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MASTER
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MASTER'S FINAL WORK
INTERNSHIP REPORT

RISK CONSULTING IN INSURANCE – IFRS 17

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To my family, friends and everyone who has helped me overcome what has been a challenging year.

GLOSSARY

ALM – Asset and Liability Management

CDS – Credit Default Swap

CRA – Credit Risk Adjustment

CSM – Contractual Service Margin

EIOPA – European Insurance and Occupational Pensions Authority

EONIA – Euro Overnight Index Average

€STR – Euro Short-Term Rate

EURIBOR – Euro Interbank Offered Rate

GMM – General Measurement Model

IASB - International Accounting Standards Board

IAN – International Actuarial Note

IFRS – International Financial Reporting Standard

LIC – Liability for Incurred Claims

LLP – Last Liquid Point

LRC – Liability for Remaining Coverage

PAA – Premium Allocation Approach

RA – Risk Adjustment

SCR – Solvency Capital Requirement

TVaR – Tail Value at Risk

UFR – Ultimate Forward Rate

VaR – Value at Risk

VFA – Variable Fee Approach

ABSTRACT

This internship report provides insights and depicts projects, activities and challenges experienced during the 6-month internship in the company KPMG. Integrated in the department of Management & Risk Consulting, specifically in Financial Services – Insurance, the internship revolved around learning and developing know-how regarding the insurance sector. Furthermore, with participation in projects of this matter, the main ones involved the accounting standard IFRS 17, a standard that establishes accounting measurement principles for insurance contracts.

IFRS 17 is a complex document built from a principle-based approach, open to various interpretations. This report delivers insights into possible interpretations for the implementation of the standard. Moreover, it assesses the IFRS 17 requirements and provides an overview of what is defined by the standard, specifically in measuring insurance contracts, including possible methodologies.

Some of the methods here presented are the result of research, as a consequence of given assignments. In addition, this report includes other methodologies gathered through research done outside of the scope of the assigned tasks, specifically developed for the report. Lastly, as the IFRS 17 standard will only become active in 2023, this report addresses various aspects that may still be question marks for insurance companies and provides some concepts that can be subject to future research.

KEYWORDS: IFRS 17; Discount rates; Risk Adjustment; Contractual Service Margin; Loss Component; Pension funds.

SUMÁRIO

Este relatório de estágio apresenta perspetivas e descreve projetos, actividades e desafios lançados durante os 6 meses de estágio realizados na empresa KPMG. Com a integração no departamento de Management & Risk Consullting, especificamente em Financial Services – Seguros, o estágio girou em torno da aprendizagem e desenvolvimento de know-how no sector dos seguros. Além disso, com a participação em projetos desta área, os principais envolveram a standarda contabilística IFRS 17, uma norma que estabelece princípios de medição contabilística para contratos de seguros.

A IFRS 17 é um documento complexo construído a partir de uma abordagem baseada em princípios, aberta a várias interpretações. O presente relatório fornece uma visão das possíveis interpretações para a implementação da norma. Além disso, avalia os requisitos da IFRS 17 e fornece uma visão geral do que é definido pela norma, especificamente na mensuração de contratos de seguro, incluindo possíveis metodologias.

Alguns dos métodos apresentados são o resultado de pesquisas feitas como consequência de tarefas atribuídas. Além disso, este relatório inclui outras metodologias recolhidas através de pesquisa realizada fora do âmbito das tarefas atribuídas, feita explicitamente para o relatório. Finalmente, como a standarda só entrará em vigor em 2023, este relatório aborda vários aspetos que ainda podem ser pontos de interrogação para as companhias de seguros e fornece alguns conceitos que podem ser objeto de pesquisa futura.

PALAVRAS-CHAVE: IFRS 17; Taxas de desconto; Ajustamento de risco; Margem de Serviços Contratuais; Componente de Perda; Fundos de pensões.

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Firstly, I must express my gratitude to my supervisor at KPMG and the team I was integrated with. I could not have done the internship without their assistance and encouragement. Furthermore, as the 6-month internship was entirely done online, it created many challenges which I was not ready for, and the team made it the best possible experience under those circumstances.

To my course coordinator, Prof. Maria do Rosário Grossinho. First, I want to thank you for providing me with this internship opportunity. Because of your help, I had my first interaction with the corporate world, which ultimately gave me my first job.

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Above all, I want to thank my family, friends, and colleagues for their vital support throughout the last two years. These years were challenging for everyone, and I could not have succeeded along the way without them.

1. INTRODUCTION

The following report portrays an internship done in the company KPMG, with a six-month duration in the Management & Risk Consulting department, specifically in Financial Services – Insurance. In this chapter, an overview of the work developed during the internship is presented. The work evolved around learning the International Financial Reporting Standard (IFRS) 17, an accounting standard that establishes accounting measurement principles for insurance and reinsurance contracts, crucial in the insurance sector.

The primary factor behind this accounting standard is that it is a complex document, and it follows a principle-based approach, where a lot is open to interpretation. As a result, different interpretations are possible for various items of it. The support in complexity and analysis of the standard for implementation in insurance companies is somewhat where the role of KPMG fits in, specifically in the department of Risk Consulting. The projects covered by the internship evolved around consulting insurance companies to consolidate IFRS 17 in their insurance contracts, including measuring them, presenting, disclosing their information, and constructing their financial statements. The standard was issued in 2017, set out to substitute IFRS 4, and due to some postponements, it will become active at the start of 2023.

As this internship was aimed more at Actuarial Science field rather than Mathematical Finance, the first month consisted in getting introduced and learning the insurance sector since there was no theoretical background developed during the academic semesters of the masters.

As an introductory phase in training and acquiring knowledge regarding the standard, the first part of the internship consisted mainly in reading documents, both internal and external. These documents served as support to a better understanding of what is defined in IFRS 17, explaining how the measurement principles and their new concepts apply within the standard.

As part of the internship, some assignments consisted of developing various position papers incorporated in the project management phase to consolidate the information learned regarding IFRS 17, to integrate the projects, and to contribute to them. In general terms, position papers have a subjective definition. However, in the context of the

company's projects, position papers were written as guidance for clients, explaining how the standard addresses its various subjects and what is required. For example, consider a position paper about discount rates, one of the subjects addressed by the accounting standard as part of estimating the future cash flows of insurance contracts at initial recognition. Firstly, the paper would detail the contextual framework to the discount rates, then the respective IFRS 17 requirements. At a later phase, the position paper presents a demonstration of possible methodologies under IFRS 17 requirements. However, as many of the addressed issues do not have methods defined as solutions by the standard because it has a less prescriptive principle-based approach, they are left to the insurance company's judgment to determine what methods to proceed with.

Therefore, in the development phase, position papers present what is defined and the next steps in the decision-making process. Then, as the final version of these papers are delivered, the decisions made by the company are presented, attached to what is stated by the standard.

Aside from the position papers, the elaboration of other documents was one of the internship's objectives, mainly within project management. These included developing presentations for work sessions, constructing projects' timetables, providing support in elaborating dry runs, and organising balance sheets. Beyond these, the assignments consisted in giving assistance in any other way possible and where the teams on existing projects needed it.

Besides the related to IFRS 17' projects, a significant part of the internship concerned the analysis of pension funds. The consulting company's role in this pension funds related project was to provide consulting to an international entity in implementing a pension plan for their employees in Portugal. The project's assignment consisted mainly in doing research, gathering information and provide it to senior colleagues. The project's analysis included a first assessment in the pension plan's adequacy from a regulatory perspective, which the client had already implemented in another country. This phase consisted in developing an overview and analysing the Portuguese legislation regarding pension plans and funds; understanding how pension plans and funds work in Portugal; what types of plans and funds exist in the country; what limitations exist when implementing a pension fund; and what restraints exist under the legislation. By assessing the adequacy of the

pension fund, the next step meant understanding what adaptations of their existing pension plan would be needed to implement the plan in Portugal in compliance with the Portuguese legislation.

Afterwards, an analysis of the pension funds' market in Portugal was carried out and a benchmark of the existing pension funds in Portugal was performed. This benchmark consisted of looking at the current offer of pension funds in the country, considering the entities that manage them, their reputation, their market shares, the conditions of the existing funds, their structure, and what rates of return they provide based on historical results. The purpose of this project was not to provide what would be the most suitable option(s) for the entity, but to provide an overview of current offers, not presenting every existing pension fund, but a representative range of what offers exist in the market. It meant understanding what information from each fund is crucial and what characteristics should interest the entity, both quantitative and qualitatively. Quantitative factors include fixed and variable fees, investment policies (assets, bonds, and other alternative investments), and rates of return. Qualitative characteristics include but are not limited to the overall reliability of the management entities in the market.

The report does not include further details of the pension funds project, mainly due to a lack of common ground in theoretical aspects of the project and the Master, however, the possible methodologies for implementation under IFRS 17 requirements involve some theory and concepts learned or seen throughout the Master courses, which is the focus of the following chapters.

