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THE IMPACT OF SHADOW BANKS ON MONETARY POLICY TRANSMISSION
IN THE EURO AREA

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Abstract: This thesis examines the impact of shadow banks on monetary policy transmission in the Euro Area. Utilizing balance sheet data of financial intermediaries from 1999 to 2024 and employing local projection methods, the study analyzes how different financial institutions respond to monetary policy shocks. The findings indicate that shadow banks react more quickly and robustly than traditional financial institutions. This accelerated response highlights shadow banks' significant role in the monetary transmission mechanism. Consequently, policymakers must fully consider the existence of shadow banks when designing strategies to ensure effective monetary policy implementation and maintain financial stability.

Key Words: Shadow Banks, Monetary Policy Transmission, Euro Area, Financial Intermediaries

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1. Introduction

1.1. Background

The financial system has changed significantly in recent decades, with non-bank financial institutions, often referred to as “shadow banks”, emerging as key players. Paul McCulley (2007) introduced the term, describing them as highly leveraged intermediaries operating outside traditional banking regulations. Pozsar et al. (2013) expanded this definition to include institutions involved in credit provision and maturity transformation without government safeguards.

The rise of shadow banks has introduced new complexities into the financial system. Monetary policy has traditionally relied on the banking sector to transmit its effects to the real economy. However, the growing prominence of shadow banks challenges this traditional framework and raises critical questions about its effectiveness. Existing research, primarily focused on the United States, presents mixed findings. Some studies argue that shadow banks weaken monetary policy transmission, while others suggest that they amplify its impact. This study examines how shadow banking influences monetary policy transmission in the Euro Area, a region that has thus far been relatively underexamined in this context.

1.2. Objectives

By analyzing the balance sheet responses of financial intermediaries after a monetary policy shock, this study aims to answer the following research question:

How do shadow banks influence monetary policy transmission within the Euro Area?

To address this research question, this study proposes two hypotheses, focusing on both the speed and magnitude of shadow banks' responses to monetary policy shocks:

- Hypothesis 1: Shadow banks adjust their balance sheets at a faster rate in response to monetary policy shocks compared to regulated financial institutions.
- Hypothesis 2: Shadow banks exhibit larger balance sheet adjustments in response to monetary policy shocks compared to regulated financial institutions.

1.3. Structure

This thesis is structured into seven chapters. Chapter 2 reviews the literature by defining financial intermediaries in the Euro Area, analyzing their evolution, and examining the mechanisms of monetary policy transmission with a focus on shadow banks. It concludes by identifying the research gap addressed in this study. Chapter 3 explains the methodology, describing the dataset spanning over two decades and the econometric techniques employed to assess the impact of monetary policy shocks. Chapter 4 presents the findings, comparing the speed and magnitude of financial institutions' responses, with shadow banks displaying distinct patterns. Chapter 5 interprets these results in relation to the hypotheses, highlighting the role of shadow banks. Chapter 6 acknowledges the limitations of the analysis, including issues related to data aggregation and the complexity arising from heterogeneous financial entities, and points toward avenues for future research. Finally, Chapter 7 concludes by summarizing the key insights, discussing their policy implications, and emphasizing the importance of incorporating shadow banks into the broader understanding of monetary policy transmission in the Euro Area.

2. Literature Review

2.1. Financial Intermediaries in the Euro Area

A precise definition of financial intermediaries within the Euro Area is essential for analyzing their role in monetary policy transmission. According to the European System of Accounts, financial institutions are categorized into three main groups: monetary financial institutions (MFIs), insurance corporations and pension funds (ICPFs), and other financial institutions (OFIs) (European Commission 2013).

2.1.1. Definition

MFIs are central to the implementation of monetary policy. This category comprises the central bank and other MFIs, including deposit-taking corporations and money market funds (European Commission 2013). The central bank is responsible for maintaining price stability, issuing currency, and managing international reserves (European Central Bank 2021). Deposit-taking corporations—including commercial banks, savings banks, and cooperative credit institutions—accept deposits, extend loans, and invest in securities. Money market funds offer deposit-like shares and invest in short-term debt instruments. Credit institutions within the MFIs sector can draw directly on central bank liquidity and are bound by reserve requirements and stringent regulation, making them pivotal actors in the transmission of monetary policy (European Central Bank 2024a).

ICPFs play a key role in financial markets by managing risks and meeting long-term obligations. Insurance companies collect premiums to cover potential losses related to life, health, or property, while pension funds gather contributions to provide retirement benefits. Both invest in financial instruments and engage in securities lending and repurchase agreements to optimize performance and ensure stability (BaFin 2023).

OFIs serve as an approximation of the shadow banking system in this analysis. This group includes non-MMF investment funds, financial vehicle corporations involved in securitizations, securities and derivatives dealers, and specialized financial corporations offering services like leasing and factoring (European Commission 2013). OFIs primarily finance themselves by issuing securities and borrowing from MFIs. The OFIs sector plays an increasingly significant role in the financial landscape, influencing credit availability and the distribution of risk (European Central Bank Data Portal 2024g).

2.1.2. Development

Since the start of the Economic and Monetary Union, the Euro Area’s financial sector has expanded markedly, both in absolute size and structural complexity. In the first quarter of 1999, total financial assets of MFIs, ICPFs, and OFIs stood at approximately €25.58 trillion. By the first quarter of 2024, this figure had reached €98.23 trillion, representing an increase of about 284%, far outpacing the 38.7% growth in GDP over the same period (European Central Bank Data Portal 2024a, 2024c). Figure A1 in the Appendix illustrates not only the cumulative expansion but also the evolving proportions of these intermediaries. Changes in the institutional landscape—most prominently the establishment of the single supervisory mechanism (European Central Bank 2024c) and the single resolution mechanism (European Commission 2024b)—have been significant. Together with reinforced regulatory requirements, evolving monetary policy stances, and shifts in investor behavior, they have collectively reshaped the contours of these sectors over this period.

From 1999 Q1 to 2024 Q1, MFIs assets rose from €16.05 trillion to €46.03 trillion—an increase of 187% (European Central Bank Data Portal 2024f). Year-on-year (YoY) growth rates, as shown in Figure A4 and Figure A5 (Appendix), reveal episodes of robust

expansion interspersed with slower increments. Although MFIs remain prominent channels of credit creation and the first line of monetary policy transmission, their growth has been tempered by successive regulatory changes. Post-crisis frameworks like Basel III, initially implemented via CRD IV and CRR (European Union 2013), tightened leverage ratios, liquidity requirements, and capital buffers, influencing risk appetite and reducing the pace of balance sheet expansion (Bundesbank 2018). At the same time, persistently low interest rates and the European Central Bank's nonstandard monetary interventions—such as targeted longer-term refinancing operations and extensive asset purchase programs—narrowed net interest margins (Fong, Sze and Ho 2021). These factors curtailed the rapid growth witnessed before the Global Financial Crisis and steered banks toward more selective lending and careful capital allocation.

ICPFs assets increased from €3.5 trillion in 1999 Q1 to €11.75 trillion in 2024 Q1, reflecting a rise of approximately 236% (European Central Bank Data Portal 2024e). Although this growth lagged that of OFIs, the YoY data depicted in Figure A4 and Figure A5 (Appendix) indicate that ICPFs generally exhibited steadier and more predictable asset accumulation patterns (European Central Bank Data Portal 2024a). Regulatory initiatives such as Solvency II (European Union 2009) and IORP II (European Union 2016) introduced market-consistent valuations and rigorous governance standards. These measures enhanced transparency, risk management, and solvency, enabling ICPFs to maintain a long-term investment horizon, which is particularly pertinent in an environment characterized by demographic aging and rising longevity risk. The result has been a stable flow of funds into sectors less sensitive to short-term interest rate volatility, effectively anchoring parts of the financial system to more conservative growth trajectories (Apostoaie and Bilan 2019).

