightening during periods of exuberance, when markets are liquid and fund managers may otherwise reduce liquidity. This would ensure sufficient liquidity in crisis periods, at which point requirements may be relaxed to allow for funds to support real economy financing, market functioning and the transmission of monetary policy.

## 6 Conclusion

The continued rise of the investment fund sector represents a challenge to how we think about monetary policy, given the traditionally bank-focused euro area financial system. As a first step we need to have a thorough understanding of how the sector responds to monetary policy shocks, including implications for transmission and possible unintended consequences for financial stability.

We have shown that the investment fund sector represents an active avenue for the transmission of monetary policy, with expansionary shocks followed by a clear growth of the sector. We provide evidence of search for yield from fund investors, who flow into riskier fund types in response to accommodative monetary policy shocks. This is particularly the case following monetary policy shocks that directly target the long-end of the yield curve, such as quantitative easing policies. Some of this search for yield may result in flows into funds investing outside of the euro area. This suggests that fund flows play a role in transmitting quantitative easing policies beyond the markets where central banks directly intervene. Search for yield by investors is amplified by asset allocation decisions of managers who tend to rebalance their portfolios away from increasingly low yielding cash assets.

As long as the fund sector continues to grow and increases its credit to the real economy, the importance of the risk-taking channel of monetary policy will also increase. While this may support the transmission of policy, it does not come without a cost. Increased demand for risky assets may improve financing conditions for the real economy but may also result in a build-up of risk within the fund sector. Increased liquidity risk-taking by fund managers may be a particular cause for concern, as this may decrease the sector's capacity to deal with large investor redemptions during a crisis scenario and provide stable credit to the real economy.

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# Appendix

## A Monetary policy shock identification

Table 2: Identifying restrictions in the VAR model

| | Shock type | | |
|---|---|---|---|
| Variables | Monetary policy (positive co-movement) | CB information (negative co-movement) | other |
| High-frequency: | | | |
| Interest rate measure | + | + | 0 |
| Bond spread | + | - | 0 |
| Low-frequency: | | | |
| Interest rate measure | •/(+) | • | • |
| Investment fund flows etc. | • | • | • |

*Notes:* Table shows restrictions on the contemporaneous responses of variables to shocks to implement the refined version of the identification method by Jarociński and Karadi (2020), where we use high-frequency changes of bond spreads instead of stock indices. +, -, and 0 denote sign and zero restrictions, while • denotes unrestricted responses.

