

Review of EIOPA's Consultation Paper EIOPA-BoS-19/465 Regarding Long-Term Equity Investments ("LTE")

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List of Abbreviations

AI	Alternative Investments
AIF	Alternative Investment Fund
ALM	Asset Liability Management
BAI	Bundesverband Alternative Investments e.V.
CDF	Cumulative distribution function
CEIOPS	Committee of European Insurance and Occupational Pensions Supervisors
CEPRES	CEPRES GmbH
CEPRES / SOF Study	Study "Methodological Review of EIOPA's Final Advice Regarding the Unlisted Equity Module" performed by SOF and CEPRES as of 18/5/2018
COM	European Commission
CMU	Capital Markets Union
DBEM	Duration-based equity module
DR	Delegated Regulation
EIOPA	European Insurance and Occupational Pensions Authority
ESG	Environmental, Social and Governance
FDD	Fund Due Diligence
IA	"Background Document on the Consultation Paper on the Opinion on the 2020 review of Solvency II Impact assessment" (EIOPA-BoS-19/452)

LTE	Long-term Equity Investments (Art. 171a DR 2015/35)
MA	Matching Adjustment
MDD	Manager Due Diligence
NAV	Net Asset Value
Opinion	"Opinion on the 2020 review of Solvency II" (EIOPA-BoS-19/465)
PE	Private Equity
PPP	Prudent Person Principle
QRT	Quantitative Reporting Template
QUEP	Qualifying Unlisted Equity Portfolios (Art. 168a DR 2015/35)
RSR	Regulatory Supervisory Reporting
SAA	Strategic Asset Allocation
SCR	Solvency Capital Requirement
SOF	Substance Over Form Ltd.
TPT	Tripartite Template
VA	Valuation Adjustment
VaR	Value at Risk

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1. Background & Summary

As part of the **Solvency II Review 2018**, the European Insurance and Occupational Pensions Authority (EIOPA) provided their final advice with regard to those portfolios which could benefit from the same risk factor as listed equity in Chapter XI of EIOPA-BoS-18/075 to the European Commission on 28/02/2018. BAI assigned CEPRES and SOF to conduct an independent review of EIOPA's final advice with regard to that particular risk category. In their study "Methodological Review of EIOPA's Final Advice Regarding the Unlisted Equity Module"¹ ("CEPRES/SOF Study") as of 18/05/2018 CEPRES and SOF concluded that "The overall appropriateness of EIOPA's final advice is low to medium.", identified methodological shortcomings and provided suggestions for improvement.

Based on EIOPA's final advice in 2018 the Commission Delegated Regulation (EU) 2019/981 of 8 March 2019 ("DR 2019/981") came into force on the 18/06/2019. With regard to illiquid equity investments DR 2019/981 amended the DR 2015/35 and introduced two new equity risk categories:

- "qualifying unlisted equity portfolios" or "QUEP" in Art. 168a DR 2015/35 mainly based on the EIOPA's final advice 2018
- "long-term equity investments" or "LTE" in Art. 171a DR 2015/35 which the EU legislators introduced without prior consultation of EIOPA

As part of the **Solvency II Review 2020**, EIOPA published its consultation paper on the "Opinion on the 2020 review of Solvency II" (EIOPA-BoS-19/465 or "the Opinion") on 15/10/2019. The Opinion is accompanied by the "Background Document on the Consultation Paper on the Opinion on the 2020 review of Solvency II Impact assessment" (EIOPA-BoS-19/452 or "the IA"). BAI assigned SOF to review that consultation paper in light of the risk module "LTE", the outcomes from the CEPRES/SOF Study and the recent market developments.

The key results are summarised in the following. While the research questions # 1 - 2 explicitly address EIOPA's consultation questions Q.2.11 and Q.2.12, the research questions # 3 – 4 address two further suggestions covered by EIOPA's Opinion:

#	Research Question	Research Findings	Suggestions for Improvement
1	Diversification with other categories (Q.2.11)	The research indicates that unlisted equity classes that are particularly eligible for the LTE module (infrastructure equity, private equity) may experience correlations between 10% and 80% to public equities derived from specific data sets for those asset classes. The current treatment in type 1 and type 2 risk modules might already overestimate those correlations. For instance, if illiquid private equity funds are	In our view, EIOPA's calculation of correlations uses input data (MSCI) that might be considered as not representative for alternative investments. In order to appropriately reflect empirical results for alternative investments, the alternative / illiquid LTE could be introduced as a separate module. Correlation coefficients between alternative / illiquid LTE and the existing equity modules could be then

¹ The study can be provided on request by BAI.

#	Research Question	Research Findings	Suggestions for Improvement
		<p>classified as type 1 AIF, they would have no diversification benefits with other type 1 equities. Therefore, the current treatment can be already considered to be rather conservative for illiquid / unlisted LTE. Appropriate treatment would additionally account for the diversification benefits.</p>	<p>derived from an empirical analysis based on a representative data set for alternative investments. A correlation of 0.75 to all other equity categories (type 1 / type 2) could be considered to be a conservative approach given that different empirical studies estimated correlations of 0.1 -0.8 and this is consistent to the current correlation between type 1 and type 2 equity risks.</p> <p>In case this suggestion will not be implemented, the current approach, where LTE is included in the correlation formula for type 1 and type 2 equities, seems to be a rather conservative framework.</p>
2	<p>Consideration of liabilities (Q.2.12)</p>	<p>The research demonstrates that the quasi-ringfencing requirement hinders the EU-wide harmonisation and introduces a burdensome and costly requirement that is not always relevant for individual ALM frameworks being far more complex than a stand-alone formalistic ringfencing. Besides, the research demonstrates that ringfencing is not a universal tool for risk reduction, in fact, it can also increase operational risks without reducing or even increasing market risks (e.g. due to the lower diversification).</p> <p>In their analysis EIOPA stated that average holding period for the asset class undertaking spotted as held to maturity / long-term asset are 9-14 years. In our view, this observation provides additional evidence for the irrelevance of fire sales for long-term assets. The requirement of Art. 171a (g) to demonstrate the ability to avoid forced sales might be therefore unnecessarily burdensome given the average holding periods estimated by EIOPA.</p>	<p>We suggest removing the quasi-ringfencing requirements set out in Art. 171a (b) – (d). The requirements with regard to the prudent risk management and ALM are already reflected in the ALM and risk management requirements of Art. 171a (e) - (h) as well as general ALM and risk management requirements of Solvency II allowing for the individual assessments of the eligibility to the individual ALM framework.</p> <p>Instead, an additional provision could be introduced requiring a more explicit and transparent demonstration of how the requirement is fulfilled, e.g. via a separate LTE documentation including relevant assumptions and methods used as well as the assessment of model risks. An example of such a requirement could be introduced instead of Art. 171a (b) in the following way: <i>“The undertaking provides a separate documentation for the determination of the equities eligible for the LTE module including all assumptions, stress tests and calculations as well as the rationale of how LTE match the liabilities with regard to char-</i></p>

