EIOPA-PSC-18/093
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# Request for Feedback

# on

# Methodological Considerations regarding Illiquid Liabilities

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# 1 Responding to this paper

EIOPA welcomes responses to the Request for Feedback on methodological considerations (in the following "Request for Feedback") concerning the request by the European Commission to EIOPA for information on the liquidity of insurance liabilities and the holding period of assets.

Comments are most helpful if they:

- respond to the question stated, where applicable;
- contain a clear rationale;
- support statements with evidence where appropriate; and
- describe any alternatives EIOPA should consider.

Please send your comments to EIOPA in the provided Template for Comments, by email CP-18-004@eiopa.europa.eu until 7 December 2018 23:59 CET.

It might not be possible to take into account contributions not provided in the template for comments, sent to a different email address or after the deadline.

## Publication of responses

Contributions received will be published on EIOPA's public website unless you request otherwise in the respective field in the template for comments. A standard confidentiality statement in an email message will not be treated as a request for non-disclosure.

Please note that EIOPA is subject to Regulation (EC) No 1049/2001 regarding public access to documents and EIOPA's rules on public access to documents[1].

Contributions will be made available at the end of the public consultation period.

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## Next Steps

Based on the feedback received and further work, EIOPA will launch a request for information in early 2019.

# 2 Introduction

## 2.1 Background

One of the most debated issues before the Solvency II implementation and still nowadays is the treatment of long-term insurance business. In particular, it has been discussed whether the risks of long-term insurance business and the associated investments backing those long-term insurance business are adequately reflected. To account for the specificities of long-term insurance business with guarantees, the LTG package was introduced and is currently assessed in a dedicated review process within an EIOPA Project Group ("LTG Review PG"). Furthermore, to explore any new evidence on the features of liabilities, especially concerning their illiquidity characteristics, a dedicated EIOPA Project Group on "Illiquid Liabilities" ("PG") was set up. The illiquidity characteristics of liabilities may contribute to the ability of insurers to mitigate short-term volatility by holding assets throughout the duration of the commitments, even in times of market stress.

The Illiquid Liabilities PG will primarily gain more insight into these aspects, and is therefore also dealing with selected parts of the Call for Information from the EU Commission. This Call was sent to EIOPA in April 2018 and requires EIOPA to submit a report by December 2019. It asks EIOPA, amongst others, to provide data on the liquidity of undertaking's insurance liabilities and information on the asset management of insurers.

## 2.2 Thematic outline

The question EIOPA addresses is how the short and long term risks of long term investments relate to the potential illiquid characteristics of insurance liabilities. The Illiquid liabilities PG therefore intends to assess the following aspects in this Request for Feedback:

- The illiquidity characteristics of insurance liabilities;
- The actual holding periods of assets of insurers; as well as the risks of holding on to assets over a longer term

The ability of insurers to invest long-term may be limited by the characteristics of the insurance liabilities. A key consideration for the PG is therefore to identify characteristics of liabilities, their so- called illiquidity characteristics, which enable insurers to invest long-term and to decide the timing of buying and selling. The work within the PG starts therefore with an analysis on the product side. The first step includes to gain an overview of current products available in the market and to analyse their characteristics. On this basis it is intended to establish "illiquidity indicators". The analysis the PG has undertaken so far in this respect is summarized in section 3.

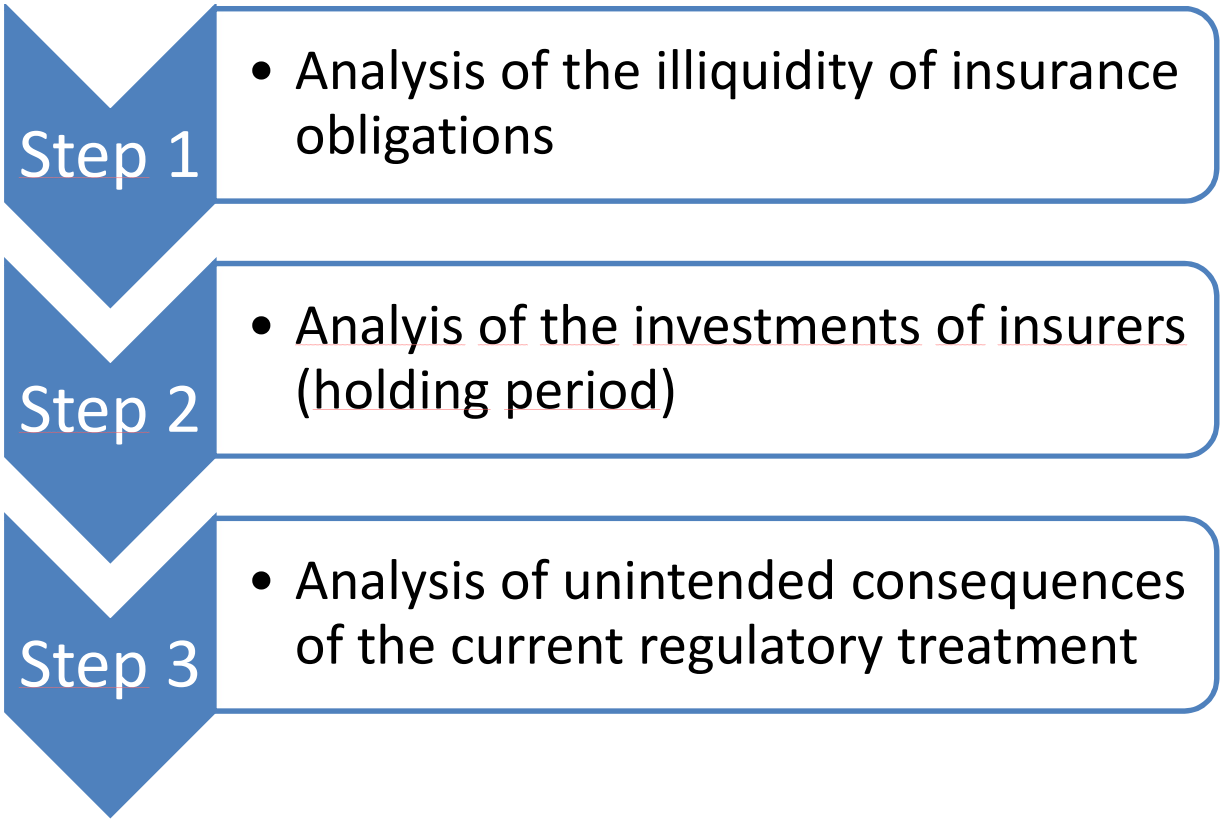
In a second step, the evidence on the actual holding period of assets by insurers will be analysed. The aim is to get an overview on the management of different asset classes and whether the holding of assets depends on the characteristics of the underlying insurance liabilities. The approach that the PG has chosen in this respect is

outlined in section 4. This section also describes the analysis to be performed by the PG on the risk of holding assets over a longer term.

With this Request for Feedback, EIOPA asks stakeholders for feedback on the approaches chosen on these two steps as described.

On this basis EIOPA will further assess whether the risks connected to illiquid liabilities and the assets covering long-term liabilities are adequately reflected in the current regulatory regime. This analysis will include an assessment of any unintended consequences of the current regulatory treatment and how such consequences, if any, could be mitigated. This step of investigation is not in the scope of this Request for Feedback.

The sequence of analysis is summarised in the following graph:




Stakeholders' input to this Request for Feedback will help preparing an information request to undertakings, that EIOPA expects to send out at the beginning of 2019. This information request will cover all relevant aspects necessary to answer the information request from the European Commission as well as the other areas covered by the PG. It is intended to consult on any results derived on the basis of the information provided by undertakings in autumn 2019.

# 3 Analysis of the illiquidity of insurance obligations

The intention of the first step is to gain an overview on potential illiquidity characteristics of insurance liabilities. For that purpose, the PG examines which characteristics are relevant to consider when talking about illiquidity of liabilities and which definitions of illiquidity could apply.

As the illiquidity of insurance liabilities is discussed in the context of the assets backing them, the PG intends to identify those features of insurance liabilities which may impact the ability of insurers to hold their assets without being forced to sell them. The PG therefore considers it relevant to assess to what extent liabilities are predictable (in amount and timing of the cash flows of the insurance liabilities).

As the assessment of any illiquidity characteristics aims at capturing the ability of insurers to invest long-term, it is intended to analyse features such as predictability and time horizon of the insurance liabilities by assessing the :

- terms and conditions of the contract (e.g. cancellation rights);
- duration of insurance liabilities also in stressed conditions; and
- sensitivity of liability cash flows when exposed to stress conditions.

These approaches are outlined in the following sections. It has to be emphasised that the inclusion in this list does not automatically imply that EIOPA will decide to further explore an approach.

**Questions to stakeholders:**

(1) In your view, are the aspects suggested relevant and sufficient when analysing the illiquidity characteristics of insurance liabilities?