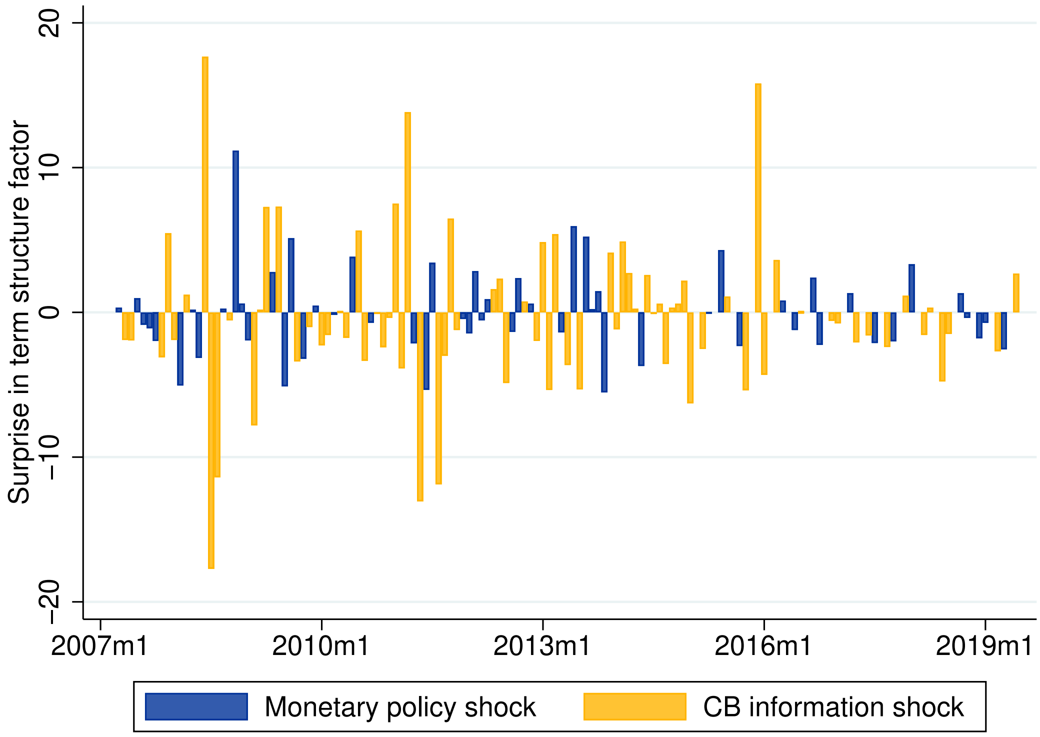


Figure 16: Monetary policy and central bank information shocks over time

*Notes:* Vertical axis in bps. Shocks are identified using co-movements with bond spreads.

# B Additional results

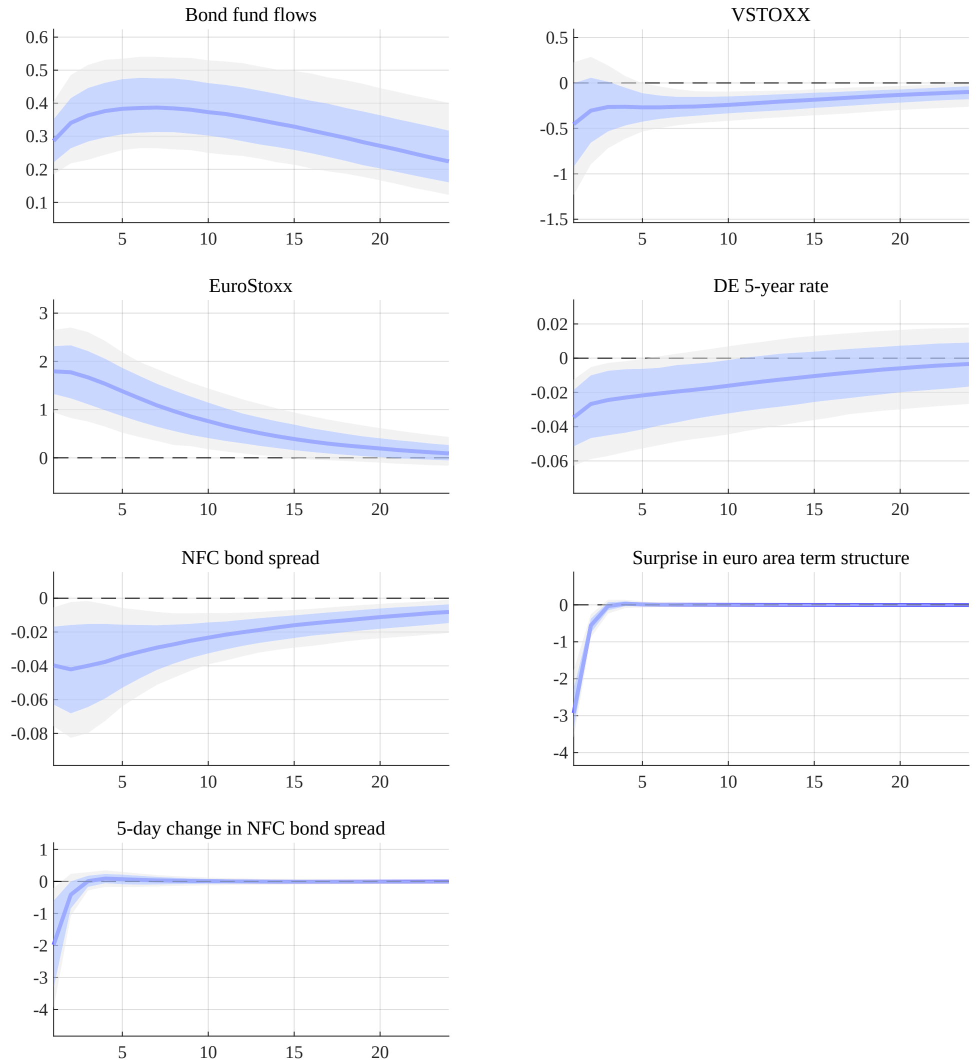


Figure 17: Impulse responses in baseline model using 5-day corporate bond spread changes

*Notes:* Impulse responses to an expansionary euro area monetary policy shock inducing a decrease of the 5-year German Bund rate (blue lines) with 68% (blue-shaded areas) and 90% (grey-shaded areas) credibility intervals obtained from a structural BVAR with high-frequency sign restriction identification. For the shock identification 5-day instead of one-day corporate bond spread changes are used.