As the report is written around the IFRS 17 accounting standard, it is the primary reference of the work. A considerable number of paragraphs are quoted or referenced throughout the report with further explanation. The following chapters review several methodologies for the measurement of insurance contracts under IFRS 17 requirements. The research included in this report goes beyond the concepts applied under the scope of the internship.

Chapter 2 provides an overview of key features of the IFRS 17 standard, with an introduction to important concepts and features of IFRS 17 which will be mentioned and used in the subsequent chapters. These fundamental concepts and features include a comparison between the IFRS 17 standard and Solvency II, the level of aggregation, the

measurement of insurance contracts, and an introduction to the measurement models used within IFRS 17.

The following chapters go deeper into the specific requirements for the measurement of insurance contracts, which starts by estimating the expected future cash flows and contract boundaries and proceeds to discounting rates, followed by a risk adjustment applied to account for the existent non-financial risk. Finally, Chapter 6 presents in a simplified approach on how profit recognition (or loss recognition) is done under the scenario of recognising profitable (or onerous) insurance contracts. Chapter 6 contains, in addition, an introduction to the concepts created by the IFRS 17 standard, Contractual Service Margin (CSM) and Loss Component.

Lastly, the conclusions in Chapter 7 include some feedback on the internship's experience and possible options for future research to resolve some of the challenges encountered during the internship, namely in developing the methodologies for measuring the insurance companies' contracts under IFRS 17.

2. OVERVIEW OF KEY FEATURES OF THE STANDARD

Concepts used in subsequent chapters require an introduction to better understand how they operate under the IFRS 17 standard's requirements. The objective of this chapter is to provide an overview of those concepts.

2.1. IFRS 17 and Solvency II

Solvency II and IFRS 17 are two EU directives for insurance companies with different purposes for this market. Solvency II is constructed from a regulatory perspective, whereas IFRS 17 arises from an accounting perspective.

Both directives aim to facilitate comparability and transparency to external stakeholders, among other common goals and similarities. However, they are built on different perspectives. For example, Solvency II sets focus on policyholder protection and solvency capital requirements to reduce insolvency risk. In contrast, IFRS 17 aims at reducing the gap between standards that apply to insurance and reinsurance contracts to reach uniform accounting standards for these types of contracts. Another factor to consider is that Solvency II is an ongoing regime that went live in 2016, whereas IFRS 17 has an effective date of 1 January 2023.

A coordinated approach between Solvency II and IFRS 17 is not required to be put into action by an entity when implementing both directives. Still, it can be beneficial due to their significant overlaps, primarily if entities have already implemented Solvency II in their systems. Solvency II has a more comprehensive approach in the extent that this directive defines throughout its framework methodologies for aspects such as some of the ones addressed in this report. For instance, IFRS 17 differs from Solvency II in this context since there are fewer restrictions throughout its framework. It has a more principle-based approach and does not define the methodologies, although it may give some examples of methods, leaving them to be determined by the entity's judgement.

Therefore, some Solvency II methods can apply for some aspects addressed in this report such as the directive's methodology for the computation of discount rates and risk adjustment and are mentioned as measurement options. Nevertheless, it is essential to note that there are situations where Solvency II methods are not applicable for measurement in IFRS 17 due to disparities in both directives' principles.

2.2 Level of Aggregation

The level of granularity for the measurement of the contracts is vital for IFRS 17. The accounting standard defines new aggregation requirements, where the way of management, the exposure to risks, and common risks are the premise for how the contracts are aggregated. If substantiated information exists, it can be concluded that the same group will include a set of contracts through these aggregation measures. In that case, the company can measure them collectively, measuring the group as one.

In addition, these requirements also define the aggregation of contracts by profitability and emission date, where aggregation requirements for profitability facilitate the analysis of the sources of profit (or loss). It also helps to recognise changes in profitable or onerous contracts readily. Most importantly, the new aggregation measures help limit the offset of profitable contracts against onerous ones. In a broader perspective, through this process, insurers can achieve a better-constructed evaluation and performance of their business, as stated in paragraph 119 of Basis for Conclusions for IFRS 17.

Portfolios are the first level of aggregation for contracts, where the contracts within each portfolio have similar risks, and the entity manages them collectively. At a more granular level of aggregation, the contracts within a portfolio are aggregated in cohorts, meaning groups of contracts cannot include contracts issued more than one year apart.

At a third level, within the cohorts, the contracts must be divided into at least three groups at initial recognition: (1) onerous contracts; (2) contracts that do not have a significant possibility of becoming onerous subsequently; and (3) all the remaining contracts.

2.3 Measurement models under IFRS 17

IFRS 17 defines three possible measurement models for measuring insurance contracts and presenting essential information regarding their expected cash flows and profitability (or loss). The baseline model of the standard is the General Measurement Model (GMM). In addition to the GMM, the standard presents two other models. One is a modification of the GMM – Variable Fee Approach (VFA) - and the other is a simplified approach to the GMM – Premium Allocation Approach (PAA).

Within IFRS 17, it is crucial to highlight initial recognition and subsequent measurement of insurance contracts. At initial recognition, it is important to assess the group of contracts, giving a value to its liabilities, and expected profit, and registering them in the entity's accounting records. The subsequent measurement, it concerns the periods and respective reporting dates following the initial recognition.

Under the General Measurement Model (GMM), when measuring a group of insurance contracts at initial recognition in a scenario where this group is profitable, they are comprised as the total of fulfilment cash flows and the Contractual Service Margin (CSM). On the other hand, if the group of contracts is onerous, the GMM comprises the fulfilment cash flows, including a Loss Component. The fulfilment cash flows are composed of three components, as explained by the IFRS 17 standard:

- The estimate of future expected cash flows.
- An adjustment to reflect the time value of money and financial risks is made through discounting the cash flows.
- A risk adjustment for non-financial risk.

When joining these three components, the fulfilment cash flows are the expected value of future discounted and adjusted to risk (financial and non-financial) cash flows.

The VFA is a modification of the GMM because the contracts eligible for this model include direct participation features, which are features in a contract of investment-related services where the entity promises an investment return based on underlying items.

For subsequent measurements, Liability for Remaining Coverage (LRC) and Liability for Incurred Claims (LIC) comprise the total liability of a group of contracts. The LRC includes the entity's liability of insured events that concern unexpired risk within the coverage period of contracts. In contrast, the LIC comprises the entity's liability of analysing and paying claims of insured events which have already been incurred, including incurred but not yet reported claims and other incurred expenses.

The Premium Allocation Approach (PAA) is a model that can apply mainly to short-term contracts, with maturities equal to or shorter than 12 months but has other eligibility criteria. This model simplifies the GMM to measure the LRC. It can be seen as just an unearned premium reserve, equal to the initially received premiums net of insurance

acquisition cash flows. The figure below shows how the three models differ in measuring LRC and LIC liabilities and how PAA is simplified.

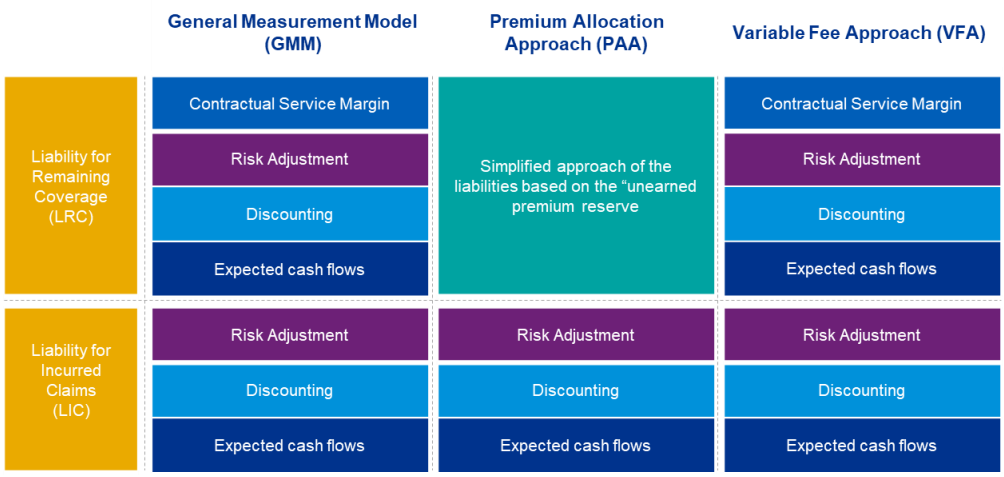

Figure 1 - Overview of measurement models
(Adapted from a KPMG's internal document)

3. Expected Cash Flows and Contract Boundaries

Estimating the cash flows is the starting point for estimating the fulfilment cash flows. When measuring insurance contracts, an entity must include all cash flows which are within a contract boundary.

The contract boundary sets the line for expected cash flows included in the contracts' measurement. As paragraph B65 of IFRS 17 states: "Cash flows within the boundary of an insurance contract are those that relate directly to the fulfilment of the contract, including cash flows for which the entity has discretion over the amount or timing." However, a complete description of which cash flows can be within the contract boundary and which ones cannot is relatively extensive, so the list is not presented in the report.