#	Research Question	Research Findings	Suggestions for Improvement
			<p>acteristics such as the timing, currency and the value of future cash flows under expected and stressed circumstances."</p> <p>We suggest reviewing the "forced-sale resistance" requirement set out in Art. 171a (g) as this is already fulfilled by the insurance industry and their average holding periods of long-term assets as demonstrated recently by EIOPA.</p>
3	Diversification within the LTE module	<p>The research suggests that a significant diversification and risk reduction can be reached with 5 – 30 target funds based on the different data and assumptions used. At the same time one paper raised concerns about a potential overdiversification. Moreover, a type 1 AIF could already be sufficient in order to fulfil the diversification requirement, which is usually an obligatory requirement based on the national regulations in the country of the AIF domicile.</p>	<p>We support EIOPA's suggestion to consider diversification requirements in the LTE module based on the clear diversification benefits indicated by the research. Since diversification is a rather complex topic and potential disadvantages of an overdiversification should also be taken into account, we agree with EIOPA's proposal where no exact quantitative limit is formulated since this is to be assessed by each individual asset manager in the specific context of their portfolio. We suggest to explicitly emphasise that the diversification can also be based on the fund level and therefore suggest to change the wording of the criterion as follows: "<i>i) the sub-set of equity investments shall be properly diversified in such a way as to avoid excessive reliance on any particular issuer or group of undertakings and excessive accumulation of risk in the portfolio as a whole. Where LTEs are held within collective investment undertakings or within alternative investment funds referred to in points (a) to (d) of Article 168(6) and in accordance with Article 171a (2), such investments are considered to be sufficiently diversified and don't have to comply with the requirement in the first sentence.</i>"</p>
4	VaR Calibration	<p>We identified the following issues with EIOPA's empirical analysis:</p> <ul style="list-style-type: none"> It is unclear if the elimination of risk-free interest rates is consistent with the general standard formula approach where equity investments are only 	<p>The overwhelming majority of the research relevant for illiquid asset classes suggests that the long-term investments are generally subjected to lower volatility. Our research shows that 10-year VaR is not larger than 12.41% for different liquid and illiquid indices as opposed</p>

#	Research Question	Research Findings	Suggestions for Improvement
		<p>subject to the equity risk and not the interest rate risk. Our understanding is under the current approach there is an implicit assumption that the equity risk reflects both, the volatility of risk-free interest rates and the equity premia (in excess of the risk-free interest rates) as opposed to debt investments where the underlying "debt risk" is divided into the spread risk and the interest rate risk.</p> <ul style="list-style-type: none"> • The selected liquid MSCI indices might not adequately reflect the illiquid specifics of alternative investment classes such as private equity or infrastructure and private markets in general. • Calculation of VaR is not a straightforward exercise as can be evidenced from the very wide range (9% - 92%) of relevant outputs generated by EIOPA. In our view, the representativeness of outcomes might be considered highly questionable given such wide ranges. It should be noted that there is no right method as every method is only an attempt to describe reality and predict the future. Therefore, it might be helpful to perform several calculations under different assumptions, with different data and using different methods. 	<p>to the maximum of 41.6% for 1-year VaR. Therefore, our view is that the currently applied charge of 22% is already a conservative risk charge for illiquid asset classes.</p>

In summary, we suggest amending Art. 171a DR 2015/35 as follows:

"Article 171a

Long-term equity investments

1. For the purpose of this Regulation, a sub-set of equity investments may be treated as long-term equity investments if the insurance or reinsurance undertaking demonstrates, to the satisfaction of the supervisory authority, that all of the following conditions are met:

(a) the sub-set of equity investments as well as the holding period of each equity investment within the sub-set are clearly identified;

~~(b) the sub-set of equity investment is included within a portfolio of assets which is assigned to cover the best estimate of a portfolio of insurance or reinsurance obligations corresponding to one or several clearly identified businesses, and the undertaking maintains that assignment over the lifetime of the obligations;~~

~~(c) the portfolio of insurance or reinsurance obligations, and the assigned portfolio of assets referred to in point (b) are identified, managed and organised separately from the other activities of the undertaking, and the assigned portfolio of assets cannot be used to cover losses arising from other activities of the undertaking;~~
~~(d) the technical provisions within the portfolio of insurance or reinsurance obligations referred to in point (b) only represent a part of the total technical provisions of the insurance or reinsurance undertaking;~~

(b) the undertaking provides a separate documentation for the determination of the equities eligible for the LTE module including all assumptions, stress tests and calculations as well as the rationale of how LTE match the liabilities with regard to characteristics such as the timing, currency and the value of future cash flows under expected and stressed circumstances

~~(e)~~ (c) the average holding period of equity investments in the sub-set exceeds 5 years, or where the average holding period of the sub-set is lower than 5 years, the insurance or reinsurance undertaking does not sell any equity investments within the sub-set until the average holding period exceeds 5 years;

~~(f)~~ (d) the sub-set of equity investments consists only of equities that are listed in the EEA or of unlisted equities of companies that have their head offices in countries that are members of the EEA;

~~(g)~~ (e) the solvency and liquidity position of the insurance or reinsurance undertaking, as well as its strategies, processes and reporting procedures with respect to asset-liability management, are such as to ensure, on an ongoing basis and under stressed conditions, that it is able to avoid forced sales of each equity investments within the sub-set for at least 10 years;

~~(h)~~ (f) the risk management, asset-liability management and investment policies of the insurance or reinsurance undertaking reflects the undertaking's intention to hold the sub-set of equity investments for a period that is compatible with the requirement of point ~~(e)~~ (c) and its ability to meet the requirement of point

g) the sub-set of equity investments shall be properly diversified in such a way as to avoid excessive reliance on any particular issuer or group of undertakings and excessive accumulation of risk in the portfolio as a whole. Where LTE are held within collective investment undertakings or within alternative investment funds referred to in points (a) to (d) of Article 168(6) and in accordance with Article 171a (2), such investments are considered to be sufficiently diversified and don't have to comply with the requirement in the first sentence

- 2. Where equities are held within collective investment undertakings or within alternative investment funds referred to in points (a) to (d) of Article 168(6), the conditions set out in paragraph 1 of this Article may be assessed at the level of the funds and not of the underlying assets held within those funds.*
- 3. Insurance or reinsurance undertakings that treat a sub-set of equity investments as long-term equity investments in accordance with paragraph 1 shall not revert back to an approach that does not include long-term equity investments. Where an insurance or reinsurance undertaking that treats a sub-set of equity investments as long-term equity investments is no longer able to comply with the conditions set out in paragraph 1, it shall immediately inform the supervisory authority and shall cease to apply Article 169(1)(b), (2)(b), (3)(b) and (4)(b) to any of its equity investments for a period of 36 months."*

2. Literature Review

2.1. EIOPA's "Opinion on the 2020 review of Solvency II" (EIOPA-BoS-19/465)

While the Opinion and the IA cover different areas of Solvency II, the following parts are specifically relevant for LTE:

