Implications of ultra-low interest rates for financial institutions' asset liability management – a policy-oriented overview

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In a historical perspective, interest rates are currently very low. The further course of nominal and real interest rates crucially depends on how the macroeconomy will develop over the cycle and in a long-term structural perspective. In this contribution, we analyze how ultra-low interest rates affect financial institutions and their asset-liability management. In the short term, the impact depends on the relative duration of assets and liabilities. Hence, different financial institutions are affected differently depending on their balance sheet structures. Yet in the long term, the income of all types of financial institutions tends to suffer from ultra-low interest rates. A protracted period of (ultra-)low interest rates might compromise financial stability by eroding financial intermediaries' capital; by amplifying the risk of bubbles and bursts; by heightening bond market volatility and its potential to trigger runs and fire sales in illiquid markets; and by causing risk positions to grow in the search for yield. Consequently, risks from a protracted period of ultra-low interest rates have been gaining attention from financial regulators and supervisors. Adequate action requires an integrated view of monetary policy, macroprudential and microprudential regulation and supervision of various types of financial intermediaries including banks, institutional investors and shadow banks.

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In response to the crisis, central banks worldwide have slashed official interest rates to historically low levels; and by adding a range of nonconventional monetary policy measures, notably large-scale bond purchases, they have also depressed medium to long-term risk-free interest rates and compressed risk premiums. As a result, prices for noninterest-bearing asset classes, such as stocks and real estate, have soared, depressing yields in these markets as well.

Given such low rates and yields, financial intermediaries – and in fact public sector entities, nonfinancial firms and households, too – face a number of challenges and open questions. First, on the asset side, how to cope with the low level of yields, now and in the foreseeable future? Second, also on the asset side, how to cope with the risk arising from an eventual normalization of yield and price levels (interest rate, price and market risks and the potential risk of financial turbulence and global real and financial repercussions). Third, on the liabilities side, how to behave optimally in the face of low financing costs, now and in the near future; in other words, to what extent to borrow at variable or fixed rates? How to deal with legacy liabilities contracted at higher cost? Finally, how to integrate asset and liability management to ensure overall optimal performance while containing risk, and to match prospective income and expenditure flows from financial and nonfinancial sources.

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To approach these questions, asset-liability managers need to form a view and build scenarios on the future path of nominal and real interest rates as well as other asset prices that are influenced by, or move jointly with, these developments. Several aspects need to be considered here. First, how is the business cycle going to develop? Will there be a lasting economic recovery, at what pace, and with what differences across world regions? Second, how is inflation going to develop, reflecting the contribution of output gaps, oil prices and other supply-side factors, as well as inflation expectations? Third, how are central banks going to react: how fast will the exit happen in those areas, such as the United States, where the recovery is well on its way? How will the Eurosystem's Extended Asset Purchase Programme proceed depending on outcomes for inflation, inflation expectations and the real economy, and how will an exit from ultra-expansionary policies eventually be engineered and timed? Fourth, in a longer-term perspective, the important question has been raised whether the euro area might be heading towards a period of secular stagnation. The implication would be that the natural rate of the real interest rate might be very low or even negative for what might be a very long time.

This article attempts to pin down this topic by mapping out the main themes and lines of discussion. Section 1 reviews the factors driving nominal and real interest rates and asset prices in the short and long run. In section 2 we offer a short overview of asset-liability management. Building on this, sections 3 and 4 discuss relevant considerations on asset and liability management in the current environment of ultra-low interest rates for three types of actors: banks, insurance companies and investment funds.[2] Section 5 summarizes and concludes.

1 Interest rates and asset prices – perspectives and scenarios

Interest rates are currently extremely low by historical standards. Central banks lowered policy rates to around zero (in some cases slightly or markedly below zero) and additionally pursued various forms of unconventional monetary policy, notably large-scale purchases of various types of bonds,[3] in response to the economic and financial crisis. After a crisis-related increase in risk premiums during the financial and sovereign debt crisis, long-term interest rates embarked on a downward trend for several years, as a result of which real long-term interest rates[4] have been oscillating around zero in a number of euro area countries (chart 1).

Interest rates in the euro area are currently considerably lower than in other major monetary areas and comparable with rates in Japan. The euro area yield curve has come to be quite flat and was extremely flat in the first four months of 2015. While flat yield curves were observed earlier (e.g. in

[2] *In fact, a fully-fledged analysis should also consider other actors (e.g. households) and the interdependencies between economic actors, in particular if the focus is on some long-run effects (e.g. pricing bubbles). Nevertheless, an analysis of the effects of low interest rates on the various economic actors taken each one by one can offer important insights.*

[3] *A central bank can conduct quantitative easing also by purchasing other assets than long-term bonds. For example, Christensen and Krogstrup (2015) introduce a reserve-induced channel of quantitative easing that works through higher holdings of central bank reserves by commercial banks. This channel works independent of the specific type of asset the central bank purchase.*

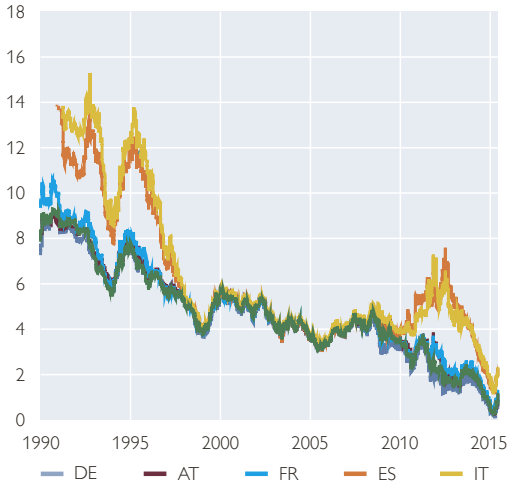
[4] *Calculated as yield on ten-year benchmark government bonds minus current HICP inflation.*

Chart 1

Ten-year bond yields

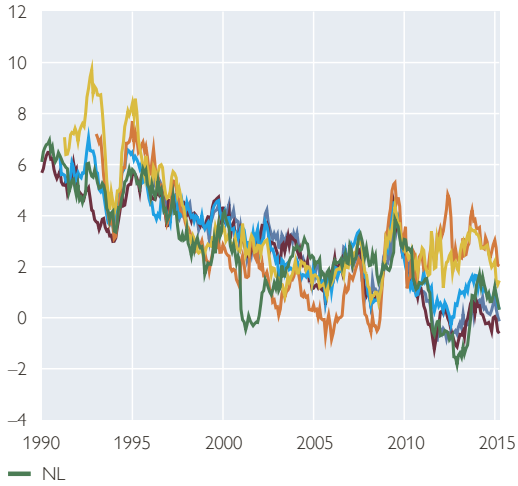
Ten-year yields

Benchmark government bonds,
daily data, cut-off date = June 10, 2015
%



Real ten-year yields

Benchmark government bonds,
ten-year minus HICP inflation, monthly data up to April 2015
%



Source: Thomson Reuters, ECB, Authors' calculations.

1999 or in 2008) interest rates were moving at higher levels at the time (chart 2, middle panel). Compared with other economic areas, the yield curve slope (calculated as the difference between ten-year and one-year yields) in the euro area is currently well below the levels in the U.S.A. and the U.K. (chart 2, lower panel).

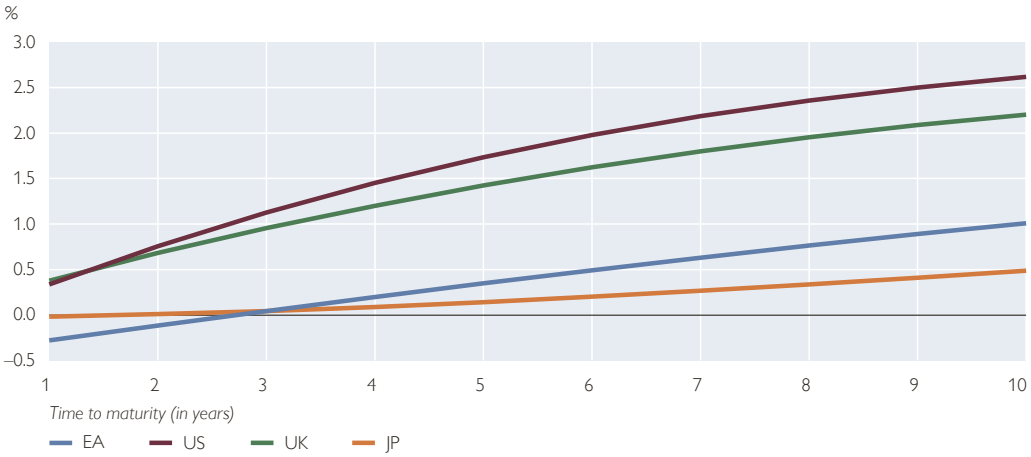
Yields on government bonds from various European countries have increased recently, starting in early May 2015. Several explanations for this development were given (see e.g. the statements of Draghi in ECB, 2015b): Improvement in growth perspectives, higher inflation expectations, technical conditions of the affected markets, increased volatility, and a drop in market liquidity.