In paragraph 33 of IFRS 17, the standard underlines the principles for the estimation of expected cash flows of a group of insurance contracts, where they must:

1. Be the probability-weighted mean of the full range of possible outcomes.
2. Include all future cash flows within a contract boundary.
3. Reflect the entity's perspective, provided that, when relevant, the estimates are consistent with observable market prices.

4. Be unbiased, current, and explicit.

Several entities develop software for a facilitated implementation and transition to IFRS 17. These software are built as technological solutions and make a path to compliance with the accounting standard, enabling entities to meet IFRS 17 requirements. The companies estimate the cash flows themselves and by using the software it further measures them in accounting terms following the standard's rules and requirements.

4. DISCOUNTING

Discounting the estimates of future cash flows is among the IFRS 17 requirements to reflect the time value of money and financial risks associated with those cash flows, assuming these financial risks are not included in the initial estimation of the cash flows previously explained. Therefore, as stated by paragraph 36 of IFRS 17, the discount rates applied to the estimates of the expected cash flows must:

1. Reflect the time value of money, the characteristics of the cash flows, and the insurance contracts' liquidity characteristics.
2. Be consistent with observable current market prices; and
3. Exclude the effects of factors that affect observable market prices used in determining the discount rate but do not affect the expected cash flows of the insurance contract.

When holding liquid risk-free transactional assets, a holder can sell them in a relatively rapid way without receiving any penalty for it or carrying any further costs. In insurance contracts, liquidity characteristics are associated with the contract's features and seen from the policyholder's perspective and actions. These features may include but are not limited to exit costs, penalties upon full or partial lapse and various other features. For example, a contract with surrender penalties can be considered more illiquid than one without when looking at exit costs. A contract that includes a partial or complete lapse penalty can be regarded as less liquid from the policyholder's perspective. Another example may also be when considering the contracts' maturities, where a 5-year term contract may be regarded as more liquid than a 10-year term contract.

Therefore, when computing the discount rates, these need to be equal to the return of less liquid assets to reflect the liquidity characteristics of insurance contracts. In addition to liquidity, the attributes of less liquid assets need to be sufficiently similar to insurance

contracts in aspects such as timing and currency of their liabilities to diminish mismatches. However, regarding similarity, there is no defined way to achieve the level of it to be considered sufficient, which means there can exist some variation.

Paragraph B79 of IFRS 17 pronounces that: “The discount rate reflects the yield curve for instruments that expose the holder to no or negligible credit risk, adjusted to reflect the liquidity characteristics of insurance contracts.”. Credit risk is not present in insurance contracts, but it is present in financial instruments. Therefore, the adjustment has the objective of reflecting the disparity of liquidity characteristics between the group of insurance contracts and the assets used to compute the yield curve.

1. Initial problem

Paragraph B78 of the standard mentions that discount rates may not be directly observable in the market. Should this happen, the entity needs to estimate the appropriate rates. The standard does not present estimation methodologies as requirements; therefore, it is left to the entity's judgement on what procedure to use. Nonetheless, the standard provides two options for estimating discount rates: the bottom-up and top-down approaches, which the following paragraphs briefly explain.

Through the bottom-up approach, the starting point is a fully liquid risk-free yield curve. Then, adjusting the curve to reflect the differences between liquidity characteristics of financial instruments and insurance contracts determines the discount rates, which paragraph B80 of IFRS 17 explains. For this adjustment, references mention it as the illiquidity premium.

The standard presents an alternative to the bottom-up approach in paragraph B81, which is the top-down approach, where the standard states it has as a starting point “a yield curve that reflects the current market rates of return implicit in a fair value measurement of a reference portfolio of assets.” The yield curve is then adjusted to eliminate any factors that are not relevant to the insurance contracts.

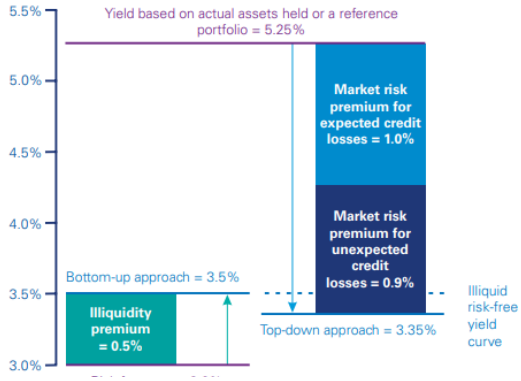

Figure 2 - Comparison between a bottom-up and top-down approach

(Source: KPMG IFRS 17 First Impressions)

As seen above and explained in previous paragraphs, the equation for the discount rate in the bottom-up approach defines as:

(1) $Discount\ rate = risk\ free\ rate + illiquidity\ premium$

Therefore, the first step in this approach is to define a risk-free yield curve. IFRS 17 does not present the methodology to obtain the risk-free yield curve. However, it references "traded instruments containing negligible credit risk levels, are highly liquid, has reliable prices, and cover a broad range of maturities, including longer-dated durations and terms."[1] Appropriate risk-free rates commonly used as references are interest rate swaps or government bonds, but other alternatives exist. These alternatives include overnight index swap rates, Treasury futures, and low-risk corporate bonds such as secured corporate bonds.

Using swap rates, specifically Euro Interbank Offer Rate (EURIBOR) swap rates, would follow the Solvency II framework and are considered liquid and available for an extensive range of maturities, which benefit the development of a risk-free curve. In addition, since the market uses these rates as an instrument to hedge and replicate interest rate risk arising from derivatives, they are a founded reference[2]. However, these swap rates do contain credit risk, which is not compliant with insurance contracts' characteristics, meaning a credit risk adjustment is necessary if this is the chosen option to develop a risk-free curve. Overnight index swap rates are also an option, such as Euro Overnight Index Rate (EONIA), but for these rates, a liquid market does not exist for longer maturities, such as in EURIBOR rates. In addition, reform will become active at

[1] Permitted approaches for constructing IFRS 17 Discount Rates by Moody's Analytics.

[2] International Actuarial Note 100

the beginning of 2022. As a result, EONIA rates will be discontinued and substituted by €STR (Euro Short-Term Rate), meaning they may not be a viable option to apply currently.

Another possible reference for risk-free rates is government bond rates. The market views bond rates from politically stable governments in economically developed countries as having a low probability of default on their debts. German government bonds are a strong example because Germany is one of the countries in the Eurozone with the highest credit ratings attributed by the major credit rating agencies, where the existing risk can be considered negligent. In addition, using government bonds gives an edge due to the availability of observable data, including for long maturities.

Due to the existence of these references and uncomplicated access to them, insurance companies do not have to construct a risk-free yield curve themselves from the ground up. Within the options available, no curve is better than the other, meaning the entity must analyse which option best fits the characteristics of its contracts. However, the resources an entity holds is a factor to consider. Some methods are more complex, thorough, and costly than others. Larger entities with developed departments have more knowledge of these methods and can apply a more thorough process. Smaller entities, which may have less access to resources may want to follow a more simplified and less costly approach due to lack of experience and budget.

2. Extrapolation and interpolation

When estimating the risk-free curve, as stated by IFRS 17, it is essential to ensure that discount rates are consistent with observable market prices. However, specific maturities in particular companies' liability cash flows may not be directly observable in the market, or it is not easy to obtain the relevant data. This issue happens, for example, with life insurance products where their maturities outlast the bonds' maturities available in the market. These factors can concern either existing maturities within the range of the data points already obtained through the market (interpolation) or maturities that extend the data points directly observable in the market (extrapolation). Therefore, the entity should evaluate both liability cash flows and the available reference market data and consider which maturities are deemed available and relevant.

When the data is unavailable or irrelevant, that determines where the observable market data ends. Regarding unavailability, it concerns scenarios where interpolation and extrapolation approaches are needed. In terms of relevance, this may involve, for example, trade volume/frequency. IFRS 17 usually requires market data to be used when available; nonetheless, in a scenario where the trading of a certain maturity of a financial instrument is not frequent, it may not be considered relevant for the development of the yield curve.

The last point at which the market data is considered available and relevant is not given a name by IFRS 17. However, various references mention it as the Last Liquid Point (LLP). Beyond this point, the rates observed are considered illiquid, and an extrapolation approach is applied if needed to obtain further maturities. As for the use of extrapolation approaches, all need to converge to an ultimate long-term rate (endpoint). Under Solvency II, this is called the Ultimate Forward Rate (UFR).

For interpolation, approaches such as linear interpolation, cubic spline interpolation, and monotone convex spline are possible. In addition, Smith & Wilson and Nelson Siegel are well-known models used in this context for interpolation or extrapolation, where Smith & Wilson is the extrapolation model applied under Solvency II.

3. EIOPA's approach

Contrary to IFRS 17, under Solvency II, EIOPA (European Insurance and Occupational Pensions Authority) publishes the risk-free term structure monthly to be used under the directive. EIOPA is an EU financial regulatory institution, an independent advisory body to the European Commission and the publisher of Solvency II. The publishing of the term structure comes as support for insurers since using their published term structure, where the institution makes a thorough assessment of a deep and liquid market for swaps, and the insurers do not have to construct a similar evaluation and develop themselves a term structure. In addition, EIOPA publishes a document demonstrating what methodology they apply to derive their risk-free curve.

