Sectoral portfolio adjustments in the euro area during the low interest rate period

Since the outbreak of the global financial and economic crisis, the general level of interest rates in the euro area and in virtually all other advanced economies has declined significantly. All other things being equal, this low interest rate period creates incentives for investors to shift their portfolios towards riskier assets. Previous analyses focused primarily on shifts within a narrowly defined asset class. These revealed that, in the euro area, credit institutions stepped up their lending to higher-risk debtors and financial intermediaries purchased riskier securities. The present article expands on this observation. First, it analyses whether the allocation of private and financial investors' total financial assets shifted towards riskier instruments during the low interest rate period. Second, it explores the extent to which monetary policy contributed to these shifts.

The analysis finds that changes in the composition of portfolios varied from sector to sector over the past decade. A shift towards riskier instruments can be identified for insurance corporations and pension funds as well as for other financial intermediaries. In the portfolios of both sectors, the weight shifted from low-risk bank deposits to securities. By contrast, the portfolios of credit institutions and, in particular, households moved more strongly towards lower-risk instruments. The importance of debt securities diminished in both sectors. Conversely, the weight of comparatively low-risk claims on insurance corporations and pension funds rose within the household portfolio. Among credit institutions, risk-free deposits with the Eurosystem grew in significance. The changes in the portfolio composition of investment funds and non-financial corporations were roughly risk-neutral. One reason why developments are opposing in some instances is that buying and selling meant that assets were exchanged between sectors.

Empirical estimates show that expansionary monetary policy shocks generally cause a shift in sectoral portfolios towards riskier forms of investment such as equity. However, comparing the portfolio adjustments made during the low interest period triggered by these monetary policy shocks with total actual portfolio changes reveals that the role played by monetary policy factors was merely minor.

■ Introduction

Since the outbreak of the global financial and economic crisis, the general level of interest rates in the euro area has declined significantly. This is true of both short-term money market rates and long-term capital market rates, in real and nominal terms alike. The decline in the interest rate level had already commenced back in the 1980s and gained substantial renewed momentum as the crisis began. This development is a broad trend that can be observed in virtually all advanced economies.[1]

The decline in the level of interest rates is most likely attributable primarily to changes in structural (real economic) determinants.[2] The first is a decrease in potential output, which is associated with reduced investment in physical capital. This caused the demand for financing to fall. Second, demographic factors such as rising life expectancy and shifts in income and wealth distribution contributed to increased saving, with rising life expectancy encouraging higher precautionary saving with a view to maintaining a certain level of consumption over a prolonged pension-drawing period. By the same token, a shift in income and wealth distribution to higher-income and wealthier households – as observed in the United States, for instance – makes for higher aggregate savings, as these households have a higher marginal propensity to save. Increased saving tended to be accompanied by a rise in the supply of financing. The interaction between decreased demand for and increased supply of financing produces a trend decline in the equilibrium "natural" rate of interest.[3] This rate is characterised by a goods market equilibrium and price stability.[4]

The natural interest rate is an important indicator for a monetary policy focused on price stability. Given a structural decline in the level of interest rates, monetary policy measures track the decrease in the natural interest rate to a certain extent.

All other things being equal, the low interest rate level creates incentives for investors to shift their portfolios towards riskier assets. In the academic literature, this is referred to as the "search for yield".[5] Various reasons are cited for this, particularly with regard to financial investors. First, financial intermediaries might have made promises of fixed returns on their liabilities. Second, asset managers' compensation might be linked to nominal targeted rates of return. These two factors create a situation in which low (nominal) interest rates on safe investments are balanced out by incurring greater risk. Furthermore, low interest rates increase asset prices and, in doing so, improve financial intermediaries' solvency. This makes it possible to take on additional risk.

Previous analyses on the search for yield focused mostly on shifts within a particular investment instrument.[6] For example, one area of research was whether banks are lending to higher-risk debtors or investors are buying bonds with poorer ratings. Furthermore, risk premium compression, i.e. a narrowing of the gap between the interest rates on risky and safe investments, was seen as a sign of a greater inclination to search for yield. The present article expands on this approach. It analyses the allocation of total financial assets between different investment instruments such as deposits, loans, debt securities or shares. Various economic sectors such as households, non-financial corporations and financial inter-

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1 See Obstfeld and Tesar (2015), Del Negro et al. (2019).
2 See, for example, Deutsche Bundesbank (2017a), Brand et al. (2018), and Rachel and Summers (2019). Economists at the Bank for International Settlements (BIS) additionally show that, in the long run, the type of monetary regime also has an effect on the interest rate level. For more information, see Borio et al. (2017).
3 The concept of the natural rate of interest has its origins in the work of Knut Wicksell. See Wicksell (1898).
4 See Deutsche Bundesbank (2017a) and Brand et al. (2018).
5 Raghuram Rajan coined the term "search for yield" in his speech at the Jackson Hole conference in 2005. For more information, see Rajan (2005).
6 Such analyses can be found, for example, in the latest Financial Stability Review of the Bundesbank for Germany and of the European Central Bank for the euro area. For more information, see Deutsche Bundesbank (2019) and European Central Bank (2019a).

mediaries are considered in this context. This article seeks to answer two questions. First, did sectoral portfolio composition in the euro area shift towards riskier investment instruments during the low interest period that began in around 2010? And second, to what extent did monetary policy contribute to this development?

In the following, shifts in sectoral portfolios in the euro area's private sector are first identified using data from the financial accounts. The influence of monetary policy on sectoral portfolio composition is then quantified by means of an econometric analysis. To conclude, the results are placed in the context of findings in the existing literature.

Changes in sectoral portfolio composition during the low interest rate period

Optimal portfolio involves weighing up risk versus return

As a general rule, investors can put their money into a variety of instruments. These differ in terms of their potential returns and the risk associated with the investment. Most of the time, higher-risk instruments will also generate higher returns. This provides compensation for the higher risk of investing in a particular instrument. Weighing up the two factors across all available investment instruments, each individual investor determines their optimal portfolio based on their preferences.[7] The portfolios aggregated across all individual investors within a sector produce the sectoral portfolio.

Analysis using financial accounts data

This article begins by describing the changes in the composition of portfolios at the sectoral level during the low interest rate period. This is based on data taken from the financial accounts. These statistics capture financial assets across all available financial instruments for all sectors within an economy.[8] This makes it possible to obtain a comprehensive and consistent overview of sectoral portfolio composition and its evolution over time.

Breakdown by holder sector and investment instrument

Domestic holders are broken down based on the definitions used in the European System of Accounts (ESA) 2010[9] into the following institutional sectors: non-financial corporations, credit institutions (including money market funds), investment funds, other financial intermediaries (e.g. financial vehicle corporations engaged in securitisation transactions and securities and derivatives dealers), insurance corporations and pension funds, and households (including non-profit institutions serving households).[10] At the instrument level, financial assets are broken down into the following components: deposits (including cash), debt securities, loans, equity (shares and other equity), investment fund shares, insurance claims and remaining assets (comprising financial derivatives, employee stock options and other accounts receivable).[11]

Conceptual considerations regarding risk classification

Lines drawn between three key risks

The various instruments can be classified by their level of risk. For the sake of simplicity, the analysis distinguishes between three (key) risks:

7 Markowitz (1952) and Tobin (1958) pioneered the framework for optimising the composition of an asset portfolio – known as portfolio theory. The capital asset pricing model (CAPM), developed by J. Treynor, W. F. Sharpe, J. Lintner and J. Mossin independently of one another in the 1960s, took portfolio theory one step further.
8 Non-financial assets, which include real estate assets and physical capital, are therefore not taken into account in this article.
9 The ESA defines the standards according to which macroeconomic and macrofinancial statistics in Europe are prepared. See https://ec.europa.eu/eurostat/documents/3859598/5925693/KS-02-13-269-EN.PDF/44cd9d01-bc64-40e5-bd40-d17df0c69334
10 Credit institutions correspond to the sector "deposit-taking corporations". The general government sector is not included in the analysis as its financial asset holdings are comparatively small and volatile. Also excluded from the analysis is the Eurosystem, as its investment decisions are motivated primarily by monetary policy. Credit institutions were not recorded separately in the financial accounts until the first quarter of 2015. Values up to the start of 1999 are estimated using data from the monthly balance sheet statistics (Balance Sheet Items – BSI) to allow for a long-term perspective.
11 Here, too, definitions are based on ESA 2010. Insurance claims correspond to the instrument "insurance, pension and standardised guaranteed schemes".

– Default risk: The risk of an investor losing the money they have invested (in some cases forever), e.g. if the borrower becomes insolvent.

– Liquidity risk: The risk of being unable to convert an asset into cash or transferable deposits quickly and/or without incurring high costs.

– Market risk: The risk of the investment's market value falling (temporarily) due to market price volatility. For this reason, it also comprises interest rate risk.

Deposits and insurance claims: lowest-risk asset class

Taking these risks as an evaluation benchmark and leaving aside the differences in the risk level of individual assets within the various instrument categories, deposits should be the safest of all the asset classes under analysis. Default risk is very low due to deposit protection and deposits' high ranking in the order of creditors. Additionally, deposits are subject to only low liquidity risk on account of their (mostly) short maturities. Finally, deposits are generally not exposed to market risk. Insurance claims should also entail very low default risk on account of the regulatory provisions in place for insurance corporations and pension funds. At the same time, this instrument is subject to medium market risk. While insurance claims are generally easy to liquidate, most of the time policyholders are forced to take a huge markdown. Liquidity risk should therefore be regarded as medium.