The OFIs segment underwent the most dramatic transformation. As shown in Figure A1 in the Appendix, total assets surged from €6.02 trillion in 1999 Q1 to €40.45 trillion in 2024 Q1, a gain of nearly 572% (European Central Bank Data Portal 2024b). While a more granular breakdown for the Euro Area specifically is not available, Figure A2 in the Appendix provides a broader overview of OFI entity types for the 21+EA group, highlighting the dominant position of other investment funds.

YoY growth rates shown in Figure A4 and Figure A5 (Appendix) underscore periods of sharp expansion, partly reflecting the evolving nature of capital market intermediation (European Central Bank Data Portal 2024a). Regulatory arbitrage played a notable role as banks faced more demanding prudential standards, and certain lending and investment activities migrated to entities outside the traditional banking perimeter (Hondula 2019). Low policy rates and ample liquidity further encouraged investors to seek higher yields, fostering the proliferation of new market-based instruments and contributing to the diversification of funding sources.

During the post-crisis period, initiatives by the Basel Committee and the Financial Stability Board have aimed to improve the oversight of these non-bank intermediaries. Regulations like the Money Market Funds Regulation (European Union 2017a) and the Securities Financing Transactions Regulation (European Union 2017b) introduced standardized reporting and tightened liquidity provisions, helping to curtail systemic risks associated with short-term funding and interconnectedness. Even so, the OFI sector has continued to expand by tapping into investor demand for more flexible and higher-yield opportunities, supported in part by the EU's broader efforts to develop a Capital Markets Union, diversify funding sources for the real economy, and reduce overreliance on bank lending (Fong, Sze and Ho 2021).

2.2. Monetary Policy Transmission

Monetary policy transmission refers to the mechanisms through which central bank actions influence the broader economy and price levels (European Central Bank 2024b). This process involves various channels by which changes in monetary policy instruments affect key economic variables. Understanding these transmission channels is essential to assess how structural changes in financial intermediation could potentially impact the effectiveness of monetary policy. The transmission mechanisms can be categorized into three main channels: neoclassical channels, credit channels, and the risk-taking channel (International Monetary Fund 2016). An overview of these channels is provided in Figure A3 in the Appendix.

2.2.1. Neoclassical Channels

Neoclassical channels of monetary policy rest on the assumption of perfect financial markets, where policy adjustments primarily influence investment, consumption, and international trade through interest rate changes. These mechanisms are categorized into the traditional interest rate channel and the asset price channels (Milic 2020; Mukamil, Rafiq, and Rehman 2021).

Through the traditional interest rate channel, monetary policy affects credit demand and the disposable income of borrowers and lenders. Rising interest rates increase the cost of capital, which dampens investment and aggregate demand. This effect extends to the financial decisions of firms and households, notably impacting expenditures on capital projects, residential construction, and durable consumer goods (International Monetary Fund 2016).

The asset price channels are divided into the equity price and the exchange rate channels (Milic 2020). The equity price channel exerts its influence via Tobin's q and wealth effects. Tobin's q , understood as the quotient of a firm's overall market valuation relative to the cost needed to replicate its existing assets, decreases when interest rates rise. Higher interest rates make bonds more attractive compared to equities, reducing equity prices, and discouraging investments that rely on equity financing (Jeenas and Lagos 2023).

The wealth effect explains how changes in asset prices influence household consumption by altering perceived lifetime wealth. In perfect markets, this effect operates independently of borrowing capacity or collateral values, as household consumption is assumed to depend solely on net worth and expected lifetime income (Júnior, Rossi and Cunha 2019).

The exchange rate channel plays a significant role in open economies. Higher domestic interest rates increase the attractiveness of local assets, driving currency appreciation. This strengthens imports, weakens exports, and reduces inflationary pressure through cheaper import prices (Reserve Bank of Australia 2024).

Neoclassical channels operate independently of financial market imperfections and do not explicitly account for the role of external finance premiums or credit constraints. This makes them less sensitive to structural changes in financial intermediation but also limits their scope in explaining modern monetary policy transmission. To address these limitations, it is necessary to explore both credit channels and the risk-taking channel further (International Monetary Fund 2016).

2.2.2. Credit Channels

Credit channels emerge from imperfections in credit markets and illustrate how monetary policy effects are amplified through changes in the external finance premium. This premium reflects the additional cost firms or households face when raising external funds compared to internal resources (Altavilla and Gürkaynak 2024). Credit channels operate via the balance sheet channel, which influences loan demand, and the bank-based credit channels, which affect loan supply (Boivin, Kiley and Mishkin 2010).

The balance sheet channel amplifies monetary policy effects by reducing borrowers' net worth as asset prices decline. Lower collateral values increase the external finance premium, restricting credit access for firms and households. Firms reduce investment, especially in capital-intensive projects, while households with real estate assets face limited borrowing capacity and lower consumption (Lane 2023). This mechanism is particularly relevant to the non-bank financial sector as it has increased credit accessibility (International Monetary Fund 2016). As a result, consumer spending has become more dependent on collateral values. Declines in asset prices therefore tighten credit conditions further, amplifying monetary policy effects through the balance sheet channel (Boivin, Kiley and Mishkin 2010).

Bank-based credit channels explore how monetary policy influences the credit supply of financial intermediaries. These channels are divided into two key mechanisms: the bank lending channel and the bank capital channel (Boivin, Kiley and Mishkin 2010). The bank lending channel highlights the effect of monetary policy on banks' ability to supply loans, primarily through changes in deposit levels. Restrictive monetary policy reduces bank reserves and deposits, limiting the funds available for lending. The significance of this channel depends on how much banks rely on deposits as their main funding source. Over

time, the expansion of capital markets has reduced the importance of this mechanism by offering alternative sources of funding. However, these alternatives still depend on the creditworthiness of banks. Higher interest rates, resulting from tighter monetary policy, erode bank net worth, raise external funding costs, and may ultimately lead to reduced lending and economic activity (Naqvi and Pungaliya 2023). The principles of this channel also apply to shadow banks. Monetary policy impacts shadow banks' ability to lend by influencing their external finance premium, which, in turn, affects credit conditions and economic performance (Bernanke 2007).

Mark to market accounting amplifies these effects. Institutions that use market-based valuations for their assets experience more pronounced impacts from monetary policy changes, as fluctuations in asset prices directly affect their balance sheets. While banks often minimize this impact by limiting the share of assets valued this way, shadow banks frequently rely on mark to market accounting, making them more sensitive to interest rate changes and enhancing the transmission of monetary policy (Borio and Zhu 2012; International Monetary Fund 2016).

The bank capital channel focuses on the relationship between monetary policy, bank capital, and lending capacity. Contractionary monetary policy reduces asset prices, increases non-performing loans, and lowers bank profitability, which weakens their capital base. Undercapitalized banks face higher external funding costs and may be forced to reduce lending, amplifying the restrictive effects of monetary policy. These effects, while less immediate, become more significant over time as capital constraints intensify (Orzechowski 2019).

The growing role of shadow banking complicates the dynamics of the bank capital channel. Shadow banks, which are less regulated than traditional banks, often step in to

provide credit when banks reduce lending. By facilitating activities like corporate bond issuance or direct lending, shadow banks allow firms to access financing even during periods of monetary tightening. This dynamic can weaken the bank capital channel's effectiveness, particularly in financial systems with stringent banking regulations (Milic 2020).

2.2.3. Risk-taking Channel

The risk-taking channel represents a more recent addition to our understanding of how monetary policy influences economic activity. Unlike traditional mechanisms, this channel highlights the impact of interest rate changes on the quality of credit and the risk profile of investment decisions (Wischnewsy and Neuenkirchen 2018). Giovanni Dell'Ariccia (2017) emphasizes that fluctuations in interest rates do not merely affect the volume of credit but also shape the risk tolerance of financial intermediaries. Claudio Borio (2012) formally introduced the concept, describing how lower or declining interest rates prompt economic agents to engage in riskier activities without adequate compensation through higher risk premiums. The International Monetary Fund (2016) outlines four primary components that facilitate this channel: leverage, search-for-yield behavior, asset management compensation structures, and institutional risk management frameworks.