Through the EIOPA approach, interest rate swaps are the basis for the derivation of risk-free rates. The risk-free rates are published monthly by the institution and based on 6-month Euribor swap rates, where these incorporate the most important currencies for the EU insurance market. Since credit risk exists in swap rates due to the possibility of

default of a counterparty, a credit risk adjustment (CRA) is made to the swap rates up until the Last Liquid Point (LLP) to obtain risk-free rates.

Up until 20 years for the currency EUR is the interval for the derivation of the risk-free yield curve, where the final maturity of the curve is known as the Last Liquid Point. Beyond that, the Smith-Wilson extrapolation method is used under the assumption that the curve moves towards an Ultimate Forward Rate (UFR) seen as a macroeconomic long-term equilibrium rate. Therefore, through the extrapolation method, an entity obtains the unobservable market data between the LLP and the UFR in a situation where that data is necessary to get, to the extent that the entity has products with maturities further than the LLP[3].

4. Illiquidity premium

Illiquidity premium is the reference for adjusting the risk-free rate to reflect the liquidity characteristics of the insurance contracts. The concept arises because insurance contracts cannot be sold in liquid markets, whereas the assets used to construct the risk-free term structure can be. In a sense, the higher the contract's liquidity, the lower the illiquidity premium is computed. Thus, the illiquidity premium quantifies the liquidity characteristics or, in other words, the additional compensation an investor requires for buying a contract less liquid than the other[4].

During the internship, the computation of the illiquidity premium was still a discussing matter. Therefore, one of the tasks meant researching this subject, which concerned the existing options to compute this factor. The research consisted in finding solutions that could be model-free or model-based approaches. As a conclusion of the study, there are various existing approaches to compute the liquidity premium, which can follow model-based frameworks or model-free frameworks, where the latter revolves around a spread between two financial instruments. The model-free frameworks found in the research are:

1 - Illiquidity premium as a spread between agency bonds and government bonds. As specified in Investopedia, agency bonds are the debt issued by a government-sponsored,

[3] Technical Documentation of the methodology to derive EIOPA's risk-free interest rate term structures.

[4] Investopedia – Illiquidity premium

government-guaranteed enterprise or a federal agency other than, for example, the U.S. Treasury. The website also clarifies that these bonds are government-guaranteed. A government commits to back the interest and principal of the issuer's debt; these bonds present the same risk of default as Treasury bonds. Consequently, the illiquidity premium represents any existing difference in the yields between treasury bonds and government-guaranteed bonds, which Ejsing, Grothe, & Grothe (2012) study in their paper.

2 – Estimation of the illiquidity premium as a spread between on-the-run and off-the-run treasury bonds. On-the-run treasuries are "The most recently issued treasury bonds or notes of a particular maturity." In contrast, off-the-run treasuries are all treasury bonds and notes of a specific maturity issued before the on-the-run treasuries.[5] In an American context, while someone can purchase on-the-run treasuries directly from the U.S Treasury, off-the-run treasuries can only be bought in a secondary market, creating already a divergence in liquidity. In addition, as investors trade more frequently on-the-run treasuries because they are more liquid than off-the-run treasuries, the latter is made less expensive and with a greater yield to build an incentive for investors to invest in them. The illiquidity premium can be measured as the spread between both treasuries.

3 – Estimation of the illiquidity premium as a spread between bonds with different maturities. A bond with a higher maturity is seen as a longer-term investment, leading to less liquidity. In longer-term investments, investors require a higher rate of return than in shorter-term investments, leading to an upward-sloping shape of the yield curve and causing a spread between bonds with different maturities.

4 – Estimation of the illiquidity premium as a spread between public and private bonds (publicly and non-publicly traded). Consider two bonds with the same characteristics or bonds issued by the same issuer. If one trades in the public exchange, but the other does not, investors are unwilling to pay as much for the non-public bond since different risks expose it. Therefore, an investor requires a specific compensation (premium) to pay for it. In addition, as the public bond is easier to trade and both bonds present the same credit risk, the spread difference between both bonds can be broadly attributable to liquidity.

5 - Estimation of the illiquidity premium as a spread between covered bonds and treasury bond yields. Covered bonds work, in a sense, as common bonds, but the

[5] Investopedia – On-the-Run and off-the-run treasuries

difference is that the cash flows promised to the bondholder are covered by the issuer in that the issuer is obliged to hold the assets that provide cash to pay the holder[6]. Hence, the bonds are considerably less exposed to credit risk when compared to regular bonds with this coverage, seen as "an additional layer of security for holders (collateral)"[7]. This approach follows the same perspective of the previous approach.

Regarding model-based approaches, one is a top-down approach explicitly applied for the illiquidity premium since it starts from a yield curve reflecting the current market rates. To these rates, a credit risk correction is subtracted to the equation below to eliminate the irrelevant factors for the insurance contracts, wherewith the subtraction of the risk-free rate obtains the illiquidity premium:

(2) $Illiquidity\ premium = yield\ to\ maturity\ of\ a\ reference\ portfolio - risk\ free\ rate - credit\ risk\ correction$

Reference portfolio

The methodology for building a reference portfolio or restrictions in constructing one is not defined by IFRS 17. However, paragraph B85 of the standard states that "fewer adjustments would be required to eliminate factors not relevant to the insurance contracts when the reference portfolio of assets has similar characteristics". Therefore, to achieve similarity in the aspects between the reference portfolio and the entity's contracts, it must consider some critical features:

- As specified in paragraph 36 of the standard, the yield curve obtained from the reference portfolio must be consistent with observable current market prices, which means the yield curve derives from the current fair value of the assets used as reference.
- The duration matching between the yield curve and the entity's contracts.
- The underlying cash flows. The reference portfolio assets' cash flows and the respective ones from the entity may not be the same regarding their timing and currency.
- Credit risk in the reference portfolio's assets.
- Other contracts' features such as embedded options.

[6] Actuarial Solutions - IFRS 17 – Dis-count dracula
[7] Investopedia – Covered Bond Definition

When constructing a portfolio regarding the aspects mentioned above, IFRS 17 points out that "if there are observable market prices in active markets for assets in the reference portfolio, those prices shall be the ones used", but this may not be possible, as referred to before.

Various approaches can be the basis for constructing a reference portfolio. One possible way is to use the entity's portfolio of assets if they are viable within the standard's requirements mentioned previously. Insurers generally endeavour in asset-liability management to match assets and liabilities closely. Hence, a reference portfolio based on its assets leads to expectations of reflecting "a level of liquidity as similar as possible to that of its issued insurance contracts"[8], being a solid and well-founded approach. Investopedia defines asset-liability management (ALM) as an essential principle behind the entity's business operations. Companies implement this principle to resolve the likelihood of duration mismatch and decrease an entity's risk of loss, among other possible objectives.

Nonetheless, there are issues with applying this approach. If the entity's portfolio of assets changes, the reference portfolio would need to be adjusted, leading to operational costs. Another obstacle may be that the entity using its portfolio of assets would need to further demonstrate how it reflects the characteristics of its liabilities[9].

Suppose an entity's portfolio of assets is not viable to be used as a reference portfolio, or this option is not the entity's preference. In that case, another option may be to develop a reference portfolio composed of a consistent mix of well-defined asset types and classes. A strength in this approach is that the portfolio can comprise of the assets that better reflect the characteristics of the insurance contracts, and the justification behind the use of the investments chosen as a reference would be more straightforward. With these aspects being primary in the reference portfolio, it achieves operational simplicity. No effects and variations in the entity's asset portfolio would affect the reference portfolio, leading to fewer needed adjustments. In addition, if the entity was involved in trading activities, this would not affect the discount rates built since there is no connection between the entity's portfolio and the reference portfolio. The disadvantage in this

[8] KPMG - Measuring insurance cash flows
[9] Canadian Institute of Actuaries – IFRS 17 Discount Rates for Life and Health Contracts

approach is that by separating the entity's actual asset portfolio and the reference portfolio, balance sheet volatility may increase due to disparities in both portfolios.

Through the comparison of both approaches, none is better than the other theoretically. However, it is essential to consider what is consistent with the entity's contracts to assess the issue of mismatch and diminish it. Therefore, it is left to the entity's judgment (either internal expert judgment, or external if the entity cooperates with a third party) to proceed with a selected approach.

Credit risk correction or adjustment

As stated in paragraph B83 of IFRS 17, to adjust the reference portfolio, it is necessary to exclude market risk premiums for credit risk since they are not relevant for the insurance contracts and only relevant to the assets in the reference portfolio.

The effect of credit risk includes the expected credit loss and unexpected credit loss. Expected credit loss is what an entity such as a bank may expect to lose on average from being exposed to a loan. The unexpected credit loss evolves around the volatility of the loss around its expected loss. It is the loss that exceeds the expected average loss or even the compensation for bearing the credit risk[10].