Low interest rates have boosted other asset prices, in particular stock and real estate prices (chart 3) and – in the case of residential property – above all in those countries that remained unaffected by property price bubbles, prior to the crisis. Plus, relative interest rate changes and expectations thereof seem to have driven exchange rates as well.

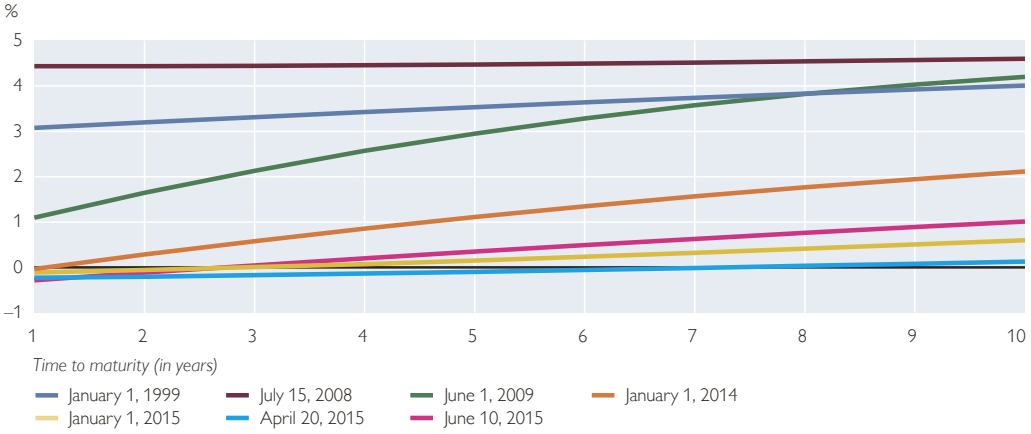
Chart 2

Yield curves

Global yield curves as at June 10, 2015



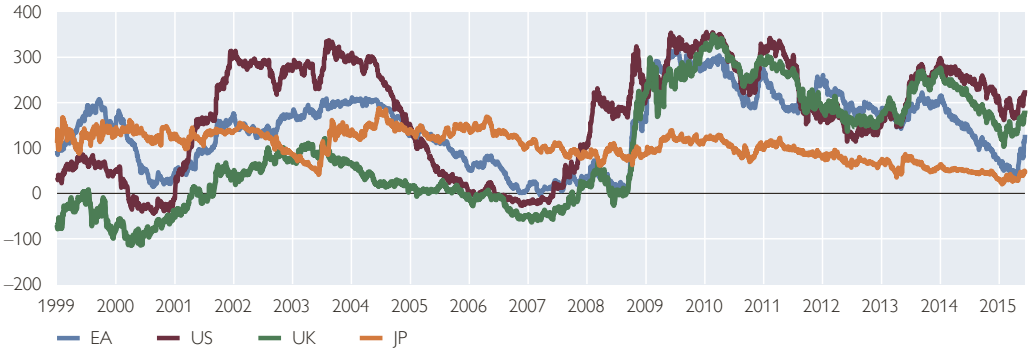
Euro area yield curve over time



Global yield curve slope over time

Difference between ten-year and one-year yields

Basis points



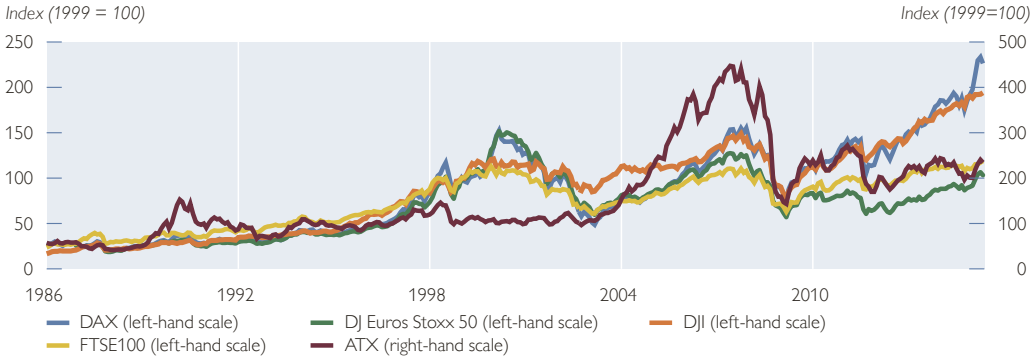
Source: Thomson Reuters.

Note: Cut-off data for data = June 10, 2015. Government bonds; for the euro area, AAA-rated government bonds. EA = euro area.

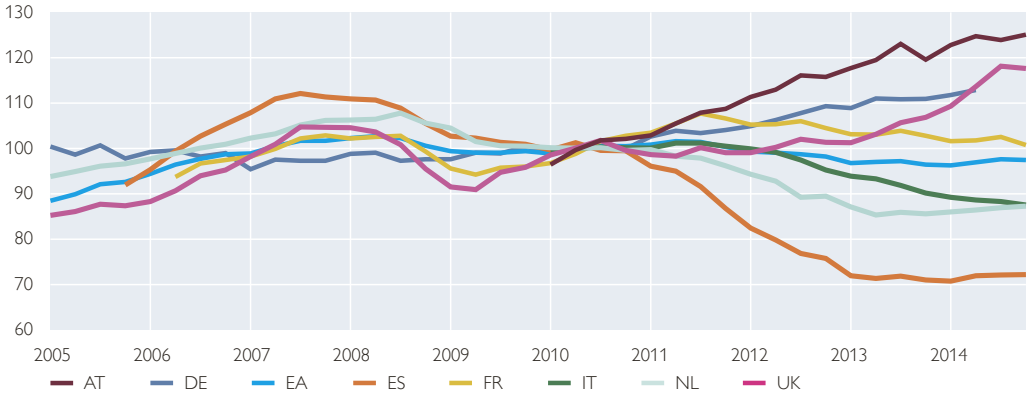
Chart 3

Asset prices

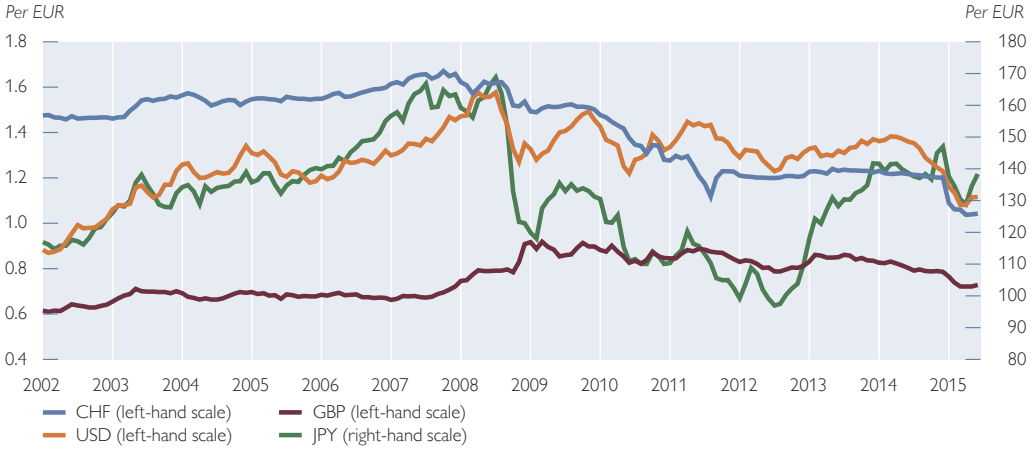
Global stock markets



European residential property prices



Euro exchange rates



Source: Eurostat, OeNB.

Note: EA = euro area.