Loans and debt securities: medium risk

Debt instruments, i.e. assets in the form of debt securities and loans, are in the medium-risk category. As instruments with generally equal status in the order of creditors, they should both involve medium default risk. Given that debt securities are tradable, their liquidity risk is rather low. However, they are exposed to high market risk. By contrast, loans are not subject to market price volatility but do entail high liquidity risk.

Equity is junior in the creditor pecking order. As a result, it has the highest default risk of all the instruments considered here. In addition, dividend payments made to equity holders are variable and can also be cancelled altogether if profits are low. While the liquidity risk of listed shares tends to be on the low side, their valuation is exposed to market risk. By contrast, unlisted shares and other equity (unlisted equity) are subject to only limited market price volatility[12] but entail high liquidity risk. With regard to their risk profile, investment fund shares should rank somewhere between debt instruments and equity. The reason for this is that, on aggregate, investment funds invest primarily in these two asset classes.

Equity: riskiest asset class

In view of the mixed composition of the remaining assets category, it is not possible to clearly determine its risk profile. Changes in their significance will be assessed below as risk-neutral. All in all, the risk level increases if an asset portfolio's composition shifts from deposits and insurance claims to debt instruments, investment fund shares and/or equity (see the chart on p. 23).

Shift from deposits and insurance claims to securities increases portfolio risk level

It should be noted at this point that the following analysis examines only some of the possible changes in the risk level of the sectoral portfolio. First, the analysis addresses only those changes in the risk level of the portfolios that can be attributed to shifts between different instruments. However, the risk content of the total portfolio can also change in the event of adjustments at the individual investment instrument level. This would be the case if, for instance, bonds or equity issued by lower-risk debtors were replaced by instruments issued by higher-risk debtors (for more information, see the remarks on pp. 28 ff.). Second, portfolios' risk content can shift if there is a change in the creditworthiness of the parties issuing the in-

Analysis does not cover shifts within an investment instrument or changes in overall risk

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12 As neither of these instruments is traded on organised markets, they have de facto no market price and cannot be subject to volatility. However, their valuation is supposed to be generally in line with the market price movements of comparable tradable instruments.

Stylised topology of the risk level of various investment instruments*

	Deposits	Insurance claims	Debt securities	Loans	Investment fund shares	Equity	
						Listed	Unlisted
Default risk	Very low	Very low	Medium	Medium	High	Very high	Very high
Liquidity risk	Low	Medium	Low	High	Low	Low	High
Market risk	Very low	Medium	High	Low	High	High	Medium
Overall risk	Very low	Low	Medium	Medium	High	Very high	Very high

* Instruments as defined in ESA 2010. Deposits including cash. Insurance claims correspond to the instrument "insurance, pension and standardised guaranteed schemes".

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vestment instruments. This would be the case if, for instance, debtors became less solvent owing to an economic downturn. As neither of these factors can be captured using financial accounts data, they are not the main focus of this analysis.

Portfolio shifts in the low interest rate period

Change in the risk inherent in sectoral portfolios during the low interest rate period

Changes in the portfolio composition of the individual sectors during the low interest rate period act as an indicator of changes in the risk inherent in the sectoral portfolios in the euro area. For the purposes of the following analyses, this period is defined as lasting from the beginning of 2010 to the third quarter of 2019 (latest available data). The portfolio shares discussed below represent the ratio of the instrument in question, valued at market prices, to total financial assets. The sum of all portfolio shares adds up to 100%.

Distinction between transaction-related and valuation-related portfolio shifts

Changes in the portfolio shares are additionally further subdivided into two components. Transaction-related portfolio shifts are the result of buying and selling and/or redemptions of investment instruments. This means that, for the most part, investors influence these changes directly. Valuation-related portfolio

shifts are the result of instruments' market price volatility. These changes occur because the market prices of individual instruments develop differently, and are largely outside of individual investors' control.[13]

The chart on p. 24 shows the changes in the sectoral portfolio shares for the individual instruments in market prices ("Total") and the contributions of transaction-related ("Transactions") and valuation-related ("Valuation effects") portfolio shifts. Looking at households, the portfolio shifted away from debt securities towards insurance claims over the period under observation. The changes were primarily driven by transactions. Deposits as a percentage of total portfolio assets remained virtually unchanged, with the noticeable drop in weight as a result of relative market price losses roughly balanced out by transaction-related portfolio rebalancing. Overall, households' portfolio

Households: reduced risk as debt securities were replaced by insurance claims
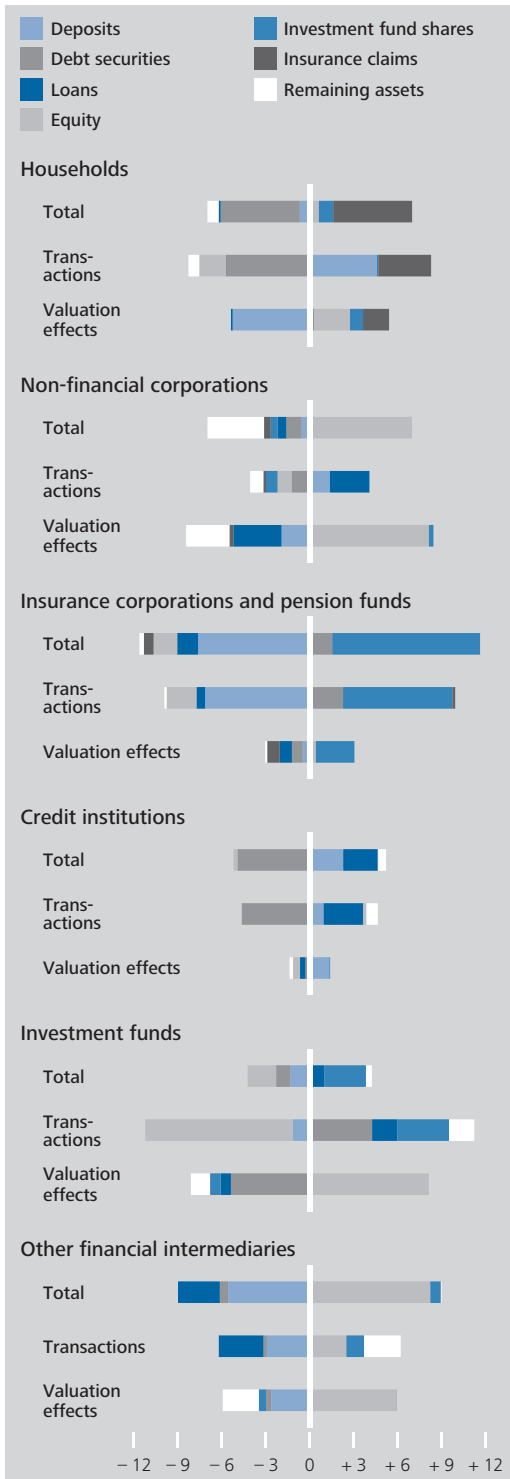
13 The transaction-related portfolio shifts are calculated as changes in portfolio share relative to book value. The latter is approximated by extrapolating initial stocks to include transactions. Valuation-related portfolio shifts are then defined as the difference between the change in portfolio shares (at market prices) and the changes in portfolio shares at book values (transaction-related portfolio shifts). Besides market price volatility, other factors, such as statistical reclassifications or write-downs, can also result in valuation-related portfolio shifts. However, these are usually so small that the simplifying assumption is made that valuation-related portfolio shifts are the result of market price volatility alone.

Sectoral portfolio shares in the euro area*

Percentage point changes between Q1 2010 and Q3 2019

Legend:
- Deposits
- Debt securities
- Loans
- Equity
- Investment fund shares
- Insurance claims
- Remaining assets

Households
- Total
- Trans-actions
- Valuation effects

Non-financial corporations
- Total
- Trans-actions
- Valuation effects

Insurance corporations and pension funds
- Total
- Trans-actions
- Valuation effects

Credit institutions
- Total
- Trans-actions
- Valuation effects

Investment funds
- Total
- Trans-actions
- Valuation effects

Other financial intermediaries
- Total
- Transactions
- Valuation effects

− 12 − 9 − 6 − 3 0 + 3 + 6 + 9 + 12

Sources: ECB and Bundesbank calculations. * Sectors and instruments as defined in ESA 2010. Households including non-profit institutions serving households. Credit institutions correspond to deposit-taking corporations and include money market funds. Deposits including cash. Insurance claims correspond to the instrument "insurance, pension and standardised guaranteed schemes". Remaining assets comprise the instruments "financial derivatives and employee stock options" and "other accounts receivable".

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composition thus shifted towards lower-risk instruments.

Equity has become a lot more prominent in the portfolio of non-financial corporations. This development was driven, first and foremost, by valuation-related portfolio shifts as a result of relative changes in market prices. By contrast, there was a drop, especially in the percentage of remaining assets, which, for the corporate sector, comprise mainly trade credits and advances. There was likewise a decline in the portfolio share of loans, in particular, loans to other non-financial corporations. This was the result of relative valuation losses, which more than offset the positive effect of transaction-related rebalancing. Given that the rise in the significance of equity is likely attributable especially to strategic equity investments, which are matched by valuation gains on net worth on the liabilities side, the portfolio shifts are likely to be risk-neutral overall.