Leverage plays a pivotal role in this channel. Lower interest rates often incentivize financial institutions to increase borrowing (Dell'Ariccia, Laeven and Suarez 2017). Institutions that engage in maturity transformation can see profitability rise when policy rates drop, at least temporarily. This will enhance these institutions' risk-absorbing capacity, allowing them to take on additional debt and expand their balance sheets (Paul 2022). As lending activities grow or assets are acquired, asset values tend to rise while risk costs decrease, thus reinforcing the impact of monetary policy.

The search-for-yield phenomenon is another key element. It describes how financial intermediaries seek higher returns in a low-interest-rate environment, especially when there are significant gaps between actual and target yields (Wischnewsky and Neuenkirchen 2018). This behavior is evident among entities with long-term fixed liabilities and shorter asset durations, such as insurance companies and pension funds, which face adverse maturity mismatches that compress or even erode margins (Calomiris et al. 2019). To counter these effects, institutions often reallocate their portfolios toward riskier assets, moving from fixed-income investments to more volatile equities (Hau and Lai 2016). Unconventional monetary policies, particularly at the zero lower bound, flatten the yield curve and squeeze banks' interest margins, which further dampens profitability (Claessens, Coleman and Donnelly 2017).

The growing influence of the asset management industry also magnifies monetary policy's effects. Since the global financial crisis, the sector has expanded considerably (International Monetary Fund 2016). Asset managers, whose compensation is frequently tied to performance relative to peers, become highly sensitive to short-term interest rate changes and the actions of competing funds (Evans, et al. 2021). This dynamic leads to pronounced asset price fluctuations (Morris and Shin 2015). Additionally, investors seeking a first-mover advantage may react to shifts in fund performance triggered by interest rate changes. The preference to avoid being the last to redeem encourages rapid withdrawals, especially when funds liquidate their most liquid assets first (International Monetary Fund 2016). These behaviors, combined with performance incentives, magnify the impact of tighter monetary conditions upon the valuation of financial assets and, in turn, shape credit flows as well as broader economic developments through the balance sheet channel (Hau and Lai 2016).

Risk management models adopted by financial institutions also shape the risk-taking channel. Lower interest rates tend to elevate asset valuations, which reduces asset price volatility. This decline can prompt both banks and non-banks to assume greater risk by loosening internal risk assessments, such as those based on Value at Risk models. Widespread use of these models among non-bank intermediaries can strengthen the transmission of monetary policy. However, post-2007–09 financial crisis evidence shows a decrease in the prevalence of such models, even though they remain significant (International Monetary Fund 2016).

2.3. Research Gap

Recent research on the role of shadow banks in the transmission of monetary policy has increasingly investigated whether these entities weaken or strengthen policy effectiveness. Although much of the literature focuses on the United States, some studies have also addressed European markets. The existing body of work can be categorized into two main perspectives: one proposing that shadow banks diminish monetary policy transmission, and another suggesting they amplify it.

Several studies argue that shadow banks weaken monetary policy channels. Den Haan and Sterk (2011), using U.S. flow data, investigated how fluctuations in monetary policy influence mortgage financing and household borrowing. Their findings indicate that monetary tightening spurred an increase in mortgage activity among non-bank lenders, while traditional banks scaled back mortgage issuance. This behavior suggests that shadow banks mitigate the effectiveness of conventional banking channels.

Elliott et al. (2022) expanded this line of inquiry by examining U.S. credit data for households and businesses. Utilizing the methodology of Gertler and Karadi (2015) they analyzed the effects of monetary shocks, finding that shadow banks significantly dampen

both the bank credit channel and the risk appetite channel. Their results support the notion that shadow banks make credit flows less responsive to interest rate changes, weakening monetary policy transmission. Xiao (2020) introduced the concept of the shadow banking channel, demonstrating how shadow banks increase money creation in response to Federal Reserve rate hikes, thereby reducing the efficacy of monetary measures. Shadow banks influence commercial banks through competition for deposits, further attenuating policy impacts.

Studies by Drechsler, Savov and Schnabl (2022), along with Buchak et al. (2022), focus on the mortgage arbitrage market. They find that monetary tightening, which reduces bank deposits, constrains banks' mortgage lending. Shadow banks, however, offset this decline by issuing privately securitized mortgages, providing alternative credit channels, and diminishing the effect of monetary policy.

Comparable research in Europe supports these observations. Igan et al. (2017) and Altunbas, Gambacorta and Marques-Ibanez (2009) examined the influence of securitization on policy transmission. Both studies concluded that shadow banks, by diversifying credit flows and exhibiting lower sensitivity to monetary shocks, reduce the effectiveness of traditional banking channels.

In contrast, other studies argue that shadow banks can enhance monetary policy transmission. Beck, Kotz and Zabelina (2016) and Hondula (2019) analyzed Euro Area financial intermediaries' reactions to monetary shocks. They found that MFIs restrict lending in response to tightening, while OFIs increase short-term lending, thereby amplifying policy effects. These asymmetric reactions suggest that non-banking financial institutions can strengthen transmission mechanisms.

Further evidence comes from Chernenko, Erel, and Prilmeier (2022) and Gopal and Schnabl (2022). They highlighted how non-bank and fintech companies became critical lenders to small and medium-sized enterprises following the 2008 Financial Crisis. In environments where regulatory constraints limited bank lending, these non-banks stepped in to provide credit, reinforcing policy transmission. Similar dynamics were observed in Denmark, where Cucic and Gorea (2024) found that non-banks increased lending relative to banks after monetary tightening, insulating investment and consumption from negative shocks.

In summary, the influence of shadow banks on monetary policy transmission is complex and context dependent. Some research suggests that they attenuate policy impacts by making credit less responsive to interest rate changes. Others indicate that shadow banks enhance transmission through rapid, flexible adjustments to monetary conditions. These conflicting findings emphasize that their role varies based on market context, regulatory frameworks, and economic conditions.

Despite significant research advancements, the influence of shadow banks in the Euro Area remains underexplored. Conclusive evidence on whether they amplify or dampen policy transmission is lacking, presenting a clear research opportunity. A systematic analysis of shadow banks' impact relative to traditional institutions is essential for understanding the evolving dynamics of monetary policy in the region.

3. Methodology

3.1. Data

The dataset comprises the unadjusted closing balance sheet financial assets of Euro Area monetary financial institutions (European Central Bank Data Portal 2024f), other financial institutions (European Central Bank Data Portal 2024g), and insurance

corporations and pension funds (European Central Bank Data Portal 2024e), sourced from the Quarterly Sector Accounts of the ECB Data Portal.

To enhance the analytical framework, a set of macroeconomic indicators is incorporated. Real gross domestic product (GDP) serves as a proxy for overall economic activity within the Euro Area (European Central Bank Data Portal 2024c). The harmonized index of consumer prices (HICP) is used to monitor inflation dynamics European Central Bank Data Portal (2024d).

The shadow short rate (SSR) is employed as a proxy for the policy interest rate to enable analysis across both zero lower bound (ZLB) and non-ZLB periods. Buch et al. (2018) demonstrate that SSRs provide stronger evidence of policy transmission during unconventional monetary periods compared to central bank balance sheet metrics, which can overlook critical aspects like communication and forward guidance. The Euro Area SSR estimates are sourced from (Krippner 2024).

The data spans from the first quarter of 1999 to the first quarter of 2024, covering periods of conventional and unconventional monetary policy. The dataset pertains to the fixed composition of the Euro Area 20 and is compiled at a quarterly frequency. To stabilize variance and enable elasticity-based interpretations, log transformations are applied to every variable apart from the HICP and SSR.