Based on the Exposure Draft of the Proposed International Actuarial Note (IAN) 100, various approaches derive the credit risk adjustment to apply in the computation of the illiquidity premium. Two of these approaches can be:

1 - Market-based approaches, where credit risk measurement through the Credit Default Swap (CDS) spread is an example. The main advantages behind the use of this approach are that first, CDS spreads are quoted daily. Secondly, the CDS is a financial derivative or contract constructed with the purpose of hedging risk by transferring the credit risk of a counterparty that exposes an investor to another counterparty[11], meaning the CDS spread theoretically reflects the credit risk directly. The issue behind this approach is that CDS, by being over-the-counter derivatives, also have their own liquidity risk and are, consequently, not pure credit risk measures[12].

[10] Analyst Prep – Capital Structure in Banks
[11] Investopedia - CDS Definition
[12] Institute and Faculty of Actuaries – Case study on top-down approach

2 - Approaches based on structural models such as the Merton Model can compute the credit risk adjustment. When using the Merton model, this well-known analysis model assesses a company's risk of credit default. However, within the options available to compute the credit risk adjustment, structural models may be the most complex ones for insurers. Consequently, even if an entity has the resources to apply structural models, other simplified approaches may be more suitable for the objective in question since they are compliant with IFRS 17 and work towards the same purpose.

Appendix 1 shows in detail a model-based approach for the computation of the illiquidity premium and credit risk adjustment, established by one of the existing software for IFRS 17. A system computed at this level may be too complex for certain insurers since it is developed at a software level. For more conceivable approaches to calculate the credit risk adjustment, insurers have different possibilities such as the following:

(3) $CRA = Expected\ Default\ Rate + X\%\ (Total\ Bond\ Spread - Expected\ Default\ Rate)$

(4) $CRA = (Cost\ of\ default + Cost\ of\ Downgrade) \times 30\% \times Long\ Term\ Average\ Spread$

In equation (3), the X% represents the corporate spread, which becomes an advantage because the credit risk premium varies depending on this variable. Regarding equation (4), it is called the fundamental spread. For corporate bonds, Solvency II presents the fundamental spread as "the part of the bond's spread that is treated by compensating for the cost of defaults and downgrades"[13]. The cost of default is the expected default loss, and the Cost of Downgrade is the risk of a downgrade of the credit rating of the respective corporate bond. As seen in the equation, the sum of the Cost of Default and the Cost of Downgrade is subject to a floor of 30% of long-term average spreads (LTAS) to swaps. The percentage is applied based on the premise that 30% of the market value is recovered[14]. The value of the fundamental spread is also published monthly by EIOPA.

[13] Polynya Consulting Actuaries – Plotting the EIOPA Fundamental Spread Tables
[14] EIOPA – Calculation of the fundamental spread

5. RISK ADJUSTMENT

Appendix A of the standard states that risk adjustment for non-financial risk, or referred to as just risk adjustment, is "The compensation an entity requires for bearing the uncertainty about the amount and timing of the cash flows that arises from non-financial risk as the entity fulfils insurance contracts."

Therefore, the measurement of insurance contracts include the risk adjustment explicitly and after the estimation and discount of the cash flows is performed[15]. In addition, the standard lists the key characteristics for the measurement of this component[16]:

- It reflects the degree of diversification benefit the entity includes when determining its compensation for bearing that risk. Diversification refers to combining different risks in the sense of a combination of groups of contracts within a portfolio. The objective of diversification is to mitigate a part of the risk. Not only in case there are variations in future expected cash flows, but also to obtain benefits in combining contracts where the risks are negatively correlated, meaning if one occurs, the other may decrease or vice-versa.
- It reflects both favourable and unfavourable outcomes in a way that reflects the entity's degree of risk aversion.
- It reflects all non-financial risks associated with the insurance contracts. Consequently, it does not reflect uncertainty arising from financial risk.
- The approach followed for the estimation of the Risk Adjustment must provide concise and informative disclosure. The objective of this approach is so that users of financial statements can benchmark the entity's performance against the performance of other entities.

The table below, based on paragraph B91 of IFRS 17, shows what characteristics can affect the risk adjustment determined for an insurance contract:

[15] IFRS 17 – Paragraph B90
[16] IFRS 17 – Paragraph B86-B92

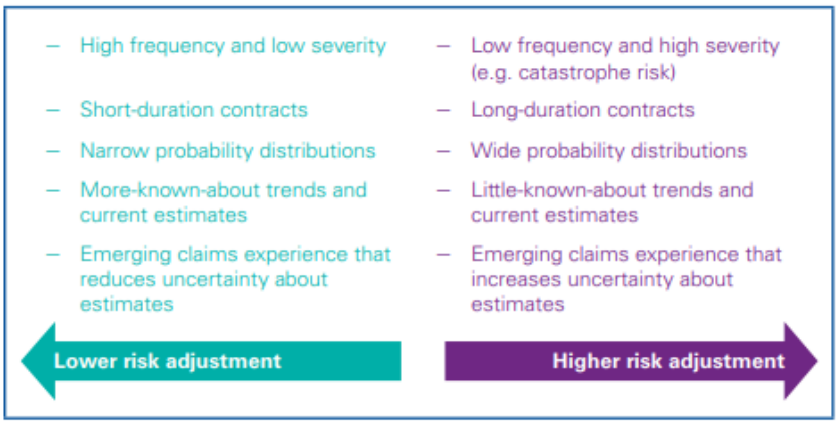

Figure 3 - Determinant factors of the Risk Adjustment

(Source: KPMG IFRS 17 First Impressions)

Estimation approaches to the risk adjustment

Within known approaches for estimating the risk adjustment, two possible ones are[17]:

(1) following a process where confidence level approaches (quantile approaches) are used, developing a probability distribution of the discounted future cash flows, and applying risk measures.

(2) applying the Cost-of-Capital approach.

The significant advantage in using quantile approaches is that they directly satisfy the requirements of the standard. For (1), firstly, it is generated a probability distribution for the future discounted cash flows. Different methods can be used such as (but not limited to):

a) Monte Carlo Simulation

Random input variables construct the stochastic model, being these random input variables, the relevant risk variables for the respective entity. Given the known probability distribution of the random variables, where the experience data from the entity is its basis and fits subsequently to that data, the model repeats various times. Different random values are used for the random variables to obtain a representative sample of possible combinations. Finally, these combinations derive a joint probability distribution based on the resulting simulations of the entity's relevant risks—for example, the computation of distribution for mortality and lapse risk. There are numerous reasons for using this model, but there are also limitations. For example, it may not become easy and be time-

[17] IFRS 17 Risk Adjustments – Reserving or Capital Modelling?

consuming to construct the model and obtain a representative sample with an approximate solution. In addition, since it is a stochastic model, it considers several risks and, as a possible disadvantage, requires a correct interpretation. The input cannot have poor parameters and constraints.

b) Bootstrapping

Bootstrapping is a statistical and resampling method to estimate statistics or stochastic scenarios on a population. It can calculate a probability distribution of sample means by sampling with replacement to generate multiple future populations. In this sense, it can also create probabilities of uncertain outcomes. This process is easier to comprehend and apply as complex equations are not its foundation. It also does not need any assumptions about the data's distribution to construct the method since it only resamples the existing data. This method is currently known and commonly used by insurers to validate reserves to withstand and meet all future claims or ultimately project loss amounts. The issue is that it does not contain more information about the population than what is given in the original sample, meaning it does not work well in small samples. Another issue is using historical data, where it may not be viable to generate or represent specific outcomes of future cash flows, such as extreme events. In addition, when insurers use this method, they assume that historical loss patterns indicate future loss patterns[18].

Risk measures

After generating a probability distribution through the methods above or another associated method, the process involves applying a risk measure to the distribution. Through the risk measures with a confidence level specified by the entity, the difference between the risk measure chosen and the representative mean of the estimates of the future cash flows results in the value of the risk adjustment. This representative mean is the best estimate of future cash flows, calculated as the probability-weighted average of discounted future net cash flows. The following paragraphs present two of existing risk measures.

[18] Wikipedia – Chain-ladder method

- Value at Risk (VaR)

In a broad sense, Value at Risk "is a statistic that measures and quantifies the level of financial risk within a firm, portfolio, or position over a specific time frame" [19], which the entity can use to determine the extent and occurrence ratio of potential losses in portfolios. In the context of measuring insurance contracts' groups, the value obtained through this metric represents the future cash flows of an entity at a certain confidence level. The higher the confidence interval, the greater the uncertainty and underlying risk, aligning with the IFRS 17 requirements.

As for selecting a confidence level to apply at the beginning of the process, there is no correct value to use. Nonetheless, an entity can observe tendencies in the insurance market. For example, under Solvency II's directive, its capital requirement is calculated at a VaR of 99.5%. Under IFRS 17, entities cannot use this confidence level as the time frame for Solvency II is of one year, while for IFRS 17 is the whole duration of the future cash flows. If the confidence level of Solvency II was used it would result in a colossal risk adjustment.