(2) What product types would you consider in scope for illiquid liabilities and why (not)? Which ones should be included, life, non-life, and/or unit-linked?

In the following of section 3, the availability and design of surrender options is investigated. The impact of surrender on insurance liabilities is considered in section 3.3 including considerations on the dependency of surrender rates on the development of financial markets (in particular the development of interest rates).

An insurance undertaking may though not only be exposed to an increase in surrender rates when interest rates increase but also in case the financial situation of the insurer deteriorates. The PG considered whether any potential interlinkage between surrender rates and the financial situation of an insurer is worth further consideration when determining the illiquidity of liabilities. At the same time recognizing the solvency position when determining the illiquidity of the liabilities may have pro-cyclical implications (e.g. in case it would be concluded that with a deterioration in the solvency position of an undertaking its liabilities become less illiquid).

**Question to stakeholders:**

(3) In your view, do you consider it possible and sensible to consider the impact of the undertaking's solvency position on the surrender risk of an undertaking?

Whether insurers account for any illiquidity characteristics in their investment decisions is intended to be addressed when analysing the holding period of assets (step 2, see section 2.2).

## 3.1 Analysis of terms and conditions of the contract

A request for information was launched in spring 2018 as part of the LTG PG work in order to gather information on the characteristics of life insurance products in the European market. In particular, undertakings were asked to indicate for each product:

- the typical contractual maturity;
- whether it faces lapse risk (in case the contract has surrender/cancellation options for the policyholder and the surrender value can exceed the value of the assets covering the obligations when the surrender option is exercised)[1];
- the typical time to the first opportunity for cancellation/surrender by policyholder;
- the historical annual cancellation/surrender rates;
- the disincentives for exercising cancellation/surrender options.

The responses provided by undertakings contained additional information (e.g. the coverage of biometrical risk), which could also be used for assessing the characteristics of life insurance products. For further details on the scope of the information request see the technical specifications on insurance products.

The PG on Illiquid Liabilities categorized the products into three buckets regarding their illiquidity characteristics:

- Products without surrender/cancellation opportunity;
- Products with a surrender/cancellation opportunity but not exposed to lapse risk because the surrender value cannot exceed the value of the assets;
- Products with a surrender/cancellation opportunity and exposed to lapse risk.

For each category, the following paragraphs display some statistics derived from the data collected that give an overview of the characteristics - in particular in respect of surrender/cancellation opportunities where applicable - of insurance products across the European market. The ratios are determined based on the written premiums at the EEA level.

It should be noted that these three categories are in theory mutually exclusive. Nevertheless, 11% of the data collected in terms of written premiums was reported as exposed to lapse risk but with no surrender/cancellation option for policyholder. Moreover, although there should be no surrender possibility for products in the first category, an historical annual cancellation/surrender rate was reported for 12% of them in terms of written premiums. This part of the data was excluded from the sample and the derivation of the following statistics.

[1] In the context of this work, not exposed to lapse risk does not mean that SCR for lapse risk is nil. In the SII metrics indeed there can be lapse risk (future profits diminish), even though the surrender value cannot exceed the value of the assets covering the obligations when the surrender option is exercised)

### Products without surrender/cancellation opportunity

In a first step, the share of products without surrender/cancellation opportunity was examined. As the data provided did not allow to directly identify those products,[2] the PG considered that products reported to have no lapse risk and where the data field "typical time to first opportunity for cancellation/surrender" was reported as not applicable could be considered to fall into this category.

With this approach, products without opportunity to surrender/cancel the contract represent 21% of the data collected. The following table displays the contractual maturities for those products:

**Table 1 : Contractual maturity for products without cancellation/surrender opportunity**

| <5 years | 5-10 years | 10-15 years | 15-20 years | >20 years | Lifelong |
|---|---|---|---|---|---|
| 19% | 3% | 9% | 10% | 31% | 28% |

### Products with a surrender/cancellation opportunity but not exposed to lapse risk

9% of the products in terms of written premiums contain a surrender/cancellation opportunity but the surrender value is limited to the value of the assets backing those contracts. In the context of this work, these products are considered not to be exposed to lapse risk.

The table below displays the distribution of the contractual maturity and any disincentives to surrender for that particular group of products.[3]

To facilitate the reading, the responses on the disincentives to surrender were allocated to the following three categories:

- No disincentives to cancellation;
- Lapse discount (i.e. mainly surrender fee);
- Other disincentives for exercising cancellation/surrender options.

[2] As the data field "Existence of cancellation/surrender option for policyholders" included also those contracts, where the surrender value does not exceed the value of the assets.

[3] Those reported to not face any lapse risk and also gave information on the typical time to first opportunity for cancellation/surrender.

**Table 2 : Contractual maturity and disincentives to surrender for products with surrender/cancellation opportunity where the surrender value does not exceed the value of the assets**

| | Percentages of written premiums | | | |
|---|---|---|---|---|
| Typical contractual maturity | All | Of which no disincentives for cancellation | Of which lapse discount | Of which other disincentives for cancellation |
| <5 years | 6% | 96% | 4% | 0% |
| 5-10 years | 1% | 86% | 13% | 1% |
| 10-15 years | 10% | 70% | 20% | 10% |
| 15-20 years | 10% | 77% | 21% | 2% |
| >20 years | 60% | 71% | 28% | 2% |
| Lifelong | 13% | 59% | 26% | 15% |

The project group investigated whether there is any observable relationship between the presence of any disincentives for cancellation/surrender and the surrender/cancellation rate. For products that are not exposed to lapse risk but where insurers reported a typical time or the first opportunity for cancellation/surrender, it is not clear that disincentives have an observable impact on the surrender rate (see table below):

**Table 3: Average surrender / cancellation rate as function of disincentives to cancellation for products with no lapse risk but where surrender is applicable**

| | Average surrender/cancellation rate | | | |
|---|---|---|---|---|
| Typical contractual maturity | All | Of which no disincentives for cancellation | Of which lapse discount | Of which other disincentives for cancellation |
| <5 years | 13% | 13% | 13% | 1% |
| 5-10 years | 6% | 5% | 11% | 4% |
| 10-15 years | 14% | 16% | 9% | 10% |
| 15-20 years | 13% | 11% | 15% | - |
| >20 years | 0% | 0% | 15% | 15% |
| Lifelong | 12% | 14% | 9% | 9% |

**Products with a surrender/cancellation opportunity and exposed to lapse risk**

The biggest share of products (70 %) has a surrender/cancellation option and is exposed to lapse risk. For 99 % of this group, the time until the first contractual opportunity to surrender is below 5 years (short-term opportunity to surrender). Table 4 displays the distribution of the contractual maturity and the corresponding disincentives to surrender:

**Table 4 : Contractual maturity and disincentives to surrender for products for products with lapse risk and short term opportunity to surrender**

| | Percentages of written premiums | | | |
|---|---|---|---|---|
| Typical contractual maturity | All | Of which no disincentives for cancellation | Of which lapse discount | Of which other disincentives for cancellation |
| <5 years | 3% | 26% | 32% | 41% |
| 5-10 years | 4% | 56% | 24% | 19% |
| 10-15 years | 9% | 51% | 36% | 14% |
| 15-20 years | 10% | 62% | 22% | 16% |
| >20 years | 47% | 55% | 34% | 11% |
| Lifelong | 28% | 43% | 32% | 25% |

The PG investigated also whether there is any observable relationship between the presence of disincentives for cancellation/surrender and the surrender/cancellation rate. For this purpose, the historical surrender rates for products where the first contractual opportunity to surrender is less than 5 years (i.e. the overwhelming majority) with and without disincentives were compared:

**Table 5 : Typical contractual maturity and disincentives to surrender for products for products with lapse risk and short term opportunity to surrender**

| | Average surrender/cancellation rate | | | |
|---|---|---|---|---|
| Typical contractual maturity | All | Of which no disincentives for cancellation | Of which lapse discount | Of which other disincentives for cancellation |
| <5 years | 8% | 8% | 7% | 7% |
| 5-10 years | 7% | 7% | 6% | 8% |
| 10-15 years | 3% | 3% | 3% | 4% |
| 15-20 years | 5% | 4% | 5% | 5% |
| >20 years | 3% | 3% | 2% | 8% |
| Lifelong | 6% | 4% | 7% | 6% |

These figures display no strong connection between surrender rates and the existence of disincentives to surrender.

**Questions to stakeholders:**

(4) Are there any characteristics with respect to terms and conditions of contracts, other than those considered above, that are relevant when analysing illiquid liabilities?

(5) Do you consider that any disincentives for surrender/cancel a contract have an impact on surrender rates/surrender risk? If yes, can you provide evidence on this? Which disincentives have the largest impact on surrender behavior? What is the evidence?