<p>Chapter 2.9.4., 2.954-2.957 of the Opinion: "Calibration of the equity risks"</p>	<ul style="list-style-type: none"> • Background for the calibration and reasoning for the LTE module • Empirical VaR analysis for multiple investment durations based on MSCI equity indices • Conclusion: "it is not possible to corroborate the assertion that investment for a longer duration justifies a lower capital charge. In fact, the data supports an increase in capital requirements, as the Solvency II calibration only considers losses over a 12-month period, whereas sustained losses can be experienced over multiple years."
<p>Chapter 2.9.7., 2.958-2.960, 2.964-2.965 of the Opinion: "Design of the long-term equity risk treatment"</p>	<ul style="list-style-type: none"> • Analysis of 3 options in order to account for the diversification between short-term and long-term equity risks: <ul style="list-style-type: none"> ○ (1) no change, i.e. LTE is part of the existing type 1 / type 2 equity risks with the corresponding correlations ○ (2) no diversification between LTE and other equity risks, i.e. LTE to be added up to other equity risks, which are then diversified with other risks ○ (3) no diversification between LTE and other risks, i.e. LTE to be added up to other risks (BSCR) • Analysis of 2 options in order to account for the diversification within the LTE portfolios: <ul style="list-style-type: none"> ○ (1) no change, i.e. a single equity instrument or a not-well diversified portfolio of equities may classify as LTE ○ (2) introduction of a diversification criterion in order to qualify as LTE, i.e. a single equity instrument or a not-well diversified portfolio of equities may <u>not</u> classify as LTE (<u>EIOPA's preferred option</u>)

Moreover, EIOPA formulated the following questions to the stakeholders, amongst others:

"[...]"

Q2.11: Considering the diversification of long-term equity risk with other risks: Do you have evidence to support any of the options set out in this section? If the answer is "Yes", please elaborate on it.

Q2.12: Do you consider that the illiquidity of liabilities (and, more broadly, the characteristics of insurance business) are reflected in an appropriate manner in the current equity risk sub-module? If the answer is "No", please elaborate on the changes that you deem necessary."

2.2. Further Sources

As of the date of this report, we are aware of several further sources analysing LTE or some of its relevant aspects such as diversification. We summarise such sources in the following making no claim to be exhaustive:

Ring-fencing, MA, VA, DBER

Title	Author	Year	Key Points Reflected in This Review
Investorenaufsichtsrecht 2019 – Private Equity unter Solvency II	Boxberger, Steinmüller, Tokarevich	2019	<ul style="list-style-type: none"> LTE requirements are difficult to implement for German insurers. The requirement might be easier to implement for insurers in other countries (e.g. France, the Netherlands, UK)
Long-term Equity Investments under Solvency II	DWS	2019	<ul style="list-style-type: none"> Insurers that already have strong asset-liability matching regimes should be able to benefit from the reduced capital charges on LTE portfolios
Review of the Solvency II Standard Formula	Ehlscheid, Wolf	2019	<ul style="list-style-type: none"> MA not applicable to the German market
Report on insurers' asset and liability management in relation to the illiquidity of their liabilities (EIOPA-BoS-19-593)	EIOPA	2019	<ul style="list-style-type: none"> Average holding period for long-term assets is 9-14 years
Commission Staff Working Document Supporting insurers' investment in equity and unrated debt (SWD(2019) 146 final)	European Commission	2019	<ul style="list-style-type: none"> Insurers can hold assets to maturity and invest in a wide range of assets, which allows for portfolio diversification and enables them to match their liability needs

Alternative Investments unter der neuen Solvency II-Verordnung	Tokarevich, Dornseifer	2019	<ul style="list-style-type: none"> There are simpler and still sufficiently risk-sensitive solutions, especially if LAI would be held by risk diversified closed-ended AIF
Report on long-term guarantees measures and measures on equity risk 2018	EIOPA-BoS-18/471	2018	<ul style="list-style-type: none"> 34 insurance undertakings from Spain (15 undertakings) and the UK (19 undertakings) apply the MA The VA is used by 696 undertakings in 23 countries Only one undertaking in France is using the DBER as of 31 December 2017
Report on a new category of equities (LTEIP) under Solvency 2 Standard Formula	Institut des actuaires (France) and PwC	2018	<ul style="list-style-type: none"> The ring-fencing criterion is burdensome and doesn't necessarily reduce the risk
ECO-SLV-18	Insurance Europe	2018	<ul style="list-style-type: none"> The ring-fencing criterion would lead to loss of diversification and lack of applicability in certain jurisdictions and should be removed The 12 years holding period is too restrictive and should be removed The holding period of assets should not be compared to the holding period of liabilities as one measure is retrospective, while the other one is prospective <p>The limitation to EEA countries should be extended to OECD countries for the sake of consistency with other provisions</p>
CEIOPS-DOC-65/10	CEIOPS	2010	<ul style="list-style-type: none"> Calibration of the 22% equity risk charge for the duration-based equity capital charge for the average holding period ≥ 12 years

Long-term VAR

Title	Author	Year	Key Points Reflected in This Review
Investment risk for long term investors: risk	IFA	2019	<ul style="list-style-type: none"> Long-term annualised expected return of S&P 500 stabilises above 10% value with a standard deviation of 3.3% over the 10-year horizon

measure- ment ap- proaches			
Mean Rever- sion in Stock Prices: Implications for Long- Term Inves- tors (Working Paper No. 343)	DNB	2012	<ul style="list-style-type: none"> • Mean-reverting stocks are relatively less risky for longer investment horizons • Since the mean-reversion behaviour cannot always be proven, it might be prudent to apply conservative assumptions in investment decisions

Correlations & Diversification

Title	Author	Year	Key Points Reflected in This Review
Guide to Al- ternatives 4Q 2019.	JP Morgan	2019	<ul style="list-style-type: none"> • Correlation of 0.8 between private equity and global equities
The infra- structure equity cycle. Infrastructure white paper series. Part 3	UBS	2018	<ul style="list-style-type: none"> • Correlation of 0.3 between private infrastructure equities and listed infrastructure equities as well as other public equities
BAI's answer to the "Tem- plate on Call for Evidence Request by the European Commission to EIOPA for Technical Advice on	BAI	2017	<ul style="list-style-type: none"> • Correlations between public stock markets and private equity market's returns are between 10% to 37%

the treatment of unlisted equity and debt without an ECAI rating in the standard formula"			
Private equity portfolios: why size matters	Gottschalg et al.	2017	<ul style="list-style-type: none"> The study found that the optimal global private equity portfolio contains about 30 funds and should include a limited number of Asian funds
Risk in Private Equity	BVCA	2015	<ul style="list-style-type: none"> Calculations based on different PE databases such as Preqin, Pevara and BVCA An investor randomly selecting one fund has a risk of losing capital in 28% of cases. A randomly selected portfolio of five funds results in a reduced risk of 10% of cases in which an investor would lose capital. In the case of a randomly selected portfolio with 20 funds, the risk for an investor is substantially reduced to 1.4%. This can be reduced even further to close to zero for a portfolio of 50 funds
Small is Beautiful: The Impact of Portfolio Diversification and Selection on Risk and Return in Private Equity	Gottschalg, Gleisberg und Derungs	2015	<ul style="list-style-type: none"> Calculations based on PE data from the Preqin database The return dispersion decreases substantially with the number of underlying primary funds. While the range between the best and worst possible outcome with a single underlying fund goes from 0.02x to 6x, a diversification across 15 primary funds already reduces this range to [1.2x, 2.6x]