3.2. Econometric Approach

To assess whether shadow banks respond more strongly and rapidly to monetary policy shocks than traditional financial institutions, this study employs the local projection method introduced by (Jordà 2005). This method estimates impulse responses directly at each forecast horizon by regressing future values of the dependent variable on current and past explanatory variables. Unlike vector autoregression models, which are prone to

biases caused by incorrect lag specifications, the local projection method provides robust and reliable estimates of dynamic effects (Ramey 2016).

The model is specified as:

$$y_{t+h} = \alpha_h + \beta_h \cdot MP_t + \gamma_h \cdot x_t + \varepsilon_{t+h} \quad (1)$$

In this equation, y_{t+h} represents the amount of financial assets held by financial intermediaries at time $t + h$. α_h is the intercept at horizon h . β_h measures the impact of the monetary policy shock at horizon h . MP_t is the monetary policy shock at time t . x_t is a vector of control variables at time t . γ_h is the coefficient vector for the control variables, and ε_{t+h} is the error term.

Exogenous monetary policy shocks are identified using sign restrictions within the local projection framework. This method imposes constraints on impulse responses, ensuring alignment with economic theory. Specifically, a positive interest rate shock is assumed to lead to a negative response in financial assets and economic activity. Sign restrictions enhance the robustness of shock identification. Uhlig (2017) highlights their effectiveness in macroeconomic models. Baumeister and Hamilton (2015) show that sign restrictions improve model-consistent interpretations, reinforcing impulse response analysis in economic research.

Control variables include lagged dependent variables to capture dynamics and autocorrelation, as well as macroeconomic indicators, specifically GDP growth and inflation rates. Including these controls ensures that estimated coefficients reflect the isolated impact of monetary policy shocks. Equations are estimated using ordinary least squares at each forecast horizon h . Bootstrap-based confidence intervals with 500 iterations are employed to address potential serial correlation and heteroskedasticity in the error terms.

To quantify the magnitude and speed of responses, this study derives several key metrics from the impulse response functions. These include the average impulse response (in %), which summarizes the overall reaction within a given horizon, the peak response (in %), capturing the maximum deviation following the shock, the time to peak (in quarters), indicating how quickly this maximum is reached, and the average slope over the first four quarters (in %), reflecting the initial rate of change. By applying these measures to OFIs, MFIs and ICPFs, the analysis provides a direct comparison of their responsiveness to monetary policy shocks.

4. Empirical Findings

4.1. Impulse Responses

The impulse responses reveal distinct dynamics across financial sectors in response to a 1% increase in SSR, as visualized in Figure A6, A7, and A8 and detailed in Table A9, A10, and A11 in the Appendix. A common pattern that emerges from the results is that all three financial sectors generally react negatively to the monetary policy shock, albeit with varying degrees of magnitude and timing.

MFIs initially show a modest positive reaction, averaging about +0.59% over the first four quarters. While significant over the first three quarters, this effect is no longer evident in the fourth and fifth quarters. Thereafter, a pronounced and persistent decline sets in, culminating in a peak negative response of about -2.80% by the eleventh quarter. Over the entire fourteen-quarter horizon, the average effect stands at -1.22%.

ICPFs display consistently negative responses from the outset. On average, across the first four quarters, the decrease amounts to roughly -1.27%. This downturn intensifies to a peak negative response of about -3.72% by the eighth quarter. Although the rate of decline stabilizes thereafter, it remains significantly negative, hovering between -2.7% and -3.0%

through the end of the fourteen-quarter period. On average, the response amounts to -2.55%.

OFls exhibit the steepest and most dynamic downturn. On average, over the first four quarters, the contraction is about -1.65%. The negative impact then rapidly deepens, reaching a peak of roughly -5.37% by the eighth quarter. While there is some partial, gradual rebound afterward, the sector's response remains substantially negative, settling at about -3.43% after fourteen quarters. On average, the overall impact is -3.59%.

These findings underscore notable differences in the speed and magnitude of adjustments to monetary policy shocks across financial sectors. Other financial institutions demonstrate the most dynamic and strongest response, followed by insurance corporations and pension funds, while monetary financial institutions exhibit the slowest and weakest adjustment.

4.2. Robustness

A series of robustness checks were conducted to ensure that the core results do not depend on modeling choices. Each test modified one element of the baseline local projection framework while preserving the central estimation approach, thereby assessing the stability of the identified relationships under altered assumptions.

First, all variables were differenced to determine whether the observed dynamics rely on level-based information. Although this transformation slightly weakened the estimated effects—indicating that long-term levels contribute to the signal—the fundamental response patterns, including the timing of peak responses and the general shape of the impulse responses, remained intact. This suggests that the primary conclusions do not hinge on the use of level data.

Second, the exclusion of the Global Financial Crisis period (2008 Q4–2010 Q4) tested the sensitivity of the results to extreme market conditions. Even without these turbulent observations, the timing, magnitude, and direction of responses closely resembled those in the full sample. This consistency confirms that the findings are not driven by extraordinary volatility but rather reflect underlying economic relationships.

Third, the specification of control variables was altered by removing GDP growth, leaving only lagged dependent variables and inflation in the model. Under this more parsimonious configuration, the impulse responses, and key metrics, such as the peak response and the average responses over short and longer horizons, continued to align with the baseline estimates. This indicates that no single macroeconomic indicator disproportionately influences the results.

Overall, these robustness checks—whose detailed results are presented in Table A12 in the Appendix—confirm that the fundamental insights of the analysis are stable. While differencing data, excluding the crisis period, or adjusting the set of controls can affect the magnitude of some responses, none of these modifications alter the essential patterns. The persistence of the main findings across these tests enhances confidence in their reliability and general relevance.

5. Discussion

The findings presented in Chapter 4 show that OFIs, representing the shadow banking sector, react both more swiftly and more forcefully to changes in monetary policy than MFIs and ICPFs. These observations directly address the research question posed in Chapter 1—“How do shadow banks influence the efficiency of monetary policy transmission within the Euro Area?”—and they substantiate the stated hypotheses that (Hypothesis 1) shadow banks adjust their balance sheets at a faster rate in response to

monetary policy shocks compared to regulated financial institutions, and (Hypothesis 2) shadow banks exhibit larger balance sheet adjustments following these shocks.

By demonstrating both a rapid and a magnified reaction to interest rate changes, the results align closely with discussions in the literature that highlight the structural and behavioral differences between regulated and non-regulated intermediaries. Earlier theoretical work, reviewed in Chapter 2.1, established that OFIs are defined by lighter regulatory regimes (European Commission 2013; Pozsar et al. 2013). Unlike MFIs or ICPFs, which must comply with prudential standards, capital requirements, and liquidity regulations, OFIs are subject to fewer direct constraints. As a result, they possess greater operational and strategic flexibility, enabling them to respond more immediately when policy rates shift (Beck, Kotz, and Zabelina 2016; Hondula 2019). This structural characteristic supports the finding that OFIs adjust their balance sheets faster, thereby confirming the first hypothesis and providing evidence that they can enhance the speed of monetary transmission (see Chapter 2.1 for definitions and regulatory contexts).

The literature also suggests that shadow banks hold assets and liabilities with shorter maturities and employ leverage more aggressively than their regulated counterparts (Borio and Zhu 2012; International Monetary Fund 2016). As outlined in Chapter 2.3, such leverage amplifies sensitivity to changes in funding costs and asset valuations. This dynamic reinforces the outcome that OFIs not only react quickly but also undergo more substantial adjustments. Their heightened leverage, combined with broader application of mark to market accounting across their portfolios, intensifies the influence of rate hikes on their balance sheets. These factors validate the second hypothesis, confirming that the magnitude of their response to monetary shocks can exceed that of more regulated institutions.