(6) Which impact do these characteristics have on the asset management (investment behaviour) of insurers? Can you provide any evidence on how

the insurance characteristics identified impact investment behaviour?

(7) Do you consider biometrical risks like mortality relevant for the qualitative illiquidity assessment? Please elaborate why (not) and how.

(8) Do you see any reason why unit-linked products with no guarantee should be kept in the scope of the work on illiquid liabilities?

## 3.2 Assessing the duration of insurance liabilities

The PG also analysed the data undertakings are required to submit on their liability cashflows profile. This information is provided annually by line of business but may be derived in different ways: Where a stochastic calculation is performed to determine technical provisions, the cashflows reported may be determined based on an average of the cashflows derived in the stochastic calculation or may reflect one medium cashflows (also called certainty equivalent cashflow). Where a stochastic calculation is performed to determine the best estimate, the information provided by undertakings is thus not sufficient to recalculate the best estimate.

However, the cashflows still allow to assess how long-term the insurance liabilities are. To assess the weighted average time of the insurance cashflows, the Macaulay duration of the liability cashflows was calculated. The duration was not calculated to enable any sensitivity calculations (e.g. variation of cashflows resulting from changing interest rate environment)[4] but purely for the sake of determining the average time of maturity of the underlying liability cashflows.

As the intention is to determine the illiquidity of insurance liabilities, the PG considered whether and how information on the duration of liabilities could be used for that purpose. The PG discussed for example whether the duration of liabilities or the variation of the duration of liabilities over time or rather in specific stressed situations could be an indicator for illiquidity of insurance liabilities.

Where the duration itself is intended to be used as an indicator for illiquidity, specific considerations apply for liabilities with embedded options, e.g. surrender options or guaranteed annuity options. In these cases the duration measure should be adjusted to account for the fact that the embedded options may change the expected cash flows of the liabilities. For example, if a liability is surrendered, the benefit payment is due before the contractual maturity. Another example is a callable bond for which interest payments cease and the principal is repaid before the contractual maturity when it is called. An option adjusted duration or effective duration could in this case be a better measure than Macaulay duration.

The PG also considered whether it would be possible to assess any correlation between the holding period of assets and the duration of insurance liabilities (cf. section 4).

Furthermore, the PG also discussed whether it would be possible to assess if the change in the duration of insurance liabilities in a stressed situation may be correlated with the ability of insurers to hold on to assets also in times of market distress.

The information provided in the annual reporting is available on the basis of lines of business. More granular information would be necessary to enable linking the findings of any duration analysis with the terms and conditions of the contracts as outlined in

[4] The limitations of such approach were considered in the stress test report 2016 already, see page 35 https://eiopa.europa.eu/Publications/Surveys/EIOPA-BOS-16-302%20Insurance%20stress%20test%202016%20report.pdf

section 3.1 (which are based on product level). The cash flows also do not differentiate between guaranteed benefits and future discretionary benefits.

**Questions to stakeholders:**

(9) Do you agree that the Macaulay duration and/or the variation of the Macaulay duration in times of stress can serve as an indicator to assess the illiquidity of most insurance liabilities?

(10) Which elements are necessary to define the cash flows to be provided for the calculation of this Macaulay duration?

(11) How significant would be the impact of using an option adjusted duration or effective duration for your liabilities with optionalities?

(12) Do you consider it necessary to analyse the duration of insurance cash flows on a more granular level than by lines of business, e.g. by product type or differentiating by guaranteed benefits and future discretionary benefits? If yes, please explain the reasons.

(13) Which stresses do you consider particularly relevant for the purpose described?

(14) Do you have a view on how the insurance cash flows should be provided for that purpose in case a stochastic valuation is performed? Is an average scenario sufficient or would it be necessary to gather further information?

## 3.3 Measuring illiquidity based on the variation in cash flows under stresses

Another way to determine the illiquidity of the liabilities is to determine which part of the liabilities is unaffected in different stress scenarios. This section outlines in in 3.3.1 two approaches to measure the illiquidity after the application of several stress-scenarios and in 3.3.2 several stresses that could be applied and. Reader should be aware that this is only one possible approach being explored and that EIOPA may not further pursue it in the future.

### 3.3.1 Description of the approaches considered

Another way to approach illiquidity is to look at the variability of cash flows under stressed conditions. EIOPA considers two approaches. For illustration assume a life insurer with a book of savings contracts with an option to surrender anytime. For simplicity, no premium payments are expected in the future and expense payments are disregarded. The expected benefits payments are assumed to be 100 in T = 1, 100 in T = 2 and 100 in T = 3. In this example, disregarding discounting and risk margin and assuming no FDB, the technical provisions would be 300 in T = 0.

In the first approach, the cumulative row indicates the sum of the cash flows after T = t. It implies that in the base case a provisions of 300, 200 and 100 are retained at T=0,1 and 2 respectively.

The relevant stressed cash flows are set out in the row "Stressed case" (for their determination cf. section 3.4 "Stress scenarios for life and non-life business").

One could deduce that, to meet the benefits payments under stressed conditions, provisions of 325, 250 and 50 should be retained at T=1, 2 and 3 respectively.

Consequently, one could define the predictable part of the liabilities to be the minimum provision retained for each year - i.e. the minimum amount of the cumulative rows in the "Base Case" and "Stressed Case" for each year. Then, the predictable part of the liabilities corresponds to the minimum provision to be held to meet the expected benefits payments in base and stressed case.

**Table 6: Illustrative example of first approach to illiquidity measurement**

| | T=0 | T=1 | T=2 | T=3 |
|---|---|---|---|---|
| Base Case | | 100 | 100 | 100 |
| Cumulative | 300 | 200 | 100 | 0 |
| Stressed Case | | 75 | 200 | 50 |
| Cumulative | 325 | 250 | 50 | 0 |
| Predictable part of the liabilities | 300 =min(300,325) | 200 =min(200, 250) | 50 =min(100,50) | 0 |

In the second approach, the cumulative row contains the sum of the cash flows until T = t. As above the effect of the relevant stresses on the cash flows is captured in the figures in row "Stressed Case".

Consequently, one could define the illiquid part of the liabilities for each year to be the technical provision in T = 0 ($TP_0$) minus the maximum cumulative expected benefits

payment until this year –i.e. ($TP_0$) minus the maximum amount in cumulative rows in the base and stressed case. Then, the predictable part of the liabilities corresponds to the minimum residual of the original technical provision ($TP_0$) after the payment to policyholders.

**Table 7: Illustrative example of second approach to illiquidity measurement**

| | T=0 | T=1 | T=2 | T=3 |
|---|---|---|---|---|
| Base Case | | 100 | 100 | 100 |
| Cumulative | 0 | 100 | 200 | 300 |
| Stressed Case | | 75 | 200 | 50 |
| Cumulative | 0 | 75 | 275 | 325 |
| Predictable part of the liabilities | 300 ($TP_0$) | 200 $=(TP_0\text{-}\max(100,75))^+$ | 25 $=(TP_0\text{-}\max(200,275))^+$ | 0 $=(TP_0\text{-}\max(300,325))^+$ |

With these approaches the effect of guarantees would be reflected as they result in liability cash flows being less sensitive to certain stresses.

So far no discounting was considered. One argument in favour of discounting could be that cash flows far in the future should have a lower impact on the current illiquidity of liabilities than cash flows in the near term. One argument against could be the need to ensure consistency in case the liability cash flows are dependent on interest rates.

**Questions to stakeholders:**

(15) Do you have any comments regarding the described approaches to measure the predictable part of the liabilities? Would you encourage an alternative approach? Please explain.

(16) What are your views on the use of discounted cash flows in the context of the two above approaches? In case of discounting, which discount rate should be used?

(17) What are the operational difficulties with this method to determine the illiquid part of the liabilities?

### 3.3.2 Stress scenarios for life and non-life business

In this section, possible stresses are set out. As calibrating the shocks and creating stress scenarios that combine shocks on several risk factors (as in a stress test approach) is a complex exercise, one simplification could be the use of the standard formula shocks as standalone scenarios instead of combined stress scenarios. Other scenarios (e.g. using different fixed lapse rates) could complement them for determining sensitivities. A full lapse scenario on contracts where lapse is possible would for example give an idea about the maximum level of illiquidity of the liabilities.

The PG considers that expense risk as well as revision risk should not be taken into account. Since the aim of the work is also to study potential consequences of illiquidity of liabilities on assets risk, the PG suggests to consider also market risks scenarios.

As far as non-life undertakings are concerned, the PG thinks that the illiquidity properties of liabilities are mainly driven by the volatility of reserves. Although premium provisions would give rise to reserves settlement, the PG considers that reserve risk better reflects the volatility of the reserves.