The assumption behind the computation of the VaR is that the actual future cash flows being less than the VaR is the percentile (p) chosen. Thus, with the defined VaR value, the final step is to subtract the mean value to obtain the value of the RA, meaning it is the difference between the future discounted cash flows with a shock applied and the average future discounted cash flows.

(5) $Risk\ Adjustment = VaR_w(p) - \mu$

- Tail Value at Risk (TVaR)

TVaR is a statistical metric that, for a confidence level p, it provides the probability-weighted value of losses that exceed the p-th quantile of the respective distribution (or, in other words, which exceed the VaR)[20].

(6) $TVaR_p(X) = \frac{\int_p^1 VaR_w(X)dw}{1-p}$

[19] Investopedia – Risk Analysis
[20] Topics in Actuarial Modelling – VaR and TVaR

The T-VaR and VaR do not result in the same risk adjustment values as they represent different points in a probability distribution. The T-VaR is the probability-weighted average of all amounts of VaR above the confidence level p. It measures the expected value of the loss, conditional on the loss exceeding the defined VaR.

T-VaR and VaR have similarities since they are built on the premise of generating a probability distribution. T-VaR in theory is a better risk measure because it is coherent. However, one of the issues with applying this metric is that it follows a more complex process and may create difficulties in understanding and interpreting the values obtained compared to the VaR itself.

- Cost of Capital

Outside quantile approaches, it now turns to the alternative, the Cost of Capital approach. Cost of Capital is the required return necessary to do a capital budgeting project, meaning a potential major project or investment[21]. In the context of insurance companies, is the expected rate of return insurers have to pay for the capital they use. Insurers need to supply their own capital to support their promise. Applying this methodology to obtain the value of the risk adjustment will be equal to the compensation an entity would require to reach an expected capital return. Following this context, RA is equal to:

(7) $RA = \sum_{t \geq 0} \frac{r_t \times C_t}{(1+d_t)^t}$

a) Capital amount (C_t)

The capital amount represents the level of non-financial risk during the duration of the liabilities. One of the approaches used for this factor is the Solvency Capital Requirement (SCR), which applies under Solvency II. SCR represents "the total amount of funds that insurance and reinsurance companies in the EU are required to hold" to ensure they can meet their obligations to policyholders and beneficiaries over the following 12 months[22]. Another option for the computation of the capital amount is through the future cash flows, where shocks are applied.

[21] Investopedia – Cost of Capital
[22] Investopedia – Solvency Capital Requirement (SCR)

b) Cost of capital rate (r_t)

This rate represents the return an entity requires to invest in a business or invest its capital, where it can be set as the Weighted-Average Cost of Capital (WACC) since this rate follows the same premise. Therefore, when considering potential investments and their underlying risks, this rate represents the profit it would require to reach when investing in new business. Within the computation of the RA reflects the relative compensation the entity needs for holding the capital amount.

c) Discount rate (d_t)

This discount rate reflects the present value of the compensation which the entity will require for the period. Therefore, this rate needs to be consistent with the one computed to obtain the present value of future cash flows, which the previous chapter of discount rates details.

It can be advantageous to use this method because it does not require a probability distribution compared to the quantile approaches. In addition, it can find coordination with Solvency II, but with this connection also comes dependency because proceeding with this approach is not possible without the computation of the SCR. Another issue is that it does not follow the IFRS 17 to the letter since it is not using a confidence level approach. Nevertheless, the accounting standard does not reject this approach, but the entity must deliver additional disclosure when using the Cost of Capital approach.

6. CONTRACTUAL SERVICE MARGIN AND LOSS COMPONENT

This chapter introduces the new concepts developed by the IFRS 17 standard. It provides an overview of how the profit (or loss) recognition applies under the standard's requirements, presenting also a practical example for a profitable group of contracts and an onerous one.

6.1. Contractual Service Margin (CSM)

The notion of CSM incorporates three items:

- fulfilment cash flows.
- derecognition of any asset or liability previously recognised for cash flows related to the group.
- cash flows occurring at the date of initial recognition.

If the sum of the three components results in a net inflow, the group of contracts is profitable and, in that sense, implies the recognition of the component CSM, equal to the sum of the components.

To prevent the entities from recognising this profitability as an immediate gain in initial recognition, IFRS 17 presents the CSM to be recognised in this context, since future profit is not, as presently constructed, immediate gain. CSM represents "the unearned profit that an entity will recognise as it provides services in the future under the insurance contracts included in the group"[23].

At each subsequent measurement or end of each reporting period, the carrying amount of CSM of a group of contracts is equal to its value at the beginning of the period but adjusted/updated for[24]:

1. The effect of any new contracts added to the group.
2. Interest accreted on the carrying amount of the CSM during the reporting period.
3. The changes in fulfilment cash flows relating to future service.
4. The effect of any currency exchange differences on the CSM; and
5. The amount recognised as insurance revenue because of the transfer of insurance contract services in the period is determined by the CSM allocation.

An entity needs to adjust the carrying amount of CSM using locked-in rates, where these rates are discount rates determined in the initial recognition of the group of contracts. Using these rates is because CSM represents the unearned profit in the group of contracts and not the future cash flows, as stated in paragraph 274 of IFRS 17 Basis for Conclusions. The effects of the time value of money and the financial risk do not affect the amount of unearned profit, so the CSM is not adjusted due to these effects in the GMM model.

What is recognised of CSM in profit or loss in each period reflects the benefits provided during that period. When considering the whole profit recognition, it is with regards to the entire coverage period of the contract. For the measurement of CSM and requirements of profit recognition, the accounting standard introduces the concept of

[23] KPMG IFRS 17 First Impressions
[24] IFRS 17 – Paragraph 44

coverage units. Coverage units reflect the quantity of services or coverage provided by an entity as established in the contract, which is determined by considering what benefits the contract offers and the expected coverage duration of the respective contract. What demonstrates the quantity of benefits the entity provides or may provide is its services during the total coverage period, not the costs it may incur for providing such services and not only when the claims are incurred.

After identifying the coverage units, at the end of each reporting period, what coverage units correspond to the respective period is determined to reflect what services the entity provided during that period. This process determines what percentage of CSM is allocated in that period to insurance revenue, equal to the respective coverage units of the period divided by the remainder of the coverage units.

As referred to in the initial chapter, the component CSM exists and is positive in a context where the group of contracts is profitable. For example, suppose we are dealing with an onerous group of contracts. The sum of the three factors mentioned in the first paragraph of this chapter results in a negative value. Here the loss is recognised immediately and a Loss Component is created, being the CSM zero.

6.2. Example of measurement of a profitable group of contracts

As for the following example, also considering the one presented for the measurement of a group of onerous contracts, are based on examples shown in internal documents, which in turn are based on the ones presented in a published paper by IASB, entitled IFRS 17 Illustrative Examples.

Consider the following scenario:

- Premium: 100 € (received at initial recognition).
- Number of contracts: 500
- Total premium: 50000 €
- Coverage period: 5 years
- Discount rate: 5%
- Risk Adjustment: 2500 €
- Annual payment claims: 6000 € (Total of 30000 €, and paid when incurred)
- Contracts are valued under the GMM measurement model.

In a more realistic context, this scenario would consider lapse risk and mortality risk. For lapse risk, a possibility would be to assign a fixed value. Not considering such risk does not deviate from the objective of showing how a profitable group of contracts is recognised. The same comes for the mortality risk. In addition, it would also be necessary to consider a mortality table to have a basis to define mortality risk values to use.

For the group of contracts in question, its initial recognition is shown below, with the respective value of the fulfilment cash flows and CSM.

Estimates of the PV of Future Cash Inflows	50000	(+)
Estimates of the PV of Future Cash Outflows	25977	(-)
Estimates of the PV of Future Cash Flows	24023	
Risk Adjustment (RA)	2500	(-)
CSM	21523	

Table 1 - Initial recognition of the group of insurance contracts

Consider the exercises round up the values to the nearest unit. The table below presents the process for the computation of the release pattern of the CSM to allocate to the respective period the quantity of benefits provided in that same period. This table also includes the release pattern of the Risk Adjustment. The CSM is released for each period in a uniform pattern where the number of coverage units is equal to the proportion of the present value of annual payment claims for the period over the total. The Risk Adjustment is released in a linear pattern during the coverage period.

Release Pattern	0	1	2	3	4	5
PV Claims	-	5714	5442	5183	4936	4701
Coverage Units (%)	-	22%	26,9%	35%	51,2%	100%
CSM	21523					
RA	2500	2000	1500	1000	500	0

Table 2 - Release pattern of the risk adjustment and the CSM

The present value of the claims is computed through a simple discounting, rounded up to the nearest unit to continue the exercise.

Year 1	Year 2	Year 3	Year 4	Year 5	Total
$\frac{6000}{1,05} = 5714,29$	$\frac{6000}{1,05^2} = 5442,18$	$\frac{6000}{1,05^3} = 5183,03$	$\frac{6000}{1,05^4} = 4936,21$	$\frac{6000}{1,05^5} = 4701,16$	25976,83

Table 3 - Discounting the future cash flows

Interest accretion is one of the factors which are added to the CSM of the previous reporting date to update and obtain the carrying amount of the CSM at the current reporting date. Thus, the interest is accreted on the carrying amount of the CSM to reflect the time value of money, which, in turn, is obtained by discounting the estimates of the cash flows considering that the entity does not already include the financial risks in the estimation of the cash flows.