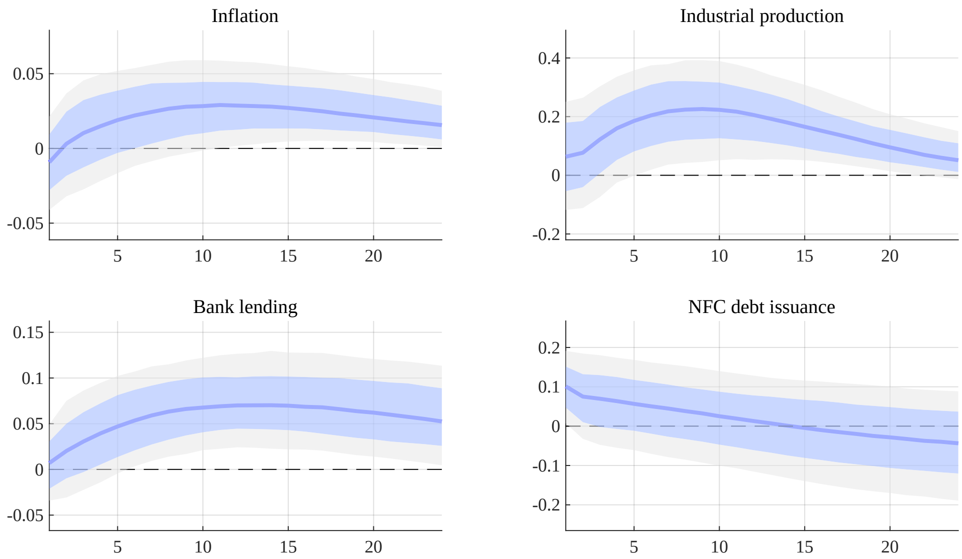


Figure 18: Impulse responses of macro and credit supply variables

*Notes:* Impulse responses to an expansionary euro area monetary policy shock inducing a decrease of the 5-year German Bund rate (blue lines) with 68% (blue-shaded areas) and 90% (grey-shaded areas) credibility intervals obtained from a structural BVAR with high-frequency sign restriction identification. Each variable is added separately to the baseline model in Figure 5.