Based on the considerations so far the following scenarios could be considered in order to assess illiquidity of liabilities based on one of the two approaches set out in the previous section:

- mortality scenarios (up, down, different mortalities for comparison, 100% mortality)
- longevity scenarios (up, down, different longevities for comparison)
- lapse scenarios (mass lapse, permanent lapse up, permanent lapse down, 100% lapse where lapse is possible)
- Disability/Morbidity scenarios
- Reserve risk scenario;
- Market scenarios (interest rate; spread widening and equity).

Another question is whether shocks should be applied to all contracts or - as in the standard formula specifications - only to contracts where the technical provisions increase. In the case of lapse, an argument for the latter is, that it reflects policyholder behaviour assuming they act financially rational while one could argue against it that mass lapses may not be driven by financially rational behaviour.

Where lapses are interest rate dependent (assuming that policyholders are – at least to some extent – financially rational) typically dynamic lapses are modelled, with increasing/decreasing lapse rates based on the development of interest rates in the stochastic valuation models for the valuation of technical provisions. Another question is whether the permanent shocks on lapse rate already capture this dependency or, if it needs to be combined, with a shock on interest rate.

Finally, the standard formula stresses are calibrated on a one-year time horizon. To determine the illiquidity of a payment some years into the future, however, the ultimate volatility of the payment and not the one-year volatility has to be considered.

One possible way to consider this could be to scale the volatility or the shock applied on a cash flow t years in the future with an appropriate scaling factor.

**Questions to stakeholders:**

(18) Do you consider using several stand-alone shocks (and then determining the minimum predictable part) rather than combined shocks (stress test approach) appropriate? Do you consider that all of the listed risks are relevant? Do you have any comment on this approach?

(19) Do you think that the scenarios listed above allow for capturing the interconnections betweeen lapses and market risks?

(20) Do you consider that multi-year horizon stress should be considered ? If so, could scaling by an appropriate factor a suitable way to address this for non-life risks? Does this work also for life risks?

(21) What is your view with respect to a possible restriction of shocks to policies where the event results in a loss?

# 4 Analysis of the investments of insurers

## 4.1 Analysis of the holding period of assets

### 4.1.1 Data and methods

The Call for Information asks EIOPA to provide information on the period over which the different types of investments are effectively held by insurance undertakings. One obvious source of information is the Solvency II reporting. Detailed lists of assets are currently available on quarterly basis from the first quarter of 2016 until the second quarter of 2018. These data show the amount of buying and selling in just these two years (i.e. a period much shorter than the typical lifetime of a life insurance obligation). Nevertheless, the turnover in these two years will provide insight in to what extent insurers hold on to their assets. The objective is to identify whether undertakings with longer term liabilities hold on to a greater part of their assets every quarter than undertakings with shorter term liabilities.

For this analysis EIOPA compares from quarter to quarter to what extent the investment in any specific asset has changed. Using only the change in the value of the asset from one quarter to another will result in a bias, since price changes may also affect the change in value from one quarter to another. This effect of price changes can be eliminated as insurers report the quantity per asset.

Comparing the notional value of individual bonds or the number of individual shares at the beginning and the end of a period allows calculating the net number of bonds or equities bought or sold during that period.

As only "snapshots" are available, it is not possible to determine whether assets were bought and then sold during the year (or vice versa) – thus the actual trading activity is underestimated - and it is impossible to determine when transactions were executed.

Comparing the notional value of the bonds or the quantities of the equities of a quarter with the previous quarter will result in the net number of bonds or equities bought or sold during that quarter. It is a net number since undertakings that have bought and sold an investment in a quarter just report the final exposure to that investment at the end of that quarter.

Define *MVi,j,t* as the market value of the holdings/investments of undertaking *i* in asset *j* at time *t* and *Ni,j,t* as the number of holdings/investments in that asset *j* at time *t*, where *N* equals the par/notional amount for bonds and the quantity for equities. The number of assets *j* bought, sold and kept by undertaking *i* in quarter *t* then becomes:

$$\Delta N_{i,j,t}^{bought} = \left[N_{i,j,t} - N_{i,j,t-1}\right]^{+}$$

$$\Delta N_{i,j,t}^{sold} = \left[N_{i,j,t-1} - N_{i,j,t}\right]^{+}$$

$$\Delta N_{i,j,t}^{kept} = N_{i,j,t} - \Delta N_{i,j,t}^{bought} - \Delta N_{i,j,t}^{sold}$$

Since with this calculation buying or selling 100,000 penny stocks would be 100,000 times more relevant as buying or selling a single stock worth 100,000, these numbers are translated into the market value of assets *j* bought, sold and kept by undertaking *i* in quarter *t*:

$$\Delta MV_{i,j,t}^{bought} = \Delta N_{i,j,t}^{bought} \times \frac{MV_{i,j,t}}{N_{i,j,t}}$$

$$\Delta MV_{i,j,t}^{sold} = \Delta N_{i,j,t}^{sold} \times \frac{MV_{i,j,t-1}}{N_{i,j,t-1}}$$

$$\Delta MV_{i,j,t}^{kept} = \Delta N_{i,j,t}^{kept} \times \frac{MV_{i,j,t-1}}{N_{i,j,t-1}}$$

Please be aware that this translation does not imply that price effects are included in the transactions.[5] If an asset is new on the balance sheet at time *t* it may be that there is no price available at time *t-1*; therefore the price, i.e. the ratio of value and numbers, at time *t* is used for this.

The degree to which an undertaking holds onto its investments does not depend on the absolute figure. When an insurer buys or sells 10 million euros of assets this is a lot if total investments are 20 million but not much in case of 1 billion of assets. Therefore, the relative amounts of assets *j* bought, sold and kept by undertaking *i* during quarter *t* are defined as the changes in market value divided by the total investments of undertaking *i* in quarter *t*:

$$\Delta_{i,j,t}^{bought} = {}^{\Delta MV_{i,j,t}^{bought}} \Big/ {}_{\sum_j MV_{i,j,t-1}}$$

$$\Delta_{i,j,t}^{sold} = {}^{\Delta MV_{i,j,t}^{sold}} \Big/ {}_{\sum_j MV_{i,j,t-1}}$$

$$\Delta_{i,j,t}^{kept} = {}^{\Delta MV_{i,j,t}^{kept}} \Big/ {}_{\sum_j MV_{i,j,t-1}}$$

In some cases analysing the total amounts of assets bought, sold and kept $\Delta MV_{i,j,t}$ may be also of interest.

A proxy for turnover ratios can be derived as the inverse of the amounts kept.

By the time EIOPA has to answer the Call for Information by the European Commission EIOPA data from 2016Q1 to 2019Q1 will be available. This implies 3 years or 12 quarters of amounts and percentages kept. Additionally EIOPA could ask as part of the information request for more data in the same format as already available. Alternatively, EIOPA could set up a completely different template to gather data on the holding periods of assets over an longer horizon.

[5] The reason to look at numbers in the first place is that changes in the market values of investments may be due to either price changes or buying or selling the investment.

**Questions to stakeholders:**

(22) Do you consider these data and methods as appropriate to analyse the holding periods?

(23) Do you have any suggestions to improve the data and methods for this analysis? Could you provide further evidence on the holding period of your assets also under different market conditions?

(24) Do you consider the data used sufficient for the analysis of the holding periods, both in terms of length as representativeness of the holding periods of assets?

(25) What could be the least effortful way to gather information on holding periods if the caculation based on the turnover ratio set out above was deemed insufficient?

### 4.1.2 Initial results on holding periods

The analysis EIOPA has performed so far has covered government and corporate bonds as well as equities. The bar graph below shows the amounts 1537[6] undertakings have kept, sold and bought as well as the amounts of bonds that matured between 2016-Q1 and 2017+Q1. Index- and unit-linked investments have been excluded from this analysis. In this period undertakings kept 80% or 1,555 billion euros of their government bonds and sold 20% or 377 billion euros of them. At the same time undertakings bought 442 billion euros of government bonds.

In the same period, undertakings sold 23% or 404 billion euros of their corporate bonds, while holding onto 77% or 1,324 million euros of them. They bought for 547 billion euros of corporate bonds. The investments in equity are smaller, but the percentages kept and sold are comparable: undertakings sold 22% or 161 billion euros of their equity investments and kept 78% or 559 billion euros, while buying 343 billion euros of equities.