Non-financial corporations: risk content largely unchanged

As regards insurance corporations and pension funds, investment fund shares as a percentage of the portfolio rose markedly. In addition, the weight of debt securities increased slightly. The significance of deposits, meanwhile, fell sharply. Equity lost some weight. Looking at the big picture, it is therefore clear that portfolio composition has shifted towards riskier instruments, with the changes virtually exclusively the result of transaction-related portfolio rebalancing. There were noteworthy valuation gains only for investment fund shares.

Insurance corporations and pension funds: higher risk as deposits were replaced by investment fund shares

Among credit institutions, portfolio composition shifted away from debt securities towards deposits with other monetary financial institutions and loans. This was almost entirely the result of transaction-related portfolio rebalancing. The drop in the significance of debt securities can be explained, in particular, by sales of government securities to the Eurosystem under the expanded asset purchase programme (APP). Acting in the opposite direction, there was a clear rise in the weight of loans to the private non-financial sector in the euro area,

Credit institutions: risk slightly reduced as debt securities were replaced by deposits

# Eurosystem asset purchases and euro area portfolio duration by investor group

One key transmission channel of the Eurosystem's expanded asset purchase programme (APP) is the portfolio rebalancing channel.[1] The way it works is that Eurosystem asset purchases induce portfolio rebalancing by market participants, which in turn impacts on asset prices and yields. Two factors are cited in the literature as determinants for price movements: the scarcity effect and the duration effect.

Scarcity effects occur when the central bank purchases a specific bond and market participants' demand for this specific bond does not decrease in equal measure owing to preferences or regulatory provisions. This raises the bond's price and reduces its yield. Empirical studies indicate that these scarcity effects tend to be temporary because certain market participants offset these relative price effects over time using arbitrage activities.[2]

Duration effects are quantitatively more important for the impact of monetary policy asset purchases.[3] Duration generally describes the length of time for which capital is tied up in a fixed income asset. The longer the capital is tied up, the more sensitive the price of a bond is to a change in market interest rates. Duration is therefore a measure of a bond's market risk as a result of a change in interest rates. By buying bonds from the other investors, the central bank extracts duration from the market, as it purchases longer-term instruments using short-term central bank money. This reduces the amount of duration and thus the aggregate duration risk held by non-central bank investors. Investors are then usually willing to accept a yield discount in terms of a falling term premium. This effect is evident across the entire term structure, i.e. for bonds of all residual maturities. However, it intensifies at the long end of the curve since the prices of longer-dated bonds are more sensitive to changes in market interest rates, owing to

Sectoral amount of duration in the euro area*
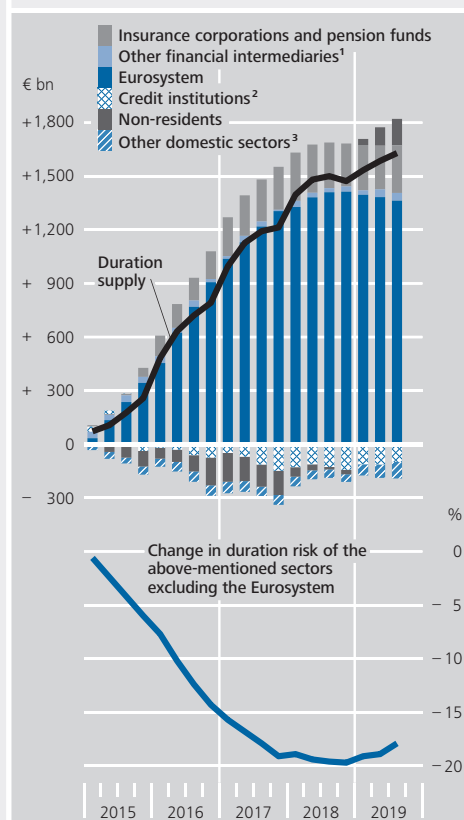
Sources: ECB and Bundesbank calculations. ***** Based on 10-year equivalents of bonds purchased under the public sector purchase programme (PSPP). Sectors as defined in ESA 2010. Eurosystem corresponds to the sector "central bank". **1** Including investment funds. **2** Correspond to deposit-taking corporations and include money market funds. **3** Households including non-profit institutions serving households and non-financial corporations.

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1 For an overview of the various transmission channels of non-standard monetary policy measures, see Deutsche Bundesbank (2016).
2 For more on this, see D'Amico and King (2013), De Santis and Holm-Hadulla (2020) and Schlepper et al. (2017).
3 See Li and Wei (2013) as well as Eser et al. (2019).

PSPP duration in the euro area by investor group*

%

	Q4 2014	Q4 2017	Q3 2019
Eurosystem	0.0	20.9	20.5
Credit institutions	18.0	12.4	12.4
Other financial intermediaries	13.3	10.7	10.6
Insurance corporations and pension funds	30.1	27.9	26.6
Other domestic sectors	7.7	5.3	4.4
Non-residents	30.9	22.8	25.6
Total	100.0	100.0	100.0

Sources: SHS and Bundesbank calculations. * Based on 10-year equivalents. Sectors defined as in ESA 2010. Eurosystem corresponds to the sector "central bank". Other financial intermediaries including investment funds, credit institutions correspond to deposit-taking corporations and include money market funds. Other domestic sectors comprises households including non-profit organisations serving households and non-financial corporations.

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the longer capital tie-up period, which means that interest rate risk is typically greater.

The analysis below quantifies the impact of the Eurosystem's monetary policy asset purchases on the trend path of the aggregate duration risk held by non-Eurosystem investors. The study focuses on the public sector purchase programme (PSPP).[4] The calculations are based on the granular European Securities Holdings Statistics by Sector (SHSS) and on information on the Eurosystem's securities holdings. Holder sectors are defined as follows: Eurosystem and non-Eurosystem investors, i.e. credit institutions (which correspond to deposit-taking corporations and include money market funds), other financial intermediaries (including investment funds), insurance corporations and pension funds, other domestic sectors and non-residents.

The chart on p. 25 shows developments in overall aggregate duration from the first quarter of 2015 (when the PSPP began) to the third quarter of 2019. The adjacent table shows the respective shares held by the various groups of investors.[5] Domestic insurance corporations and pension funds, along with non-residents, each accounting for just over 30%, were the two largest holders of outstanding aggregate duration risk immediately prior to the launch of PSPP net purchases. With the launch of PSPP net purchases, the Eurosystem continuously expanded its share of the amount of duration. This was mirrored by reductions in shares of outstanding aggregate duration by all other investors, particularly domestic credit institutions and, above all, non-residents up to end-2017.[6]

Across the observation period, insurance corporations and pension funds continued to increase their amount of duration, possibly to meet regulatory provisions. However, their share of total outstanding aggregate duration risk dropped by 3.5 percentage points by end-2019. The rise of duration risk in this sector's portfolio thus failed to match the increase in the aggregate outstanding amount of duration, which rose continuously owing, above all, to net new issuance by euro area governments. On the whole, the Eurosystem has raised its share of aggregate duration risk by around 20 percentage points since 2015.[7]

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4 Just over 83% of all net APP purchases were conducted under the PSPP by end-2019. In order to reduce computational complexity, this analysis ignores the other programmes (ABSPP, CSPP, CBPP3). In addition, for simplicity the broadest possible definition of securities potentially eligible for the PSPP is used. What this specifically means is that all euro-denominated bonds of current PSPP issuers with a residual maturity of between 1 and 31 years is taken into account. This factors out, for instance, structural breaks caused by changes in the PSPP parameters over time.
5 On a security-by-security basis, duration is approximated in the form of what are known as ten-year equivalents by multiplying the bond's nominal value by its residual maturity (in years) and scaling it by a factor of 1/10. For more on this, see Eser et al. (2019).
6 For a detailed analysis of developments in the holder structure of German Bunds, see Deutsche Bundesbank (2018b).
**7** For more on this topic, see also Lane (2019).

What is the relationship between the Eurosystem's duration extraction and the decline in yields of different residual maturities in the euro area? To answer this question, changes in term premiums derived from a term structure model are regressed on changes in a measure of duration held by non-Eurosystem investors. In this way, the decline in term premiums that is explained by duration extraction can be determined. The duration measure comprises not only ongoing aggregate duration risk but also projected duration risk held by non-Eurosystem investors. Theoretically, the entire projected trend path of duration risk across the maturity of a bond is relevant to the pricing of assets.[8]

The above chart shows how strongly the APP asset purchases have contributed to compressing term premiums and thus euro area interest rates over time.[9] The impact is clearly larger for interest rates with longer maturities than that for interest rates with shorter maturities. The estimates indicate that the ten-year (two-year) OIS interest rate as at end-2019 was around 60 (10) basis points lower compared to a scenario in which the Eurosystem had not bought bonds under the APP. These findings are consistent with other studies which use alternative methods to quantify the effect of the APP on the euro area yield curve.[10]

In closing, it must be noted that the results presented here are subject to considerable uncertainty. In addition to the assumptions that had to be made for calculating the projected duration measure, the statistical estimation uncertainty of the impact on the decline in interest rates is quite high. Furthermore, the results can vary depending on the choice of the underlying yield curve. Consequently, the effects on OIS interest rates calculated here are likely to be smaller compared to the effects on government

**Contribution of bond purchases*
to decline in OIS interest rates
in the euro area**

Overall effect in basis points
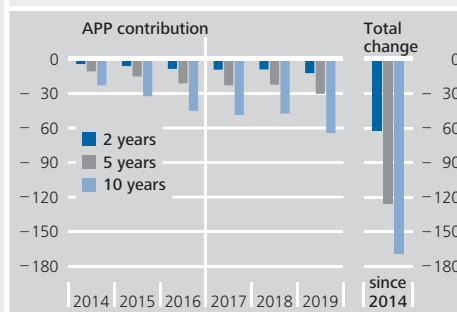
Sources: Bloomberg, ECB and Bundesbank calculations. * Under the Eurosystem's expanded asset purchase programme (APP).