Moreover, OFIs' propensity to engage in securitization, securities lending, and derivatives trading—activities discussed in Chapter 2.1—helps explain why they stand out in terms of the extent of their adjustments. When interest rates rise, the cost of rolling over short-term funding sources increases, while the valuation of interest-sensitive assets declines. OFIs, which depend disproportionately on these short-term, market-based funding models, face immediate pressures to rebalance. This pattern is consistent with the risk-taking and credit channels of monetary policy transmission detailed in Chapter 2.3, where entities with more volatile funding structures and riskier portfolios respond more forcefully to policy changes (Dell'Ariccia et al. 2017; Wischnewsky and Neuenkirchen 2018). Such responses do not occur in isolation. Instead, they transmit shocks directly into asset prices, credit availability, and overall financial conditions, thereby potentially amplifying the central bank's policy signals.

In contrast, MFIs and ICPFs — described in Chapter 2.1 — operate under more stringent supervisory frameworks. Their asset and liability structures are longer-term and less vulnerable to immediate market revaluations. Consequently, their responses to rate changes occur more gradually and with a smaller magnitude. This measured reaction aligns with the literature emphasizing banks' reliance on stable deposits, access to central bank liquidity facilities, and the presence of regulatory buffers (Bernanke 2007; Bundesbank 2018). Such resilience tempers their responses to shocks and makes them less agile in transmitting policy changes into financial market conditions. The contrast with OFIs thus underscores the centrality of institutional structure, funding practices, and regulatory contexts in shaping how financial intermediaries react to monetary policy actions (see Chapter 2.2 for growth and balance sheet compositions).

These findings integrate well with the previously identified research gap in Chapter 2.4, which highlighted the ambiguity in existing literature. Some authors posited that shadow

banks diminish monetary transmission by offering credit outside the regulated framework, while others contended that these non-bank entities could reinforce or amplify policy effects through quicker and larger portfolio adjustments. The current results suggest that within the Euro Area, the combination of market-based funding, leverage, and limited regulatory oversight that characterizes OFIs allows them to accelerate and intensify certain monetary transmission channels. In doing so, they add empirical weight to arguments that shadow banks can strengthen the influence of policy shifts, especially during tightening phases, by propagating changes more rapidly and with greater force across financial markets (Buch et al. 2018; Igan et al. 2017).

Overall, these findings validate the initial hypotheses and demonstrate that shadow banks respond more rapidly and forcefully to interest rate changes, underscoring their distinct influence on monetary policy transmission.

6. Limitations

While this study offers valuable insights, several limitations merit attention. Using aggregate Euro Area data may obscure country-specific differences and limit generalizability. Limited data availability hinders a full understanding of the sector's scope and evolution. The analysis does not distinguish between conventional and unconventional monetary policies, nor fully account for heterogeneity within the shadow banking sector. Methodological constraints, including potential endogeneity and omitted variable bias, also affect the robustness of the findings. Future research should adopt more granular, country-specific approaches, differentiate between policy regimes, and leverage better data sources to address these issues.

7. Conclusion

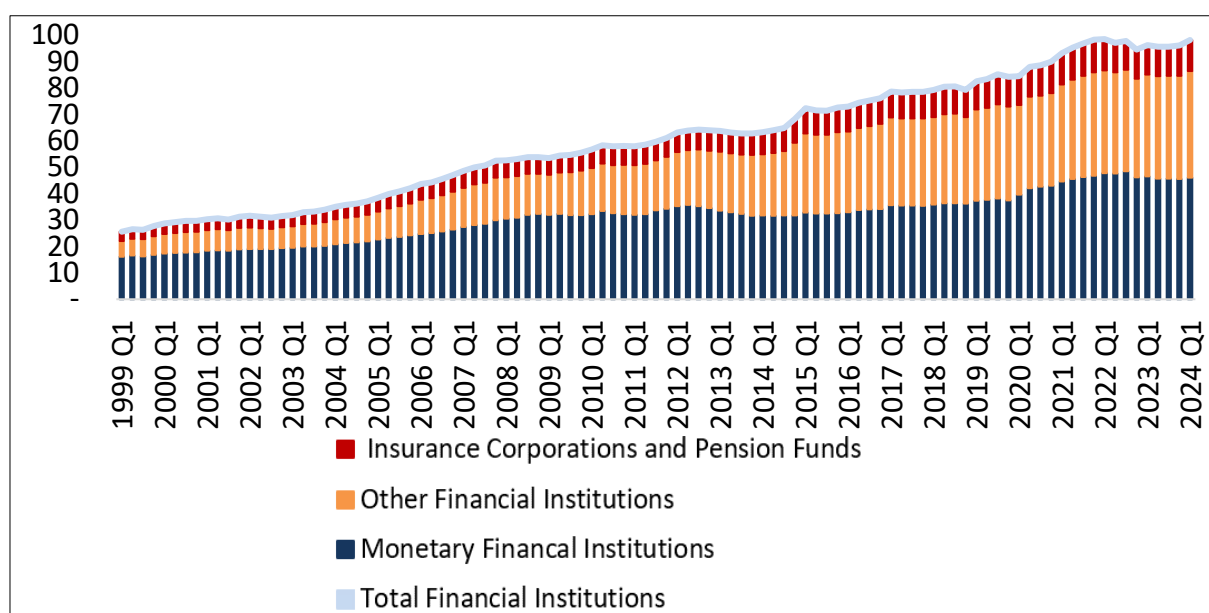
The growing prominence of the shadow banking sector in the Euro Area is changing how monetary policy affects financial markets. Unlike traditional intermediaries, these lightly regulated entities rely on short-term funding and flexible balance sheets, allowing them to react dynamically and influence liquidity and risk allocation more directly.

This dynamic has drawn the attention of the European Commission. Their consultation on non-bank financial intermediation marks an important step (European Commission 2024a). Its goal is to close regulatory gaps, introduce new tools, and recalibrate existing measures to enhance resilience. By targeting the structural susceptibilities of shadow banking, policymakers aim to contain the spillover effects of shocks before they threaten the broader financial architecture.

At the same time, it is essential to acknowledge the benefits that a robust shadow banking sector can confer. By diversifying funding and investment options, shadow banking can strengthen markets and enhance shock absorption. As the EU's Capital Markets Union evolves, more effective integration of these entities fosters deeper liquidity and ensures resilience with systemic safeguards.

The core challenge is to balance innovation and diversification against the need for stability. Clear-eyed regulation that incorporates sound data, coordinated international action, and forward-looking supervision can support a healthy equilibrium. With more granular research on distinct non-bank segments, authorities can fine-tune their policy instruments. This integrated approach will help ensure that shadow banks contribute constructively to the financial ecosystem—enhancing efficiency, reinforcing stability, and ultimately improving monetary policy transmission in the Euro Area.