To gain some understanding of the long-term trends that contributed to the current ultra-low interest rate environment, it is useful to consider the concept of the equilibrium real interest rate[5], an idea going back to 19th century theories by Wicksell. More recently, the equilibrium real interest rate was defined e.g. by Bernanke (2015a) as "the real interest rate consistent with full employment of labor and capital resources, perhaps after some period of adjustment." It follows that the equilibrium real interest is consistent with a stable rate of inflation and represents a hypothetical rate of interest that depends on structural factors. In the absence of cyclical fluctuations, the equilibrium interest rate would equate savings with investments and is hence affected by the factors driving saving and investment decisions. A drop in the demand for loanable funds (i.e. primarily for investment purposes) and an increase in the supply of loanable funds (i.e. savings) will lead to lower real interest rates. Accordingly, a savings-investment framework (as used e.g. by the IMF, 2014a) can shed light on the evolution of the real interest rate.[6]

A large part of the supply of capital is generated by household savings. Hence, factors that affect households' savings decisions also determine the supply of loanable funds. Economic theory (e.g. the permanent income hypothesis, life cycle hypothesis) predicts that savings are determined by households' rate of time preference, changes in current and expected income as well as uncertainty (e.g. precautionary savings). On an aggregate level, savings are also determined by demographic factors, e.g. the proportion of young households that save for retirement to retired households that tend to dissave.

The IMF (2014a) argues that savings behavior changed because of the large increase in the saving rates in emerging market economies in the first decade of the 2000s.[7] Another factor that may have contributed to an increasing supply of capital is increasing income inequality, which implies that a higher proportion of aggregate income is earned by groups with a higher propensity to save (Summers, 2014b).

On the demand side, the drop in investment, itself triggered by low growth and low growth expectations, may have depressed equilibrium interest rates. The IMF (2014a) observes that investment in advanced economies declined in recent years because of low investment profitability as a result of the financial crisis.[8] Summers (2014a) argues that the demand for debt-financed investment declined amongst other things because many high-tech companies have a large stock of cash and the founding of high-tech companies requires only little capital investment.

[5] *Similar concepts are the natural or neutral real interest rate. For a discussion of different concepts as well as the calculation of the natural rate of interest, see also Crespo Cuaresma et al. (2005).*

[6] *The IMF (2014a) takes the view that because of financial integration, interest rates are determined largely by common global factors. Consequently, in assessing the drivers of equilibrium long-term real interest rates, global developments should be taken into account. However, in the presence of home bias (which can have various reasons such as regulation favoring domestic sovereign bonds, various forms of other de facto restrictions on the free flow of capital, as well as information asymmetries), actual real short- and long-term interest rates can be heavily influenced by conventional and unconventional monetary policies, various risk premiums etc.*

[7] *For a discussion of a global savings glut and its economic implications, see Bernanke (2005, 2015b).*

[8] *In contrast, the IMF (2014a) attributes the reduction in investment from the 1980s to the early 2000 to a drop in the price of investment goods.*

Moreover, according to the IMF (2014a), a large part in the decline of real risk-free interest rates between 2000 and 2010 was due to an increase in the relative demand for safe versus risky assets, i.e. bonds versus equity. Fiscal policy could also affect savings and investment amongst other things through its impact on private investment[9] or the impact of public borrowing on the interest rate. However, the IMF (2014a) does not empirically find a significant effect of fiscal policy on the evolution of equilibrium interest rates after the 1990s.

For a comprehensive analysis, it is important to go beyond the determinants of the risk-free rate, as observed interest rates are also affected by risk considerations. Accordingly, observed interest rates in some countries could be higher than average rates because of various forms of risk premiums (credit risk, redenomination risk, inflation risk, liquidity risk).

Looking ahead, several scenarios are currently being debated among analysts, commentators and in policy circles regarding the future development of real interest rates in the euro area (see e.g. EIOPA, 2014b; Focarelli, 2015; IMF, 2014a; Moser et al., 2015; Swiss Re, 2012):

First, a gradual increase of inflation and nominal interest rates, with real yields returning to positive territory. Such a scenario assumes that the economic recovery continues, and that inflation and inflation expectations are well anchored above zero.[10]

Second, a prolonged period of (ultra-)low interest rates ("Japanese scenario"): This scenario is related to the debate on secular stagnation.[11] Summarizing the literature on secular stagnation, Teulings and Baldwin (2014) conclude that a broad consensus has emerged that secular stagnation can be defined as a situation in which negative real interest rates are needed to equate savings and investments. In a similar vein, Summers (2014b) notes that "it may be impossible for an economy to achieve full employment, satisfactory growth and financial stability simultaneously simply through the operation of conventional monetary policy."

The IMF (2014a) expects interest rates to remain low (at least in the medium term) even after some improvement of the economic situation and a shrinking of the output gap because of persistent effects of the crisis (e.g. subdued investment[12]). Because of stronger financial sector regulation, it is likely that the high demand for safe assets will continue.

A third scenario, which was vividly discussed when global unconventional monetary policies were started but has lost attention recently in the face of very low inflation outturns, might, according to some observers, materialize if inflation and inflation expectations were to rise sharply at some point, e.g. if central banks exited expansionary

[9] *According to standard economic theory, public investment can crowd out private investment. However, in the current situation of economic slack, public infrastructure investments might actually "crowd in" private investment (IMF, 2015).*

[10] *Ultra-easy monetary policy can facilitate such a scenario also via the exchange rate channel, i.e. lower interest rates lead to currency depreciation, which in turn has a positive effect on exports and eventually on growth. However, it is evident that not all countries can pursue such a strategy at the same time.*

[11] *This term was (re-)introduced by Summers in 2013 in a speech at the IMF (see also Summers, 2014a).*

[12] *For an assessment of investment prospects, see e.g. Banerjee et al. (2015).*

monetary policies too late (see e.g. Focarelli, 2015).

Such scenarios must also be seen against the backdrop of an observation made by many commentators these days, namely that, at least during a period of large-scale asset purchases by central banks, yields – also those on longer maturities and risky assets – may to a considerable extent be determined by current and expected central bank policy. This is why central banks' action is so closely monitored by financial market analysts and investors. According to some critics, however, such a focus may also risk to divert analysts' attention from underlying real economic fundamentals, which should drive real interest rates in the long run, creating the risk of bubbles – both in financial markets as well as other markets (e.g. real estate) – in the short to medium term.

2 Asset-liability management – a short nontechnical overview

Asset-liability management (ALM) can be defined as a "process of formulating, implementing, monitoring, and revising strategies related to assets and liabilities to achieve an organization's financial objectives, given the organization's risk tolerances and other constraints" (Society of Actuaries, 2003). Joint consideration of assets and liabilities, aimed at managing the assets and liabilities of a company in a coordinated manner, is an improvement above more traditional approaches to risk management and financial planning that dealt with the two sides of the balance sheet more or less separately.

Initially, ALM was practiced primarily by financial corporations; today it is also common among nonfinancial corporations.[13] The traditional focus on interest rate and liquidity risk has since been broadened to cover a wider range of risks, including equity risk, legal risk, currency risk, counterparty risk and sovereign or country risk. In the current environment of protracted low interest rates, the original focus on interest rate risk is of immediate relevance for financial institutions. Focusing on interest rate risk, Brick (2014) offers the following narrow definition of ALM: "Asset-liability management (ALM) is a forward-looking process involving the joint and simultaneous management of assets and liabilities to measure, monitor, and control the effects of changing interest rates on income, asset values, liquidity, and regulatory capital." Ultimately, risks from low interest rates imply ultra-low yields and high asset valuations for all kinds of asset classes. Thus, price risk is intricately linked to interest rate risk and needs to be considered simultaneously. Another crucial element to be considered by ALM is the liquidity of balance sheet positions, as a measure of a firm's ability to preserve its ability to pay. Of course, off-balance-sheet positions must also be taken into account (e.g. the interest rate swaps used for hedging interest rate risk).

Because of our focus on interest rate-related aspects of ALM, we first briefly review some aspects of interest rate risk. The BIS (2004) defines interest rate risk as "exposure of a bank's financial condition to adverse movements in interest rates" and distin-

[13] *In addition, ALM considerations may affect the decisions of sovereigns and private households. However, implementing ALM outside financial corporations needs to take into account differences in the balance sheet structure. For example, the assets of nonfinancial corporations include machinery and equipment.*

guishes the following types of interest rate risk: First, the risk arising from different repricing dates or different maturity/tenor of assets and liabilities (repricing risk). Second, the risk stemming from changes in the slope of the yield curve when interest rates for different tenors are affected differently by rate changes (yield curve risk). Third, the risk stemming from the fact that interest rate adjustment of variable rate asset and liabilities can be determined by different rates (basis risk). Fourth, risk that arises from option-like elements of balance sheet items (optionality). A case in point is the loss of profitable loans for banks due to early redemption and the need to re-invest in unfavorable market conditions.