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bond yields, amongst other things because the APP causes additional scarcity effects in relation to high-quality government bonds.[11]

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8 Regarding the approach to choosing the reference data and making assumptions about the projected duration pattern, the estimates follow Eser et al. (2019) closely. These authors analyse the effects within a dynamic term structure model into which the duration measure feeds directly. In this box, on the other hand, the change in the duration measure is regressed directly on term premiums calculated from the zero lower bound model developed by Geiger and Schupp (2018).
9 The empirical studies are based on overnight index swap (OIS) interest rates. For more on the arguments in favour of recourse to OIS interest rates as part of monetary policy analyses, see Deutsche Bundesbank (2017b).
10 See Altavilla et al. (2019), Eser et al. (2019), Lane (2019) and Rostagno et al. (2019).
11 See Deutsche Bundesbank (2018b) and Lane (2019).

and excess liquidity held with the Eurosystem increased. Overall, portfolio composition has consequently shifted slightly towards less risky instruments (for more on risk reduction, see also the box on pp. 25 to 27).

Investment funds: risk roughly unchanged

The portfolio of investment funds shifted from (directly held) equity and debt securities towards investment fund shares. The latter, in turn, represent indirect claims on a portfolio which consists, in particular, of debt securities and equity, as well as real estate. Looking at debt securities and equity, transaction-related and valuation-related portfolio shifts acted in opposite directions. The weight of equity rose very sharply as a result of changes in relative market prices. However, transaction-related changes reduced this instrument's portfolio share by an even greater margin. All other things being equal, transactions expanded debt securities' portfolio share. Nonetheless, their portfolio share fell, as this asset class lost a lot of weight owing to relative market price changes. By contrast, the change in the significance of investment fund shares was almost entirely the result of transaction-related portfolio rebalancing. Overall, the risk inherent in portfolio composition is probably roughly unchanged.

Other financial intermediaries: increased risk as deposits and loans were replaced by equity

Looking at other financial intermediaries, the portfolio shifted from deposits and loans towards equity. As a result, portfolio composition has moved perceptibly towards more risky instruments. Unlike for investment funds, transaction-related and valuation-related portfolio shifts pointed in the same direction, in most cases. For instance, the percentage of equity rose, not only as a result of marked valuation gains, but also due to transaction-related portfolio rebalancing. The significance of deposits fell, as their relative market value declined, and they were, furthermore, offloaded as a result of transaction-related portfolio shifts. Regarding loans, valuation-related portfolio shifts had virtually no impact, whereas transaction-related restructuring reduced their portfolio weight.

Mixed developments in sectoral risk

All in all, developments in portfolio composition were mixed across the sectors under observation. A shift towards more risky instruments is evident for insurance corporations and pension funds as well as for other financial intermediaries. In both sectors, the focus shifted from low-risk bank deposits to securities. By contrast, the portfolios of credit institutions and, in particular, households moved towards less risky instruments. Both sectors saw a drop in the importance of debt securities. Within the household portfolio, the weight of comparatively low-risk claims on insurance corporations and pension funds rose considerably. Among credit institutions, the significance of risk-free deposits with the Eurosystem rose. The changes in the portfolio composition of investment funds and non-financial corporations are roughly risk-neutral. One reason why developments are working in opposite directions, in some instances, is that buying and selling meant that assets were exchanged between sectors.

Shifts within the securities portfolio

Supplementary analysis of shifts within the securities portfolio …

As indicated above, the shifts between the various investment instruments cover only one aspect of portfolios' risk content. In order to supplement the above analysis and existing work,[14] shifts within selected categories of the instruments under observation will be described below. More granular data are needed to document such changes than those provided by the financial accounts. However, such data are available only for a small number of instruments. One suitable source of data for this analysis purpose is the Securities Holdings Statistics by Sector (SHSS). The SHSS list, for every sector and on a security-by-security basis, information on all securities held by euro area residents. Securities held in custody outside of the euro area are, by contrast, only covered for selected holder sectors. At the instrument level,

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14 See European Central Bank (2019a, 2019b).

the statistics cover listed shares – a fraction of equity – and debt securities.[15]

… in the period since the APP was announced

The following analyses are limited to comparing the portfolios as at the fourth quarter of 2014 with those as at the third quarter of 2019 (latest available data). The first point in time is the point as of which reliable data are available in the SHSS. It is also the last data point before the APP was announced. The calculations are always based on the volume-weighted aggregation of individual securities at market prices. As a result, transaction-related and valuation-related portfolio changes are shown as a whole. The sectoral securities portfolios are examined in relation to two dimensions:

– Issue currency: a distinction is made between securities denominated in euro, US dollars, the currencies of the other advanced economies[16] and the currencies of emerging and developing economies (rest of the world). A shift away from euro-denominated securities towards shares and debt securities denominated in foreign currency, especially the currencies of emerging and developing economies, generates exchange rate risk and consequently raises the riskiness of the securities portfolio, all other things being equal.

– Average maturity of the portfolio of debt securities:[17] If the portfolio has a longer maturity, interest rate risk is higher, which also means that the portfolio of debt securities involves greater risk.

Developments in portfolio composition for listed shares mixed

The above chart summarises the results broken down by issue currency. Developments in the portfolio composition of listed shares were fairly mixed across all sectors. The percentage of shares denominated in euro fell slightly for investment funds; it came down perceptibly for households and very sharply for insurance corporations and pension funds. For investment funds, the significance of shares denominated in the currencies of the other advanced economies and emerging and developing econ-

Portfolio shares of securities, by currency*

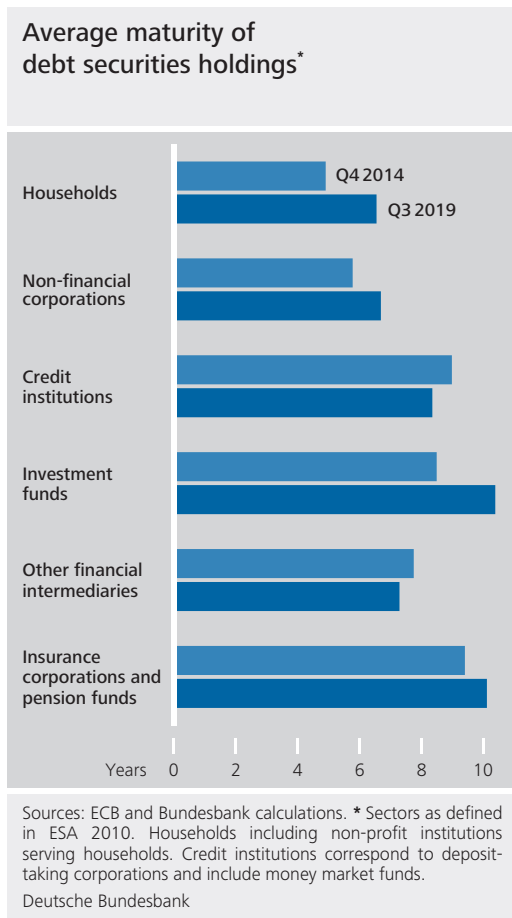Percentage point changes between Q4 2014 and Q3 2019
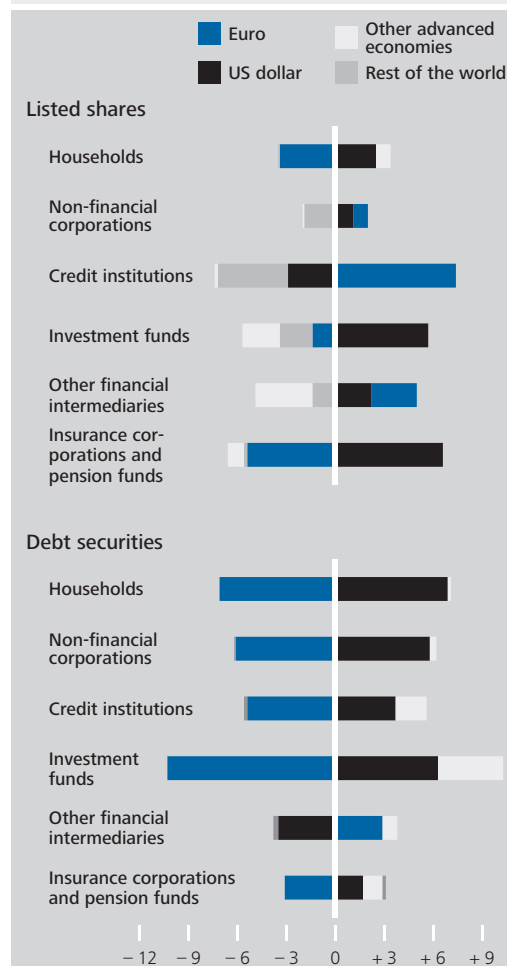
Sources: ECB and Bundesbank calculations. ***** Sectors as defined in ESA 2010. Households including non-profit institutions serving households. Credit institutions correspond to deposit-taking corporations and include money market funds.

