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COVER NOTE

From:	Mr Gabriel BERNARDINO, Chairman of the European Insurance and Occupational Pensions Authority (EIOPA)
date of receipt:	18 August 2020
To:	Mr Jeppe TRANHOLM-MIKKELSEN, Secretary-General of the Council of the European Union
Subject:	Pan-European Personal Pension Regulation: submission of draft regulatory and implementing technical standards, as well as technical advice on delegated acts

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ANNEX I

STANDARD TEMPLATE FOR THE PEPP KEY INFORMATION DOCUMENT

1. PEPP providers shall comply with the section order, titles, presentation tools and icons set out in the template, which however does not fix parameters regarding the length of individual sections and the placing of page breaks, and is subject to an overall maximum of five sides of A4-sized paper when printed.

2. Under the prominent title 'PEPP Key Information Document', the following statement shall be added: 'This document provides you with key information about this pan-European Personal Pension Product (PEPP). It is not marketing material. The information is required by law to help you understand the nature, risks, costs, potential gains and losses of this personal pension product and to help you compare it with other PEPPs.'.

3. In the template, PEPP providers may include a QR code linking to the electronic version of the PEPP KID.

4. At the top of the template, under the section titled 'PEPP at a glance', PEPP providers shall set out the following information:

(a) the projected accumulated capital for a monthly contribution of EUR 100 for a period of 40 years, under the unfavourable and favourable scenario;

(b) the total costs per annum as a percentage of the accumulated capital on the basis of monthly contributions of EUR 100;

(c) the classification of the summary risk indicator; and

(d) a statement whether the product provides for a guarantee.

5. The PEPP provider shall add the following statement: 'The retirement product described in this document is a long-term product with limited redeemability which cannot be terminated at any time.'.

6. In the following section, the PEPP provider may add its corporate branding or logo and shall provide the following information:

(a) the identity and contact details of the PEPP provider;

(b) the competent authorities of the PEPP provider;

(c) the name of the PEPP and the registration number of the PEPP in the central public register;

(d) under 'product type', whether it is a Basic PEPP or not; if not, whether the PEPP KID refers to a specific alternative investment option or provides generic information for a range of alternative investment options; and

(e) the date of the document.

7. Under the title 'How is my money invested?, the PEPP provider shall present the information according to Article 3(1) of this Regulation. PEPP providers may use the right-hand side column or the main area to provide information according to Article 3(10) of this Regulation.

8. Under the title 'Who is this for?', the PEPP provider shall present the information according to Article 3(2) of this Regulation.

9. Under the title 'Are my savings guaranteed?', the PEPP provider shall indicate:

(a) whether the Basic PEPP provides a guarantee on the capital or takes the form of a risk-mitigation technique consistent with the objective to allow the PEPP saver to recoup the capital; or

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(b) whether and to what extent any alternative investment option, if applicable, provides a guarantee or a risk-mitigation technique.

10. Under the title 'What happens when I retire?', the PEPP provider shall present the information according to Article 3(3) of this Regulation.

11. Under the title 'What happens to my PEPP savings if I die/become disabled/live longer than assumed in my PEPP contract?', the PEPP provider shall present the information according to Article 3(4) of this Regulation.

12. Under the title 'What happens if I move countries?', the PEPP provider shall present the information according to Article 3(5) of this Regulation. PEPP providers may use the right-hand side column or the main area to indicate where to retrieve further information.

13. Under the title 'Can I withdraw from the product early?', the PEPP provider shall include a statement on the consequences for the PEPP saver:

(a) of early withdrawal from the PEPP, including all applicable fees, penalties, and possible loss of capital protection and possible loss of other advantages and incentives; and

(b) if the PEPP saver stops contributing to the PEPP, including all applicable fees, penalties, and possible loss of capital protection and possible loss of other advantages and incentives.

14. Under the title 'Can I switch my provider?', the PEPP provider shall present the information according to Article 3(6) of this Regulation PEPP providers may use the right-hand side column or the main area to indicate where to retrieve further information.

15. Under the title 'Can I change my investment option?', the PEPP provider shall present the information according to Article 3(7) of this Regulation.

16. Under the title 'Will my money be invested sustainably?', the PEPP provider shall present the information according to Article 3(8) of this Regulation. PEPP providers may use the right-hand side column or the main area to indicate where to retrieve further information.

17. Under the title 'Is this governed by [Member State] law?', the PEPP provider shall present information about the law applicable to the PEPP contract where the parties do not have a free choice of law or, where the parties are free to choose the applicable law, the law that the PEPP provider proposes to choose.

18. Under the title 'Can I cancel or change my mind?', the PEPP provider shall present the information according to Article 3(9) of this Regulation.

19. Under the title 'What is the risk profile of this product?', the PEPP provider shall present the information according to Article 4(1) of this Regulation. PEPP providers may use the right-hand side column or the main area to indicate where to retrieve further information, in particular on the applied methodologies for the summary risk indicator.

