	Comments Template on the Consultation Paper on the methodology to derive the UFR and its implementation	Deadline 18 July 2016 23:59 CET
Name of Company:	Toulouse School of Economics, Université de Toulouse-Capitole	
Disclosure of comments:	Please indicate if your comments should be treated as confidential:	Public
	Please follow the following instructions for filling in the template: ⇨ Do **not** change the numbering in the column "reference"; if you change numbering, your comment cannot be processed by our IT tool ⇨ Leave the last column empty. ⇨ Please fill in your comment in the relevant row. If you have no comment on a paragraph or a cell, keep the row empty. ⇨ Our IT tool does not allow processing of comments which do not refer to the specific numbers below. **Please send the completed template, in Word Format, to** CP-16-003@eiopa.europa.eu **Our IT tool does not allow processing of any other formats.** The numbering of the paragraphs refers to on the Consultation Paper on the methodology to derive the UFR and its implementation.	
Reference	**Comment**	
General Comment	Underlying the consultation is the question of how should insurers price and discount safe financial liabilities whose maturity exceeds the maturity of liquid traded assets with equal degree of certainty – which is a key question in the economic science and linked to many theoretical works in the last decades. In answering this question, EIOPA follows however a contestable purely statistical methodology that completely ignores the scientific progesses that have been made in economics over the last two decades. In particular, two recent branches of the economics literature provide a scientifically-based approach to the problem of the UFR, which cannot be overlooked in the current	

economic and monetary context. Both indeed conclude that:

- there is no rationale to revise the UFR level even if the current observed short interest rates are lower than their levels at the time of its initial setting for Euro liabilities;
- there is even less rationale to envisage a yearly revision of UFR as most economic models would define it as a constant (as long as collective beliefs about the secular growth rate is perennial);
- there are credible and important arguments to keep the UFR around its current level for Euro liabilities (as a sum of a real long-term component close to 2 to 2.5% and an inflation target in the Eurozone of 2% as set by the ECB).

First, in asset-pricing theory, experts have developed models of "long-run risk" initiated by Bansal and Yaron (2004). These developments focus on slow-moving stochastic factors that affect the value of assets with extra-long maturities. They can explain the classical puzzles of asset prices that emerged from the traditional CAPM literature. Their predictive power for asset prices has been much improved compared to the CAPM. Therefore, these models could – and should -- be used to estimate what extra-long interest rates would prevail at equilibrium if a liquid market would exist for long-dated safe assets. In these models, the UFR is a deterministic function of the asymptotic growth rate of consumption. Although the short-term interest rate fluctuates widely with the volatile expectations about short-term economic growth, the UFR is almost constant, as are our beliefs about the growth of our economies in the coming centuries. **We learned from this highly visible branch of the finance literature that the UFR should be revised only very infrequently, only when our collective beliefs about the long-term growth of our economy have been modified.**

It must be noticed that the proposed methodology of the Consultation Paper is completely disconnected from this approach. The averaged short-term interest rates over the last 50 years, weighted or not, is indeed a very crude instrument to detect changes in beliefs about the secular growth of our economies.

The second branch of the economics literature that is related to the UFR is about the discount rate that should be used to evaluate the "social cost of carbon", i.e., the discounted value of the climate damages generated by emitting one ton of CO2 today. Because the duration of this "liability" can be measured in decades and centuries, many prominent economists (see for example the Stern Report (2007)) have taken a stand about what UFR should be used in climate change economics. **There are clear arguments (law of one price; cost-benefit theory) for why governments, regulators and private parties should use the same rate to discount all safe assets and liabilities in the economy**. Gollier (2012) provides a survey of the literature that emerged at the frontier between finance theory and environtmental economics about what UFR should be used. Drupp et al. (2015) report the results of a survey of over 200 experts of this field. **This survey describes a strong consensus around a mean real UFR of 2.27% (to which one should add the inflation target component of 2% as set by the ECB to reach the UFR as defined by EIOPA, thus at 4.27%)**. The respondents were also asked to estimate the expected real interest rate in the distant future, yielding a mean estimation at 2.38%. Notice also that this literature focuses on "the" long-term discount rate, making it quite explicit that **this rate should not vary through time. In fact, most models of this literature have that property that the UFR is a constant**.