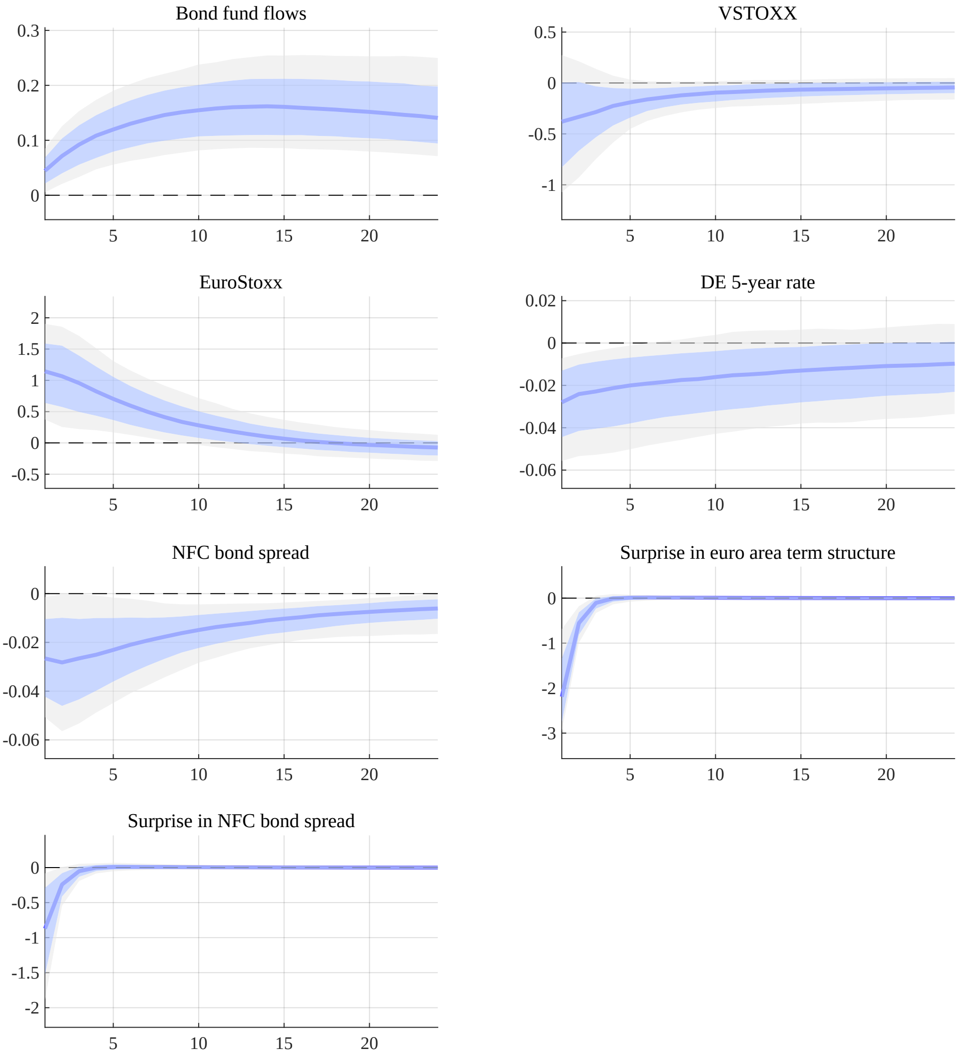


Figure 19: Impulse responses in baseline model with European focused bond fund flows using a sample without the global financial crisis

*Notes:* Impulse responses to an expansionary euro area monetary policy shock inducing a decrease of the 5-year German Bund rate (blue lines) with 68% (blue-shaded areas) and 90% (grey-shaded areas) credibility intervals obtained from a structural BVAR with high-frequency sign restriction identification. Sample starts after-end of the recession around the global financial crisis (June 2009).

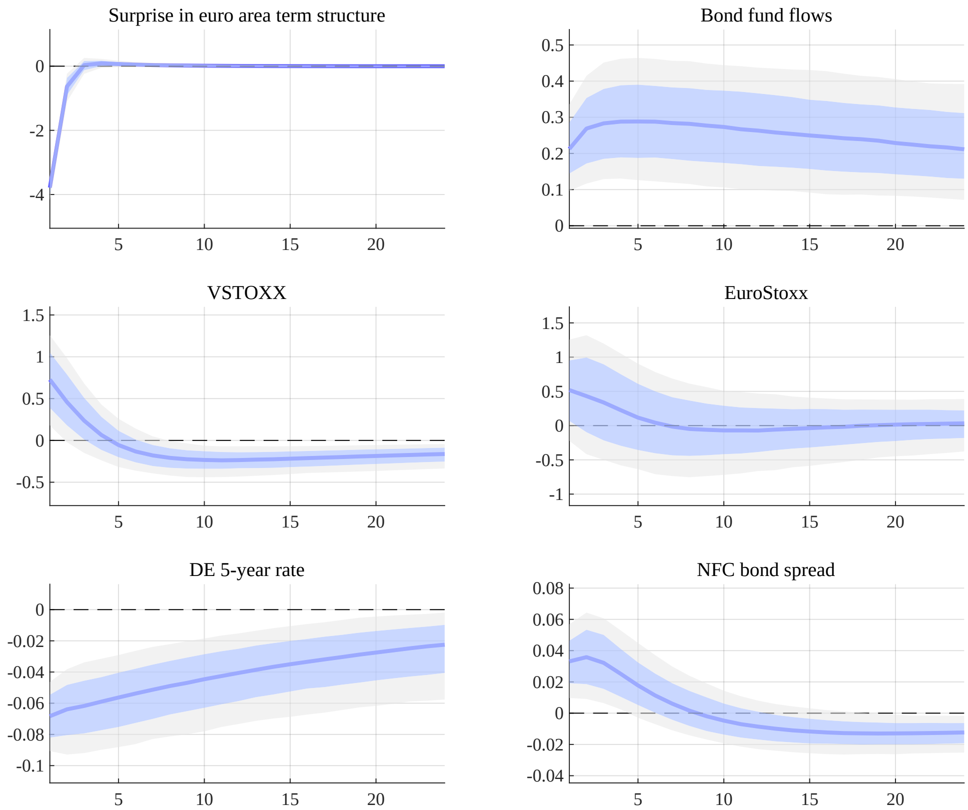


Figure 20: Impulse responses in baseline model with standard high-frequency identification

*Notes:* Impulse responses to an expansionary euro area monetary policy shock inducing a decrease of the 5-year German Bund rate (blue lines) with 68% (blue-shaded areas) and 90% (grey-shaded areas) credibility intervals obtained from a structural BVAR with high-frequency Cholesky identification. High-frequency monetary policy indicator (surprise in euro area term structure) ordered first.