20. Under the title 'Is there a risk that I will lose all my invested capital?', the PEPP provider shall present the information according to Article 4(2) of this Regulation.

21. Under the title 'What can I expect at retirement?', the PEPP provider shall present the information according to Article 4(3) and (4) of this Regulation, presenting the outcomes of

(c) the unfavourable scenario under the category 'if your investments perform poorly';

(d) the best estimate scenario under the category 'if your investments have medium success';

(e) the favourable scenario under the category 'if your investments perform very well';

(f) the projections of the 40 years accumulation period to 'your current age is 25', of the 30 years accumulation period to '35', of the 20 years accumulation period to '45' and of the 10 years accumulation period to '55' respectively.

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22. Under the title 'What can I expect at retirement?', the PEPP provider shall present a statement that the tax law of the PEPP saver's Member State of residence may have an impact on the actual pay-out.

23. Under the section titled 'What happens if [the name of the PEPP provider] is unable to pay out?', the PEPP provider shall add a short description of whether the related loss is covered by an investor compensation or guarantee scheme and if so, which scheme it is, the name of the guarantor and which risks are covered by the scheme and which are not.

24. Under the title 'One-off costs', the PEPP provider shall present the costs for signing up to the contract and the one-off fees if the contract is terminated within five years.

25. Under the title 'Annual costs', the PEPP provider shall present the information according to Article 5(1) and (3) of this Regulation. PEPP providers may use the right-hand side column or the main area to explain any additional costs that the PEPP provider or PEPP distributor charges and provide information detailing any cost of distribution that is not already included in the costs specified under the previous titles, so as to enable the PEPP saver to understand the cumulative effect that those aggregate costs have on the return of the investment.

26. Under the section titled 'What are the specific requirements for the sub-account corresponding to [my Member State of residence]?' and under the sub-section titled 'Requirements for the pay-in phase', the PEPP provider shall describe the conditions for the accumulation phase, as determined by the Member State of residence of the PEPP saver. Under the sub-section titled: 'Requirements for the pay-out phase', the PEPP provider shall describe the conditions for the decumulation phase, as determined by the Member State of residence of the PEPP saver.

27. Under the section titled 'How can I complain?', the PEPP provider shall present information about how and to whom a PEPP saver can make a complaint about the PEPP or the conduct of the PEPP provider or PEPP distributor.

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Pan-European Personal Pension Product (PEPP)

Key Information Document

This document provides you with key information about this Pan-European Personal Pension Product (PEPP). It is not marketing material. The information is required by law to help you understand the nature, risks, costs, potential gains and losses of this personal pension product and to help you compare it with other PEPPs.

QR code, which navigates consumers to the electronic version of this KID

PEPP at a glance

If you contribute: **€100/month**
for a period of: **40 years**
you could receive: **€xx,xxx to €xx,xxx**
...depending on how the markets and your investments perform

Annual costs: **xx% of your accumulated savings**

This pension product has been classified as **1/2/3/4** out of 4

This **PEPP does not/ provides a guarantee** (see information below)

Provider logo

The retirement product described in this document is a long-term product with limited redeemability which cannot be terminated at any time.

Product name: [Name of the PEPP]

Provider:

Registration number: *xxx xxx*

Product type: *xxx*

Competent authority: *xxx*

Date: *DD Month YYYY*

1 WHAT IS THIS PRODUCT?

How is my money invested?

Information on how this product has performed in the past can be found here:

Who is this for?

Are my savings guaranteed?

To protect your money, PEPPs can either provide a guarantee or take steps to minimise the risk of you losing your money. This PEPP:

- ✓ Provides a guarantee: At retirement you will at least be able to recoup all the money you put in over time (minus any costs and charges)
- ○ Does not provide a guarantee, but takes the form of a risk-mitigation technique consistent with the objective to allow the PEPP saver to recoup the capital

1

1 WHAT IS THIS PRODUCT? *(continued...)*

What happens when I retire?

PEPPs give you a choice of different forms of retirement income. This PEPP offers you the choice of:

✓ Annuity and life-long pay-out	✓ Lump sum	✓ Drawn down payments	✓ A combination of these

Please see section 2 for what you can receive at retirement.

What happens to my PEPP savings if I die/become disabled/live longer than assumed in my PEPP contract?

If you die before you retire	
If you are unable to continue to pay into the PEPP	
If you choose to receive monthly payments after retirement, but live longer than assumed in your PEPP contract	

What happens if I move countries?

More information on portability is available at:

Can I withdraw from the product early?

Can I switch my provider?

Can I change my investment option?

2

1 WHAT IS THIS PRODUCT? *(continued...)*

Will my money be invested sustainably?

More information on our investment Policy principles is available at:

Is this governed by [Member State] law?

Can I cancel or change my mind?

2 WHAT ARE THE RISKS AND WHAT COULD I GET IN RETURN?

What is the risk profile of this product?