As outlined by the BIS (2004), banks' interest rate exposure can be assessed from both an earnings perspective and an economic value perspective. The earnings perspective focuses on near-term earnings and uses e.g. the net interest margin as an indicator. Taking into account the economic value of a bank, which is defined as the present value of expected net cash flows, allows a more comprehensive and long-term view. Furthermore, embedded losses that reflect how past interest rate development may affect future performance should also be considered, in particular for instruments that are not marked to market.

To gain a first indication of the interest rate risk institutions face, supervisors calculate impact of standardized interest rate shocks, also known as Basel interest rate shock (see BIS, 2004; Bundesbank, 2012; EBA, 2015).

ALM uses various methods to identify risks. Traditional approaches include gap analysis to identify gaps in maturity or repricing dates and duration analysis to identify duration gaps, the idea being that knowledge of the impact of interest rate changes on both the asset and the liability side will help financial institutions immunize balance sheets against the adverse consequences of interest rate changes. However, these more traditional approaches are of limited suitability if balance sheet items exhibit option-like elements. More sophisticated frameworks apply techniques to model both sides of the balance sheet stochastically or use dynamic approaches, which are more widespread today. For example, scenario analysis develops various interest rate scenarios and eventually establishes the impact of each scenario on the balance sheet. After identification, these risks can be managed and hedged in various ways, including the use of interest rate swaps or derivative instruments. Since interest rate risk is a potential source of profits for financial institutions, these risks are not necessarily hedged completely.

In this respect, it should be taken into account that in a low interest rate environment changes in interest rates as well as changes in future expected cash-flows (e.g. dividends) of assets have a more pronounced impact on asset prices because the future is less heavily discounted compared to a high-interest rate environment. In other words, low interest rates are a source of volatility. Higher volatility also affects the price of derivatives used for hedging. Altogether, a low interest rate environment can make hedging more difficult. This short discussion should make it obvious that the application of ALM requires sophisticated models.[14]

[14] *A more detailed discussion of quantitative models in ALM is beyond the scope of this contribution.*

Table 1

Stylized balance sheets of financial institutions

Assets	Liabilities
MFI	
Loans (including loans to other MFI)	Deposits (including deposits from other MFI)
Holdings of debt securities	Debt securities issued
External assets	External liabilities
	Capital and reserves
Insurance corporation	
Securities other than shares (mostly fixed income securities)	Net equity of households in life insurance reserves
Investment fund shares	Prepayments of insurance premiums and reserves for outstanding claims
Shares and other equity	
Pension fund	
Investment fund shares	Net equity of households in pension fund reserves
Securities other than shares	
Shares and other equity	
Investment fund	
Debt securities	Investment fund shares issued
Equity	
Investment fund shares	

Source: The table shows the most important balance sheet positions based on aggregated balance sheet statistics from the ECB.

Banks, insurance companies, pension and investment funds fulfill different roles (e.g. lending versus providing a vehicle for long-term financial investments) and use – to some extent – different instruments (e.g. only banks assign loans). Furthermore, they are subject to different regulations. This also affects the incentive structure of managers. Consequently, the purpose of a financial firm will generally determine at least one side of its balance sheet. For example, the promise of pension funds to pay pensions later entails long-term liabilities. Because of ALM considerations, such structural determination of one side of the balance sheet also affects decisions about the other side of the balance sheet. Table 1 shows stylized balance sheets of financial institutions in the euro area and suggests a heavy impact of the business model on the liability side of (life) insurance companies and pension funds. Consequently, the task of ALM is to invest in instruments that will limit the duration mismatch between assets and liabilities. Likewise, the asset side of an investment fund will be determined by its investment style whereas its liability side will be heavy on equity, in line with its business purpose. Finally, the economic function of banks as intermediating between savers and borrowers determines at least part of both a bank's asset (loans) and liability side (deposits). Hence, the task of ALM is to minimize mismatches between the characteristics of loans assigned and deposits taken, while bearing in mind that e.g. maturity transformation from shorter-term liabilities into longer-term loans is a major function of banks, and also a source of revenue. In the following sections we will discuss these sectoral features in more detail.

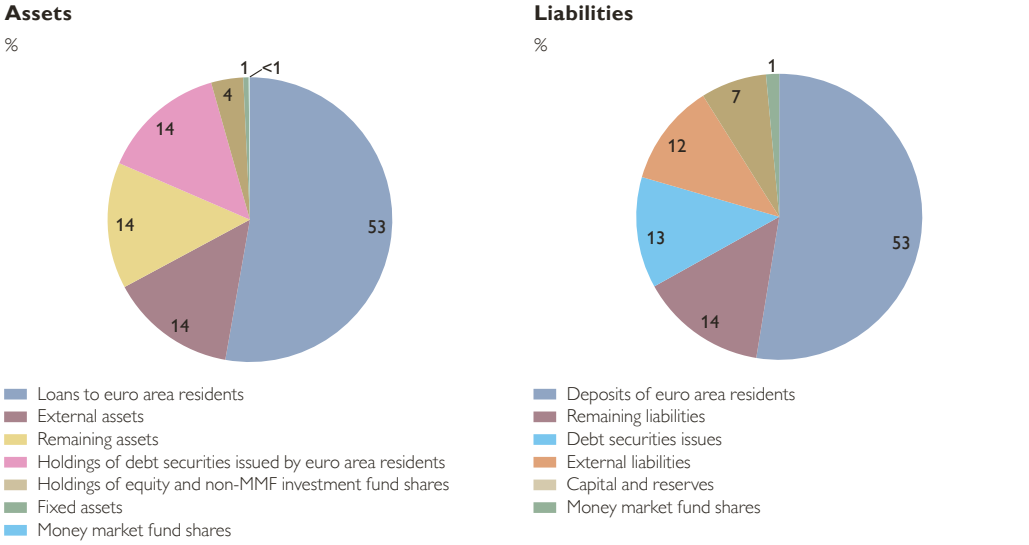
3 Banks

The economic functions of banks include maturity, size, liquidity and risk transformation. These activities intrinsically entail various risks, including interest rate risk.[15] While managing these risks is part and parcel of a bank's business, a low interest rate environment can affect banks' exposure to interest rate risk in various ways.

The breakdown of the aggregate balance sheets of euro area monetary financial institutions (MFIs, i.e. essentially banks as well as money market funds) illustrates that their interest income and payments hinges essentially on the development of interest rates on loans and deposits as well as debt securities held or issued (chart 4). Initially, lower interest rates may even benefit banks as they lower funding costs and trigger a reappraisal of assets. Banks usually also profit from a parallel downward shift of the yield curve because – unlike in the case of life insurers (see below) – the duration of deposits is typically shorter than the duration of assets. However, in a protracted period of ultra-low interest rates, it is quite likely that the yield curve becomes flatter. The flattening is supported by the zero floor on interest rates on deposits as long, as it is not (legally) possible or not appropriate to charge negative interest rates on deposits. Consequently, net interest margins are compressed and the income from maturity transformation is reduced. However, if banks' refinancing rate falls sharply in negative territory – as it is currently the case in Switzerland – banks' interest rate margins may actually expand, if for legal reasons interest rates on loans are subject to a zero lower bound.[16] Of course, the effect of changes of the yield curve on loan and deposit interest

Chart 4

Aggregated balance sheet of euro area MFIs (excluding the Eurosystem)



Source: ECB.

Note: As of March 2015; MMF = money market fund. Loans to/deposits from euro area residents also include loans/deposits to/from MFI.

[15] *Banks need not necessarily bear all the interest risks of e.g. a loan, because risks can also be transferred to customers (e.g. variable rate loans). See also the discussion at the end of this section.*

[16] *This issue is discussed further in OeNB (2015a).*

rate depends also on the market power of banks. Furthermore, interest rate changes affect the present value of future cash flows and consequently the underlying value of banks' assets, liabilities, and off-balance sheet instruments (BIS, 2004).

Chart 5 gives some indication on the correlation between lending margins (difference between interest rates on loans for house purchases or business loans and on deposits) and the slope of the yield curve. The chart suggests that in Germany, the Netherlands, and France, lending margins on housing loans to households tend to be higher the steeper the yield curve. On the other hand, yield curve slope and lending margins for loans to nonfinancial corporations are only correlated in Germany and to some extent in the Netherlands. It is likely that one factor that affects the relationship between lending margins and the yield curve slope is the interest rate fixation period. A high share of variable rate loans, as e.g. in Austria or for loans to nonfinancial corporations in many euro area countries, reduces the correlation between these two variables since the impact of a flatter yield curve on income from maturity transformation is less pronounced.[17] Obviously, such a simple analysis cannot thoroughly analyze the existence of a link between these two variables.