The Consultation Paper is based on the idea that markets provide no hint about how to value very distant costs and benefits. This is an exaggeration. Giglio, Maggiori and Stroebel (2015) estimated discount rates for maturities from 50 to 999 years by comparing real estate prices of freeholds (with infinite property rights) to those of leaseholds (with property rights of fixed maturity from 50 years to 999 years), both in the UK and in Singapore. Their analysis suggests that the discount rate for real estate assets is slightly below 2.6% for 100-year maturity, justifyring a UFR as set by EIOPA around 4.5%.

Bibliography

Bansal, R., and A. Yaron, (2004), Risks For the Long Run: A Potential Resolution of As

	Pricing Puzzles, *Journal of Finance,* 59, 1481–1509. Drupp, M., M. Freeman, B. Groom and F. Nesje, (2015), Discounting disentangled, Grantham Institute on Climate Change and the Environment WP 172, London School of Economics. Giglio, S., M. Maggiori, and J. Stroebel, (2015), Very long-run discount rates, *Quarterly Journal of Economics*, 130, 1-53. Gollier, C., (2012), *Discounting the planet's future: The economics of discounting in an uncertain world*, Princeton University Press.	
Q1. (pg. 56)		
Q2. (pg. 56)		
Q3. (pg. 56)		
Q4. (pg. 56)		
Q5. (pg. 56)		
Q6. (pg. 56)		
Q7. (pg. 56)		
Paragraph 1.		
Paragraph 2.		
Paragraph 3.		
Paragraph 4.		
Paragraph 5.		
Paragraph 6.		
Paragraph 7.		
Paragraph 8.		

Paragraph 9.		
Paragraph 10.	It is apparent that the procedure proposed by the Consultation Paper violates Article 47. For example, under this proposition, the UFR will change not because of "changes in long-term expectations", but because of persistent changes in short-term expectations. One can also questions the objectivity and the time consistency of the procedure. EIOPA should make more explicit what stochastic model it has in mind for interest rates. If, as stated in paragraph 53, the best predictive model for interest rates is an AR(1), EIOPA should recognize a crucial consequence of this model, which is that the real UFR is a constant equaling the historical (unweighted and non-truncated backward) mean of the short-term real interest rates. But then, why should it revise the UFR every year? The historical mean of interest rates over the last, say, 100 years (using for example the Dimson-Marsh-Staunton data set), is not expected to change every year. **EIOPA should either stick to this assumption and abandon the idea to revise the UFR periodically, or it should explain what stochastic model for interest rates it has in mind that will trigger its periodical revision of the UFR**. This is a crucial condition for objectivity, transparency, consistency and credibility.	
Paragraph 11.	The requirement that financial intermediaries should be able to earn the rates of the term structure in a risk-free manner is theoretically impossible, as soon as we recognize that future interest rates are uncertain. Uncertainty is the essence of the question raised by the UFR. Because of this uncertainty, there is a crucial reinvestment risk that should be taken into account when estimating the UFR. Because of the absence of liquid long-term safe assets, there is just no way for "insurance and reinsurance undertakings to be able to earn the rates of the term structure in a risk-free manner in practice" as required by Article 43 of the Delegated Regulation. Given this intrinsic impossibility, some interpretation must be made about the true intention of the regulator. A natural interpretation is that insurers should be able to earn the rates of the term structure *in expectation*, so that their pricing of long-term insurance products would be actuarially fair, a standard practice on this market. But this interpretation is incompatible with the proposal made in this Consultation Paper. In particular, it is incompatible with the proposal to ignore the term premium. **In other**	

words, it is inconsistent for EIPOA to work on the presumption that future interest rates are uncertain and to ignore that this uncertainty when determining the UFR. This inconsistency can be summarized by the following theorem.