This pension product has been classified as **1/2/3/4** out of 4

More information on the methodology used for the PEPP risk indicator is available at:

Is there a risk that I will lose all my invested capital?

3

2 WHAT ARE THE RISKS AND WHAT COULD I GET IN RETURN? *(continued...)*

What can I expect at retirement?

It's impossible to predict exactly how your savings will evolve over time, but to help you know what to expect, here are three possible scenarios. Your final retirement income will depend in part on your age now (because the younger you are now, the longer you will save for), and in part on how the investment market performs.

Assuming you invest €100 each month until retirement in this PEPP:

Your current age	If your investments perform **poorly**, you could receive:		If your investments **have medium success**, you could receive:		If your investments perform **very well**, you could receive:	
	lump sum	*or* monthly	lump sum	*or* monthly	lump sum	*or* monthly
25 years old	€xx,xxx	€xxx	€xx,xxx	€xxx	€xx,xxx	€xxx
35	€xx,xxx	€xxx	€xx,xxx	€xxx	€xx,xxx	€xxx
45	€xx,xxx	€xxx	€xx,xxx	€xxx	€xx,xxx	€xxx
55	€xx,xxx	€xxx	€xx,xxx	€xxx	€xx,xxx	€xxx

These figures are adjusted to take account of inflation, as an increase in the general price level can have an impact on savings in any form.

If you want to understand better how the scenarios are build, please visit:

3 WHAT HAPPENS IF [THE NAME OF THE PEPP PROVIDER] IS UNABLE TO PAY OUT?

4

4
WHAT ARE THE COSTS?
1
One-off costs
Total one-off costs for signing up for the product
€x
You will pay a one-off fee of €xxx if you exit the account within five years of opening
Annual costs
Total annual costs
x%
These costs are a percentage of your savings paid in
€xxx
This would be the expected annual costs
5
WHAT ARE THE SPECIFIC REQUIREMENTS FOR THE SUB-ACCOUNT CORRESPONDING TO [MEMBER STATE]?
Requirements for the pay-in phase
Requirements for the pay-out phase
6
HOW CAN I COMPLAIN?
5

ANNEX II

STANDARD TEMPLATE FOR THE PEPP BENEFIT STATEMENT

1. PEPP providers shall comply with the section order, titles and presentation tools or charts and icons set out in the template, which however does not fix parameters regarding the length of individual sections and the placing of page breaks.
2. In the template, PEPP providers may include a QR code linking to the electronic version of the PEPP Benefit Statement and may add the PEPP provider's corporate branding or logo.
3. Under the title 'What will I receive when I retire?', the PEPP provider shall present the outcomes of:
   (a) the unfavourable scenario under the category 'if the investments perform poorly';
   (b) the best estimate scenario under the category 'if the investments have medium success'; and
   (c) the favourable scenario under the category 'if the investments perform very well'.