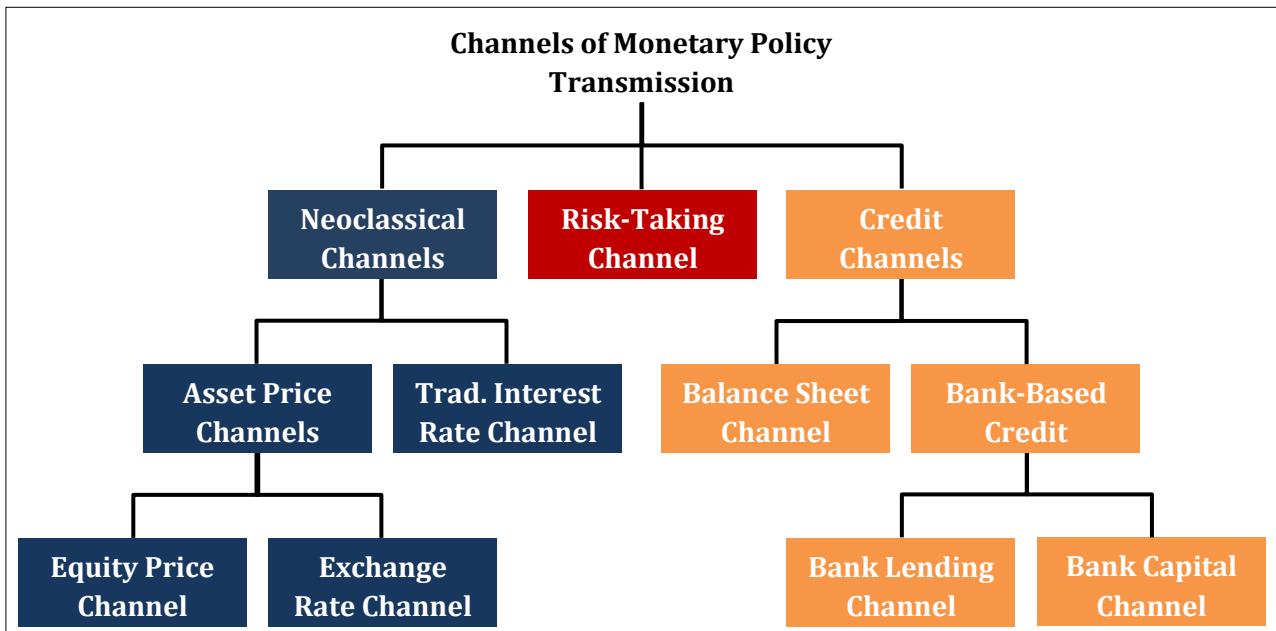
Appendix



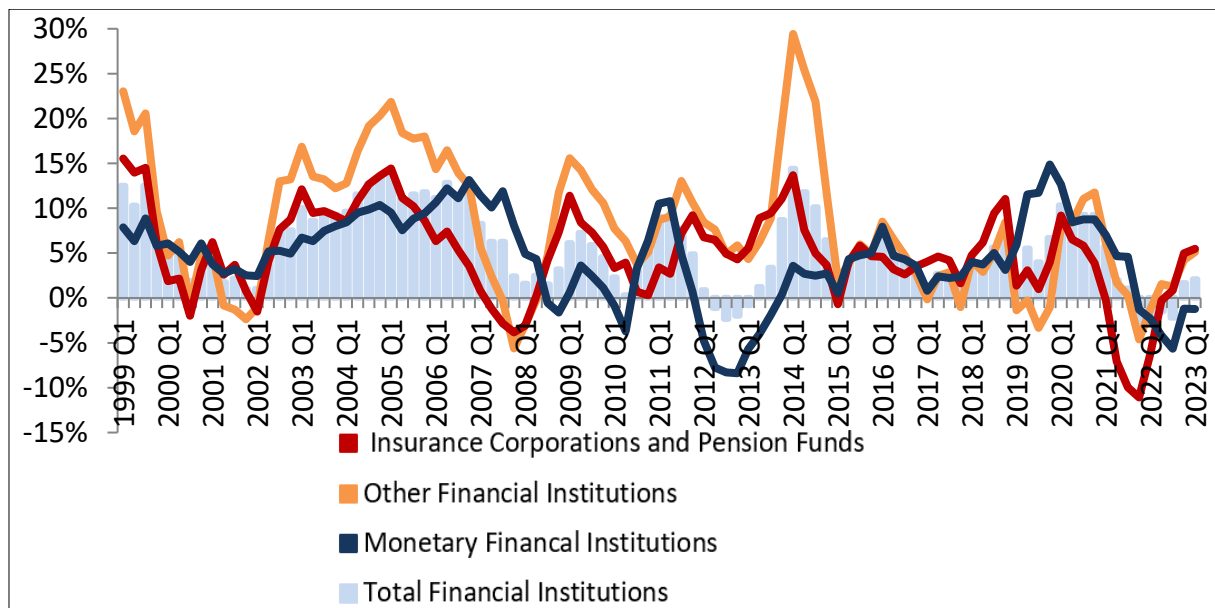
A1: Quarterly financial assets held by ICPFs, OFIs, MFIs and TFIs in the Euro Area (in EUR trillions). Source: Own calculations based on data retrieved from the European Central Bank Data Portal (2024a).

OFI Entities	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Broker-Dealers	6,8	7,6	8,7	7,3	7,7	8,1	8,3	8,2	9,0	8,3	8,7	8,7	9,3	9,8	10,9	11,1	11,6
Captive Financial Institutions	2,7	2,8	2,9	2,2	2,3	2,1	2,2	2,5	2,6	2,9	6,1	6,6	6,7	5,8	6,5	7,0	6,9
Central Counterparties	0,2	0,2	0,4	0,4	0,4	0,4	0,3	0,3	0,3	0,3	0,4	0,6	0,6	0,5	0,6	0,8	0,8
Finance Companies	3,1	3,4	3,8	3,5	4,1	4,1	4,0	4,1	4,1	4,2	4,2	4,4	4,6	4,9	5,3	5,7	6,2
Hedge Funds	0,0	0,5	0,5	0,6	0,7	1,4	2,7	3,2	3,9	4,2	4,3	5,0	5,0	5,8	6,3	6,8	7,0
Money Market Funds	3,7	4,6	5,5	5,0	4,6	4,4	4,4	4,5	4,8	5,3	5,3	5,8	6,2	7,0	8,2	8,9	9,1
Other Investment Funds	11,7	14,6	14,8	18,6	21,5	21,3	25,6	29,9	33,2	34,8	37,8	43,1	41,4	49,6	55,4	64,8	56,0
Others (identified)	0,4	0,5	0,5	0,7	0,7	0,7	0,8	1,9	2,5	3,8	5,3	5,5	5,5	6,0	8,9	9,7	9,7
Others (unidentified)	13,6	16,0	13,1	12,0	13,6	15,3	16,2	16,7	19,8	21,4	20,4	20,4	20,1	20,6	18,8	19,6	19,3
Real Estate Investment Funds	0,5	0,5	0,6	0,6	0,7	0,9	1,1	1,3	1,5	1,5	1,7	1,8	2,1	2,3	2,2	2,5	2,7
Structured Finance Vehicles	5,0	5,9	6,0	7,6	6,4	5,7	5,2	4,7	4,6	4,4	4,3	4,4	4,7	5,1	5,4	6,0	6,2
Trust Companies	0,0	0,1	0,3	0,5	0,6	0,9	1,3	1,9	2,4	2,8	3,4	4,3	3,8	3,8	3,7	3,8	3,9