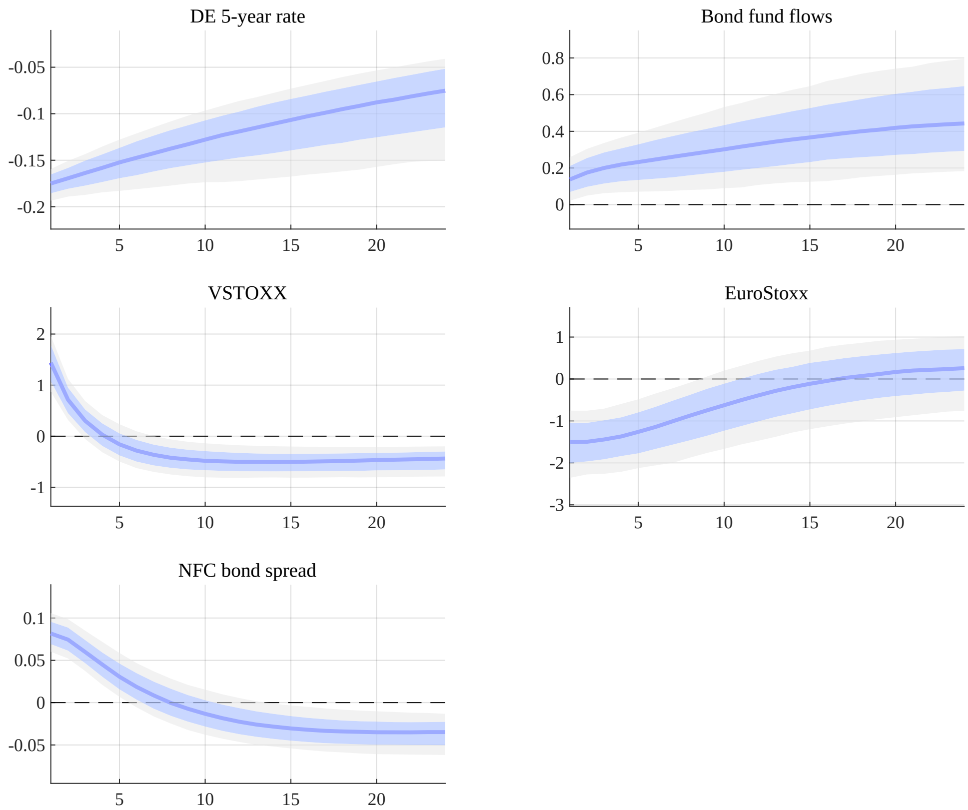


Figure 21: Impulse responses in baseline model with recursive identification

*Notes:* Impulse responses to an expansionary euro area monetary policy shock inducing a decrease of the 5-year German Bund rate (blue lines) with 68% (blue-shaded areas) and 90% (grey-shaded areas) credibility intervals obtained from a structural BVAR with Cholesky recursive identification. The monetary policy indicator (monthly 5-year German Bund rate) is ordered first.