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omies also fell noticeably. Conversely, the portfolio share of shares denominated in US dollars

15 In principle, the SHSS also include information on the investment fund shares or units held by institutional sectors. As these are almost exclusively issued by euro area issuers and denominated in euro, an analysis provides little information. In addition, investment fund shares are ultimately indirect investments in a securities portfolio which is observed in the form of the assets side of the investment fund. There is currently no euro area-wide database available for credit institutions' lending.

16 Following the classification of the International Monetary Fund, which can be accessed at: https://www.imf.org/external/pubs/ft/weo/2019/01/weodata/groups.htm

17 Averaged across all sectors, data on maturity are available for just roughly 70% of the overall market value captured. The following analysis is therefore subject to the proviso that securities for which information on maturity is available are representative of the portfolio of debt securities as a whole.

**Average maturity of
debt securities holdings***

Sources: ECB and Bundesbank calculations. ***** Sectors as defined in ESA 2010. Households including non-profit institutions serving households. Credit institutions correspond to deposit-taking corporations and include money market funds.

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the same time, the percentage of bonds by euro area issuers fell, while the significance of debtors from the United States and other advanced economies rose. These developments suggest that debtors resident in the United States and the other advanced economies issued large volumes of euro-denominated bonds. Among households and investment funds, a fairly significant percentage of the growth in US dollar-denominated bonds can be attributed to debtors in emerging and developing economies.

Mixed develop-ments in aver-age maturity of debt securities

The average maturity of the portfolio of debt securities rose markedly for investment funds and households (see the adjacent chart). Among non-financial corporations and insurance corporations and pension funds, the rise was only small. By contrast, average maturity fell for credit institutions and other financial intermediaries.

Risk content of the securities portfolio of insurance cor-porations and pension funds as well as invest-ment funds up slightly

All in all, the risk content of the securities portfolios held by insurance corporations and pension funds as well as those of investment funds is likely to have risen somewhat (see the box on pp. 31 to 33 for a detailed analysis of investment funds' investment patterns).[18] This is suggested mainly by the higher average maturity of debt securities and the associated interest rate risk.[19] Another factor that may have increased the riskiness of the portfolio is the greater focus on shares denominated in foreign currency and debt securities issued by debtors outside of the euro area. However, the resulting exchange rate risk can, in principle, be hedged. In addition, the higher borrower risk as a result of a greater weight of bonds issued by emerging markets and developing countries has to be weighed up against the advantages

rose for these sectors. Among credit institutions and other financial intermediaries, by contrast, euro-denominated securities gained weight significantly. Looking at other financial intermediaries, US dollar-denominated shares also saw perceptible growth. Meanwhile, the significance of paper denominated in the currencies of the other advanced economies fell distinctly. Among credit institutions, in return, the weight of shares from the three other currency blocs rose by roughly the same volume. There were no major shifts in the portfolios of non-financial corporations.

Shift from euro-denominated debt securities to paper denominated in US dollars and the currencies of the other advanced economies

Looking at debt securities, a shift in portfolio shares away from euro-denominated bonds towards paper issued in US dollars or in the currencies of the other advanced economies is in evidence across virtually all sectors. Other financial intermediaries are the sole exception. Here, the significance of euro-denominated debt securities rose perceptibly, while the portfolio share of US dollar bonds fell noticeably. At

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18 The European Central Bank's Financial Stability Review comes to a similar conclusion. In addition, it identifies a shift in the portfolios of investment funds as well as insurance corporations and pension funds towards less liquid bonds with worse ratings. See European Central Bank (2019a), Chapter 4.
19 As the liabilities of insurance corporations and pension funds are very long term, this is not associated with elevated maturity transformation risk.

Procyclical behaviour of institutional investment funds[1]

Institutional funds manage the assets of a small number of institutional investors, usually smaller banks and insurers, but also pension funds, foundations and churches. In Germany, institutional funds are set up as specialised funds. These differ from retail funds in that they are only open to experienced (institutional) investors, often have more flexible investment mandates and prescribe longer redemption notice periods for fund shares. Institutional funds account for the bulk of German investment funds and, in February 2020, managed 78% of their total investment volume.

Institutional funds' search for yield

An evaluation of German institutional bond funds and mixed funds with investments in euro-denominated bonds shows that these funds significantly increased the level of risk in their bond portfolios between November 2009 and June 2017, the period under observation.[2] The average bond credit rating went down by two rating grades, from AA+ to AA- (S&P scale). At the same time, average duration as a measure of interest rate risk increased by just under one year. The period under observation was shaped by falling and negative interest rates as well as declining risk premia. It is therefore reasonable to assume that the rise in risk-taking was driven by a search for yield in the context of falling interest rates.

In order to separate the intentional increase in portfolio risk from pure valuation effects, the search for yield is measured by the change in the total portfolio return as a result of active portfolio reallocations from one month to the next. Using this measure, a transaction-related increase in the total portfolio return is equated with an intensified search for yield. According to this measure, the search for yield was especially pronounced in the period from 2012 to 2015, during which the majority of funds increased the level of risk in their portfolios (see the adjacent chart).

Regression analyses show that this measure of the search for yield increases when the interest rate level decreases.[3] If the interest rate on bonds held for interest rate risk incurred falls by 1 percentage point, institutional funds purchase bonds in the follow-

1 Findings are based on the research paper by Barbu, Fricke and Mönch (2020).
2 This evaluation is based on data on specialised funds from the Bundesbank's investment funds statistics for the period from November 2009 to June 2017. The study focuses on bond funds and mixed funds with investments in bonds in order to be able to make representative statements about institutional funds' search for yield in the bond market. Funds with different investment priorities, such as equity funds or real estate funds, whose primary focus is not on bonds, are explicitly excluded from this analysis. For more details, see Barbu, Fricke and Mönch (2020).
3 The interest rate level and bond prices have an inverse relationship. Procyclicality is based on price developments, meaning that there is also an inverse relationship between the search for yield and the interest rate level.

Search for yield*
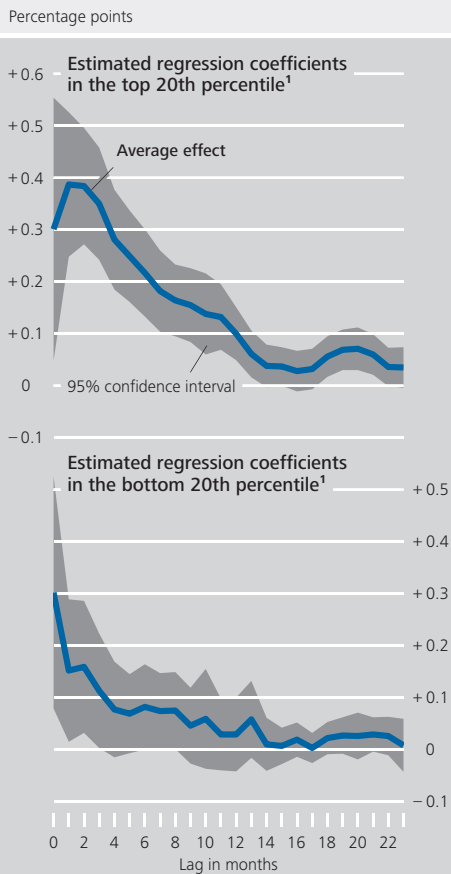
Basis points
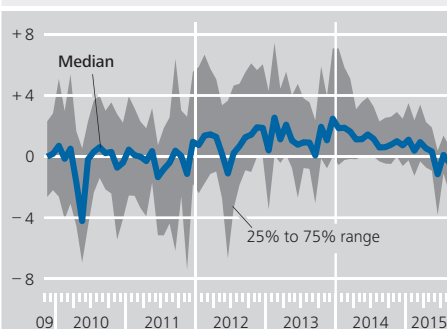
Source: Investment funds statistics and Bundesbank calculations. ***** Month-on-month change in the total portfolio return as a result of active portfolio reallocations. Distribution across all funds under observation. Outliers below the 5th percentile and above the 95th percentile were not taken into account.

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Demand effect on excess returns depending on the intensity of the search for yield*

Percentage points

Estimated regression coefficients in the top 20th percentile[1]

Average effect

95% confidence interval

Estimated regression coefficients in the bottom 20th percentile[1]

Lag in months

Sources: Investment funds statistics, securities holdings statistics and Bundesbank calculations. * Estimated using regressions of excess returns on net purchases by institutional funds from the same month and the preceding 24 months. **1** Top (bottom) 20th percentile of the distribution of the search for yield.

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ing month with yields that are, on average, 42 basis points higher. Following an equivalent change in credit risk, funds invest in bonds with yields that are 16 basis points higher.

The investment behaviour of the funds under observation is therefore procyclical. On average, the funds increase their share of riskier bonds when their prices rise and reduce their share of riskier bonds when their prices fall.