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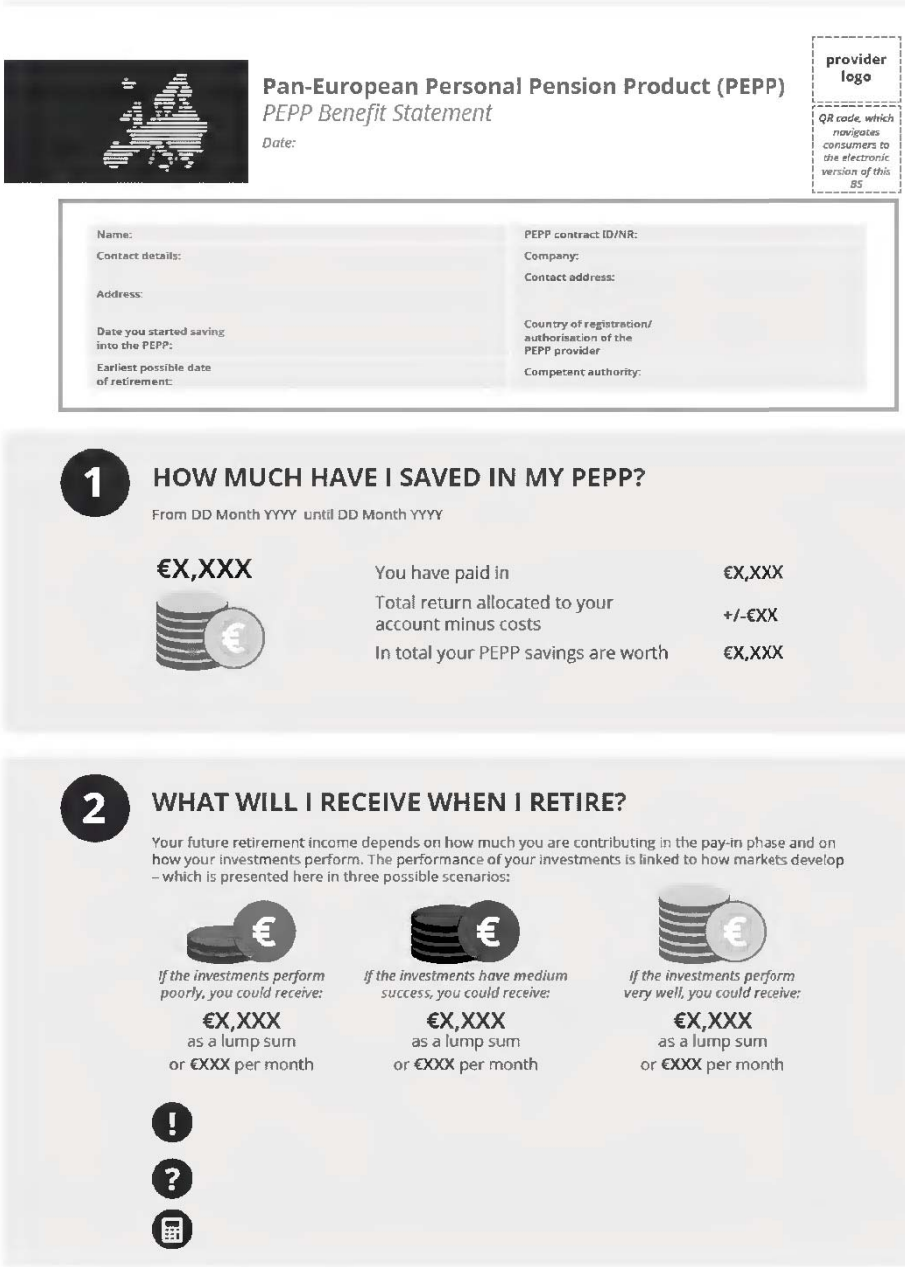
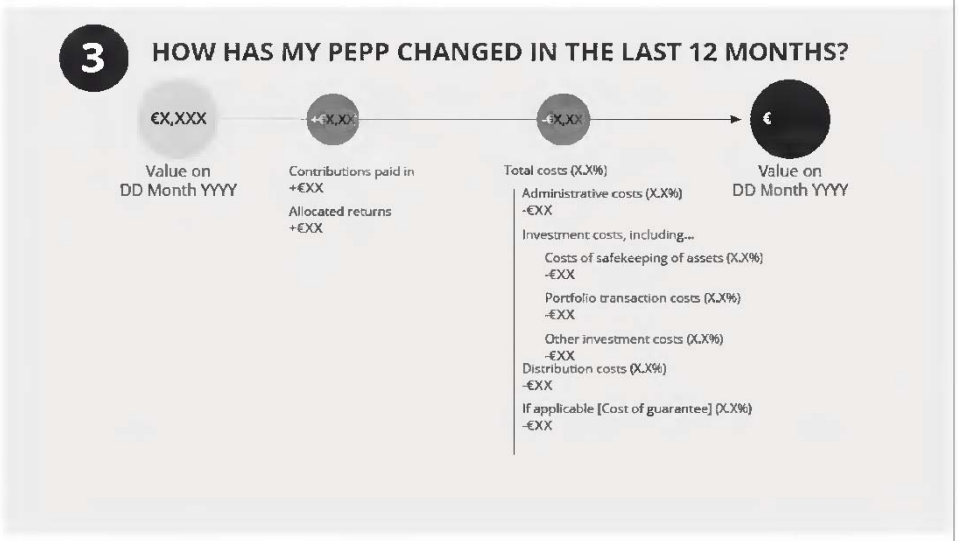
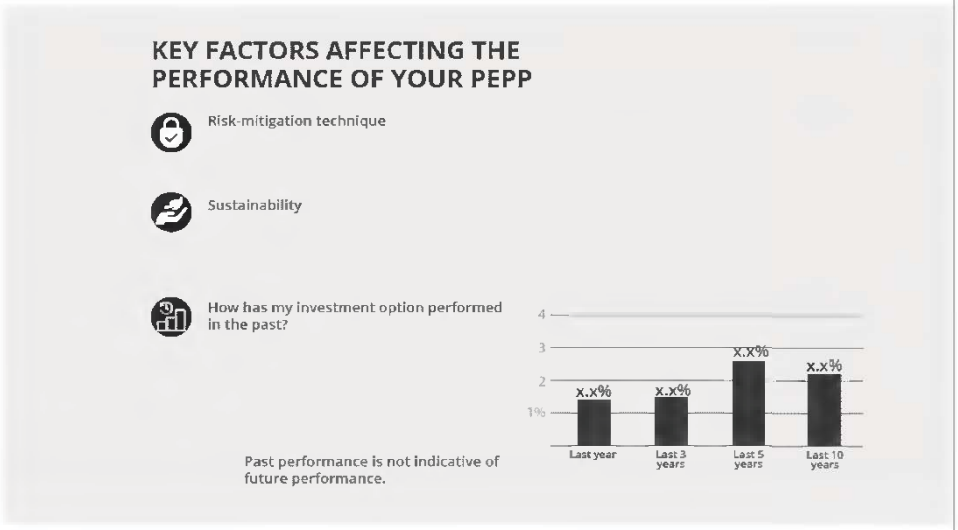