Risk Metrics Incl. VaR Outcomes for Illiquid Equity Investments

Title	Author	Year	Key Points Reflected in This Review
MSCI WORLD INDEX (USD)	MSCI	2019	<ul style="list-style-type: none"> The annualised expected return of the MSCI World index amounts to 9.34% with a standard deviation of 12.99% over a 10-year horizon
Methodological Review of EIOPA's Final Advice Regarding the Unlisted Equity Module	CEPRES / SOF	2018	<ul style="list-style-type: none"> A combined approach where the VaR is calculated (i) on the level of PE fund shares and (ii) is based on empirical PE data under consideration (iii) of the individual long-term investment ability (e.g. approximated by the duration of individual insurance liabilities) could lead to improvements in the methodological correctness, the operational usability and the regulatory consistency One-year VaR at a confidence level of 99.5% derived from the CEPRES database of private equity data resulted in a value below 30% of the market value. The study was also presented to EIOPA in several meetings over the phone and in-person and referred to by EIOPA-BoS-18/075, p. 217 during the Solvency II Review 2018 The qualitative rationale why VaR should decrease over a long-term holding period
Private Infrastructure Broad Market Equity Indices	EdHec	2017	<ul style="list-style-type: none"> The calculated annualised model volatility and expected return are available on the EdHec platform https://indices.edhecinfra.com/
Research Paper: "Calibration of Risk and Correlation in Private Equity"	EVCA	2012	<ul style="list-style-type: none"> Depending on the calibration method and the database used (Preqin and Pevara), the one-year VaR @ 99.5 are between 20% and 35%

3. Assessment Results

3.1. EIOPA's Questions

3.1.1. Diversification with other categories (Q.2.11)

Currently, LTE is treated as a sub-class of type 1 and type 2 equities which leads to the diversification applied on multiple levels of the standard formula, in particular between the type 1 and type 2 risks, between the equity risk and other market risk sub-modules as well as between the market risk and other modules. EIOPA raised concerns about potential diversification restrictions between long-term and short-term risks as well as cited CEIOPS (2010) where DBER is added up to the equity module, i.e. no diversification benefits are accounted for between equity sub-risks due to the different time horizon of DBER. Moreover, in EIOPA-BoS-19-465 EIOPA estimated empirical correlation coefficients between long-term equity returns and other short-term financial market risks incl. short-term equity returns. Having calculated with different methods, EIOPA determined correlations between -0.005 and 0.54 between the long-term equity risk and the short-term equity risk among other correlations.

Since the data used for the calculation of the long-term equity risks stem from the public equity index (MSCI World), it might be useful to consider the existing research on correlations between private equity and unlisted infrastructure equity investments that could generally qualify as LTE due to their illiquid characteristics as well. Please also see our findings regarding the representativeness of the chosen public equity index for alternative investments in chapter [3.2.2](#) :

BAI (2017) concluded in the *"Template on Call for Evidence Request by the European Commission to EIOPA for Technical Advice on the treatment of unlisted equity and debt without an ECAI rating in the standard formula"* that *"for illustration purposes CEPRES calculated equivalent returns that an investor would have achieved by investing the same cash flows into global stocks, bonds and high yield markets for a sample of more than 700 private equity buyout funds. That allows a comparison of returns to measure correlations to the public markets. The results document correlations between 10% to 37% to public stock markets (as a proxy to type 1 equities)."*

Capital Dynamics (2017) performed calculations based on Cambridge Associates and Colmore private equity data with the following result: *"Over the past 15 years, the average correlation between the European and US buyout markets and public equity has been 80%. Over the same period, the correlation of the European buyout market has been lower than that of the US buyout market"*

JP Morgan (2019) presented a similar result and calculated a correlation of 0.8 between private equity and global equities.

UBS (2018) identified a correlation of 0.3 between private infrastructure equities and listed infrastructure equities as well as other public equities.

The research indicates that unlisted equity classes that are particularly eligible for the LTE module (infrastructure equity, private equity) may experience correlations between 10% and 80% to public equities derived from specific data sets for those asset classes. The

current treatment in type 1 and type 2 risk modules might already overestimate those correlations. For instance, if illiquid private equity funds are classified as type 1 AIF, they would have no diversification benefits with other type 1 equities. **Therefore, the current treatment can be already considered to be rather conservative for illiquid / unlisted LTE. Appropriate treatment would additionally account for the diversification benefits.**

Suggestion for improvement: In our view, EIOPA's calculation of correlations uses input data (MSCI) that might be considered as not representative of alternative investments. In order to appropriately reflect empirical results for alternative investments, the **alternative / illiquid LTE** could be introduced as a **separate module**. Correlation coefficients between alternative / illiquid LTE and the existing equity modules could be then derived from an empirical analysis based on a representative data set for alternative investments. A correlation of **0.75 to all other equity categories (type 1 / type 2)** could be considered to be a conservative approach given that different empirical studies estimated correlations of 0.1-0.8 and this is consistent to the current correlation between type 1 and type 2 equity risks.

In case this suggestion will not be implemented, the current approach, where LTE is included in the correlation formula for type 1 and type 2 equities, seems to be a rather conservative framework.

3.1.2. Consideration of liabilities (Q.2.12)

In their document SWD(2019) 146 final the EU COM stated that “[...] depending on the cash-flow profile of their liabilities, insurers can hold assets to maturity and invest in a wide range of assets, which allows for portfolio diversification and enables them to match their liability needs. The duration of liabilities determines the holding period of investments, while the probabilities of cash outflows of liabilities determine the investment liquidity.”

When introducing the long-term equity module in the Art. 171a the EU COM provided the rationale for the qualification criteria: “The prudential criteria set out in the Delegated Regulation focus on the ability and intention of the insurer to invest for the long term, while ensuring sound asset-liability management by the insurer. The focus on asset-liability management is a fundamental element of insurers' strategies and operations, due to the liability-driven nature of the insurance business, with assets purchased to "match", in a risk-efficient manner, the estimated cash flows of insurance obligations”

The qualification criteria for the duration-based equity module (“**DBER**” according to Art. 304 Solvency II Directive) as well as for the LTE were introduced as a reaction to the concerns of stakeholders such as the DIA Danish Insurance Association documented in the paper “Resolutions on Comments on CEIOPS-CP-69/09 (L2 Advice on Design of the equity risk sub-module)” and stating that “the duration approach according to Article 305b is, fundamentally, not in line with the economic approach which the directive aims to achieve. This is why the use of the duration approach must be authorised by member states – and this is why there are restrictions to the use of the approach (reference to Article 305b). If

it were possible in practice to give policyholders the same protection under this approach as under the general, risk sensitive approach, these measures would be redundant."