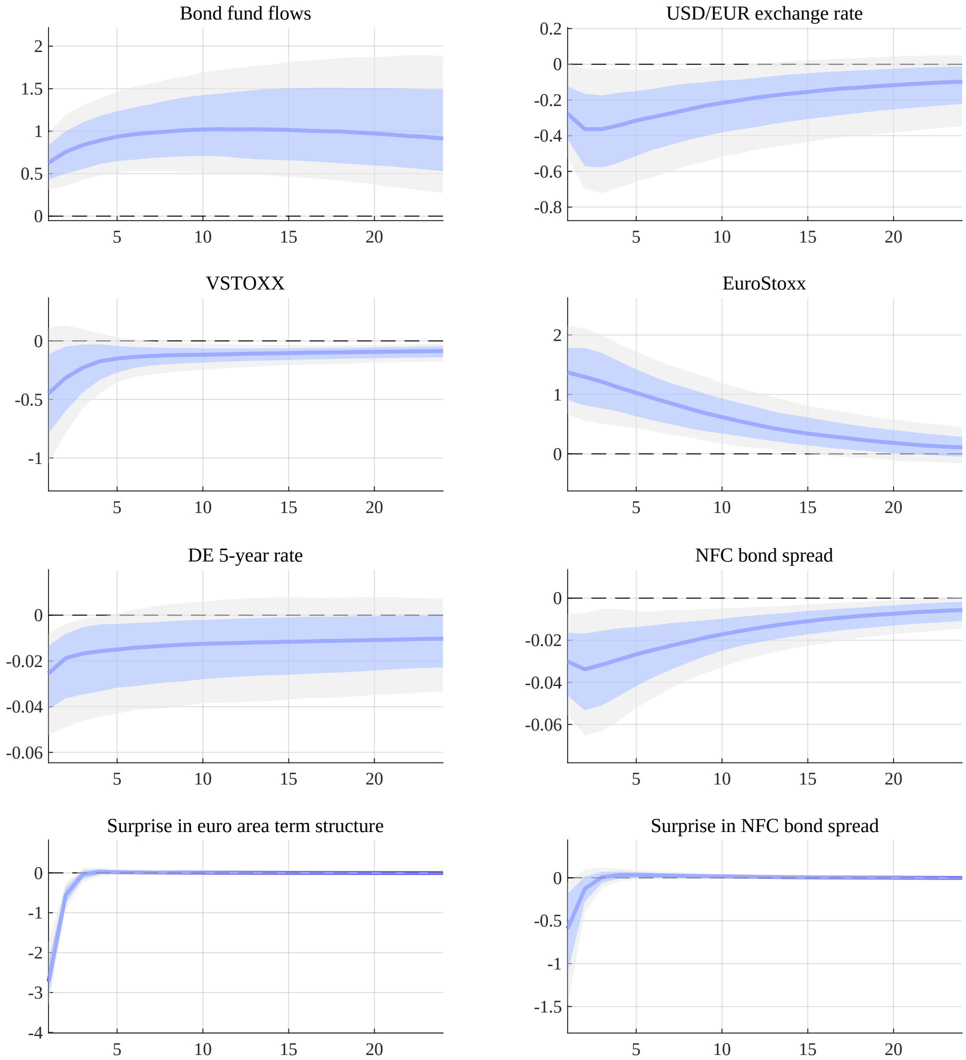


Figure 22: Impulse responses in baseline model with US focused bond fund flows

*Notes:* Impulse responses to an expansionary euro area monetary policy shock inducing a decrease of the 5-year German Bund rate (blue lines) with 68% (blue-shaded areas) and 90% (grey-shaded areas) credibility intervals obtained from a structural BVAR with high-frequency sign restriction identification.