Pan-European Personal Pension Product (PEPP)
PEPP Benefit Statement
Date:
provider logo
QR code, which navigates consumers to the electronic version of this BS
Name:
Contact details:
Address:
Date you started saving into the PEPP:
Earliest possible date of retirement:
PEPP contract ID/NR:
Company:
Contact address:
Country of registration/ authorisation of the PEPP provider
Competent authority:
1
HOW MUCH HAVE I SAVED IN MY PEPP?
From DD Month YYYY until DD Month YYYY
€X,XXX
You have paid in €X,XXX
Total return allocated to your account minus costs +/-€XX
In total your PEPP savings are worth €X,XXX
2
WHAT WILL I RECEIVE WHEN I RETIRE?
Your future retirement income depends on how much you are contributing in the pay-in phase and on how your investments perform. The performance of your investments is linked to how markets develop – which is presented here in three possible scenarios:
If the investments perform poorly, you could receive:
€X,XXX
as a lump sum
or €XXX per month
If the investments have medium success, you could receive:
€X,XXX
as a lump sum
or €XXX per month
If the investments perform very well, you could receive:
€X,XXX
as a lump sum
or €XXX per month





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ANNEX III

METHODOLOGIES

Methodology underpinning the presentation of risk and reward

Summary risk indicator

1. PEPP providers shall allocate the Basic PEPP and the individual alternative investment options to four different categories: '1', '2', '3' and '4'. The allocation shall be based on:
   (a) the risk of not recouping the inflation-adjusted contributions;
   (b) the expected shortfall; and
   (c) shall be compared to the expected rewards in terms of reaching a certain level of PEPP benefits, as appropriate, at the start of, or during the decumulation phase.
2. To calculate the risk of not recouping the inflation-adjusted contributions, PEPP providers shall stochastically determine the range of the expected accumulated capital at the end of the accumulation period for generic PEPP savers, generic lengths of accumulation periods and standardised contribution levels. Following a stochastic simulation, the risk shall be expressed as the probability in percentage points, which is translated from the number of observations where the sum of the inflation-adjusted contributions are higher than the expected value of the accumulated capital at the end of the accumulation period, compared to the number of all observations.
3. The individual investment option's risk of not recouping the inflation-adjusted contributions shall be allocated to the different categories as follows:

Categories	Accumulation periods			
	40 years	30 years	20 years	10 years
1	up to 13.75%	up to 17%	up to 27%	up to 36%
2	13.8 to 16.55%	17 to 19.75%	27 to 29.25%	36 to 43.25%
3	16.6 to 19.35%	19.8 to 22.55%	29.3 to 31.55%	43.3 to 50.55%
4	above 19.4%	above 22.6%	above 31.6%	above 50.6%

Where the risk category of the investment option diverges between the different accumulation periods, the highest risk category shall be used.

4. To calculate the expected shortfall, PEPP providers shall stochastically determine the range of the expected accumulated capital at the end of the accumulation period for generic PEPP savers, generic lengths of accumulation periods and standardised contribution levels. Following a stochastic simulation, the risk shall be expressed as the percentage of the expected shortfall in relation to the sum of the inflation-adjusted contributions. The expected shortfall is determined by the observations where the inflation-adjusted contributions are higher than the expected value of the accumulated capital at the end of the accumulation period and the average losses of these observations.
5. The individual investment option's risk in terms of expected shortfall shall be allocated to the different categories as follows:

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Categories	Accumulation periods			
	40 years	30 years	20 years	10 years
1	up to -20%	up to -17%	up to -13%	up to -8%
2	-20 to -23%	-17 to -20.25%	-13 to -16.5%	-8 to -11.25%
3	-23.5 to -26.5%	-20.3 to -23.55%	-16.6 to -20.1%	-11.3 to -14.55%
4	above -26.5%	above -23.6%	above -20.1%	above -14.6%

Where the risk category of the investment option diverges between the different accumulation periods, the highest risk category shall be used.

6. To calculate the expected rewards to reach a certain level of PEPP benefits, PEPP providers shall stochastically determine the range of the expected accumulated capital at the end of the accumulation period for generic PEPP savers, generic lengths of accumulation periods and standardised contribution levels. PEPP providers shall express the rewards in terms of the median accumulated capital at the end of the accumulation period as a multiple of the sum of the inflation-adjusted contributions.
7. The individual investment option's rewards to reach a certain level of PEPP benefits shall be allocated to the different categories as follows:

Categories	Accumulation periods			
	40 years	30 years	20 years	10 years
1	up to 1.7	up to 1.3	up to 1.08	up to 0.93
2	1.7 to 2.03	1.3 to 1.45	1.08 to 1.165	0.93 to 0.985
3	2.035 to 2.36	1.455 to 1.61	1.17 to 1.255	0.99 to 1.045
4	above 2.365	above 1.615	above 1.26	above 1.05

Where the rewards category of the investment option diverges between the different accumulation periods, the lowest rewards category shall be used.