Interest rate volatility attributable to the search for yield

Such procyclical behaviour can theoretically lead to increased interest rate volatility.[4] For an empirical analysis of this effect, excess returns in the bond market are analysed. Excess returns are defined here as the difference between the percentage change of a bond price over one month and the one-month risk-free interest rate.

Using granular data on securities from the securities holdings statistics, this effect can be examined empirically. To this end, the monthly excess returns of all European corporate and government bonds are regressed on the net purchases of these bonds by German institutional funds in the previous month. This involves controlling for the corresponding net purchases by other sectors, such as credit institutions, insurers and pension funds. The regression analysis shows that institutional funds have a strong influence on the excess returns of bonds, particularly those bonds with lower ratings or longer maturities that are in higher demand among funds. The effect is stronger and more persistent for bonds that are sought after by funds with particularly aggressive portfolio adjustments. For funds in the top quantile of the distribution of the search for yield over the past six months, the impact on the excess return declines slowly over a period of 12 months (see the chart above, upper panel). By contrast, for funds in the bottom quantile, in which securities sales are the dominant force, there is no demonstrable effect after three to four months (see the chart above, lower panel).

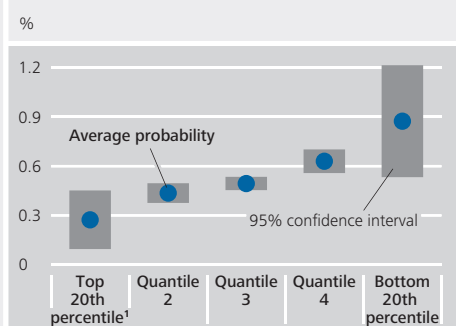**4** For more information, see Coval and Stafford (2007) and Guerrieri and Kondor (2012).

Incentives in the fund sector promote the search for yield

Given their stable liabilities compared with retail funds, the procyclicality of institutional funds' investment behaviour initially seems puzzling. This behaviour can, however, be empirically attributed to implicit incentives for fund managers and explicit yield targets.

Implicit incentives for a risky investment strategy arise when investors penalise a less risky investment strategy.[5] Institutional funds with a comparatively low search for yield within the sector, are, at 0.84% per month, three times as likely to have their mandate terminated by investors than funds which search the most aggressively for yield (0.27%) (see the chart above). This effect reverses, however, in times of increased financial market stress and correspondingly higher risk aversion among fund investors, who then increasingly terminate their investment mandates with the funds which were previously operating comparatively aggressively.

Explicit yield targets for fund managers also fuel the search for yield, particularly in a negative interest rate environment. Such targets are in place, inter alia, for funds which offer a guaranteed return on the capital supplied by investors. Correspondingly, the portfolios of guarantee funds are less risky compared with the portfolios of other specialised funds, since guarantee funds try to use their investments to eliminate losses for their investors. However, negative interest rates pose a challenge for guarantee funds in terms of being able to honour their guarantees. Investment strategies therefore have to be adjusted in some cases to be able to ensure value retention or asset appreciation. It can be demonstrated empirically that guarantee funds, in comparison with specialised funds, are

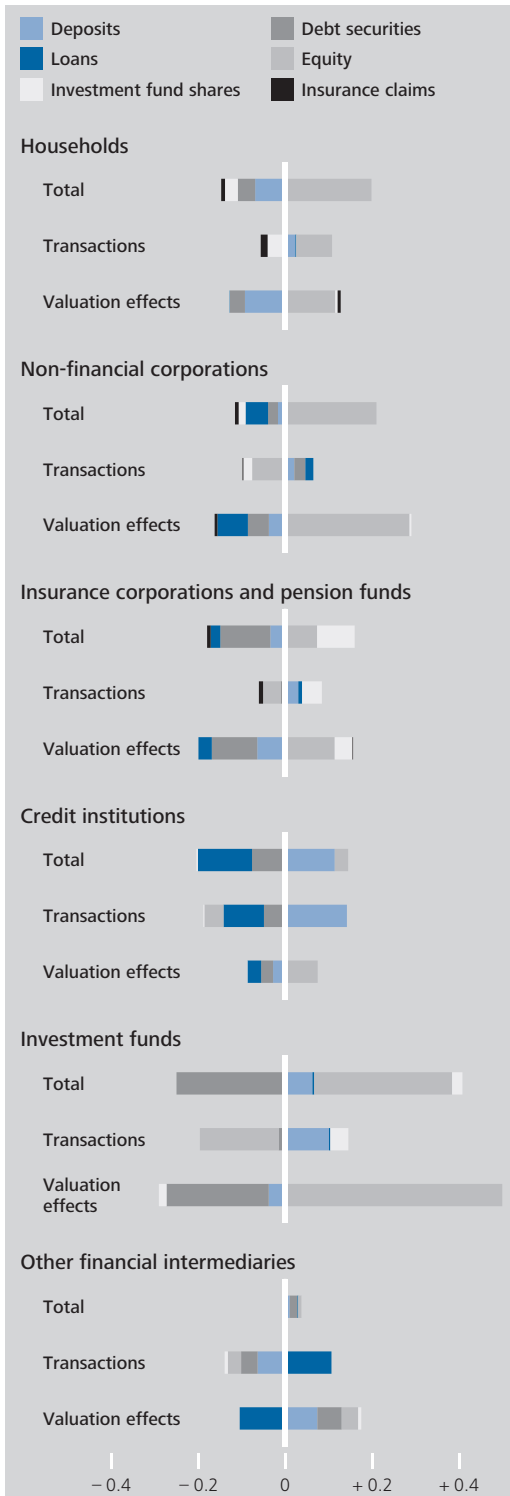**Monthly probability of mandate termination depending on the search for yield**

%

Average probability

95% confidence interval

Top 20th percentile[1] / Quantile 2 / Quantile 3 / Quantile 4 / Bottom 20th percentile

Source: Investment funds statistics and Bundesbank calculations. **1** The funds were subdivided into five evenly distributed quantiles according to the average intensity of their search for yield over the preceding six months.
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much more inclined to search for yield as the share of negative-yield bonds in their portfolios increases.

5 For more information, see Guerrieri and Kondor (2012).

Portfolio shifts as a result of an expansionary monetary policy shock*

Percentage points

Legend:
- Deposits
- Loans
- Investment fund shares
- Debt securities
- Equity
- Insurance claims

Households
- Total
- Transactions
- Valuation effects

Non-financial corporations
- Total
- Transactions
- Valuation effects

Insurance corporations and pension funds
- Total
- Transactions
- Valuation effects

Credit institutions
- Total
- Transactions
- Valuation effects

Investment funds
- Total
- Transactions
- Valuation effects

Other financial intermediaries
- Total
- Transactions
- Valuation effects

−0.4   −0.2   0   +0.2   +0.4

Sources: ECB and Bundesbank calculations. * Cumulative results after one year calculated using local projections as in Jorda (2005). Sectors and instruments as defined in ESA 2010. Households including non-profit institutions serving households. Credit institutions correspond to deposit-taking corporations and include money market funds. Deposits including cash. Insurance claims correspond to the instrument "insurance, pension and standardised guaranteed schemes".

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afforded by greater risk diversification. For households and non-financial corporations, this development is visible in slightly weaker form. However, securities make up only a small percentage of total financial assets in these two sectors. As a result, the changes have little impact on the riskiness of the portfolio as a whole. The risk content of the securities portfolio as a whole is likely to have remained roughly constant for credit institutions and other financial intermediaries.

The influence of monetary policy on sectoral portfolio composition

One hypothesis repeatedly expressed in public discourse is that it is monetary policy that is primarily responsible for low interest rates, thereby forcing investors to take on greater risks. Building on the descriptive overview in the previous chapter, this section will analyse that hypothesis on the basis of two questions: first, how does an exogenous change in the monetary policy stance (monetary policy shock) influence sectoral portfolio composition in the euro area in general? Second, to what extent has monetary policy contributed to the changes in investment portfolios documented above? For the following assessment, it should be noted that the estimates analyse solely the extent to which unexpected changes in the monetary policy stance influence portfolio composition. By contrast, if the Eurosystem implements measures to respond to economic developments or to a structural decline in the interest rate level, then these effects are not attributed to monetary policy. The box on pp. 35 to 37 provides a detailed description of the econometric approach used to derive the results.

Public discourse often holds monetary policy responsible for low interest rates

The adjacent chart shows the changes in the portfolio shares of various financial instruments cumulated over one year in each individual sector as a result of a standardised expansionary

Empirical approach for quantifying the effects of monetary policy shocks on sectoral portfolio composition

Measuring the causal influence of monetary policy on portfolio composition requires identification of exogenous changes in the monetary policy stance. These are defined as changes in the monetary policy stance that market participants were not expecting, referred to as monetary policy shocks. These are distinct from changes in the monetary policy stance in response to past, present or expected developments that market participants were already anticipating. Only in the first case would monetary policy actually be at the root of any corresponding portfolio responses. In the second case, the cause would instead lie in the changing economic setting, to which monetary policy systematically responds within the framework of its monetary policy reaction function.