The – initially- ambiguous effect of low interest rates on banks is also reflected in the ECB's May 2015 Financial Stability Report. According to ECB (2015a) in the euro area as a whole, banks' operating income showed some improvement in 2014. This improvement can be mainly attributed to higher net interest income in vulnerable countries because of a decline in funding costs. However, the ECB (2015a) expects that it will become difficult to further improve net interest income because of the low interest rate environment and a flattening of the yield curve.

Simulations from Banca d'Italia (2015) suggest that the Eurosystem's Extended Asset Purchase Programme will increase profits of Italian banks. Different and partly opposing effects are at work: On the one hand, there is a negative impact on net interest income because of a drop in lending rates that cannot be offset by lower deposit rates since deposit rates are already close to zero.[18] On the other hand, it is expected that other revenues of Italian banks increase particularly because of higher earnings from security trading.

Regarding the impact of compressed interest margins on banks' profitability, the Joint Committee of the European Supervisory Authorities (2014) sees "fundamental structural issues in terms of the sustainability of some business models which have not adapted to the low interest rate environment, and creating pressure on the net interest margins of banks as well as profitability concerns."

Likewise, empirical findings by Lambert and Ueda (2014[19]) using data from U.S. banks suggest that uncon-

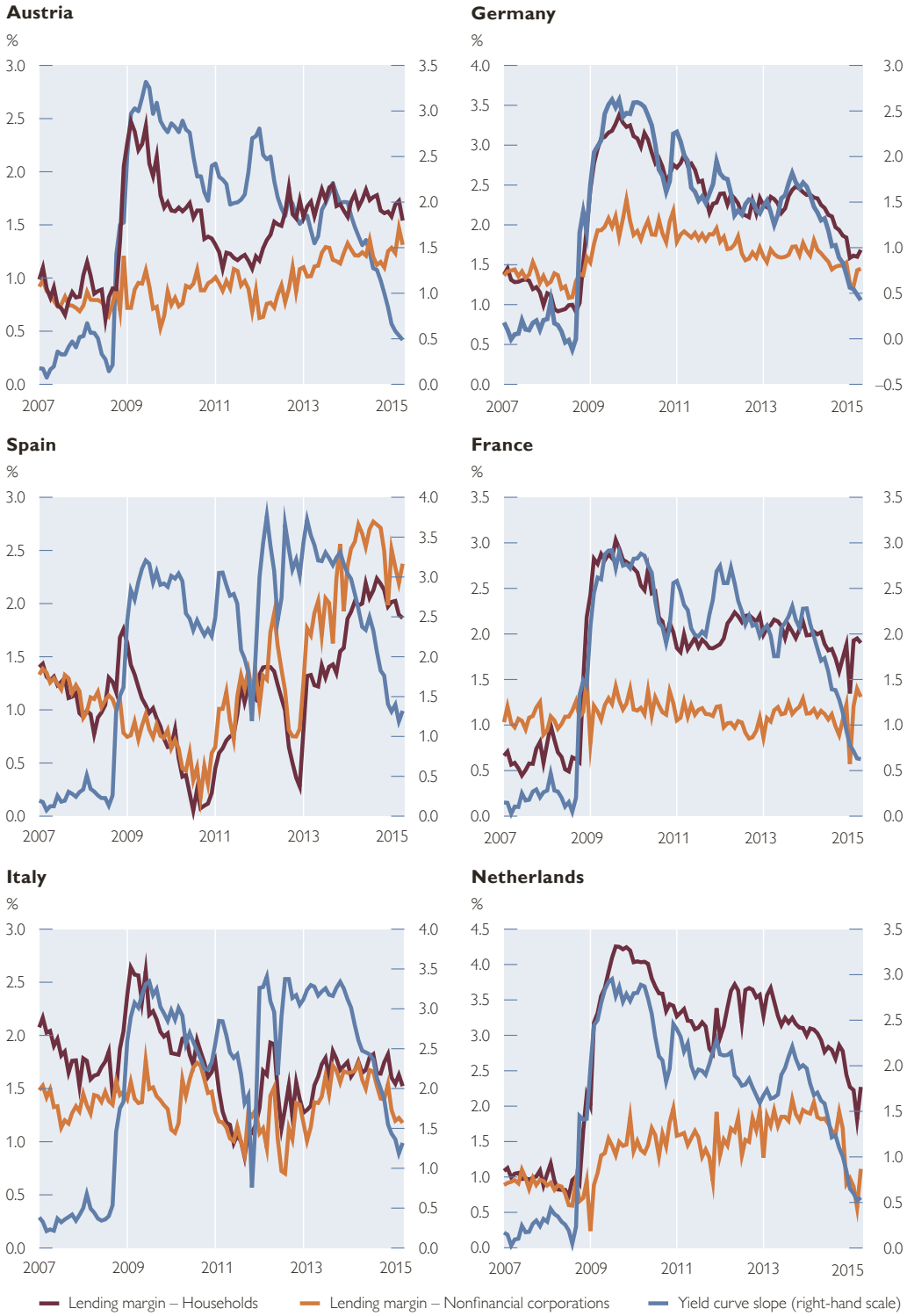
[17] *Regarding Spain and Italy it is likely that country-specific repercussions of the economic and financial crisis blurred any relationship between the two variables.*

[18] *This effect is particularly important in 2015; for 2016, Banca d'Italia (2015) expects an amelioration of net interest income because of increased lending volumes.*

[19] *See also Lambert (2015).*

Chart 5

Yield curve slope and lending margin



Source: ECB, Thomson Reuters.

Note: Lending margins is defined by the ECB as the difference between MFIs' interest rates for new loans (in case of households housing loans) and a weighted average rate of new deposits from households and NFCs. Monthly data up to April 2015.

ventional monetary policy[20] initially has a small positive effect on bank profitability. Yet when unconventional monetary policy persists for a protracted period, the negative impact outweighs the initial positive effect, leading to a slightly negative effect on balance.

Analyzing also the effects of unconventional monetary policy on risks, Lambert and Ueda (2014) find that potential effects of ultra-low interest rates may include increased risk-taking (search for yield, encouraging leverage) and delayed balance sheet repair (e.g. evergreening of loans). Their regression results suggest that banks reduce their leverage, though only to a very small degree. Furthermore, as expected, banks increase their risky assets. Regarding balance sheet repair, Lambert and Ueda (2014) also find evidence for evergreening of nonperforming loans. In addition, the U.S. banks considered took advantage of lower long-term interest rates to extend the maturity of their debt and reduce the risk of maturity mismatches. At the same time, research into potential risk-related aspects of low interest rates by Maddaloni and Peydró (2010), using data from the euro area bank lending surveys and the U.S. senior loan officer surveys, implies that low short-term (i.e. policy) interest rates gave rise to softer lending standards in the run-up of the financial crisis. Moreover, the effects of low short-term rates on lending standards were reinforced by securitization activity and weak supervision, and they were the more pronounced the longer interest rates were low. This was especially the case for mortgage loans.

A further and ALM-related effect of a protracted period of ultra-low interest rates is the potential reduction in banks' "natural duration netting" capacity. With ultra-low interest rates, the balance sheet structure of a bank is likely to change. On the liability side, customers tend to move from fixed-term deposits into nonmaturing (e.g. sight) deposits.[21] On the asset side, customers may, depending on their interest rate expectations (or their risk-taking behavior), either increasingly prefer longer tenors for fixed rate loans or variable rate loans linked to currently ultra-low base interest rates. If the duration of assets increases by more than the duration of liabilities[22], the net asset duration gap would widen. As a result, the balance sheet would exhibit a lower degree of natural duration netting capacity, and the reliance on external markets to hedge interest rate risk would increase (Moser et al., 2015).

Moreover, banks need to be aware of potential technical and operational problems in an ultra-low environment, and in particular in a negative interest rate environment. Amongst other things, banks need to ensure that their business infrastructure (e.g. derivative models, value at risk models) and their IT systems can handle negative rates and yield reasonable results. In addition, customer behavior might change, with negative rates potentially affecting the stability of deposits. Hence, banks

[20] *In their regression, they include variables that account for the monetary policy stance ("Taylor rule" residuals), changes in the ratio of central bank assets to GDP, and the time duration of low interest rates.*

[21] *Comparing this analysis with the results from Lambert and Ueda (2015) above also indicates that the effects of a prolonged period of low interest rates depends on whether retail deposits or market instruments play a more prominent role in the funding of banks.*

[22] *The duration of liabilities will only increase if the duration of nonmaturing deposits is higher than the duration of fixed-term deposits.*

need to scrutinize their deposit modeling (Ibel, 2015).