[6] The difference between the "Total sample solo prudential Q1 2016" and the "analysis sample" is explained by rejected submissions, non-standard reporting, undertakings which are included in only one period and data cleansing. SII Investments (other than assets held for unit-linked and index linked contracts) for the analysis sample amount to 6,340 Billion Euro, whereas the value for the entire EU sample is 6,808 Bn. Life, non-life, reinsurance and composites account for respectively 48, 15, 5 and 32% of the analysis sample in terms of SII investment amount non-unit-linked

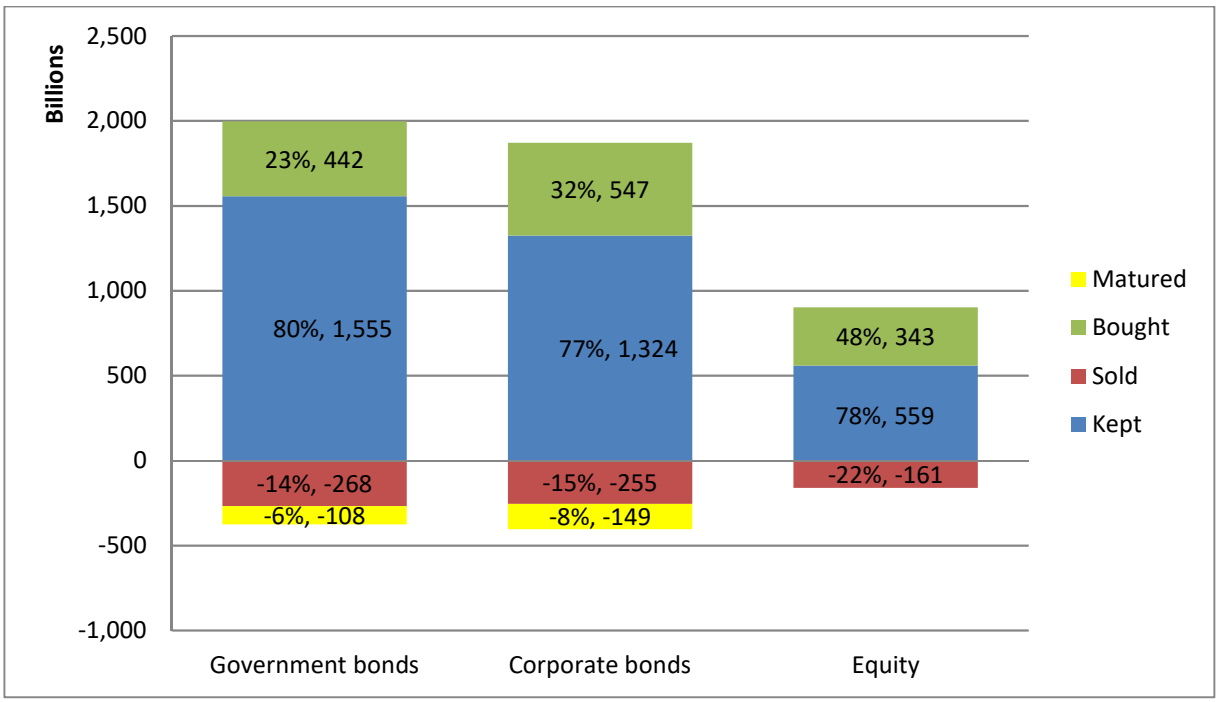
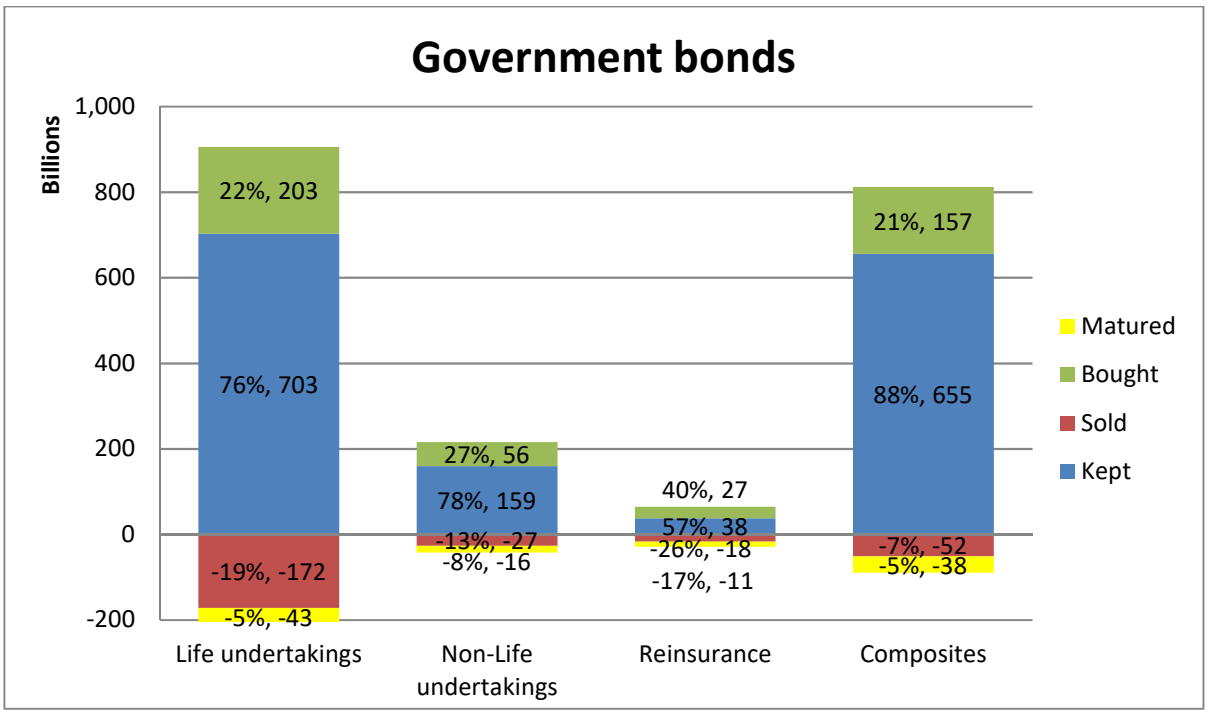



***Figure 1**: Total amounts and percentages of government bonds, corporate bonds and equities sold, kept, bought and matured of insurance undertakings between 2016-Q1 and 2017-Q1.*

The following graphs divide these numbers over the different types of undertakings. This provides a view on whether or not life, non-life, composites and reinsurance undertakings hold on to their assets to a different extent. Composite undertakings sold less than 10% of their government bonds, while life undertakings and reinsurance undertakings sold more than 20% of these investments. Different types of undertakings sold between 10% and 20% of their corporate bonds, although reinsurance undertakings sold more than 25% of their corporate bonds. Life undertakings sold the largest part of their equities, 27%; this percentage varies between 17% for non-life undertakings and 23% for composites.



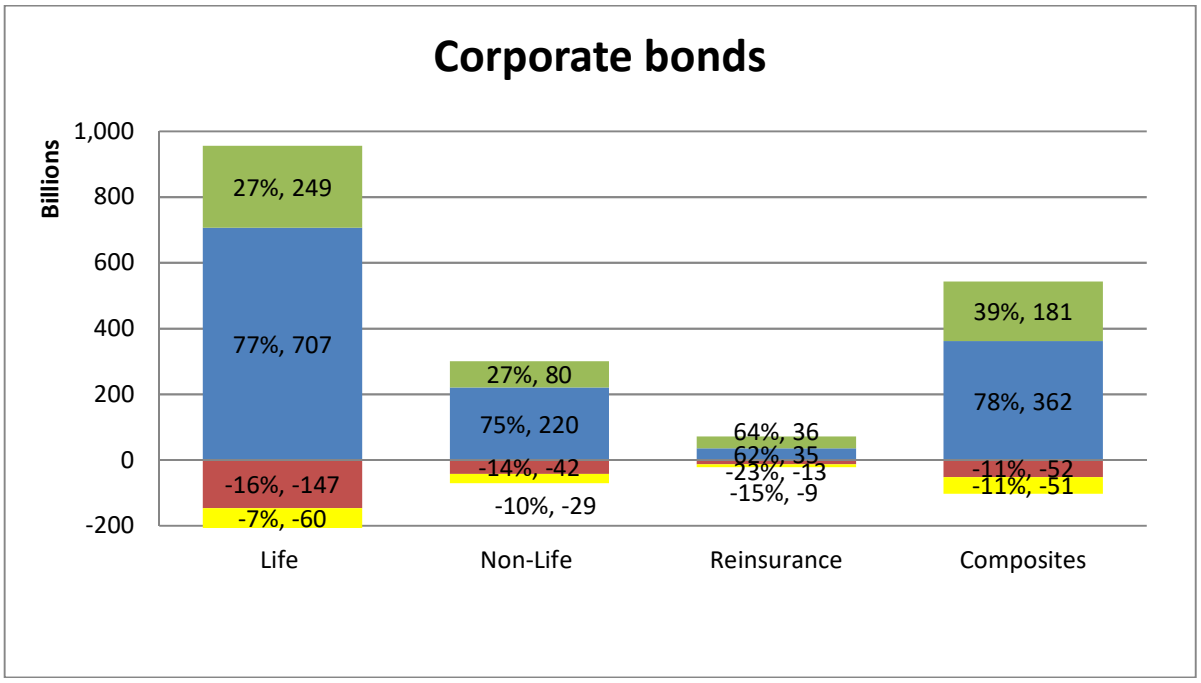




***Figure 2**: Total amounts and percentages of government and corporate bonds sold, kept, bought and matured of insurance undertakings between 2016-Q1 and 2017-Q1 per type of undertaking.*