The key asset-liability management ("ALM") requirements defined on the level of insurance companies for LTE include the following key aspects:

- *"LTE included within a portfolio of assets which is assigned to cover the best estimate of a portfolio of insurance or reinsurance obligations corresponding to one or several clearly identified businesses, and the undertaking maintains that assignment over the lifetime of the obligations" (Art. 171a (b) DR)*
- *"the portfolio of insurance or reinsurance obligations, and the assigned portfolio of assets referred to in point (b) are identified, managed and organised separately from the other activities of the undertaking, and the assigned portfolio of assets cannot be used to cover losses arising from other activities of the undertaking;" (Art. 171a (c) DR)*
- *"the technical provisions within the portfolio of insurance or reinsurance obligations referred to in point (b) only represent a part of the total technical provisions of the insurance or reinsurance undertaking;" (Art. 171a (d) DR)*
- *"the average holding period of equity investments in the sub-set exceeds 5 years, or where the average holding period of the sub-set is lower than 5 years, the insurance or reinsurance undertaking does not sell any equity investments within the sub-set until the average holding period exceeds 5 years;" (Art. 171a (e) DR)*
- *"the solvency and liquidity position of the insurance or reinsurance undertaking, as well as its strategies, processes and reporting procedures with respect to asset-liability management, are such as to ensure, on an ongoing basis and under stressed conditions, that it is able to avoid forced sales of each equity investments within the sub-set for at least 10 years;" (Art. 171a (g) DR)*
- *"the risk management, asset-liability management and investment policies of the insurance or reinsurance undertaking reflects the undertaking's intention to hold the sub-set of equity investments for a period that is compatible with the requirement of point (e) and its ability to meet the requirement of point (g)." (Art. 171a (h) DR)*

Table 26 of EIOPA's "Report on insurers' asset and liability management in relation to the illiquidity of their liabilities" (EIOPA-BoS-19-593) stated that average holding periods for the asset class undertaking spotted as held to maturity / long-term asset are 9-14 years. In our view, this observation provides additional evidence for the irrelevance of fire sales for long-term assets. **The requirement of Art. 171a (g) to demonstrate the ability to avoid forced sales might be therefore unnecessarily burdensome given the average holding periods estimated by EIOPA.**

The industry feedback related to those ALM requirements indicated that such provisions might be **unnecessarily restrictive**:

- Insurance Europe (2018) stated in their paper ECO-SLV-18 that *"the ring-fencing obligation is a clear disincentive from applying this proposal, as it would lead to loss of diversification, which is key to an overall portfolio risk assessment. This requirement is not needed and should be*

removed. [...] Furthermore, the requirement that the holding period of assets is higher than that of liabilities does not make sense, as it suggests comparing a retrospective parameter (i.e. holding period of assets) with a prospective one (i.e. current duration of future liabilities)."

- Institut des actuaires (France) and PwC (2018) that conducted a study for the French Treasury Department and the Dutch Ministry of Finance concluded that *"a condition of ringfencing of the assets and liabilities is added, which would make the approach very burdensome for the insurers and is not relevant to capture the long term character of the investments. This would create artificial modifications of the hierarchy of creditors between policyholders. In our views, it would deprive the whole approach from its useful effect"*
- Tokarevich and Dornseifer (2019) commented in the journal VWheute: *"Although the hard ringfencing requirement was removed from the Draft Delegated Regulation, the substance of the new requirement is very similar to the duration-based equity module or the matching adjustment. Solvency II companies could only implement this requirement with significant additional effort. This is especially the case for Germany where ringfencing constructions don't play a significant role and the implementation is very burdensome. There could have been more simple and still sufficiently risk sensitive solutions especially if LAI would be held by risk diversified closed-ended AIF"*
- Boxberger, Steinmüller and Tokarevich (2019) discussed the equity investments under Solvency II during the panel discussion of the Munich Private Equity Training (MUPET) 2019 and agreed that *"the (LTE) requirements are difficult to implement for German insurers. The requirement might be easier to implement for insurers in other countries (e.g. France, the Netherlands, UK) who promoted this requirement since they already have the necessary balance sheet structures in place. The time will show if the requirement will be amended in such a way that it becomes applicable on the EU-wide basis"*
- Ehlscheid and Wolf (2019) presented a similar conclusion at the qx club, a working group of the German Actuarial Association (DAV): *"Due to the matching requirement between assets and liabilities the new amendment is generally not applicable for the German market"*
- DWS (2019) analysed the applicability of LTE in different jurisdictions as follows: *"In particular insurers that already have strong asset-liability matching regimes should be able to benefit from the reduced capital charges on LTE portfolios. This, for example, includes insurance companies with a significant annuity business such as life insurers in the UK or Spain, many of whom are already users of the matching adjustment. Additionally, insurance companies in France and in Denmark often have a liability structure that is favorable for LTE investments. Given the significant reduction in the Solvency Capital Requirement (SCR) that the LTE classification offers other insurance companies may consider modifying parts of their books and portfolios in order to meet the requirements for LTE investments. This is especially true for insurers that already hold significant equity portfolios such as insurers in the Nordics."*

In summary, the comments indicate that the LTE ALM requirements are **(i) operationally burdensome, (ii) only applicable in certain EU jurisdictions where the "quasi-ringfencing" requirement can be fulfilled due to their typical national balance sheet structures and (iii)**

² Unofficial translation from German

³ Unofficial translation from German

⁴ Unofficial translation from German

this current requirement is not the optimal way to balance the risk-based prudential approach and the incentive to invest in long-term equity investments.

The key question is, therefore, if the current "quasi-ringfencing" requirement is a necessary risk mitigation measure required to justify the reduced capital charge or if other alternative provisions may introduce a less burdensome approach with the same degree of protection as it is currently the case. A research on the current ALM approaches of insurers and the integration of long-term investments as well the current market feedback to the existing and comparable long-term measures such as the Matching Adjustment ("MA"), the Volatility Adjustment ("VA") and the DBER may be a good starting point for this discussion:

In their research paper "The evolution of insurer portfolio investment strategies for long-term investing" Gründl and Dong (2016) reviewed the long-term investment behaviour as part of ALM performed by insurers. They identified different ALM strategies (stochastic models such as dynamic financial analysis (DFA), immunisation strategies, optimisation strategies, and scenario analyses incl. stochastic economic scenario generators (ESG)) and asset allocation processes applied by different insurance companies dependent on a variety of factors such as the line of business (life, non-life) or the size. The authors state that *"the specific applications of these ALM methods are heterogeneous among the sample insurance companies due to their different business models, i.e. different liability structures. [...] In principle, direct long-term investment is a suitable asset class for life insurers' ALM. In this case, the inherent illiquidity of long-term investment fits well with illiquid liabilities and creates a sort of "natural marriage". However, market demand for products that offer more, not less, liquidity could be an impediment for long-term investment by life insurers. Especially if policyholders' surrender options are granted for consumer protection purposes which require a degree of liquidity by the insurer. Such liquidity must then be supported by investments in liquid assets, which reduces the capacity for investing in illiquid, long-term assets. This may explain some of the observations made in the OECD Large Insurer Survey that the asset allocation of insurers has not moved towards long-term investments in the last couple of years. Despite the low-interest rate environment, illiquidity premiums of long-term investments were not sufficient to outweigh the disadvantages of long-term investments' inherent illiquidity"*. Further factors identified that are relevant for long-term investments are appropriate financing vehicles, public-private-partnerships, expertise, high-quality data, demographic change and climate change.