If banks' income suffers from interest rate developments, higher fees in combination with low or zero interest rates on deposits are potential mitigation measures. However, depositors may always respond by holding their savings in the form of banknotes instead.[23] Furthermore, the feasibility of introducing or increasing fees also depends on competition. An assessment of banks' exposure to interest rate risk should also take into account that banks can in principle shift interest rate risk to their customers in the form of variable rate loans and variable rate deposits and savings accounts. In Austria, for example, variable rate loans are quite common (indeed, the share of variable rate mortgage loans has been steadily on the rise in recent years). However, this implies higher credit risk, as borrowers may be unable to repay their loan at higher future interest rates, and the likelihood that the collateral loses in value when interest rates increase (Hellwig, 2011).[24] Another issue that arises in this context is how legacy variable-rate loan contracts would deal with negative interest rates triggered by a mechanical application of existing interest rate clauses.[25]

4 Institutional investors

For institutional investors, the impact of ultra-low yields and the accompanying developments is immediate, which has triggered an active debate among supervisors and in the industry.

First, as market yields are declining, securities portfolios benefit from substantial windfall gains, as the prices of bonds and other asset classes such as stocks and real estate are soaring. This development may risk generating excessive and unrealistic yield expectations on the part of institutional investors' customers. Life-insurers and pension funds are confronted with an immediate increase in liabilities because the discounted value of future cash flows changes.

Second, when yields have reached their lowest level bond prices will no longer rise, and this may also be associated with an end to the rise in the prices of other asset classes. During this phase at the latest, investors and their customers will need to adjust their yield expectations to a new lower level. The adjustment of expectations may also trigger a rebalancing of portfolios, leading to asset sales and price declines in various asset classes, further depressing portfolio performance.

Third, at some point in the future (as outlined in section 1, various scenarios are conceivable) the interest rate cycle will reverse and nominal yields will move up again. Then, holders of long-term fixed rate bonds will suffer valuation losses, and, depending on other factors influencing earnings and price expectations, this will happen in other asset classes as well.

[23] *This issue is being actively debated in Switzerland, where pension funds and other institutional investors actively consider holding cash in the form of banknotes should they be charged negative interest rates on bank deposits (see FAZ, 2015). However, the usefulness of such an action also depends on the acceptance of banknotes as a means of payment and restrictions to holding banknotes. For example, the Danish government wants to exempt certain retailers from the obligations to accept banknotes and coins (Reuters, 2015).*

[24] *Generally, mortgage loans have specific characteristics: Lower interest rates imply higher housing values and therefore higher collateral values increasing the creditworthiness of borrowers. Consequently, home owners might take out further loans. As a result, demand for housing and housing values might increase further. The opposite self-enforcing developments might take place if interest rates decline.*

[25] *There seems to be some disagreement whether negative interest rates on loans or deposits are legally admissible. However, this question is beyond the scope of our contribution.*

To compensate for lower risk-free or low-risk yields, investors may rebalance their portfolios into higher-risk asset classes (an effect explicitly considered by central banks as part of the transmission channels of asset purchase programs under the heading of the "portfolio rebalancing channel"). This may lead to a compression of risk and liquidity premiums, which may be desirable from a short-term macroeconomic viewpoint but entails the risk of subsequent corrections, which might aggravate institutional investors' earnings compression in the later phases of the interest rate cycle.

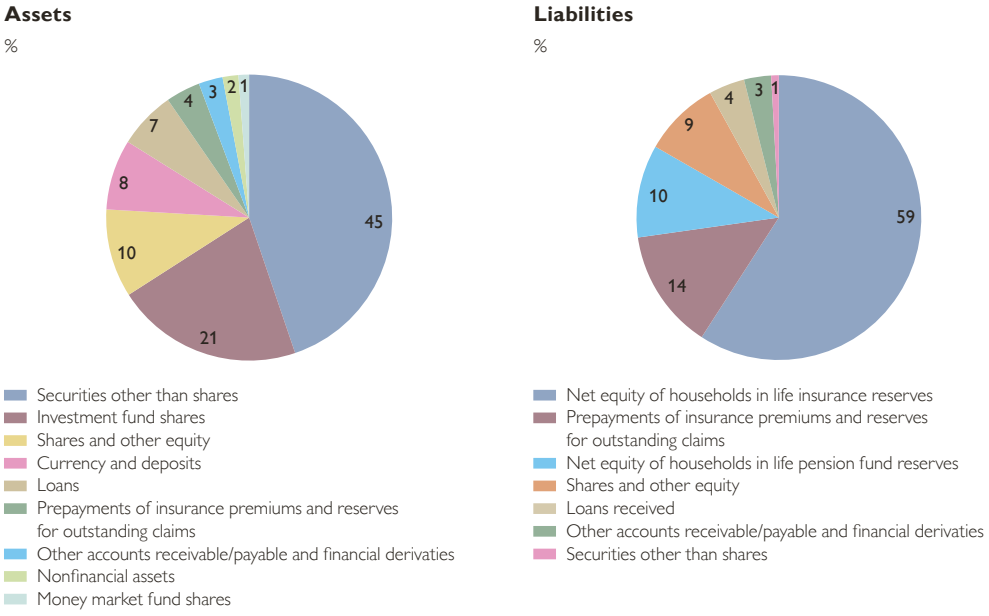
In the following paragraphs, we elaborate on aspects specific to two types of institutional investors: first, insurance firms and pensions funds and, second, investment funds.

4.1 Insurance firms and pension funds

The balance sheet of insurance firms and pension funds reflects various forms of contractual obligations vis-à-vis customers on the liabilities side, while insurance or pension premiums are invested in various types of assets. In a stylized simplification, these obligations come in two forms, depending on the type of insurance: Life insurance obligations (including pension insurances) have many aspects of savings contracts and often involve contractual minimum yield guarantees by the insurer to the customer. The payment obligations of nonlife insurers, in contrast, materialize in rare events, such as accidents, fire, catastrophes etc. Unlike nonlife insurance contracts, life insurance contracts (as well as contracts with pension funds) tend to be long term. Consequently, the duration of liabilities of life insurers is higher than of that of nonlife insurers. As Antolin et al. (2011) note, this difference in the duration of liabilities also affects asset choice because ALM considerations suggest that the mismatch between

Chart 6

Aggregated balance sheet of euro area insurance corporations

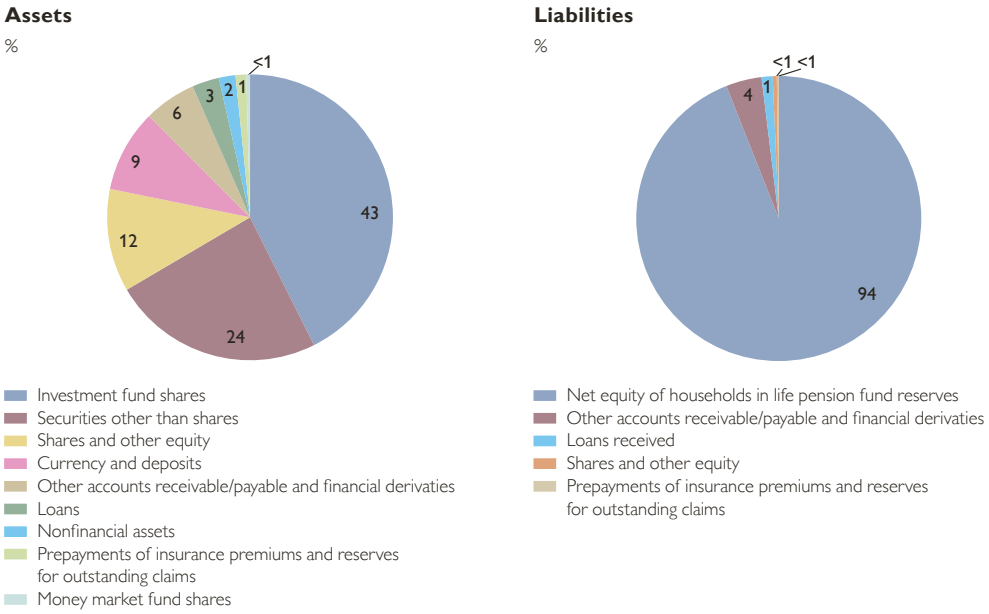


Source: ECB.