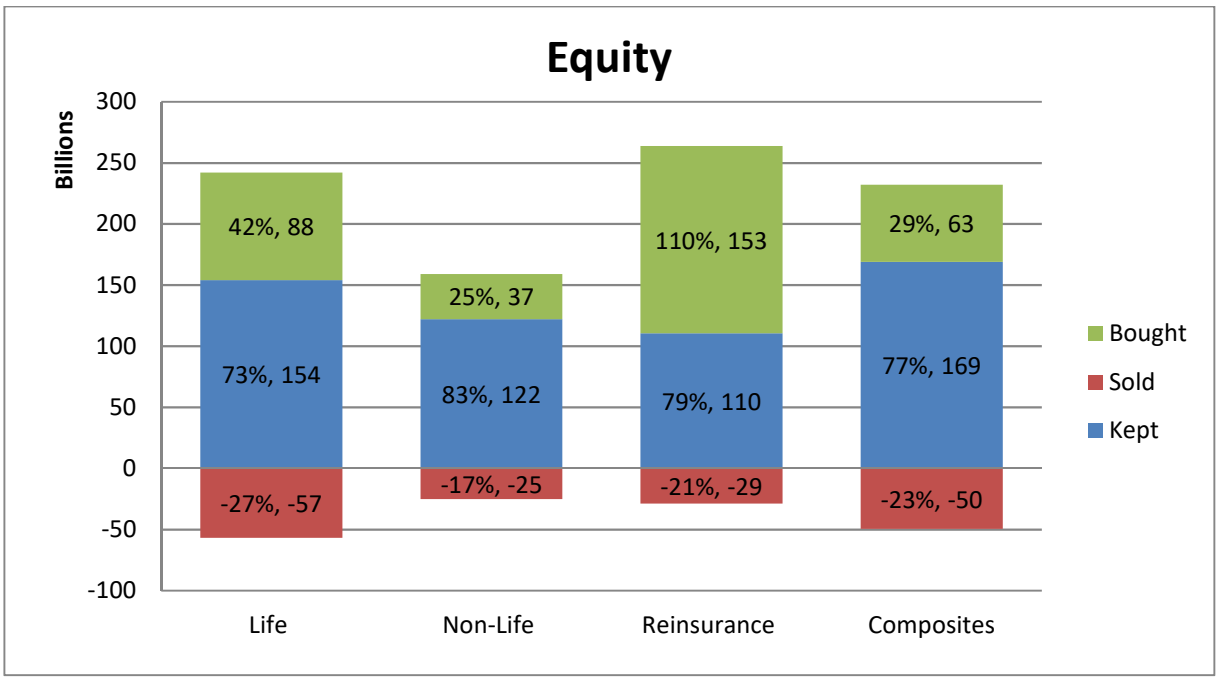



***Figure 3**: Total amounts and percentages of equities sold, kept, bought and matured of insurance undertakings between 2016-Q1 and 2017-Q1 per type of undertaking.*

The next graphs divide the amounts of bonds kept, sold and bought for the different maturities of these bonds. Undertakings sold 22% of their government bonds with a maturity between 1 and 3 years at 2016-Q1, while 13% of their government bonds with a maturity of more than 12 years were sold; 13% to 16% of the government bonds with maturities between 3 and 12 years were sold. For corporate bonds the percentages sold varied between 13% and 21% where 18% of the corporate bonds with a maturity of more than 12 years were sold.

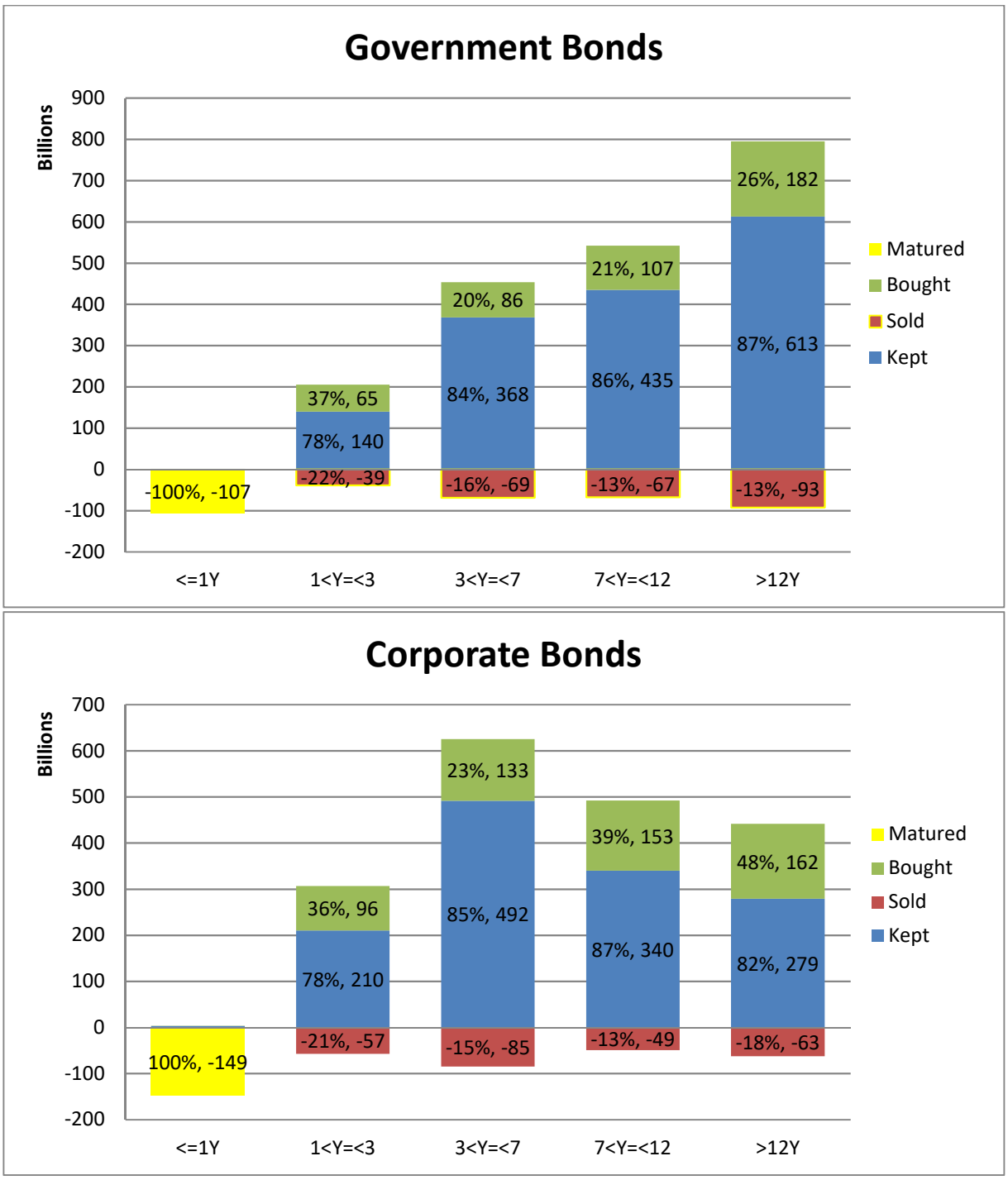



***Figure 4**: Total amounts and percentages of government bonds and corporate bonds, bought and matured of insurance undertakings between 2016-Q1 and 2017-Q1 for different maturities of these bonds at 2016-Q1.*

The following graphs divide the amounts and percentages kept, sold and bought of the government and corporate bonds over the different credit quality steps. Undertakings sold about 13% of the government bonds with credit quality steps between 0 and 3, while they sold more than 20% of their government bonds with lower credit quality steps as well as of their unrated bonds. For corporate bonds these percentages vary over the different credit quality steps between 11% for credit quality step 2 and more than 20% for credit quality steps 4 and 5 as well as for unrated bonds.