THEOREM: If future interest rates are uncertain, the following two statements are mutually incompatible:

1. Insurance and reinsurance undertakings should be able to earn the rates of the term structure (Article 43 of the Delegated Regulation) in expectation;
2. The UFR net of the rate of inflation is the expected short-term interest rate, i.e., there is no term premium (conclusion 3.3.5 of the Review) in expectation.

PROOF: Without loss of generality, we ignore here inflation. Let r_t denote the interest rate that will prevail in t years from now (date 0). Let r_t^* denote the term structure of the safe discount rates imposed by EIOPA. What insurance and reinsurance undertakings will be able to earn from each euro of their current reserve in T years from now is

$$FV_T = exp\left(\sum_{t=1}^{T} r_t\right). \quad (1)$$

Now, suppose that r_t is not known today, i.e., it is a random variable whose mean is the historical average short-term interest rate $\bar{r}$. In that case, condition 1 means we must have

$$exp\left(\sum_{t=1}^{T} r_t^*\right) = E_0\left[FV_T\right] = E_0\left[exp\left(\sum_{t=1}^{T} r_t\right)\right]. \quad (2)$$

Statement 2 implies that for large maturities T , the discount rate must converge to $\bar{r}$. Thus, for large maturities T , condition (2) can be rewritten as follows:

$$exp\left(\bar{r}T\right) = E_0\left[exp\left(\sum_{t=1}^{T} r_t\right)\right]. \quad (3)$$

But this condition coud be true only if

$$E_0\left[exp\left(\sum_{t=1}^{T} r_t\right)\right] = exp\left(\sum_{t=1}^{T} E_0\left[r_t\right]\right), \quad (4)$$

Which cannot be true as soon as interest rates are uncertain, because the exponential function is convex. This concludes the proof of the theorem. □

In fact, this theorem is a direct consequence of the fact that the Expectations Hypothesis used until the 80's in finance theory to price bonds has no scientific foundation, as shown by Cox, Ingersoll and Ross (1981) and Gilles and LeRoy (1986). The Expectation Hypothesis basically means that the term premium is zero in expectation, so that the proposal made in conclusion 3.3.5 of this Consultation Paper is nothing else than the reemergence of an old false theory that has long been rejected by the theory and by the large empirical literature on bond pricing. For example, Froot (1989) states that "if the attractiveness of an economic hypothesis is measured by the number of papers which statistically reject it, the expectations theory of the term structure is a knockout."

This is not a marginal problem. To illustrate, suppose that the average short-term interest rate fort he next 100 years will be either 1% or 3% with equal probabilities. If one would apply an UFR equaling to the average short-term rate, which is 2% in this context, the future value of 1€ in 100 years is 7.4€. But in reality, the expected future value of this 1€ in 100 years is 11.4€, which corresponds to a certainty equivalent interest rate of 2.4% per annum. For a discussion about the impact of uncertain future interest rates, see Pazner and Razin (1975), and Gollier (2004, 2016).

To sum up, the objective contained in the Delegated Regulation to determine the UFR in such a way for insurers to be able to earn this rate in the long run in a risk-free manner is scientifically impossible to realize. It can be attained only in expectation. But under this interpretation, the proposed methodology to determine the UFR by ignoring the term premium is incompatible with the fundamental laws of the pricing of safe assets. Proposing such a regulation is parallel to proposing to launch a rocket to Mars when asking the engineers in charge to ignore the fundamental laws of physics.

The consequence of this inconsistency prevents any possibility to organize this discussion on a scientifically sounded basis. It renders the problem of answering to the seven questions individually irrelevant.

The two branches of the literature mentioned in my "general comment" above provide ample evidence and arguments for why it is socially desirable to integrate a term premium to the real UFR. Ignoring this term premium is ignoring that there is uncertainty about what interest rate and economic prosperity will prevail in many decades from now, a fact of life.

Finally, it makes no sense to me to accept a term premium for all maturities below the LLP, and to ignore it for the estimation of the UFR.

Bibliography

Cox, J.C., J.E. Ingersoll, and S. Ross, (1981), A reexamination of traditional hypotheses about the term structure of interest rates, *Journal of Finance* 36, 769-799.