The British Institute and Faculty of Actuaries IFA (2019) reviewed the long-term investment risk in light of the existing long-term equity modules such as the VA and the MA which is prevalent on the UK market: *"Due to the stringent requirements underlying SII and in particular the matching adjustment constraints, companies have had to jump through many 'hoops' before including suitable asset classes within the matching adjustment ("MA") portfolio. These include the need to create "matching adjustment friendly" (e.g. decomposing property assets into income strips and residual property values due to the need for asset cashflows to be fixed unconditionally to be matching adjustment eligible). This type of activity does not lead to any reduction in investment risk. Indeed, the additional complexity adds operational risk, creates asset valuation challenges, reduces transparency and adds cost. [...] The long-term guarantee packages in the form of MA and volatility adjustment ("VA") helps balance things somewhat but these measures are still viewed to be overly prescriptive and perhaps opportunities for a principles-based approach may be available post-Brexit. While MA has a generally high take-up in the UK, on VA, there appears to be general consensus that the rules are too rigid. Recently, there has been discussion between major industry players and the regulator on possible ways to evolve a more dynamic VA."* The

authors also identified a large variety of risk management and ALM approaches and considerations that the authors suggest accounting for by long-term investors.

This is also in line with the views of the UK Prudential Regulation Authority PRA (2018) who formulated the goal to “*develop proposals for the Matching Adjustment and the Volatility Adjustment which allow more flexibility and a more principles-based approach, and which reduce the requirement for insurers to develop complex structures in order to achieve the regulatory treatment that they warrant. [...] the eligibility requirements in the Solvency II Directive are detailed and prescriptive. Whilst Solvency II remains the applicable regulatory regime in the UK, the PRA does not have the power unilaterally to change the criteria upon which the MA is assessed in line with more principles-based requirements. We are legally required to consider MA applications against each of the Directive’s eligibility criteria, including the requirement that assets have ‘fixed’ cash-flows. Set against this requirement, we have where possible taken a flexible view of the Directive, for example, by allowing firms to restructure otherwise ineligible assets (such as equity release mortgages) in order to meet the eligibility requirements in relation to the fixity of cash-flows. In general we do not encourage widespread use of asset restructuring as this introduces additional risks and complexity”.*

Moreover, in their “Report on long-term guarantees measures and measures on equity risk 2018” (EIOPA-BoS-18/471) EIOPA found out that “34 insurance undertakings from Spain (15 undertakings) and the UK (19 undertakings) apply the MA. [...] The VA is used by 696 undertakings in 23 countries. [...] Only one undertaking in France is using the DBER as at 31 December 2017”.

The key findings based on the over-mentioned sources can be summarised as follows:

- There is a great variety of eligible ALM methods. The selection and the implementation of the optimum and company-specific ALM framework is a core process of any insurance organisation. ALM is a complex and multifaceted area which goes far beyond the ringfencing requirement.
- Effective decision-making processes based on their ALM frameworks were demonstrated by the OECD Large Insurer Survey where the advantages and disadvantages of moving into long-term assets were carefully considered in the asset allocation processes. **The individual and company-specific ALM framework is, therefore, an essential trigger for the investment decision process.**
- The UK regulator PRA representing one of the key jurisdictions using the MA considers the requirements “*detailed and prescriptive*”, makes an attempt to take a flexible view on such requirements, where possible, and also permits restricting of ineligible assets with the primary aim to enable the eligibility.
- IFA assesses such restructuring to “*matching adjustment friendly*” portfolios as an increase in operational risks and costs.
- Based on EIOPA’s research, the MA is only used by a limited number of undertakings in certain jurisdictions, while the DBER is almost not used at all.

Besides, we could observe in the market that the ringfencing provision created the following assumedly unfavourable consequences:

- fund managers / GP's attempt to create fund products qualifying as LTE via additional structuring and expenses which will, in turn, reduce the return of Solvency II investors without any observable risk reduction
- Solvency II investors / LP's attempt to artificially split their balance sheet into several parts in order to fulfil the requirement for a separate "quasi-ringfenced" portfolio – such approaches increase operational costs and risk without any observable risk reduction

Since the same arguments can be applied to LTE, it can be concluded that the research demonstrates that the quasi-ringfencing requirement hinders the EU-wide harmonisation and introduces a burdensome and costly requirement that is not always relevant for individual ALM frameworks being far more complex processes than a stand-alone formalistic ringfencing. Besides, the research demonstrates that ringfencing is not a universal tool for risk reduction, in fact, it can also increase operational risks without reducing or even increasing market risks (e.g. due to the lower diversification).

Suggestion for improvement:

We suggest **removing the quasi-ringfencing requirements set out in Art. 171a (b) – (d)**. The requirements with regard to the prudent risk management and ALM are already reflected in the ALM and risk management requirements of Art. 171a (e)-(h) as well as general ALM and risk management requirements of Solvency II, allowing for the individual assessments of the eligibility to the individual ALM framework.

Instead, an additional provision could be introduced requiring a more explicit and transparent demonstration of how the requirement is fulfilled, e.g. via a separate LTE documentation including relevant assumptions and methods used as well as the assessment of model risks. An example of such a requirement could be introduced instead of Art. 171a (b) in the following way: *"The undertaking provides a separate documentation for the determination of the equities eligible for the LTE module including all assumptions, stress tests and calculations as well as the rationale of how LTE match the liabilities with regard to characteristics such as the timing, currency and the value of future cash flows under expected and stressed circumstances"*

We suggest reviewing the "forced-sale resistance" requirement set out in Art. 171a (g) as this is already fulfilled by the insurance industry and their average holding periods of long-term assets as demonstrated by EIOPA

3.2. Further Areas

3.2.1. Diversification within the LTE module

In EIOPA-BoS-19-465 EIOPA suggests the introduction of a diversification requirement to the LTE module since EIOPA expressed a concern that a single equity or a not well-diversified portfolio may still benefit from a lower equity risk charge for LTE. Hence EIOPA suggests adding the following provision: *"i) the sub-set of equity investments shall be properly diversified in such a way as to avoid excessive reliance on any particular issuer or group of undertakings and excessive accumulation of risk in the portfolio as a whole."*

Weidig, Kemmerer and Born (2005) identified in their study that *"The default probability as a measure of risk of a FoF portfolio decreases with the rising number of funds in its portfolio. This kind of risk is also called shortfall risk or downside risk. A large part of diversification benefits appear to derive from the first five funds. The more the number of funds in the portfolio increases, the more idiosyncratic risk is diversified. Thus the probability of loss for a FoF consisting of 20 VC (Buyout) funds lies at 0.01% (0.4%) for US funds and at 1.7% (0.001%) for European funds."*

Gottschalg, Gleisberg und Derungs (2015) performed a study on portfolios of private equity funds and concluded that the overall risk and return profile improves via the diversification by the number of target funds, while the geography tends to play a smaller role if there is a sufficient diversification by the number of funds. The authors found out that a portfolio with 25 lower median funds results in the minimum TVPI of 0.97x. Gottschalg et al. (2017) updated the initial study with the following result: *"We found that a portfolio only needed to have a minimum of 10 funds for even the worst performers from our sample to still deliver a positive return. However, the benefit of diversification for a portfolio was shown to reduce as the number of underlying funds became much larger. Indeed, these larger portfolios also had lower upside potential. On the other hand, the inclusion of Asian growth and / or buyout funds introduced further upside potential, albeit with more risk in the form of performance volatility. In summary, our study found that the optimal global private equity portfolio contains about 30 funds and should include a limited number of Asian funds"*.