8. To aggregate the outcomes of the categorisation of the individual investment options to the summary risk indicator, PEPP providers shall:
   (a) compare the two risk categories and where the value of the category diverges, choose the higher one;
   (b) compare the resulting risk category to the value of the rewards category for the PEPP provider to complement the information according to Article 4(1) of this Regulation, comparing the investment option's rewards relative to its riskiness.

Performance scenarios

9. PEPP providers shall stochastically determine the expected PEPP benefits, as appropriate, at the start of, or during the decumulation phase, taking into consideration:
   (a) the standardised or personalised contribution levels;
   (b) the length of the accumulation phase;
   (c) the life expectancy of the average PEPP saver, where relevant;
   (d) the trends in wage growth, where applicable;

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(e) the expected nominal investment returns, following the investment strategy, the strategic investment allocation;
(f) the annual rate of inflation; and
(g) the cost levels.

10. The scenario values of the expected PEPP benefits under the different performance scenarios shall be determined in line with the stochastic dispersion of the expected PEPP benefits:
    (a) the favourable scenario shall be the value of the PEPP benefits at the 85th percentile of the distribution;
    (b) the best estimate scenario shall be the value of the PEPP benefits at the 50th percentile of the distribution;
    (c) the unfavourable scenario shall be the value of the PEPP benefits at the 15th percentile of the distribution;
    (d) the stressed scenario shall be the value of the PEPP benefits at the 5th percentile of the distribution.

Rules to determine the assumptions on pension benefit projections

Annual rate of nominal investment returns

11. PEPP providers shall determine the Basic PEPP's and alternative investment options' expected nominal investment returns in an appropriate stochastic approach, mirroring the corresponding investment strategy, the strategic investment allocation and the risk-mitigation technique applied for the individual investment option.
12. When determining the different elements of the stochastic model, PEPP providers shall use the annual rate of inflation and may consider to take a modular approach for the stochastic calculation of, at least:
    a. the nominal interest rates;
    b. the credit spreads, including migration and default; and
    c. the equity returns.
13. For the determination of the nominal interest rates, the PEPP provider may use the G2++ short-rate model, as described by Brigo et al. (2006)[5], which is equivalent to the two-factor Hull-White model and allows for negative interest rates. Its behaviour is driven by five parameters, two per factor and one for the correlation. The components of the two-dimensional Wiener process are correlated and a deterministic shift factor allows for a perfect fit of the initial term structure to market rates.

    The stochastic differential equations for the two factors $x(t)$ and $y(t)$ are

$$dx(t) = -ax(t)dt + \sigma dW_1^{\mathbb{Q}}(t), x(0) = 0$$

    and

$$dy(t) = -by(t)dt + \eta dW_2^{\mathbb{Q}}(t), y(0) = 0,$$

[55] Brigo, D., Mercurio, F.: Interest Rate Models – Theory and Practice, Second Edition, Springer-Verlag Berlin Heidelberg, 2001, 2006

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where a, b, σ and η are positive parameters and $W_1^{\mathbb{Q}}$ and $W_2^{\mathbb{Q}}$ correlated Wiener processes under the risk-neutral measure $\mathbb{Q}$. The correlation parameter ρ is defined through

$$dW_1^{\mathbb{Q}}(t)dW_2^{\mathbb{Q}}(t) = \rho dt.$$

14. The risk-neutral valuation using the risk-neutral measure $\mathbb{Q}$ requires adaptation to the real-world measure $\mathbb{P}$, which may be chosen as a constant, time-independent market price of risk.
15. Using the Girsanov's theorem, the calculation follows

$$dW_i^{\mathbb{P}} = -\lambda_i dt + dW_i^{\mathbb{Q}}, \qquad i = 1,2$$

with λ_i being the market price of risk. The dynamics under the $\mathbb{P}$-measure can then be described as

$$dx(t) = \big(\lambda_1\sigma - ax(t)\big)dt + \sigma dW_1^{\mathbb{P}}(t), x(0) = 0$$

and

$$dy(t) = \big(\lambda_2\eta - by(t)\big)dt + \eta dW_2^{\mathbb{P}}(t), y(0) = 0.$$

The short-rate process $r(t)$ is the sum of the two factors and the deterministic shift, i.e.

$$r(t) = x(t) + y(t) + \varphi(t),$$

where for the deterministic shift factor $\varphi(t)$

$$\varphi(T) = f^M(0,T) + \frac{\sigma^2}{2a^2}(1 - e^{-aT})^2 + \frac{\eta^2}{2b^2}(1 - e^{-bT})^2 + \rho\frac{\sigma\eta}{ab}(1 - e^{-aT})(1 - e^{-bT})$$

holds. In this equation, $f^M(0,T)$ denotes the market instantaneous forward rate at initial time 0 with the horizon T.