Within the statement of financial performance, IFRS 17 requires that the effect of the time value of money and financial risk are presented separately, as insurance finance income or expense, where the interest accretion is included. Interest accretion accounts for both future cash flows and CSM. The table below shows the effect of the interest accretion in future cash flows within the initial and subsequent measurement of the profitable group of contracts, which the segment of insurance finance expenses includes.

Reconciliation of Future Cash Flows	1	2	3	4	5
Opening balance	0	21276	16340	11157	5715
New Contracts	-24023	-	-	-	-
Cash inflows: Premiums	50000	-	-	-	-
Insurance Finance Expenses	1299	1064	817	558	286
Cash Outflows	-6000	-6000	-6000	-6000	-6000
Closing balance	21276	16340	11157	5715	0

Table 4 - Reconciliation of Future Cash Flows

In Table 4, the row of new contracts represents the estimates of the present value of future cash flows. Here it is mainly done the sum between the cash inflows and outflows, giving the remaining in the closing balance. The row of cash outflows represents the annual payment claims. The insurance finance expenses are calculated by multiplying the interest rate (5%) with the value at the opening balance (in year 1 is the resulting value between the sum of the new contracts and the premiums instead of the opening balance). Regarding the interest accretion related to CSM, it is shown in the table below.

Reconciliation of CSM	1	2	3	4	5
Opening balance	0	17627	13529	9233	4731
New Contracts	21523	-	-	-	-
Insurance Finance Expenses	1076	881	676	462	237
Changes related to current service (% coverage units)	-4972	-4979	-4972	-4964	-4958
Closing balance	17627	13529	9233	4731	0

Table 5 - Reconciliation of the CSM

The row of new contracts in the table above represents the value of CSM at initial recognition. The row of the changes related to the current service shows the share of the quantity of coverage units allocated in the respective period to insurance revenue, representing the release of CSM and, therefore, the quantity of benefits provided during each period. The following equation calculates the changes related to the current service:

(8) $Changes\ related\ to\ current\ service = (Opening\ balance + Interest\ accretion) \times \%\ coverage\ units$

The % coverage units are the values shown in Table 2 concerning the release pattern. Appendix 2 presents the computation for the changes related to the current service for each year.

In a perspective to see an overview and summary of the initial recognition and subsequent measurement, the entire group of insurance contracts' liability is presented in the table below, being it, the sum of the fulfilment cash flows and the CSM.

The insurance finance expense is the sum of interest accretion for the future cash flows and the CSM in this table. The changes to the current service concern the CSM release plus the linear release of the Risk Adjustment.

Insurance Contract Liability	1	2	3	4	5
Opening Balance	0	40903	31369	21390	10946
Cash inflows: Premiums	50000	-	-	-	-
Insurance Finance Expenses	2375	1945	1493	1020	523
Changes to current service	-5472	-5479	-5472	-5464	-5468
Cash outflows	-6000	-6000	-6000	-6000	-6000
Closing Balance	40903	31369	21390	10946	0

Table 6 - Insurance Contract Liability

6.3. Loss Component

When measuring a group of contracts which recognises as onerous, the Loss Component is the amount that equals the net outflow resulting from the sum of the fulfilment cash flows, derecognition of any asset or liability previously recognised for cash flows related to the group and any cash flows occurring at the date of initial recognition.

The measuring of this component differs from CSM, where the measured loss is recognised immediately in profit or loss, with a counterpart (Loss Component) being recognised simultaneously in LRC, established within this liability independently, where the example below showcases this separation in more detail. By applying these requirements, also ensures that profitable contracts do not offset onerous contracts.

For onerous groups of contracts (as for profitable ones), changes may happen during subsequent measurements, favourable or unfavourable, where onerous groups may become profitable, and vice-versa. In addition, onerous groups can become more onerous or profitable ones more profitable.

6.4. Example of measurement of an onerous group of contracts

With the same type of contracts as the ones presented in the case before (valued under the GMM measurement model), consider the following scenario:

- Number of contracts: 500
- Premium: 20 €
- Total Premium: 10000 €
- Coverage period: 3 years
- Discount Rate: 5%
- Risk Adjustment: 1000 €
- Annual payment claims: 5000 € (Total of 15000 €)

With this information, we can obtain at initial recognition what the table below presents.

Estimates of the PV of Future Cash Inflows	10000	(+)
Estimates of the PV of Future Cash Outflows	-13616	(-)
Estimates of the PV of Future Cash Flows	-3616	
Risk Adjustment (RA)	1000	(-)
Fulfilment Cash Flows	-4616	
CSM	0	
Insurance Contract Liability	-4616	

Table 7 - Initial recognition of the group of insurance contracts

The company must immediately register a loss of 4616 € at initial recognition in the profit and loss statement due to this group of contracts.

Following IFRS 17 requirements, once a loss component is recognised, the company must apply a systematic allocation of subsequent changes of the LRC between the Loss Component and the LRC, excluding the Loss Component.

In this scenario, the company can allocate by releasing the Loss Component as a negative CSM. The remainder of the changes in the LRC the entity allocates to the LRC, excluding the Loss Component.

The release of the Loss Component follows the same process as the CSM release presented in the previous example, where the coverage units are calculated in line with the annual payment claims but here, it does not consider the discounting effect. As a result, the proportion of the loss component release in each period aligns with the proportion of claims over the total period. By applying this process, the entity calculates the insurance finance expense as if the loss component was a CSM. As a result, it is accreted based on the loss amount at the beginning of the respective period. The process can start by calculating the interest accretion which will be applied.

Year 1

Interest Accretion for Future Cash Flows	$13616 \times 5\% = 681$
Interest Accretion for Loss Component	$4616 \times 5\% = 231$
Interest Accretion for Liability for Remaining Coverage, excluding Loss Component	$681 - 231 = 450$

Table 8 - Interest Accretion for Year 1

The respective coverage units are computed considering the proportion of the loss component the entity will allocate for the period, which, as mentioned before, align with the annual payment claims, disregarding the discounting effect. The values round up to the nearest unit.

(9) $Loss\ released = \frac{Claims\ for\ the\ period}{Claims\ for\ the\ total\ coverage\ period} = \frac{5000}{15000} = 33.3 \ldots \%$

This example defines the release of the risk adjustment as a linear approach, so it divides into equal shares per period.

Risk Adjustment has a total value of 1000 which is released linearly throughout the coverage period which gives the following allocation for each year:	Year 1 = 333,33...
	Year 2 = 333,33...
	Year 3 = 333,33...

Table 9 - Release of the risk adjustment

The total value of changes to the LRC includes the annual payment claims and the allocation of the Risk Adjustment for each period. To compute the allocation of the differences concerning the Loss Component is through the following equation:

(10) $LRC_{LC} = Insurance\ Contract\ Liability \times (1 + Interest\ Rate) \times Loss\ released = 4616 \times 1{,}05 \times 33\% = 1599$

With the remainder of the changes being allocated to the LRC, excluding the Loss Component:

$$(11)\ LRC_{\backslash LC} = LRC - LRC_{LC} = 5333 - 1599 = 3734$$

In what concerns the reconciliation of the future cash flows, the table below showcases the present value and reconciliation of them:

Present Value of Future Cash Flows	1	2	3
Opening balance	0	9297	4762
New Contracts	3616	-	-
Cash inflows: Premiums	10000	-	-
Insurance Finance Expenses	681	465	238
Cash Outflows	-5000	-5000	-5000
Closing balance	9297	4762	0

Table 10 - Reconciliation of the Future Cash Flows

Regarding the reconciliation of the insurance contract liability, which represents the value of the fulfilment cash flows (only including the present value of the future cash flows and the risk adjustment, since the CSM is zero) is the following for Year 1:

Insurance Contract Liability	1	2	3
Opening balance	0	9964	5096
New Contracts	4616	-	-
Cash inflows: Premiums	10000	-	-
Insurance Finance Expenses	681	465	238
Changes related to current service	-333	-333	-333
Cash Outflows	-5000	-5000	-5000
Closing balance	9964	5096	0

Table 11 - Insurance contract liability

Considering the computations made above, the Liability for Remaining Coverage (LRC) reconciliation for the first year is equal to the other two years. Therefore, the calculations and tables concern the other two years presented in Appendix 3.

Reconciliation of Liability for Remaining Coverage (LRC)	LRC, excluding Loss Component	Loss Component of LRC	Liability for Incurred Claims	Insurance Contract Liability
Opening balance	0	0	0	0
Cash inflows	10000	-		10000
Insurance Service Expenses (Loss Component)	0	4616		4616
Insurance Finance Expenses	450	231		681
Insurance Revenue	-3734	-		-3734
Insurance Service Expenses (Incurred Expenses)	-	-1599	5000	3401
Cash Outflows	-	-	-5000	-5000
Closing balance	6716	3248	0	9964

Table 12 - Reconciliation of the LRC for Year 1

7. CONCLUSION

The internship was done in the company KPMG, specifically in the Financial Services – Insurance in projects of support and implementation of the accounting standard IFRS 17. It is a product of a challenging experience, mainly because of the circumstances in which took place due to the pandemics.