BVCA (2015) arrived at the following results in their PE study: *"In the case of the TVPI, an investor who only selects one fund ends up with a TVPI of 0.4x or lower with a 5% probability. If they commit equally to five funds, the TVPI for the 5th percentile is increased significantly to 0.9x. And in the case of 20 funds, the TVPI in 95% of the runs in the simulation is 1.1x or higher. Even at the 1st percentile, the TVPI is just below 1x, which shows that it is very hard for an investor to lose money with a well-diversified portfolio."*

BAI (2017) also presented the following findings in the "Template for Comments on CP-17-006": *"[...] If managers (being a mediator variable rather than a direct market risk driver) are subject to the diversification requirements, it is unclear why the requirement is so high. A typical fund of fund structure where the fund of fund manager is constructing a private equity fund portfolio for the investor has 10 – 15 target funds / fund managers which is usually considered to be sufficiently diversified in practice. The requirement of 25 managers could create overdiversification and lead to a dramatical increase of expenses and administrative burdens."*

In Chapter 5.2. CEPRES / SOF (2018) suggested introducing new requirements on the level of fund shares. Building on that research Tokarevich, Dornseifer (2019) stated in the journal be.in.VALUE that *"simpler solutions without any additional risks could have been introduced in particular if LTE would be acquired via closed-ended and risk diversified AIF"*⁵. This suggestion was implemented in the final in Article 171a (2) DR 2015/35 stating that LTE criteria can be applied on the level of the fund share of a "type 1 AIF" (usually closed-ended, unlevered EEA AIF) according to Art. 168 (6) DR 2015/35.

⁵ Unofficial translation from German

The research suggests that a significant diversification and risk reduction can be reached with 5 – 30 target funds based on the different data and assumptions used. At the same time, one paper raised concerns about a potential overdiversification. Moreover, a type 1 AIF could already be sufficient in order to fulfil the diversification requirement, which is usually an obligatory requirement based on the national regulations in the country of the AIF domicile.

Suggestion for improvement: We support EIOPA's suggestion to consider diversification requirements in the LTE module based on the clear diversification benefits indicated by the research. Since diversification is a rather complex topic and potential disadvantages of an overdiversification should also be taken into account, we agree with EIOPA's proposal where no exact quantitative limit is formulated since this is to be assessed by each individual asset manager in the specific context of their portfolio. We suggest to explicitly emphasize that the diversification can also be based on the fund level and therefore suggest to change the wording of the criterion as follows: *"i) the sub-set of equity investments shall be properly diversified in such a way as to avoid excessive reliance on any particular issuer or group of undertakings o and excessive accumulation of risk in the portfolio as a whole. Where LTE are held within collective investment undertakings or within alternative investment funds referred to in points (a) to (d) of Article 168(6) and in accordance with Article 171a (2), such investments are considered to be sufficiently diversified and don't have to comply with the requirement in the first sentence".*

3.2.2. VaR Calibration

In EIOPA-BoS-19-465 EIOPA investigated if there was sufficient evidence for the reduced capital stress of 22% for LTE. For this purpose, EIOPA used several MSCI indices for listed equities and computed historical VaR for the holding periods of up to 10 years under certain assumptions such as the elimination of the risk-free rates from the historical data. Based on those assumptions and using different methods, EIOPA obtained a range of VaR values of 9% - 92% for the holding periods between 9 and 10 years. In 2.836 EIOPA-BoS-19-465 EIOPA summarised key assumptions underlying different calculations such as

- empirical data vs model predictions
- minimum value vs anniversary date
- including vs excluding risk-free interest rates from the returns

EIOPA concluded that "there is *no clear decreasing trend in the risk with regard to extending the time horizon*. Therefore, the *empirical analysis does not corroborate the 22 percent capital charge*."

We reviewed EIOPA's empirical analysis from the methodological perspective and identified the following questions and issues:

- It is unclear if the elimination of risk-free interest rates is consistent with the general standard formula approach where equity investments are only subject to the equity risk and not the interest rate risk. Our understanding is under the current approach there is an implicit assumption

that the equity risk reflects both, the volatility of risk-free interest rates and the equity premia (in excess of the risk-free interest rates) as opposed to debt investments where the underlying "debt risk" is divided into the spread risk and the interest rate risk.

- The selected liquid MSCI indices might not adequately reflect the illiquid specifics of alternative investment classes such as private equity or infrastructure and private markets in general. It is not entirely clear why a more representative benchmark for illiquid data was not chosen although the research identified various data providers for alternative investments data such as CEPRES, PreQin, Cambridge Associates, EdHec Infra, Pevara and others.
- Calculation of VaR for an asset class is not a straightforward exercise as very different results can be achieved based on different assumptions, inputs and models. This can be evidenced from the very wide range (9% - 92%) of relevant outputs generated by EIOPA (see above). In our view, the representativeness of outcomes might be considered highly questionable given such wide ranges. It should be noted that there is no right method as every method is only an attempt to describe reality and predict the future. Therefore, it might be helpful to perform several calculations under different assumptions, with different data and using different methods.

In order to address those issues, we reviewed different research and performed simplified analytical VaR calculations based on the data identified. We performed a calculation of 1-year and 10-year delta-normal VaR based on the different sets of data and on the different methodology of estimating the annualised expected return and standard deviation values. We also calculated Cornish-Fisher VaR where research papers provided skewness and kurtosis. In our approach, we either used the calculated VaR where such values were given and scaled them up or down to the relevant time horizon or used the parameters for the calculation of VaR. While we did not perform an in-depth analysis and validation of the data and methods used and heterogeneous inputs were used (USD vs EUR, infrastructure vs private equity vs listed equity), the calculations might still provide a first general overview of the findings.

Please note: positive VaR values indicate a risk / a decline in market values while negative VaR values stand for an opportunity / a decrease in market values.

The results vary widely but are all in the interval [-66.89%; 12.41%] for the holding period of 10 years and [3.55%; 41.60%] for the holding period of 1 year. The values seem to be far below the values estimated by EIOPA. Besides, there is a clear indication that the VaR decreases if the holding period increases.

Below we display a standard framework that was used for our estimates:

Delta-normal VaR for the horizon of T years and with a confidence level of α is calculated by

$$VaR(\alpha, T) = -\mu * T + \sigma * \sqrt{T} * \phi^{-1}(\alpha),$$

where μ is the annualised expected return, σ is the annualised standard deviation, and $\phi^{-1}(\cdot)$ is the inverse of the CDF of the standard normal distribution.

To scale a VaR over t years to VaR over T years at the same confidence level, we use a modified-square root rule⁶

$$VaR(\alpha, T) = VaR(\alpha, t) * \sqrt{\frac{T}{t}} + \left(\sqrt{\frac{T}{t}} - \frac{T}{t} \right).$$

The formula above accounts for the different scaling factors of μ and σ . That are, T and \sqrt{T} respectively.