16. Following the G2++ model, analytical solutions of the price of a zero coupon bond exist by defining

$$\begin{aligned} V(t,T) := &\frac{\sigma^2}{a^2}\left[T - t + \frac{2}{a}e^{-a(T-t)} - \frac{1}{2a}e^{-2a(T-t)} - \frac{3}{2a}\right] \\ &+ \frac{\eta^2}{b^2}\left[T - t + \frac{2}{b}e^{-b(T-t)} - \frac{1}{2b}e^{-2b(T-t)} - \frac{3}{2b}\right] \\ &+ 2\rho\frac{\sigma\eta}{ab}\left[T - t + \frac{e^{-(T-t)} - 1}{a} + \frac{e^{-b(T-t)} - 1}{b} - \frac{e^{-(a+b)(T-t)} - 1}{a+b}\right], \end{aligned}$$

$$A(t,T) := \frac{P^M(0,T)}{P^M(0,t)}e^{\frac{1}{2}[V(t,T) - V(0,T) + V(0,t)]},$$

and

$$B(z,t,T) := \frac{1 - e^{-z(T-t)}}{z}$$

For which the price of a zero coupon bond in the G2++ model is

$$P(t,T) = A(t,T)\, e^{-B(a,t,T)x(t) - B(b,t,T)y(t)}.$$

$P^M(t,T)$ denotes here the market price of a zero coupon bond at time t for maturity T.

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17. The PEPP provider may use the model prices for determining the returns of risk-free investments in bonds. Further, the short-rate may be used as an input to the modelling of the equity returns and potentially for property returns.
18. For the determination of credit spreads, the PEPP provider may use the simulation of credit spreads as to combine the risk-free zero coupon bond term structure to yield a credit-risky zero coupon bond term structure. The hazard rates of bonds of different rating classes may be modelled through the use of Cox-Ingersoll-Ross (CIR) processes. The hazard rate π_i develops in the risk-neutral measure according to the stochastic differential equation:

$$d\pi_i(t) = k\big(\theta - \pi_i(t)\big)dt + \sigma\sqrt{\pi_i(t)}dW_i^{\mathbb{Q}}(t), \pi_i(0) = \pi_{i,0}$$

together with the condition $2k\theta > \sigma^2$ in order to keep $\pi(t)$ positive for all t. Assuming a market price of risk of the form

$$\lambda(t) = \lambda\sqrt{\pi_i(t)},$$

the real-world dynamics are given by

$$d\pi_i(t) = \big(k\theta - (k + \lambda\sigma)\pi_i(t)\big)dt + \sigma\sqrt{\pi_i(t)}dW_i^{\mathbb{P}}(t), \pi_i(0) = \pi_{i,0}.$$

19. PEPP providers may model hazard rates for the rating classes AAA ($i = 1$), AA, A, BBB and BB ($i = 5$), potentially differentiated for corporate, covered and other bonds. The default probabilities $p_i(t,T)$ are then calculated as the product of the CIR-prices $P_i(t,T)$ at time t for maturity T, i.e.

$$p_i(t,T) = \prod_{j=1}^{i} P_i(t,T) = \prod_{j=1}^{i} A_j(t,T)e^{-B_j(t,T)\pi_j(t)},$$

where

$$A_i(t,T) = \left[\frac{2\,h_i\, e^{\frac{(k_i+h_i)(T-t)}{2}}}{2h_i+(k_i+h_i)\left(e^{(T-t)h_i}-1\right)}\right]^{2k_i\theta_i/\sigma_i^2},$$

$$B_i(t,T) = \frac{2\left(e^{(T-t)h_i}-1\right)}{2h_i+(k_i+h_i)\left(e^{(T-t)h_i}-1\right)} \text{ and}$$

$$h_i = \sqrt{k_i^2 + 2\sigma^2}.$$

The spreads $s_i(t,T)$ are then determined through

$$s_i(t,T) = \big(\delta + (1-\delta)\cdot p_i(t,T)\big)^{-\frac{1}{T}} - 1,$$

with δ being the recovery rate.

20. For the determination of equity returns, the PEPP provider may use a model for the development of one stock market index through the use of geometric Brownian motion. This model has two parameters: the volatility and the equity risk premium. The nominal interest rate model provides the applicable risk-free rate and the output of the model are yearly annualized returns for investments in the market index.

$$dS_t = (r(t) + \lambda)S_t dt + \sigma S_t dW_t$$

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21. To determine the yearly volatility, PEPP providers may use the standard deviation of the monthly returns of an appropriate equity index for an appropriate, representative time period to annualise the result.

22. PEPP providers may apply the equity risk premium λ_{eq} as an implied measure following Damodaran (2020)[6], but calculating it directly on the appropriate equity index without further country risk premia. It is defined as

$$\lambda_{eq} := E[R_m] - R_f,$$

where $E[R_m]$ is the expected market return and the risk-free rate R_f may be chosen as the 10Y spot rate of the ECB's or National Central Bank's curve.