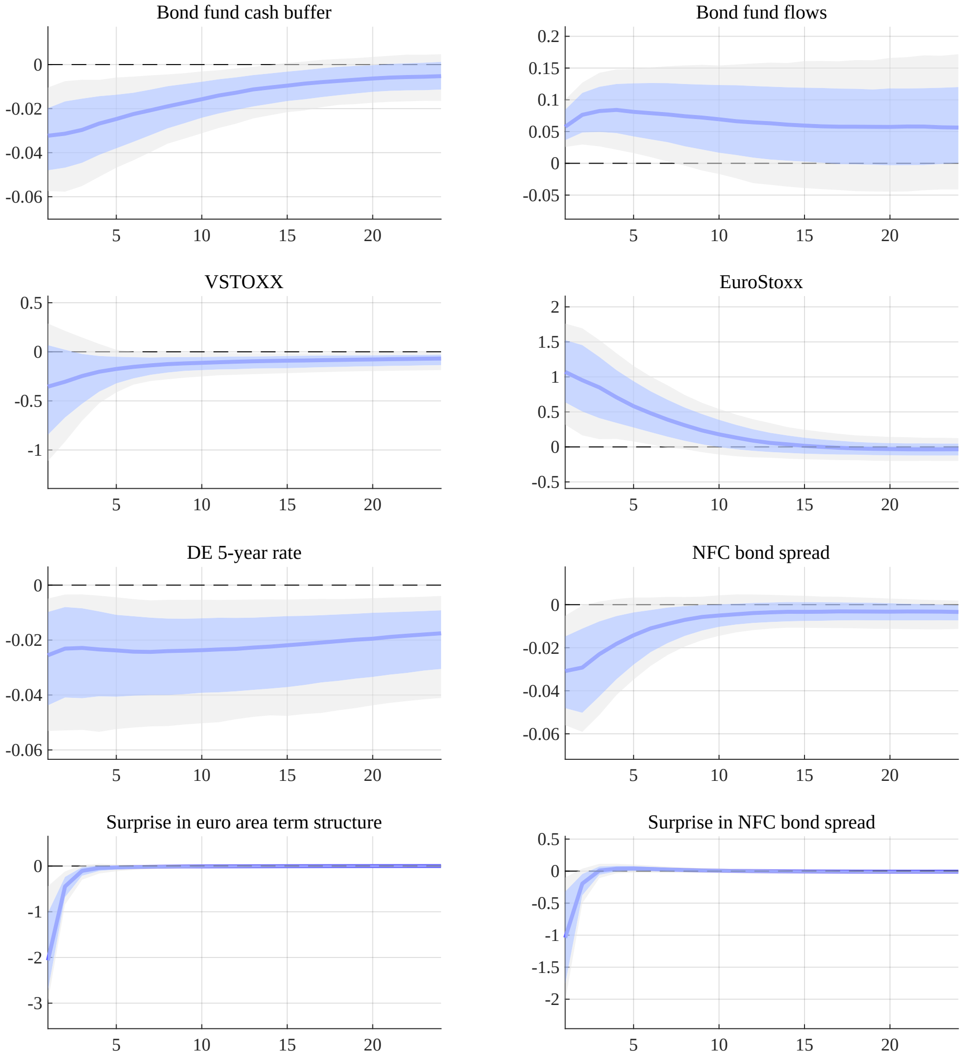


Figure 23: Impulse responses in baseline model with bond fund cash holdings as percentage of total assets

*Notes:* Impulse responses to an expansionary euro area monetary policy shock inducing a decrease of the 5-year German Bund rate (blue lines) with 68% (blue-shaded areas) and 90% (grey-shaded areas) credibility intervals obtained from a structural BVAR with high-frequency sign restriction identification.