Froot, K.A., (1989), New hope for the expectations hypothesis of the term structure of interest rates, *Journal of Finance* 44, 283-305.

Gilles, C., and S.F. LeRoy, (1986), A note on the local expectations hypothesis: A discrete-time exposition, *Journal of Finance* 41, 975-979.

Gollier, C., (2004), Maximizing the expected net future value as an alternative strategy to gamma discounting." *Finance Research Letters* 1 (2): 85-89.

Gollier, C., (2016), Gamma discounters are short-termist, *Journal of Public Economics*, forthcoming.

Pazner, E. A. and A. Razin, (1975), On expected present value vs. expected future value, *Journal of Finance* 30 (3): 875-877.

	Comments Template on the Consultation Paper on the methodology to derive the UFR and its implementation	Deadline 18 July 2016 23:59 CET
Paragraph 12.		
Paragraph 13.		
Paragraph 14.		
Paragraph 15.		
Paragraph 16.		
Paragraph 17.		
Paragraph 18.		
Paragraph 19.		
Paragraph 20.		
Paragraph 21.		
Paragraph 22.		
Paragraph 23.		
Paragraph 24.		
Paragraph 25.		
Paragraph 26.		
Paragraph 27.		
Paragraph 28.		
Paragraph 29.		
Paragraph 30.		
Paragraph 31.		
Paragraph 32.		
Paragraph 33.		
Paragraph 34.		
Paragraph 35.		

Paragraph 36.		
Paragraph 37.		
Paragraph 38.		
Paragraph 39.		
Paragraph 40.		
Paragraph 41.		
Paragraph 42.		
Paragraph 43.		
Paragraph 44.		
Paragraph 45.		
Paragraph 46.		
Paragraph 47.		
Paragraph 48.		
Paragraph 49.		
Paragraph 50.		
Paragraph 51.		
Paragraph 52.		
Paragraph 53.	This paragraph is crucial. It raises the question of how to model the dynamics of short and long interest rates, and, at least implicitly, of our collective beliefs about the future prosperity of our economy. The Delegated Regulation stipulates that the UFR should be based upon these expectations, and that changes in the UFR should be transparently justified by changes in these expectations. We know that the term structure of interest rates aggregates information about these expectations. Financial econometrics provides the statistical tools to filter the dynamics of interest rates in order to detect changes in long-term expectations. See for example Ang and Liu (2004), or Collin-Dufresne et al. (2015). But doing this would require again that	

	EIOPA expresses first its representation of the stochastic dynamics of interest rates. Bibliography Ang, A., and J. Liu, (2004), How to discount cashflows with time-varying expected retu *Journal of Finance* 59, 2745-2783. Collin-Dufresne, P., M. Johannes, and L.A. Lochstoer, (2015), Parameter learning general equilibrium: The asset pricing implications, *American Economic Revi* forthcoming.	
Paragraph 54.		
Paragraph 55.		
Paragraph 56.	Using weights to measure the average interest rates makes no sense if EIOPA believes that interest rates follow an AR(1) process, a process favored by EIOPA in its paragraph 53. However, weighting more recent interest rates make sense if one recognizes that the dynamics of interest rates contains a slow-moving state variable that influences interest rates. The literature on long-run risk mentioned earlier provides various illustrations of such a phenomenon: slow-moving fluctuations of the trend of economic growth, stochastic volatility, parametric uncertainty,… The way by which the evolution of interest rates is impacted by the change of this long-run variable – and so, the frequency and intensity of the UFR – depends upon the assumptions that are made to describe the dynamics of the economy. EIOPA should describe its representation of this process.	
Paragraph 57.		
Paragraph 58.		
Paragraph 59.		
Paragraph 60.		
Paragraph 61.		
Paragraph 62.		