IFRS 17 is both a crucial accounting standard and a challenge for insurance companies. Through the standard's requirements, stakeholders can understand companies' risk exposure, and their performance. The basis of the standard is more transparency and comparability for an insurance company's stakeholders and to reduce a gap between the insurance standards worldwide.

One of the main internship's assignments was the development of position papers, where these papers aggregated the requirements for the implementation of a subject of the standard and served as a guide for the introduction of the subject to the entities. Research to find a solution for the computation of the illiquidity premium was another assignment, as the research's results are shown in this report. During the internship, this was a discussing matter in a scenario of implementation in a smaller company with fewer resources.

The computation of the illiquidity premium is one of the subjects positioned for further research to find what other possibilities exist under IFRS 17 requirements and if the options shown in Chapter 4 are valid. Another issue for future research is the modelling or computation of liquidity risk under credit default swaps, under non-complex models. Other future challenges concern the benchmark rates such as EURIBOR, which apply under Solvency II, or Euro Overnight Index Average (EONIA), where current reforms are in effect for these rates. EONIA will be discontinued at the beginning of 2022, and a new rate will replace it, named Euro Short-Term Rate (€STR). Further research may conclude if these new rates will be an option under IFRS 17 measurement requirements.

To conclude, as the main goals of the IFRS 17 standard are the increase of transparency and comparability, the standard is crucial for the insurance business sector. In present times, stakeholders look to obtain more information and understand better the

insurance companies' performance, and for the future, it is expected that this demand for quality information will continue to grow.

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APPENDICES

Appendix 1: Moody's Analytics approach for the computation of credit risk adjustment and illiquidity premium

Moody's Analytics is an entity that identifies as a financial intelligence and analytical tools provider. They develop software for the measurement of insurance contracts under IFRS 17. The demonstration is shown in (Thompson & Jessop).

This approach is not used as a reference here because they present advantages that the existing competition does not. However, they have divulged how they compute the credit risk adjustment and the illiquidity premium within their software. Therefore, this is of interest to use as a reference to understand how current software calculates the illiquidity premium and credit risk adjustment.

This method applies a top-down approach, where the yield curve used as a reference portfolio is constructed from the market yield of corporate bonds. Subsequently, the software computes the expected and unexpected credit losses through a Merton-style model. It is a Merton-style model in that it calculates the firm's credit risk by considering a call option on the firm's assets where its strike price is the default point in a scenario where the firm's assets cannot cover liabilities. As the value of the firm's assets values under a Geometric Brownian Motion, the probability of default can be calculated for a given horizon, considering the firm's leverage, the expected return on the firm's assets, and the asset volatility factors within the computation.

The following equation computes the expected credit loss spread for a given bond, or in other words, the compensation for expected credit loss of that bond:

(12) $Expected\ credit\ loss\ spread = -\frac{1}{T}\ln\left(1 - CPD \cdot LGD\right)$

The CPD is the duration-matched cumulative probability of default for the respective bond, and the LGD is the loss given default of the issuer's sector.

To compute the unexpected credit loss, it adjusts the probability of default to account for the credit risk premium. The latter is calculated based on a cost-of-capital approach (this approach assumes there is a relation between the expected return in the firm's assets and the leverage weighted cost of capital for that firm):

(13) $Cost\ of\ Capital = Leverage \cdot Cost\ of\ debt + (1 - Leverage) \cdot Cost\ of\ Equity$

The corporate bond spread determines the cost of debt, whereas the cost of equity is the equity risk premium.

As the cost of capital is estimated at a portfolio level to quickly determine an average equity risk premium, a portfolio beta is used to obtain for a specific issuer. The portfolio betas for the overall market portfolio and a given issuer are estimated using implied returns. Therefore, the following equation computes the credit risk premium as:

(14) $$Credit\ Risk\ Premium = \frac{Portfolio\ Weighted\ Cost\ of\ Capital\ \cdot Issuer\ Market\ Implied\ Return}{Portfolio\ Market\ Implied\ Return}$$

As the unexpected credit loss is due to the credit risk premium, the total credit risk adjustment is equal to:

(15) $Credit\ Risk\ Adjustment = Expected\ Credit\ Loss + Credit\ Risk\ Premium$

In addition, the illiquidity premium can be obtained through the following equation, backing the IFRS 17 requirements of being an adjustment to reflect the liquidity characteristics of insurance contracts. Furthermore, it supports in the same aspect since it retrieves from the market yield of corporate bonds (reference portfolio) what is not relevant to the insurance contracts:

(16) $Illiquidity\ premium = Market\ spread - Total\ Credit\ Adjustment$

Appendix 2: Computations for the changes related to current service in the example of the measurement of a profitable group of contracts

(17) $Changes\ related\ to\ current\ service\ Year\ 1 = (21523 + 1076) \times 22\% = 4972$

(18) $Changes\ related\ to\ current\ service\ Year\ 2 = (17627 + 881) \times 26{,}9\% = 4979$

(19) $Changes\ related\ to\ current\ service\ Year\ 3 = (13529 + 676) \times 35\% = 4972$

(20) $Changes\ related\ to\ current\ service\ Year\ 4 = (9233 + 462) \times 51{,}2\% = 4964$

(21) $Changes\ related\ to\ current\ service\ Year\ 5 = (4731 + 237) \times 100\% = 4968$

Appendix 3: Computations for Year 2 and 3 of the measurement of the Loss Component for an onerous group of contracts

Year 2:

Year 2

Interest Accretion for Future Cash Flows	$9297 \times 5\% = 465$
Interest Accretion for Loss Component	$3248 \times 5\% = 117$
Interest Accretion for Liability for Remaining Coverage, excluding Loss Component	$465 - 117 = 348$

Table 13 - Interest accretion for Year 2

Considering the remainder of annual payment claims, the proportion of the loss component release is equal to:

(22) $Loss\ released = \frac{5000}{10000} = 50\%$

The allocation of the changes concerning the loss component is:

(23) $LRC_{LC} = Insurance\ Contract\ Liability \times (1 + Interest\ Rate) \times Loss\ released = 3248 \times 1{,}05 \times 50\% = 1705$

With the remainder of the changes being allocated to the LRC, excluding the Loss Component:

(24) $LRC_{\setminus LC} = LRC - LRC_{LC} = 5333 - 1705 = 3628$

Considering the computations, the reconciliation of the LRC for Year 2 is:

Reconciliation of Liability for Remaining Coverage (LRC)	LRC, excluding Loss Component	Loss Component of LRC	Liability for Incurred Claims	Insurance Contract Liability
Opening balance	6716	3248	0	9964
Cash inflows	-	-	-	-
Insurance Service Expenses (Loss Component)	-	-	-	-
Insurance Finance Expenses	348	117	-	465
Insurance Revenue	-3628	-	-	-3628
Insurance Service Expenses (Incurred Expenses)	-	-1705	5000	3295
Cash Outflows	-	-	-5000	-5000
Closing balance	3436	1660	0	5096

Table 14 – Reconciliation of LRC for Year 2

Year 3:

Year 3

Interest Accretion for Future Cash Flows	$4762 \times 5\% = 238$
Interest Accretion for Loss Component	$1660 \times 5\% = 83$
Interest Accretion for Liability for Remaining Coverage, excluding Loss Component	$238 - 83 = 155$

Table 15 - Interest Accretion for Year 3

As it is the final year of the coverage period, it is released the remainder of the loss component:

(25) $Loss\ released = \frac{5000}{5000} = 100\%$

Therefore, the allocation of the changes concerning the loss component is:

(26) $LRC_{LC} = Insurance\ Contract\ Liability \times (1 + Interest\ Rate) \times Loss\ released = 1660 \times 1{,}05 \times 100\% = 1743$

With the remainder of the changes being allocated to the LRC, excluding the Loss Component:

(27) $LRC_{\setminus LC} = LRC - LRC_{LC} = 5333 - 1743 = 3590$

In conclusion, the table below shows the reconciliation of the LRC for Year 3, wherewith the closing balance as 0; it defines the end of the coverage period of the group of insurance contracts.

Reconciliation of Liability for Remaining Coverage (LRC)	LRC, excluding Loss Component	Loss Component of LRC	Liability for Incurred Claims	Insurance Contract Liability
Opening balance	3436	1660	0	5096
Cash inflows	-	-	-	-
Insurance Service Expenses (Loss Component)	-	-	-	-
Insurance Finance Expenses	155	83	-	238
Insurance Revenue	-3590	-	-	-3590
Insurance Service Expenses (Incurred Expenses)	-	-1743	5000	3257
Cash Outflows	-	-	-5000	-5000
Closing balance	0	0	0	0

Table 16 – Reconciliation of the LRC for Year 3