In keeping with the literature, our identification of monetary policy shocks is based on high-frequency financial market data.[1] This involves measuring changes in market rates surrounding what is known as an event window.[2] Specifically, we are looking at the period from shortly before publication of the press release on monetary policy decisions to just after the press conference following the meetings of the ECB Governing Council. This is in line with the bounds defined in the approach taken by Altavilla et al. (2019). The underlying identification assumption is that all interest rate changes occurring within this selected event window are attributable to unexpected monetary policy-related announcements. These rate changes are then used as external instrumental variables in the econometric estimations. This enables us to identify changes in the monetary policy stance as a result of an exogenous monetary policy shock. The short-term shadow rate of Gei-

ger and Schupp (2018) serves as a composite indicator for the monetary policy stance. Since the shadow rate combines information on short-term and long-term interest rate movements, it responds to both standard and non-standard monetary policy measures, provided these are reflected in the yield curve. This allows, for example, for account to be taken of the fact that the non-standard monetary policy measures implemented in recent years impacted the long end of the yield curve in particular.

In concrete terms, we estimate the influence of monetary policy on portfolio allocation using local projections as propounded by Jordà (2005) with instrumental variables (LP-IV).[3] In the first step, the shadow rate is regressed on the previously identified monetary policy shocks.[4] The estimation results are then used to calculate predicted values for the shadow rate.[5] These forecasts depict the changes in the shadow rate that can be ascribed purely to monetary policy shocks. The second step uses these forecasts to

[1] See Gürkaynak et al. (2005) and Gertler and Karadi (2015).
[2] The Euro Area Monetary Policy Event Database serves as our data basis here. For more information, see Altavilla et al. (2019).
[3] Current analyses that apply this method include, for example, Ramey and Zubairy (2018) and Jordà et al. (2019).
[4] The shock time series is identified analogously to the split-sample method of Swanson (2017). Up to the end of 2013, unexpected changes in the one-year OIS rate around the time of monetary policy meetings are defined as monetary policy shocks. From 2014 onwards, however, reference is made to unexpected changes in the ten-year OIS rate. This accounts for the non-standard monetary policy measures, which affect the long end of the yield curve in particular. For a similar approach, see, for example, Tillmann (2019). The interest rate changes are drawn from the database of Altavilla et al. (2019).
[5] Applying the test of Olea and Pflueger (2013), the effective F-statistics of the estimations in the first step all exceed their critical value. The null hypothesis regarding weak instruments can thus be rejected in each case.

construct what are known as local projections for the sectoral portfolio shares of individual investment instruments. This involves estimating a series of equations in which the changes in the sectoral portfolio shares of the various specific financial instruments are regressed on the estimated shadow rate values. These equations are calculated for different lags in the shadow rate in comparison with the dependent variables. The function of the shadow rate's regression coefficients for each lag calculated in this way then corresponds to the response of the particular sectoral portfolio share to the monetary policy shock for the response horizon in question. It can be interpreted as the impulse-response function of the dependent variables in reaction to the monetary policy shock. Data taken from the financial accounts serve as the basis here. As a general rule, monthly data is used. Where these are unavailable, quarterly values are linearly interpolated. Separate estimations are carried out for each of the following sectors and instruments:[6]

– sectors: non-financial corporations, credit institutions (including money market funds), investment funds, other financial intermediaries, insurance corporations and pension funds, households (including non-profit institutions serving households);[7]

– instruments: deposits, debt securities, loans, equity, investment fund shares, insurance claims.[8]

As in the approach to the descriptive documentation of developments, a distinction is drawn between portfolio shares at market prices and portfolio shares at book values. Changes in the portfolio shares at market prices trace back to both valuation-related and transaction-related portfolio shifts. The portfolio shares at book values, on the other hand, change only through transaction-related portfolio shifts. The difference between the calculated changes in the portfolio shares at market prices and at book values approximates the influence of valuation-driven portfolio allocation. Combined, this results in the following estimation equations:

First regression step: estimation of instrumental variables

$$ssr_t = \mu + \varphi inst_t + \omega \sum_{s=1}^{q} X_{t-s} + \eta_t$$

where ssr_t is the short-term shadow rate, μ is a constant, $inst_t$ is the high-frequency change in the market interest rate, X_t is a vector with control variables,[9] η_t is an error term and t is the time index. This estimation equation is used to generate predicted values for $\widehat{ssr}_t$, which are then input into the estimation equations of the second regression step.

Second regression step: influence of monetary policy on portfolio shares[10]

$$\Delta pf_{i,j,t+h} = \alpha_h + \beta_h \widehat{ssr}_t + \gamma_h \sum_{s=1}^{q} X_{t-s} + \epsilon_{t+h}$$

where $\Delta pf_{i,j,t+h}$ is the change in the sectoral portfolio share of investment instrument i

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6 The external sector and remaining assets serve as residuals in each case.
7 Sector groupings are based on the definitions used in ESA 2010.
8 Again, classifications are based on the definitions used in ESA 2010. Deposits correspond to the instrument "cash and deposits" and insurance claims to the instrument "insurance, pension and standardised guaranteed schemes".
9 Specifically, the following control variables are included: real GDP growth, inflation rate, growth in real house prices and the real oil price as well as lagged values for the dependent variables. The lag length is $q=5$.
10 So that the estimation uncertainty of the first step is accounted for in the second step, the sum of the squared error terms is corrected accordingly.

for sector j, α_h is a constant, $\widehat{ssr}_t$ is the adjusted values for the shadow rate from the first regression step, X_t is the vector with control variables used previously, ε_t is an error term and t is the time index. The variable h can take a value between 0 and 12. This yields a local projection spanning a period of 12 months. As the error terms can be auto-correlated due to the nature of the design, Newey-West standard errors are used. The estimation period extends from the beginning of 1999 to mid-2019. The estimations are calculated separately for both valuation methods. The local projections illustrate responses to an expansionary monetary policy shock across all sectors and financial instruments. The shock is standardised to an unexpected reduction in the shadow rate of 25 basis points. Six sectors, six instruments and two valuation methods

thus yield a total of 72 stylised impulse-response functions.

monetary policy shock.[20] According to the chart, the portfolio share of equity at market prices (sum of transaction-related and valuation-related changes: "Total") experiences a statistically significant rise in all sectors – with the exception of other financial intermediaries – in response to an expansionary monetary policy shock. Amongst insurance corporations and pension funds, the proportion of investment fund shares also rises. In addition, there is a significant increase in the portfolio share of deposits of investment funds and credit institutions. For the latter, this should be particularly attributable to the fact that the non-standard monetary policy measures (targeted longer-term refinancing operations and asset purchases) are usually associated with an expansion of (risk-free) excess liquidity held as deposits.[21] Although these measures have only been implemented since 2014/15, their impact appears to dominate the entire estimation period.[22] By contrast, the portfolio share of debt securities generally sees a statistically sig-

nificant decline. In this case, too, other financial intermediaries are the sole exception. Furthermore, there is a statistically significant decrease in the share of deposits amongst insurance corporations and pension funds as well as households. By contrast, the portfolio share of loans falls among credit institutions.[23]

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20 For reasons of clarity, the impulse-response functions are not shown individually, but are consolidated in the form of the chart. As this concerns adjustments within each sectoral portfolio, the portfolio shifts of the individual financial instruments must necessarily balance each other out overall. In line with this, statistical tests show that the sum of the sectoral portfolio shifts is not significantly different from zero for any of the observed sectors.
**21** Consistent with this, Andrade et al. (2016) show that the APP reduced risk for credit institutions domiciled in the euro area.
22 In line with this explanation, deposits lose their statistical significance if the estimation period is restricted to the years 1999 to 2010.
23 It should be noted here that this development is not synonymous with a reduction in lending. Instead, the absolute inflows to deposits exceed the respective inflows to credit claims (and debt securities). This results in a corresponding rise or fall in the portfolio share.

Stylised influence of monetary policy shocks on actual portfolio shifts since 2010[*]

Percentage points
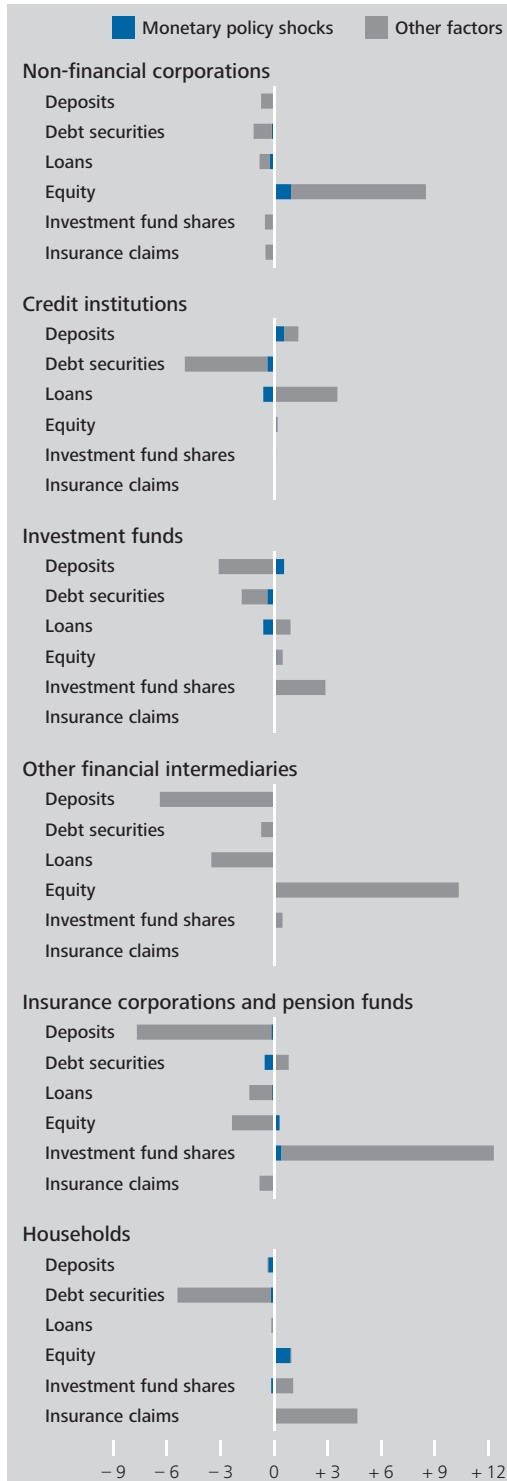
Sources: ECB and Bundesbank calculations. ***** Sectors and instruments as defined in ESA 2010. Households including non-profit institutions serving households. Credit institutions correspond to deposit-taking corporations and include money market funds. Deposits including cash. Insurance claims correspond to the instrument "insurance, pension and standardised guaranteed schemes".