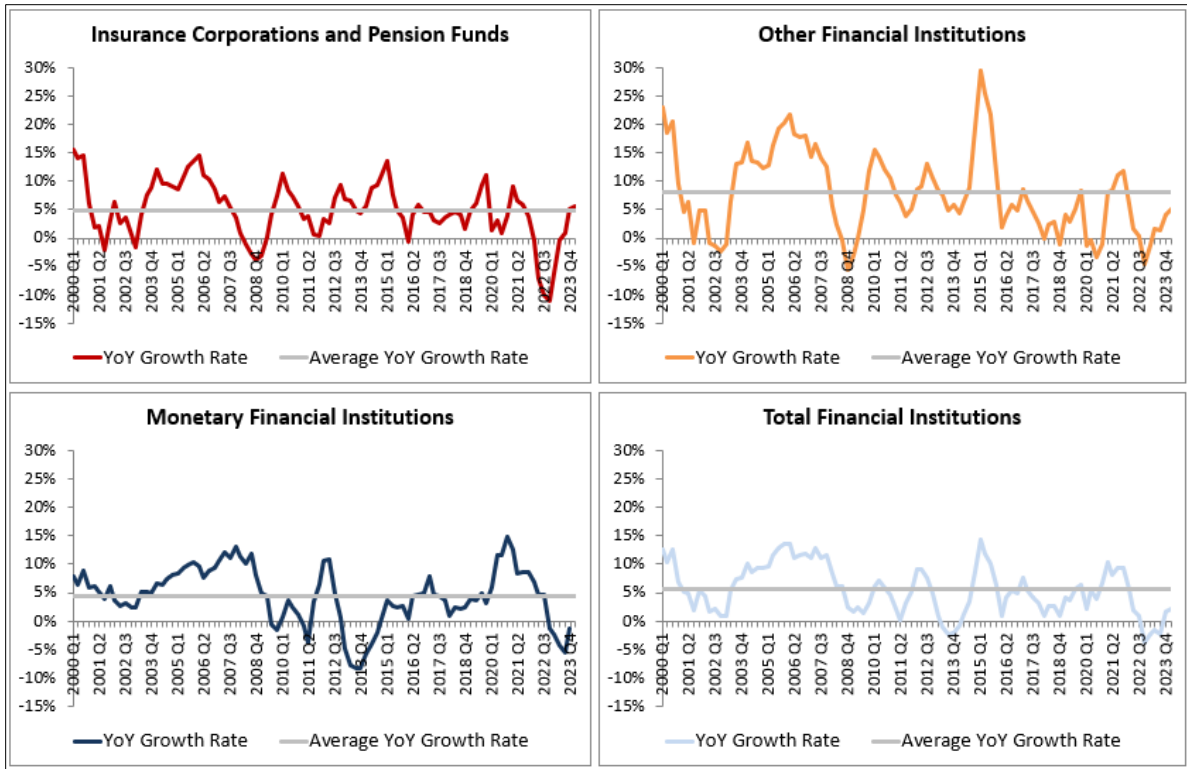
A2: OFIs total financial assets by entity type, for the 21 + EA Group (in USD trillions). This group includes Argentina, Australia, Brazil, Canada, Cayman Islands, Chile, China, Hong Kong, Indonesia, India, Japan, Korea, Mexico, Russia, Saudi Arabia, Singapore, South Africa, Switzerland, Turkey, United Kingdom, United States, and the 19 member Euro Area. These figures may differ from similar statistics published by national/regional authorities due to differences in definitions. Source: Retrieved from Financial Stability Board (2024).



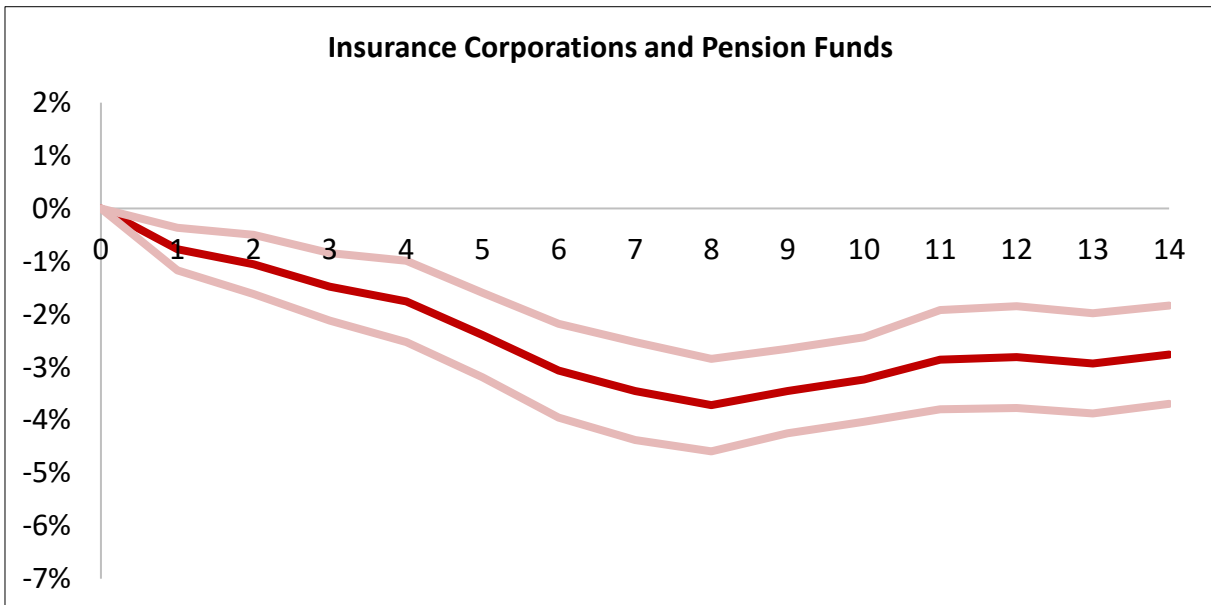
A3: Channels of Monetary Policy Transmission, as defined in Chapter 2.2.



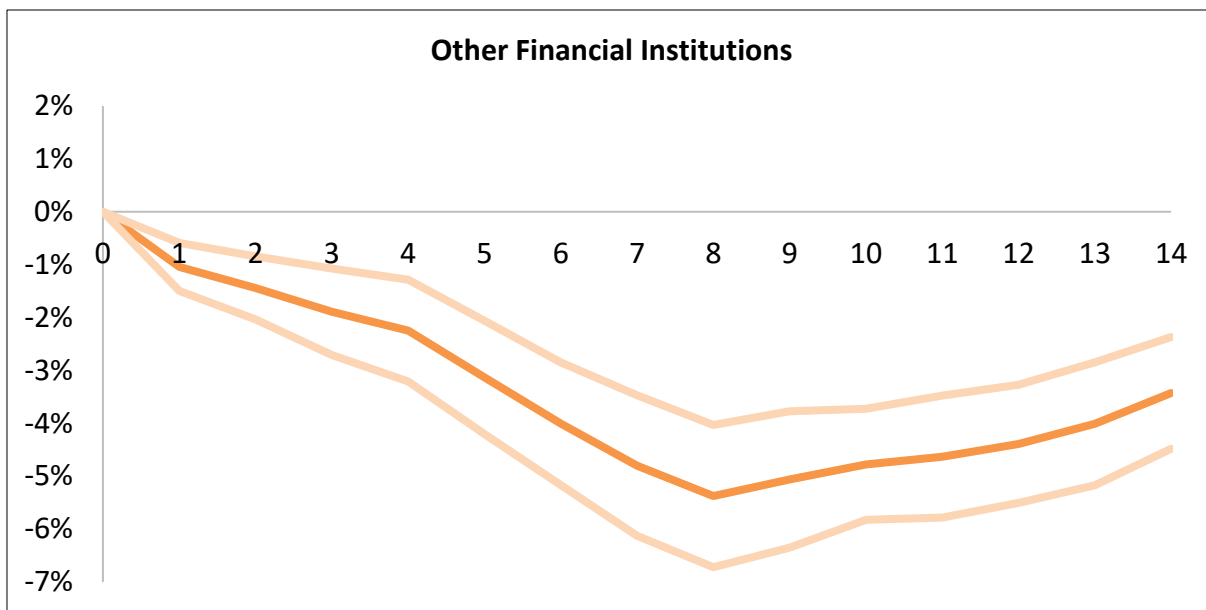
A4: YoY growth rates of quarterly financial assets held by ICPFs, OFIs, MFIs and TFIs in the Euro Area (in %). Source: Own calculations based on data retrieved from the European Central Bank Data Portal (2024a).