Note: Data refer to Q4 14.

Chart 7

Aggregated balance sheet of euro area pension funds



Source: ECB.

Note: Data refer to Q4 14.

asset and liabilities should be confined. Charts 6 and 7 illustrate the importance of securities and investment fund shares for the asset allocation of insurance corporations and pension funds.

The purpose of insurance firms' ALM is to ensure the ability to generate the cash outflows resulting from insurers' contractual obligations at all times given a firm's solvency; notably compliance with regulatory rules. Given the probabilistic nature of these outflows, buffers need to be built up for contingent outflows. The assets in which insurers invest premiums are subject to interest and price shocks and may not allow for immediate liquidation (because of the illiquid nature of an asset or because of a crisis-related drying up of markets). The cash flows to be expected from investments on an ongoing basis (interest, redemptions, dividends etc.) and from asset sales are thus risky as well.

Changes in the level of interest rates affect insurers' assets and liabilities immediately through changes in the net present value of cash flows, which is, for example, reflected in the price changes of fixed rate debt, but also in the prices of stocks, real estate and other assets. Moreover, Antolin et al. (2011) note that in a low interest rate environment increases in life expectancy have a more pronounced impact on pension funds' liabilities because future cash flows are discounted at a lower discount rate. If the maturities of assets and liabilities are not perfectly matched (which will usually be the case), assets and liabilities are affected differently by a given change in the level of interest rates. A longer maturity of liabilities (typically the case for life insurers or pension funds) relative to assets implies that a fall in interest rates increases the net present value of liabilities by more than that of assets. Such duration mismatch also entails a

re-investment risk: if high-interest rate assets mature and have to be rolled over into new ones yielding much lower returns, high guaranteed returns to customers become difficult to achieve. Furthermore, if the yield curve does not shift in parallel but twists, resulting gaps between assets and liabilities may be amplified. Here, simulations using past empirical data show that parallel shifts of the yield curve are the exception rather than the rule (see Herold and Wirth, 2015).

Many life insurers have guaranteed minimum returns to their customers, creating a floor to liabilities also during times of very low yields. Under defined benefit schemes (as opposed to defined contribution schemes) pension funds have to pay fixed pension payments irrespective of the actual yield earned on the fund's assets. These contracts expose life insurers and pension funds to substantial profitability risk during times of ultra-low yields. In this respect, the European Insurance and Occupational Pension Authority (EIOPA, 2014a) observes that life insurance companies with high exposure to guarantees pay more attention to developing effective ALM tools (in addition to restructuring their business model towards less interest-sensitive products with reduced, flexible or no interest guarantees[26]).

In response to ultra-low yields, euro area insurers have gradually taken on higher risk, by re-investing maturing bonds in higher-yielding ones, by extending duration and by investing in less liquid assets. The Joint Committee (2014) states some indications for search for yield in insurance companies in order to honor guaranteed rates: higher share of lower quality corporate bonds instead of government bonds, investing in infrastructure financing, direct loans, more investment in real estate assets, equities and the establishment of partnerships with banks to fund direct loans to medium and large corporates. Various factors may result in procyclical herding-type asset allocation behavior among insurers, e.g. similarity of business models, increased use of asset managers, compliance with regulation and the use of interest rate swaps (ECB, 2015a).

The potential effects of ultra-low interest rates on financial stability have been on the agenda of European supervisory authorities for several years. Already in 2012, the ESRB General Board suggested investigating the potential impact of a low interest rate environment on the ability of long-term investors to generate adequate returns and to monitor the effects of low interest rates on the soundness of insurance companies and pension funds (ESRB, 2012). Recent assessments identify persistent low interest rates as among the key risks to the stability of the European financial system (e.g. Joint Committee, 2014; EIOPA, 2014a). Various policy and supervisory institutions have recently conducted stress test simulations to investigate the effects of ultra-low yields on insurance companies' earnings and solvency. In February 2013, EIOPA (2013) issued an Opinion on the Supervisory Response to a Prolonged Low Interest Rate Environment, which highlighted the potential solvency risks for insurers (and for occupational pension funds) from a low-yield scenario. Based on scenario analysis, EIOPA (2011) concluded that 5% to 10% of tested insurance firms would face a fall of their minimum cap-

[26] *The reduction of guaranteed returns as well as the shift from defined benefits to defined contributions by pension funds implies that interest rate risk is transferred to customers.*

ital requirement ratio below or only slightly above 100%. Stress tests conducted by EIOPA in 2014 showed that one quarter of insurers could not meet the 100% solvency capital requirement under a scenario of prolonged low interest rates ("Japanese scenario"); however, meanwhile the euro area yield curve has even fallen below EIOPA's "Japanese scenario," rendering these stress tests optimistic. Furthermore, these stress tests do not consider wide-ranging systemic events, which could include forced asset reallocations from a systemically important part of insurers, possibly in tandem with other institutional investors. In such events, the initial interest rate shock might be amplified, further aggravating the impact for individual insurers' balance sheets and earnings. The ECB (2015a) confirms that interest rate risk is by far the most important driver of asset valuation losses in various stress scenarios: in recently conducted stress tests, declines in net asset values resulting from interest rate risk amount to up to 3.6% of insurers' total assets. Against this background, EIOPA (2014a) and the IMF (2015) conclude that, first, insurance contracts with guaranteed customer returns should be fundamentally reconsidered or at least brought in line with the secular trend in returns; and, second, regulators "must improve the sector's asset-liability matching and hedging capabilities" (IMF, 2015).

The speed at which "yield compression" becomes visible in insurers' balance sheet depends also on accounting methods used. If historic cost accounting is used the impact on the balance sheet appears more slowly than if market values are used. The transition from the current regulatory framework of Solvency I to Solvency II, which will be in force starting January 1, 2016, involves a transition to market value accounting, thus exposing risks previously not so obvious. Transition periods granted to insurers for full implementation of Solvency II thus aim to grant insurers a very long time window to adjust their business to comply with new regulatory standards (see EIOPA, 2013).

Developments in insurances and pension funds are closely linked to another type of institutional investors, investment funds, as it is common for them to mandate the management of portions of their asset portfolios to these specialized financial institutions (see charts 6 and 7).

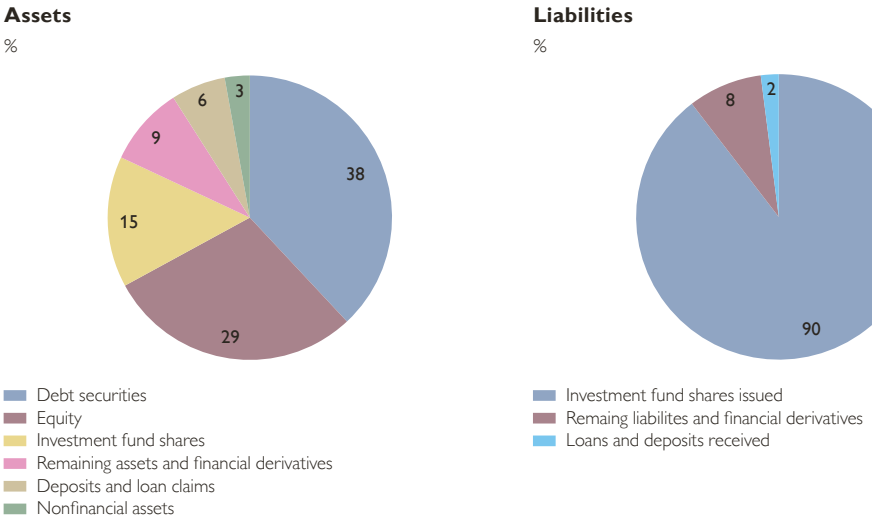
4.2 Investment funds

According to the IMF (2015), the volume of assets under management of world top 500 asset managers reached USD 76 trillion, or 40% of global financial assets at the end of 2013. In relation to GDP, while assets of global top 500 asset managers have been stable at around 100% of world GDP, the role of investment funds in advanced economies[27] has substantially risen between 2002 and 2012, from 60% to 90% of GDP of the country group. Growth was particularly strong among investment funds, with assets managed increasing by 70% to EUR 9.4 trillion by end-2014 (ECB, 2015a). The role of investment funds has particularly expanded in fixed-income bond markets, and bond funds have potentially a very large market impact (IMF, 2015; ECB, 2015a).