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Furthermore, the estimations suggest that valuation-related changes to the portfolio structure triggered by market price volatility generally account for a large part of the overall effect.[24] At the same time, the valuation-related shifts are often counteracted by transaction-related changes. This relationship is especially pronounced amongst institutional investors such as investment funds and other financial intermediaries. In this way, as a result of an expansionary monetary policy shock, the proportion of equity in investment funds' portfolios rises considerably due to relative market price changes. In turn, they counteract this through a transaction-related reduction of the portfolio share. This behaviour is indicative of active portfolio rebalancing, which is carried out to compensate for market price-related disturbances in the balance of the portfolio.[25] Amongst other financial intermediaries, the portfolio share of loans falls considerably due to relative market price fluctuations. By contrast, all other things being equal, transaction-related portfolio shifts increase their significance in the portfolio. As a result, there is no significant change in the share of loans. These opposing developments could be linked to the securitisation of credit claims.

Valuation-related portfolio shifts are quantitatively more significant and are partially offset by opposing transactions

Overall, the results suggest that the portfolio composition shifts towards equity in response to an expansionary monetary policy shock. As this form of investment is comparatively risky, the results can be seen as evidence of monetary policy being transmitted via the risk-taking channel.[26] Through this transmission channel, monetary policy measures influence investors' risk perception and risk tolerance.[27] In turn, this

Results in line with the risk-taking channel concept

24 Consistent with this, Bubeck et al. (2017) show that monetary policy shocks in the Eurosystem cause shifts in the portfolios of investment fund investors due to valuation effects in particular.
25 See Tobin (1969), Brunner and Meltzer (1972), and Deutsche Bundesbank (2016).
26 See Borio and Zhu (2008).
27 Borio und Zhu (2008) specifically refer to three ways through which the risk-taking channel operates: first, via the impact of interest rates on the valuation of assets, income, and free cash flows; second, via the relationship between market interest rates and target rates of return; and third, via the communication policies and the reaction function of the central bank.

changes their investment behaviour and ultimately the composition of their portfolios, too. In the event of expansionary monetary policy measures, this leads to a rise in risk appetite and causes portfolios to be reallocated to higher-yielding forms of investment.[28]

The results described above show, in stylised form, how a standardised monetary policy shock would affect portfolio composition. However, they do not provide any information on the extent to which monetary policy shocks have affected the portfolio shifts that have actually been observed during the period of low interest rates. To assess this impact, two scenarios were compared for each sector and each instrument.[29] In the first scenario, the monetary policy shocks are explicitly taken into account.[30] In the second scenario, it is instead assumed that no monetary policy shock occurred. The difference between the two scenarios is then interpreted as the stylised impact of monetary policy. All of the sectoral portfolio shifts in the period from the first quarter of 2010 to the third quarter of 2019, as well as the stylised impact of monetary policy shocks, are depicted in the chart on p. 38. The figures suggest that monetary policy shocks are generally responsible for just a small proportion of the portfolio changes. Only in isolated cases – such as that of equity in the portfolios of investment funds and households – is the impact of monetary policy shocks the predominant factor. Overall, it seems that monetary policy shocks have a rather limited effect on the change in the composition of the portfolios of institutional investors in the euro area during the low interest period.

Summary and integration of the results

Low interest rate period creates incentives to shift portfolios towards riskier forms of investment

A low interest rate level, all other things being equal, creates an incentive for investors to shift their portfolios towards riskier forms of investment. In this context, investors essentially have two options for taking on greater risk. The first

option is to increase their risk within a given instrument category. Various analyses show that, in recent years, non-bank financial intermediaries in particular increasingly purchased securities from riskier issuers.[31] A shift in lending towards riskier borrowers during periods of low interest rates has also been widely documented among credit institutions.[32] The second option is for investors to rebalance their entire portfolios towards riskier instruments. For example, this would be the case if investors replace safe bank deposits with riskier shares.

To expand upon the existing findings, this article analysed the extent to which the overall portfolios of the institutional sectors in the euro area have changed during the low interest rate period, which has been ongoing since around 2010. This revealed that the portfolios have not developed uniformly across sectors. A shift towards riskier instruments is evident for insurance corporations and pension funds as well as for other financial intermediaries. Both of these sectors reduced the share of safe deposits in their overall portfolios. In return, insurance corporations and pension funds increased the proportion of investment fund shares. Among the other financial intermediaries, it was chiefly the proportion of equity that saw

Other financial intermediaries as well as insurance corporations and pension funds rebalance their portfolios towards riskier instruments, credit institutions and households towards safer instruments

28 Likewise in keeping with these theoretical considerations, Boneva et al. (2019) show that, since the beginning of the APP, investors have shifted their securities portfolios towards riskier bonds. Furthermore, they conclude that investors rebalance their portfolios in response to interest rate changes to a greater extent than before.
29 When interpreting the figures, it should be noted that this is only an approximate estimation of the contribution of an unexpected monetary policy shock and that interdependencies could not be taken fully into account. To this extent, these figures are subject to a certain degree of uncertainty.
30 In order to obtain as complete a picture of monetary policy communication as possible, unexpected interest rate changes on days on which all ECB presidents to date gave a speech were also taken into consideration alongside unexpected interest rate changes in the periods surrounding monetary policy meetings. This helps to assess the impact of monetary policy more precisely, as, especially in recent years, a large number of unexpected changes in monetary policy occurred in close proximity to speeches held by the ECB president.
31 See, for example, Andrade et al. (2016), Boneva et al. (2019), and European Central Bank (2019a, 2019b).
32 See, for example, Altunbas et al. (2014), Jiménez et al. (2014), and Maddaloni and Peydró (2011).

an increase. By contrast, the portfolios of credit institutions and, in particular, households moved towards less risky instruments. Both of these sectors reduced the share of debt securities holdings. On the other hand, low-risk insurance claims in particular gained significance among households. Credit institutions increased the weighting of risk-free deposits held as excess liquidity with the Eurosystem. The shifts in the portfolio composition of investment funds and non-financial corporations were largely risk-neutral.

Increased search for yield especially amongst other financial intermediaries

In conjunction with the findings from the existing literature, it is possible to obtain a comprehensive picture of the changes in riskiness in the sectoral portfolios. In this vein, as shown above, insurance corporations and pension funds as well as other financial intermediaries rebalanced their overall portfolios towards riskier instruments. In addition, as previously documented in a variety of studies, securities portfolios have shifted towards riskier paper. On the whole, this reinforces the indications of increased risk-taking in both of these sectors. Amongst insurance corporations and pension funds, high nominal interest rate guarantees are likely to be chiefly responsible for this.[33] In this way, the lower interest rate level causes the duration of liabilities to increase to a greater extent than the duration of claims, which widens what is known as the duration gap. In order to close this gap, insurance corporations and pension funds can purchase bonds with longer maturities. However, the documented substitution of short-term deposits by investment fund shares in this sector can, in a broader sense, also be interpreted as an increase in the duration of the overall portfolio. By contrast, among the less heavily regulated other financial intermediaries, there are many indications that their increased risk-taking represents a search for yield in the narrower sense. Among credit institutions, the studies cited above suggest a positive relationship between low interest rates and the granting of risky loans. Contrary to this, the analysis of the changes to credit institutions' overall portfolios conducted here provides no indication of a shift towards riskier instruments. This also holds true for households, investment funds and non-financial corporations.

Impact of monetary policy on portfolio shifts during low interest rate period tends to be minor

This report also analysed the impact of monetary policy on shifts in sectoral portfolio composition. The empirical estimates showed, in the form of impulse-response functions, that expansionary monetary policy shocks shift the sectoral portfolios towards riskier forms of investment, such as equity. However, if the total portfolio changes are compared with the portfolio adjustments that have been triggered by monetary policy shocks since 2010, then these reactions seem modest. Nevertheless, the observed portfolio adjustments could be fundamentally attributable to the persistently low interest rate level. However, the latter is more likely a result of structural changes. In this context, these include, in particular, demographic trends, changes in income distribution, declining trend growth, and growing demand for safe forms of investment.

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33 See Domanski et al. (2017). For a detailed analysis of the risks amongst insurance corporations and pension funds in Germany, see Deutsche Bundesbank (2017c).

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