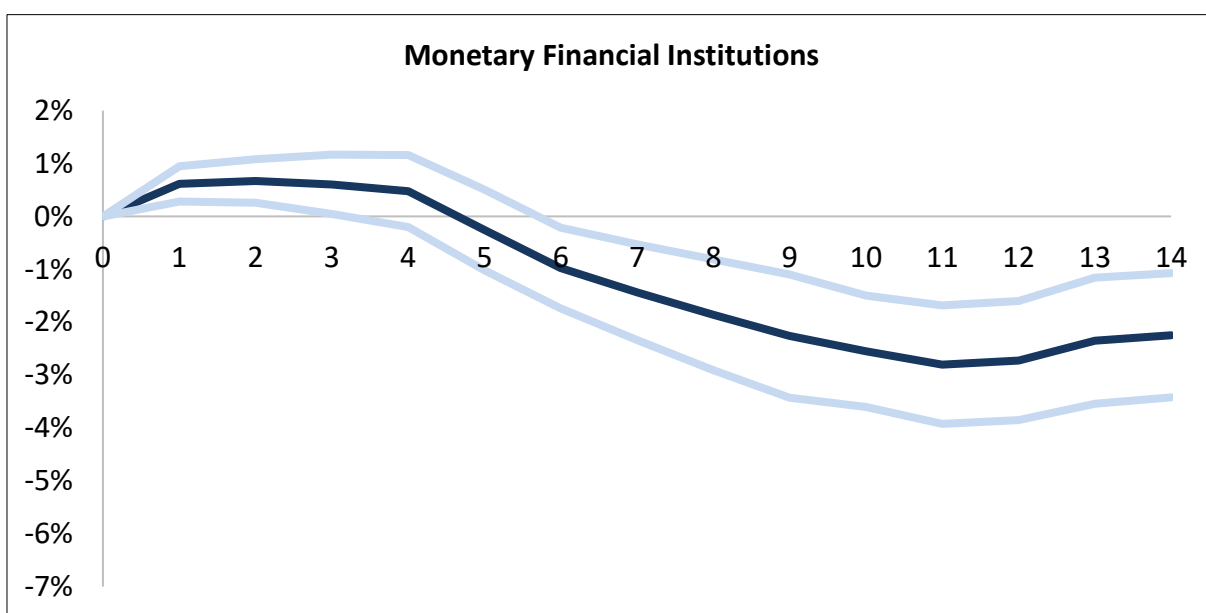
A5: YoY growth rates of quarterly financial assets held by ICPFs, OFIs, MFIs and TFIs in the Euro Area, with individual panels for each category (in %). Source: Own calculations based on data retrieved from the European Central Bank Data Portal (2024a).



A6: Visualization of impulse responses of quarterly financial assets held by ICPFs in the Euro Area to a 1% increase in the SSR over 14 quarters, with 95% bootstrap-based percentile confidence intervals (in %). Source: Table A9.



A7: Visualization of impulse responses of quarterly financial assets held by OFIs in the Euro Area to a 1% increase in the SSR over 14 quarters, with 95% bootstrap-based percentile confidence intervals (in %). Source: Table A10.



A8: Visualization of impulse responses of quarterly financial assets held by MFIs in the Euro Area to a 1% increase in the SSR over 14 quarters, with 95% bootstrap-based percentile confidence intervals (in %). Source: Table A11.

Insurance Corporations and Pension Funds				
Quarters	IRF	Lower 95% CI	Upper 95% CI	Significance
1	-0,77%	-1,17%	-0,37%	*
2	-1,06%	-1,62%	-0,50%	*
3	-1,48%	-2,12%	-0,84%	*
4	-1,76%	-2,53%	-0,99%	*
5	-2,40%	-3,19%	-1,60%	*
6	-3,07%	-3,96%	-2,18%	*
7	-3,45%	-4,38%	-2,53%	*
8	-3,72%	-4,59%	-2,84%	*
9	-3,45%	-4,25%	-2,65%	*
10	-3,23%	-4,03%	-2,43%	*
11	-2,86%	-3,80%	-1,92%	*
12	-2,81%	-3,77%	-1,85%	*
13	-2,93%	-3,88%	-1,98%	*
14	-2,76%	-3,69%	-1,84%	*
Average 1-4	-1,27%	-1,86%	-0,67%	-
Average 1-14	-2,55%	-3,35%	-1,75%	-

A9: Impulse responses of quarterly financial assets held ICPFs in the Euro Area to a 1% increase in the SSR over a 14-quarter horizon. All intervals are 95% bootstrap-based percentile confidence intervals derived from 500 iterations, without assuming normality. An asterisk (*) indicates that the interval does not include zero, thus signaling statistical significance at the 95% level. Source: Own calculations based on data retrieved from the European Central Bank Data Portal (2024e).

Other Financial Institutions				
Quarters	IRF	Lower 95% CI	Upper 95% CI	Significance
1	-1,04%	-1,50%	-0,59%	*
2	-1,44%	-2,04%	-0,85%	*
3	-1,89%	-2,71%	-1,08%	*
4	-2,25%	-3,21%	-1,28%	*
5	-3,13%	-4,20%	-2,06%	*
6	-4,00%	-5,16%	-2,84%	*
7	-4,80%	-6,13%	-3,47%	*
8	-5,37%	-6,72%	-4,03%	*
9	-5,06%	-6,35%	-3,77%	*
10	-4,78%	-5,83%	-3,73%	*
11	-4,63%	-5,78%	-3,48%	*
12	-4,39%	-5,50%	-3,27%	*
13	-4,01%	-5,17%	-2,85%	*
14	-3,43%	-4,48%	-2,37%	*
Average 1-4	-1,65%	-2,36%	-0,95%	-
Average 1-14	-3,59%	-4,63%	-2,55%	-

A10: Impulse responses of quarterly financial assets held OFIs in the Euro Area to a 1% increase in the SSR over a 14-quarter horizon. All intervals are 95% bootstrap-based percentile confidence intervals derived from 500 iterations, without assuming normality. An asterisk (*) indicates that the interval does not include zero, thus signaling statistical significance at the 95% level. Source: Own calculations based on data retrieved from the European Central Bank Data Portal (2024g).

Monetary Financial Institutions				
Quarters	IRF	Lower 95% CI	Upper 95% CI	Significance
1	0,62%	0,28%	0,95%	*
2	0,67%	0,26%	1,08%	*
3	0,61%	0,04%	1,17%	*
4	0,48%	-0,20%	1,16%	
5	-0,26%	-1,02%	0,51%	
6	-0,98%	-1,74%	-0,21%	*
7	-1,43%	-2,34%	-0,53%	*
8	-1,86%	-2,90%	-0,81%	*
9	-2,26%	-3,42%	-1,09%	*
10	-2,55%	-3,60%	-1,50%	*
11	-2,80%	-3,92%	-1,68%	*
12	-2,72%	-3,85%	-1,60%	*
13	-2,35%	-3,54%	-1,16%	*
14	-2,25%	-3,42%	-1,07%	*
Average 1-4	0,59%	0,10%	1,09%	-
Average 1-14	-1,22%	-2,10%	-0,34%	-

A11: Impulse responses of quarterly financial assets held MFIs in the Euro Area to a 1% increase in the SSR over a 14-quarter horizon. All intervals are 95% bootstrap-based percentile confidence intervals derived from 500 iterations, without assuming normality. An asterisk (*) indicates that the interval does not include zero, thus signaling statistical significance at the 95% level. Source: Own calculations based on data retrieved from the European Central Bank Data Portal (2024f).

Robustness Test	Institution	Avg. 1-4	Avg. 1-14	Peak	Peak Time
Altern. Contr.	ICPFs	-3,72%	-2,09%	-3,79%	3
Altern. Contr.	OFIs	-5,68%	-3,49%	-5,76%	2
Altern. Contr.	MFIs	0,04%	-0,22%	-0,46%	8
Excluding GFC	ICPFs	-3,77%	-2,58%	-3,83%	4
Excluding GFC	OFIs	-5,61%	-3,38%	-5,70%	2
Excluding GFC	MFIs	-0,34%	-0,87%	-1,41%	14
First Differences	ICPFs	-0,57%	-0,56%	-0,85%	8
First Differences	OFIs	-0,58%	-0,82%	-1,38%	8
First Differences	MFIs	0,03%	-0,32%	-0,94%	10

A12: Impulse responses of financial assets held by ICPF, OFI, and MFI sectors under various robustness tests (alternative controls, exclusion of the Global Financial Crisis period, and first differencing of all variables) over a 14-quarter horizon. Source: Own calculations based on data retrieved from the European Central Bank Data Portal (2024e, 2024f, 2024g).

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