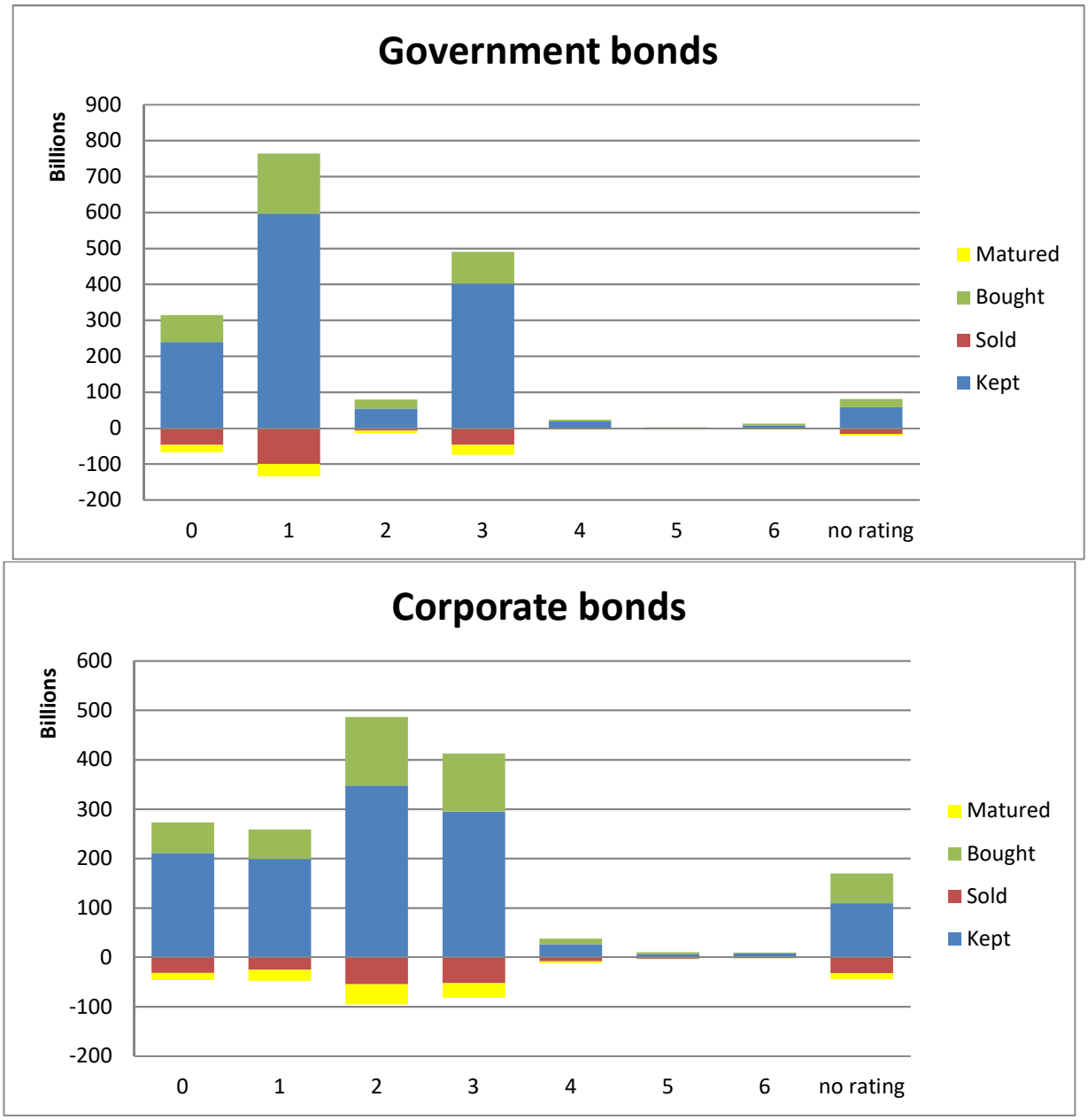



***Figure 5**: Total amounts and percentages of government bonds and corporate bonds, bought and matured of insurance undertakings between 2016-Q1 and 2017-Q1 for different credit quality steps at 2016-Q1.*

As the numbers do not fit into the respective sections of the columns in figure 5 above the following tables provide the amounts and percentages:

**Table 8 : Total amounts and percentages of government bonds matured, bought, sold and kept per credit quality step**

| | CQS 0 | CQS 1 | CQS 2 | CQS 3 | CQS 4 | CQS 5 | CQS 6 | No rating |
|---|---|---|---|---|---|---|---|---|
| Bought | 75/24% | 167/23% | 25/38% | 89/19% | 5/23% | 1/34% | 5/42% | 23/29% |
| Kept | 239/78% | 597/81% | 54/80% | 402/84% | 18/81% | 1/70% | 7/64% | 58/73% |
| Sold | -47/-15% | -100/-14% | -7/-11% | -47/-10% | -3/-13% | 0/-22% | -3/-23% | -17/-21% |
| Matured | -20/-7% | -34/-5% | -6/-9% | -28/-6% | -1/-6% | 0/-8% | -1/-13% | -4/-5% |

**Table 9 : Total amounts and percentages of corporate bonds matured, bought, sold and kept per credit quality step**

| | CQS 0 | CQS 1 | CQS 2 | CQS 3 | CQS 4 | CQS 5 | CQS 6 | No rating |
|---|---|---|---|---|---|---|---|---|
| Bought | 62/24% | 60/24% | 139/31% | 118/31% | 11/30% | 3/28% | 2/15% | 60/39% |
| Kept | 211/82% | 199/80% | 348/79% | 295/78% | 26/69% | 7/65% | 8/77% | 110/71% |
| Sold | -32/-12% | -25/-10% | -54/-12% | -52/-14% | -8/-21% | -3/-26% | -2/-15% | -32/-21% |
| Matured | -14/-6% | -23/-9% | -41/-9% | -30/-8% | -3/-9% | -1/-9% | -1/-7% | -12/-8% |

Within equity investments a distinction can be made between participations and 'regular' equity investments. The graph below shows the amounts of equity participations and non-participating equities being kept, sold and bought. The percentages kept and sold do not differ much for the equity participations: 21% is sold, while 23% is sold of the 'regular' equity investments.

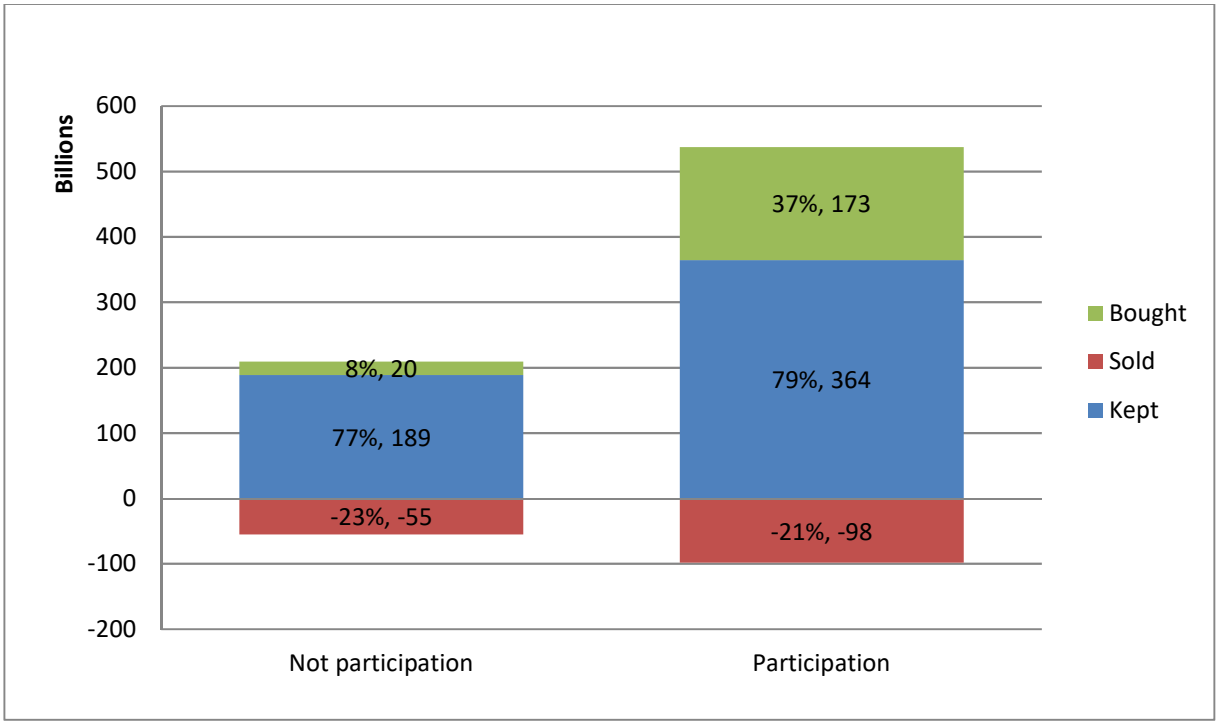



***Figure 6**: Total amounts and percentages of equity participations and non-participating equities sold, kept, bought and matured of insurance undertakings between 2016-Q1 and 2017-Q1.*

**Question to stakeholders:**
(26) Do you consider these initial results plausible? Why (not)?

### 4.1.3 Link between holding periods and characteristics of liabilities

In the context of the analysis it is of interest why the holding periods differ across undertakings. For this purpose the percentages the undertaking keep from one period to another are related with several characteristics of the undertaking. The characteristics of interest relate to the duration and illiquidity of the liabilities of the undertaking. The following regression equation will relate the holding periods, percentages kept, with different characteristics of the undertakings:

$$\Delta_{i,j,t}^{kept} = \alpha_i + \alpha_j + \alpha_{jt} + \beta_m \times Maturity_{i,j} + \beta_{MD} \times DurationLiabilities_i + \beta_{liq} \times LiquidityLiabilities_i + \cdots + \varepsilon_{i,j,t}$$

where $Maturity_{i,j}$ equals the average duration/maturity of assets $j$ of undertaking $i$, $DurationLiabilities_i$ equals the duration for the liabilities of undertaking $i$ and $LiquidityLiabilities_i$ can be any measure for illiquidity (e.g. the percentage of illiquid liabilities derived from the application of the stress-scenarios or the percentage of non-lapsable product).