[27] *The selected advanced economies taken into account by IMF (2015) are Canada, Germany, Ireland, Japan, Luxembourg, the United Kingdom and the United States. Investment funds include mutual funds, money market funds and exchange-traded funds.*

Chart 8

Aggregated balance sheet of euro area investment funds



Source: ECB.

Note: Data refer to Q4 14.

There are many different types of asset managers. On the asset side, the focus of asset managers can be on short-term money market instruments, on various types of bonds, on equities, commodities, derivatives, or less liquid forms of assets such as private equity, venture capital or private debt (see chart 8). On the liabilities side, funds usually issue shares to customers, which implies that investment risk lies with shareholders. However, there are also funds with some or considerable leverage (e.g. hedge funds).

Many open-end investment funds face liquidity risk: their customers can sell back their shares at any time without notice. This may particularly happen during periods of market stress but also when expectations are being adjusted abruptly and by many investors at the same time. A fund manager can either cover fund outflows from cash reserves or sell assets (if leverage is not considered or excluded). This implies the risk that in periods of financial market stress or crisis, funds may experience "runs" and be forced to shed assets quickly and in large volumes ("fire sales"). Given the size of large funds relative to the size of some markets (e.g. emerging market bonds and corporate bonds), their asset transactions may influence market pricing already in normal times; this may be aggravated in periods of market distress, when liquidity dries up. These properties and their potential consequences for financial stability have already been recognized by financial supervisors (see e.g. IMF, 2015; ECB, 2015a).

What does this imply in the current period of ultra-easy monetary policies? First, fund managers may want to explore potentially unutilized avenues to optimize the risk-return properties of their portfolios. For instance, they may aim to harvest various market and alternative risk premiums in a balanced way. They may try to exploit past empirical patterns supporting certain "investment styles" or combinations thereof. The risk of a sudden bond yield reversal may, according to past experi-

ence, be easier to manage with combined portfolios of long and short positions (Ilmanen, 2015).

Portfolio management may be complicated by changed post-crisis market behavior: For example, the IMF (2015) shows that in the post-crisis period since 2010, the correlation between various asset classes has markedly increased. Cross-asset correlation is further heightened during periods of high volatility. This renders risk management through portfolio diversification less effective. Furthermore, the causal direction of spillover effects between global bond market yields has sharply changed since first indications of large-scale asset purchases by the Eurosystem. It is now more likely that changes in the 10-year German bund rate precede changes in the 10-year Treasury rate (IMF, 2015).

Second, ultra-low interest rates may trigger a search for yield. Incentive structures of fund managers encourage search for yield: as fund performance is regularly and publicly compared, managers may try to meet demanding customer expectations by taking more risk. This behavior tends to be combined with herding behavior, as portfolio managers tend to orient their portfolio decisions towards benchmarks. The resulting compression of risk premiums, while generating valuation gains in the short term, results in lower returns (at a given risk) for the future and furthermore carries the risk of subsequent yield and price corrections.

Third, search for yield also may prompt investment in less liquid assets, exacerbating the aforementioned liquidity mismatch. There are limits to such developments, though, as asset managers are restricted by their mandate.

Finally, if a scenario of lower investment returns across all or most asset classes for the medium to long-term future turns out to be realized, then asset management fees might be squeezed, since they would no longer be covered or justified by returns.[28] This could in turn ultimately have repercussions on asset management strategies towards low-cost styles such as passive management, index funds, synthetic portfolios, which in turn increases herd behavior. It could also affect the marketing channels and methods for investment products, with increasing use of internet banking and brokerage, personal expert advice being available to customers from a certain investment volume only or being charged separately.

Supervisors and international organizations have been increasingly pointing to financial stability risks potentially arising from the "shadow banking sector" (IMF, 2014b, 2015; ECB, 2015a). However, contrary to the insurance sector, the consequences from ultra-low interest rates have so far not been the focus of concerns. This may change in the future, as several of the risks addressed from a (systemic) financial stability perspective might become relevant in the event of a sharp reversal in interest rates, stock and other asset prices. As pointed out by the IMF (2015) and ECB (2015a), large and/or concentrated mutual fund bond holdings appear to exacerbate bond spread reactions during periods of market stress, as funds suffer from runs and are forced into fire sales to meet customer redemptions or by themselves adjust portfolio holdings to contain losses in

[28] *The performance of an asset manager depends on relative returns; retail investors in particular might, however, question whether investing in funds makes sense.*

stressed markets. While the IMF presents evidence for this for corporate and emerging market bonds, the same can happen in euro area sovereign bonds, particularly those of smaller and more vulnerable states. Due to various linkages to banks and insurance firms, shocks to the shadow banking sector may also affect banks' refinancing costs and insurance firms' portfolio performance, with nonnegligible repercussions for the real economy.

5 Summary and conclusions

We have shown in this paper that ultra-low interest rates affect different types of financial institutions differently. This is due to differences in balance sheet structure, in particular the relative duration of assets and liabilities. If assets tend to exhibit a longer duration than liabilities, as in the case of banks, low interest rates can initially be an advantage. However, there is evidence that in the longer term also banks suffer from low interest rates. This arises from interest rate margin compression, because low interest rates tend to go hand in hand with a flattening of the yield curve (particularly if deposit rates hit the zero lower bound), reducing the income from banks' maturity transformation. By contrast, in the case of life insurers and pension funds, the duration of liabilities usually exceeds the duration of assets. Therefore, a drop in interest rates is a direct disadvantage for these institutions, as the net present value of liabilities rises by more than that of assets; the negative effect is amplified if insurers have granted minimum returns on liabilities, as was the case with life insurers in the past in several countries.

We have further argued that the further course of nominal and real interest rates crucially depends on the future development of the macroeconomy over the business cycle and in a long-term structural perspective. A further fall in long-term interest rates and a further rise in asset valuations would in the short term imply further asset valuation gains. However, this comes at the cost of lower future returns (e.g. lower interest on banks' new loans, lower yields on institutional investors' reinvestment of maturing bonds). Finally, it involves the risk of asset valuation losses for the future if and when interest rates rise and asset valuations are corrected downwards. A taste of this last phase was given in early May and June 2015, when stock and bond markets suffered marked price corrections. Thus, ultra-easy monetary policy may risk to create financial sector and market exuberance as long as the tailwinds of falling interest rates and rising asset prices goes on. They must not conceal needed adjustments in business practices and models. Once yields have reached their floor, financial institutions and investors must get acquainted with ultra-low returns and must heed against the risks from an eventual rise in interest rates. Thus, within overall medium to long-term corporate strategies on business models, asset-liability management must seek to make the transition through the various interest rate phases smooth and the incidence of different future scenarios manageable. Both liquidity and solvency risks need to be carefully considered. The possibility of systemic events, e.g. as a consequence of sudden swings in economic or interest rate expectations, which might also result in liquidity dry-ups in certain market segments, should be carefully evaluated and provided for.

Against this background, it is not surprising that risks from a protracted period of ultra-low interest rates have been gaining regulatory attention. Super-

visors and the major international financial institutions have conducted scenario analyses and stress tests. Their attempts to quantify the impact of future interest and asset price shocks confirm that ultra-low interest rates entail substantial systemic risks, with nonnegligible potential repercussions on the real economy. While some measures are starting to be discussed or taken, further regulatory and macroprudential action may be required to contain these risks. At the same time, awareness is also increasing that regulation itself may become the source of some of the relevant risk channels (e.g. increased risk of liquidity dry-ups due to a reduced role of banks as market makers; see e.g. IMF, 2015). Since the outbreak of the financial crisis plenty of new requirements that financial institutions need to fulfill were introduced and the mandate of regulators and authorities was extended. Even though measures were not directly aimed at tackling the low interest rate environment, the regulatory toolkit nowadays offers many possibilities to address these issues. Stress tests allow identifying potential problems from a protracted period of low interest rates but also of a return of interest rates to higher levels. Macroprudential measures can be employed to curtail specific problems in specific sectors. It also becomes more and more obvious that monetary policy, macroprudential and microprudential regulation and supervision should be conceived in a more closely integrated manner to achieve desired policy outcomes as effectively as possible and avoid cost and risks as best as possible. This might help to achieve macroeconomic stabilization goals while at the same time safeguarding financial stability. Finally, the article may also be seen as a case study on how policymakers need to understand the challenges, incentives and restrictions faced by financial sector actors (in this case asset-liability managers), while at the same time successful asset-liability management requires a deep understanding of the motivations and concerns guiding future policy action.

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