Finally, we also calculate Cornish-Fisher VaR, a modified version of VaR that accounts for non-normality of the underlying distribution. However, this was performed only on the datasets that provided skewness (S) and kurtosis (K) as parameters. Let $z = \Phi^{-1}(\alpha)$, then the formula for Cornish-Fisher VaR is as follows:

$$VaR_{CF}(\alpha, T) = -\mu * T + \left(z + (z^2 - 1) * S / (6\sqrt{T}) + (z^3 - 3 * z) * K / (24 * T) - (2 * z^3 - 5 * z) * S^2 / (36 * T) \right) * \sigma * \sqrt{T}.$$

The following table contains a complete overview of the calculation outcomes.

	EVCA: PrEgin (equal-weighted, USD)	EVCA: PrEgin (value-weighted, USD)	MSCI: World (USD)	EdHec Infra: Global Infrastruc- ture Equity (equal-weighted, EUR)	EdHec Infra: Global Infrastruc- ture Equity (value-weighted, EUR)	IFA: S&P500 (USD)
μ (annualised)	12.80%	13.16%	9.34%	13.49%	11.93%	10.10%
σ (annualised)	14.76%	12.90%	12.99%	8.35%	11.60%	5.30%
S (annualised)	0.81	0.42	-	-	-	-
K (annualised)	1.89	1.19	-	-	-	-
$VaR_{\text{Delta-normal}}$(99.5%, 1Y)	25.22%	20.07%	24.12%	8.02%	17.95%	3.55%
$VaR_{\text{Cornish-Fisher}}$(99.5%, 1Y)	41.60%	29.80%	-	-	-	-
$VaR_{\text{Delta-normal}}$(99.5%, 10Y)	-7.77%	-26.52%	12.41%	-66.89%	-24.81%	-57.83%
$VaR_{\text{Cornish-Fisher}}$(99.5%, 10Y)	5.11%	-19.94%	-	-	-	-
VaR change from 1 Y to 10Y	decreased	decreased	decreased	decreased	decreased	decreased

It is apparent that 10-year VaR are in the lower end of the spectrum if not negative. Looking at the formula for delta-normal VaR, this is not surprising. The expected return μ grows linearly with T while the standard deviation grows with \sqrt{T} . Thus, when μ is non-negative, it inevitably

⁶ On time-scaling of risk and the square-root-of-time rule (2006). Jón Danielsson and Jean-Pierre Zigrand, Journal of Banking and Finance

dominates the standard deviation term as T grows large. The results make economic sense too. Despite occasional shocks, the equity market historically grows on average. Hence, with large enough horizon, one would expect the positive deterministic drift to outweigh the probabilistic volatility term. In the following, we summarised our approach for each column:

In EVCA's Research Paper, they concluded that *"equal-weighting all investments, however, is not entirely in-line with reality and does not account for the change in capital allocation by investors, depending on the size of fund to which the commitment is being made."* Thus, a value-weighted index could be more representative of the PE universe. *"EVCA believes that the risk of the NAV index is best captured through the Base index and its real data. As shown before the numbers of the shock event are in the area of 25% to 29%,"* which is in line with our 1-year VaR calculation. Expanding the VaR to longer horizon results in negative values both for delta-normal and Cornish-Fisher VaR metrics.

The MSCI World index was used in EIOPA's research. Even though MSCI covers listed equity and, therefore, does not seem to be a good proxy for the PE market, having considered the same index but with a shorter history (10Y in the MSCI's report vs approximately 50Y in EIOPA's paper), and a different approach we arrive at completely different results.

EdHec Institute's research is specifically aimed towards building a representative index for unlisted infrastructure investments. *"Our broad European market infrastructure equity index (including project and infrastructure corporates) significantly outperforms the European public equity reference index over the 2000-2016 period; it also does not suffer from any drawdown during the 2007-2008 and 2010-2011 periods of stock market collapse"*. There are several risk metrics and parameters displayed on the EdHec platform. These include model volatility (displayed σ in the table above) calculated based on the 8-factor model including infrastructure-specific drivers such as lifecycle effects, measured by using the log of age (number of years of operation) and/or the exponential of time to maturity, business-model/risk effects, industry effects, country effects, and corporate-governance effects. As was mentioned before, the value-weighted index is more fit to represent the market structure in the PE world. The long-term VaR is still negative.

IFA performed extensive research to compare the short-term to long-term strategies. They considered an index of liquid equity S&P500 and arrived at a conclusion that *"high volatility (standard deviation in returns) has been experienced over shorter investment horizons but this reduces significantly as the time period of investment increases while the returns are broadly stable around the 10% p.a. mark."* Moreover, they compared the historical returns of the index to 10-year US Treasury bond, which is usually used as a proxy for the risk-free rate of return. The conclusion was that *"the S&P500 has provided higher returns than 10-year Treasury Bond but, historically, the risk of underperformance is large over the short term to the near medium term (five years). Later, the historical proportion of lower equity returns than long term interest rate reduces significantly and over the far end of the long term (greater than 25 years), reduces to 0%."*

In addition to the empirical findings, the following qualitative specifics of alternative investments should be considered in our opinion:

- Illiquid equity investments are often acquired via closed-ended structures where the lifetime of the fund is fixed and can usually be optionally extended subject to the approval of the investors. Such flexible structures enable investors and fund managers to choose the optimal selling point.
- Closed-ended funds are illiquid by definition. Investors in such funds usually allocate them to illiquid parts of their investment strategies, meaning that they are not acquired to cover urgent liquidity needs. Thus, investors should generally be willing to accept extensions of the fund lifetime in times of market downturns.
- Private equity strategies are typical buy-and-sell strategies where the manager is seeking for the optimal exit point during the effective lifetime of the fund. The lifespan of the investment in the fund can, therefore, range between 3 and 12 years dependent on the private equity managers' discretionary decision. The quality of the manager and his exit abilities are, therefore, key determinants that are identified by the research rather than the market development at one point of time.
- Infrastructure equity strategies are typical buy-and-hold cash-flow based strategies. Investors achieve their returns from ongoing cashflows (e.g. from selling electricity or from toll road revenues net of costs) rather than from exit values which are often not incorporated into financial models. The value of such ongoing future cash flows will change for each valuation depends on the market developments. However, during the usually long investment periods ranging from 10 to 30 years, the investor will receive highly valued cashflows in the periods of market upturns as well as lowly valued cashflows (in the periods of market downturns). A cash-flow based investment naturally diversifies the risk over time as each future cash flow occurs at different point of time for a long period rather than at one point of time as it is the case for asset-based finance.

Suggestion for improvement: The overwhelming majority of the research relevant for illiquid asset classes suggests that the long-term investments are generally subjected to lower volatility. Our research shows that 10-year VaR are not larger than 12.41% for different liquid and illiquid indices as opposed to the maximum of 41.6% for 1-year VaR. Therefore, our view is that the currently applied charge of 22% is already a conservative risk charge for illiquid asset classes.

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