**Questions to stakeholders:**
(27) Do you consider this regression analysis appropriate to relate the holding periods of the assets to the illiquidity characteristics of the liabilities?

## 4.2 Risks of bonds over longer horizons

Life insurers typically try to match the cash flows of their long-term liabilities with cash flows from fixed income investments. Insurers may hold these fixed income investments until their maturity. In the following the "set-up" that is intended for the analysis for risks over longer periods is set out. The question intended to be answered is how the variation in excess returns on bonds over periods longer than one year relates to the variation in these excess returns on bonds with a horizon of one year, the Solvency II SCR horizon.

### 4.2.1 Data

The analysis will be based on the total return series for seven monthly rebalanced rating class indices ('AAA' to 'CCC and below') for Euro corporate bonds. Total return means that coupon payments are reinvested. The analysis starts at the earliest date for which all indices are available up to the present.

Bond indices per rating class should also be available for different maturities: There are time series for the rating classes AAA to BBB for the maturity buckets up to 3 years, 3 to 5, 5 to 7 and 7 to 10 years but corresponding data for the ratings classes below investment grade is likely not available.

Another source of data are annual transition matrices from S&P Global Market Intelligence for the period 1999 to 2017.

**Question to stakeholders:**
(28) Do you consider these data, both return indices and migration matrices,

as representative for the analysis of the risks associated with holding to maturity as described in the following section?

### 4.2.2 Methods

#### 4.2.2.1 Duration matched excess returns

The analysis will be based on returns of these indices in excess of the risk-free rates as technical provisions will accrue over time with these risk-free rates. Returns below these risk-free rates imply losses in own funds that should be reflected in the SCR. Par swap rates from 31 December 1998 up to 31 December 2017 for maturities of 1, 2, …, 10 years are the basis for EIOPA to derive the risk-free interest rate term structure.

The excess return is the return in excess of a duration matched risk-free investment. If the duration of an index is 5 years at a point in time, its excess return over the following period is its return in excess of the return of a 5 year risk-free zero coupon bond. The annual return on a risk-free investment in year *t* with a certain duration *T* determined at the end of year *t-1* is as follows:

$$r_{riskfree,t}^{T=MD_{t-1}} = \left(1 + r_{t-1}^{T=MD_{t-1}}\right) \times \frac{DF_t^{T=MD_{t-1}-1}}{DF_{t-1}^{T=MD_{t-1}}} - 1$$

where $DF_{t-1}^{T}$ equals the discount factor, the price of a zero coupon bond, with maturity *T* at the end of time *t-1,* $r_{t-1}^{T}$ equals the zero coupon rate for a risk-free investment with maturity *T* at the end of time *t-1* and $MD_{t-1}$ equals the duration at the end of time *t-1*.

Those annual returns translate into the following monthly returns:

$$r_{riskfree,t}^{T=MD_{t-1}} = \left(1 + r_{t-1}^{T=MD_{t-1}}\right)^{1/12} \times \frac{DF_t^{T=M\ \ t-1-1/12}}{DF_{t-1}^{T=MD_{t-1}}} - 1$$

The excess returns now become

$$r_{excess,t}^{cat} = \frac{(1 + r_t^{cat})}{\left(1 + r_{riskfree,t}^{T=MD_{t-1}}\right)} - 1$$

where $r_t^{cat}$ equals the return on an investment at time *t* in an index with a specific rating category *cat* and *T* equals the modified duration of that specific index.

**Question to stakeholders:**
(29) Do you consider this method appropriate to approximate the excess returns on an initial investment of a portfolio of investments in just one asset class?

#### 4.2.2.2 Returns taking account of migrations and defaults

The return indices at hand are rebalanced every month to reflect rating migrations and defaults out of the respective indices. The focus of the analysis here are the risks

and returns when holding on to assets. Thus buying a portfolio of AAA bonds and holding on to these bonds for 10 years will result in a portfolio of AAA-, AA-, A-, BBB- etc. rated bonds with some even defaulted. The return on such portfolio of initial AAA bonds in the second year will equal the return on the part of these AAA bonds that have remained AAA plus the return on AA bonds for the part of the initial investment that has migrated to AA and etc. for the other ratings. The cumulative excess return vector in *x* years equals:

$$r^{x}_{cum.excess,t} = \prod_{1}^{x} M_{t+x} \times \left( 1 + \begin{bmatrix} r^{AAA}_{excess,t+x} \\ \vdots \\ r^{CCC-belo}_{excess,t+x} \end{bmatrix} \right) - 1$$

where $M_{t+x}$ is the 7 by 7 migration/transition matrix in year *t+x* with the transition probabilities from and to the 7 different rating classes.

The excess return vector in year *x* when holding on to the assets for *x* years equals:

$$r^{x}_{excess,t} = \frac{\left(1 + r^{x}_{cum.excess,t}\right)}{\left(1 + r^{x-1}_{cum.excess,t}\right)} - 1$$

The return series of the different indices already take account of defaults: If a specific bond defaults it is removed from the index at the end of that month. In such a case, the price of the defaulted bond at the end of a month is used to calculate its return. This is possible since defaulted bonds can still be traded and pricing is available; in those cases the price reflects market participants views regarding the recovery rate of that bond. This more or less implies that insurers hold on to their bonds up to maturity or to the end of the month that the bonds default.

Consequently, there is no need to have a specific default state to migrate to and no default returns including recovery rates. This also implies that the default probabilities for the different rating categories are added to the probabilities of staying in the same rating class, since the default return is already included in the index for that specific rating.

**Question to stakeholders:**
(30) Do you consider this method appropriate to approximate the returns on an initial investment of a portfolio of investments in just one asset class?

#### 4.2.2.3 Monthly migration

Transition/migration matrices are available on an annual basis, while EIOPA has monthly return series. Rather than migrating in 'one big step' every 12 months, the annual migration matrices are transformed to monthly migration matrices for each *year* with the following Matlab functions: [7]

[7] MATLAB is a registered trademark of The MathWorks, Inc.

$$M_t^{mont} = \text{expm}\left(\text{logm}\left(M_t^{year}/_{12}\right)\right)$$

**Questions to stakeholders:**

(31) Do you consider these monthly migrations necessary for the analysis of holding onto specific investments?

(32) Do you consider this method using Matlab's exponential and log functions for matrices appropriate to derive monthly migration matrices?

### 4.2.3 Risks of holding on to bonds until maturity

The methods so far do not yet take account of the fact that bonds mature as time passes. Until now, migrations do occur from one rating to another, but the migration is from a AAA index with an average duration of 5 years to a AA index with an average duration of 5 years. These average durations vary over time because of the inclusion of new issues and the exclusion of defaults and migrated issues. As such, the returns on these indices, taking account of migrations, do not yet reflect the returns of holding on to a portfolio of 5-year bonds.

EIOPA considers that the returns of holding on to a portfolio of 5-year bonds for 5 years can be approximated by 'switching' after 2 years from the 3-5 indices to the indices with maturities up to three years, while still taking account of migration. For the analysis of the risks of a portfolio of 10-year AAA bonds, the method would use for the first three years the returns on the 7-10 series, then switch for the next two years to the 5-7 series, after two more years to the 3-5 series etc., while still taking account of the monthly migrations.

**Question to stakeholders:**

(33) Do you consider this method to switch from indices with bonds with different maturities appropriate to approximate the returns of holding onto a diversified portfolio of bonds with the same maturity in a single rating category?

## 4.3 Risk of equity investments

For equity investments it is intended to analyse the total excess returns (i.e. including reinvested dividends) of broad equity indices. This can be country indices as well as broader geographical indices (e.g. Europe). Being aware of the limitations, it is intended in light of the limited available data to gather historical information for a period as long as possible.

**Questions to stakeholders:**

(34) Do you see arguments why indices from the US and Japan should not be used for the analysis?

(35) Can you point to sources for data on historical equity valuations (price to book, price to earnings, price to cyclically adjusted earnings etc.) for equities in developed countries?