23. For the growth rate g, the PEPP provider may use the long term growth EPS forecast and the sum γ of the dividend yield and the buyback yield times the index price are the initial cash flows considered. Cash flows may be determined using the constant growth rate for five years, after which the final cash flow is a perpetuity with the risk-free rate as the growth rate.

$$PV_{Index} = \frac{\gamma P_0}{(1+E[R_m])} + \frac{\gamma(1+g)P_0}{(1+E[R_m])^2} + \frac{\gamma(1+g)^2 P_0}{(1+E[R_m])^3} + \frac{\gamma(1+g)^3 P_0}{(1+E[R_m])^4} + \frac{\gamma(1+g)^4 P_0}{(1+E[R_m])^5} + \frac{\frac{\gamma(1+g)^4(1+R_f)P_0}{E[R_m]-R_f}}{(1+E[R_m])^5},$$

in which PV_{index} is the present value of the index in this discount dividend model and P_0 is the price of the index at time $t = 0$.
By demanding

$$P_0 = PV_{Index},$$

the expected market return can be solved and the equity risk premium can be calculated.

Annual rate of inflation

24. To calculate the annual rate of inflation, the PEPP provider shall use a one factor Vasicek process. The mean-reverting dynamics of the model are driven by three parameters. The stochastic differential equation of the model is

$$di(t) = k(\theta - i(t))dt \div \sigma dW(t), i(0) = i_0,$$

in which $i(t)$ is the inflation rate at time t, k refers to the speed of mean reversion, θ to the level of mean-reversion and σ to the volatility.

25. The modelling shall target the inflation rate target level of the European Central Bank for the Euro area or, where applicable, of the corresponding central banks for countries outside the Euro area in the medium term, together with the observed standard deviation of the inflation rates. The speed of the mean reversion, together with the current inflation rate, shall be used to fit the model to the current environment and short-term inflation rate forecasts.

[6] Damodaran, Aswath, Equity Risk Premiums: Determinants, Estimation and Implications - The 2020 Edition (March 5, 2020). NYU Stern School of Business, https://ssrn.com/abstract=3550293

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26. The calibration of the inflation rate shall use for the Euro area the European Central Bank's or, for Member States outside the Euro area, the central bank's inflation target for the θ-parameter. The monthly Year-on-Year-inflation rate time series of the Member State's Harmonised Index of Consumer Prices (HICP) shall be used for deriving the standard deviation of the inflation rate in the long-term, which shall be assumed as 100 years. From the same time series, the initial value of the inflation rate at the reference date shall be used. The PEPP provider shall use the inflation projections for the Member State's HICP, published as the Eurosystem staff macroeconomic bi-annual projections for the Euro area countries, or of the European Commission's economic forecast for the countries outside the Euro area, unless the corresponding central bank provides for projections. Those inflation projections shall be used for fitting the speed of the mean reversion.

Trend of future wages

27. To take into account the trends of future wages, where applicable, PEPP providers shall consider the real wage growth in the different Member States, considering Eurostat data and taking into account that real wages increase significantly during the early part of a PEPP saver's career and experience significantly lower growth or losses in the later parts. The PEPP provider may consider a pattern in the PEPP savers' real-wage paths partly to reach a plateau closer to the end of the accumulation phase and partly to reach the plateau earlier, which means 20 years from retirement and fall thereafter.
28. To reflect a large range of possible paths, the PEPP provider may use a real wage index following a quadratic equation with age: wage = $a(max - age)^2 + b$. The coefficient a is taken from a uniform distribution between -0.15 and 0.011; max is taken from a uniform distrbibution between 47 and 64 and corresponds to the age when real wages are at their maximum value; and the coefficient b is solved so that the wage index starts at 100 at age 25.

Methodology for the calculation of costs, including the specification of summary indicators

29. In the PEPP KID, the PEPP provider shall present the total annual costs, comprising all costs incurred and chargeable within 12 months in monetary terms and as a percentage of the projected accumulated capital after 12 months. Where necessary, these amounts may be calculated as the average total annual costs over the term of the PEPP contract. The calculation of the compound effect of the costs shall be based on a 40 years' accumulation period, based on monthly contributions of EUR 100 and on the projected accumulated capital in the best estimate scenario.
30. In the PEPP Benefit Statement, the PEPP provider shall present the estimated impact of costs on the final PEPP benefits by using the 'Reduction in Wealth' approach. The 'Reduction in Wealth' shall be calculated as the difference between the projected accumulated savings at the end of the accumulation and the projected accumulated savings at the end of the accumulation period in a cost free scenario. The difference shall be disclosed in monetary and percentage terms relative to the projected accumulated savings. The calculation shall be based on the personalised contribution

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level of the individual PEPP saver and based on the best estimate scenario of point 10 of Annex III.

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