Paragraph 63.		
Paragraph 64.		
Paragraph 65.		
Paragraph 66.		
Paragraph 67.		
Paragraph 68.		
Paragraph 69.		
Paragraph 70.		
Paragraph 71.		
Paragraph 72.		
Paragraph 73.		
Paragraph 74.		
Paragraph 75.		
Paragraph 76.		
Paragraph 77.		
Paragraph 78.		
Paragraph 79.		
Paragraph 80.		
Paragraph 81.		
Paragraph 82.		
Paragraph 83.		
Paragraph 84.		
Paragraph 85.		
Paragraph 86.		
Paragraph 87.		

Paragraph 88.		
Paragraph 89.		
Paragraph 90.		
Paragraph 91.		
Paragraph 92.		
Paragraph 93.		
Paragraph 94.		
Paragraph 95.		
Paragraph 96.		
Paragraph 97.		
Paragraph 98.		
Paragraph 99.		
Paragraph 100.		
Paragraph 101.		
Paragraph 102.		
Paragraph 103.		
Paragraph 104.		
Paragraph 105.		
Paragraph 106.		
Paragraph 107.		
Paragraph 108.		
Paragraph 109.		
Paragraph 110.		
Paragraph 111.		
Paragraph 112.		

Paragraph 113.		
Paragraph 114.		
Paragraph 115.		
Paragraph 116.		
Paragraph 117.		
Paragraph 118.		
Paragraph 119.		
Paragraph 120.		
Paragraph 121.		
Paragraph 122.		
Paragraph 123.		
Paragraph 124.		
Paragraph 125.		
Paragraph 126.		
Paragraph 127.		
Paragraph 128.		
Paragraph 129.		
Paragraph 130.		
Paragraph 131.		
Paragraph 132.		
Paragraph 133.		
Paragraph 134.		
Paragraph 135.		
Paragraph 136.		
Paragraph 137.		

Paragraph 138.		
Paragraph 139.		
Paragraph 140.		
Paragraph 141.		
Paragraph 142.		
Paragraph 143.		
Paragraph 144.		
Paragraph 145.		
Paragraph 146.		
Paragraph 147.		
Paragraph 148.		
Paragraph 149.		
Paragraph 150.		
Paragraph 151.		
Paragraph 152.		
Paragraph 153.		
Paragraph 154.		
Paragraph 155.		
Paragraph 156.		
Paragraph 157.		
Paragraph 158.		
Paragraph 159.		
Paragraph 160.		
Paragraph 161.		
Paragraph 162.		

Paragraph 163.		
Paragraph 164.		
Paragraph 165.		
Paragraph 166.		
Paragraph 167.		
Paragraph 168.		
Paragraph 169.		
Paragraph 170.		
Paragraph 171.		
Paragraph 172.		
Paragraph 173.		
Paragraph 174.		
Paragraph 175.		
Paragraph 176.		
Paragraph 177.		
Paragraph 178.		
Paragraph 179.		
Paragraph 180.		
Paragraph 181.		
Paragraph 182.		
Paragraph 183.		
Paragraph 184.		
Paragraph 185.		
Paragraph 186.		
Paragraph 187.		

Paragraph 188.		
Paragraph 189.		
Paragraph 190.		
Paragraph 191.		
Paragraph 192.		
Paragraph 193.		
Paragraph 194.		
Paragraph 195.		
Paragraph 196.		
Paragraph 197.		
Paragraph 198.		
Paragraph 199.		
Paragraph 200.		
Paragraph 201.		
Paragraph 202.		
Paragraph 203.		
Paragraph 204.		
Paragraph 205.		
Paragraph 206.		
Paragraph 207.		
Paragraph 208.		
Paragraph 209.		
Paragraph 210.		
Paragraph 211.		
Paragraph 212.		

Paragraph 213.		
Paragraph 214.		
Paragraph 215.		
Paragraph 216.		
Paragraph 217.		
Paragraph 218.		
Paragraph 219.		
Paragraph 220.		
Paragraph 221.		
Paragraph 222.		
Paragraph 223.		
Paragraph 224.		
Paragraph 225.		
Paragraph 226.		
Paragraph 227.		
Paragraph 228.		
Paragraph 229.		
Paragraph 230.		
Paragraph 231.		