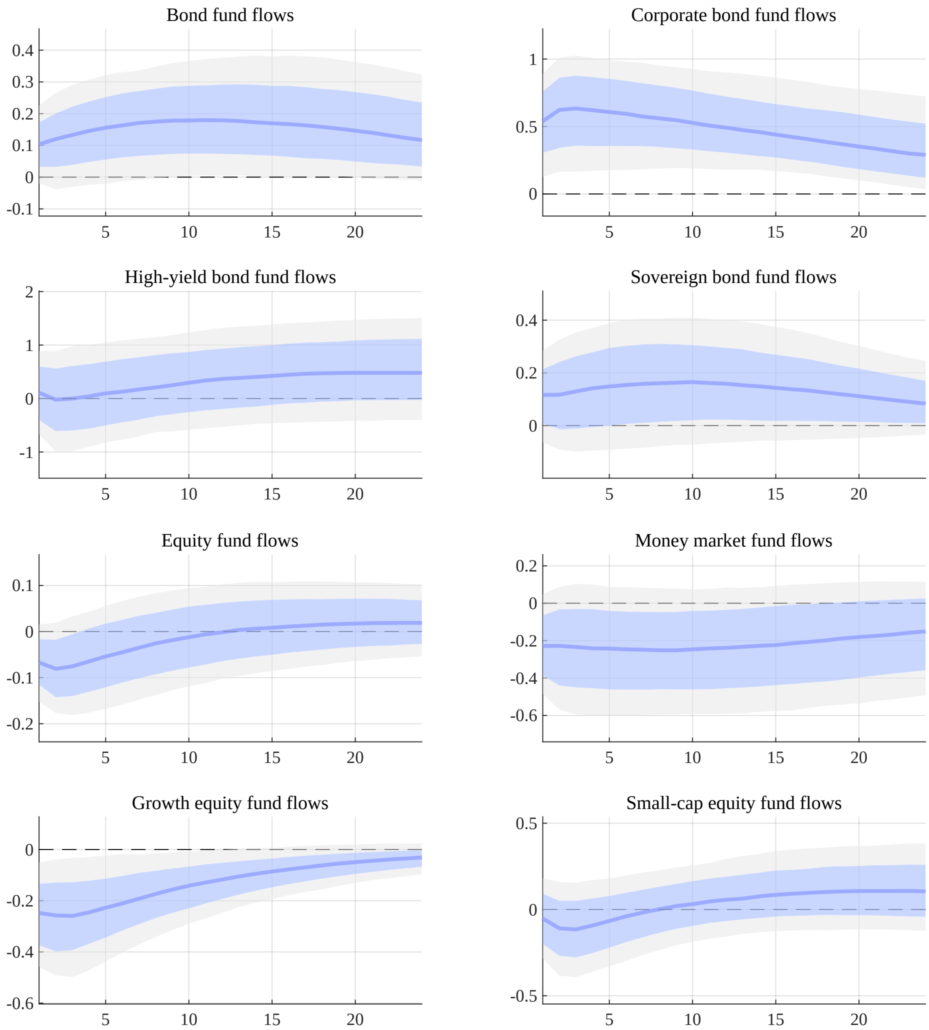


Figure 24: Response of flows to European focused funds across a range of asset classes following short-end shock

*Notes:* Impulse responses to an expansionary euro area monetary policy shock inducing a decrease of the 3-month OIS rate (blue lines) with 68% (blue-shaded areas) and 90% (grey-shaded areas) credibility intervals obtained from a structural BVAR with high-frequency sign restriction identification. Each variable added separately to the baseline model in the left panel of Figure 13.

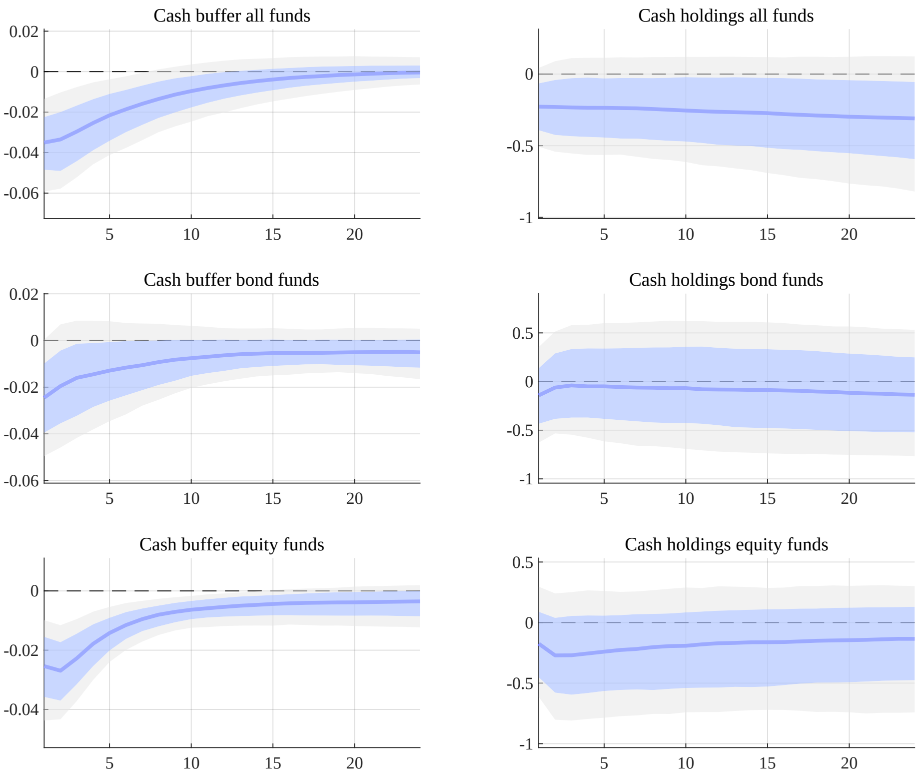


Figure 25: Response of fund cash holdings across a range of asset classes following short-end shock

*Notes:* Impulse responses to an expansionary euro area monetary policy shock inducing a decrease of the 3-month OIS rate (blue lines) with 68% (blue-shaded areas) and 90% (grey-shaded areas) credibility intervals obtained from a structural BVAR with high-frequency sign restriction identification. Each variable added separately to the model in Figure 14.

**Acknowledgements**

We wish to thank Karl Whelan, Marek Jarociński, Peter Karadi and Johnathan Wright as well as conference and seminar participants at the European Central Bank, the Banca d'Italia workshop "Longterm investors' trends: theory and practice", the 28th Annual Global Finance Association Conference and the Irish Economic Association Annual Conference 2021 for helpful comments and suggestions. Disclaimer: The views expressed in this paper are those of the authors only and do not necessarily reflect the views of the European Central Bank or the Eurosystem.

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PDF ISBN 978-92-899-4858-6 ISSN 1725-2806 doi:10.2866/43947 QB-AR-21-096-EN-N